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Minerals Yearbook

CENTENNIAL EDITION 1981

Volume III

AREA REPORTS: INTERNATIONAL

Prepared by staff of the

BUREAU OF MINES

UNITED STATES DEPARTMENT OF THE INTERIOR • James G. Watt, Secretary

BUREAU OF MINES • Robert C. Horton, Director

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water, energy and minerals, fish and wildlife, and park and recreation areas, and for the wise use of all those resources. The Department also has a major responsibility for American Indian reservation communities and for the people who live in Island Territories under U.S. administration.

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Foreword

This edition of the Minerals Yearbook marks the centennial of the first annual publication of comprehensive mineral industry statistics by the Federal Government. The need for complete, reliable mineral statistics on a regular basis was recognized in 1880, when Clarence King, then Director of the United States Geological Survey, stated in his annual report:

"As a whole it is true, and can never be refuted, that the Federal Government alone can successfully prosecute the noble work of investigating and making known the natural mineral wealth of the country, current modes of mining and metallurgy, and the industrial statistics of production."

In response to this suggestion the Forty-seventh Congress, in an appropriations act of August 7, 1882 (22 Stat. 329), placed collection of mineral statistics on an annual basis, stating in the act that "...not to exceed ten thousand dollars of the amount appropriated in this paragraph may be applied under the direction of the Secretary of the Interior to the procuring of statistics in relation to mines and mining other than gold and silver..."

Data on minerals production for 1882, collected under this appropriation, along with census data for 1880 and such data as were available for 1881, were published in a report entitled "Mineral Resources of the United States." That volume began the annual series that has continued unbroken to the present.

"Mineral Resources of the United States" was compiled and published by the Geological Survey from the initial volume through the volume covering 1923. Beginning with the 1924 edition, compilation and publication of this report became the responsibility of the Bureau of Mines, then part of the Department of Commerce. The title "Mineral Resources of the United States" continued in use through the 1931 edition, when after a half century of publication, the title was changed to the current "Minerals Yearbook."

The first "Minerals Yearbook" covered the period 1932-33 and had a statistical appendix. Before the edition was completed, however, the Bureau of Mines was transferred to the Department of the Interior; therefore, the statistical appendix bears the seal of the Department of the Interior, rather than that of the Commerce Department.

Throughout a century of publication, the content, format, and length of these volumes have changed in response to user requirements and a changing industry. Initially a single volume of some 800 pages, the Yearbook became a two-part report "Metals" and "Nonmetals" in 1907 and continued in that format through the 1931 edition. From the combined 1932-33 edition through that of 1951, it returned to single-volume format, although the editions of 1932-33, 1934, and 1935 each had a statistical appendix. Beginning with the 1952 edition, the multivolume format of commodity and geographic area coverage was instituted, continuing through this edition as follows:

1952-62 - Volume I, Metals and Minerals
Volume II, Fuels
Volume III, Area Reports

1963-65 - Volume I, Metals and Minerals
Volume II, Fuels
Volume III, Area Reports, Domestic
Volume IV, Area Reports, International

1966-69 - Volume I—II, Metals, Minerals, and Fuels
Volume III, Area Reports, Domestic
Volume IV, Area Reports, International

1970-76 - **Volume I, Metals, Minerals, and Fuels**
Volume II, Area Reports, Domestic
Volume III, Area Reports, International
1977-81 - **Volume I, Metals and Minerals**
Volume II, Area Reports, Domestic
Volume III, Area Reports, International

Commodity coverage has also changed thoughout the period. Some minerals that were given substantial space in the early volumes no longer have separate chapters, and new mineral commodities have been added. The 1882 edition contained 48 commodity or commodity group chapters whereas this edition contains 71. Data on the mineral fuels, included in the Yearbook from its onset, were deleted beginning with the 1977 edition, when responsibilities for those commodities were transferred to the new Department of Energy.

As we move into the second century of publication, our philosophy remains to publish a viable document responsive to the needs of its varied user community. To this end we continue to invite constructive comments and suggestions from our readers.

Robert C. Horton, *Director*

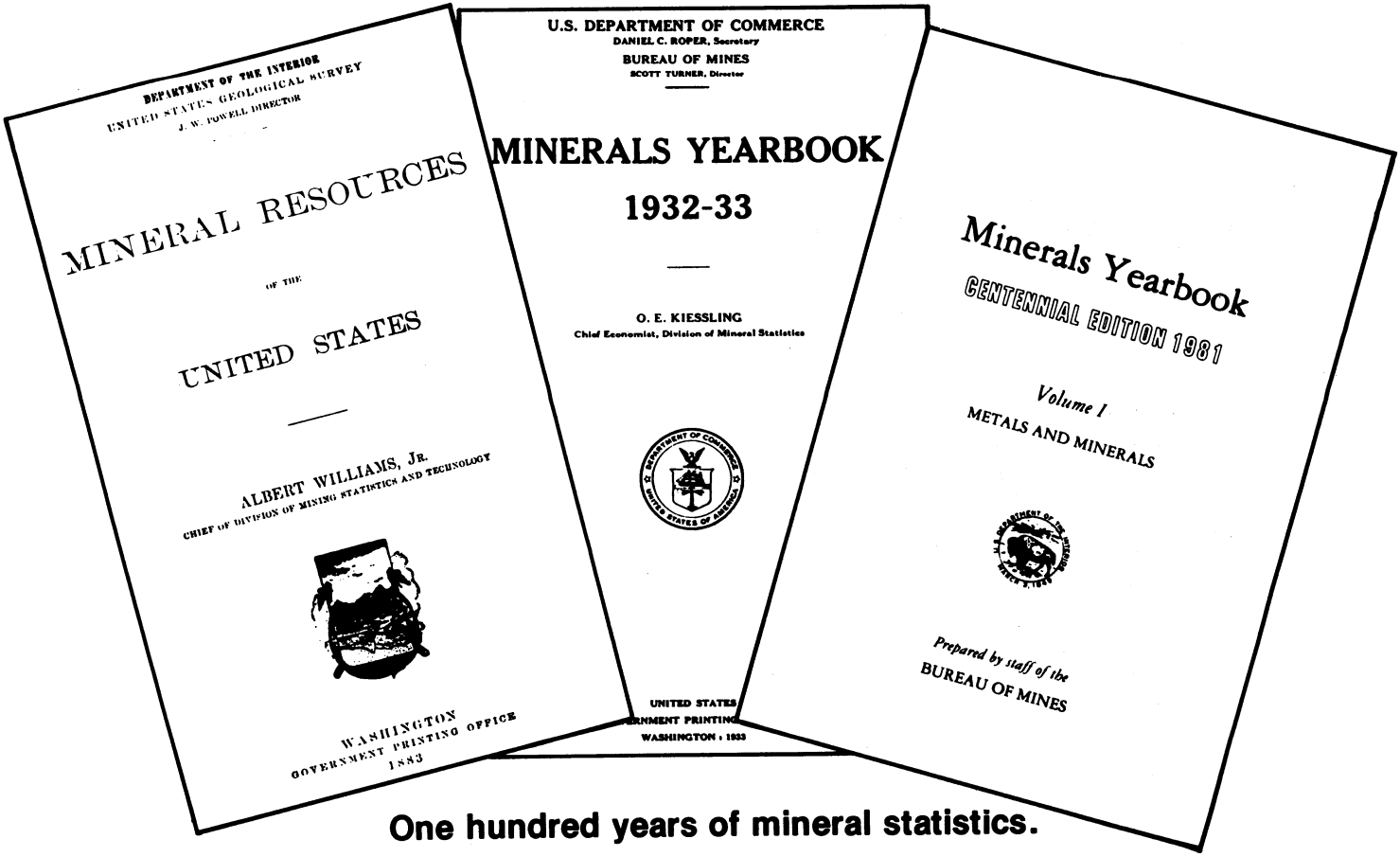
Acknowledgments

In preparing volume III, the Bureau of Mines utilized extensively statistical and other data on mineral production, consumption, and trade provided by various foreign government mineral and statistical agencies through a variety of official publications. The cooperation and assistance of these organizations is gratefully acknowledged: Statistical and informational material was also obtained from airgrams of the U.S. Department of State, from United Nations publications, and from the domestic and foreign technical and trade press. Of particular assistance were the routine and special reports submitted by the minerals, petroleum, economic, and commercial officers and other members of the Department of State. Their contributions are sincerely appreciated.

The text and tables of this volume were prepared by the staff of the Division of Foreign Data, Assistant Directorate, Minerals Information. Final correlation and checking of this volume was performed by the Division of Publication.

The regimes of some countries reviewed in this volume are not recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not construed as conflicting with or being contradictory of U.S. policies toward these countries.

Albert E. Schreck, *Chief, Division of Publication*



One hundred years of mineral statistics.

Contents

Minerals in the World Economy

By Charles L. Kimbell[1] and John Panulas[2]

For the world mineral industry as a whole, the year 1981 was a period of continuation and, in some instances, an acceleration of negative trends extending back into 1980. Most available statistical data reflected stagnation or downturns in activity. Levels of production, trade, and consumption declined for a substantial number of leading mineral commodities, including, most notably, steel and petroleum. Investment, if not lower than in 1980, was evidently increasing at a more modest rate. Prices for major mineral commodities were generally lower, at least in terms of constant dollars, and in some cases even in terms of current dollars. Prospects of a major reversal of these patterns seemed dim. The mineral industry, however, was far from alone in this general downturn; most other elements of the national economies of the world's nations fared little better. General conditions of inflation, recession, and reduced industrial product consumption were reflected in most other sectors of the total economy.

International political events continued to influence mineral output and flow but had less influence on overall levels of activities than on the geographic distribution of these activities. The Iran-Iraq war certainly played a role in reducing mineral industry activities in those nations, but the commodity most affected, petroleum, was available from other sources in sufficient quantity that, in the face of reduced demand, a substantial surplus developed.

In the lands of the eastern Mediterranean, continued internal and international disturbances certainly had an adverse effect on the mineral industries as well as on the general economics of Israel, Syria, Lebanon, and Jordan. However, the relatively small contribution of these nations to world mineral supplies made the impact of these problems minimal on a global basis to the mineral industry.

Similarly, the Soviet incursion into Afghanistan had little impact on world mineral supplies, but that nation's meager mineral output was adversely affected. Of considerably greater world significance were cutbacks in mineral industry activities in Poland as a result of continued worker dissatisfaction and governmental efforts at suppression.

In Africa, problems continued between Angola and the Republic of South Africa in the Namibian area, and the resolution of the political status of Zimbabwe (formerly Southern Rhodesia) did not solve all the problems of that state.

In the Western Hemisphere, continued guerrilla warfare in several Central American Republics curtailed mineral industry activities there.

Efforts continued through the United Nations to achieve international agreement on a Law of the Sea treaty, but there seemed little prospect of agreement by member nations. Moreover, the need for seabed mining, at least in the immediate future, seemed a questionable matter, viewing the developed but unused onshore capacity for the principal minerals available from seabed deposits—manganese, nickel, copper, and cobalt.

PRODUCTION

The estimated value of world crude mineral production in 1981 was $552,200 million in terms of 1978 dollars, an amount approximately equal to the 1980 value, reflecting a stagnation in growth during the year. The output value level for 1980 and 1981 was approximately 2.5% below the historical peak of $566,500 million achieved in 1979. The following table summarizes approximate data on the value of world mineral production for selected years:

Year	Billion constant 1978 dollars	
	Value of 53[1] major crude mineral commodities[2]	Value of all crude mineral commodities[3]
1950	67.8	77.2
1953	88.5	101.7
1958	113.6	136.5
1963	125.7	154.0
1968	145.6	176.5
1973	234.0	281.6
1978	478.9	539.7
1979[r]	502.7	566.5
1980[r]	489.9	552.2
1981	489.9	552.2

[r]Revised.
[1]The list of commodities included appears in table 3 of this chapter; one commodity covered in 1950-68 (beryl) is excluded from the 1973-81 figures, but the overall impact of this omission is regarded as insignificant.
[2]Data for all years except 1979, 1980, and 1981 are as reported in Annales des Mines, November-December 1980, p. 173; data for 1979, 1980, and 1981 are extrapolated from the 1978 Annales des Mines figures on the basis of the United Nations index of extractive industry production in the United Nations Monthly Bulletin of Statistics, August 1982, p. xiv.
[3]Data extrapolated from values for 53 commodities to compensate for other mineral products. For details on the basis for this extrapolation, see accompanying text under "Value of World Mineral Production."

The foregoing data, however, do not completely portray the role of the mineral industry in the world economy, in that they represent only the value for crude mine output (raw materials from mines, quarries, and wells), rather than the considerably enhanced value that results from beneficiation, smelting, refining, and other equivalent downstream processing. If the value added through such processing were included, a 1981 figure on the order of $1,300,000 million (1978 dollars) could be regarded as a conservative estimate of the value of output of mineral industry plants operating from primary materials only. An additional unestimated increment should also be considered for the value of those processed materials recovered from secondary sources—scrap and other reclaimed materials.

It should be stressed that crude and processed mineral commodities constitute not only the overwhelmingly dominant share of the total raw material base for all manufacturing operations but also, in the form of fertilizers, a significant requirement for the agricultural sector and the only significant source of energy for all sectors of the economy of the world as a whole.

PRODUCTION INDEX PATTERNS

The following tabulation summarizes the growth in world mineral industry output as reflected by the United Nations indexes for extractive mineral industry components:

Year	Index numbers (1975=100)			
	Coal	Crude petroleum and natural gas	Metals	Extractive industry total
Annual averages:				
1978	101.1	116.2	101.4	112.7
1979	106.2	122.0	103.8	118.3
1980	109.4	117.1	105.5	115.3
1981	108.5	117.6	103.6	115.3
Quarterly results:				
1980:				
1st quarter	108.9	123.8	106.8	120.0
2d quarter	110.7	117.6	108.2	116.3
3d quarter	106.8	115.9	102.1	113.6
4th quarter	111.3	111.0	105.1	111.3
1981:				
1st quarter	112.6	118.5	102.0	116.3
2d quarter	99.8	123.5	105.4	118.7
3d quarter	108.7	118.7	103.1	115.9
4th quarter	113.0	109.8	104.0	110.4

Source: United Nations. Monthly Bulletin of Statistics. V. 36, No. 8, August 1982, p. xiv.

The pattern of change in the index for the overall extractive industry across the quarters of 1981 is notable. The first quarter of 1981 was significantly above the last quarter of 1980, and growth continued, on a more limited scale, into the second quarter, but thereafter, there was a substantial downturn. This overall trend was mirrored in the trends for petroleum and natural gas and that for metals, but in contrast, the pattern for coal was such that after a good first quarter, there was a sharp downturn in the second quarter and gradual improvement thereafter.

Comparison of the world extractive industry indexes in the foregoing tabulation with indexes for the processing sectors of the mineral industry that are presented in the following tabulation reflects the same general pattern: A general upturn in the first half year followed by a substantial downturn in the last half year but, in the case of the processed materials, fourth quarter indexes for both the chemicals and petroleum group and basic metals group were significantly below the first quarter levels:

	Index numbers (1975=100)		
	Nonmetallic mineral products	Chemicals, petroleum, coal, and rubber products	Base metals
Annual averages:			
1978	117.4	125.5	115.2
1979	121.9	131.8	120.3
1980	122.5	130.8	117.3
1981	121.3	131.2	116.5
Quarterly results:			
1980:			
1st quarter	120.9	134.4	123.2
2d quarter	126.5	132.8	121.2
3d quarter	121.3	125.8	109.6
4th quarter	121.3	130.1	115.1
1981:			
1st quarter	117.6	133.4	119.5
2d quarter	127.1	135.3	120.5
3d quarter	121.9	128.3	113.1
4th quarter	118.5	127.6	113.0

Source: United Nations. Monthly Bulletin of Statistics. V. 36, No. 8, August 1982, p. xv.

For details on differences in mineral index growth patterns for various geographic areas, see the source publication for the foregoing tabulations.

QUANTITATIVE COMMODITY OUTPUT

Total world production of 95 distinct mineral commodities and/or specific forms of mineral commodities is given in table 1 for 1977-81. Of these commodities, only 38 registered gains in 1981 relative to their 1980 level, and 56 recorded declines (1 commodity registered no change). The overall results were much poorer than those for 1979-80, when 54 registered gains and 41 recorded declines. It is also noteworthy that of the 56 commodities for which declines were noted between 1980 and 1981, 26 had also recorded declines between 1979 and 1980; in contrast, of the 38 commodities registering gains between 1980 and 1981, only 24 had done so between 1979 and 1980 as well.

Of the 50 metallic commodities listed, 16 were produced in greater quantities in 1981 than in 1980; 34 showed production declines, including all stages of iron production (ore, pig iron, ferroalloys, and crude steel), all stages of aluminum production (bauxite, alumina, primary aluminum ingot), and most forms of the other major nonferrous metals (copper, lead, nickel, and zinc).

Among the 34 listed nonmetals, 16 showed increases, 17 showed declines, and 1 was unchanged. Notable among those showing increases were cement, phosphate rock, nitrogen (in ammonia), potash, barite, and fluorspar, while significant among commodities showing declines were sulfur, salt, diamond, and asbestos.

Of the 11 fuel mineral commodities listed (excluding uranium, which is listed under metals), 6 showed increases between 1980 and 1981, while 5 registered declines. The continued decline of crude oil and growth in coal and marketed natural gas were notable.

No viable means exist to sum up the overall performance of the nonfuel mineral industry except on a value basis, and for these commodities, exactitudes on value are not available for 1979-81. Among the fuel commodities, however, the overall pattern of output change can be demonstrated by United Nations data in which all fuels are reduced to a common energy equivalent basis. The following tabulation summarizes world energy commodity output for 1976-80 on this basis; corresponding data for 1981 were not available in time for inclusion here:

Year	Million metric tons of standard coal equivalent[1]				
	Coal	Crude petroleum and natural gas liquids	Natural gas	Hydro and nuclear electricity	Total[2]
1976	2,393	4,309	1,639	231	8,573
1977	2,447	4,482	1,681	249	8,859
1978	2,476	4,526	1,758	274	9,034
1979	2,614	4,715	1,854	288	9,470
1980	2,654	4,506	1,878	300	9,338

[1]Virtually all figures are revised from those published in the 1980 edition of this chapter owing to revisions made by the source agency.
[2]Detail may not add to totals shown because of independent rounding.

Source: United Nations. Yearbook of World Energy Statistics. New York, 1982, p. 2.

Table 1.—World production of major mineral commodities[1]

Commodity	1977	1978	1979[p]	1980[p]	1981[e]
METALS					
Aluminum:					
Bauxite, gross weight[2] thousand metric tons	83,511	81,390	89,357	87,552	87,543
Alumina, gross weight do	29,745	29,736	31,444	33,249	32,335
Unalloyed ingot metal do	13,779	14,135	14,570	15,427	15,071
Antimony, mine output, metal content metric tons	67,676	62,289	64,758	65,070	59,190
Arsenic, white[3 4] do	30,648	30,754	31,422	28,727	28,712
Beryl concentrate, gross weight[3 4] do	2,580	2,620	2,399	2,510	2,634
Bismuth[3] do	4,478	4,269	3,435	3,249	3,247
Cadmium metal, smelter do	18,288	17,446	18,883	18,130	17,721
Chromite, gross weight[4] thousand metric tons	9,448	9,262	9,685	9,749	9,276

See footnotes at end of table.

Table 1.—World production of major mineral commodities[1] —Continued

Commodity	1977	1978	1979[p]	1980[p]	1981[e]
METALS —Continued					
Cobalt:					
Mine output, metal content ___ metric tons__	23,450	27,008	29,749	30,607	31,252
Metal, refined _____do____	20,762	24,780	28,242	30,143	28,374
Columbium-tantalum concentrates[4 5] ___do____	21,606	23,588	35,193	36,773	38,536
Copper:					
Mine output, metal content thousand metric tons__	7,739	7,628	7,674	7.656	8,153
Metal:					
Smelter:					
Primary[6] _____do____	7,612	7,522	7,508	7,423	7,792
Secondary[7] _____do____	525	496	538	516	533
Refined:					
Primary[6] _____do____	7,515	7,592	7,614	7,638	7,900
Secondary[7] _____do____	1,135	1,200	1,289	1,333	1,284
Gold, mine output, metal content thousand troy ounces__	38,906	38,983	38,769	39,141	40,785
Iron and steel:					
Iron ore, gross weight thousand metric tons__	841,102	847,278	904,272	895,872	860,781
Metal:					
Pig iron _____do____	487,538	508,396	530,161	510,322	501,220
Ferroalloys _____do____	13,467	14,095	16,017	15,794	14,992
Steel, crude _____do____	672,794	714,109	745,014	714,387	704,337
Lead:					
Mine output, metal content _____do____	3,345	3,373	3,401	3,428	3,353
Metal:					
Smelter:					
Primary[6] _____do____	3,190	3,224	3,299	3,205	3,159
Secondary _____do____	1,950	1,961	2,071	1,929	1,822
Refined:					
Primary _____do____	3,212	3,280	3,325	3,225	3,216
Secondary _____do____	2,208	2,218	2,370	2,198	2,093
Magnesium metal, smelter, primary[8] metric tons__	257,236	288,240	307,400	317,146	297,663
Manganese ore, gross weight thousand metric tons__	22,870	22,586	26,225	26,390	23,573
Mercury, mine output, metal content 76-pound flasks__	190,736	181,434	174,735	203,925	206,604
Molybdenum, mine output, metal content metric tons__	95,122	100,113	103,968	109,654	109,038
Monazite concentrate (source of rare-earth metals and thorium)_____do____	16,631	22,388	22,488	19,829	19,910
Nickel:					
Mine output, metal content thousand metric tons__	828	656	679	745	700
Metal, smelter _____do____	714	603	642	730	691
Platinum-group metals, mine output thousand troy ounces__	6,511	6,440	6,486	6,836	6,823
Selenium metal, smelter[4 5] _____ metric tons__	1,384	1,421	1,620	1,369	1,340
Silver, mine output, metal content thousand troy ounces__	331,270	345,428	344,630	339,800	364,912
Tellurium metal, smelter[4 5] _____ metric tons__	131	137	147	146	127
Tin:					
Mine output, metal content _____do____	230,694	241,082	245,948	246,493	242,509
Metal, smelter _____do____	228,451	244,108	249,167	250,099	242,097
Titanium concentrates, gross weight:					
Ilmenite[4 9] _____ thousand metric tons__	3,314	3,515	3,556	3,645	3,609
Rutile[3 4] _____do____	363	323	376	417	361
Titaniferous slag _____do____	694	941	764	1,219	1,132
Tungsten, mine output, metal content metric tons__	41,069	46,603	48,665	51,736	49,147
Uranium oxide, mine output, U_3O_8 content[4 5] do____	33,509	40,323	44,142	51,798	49,576
Vanadium, mine output, metal content __do____	30,595	32,129	35,968	36,810	37,769
Zinc:					
Mine output, metal content thousand metric tons__	5,920	5,846	5,867	5,775	5,841
Metal, smelter:					
Primary[6] _____do____	5,589	5,676	6,029	5,809	5,855
Secondary[7] _____do____	223	208	240	248	285
Zirconium concentrate[3] _____do____	505	525	629	676	634
NONMETALS					
Asbestos _____do____	4,793	4,693	4,885	4,887	4,726
Barite _____do____	5,928	6,811	7,068	7,320	7,906
Boron minerals _____do____	2,732	3,206	2,757	2,804	2,950
Bromine[4] _____do____	350	361	403	345	345
Cement, hydraulic _____do____	797,084	852,987	870,337	884,347	888,061
Clays:[4]					
Bentonite[5] _____do____	5,379	6,010	6,201	6,050	6,506
Fuller's earth[5] _____do____	1,673	1,731	1,833	1,761	1,813

See footnotes at end of table.

Table 1.—World production of major mineral commodities[1] —Continued

Commodity	1977	1978	1979[p]	1980[p]	1981[e]
NONMETALS —Continued					
Clays[4] —Continued					
Kaolin thousand metric tons	22,641	21,946	23,932	23,533	23,239
Corundum, natural metric tons	14,695	17,217	26,366	29,121	29,434
Diamond:[4]					
Gem[e] thousand carats	9,281	9,461	10,220	10,281	10,097
Industrial[e] do.	30,378	30,162	29,180	31,826	29,024
Total do.	39,659	39,623	39,400	42,107	39,121
Diatomite[4] thousand metric tons	1,468	1,471	1,519	1,492	1,486
Feldspar[4] do.	2,939	3,086	3,186	3,157	3,124
Fluorspar do.	4,382	4,660	4,623	4,931	4,996
Graphite[3] metric tons	493,441	528,445	621,264	592,971	594,467
Gypsum thousand metric tons	74,511	78,651	81,306	78,227	78,307
Iodine metric tons	10,326	10,378	11,134	11,576	12,025
Lime[4] thousand metric tons	116,522	119,828	119,369	118,641	116,943
Magnesite[3] do.	9,960	10,232	10,767	11,330	11,531
Mica[4] do.	340	363	357	332	350
Nitrogen: N content of ammonia[10] do.	66,118	65,883	69,762	71,322	71,466
Perlite do.	1,360	1,428	1,506	1,477	1,438
Phosphate rock and guano do.	119,322	128,647	132,923	138,362	138,660
Potash, marketable, K_2O equivalent do.	25,252	26,113	25,677	27,673	27,357
Pumice[4 5] do.	13,948	14,197	13,414	12,720	12,777
Salt do.	161,576	171,423	173,513	168,635	166,027
Sodium compounds, n.e.s.:[4]					
Sodium carbonate do.	26,443	27,332	28,199	28,524	28,317
Sodium sulfate do.	4,125	4,292	4,426	4,455	4,454
Strontium minerals[4 5] metric tons	95,312	92,620	97,391	85,783	84,971
Sulfur, elemental basis:					
Elemental[11] thousand metric tons	16,476	17,042	17,454	18,135	17,639
From pyrite do.	9,675	9,801	9,987	10,297	10,260
Byproduct[12] do.	26,232	26,844	27,304	28,203	27,770
Total do.	52,383	53,687	54,745	56,635	55,669
Talc, soapstone, pyrophyllite do.	6,094	6,396	6,847	6,738	6,615
Vermiculite[4 5] metric tons	520,364	542,146	540,179	533,292	522,425
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[4 5] thousand metric tons	3,653	3,991	4,148	4,186	4,174
Coal:					
Anthracite million metric tons	219	228	229	225	228
Bituminous do.	2,364	2,408	2,558	2,615	2,621
Lignite do.	907	924	943	962	998
Total do.	3,490	3,560	3,730	3,802	3,847
Coke:[13]					
Metallurgical thousand metric tons	352,877	355,853	369,848	368,799	362,335
Other do.	17,143	12,965	12,631	12,760	12,465
Gas, natural, marketed billion cubic feet	49,687	51,484	54,724	55,295	56,631
Natural gas liquids[4] million 42-gallon barrels	1,074	1,086	1,143	1,115	1,219
Peat[14] thousand metric tons	202,635	203,553	202,640	203,854	204,079
Petroleum:					
Crude million 42-gallon barrels	21,895	22,097	22,909	21,912	20,814
Refined do.	22,227	22,675	23,157	22,380	21,380

[e]Estimated. [p]Preliminary.

[1]Incorporates numerous revisions from the table corresponding to this table in previous editions of this chapter. Figures generally conform to those published in appropriate commodity chapters of volume I of the Minerals Yearbook, 1981 edition.

[2]Includes bauxite equivalent of nepheline syenite and alunite produced in the U.S.S.R. (the only producer on record of such materials as a source of aluminum).

[3]Excludes data for the United States (withheld to avoid disclosing company proprietary data).

[4]Excludes data for China (no adequate basis for estimation available).

[5]Excludes data for the U.S.S.R. (no adequate basis for estimation available).

[6]Includes all metal clearly identified as primary as well as all metal that cannot be subdivided clearly between primary and secondary (see footnote 7).

[7]Includes only that metal that is clearly identified as secondary. Some countries do not distinguish between primary and secondary, and for some of these, no basis is available for estimating the breakdown of total production. For such countries, the total has been included under primary (see footnote 6).

[8]Excludes data for the United States (withheld to avoid disclosing company proprietary data), which in previous years accounted for approximately 50% of the world total.

[9]Includes leucoxene.

[10]Data are for years ending June 30 of that stated.

[11]Comprises sulfur produced by the Frasch process plus sulfur mined in the elemental state from ores.

[12]Comprises sulfur recovered from coal gasification, metallurgical operations (except pyrite processing), natural gas, petroleum, tar sands, spent oxides, and gypsum, whether recovered in the elemental state or as a sulfur compound.

[13]Production of coke other than metallurgical by China and the U.S.S.R. is included with metallurgical coke production.

[14]Of which fuel peat, as follows, in thousand metric tons (balance for agricultural use): 1977—66,377; 1978—67,140; 1979—65,785; 1980—66,958; and 1981—67,196.

VALUE OF WORLD MINERAL PRODUCTION

The value of world crude mineral output in 1981 was estimated at $552.2 billion constant 1978 dollars as shown in a foregoing tabulation. Details on the methodology employed to prepare this estimate are summarized in the 1980 edition of this chapter, to which the reader is referred.

GEOGRAPHIC DISTRIBUTION OF WORLD MINERAL OUTPUT VALUE

Available information is inadequate to extrapolate to 1980 the 1978 data on geographic distribution of world crude mineral output published in Annales des Mines in the November-December 1980 edition of that publication. A summary of the 1978 distribution, together with comparable figures for 1973 and 1950 and additional textual comments on regional distribution of these values, was included in the 1980 edition of this chapter, and the reader is referred to this publication as well as to the original source for further detail.

COMMODITY DISTRIBUTION OF WORLD MINERAL OUTPUT VALUE

As in the case of geographic distribution of world crude mineral output value, the inadequacy of data precludes any reliable extrapolation of the various commodities' shares of the totals shown in the preceding edition of this chapter and in the source publication, Annales des Mines. The reader should refer to these publications for the data for 1978 and prior years.

TRADE

In 1980, the aggregate value of total world trade in mineral commodities reached an estimated $793,900 million (current dollars), a 36.3% increase in the previous high set in 1979. Comparable data for 1981 were not available in time for inclusion in this chapter, but available partial figures clearly suggested a continued increase, at least in terms of current dollars, despite some declines in volume of materials shipped. This current dollar value increase, of course, would be in large measure due to continued inflation, at or near the double-digit level, in a number of countries, but would also be the result of advancing prices, in terms of constant dollars, for some goods. The following tabulation summarizes the growth pattern in mineral commodity trade value for 1976-80, as well as the share of that trade in total commodity trade:

Year	Estimated value of all mineral commodities traded (millions)	Change from previous year (percent)	Mineral commodities' share of all commodities traded (percent)
1976	$353,200	+13.1	35.7
1977	r387,400	r+9.7	r34.4
1978	r407,300	r+5.1	r31.4
1979	r582,600	r+43.0	r35.6
1980	793,900	+36.3	39.8

rRevised.

Table 2, which serves as the basis for the estimates of total mineral commodity trade that appear in the foregoing tabulation, provides reported data on the value of trade in major mineral commodity groups and total commodity trade for 1976-80. Table 3 shows the percentage share of major mineral commodity groups in the aggregate for these commodities for 1976-80, and table 4 provides individual growth (or decline) rates for each of the major mineral commodity groups as well as for total commodity trade for the same 5 years.

Major mineral commodity trade by region (such as tables 8-10 in the 1976 edition of this chapter depicted) may be obtained for more recent years directly from the United Nations Monthly Bulletin of Statistics for May 1982.

CONSUMPTION

NONFUEL MINERAL COMMODITIES

As in 1980, virtually worldwide cutbacks in general industrial production were reflected in consumption data for metallic commodities in 1981. The following tabulation, which provides summary data on estimated world use of seven prominent nonferrous metals for recent years, illustrates this downturn:

Commodity	Thousand metric tons				
	1977	1978	1979	1980	1981[p]
Aluminum, primary refined	14,511	[r]15,325	[r]15,973	[r]15,352	14,685
Cadmium	16	[r]17	18	17	16
Copper, refined[1]	[r]9,056	[r]9,520	[r]9,826	[r]9,351	9,478
Lead, refined[1]	[r]5,404	[r]5,461	[r]5,571	[r]5,296	5,184
Nickel[2]	642	697	[r]774	[r]717	654
Tin, refined[1]	231	231	232	224	[e]218
Zinc, slab[1]	[r]5,818	[r]6,147	[r]6,328	[r]6,125	5,945

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Primary and secondary combined.
[2]Nickel content of refined nickel, ferronickel, and nickel oxide.

Source: World Bureau of Metal Statistics. World Metal Statistics. V. 34, No. 9, London, Aug. 20, 1982, pp. 12, 33, 38, 73, 87, 97, and 101.

The seven commodities listed registered an unweighted average consumption decline of 3.6% between 1980 and 1981; the corresponding weighted average figure was 2.4%. These may be compared with a 4.7% decline on an unweighted average basis and 4.2% on a weighted average basis between 1979 and 1980. Refined copper was the only commodity in the group for which 1981 consumption was higher than that for 1980, and even in that case, the 1981 level remained substantially below that of 1979.

Regarding ferrous metals, less current and complete data are available; nevertheless, a further downturn in 1981 was clearly evident. A downturn in iron ore consumption of 4% to 5% seemed likely, compared with a 2% downturn in 1980. An iron and steel scrap consumption decline of about 1.5% was indicated for 1981 compared with a drop of over 6% in 1980. Manganese ore consumption also almost assuredly declined in 1981 but could not be quantified on the basis of available information.

Considering major nonmetallic commodities, the 4% growth in world cement output and a 1% growth in gypsum production seemed to be evidence that construction material consumption did not edge downward on a worldwide basis, but in the United States at least, the decline in housing starts was reflected in declining consumption of such materials, a downturn apparently compensated for elsewhere. The fertilizer-materials area was a relative bright spot in the mineral commodity sales scene; each of the three fertilizer types registered consumption increases between 1980 and 1981, as shown in the following tabulation:

Commodity	Crop (ending June 30 of year stated)		
	1979[r]	1980[r]	1981
Nitrogenous, million metric tons N	53.5	57.4	60.6
Phosphate, million metric tons P_2O_5	29.7	31.1	31.4
Potassic, million metric tons K_2O equivalent	24.4	24.0	24.1

[r]Revised.

Sources: Nitrogen data: British Sulphur Corp. Ltd. Nitrogen, No. 135, January-February 1982, London, p. 44; phosphate and potassium data: British Sulphur Corp. Ltd. Phosphorus and Potassium, No. 117, January-February 1982, London, pp. 44, 46.

Available information on world sulfur consumption in 1981 suggests a very slight downturn (under 1%), to a total level of about 55.98 million tons.

MINERAL FUEL COMMODITIES

Comprehensive information on world energy consumption are not available for 1981; the following tabulation summarizes consumption by primary energy sources for 1976-80:

Year	Million metric tons of standard coal equivalent				
	Solid fuels	Liquid fuels	Natural gas	Hydro and nuclear electricity	Total
1976	r2,398	r3,602	r1,640	231	r7,872
1977r	2,448	3,716	1,663	248	8,076
1978r	2,490	3,800	1,754	274	8,318
1979	r2,637	r3,867	r1,842	288	r8,634
1980	2,669	3,709	1,871	299	8,548

rRevised.

Source: United Nations Yearbook of World Energy Statistics. New York, 1982, p. 3.

The most salient fact demonstrated is the decline in the share of the total accounted for by liquid fuels between 1979 (44.8%) and 1980 (43.8%). All other energy types—solid fuels, natural gas, and hydro and/or nuclear electricity—showed quantitative gains, and each accounted for a larger share of the 1980 total than in 1979.

INVESTMENT

Comprehensive world mineral industry investment data do not exist, but available figures generally point to a reduced rate of investment on the whole. Data published by the U.S. Department of Commerce relating to U.S. foreign investment in 1981 showed a substantial reduction in the rate of increase.

Available information on steel industry investment by Organization for Economic Cooperation and Development nations (table 5) shows an upturn between 1979 and 1980 (the latest published figures available), but it is not believed that this was matched in 1981.

Regarding market economy country petroleum industry investment, 1981 data are not yet available; information on capital expenditures and exploration expenditures for 1976-80 are given, distributed by major world regions, in table 6, and table 7 provides a distribution of the market economy country capital expenditure total by various activity phases of the industry. Table 8 provides some data on U.S. direct foreign investment in mineral industry activities, divided between (1) mining, smelting, and refining and (2) petroleum for 1979-81. For region-by-region detail such as has been furnished in previous editions of this chapter, the reader is referred to the source publication for this table.

Other scattered data on mineral industry investment follow, on a country-by-country basis, for selected nations. These figures generally represent domestic investment in domestic mineral industry activities for each nation discussed. That is, they exclude investment by these nations in mineral industry activities outside of the country being covered, as well as foreign investment in the mineral industry of the country, but could include domestic investment based on capital borrowed internationally.

In 1981, mineral industry investment in Canada reportedly totaled $924.5 million. Of the sum, the following amounts were expended on projects in various mineral commodity areas: $268.5 million for lead and zinc, $254 million for copper, $145 million for molybdenum, $130 million for uranium, $77 million for asbestos, $35 million for silver, and $15 million for gold. The bulk of those expenditures, which constituted 6.9% of total investment in the Canadian economy, were directed primarily to mineral recovery as well as to mineral processing. The investments were made at a time when the Canadian Government set forth a comprehensive mineral report that stresses the importance of investment as a means by which the Canadian mineral industry could enhance its international competitiveness and by which anticipated

strong demand growth could be met. Additionally, the Canadian Government indicated that it would encourage mineral industry investment by maintaining stability in taxation and by negotiating the settlement of native land claims. More broadly, the Canadian Government marked mineral resource development and, in turn, investment as one of several priorities in Canadian economic development over the next decade.

Information on the Republic of South Africa's mineral industry investment for 1981 indicated a total level equivalent to $683 million, including $530 million for gold production facilities, $36 million for phosphate projects, and $17 million for expansion and improvement of manganese-refining plants.

In Brazil, total mineral industry investment dropped from a reported $660 million in 1980 to $379.5 million in 1981. Of the 1981 total, $149.5 million was spent on phosphate extraction facilities, $130 million on soda ash projects, and $100 million primarily on construction of aluminum smelting facilities. The 1981 investment decline was commensurate with the overall patterns of zero economic growth in Brazil resulting, in part, from Government austerity measures.

In an investment environment dampened by high interest rates, a volatile industrial relations atmosphere, environmental issues, and aboriginal land rights controversies, Australia saw mineral industry capital outlays of $348 million. Of this total, $250 million was directed toward uranium projects, and $98 million was expended for development and expansion of existing aluminum smelting facilities. The investments in aluminum projects are part of a drive to increase aluminum productive capacity to the extent that Australia could account for 5% to 10% of world aluminum production in 1985, compared with approximately 2% in 1981.

Investments of $352.5 million were made in raw copper and gold facilities in the Philippines.

Finally, aggregate mineral industry investment data available for other nations indicate the following: China-$150 million, Cameroon-$130 million, Burma-$124 million, Bahrain-$120 million, the Federal Republic of Germany-$85 million, the United Kingdom-$74 million, Iraq-$70 million, Yugoslavia-$40 million, and Israel-$15 million.

TRANSPORTATION

MARINE TRANSPORT

Tankers, bulk carriers, and freighters are the three classes of vessels engaged in transporting mineral commodities. The number, gross tonnage, and deadweight tonnage of these vessels, as well as similar data for other vessels of the world's merchant fleet, as reported by the U.S. Maritime Administration for 1975-80, are given in table 9.

It should be noted that vessels in each of the three categories are not devoted wholly to mineral commodity transport. Tankers, although largely engaged in moving crude oil and refinery products, also transport liquid chemicals, wine, molasses, and whale oil. Bulk carriers move agricultural products as well as crude minerals and mineral fertilizers, while freighters, because of their great variety, can be devoted wholly to hauling mineral products or wholly to moving nonmineral goods, as well as carrying mixed mineral and nonmineral cargoes.

Table 10 gives information on total loadings and unloadings of vessels, divided between tanker-type cargo and dry cargo, for the years 1976-80. Although it is recognized that these figures on loadings and unloadings include goods other than minerals, they nevertheless serve as a reasonable measure of mineral commodity shipments, because the preponderance of total weight of all goods moved is accounted for by minerals. Some measure of the significance of mineral commodity movement to total commodity movement is apparent in data for the world's two major canals, the Panama and the Suez, and it should be noted that figures for these waterways are skewed in favor of nonmineral commodities by both waterways' inability to handle large supertankers and bulk cargo vessels engaged in ore trade. Although exact recent figures are not available, it appears likely that minerals and mineral products account for three-quarters or more of total cargo carried in any single year on a weight basis.

Tables 11 and 12 provide a geographic breakdown of loadings and unloadings of dry cargo and tanker cargo, respectively, for 1978-80 on a tonnage basis. Again recognizing that both tables include mineral and nonmineral goods, but also recognizing the

dominance of mineral materials from the viewpoint of tonnage, these tables give some idea of the relative importance of various world areas as origins and destinations for mineral materials.

Although physical characteristics of vessels—size, draft, age, crew requirements, type of propulsion system, etc.—as well as fuel costs have an undeniable influence on shipping industry performance, problems of the changes in the quantity and type of material being moved also significantly affect the shipping sector of the world economy. Therefore, before detailing changes in composition of the merchant fleet that serves the mineral industry, some observations on major mineral cargoes seem in order. First in importance because of the volume of material moved was oil; there was a decline of 13% in seaborne oil trade from the 1980 level of 1,665 million tons to a level of 1,445 million tons in 1981, both figures include crude oil and refinery products. Total haulage in 1981 was 13,325,000 million ton kilometers, 12% below the 1980 level. The drop, which marked a continuation of the slump in seaborne oil movement that began in 1980, was a result of the general recession conditions, efforts to conserve energy, and substitution of other sources of energy for oil.

Another mineral commodity with considerable significance to seaborne transport was phosphate rock. Preliminary 1981 statistics indicate that total seaborne trade of phosphate rock was about 41 million tons, a decline of 16% from the 1980 level. Contributing to this reduction were somewhat reduced demand by some importing countries resulting from higher fertilizer prices, as well as general economic sluggishness. For exporting nations, Algeria excepted, these and other conditions led to declining international sales and, in turn, reduced haulage of phosphate rock on dry bulk carriers over 40,000 deadweight tons. Only Morocco and the United States posted significant shipments on such vessels but these nations together accounted for over 60% of the total seaborne phosphate rock shipments.

Bauxite and alumina also were among the mineral commodities accounting for substantial seaborne trade; preliminary statistics indicate total shipments of these materials in 1981 approached 46 million tons, of which 24% was alumina. Of the total, Australian exports accounted for nearly one-third, West African shipments for about one-fourth, Caribbean shipments for another one-fourth, and Guyana-Suriname-Brazil shipments for about one-sixth.

Iron ore shipments fell from 310 million tons in 1980 to 303 million tons in 1981. Despite this drop, iron ore easily retained its position as the largest single dry bulk commodity in world seaborne trade, accounting for 15% of the total quantity of dry cargo moved. Australia, Brazil, Canada, India, Liberia, the Republic of South Africa, and Sweden again accounted for about 80% of total seaborne iron ore exports. Noteworthy was the fact that Brazil and other Latin American nations increased their iron ore exports, sending a particularly high number of shipments to Japan. Largely as a result of this, the average haul length for iron ore increased from 8,288 kilometers in 1980 to 8,409 kilometers in 1981. About 65% of total seaborne iron ore shipments were transported in dry bulk carriers of over 100,000 deadweight tons, serving the long-haul trades from Australia, South America, and the Republic of South Africa, to Europe and Japan. Less than 20% of the total moved in vessels below 40,000 deadweight tons.

Commensurate with an increase in demand for coal, the level of coal shipments rose from 172 million tons in 1980 to 196 million tons (117 million metric tons of metallurgical coal and 79 million tons of steam coal) in 1981. Of the 1981 total moved, the United States, Australia, the Republic of South Africa, Canada, and Poland exported 38.7%, 27%, 12.7%, 6.7%, and 4%, respectively. Exports from the United States rose by 2.6% over that of 1980, reflecting an increase in steam coal shipments of 13 million tons. Relative to 1980, Australia also registered a rise in coal exports on the order of 4.7% as a result of an increase of 2 million tons in steam coal exports. On the other hand, the Republic of South Africa experienced a 1.1% decline in coal exports as steam coal movements did not increase. Combined, the United States, Australia, and the Republic of South Africa accounted for 85% of the total steam coal trade. Poland's coal exports fell 6.6% largely because steam coal availability from that country dropped sharply. In terms of metallurgical coal, the United States exported

41% of the total while Australia exported 37%.

On the import side, Japan ranked first among the world's coal importers, it took an amount of coal 15% greater in 1981 than in 1980. Responsible for this growth was the increase in the import level of steam coal, from 6 million tons in 1980 to 13 million tons in 1981. As a result of this, Japan's intake accounted for 40% of the world's coal imports. Second to Japan was France, which imported 30 million metric tons (including steam and metallurgical coal) of which 32% came from the United States and 26% from the Republic of South Africa. Italy, Belgium, and the Federal Republic of Germany were the other primary importers. Also importing coal were the U.S.S.R., the Republic of Korea, Taiwan, and Brazil.

The aforementioned increases and decreases in the amount of coal exported by various nations coupled with destination points impacted significantly on haul length, which increased from 8,127 kilometers in 1980 to 8,449 kilometers in 1981. Characteristic of this increase is the fact that more vessels, particularly those over 100,000 deadweight tons, were used largely in short-haul European movements, transporting between 25% and 30% of same.

Bulk Carriers.—In 1980, the world's bulk carrier fleet increased by 84 vessels, compared with a 68-vessel increase in 1979. The 1980 growth represented a 1.9% gain on the basis of number of vessels. There was a very small increase in the average gross tonnage and deadweight tonnage of such vessels for a second year. In 1980, the average bulk carrier grossed 22,286 tons and had a deadweight tonnage of 38,622, compared with 1979 figures of 22,346 and 38,676, respectively. The following tabulation shows the distribution of the world's bulk carrier fleet by country of registry for 1979:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Liberia	853	41,520
Greece	943	30,096
Japan	511	22,057
United Kingdom	216	11,086
Panama	406	11,016
Norway	151	10,424
Italy	144	6,851
India	102	4,346
China	95	3,238
U.S.S.R.	161	3,140
Singapore	85	3,118
Brazil	49	2,914
Germany, Federal Republic of	47	2,762
France	48	2,719
Spain	71	2,375
Poland	81	2,023
Sweden	30	1,150
Other	805	24,476
Total	4,798	185,311

Freighters.—In 1980, the world's freighter fleet decreased by 87 vessels, a 0.6% decrease. In terms of total gross tonnage and deadweight tonnage, there were 1.15% and 0.6% increases, respectively, over the 1979 levels. The average freighter in 1980 had a gross weight of 6,367 tons (6,256 tons in 1979) and a deadweight tonnage of 8,514 tons (8,409 tons in 1979), and a modest increase when the number of vessels involved is considered. The following tabulation shows the distribution of the world's freighter fleet by country of registry for 1979:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Greece	1,515	14,765
Panama	1,701	13,301
U.S.S.R.	1,847	11,235
United States	471	6,885
Japan	717	6,503
Liberia	522	5,876
China	495	5,004
United Kingdom	450	4,820
Singapore	431	3,912
Germany, Federal Republic of	359	3,651
India	230	2,826
Netherlands	350	2,444
Norway	194	2,011
Cyprus	344	1,914
Other	4,616	36,105
Total	14,242	121,252

Tankers.—In 1980, the world's tanker fleet was 99 vessels greater than that of 1979. The average vessel's gross tonnage declined from 34,816 tons in 1979 to 34,308 tons in 1980, and deadweight tonnage similarly declined, from 65,757 tons in 1979 to 64,626 tons in 1980.

Accounting for the inconsequential growth in the world's tanker fleet in 1980 was the small but continued reduction in demand for oil.

The following tabulation distributes the world's tanker fleet by country of registry for 1979:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Liberia	889	105,980
Japan	526	33,408
United Kingdom	378	26,323
Norway	248	26,072
Greece	415	24,518
United States	308	16,152
France	117	14,782
Panama	294	13,468
Italy	230	8,687
Spain	117	8,354
U.S.S.R.	467	7,248
Germany, Federal Republic of	64	5,441
Denmark	69	5,228
Netherlands	63	4,794
Singapore	98	4,696
Sweden	67	3,746
Other	1,009	37,432
Total	5,359	346,329

Considering the world's tanker fleet as a whole, there have been some modest changes in the share of the total accounted for by vessels of different size groups over the 5 years 1977-81, as shown in the following tabulation, based on data published on page 24 in the British Petroleum Co. Ltd. annual publication, BP Statistical Review of the World Oil Industry, 1981:

Size group (deadweight tons)	Percent of total		
	1977	1979	1981
10,000-25,000	4.8	4.3	4.3
25,000-45,000	8.0	7.4	8.1
45,000-65,000	5.5	4.7	5.2
65,000-125,000	16.3	15.6	17.3
125,000-205,000	9.7	10.2	9.7
205,000-285,000	42.8	43.4	41.0
285,000 and over	12.9	14.4	14.4

OCEAN FREIGHT RATES

In 1980, dry cargo rates increased while tanker rates fell. In 1981, tanker rates continued to fall. Among the reasons for this were reductions in oil consumption resulting from energy conservation and the use of fuels other than oil, cutbacks in Organization of Petroleum Exporting Countries oil production, and in turn, cutbacks in oil shipments.

Unlike 1980, however, dry cargo rates also dropped. At least three factors were responsible for this. First, there was a large fleet expansion, especially in combination carriers. During 1981, up to 80% of those vessels served the dry cargo markets. Second, overall economic growth was slow. Demand for steel, bauxite and alumina, and phosphate rock was relatively lower than in 1980, resulting in reduced demand for dry bulk carriers. Third, many port congestion problems were at least partly resolved as, for example, at Hampton Roads where bottlenecks were severe. The U.S. coal mine strike helped to alleviate the situation as coal cargoes were withheld. Moreover, by strike's end a system of preallocation and/or preregistration was implemented that diminished delays considerably. Port congestion was also reduced at the Panama Canal and elsewhere similar systems were used. As a result, numerous ports around the world were more able to handle shipping loads.

Specific indices for 1981 ocean freight rates may be found in the March, June, and September 1982 issues of the United Nations Monthly Bulletin of Statistics.

PANAMA AND SUEZ CANALS

Summary data on activity at the Panama Canal for the year ending September 30, 1981, are not yet available, and activity for the previous fiscal year was summarized in the previous edition of this chapter. Readers desiring such information for the more recent year are referred to the annual report of the Panama Canal Co., when it becomes available.

At the Suez Canal, a total of 20,795 vessels transited the canal in 1980, an increase of 432 vessels, relative to 1979 transits (up 2.1%). The tonnage passing through the waterway increased from 266,171,000 tons to 281,305,000 tons. Of the total number of vessel transits, tankers accounted for 2,921, a figure 8.3% above that of 1979. The net tonnage credited to tankers increased from 86,278,000 tons in 1979 to 88,870,000 tons in 1980. The following tabulation indicates the distribution of tankers by number, direction, net tonnage, and status (loaded or in ballast):

Direction	Number		Net tonnage (thousand metric tons)	
	1979	1980	1979	1980
Southbound:				
In ballast	1,026	922	55,913	51,996
Laden	518	717	6,867	10,215
Total	1,544	1,639	62,780	62,211
Northbound:				
In ballast	304	428	3,886	5,447
Laden	850	854	19,612	21,212
Total	1,154	1,282	23,498	26,659

Freighters ranked next after tankers in terms of number of transits and net tonnage, with bulk carriers following in third rank. The following tabulation summarizes transits by these vessel classes:

Vessel class	Number		Net tonnage (thousand metric tons)	
	1979	1980	1979	1980
Freighters:				
In ballast	1,678	1,548	8,422	8,538
Laden	8,884	8,637	60,958	61,336
Total	10,562	10,185	69,380	69,874
Bulk carriers:				
In ballast	343	470	5,673	7,645
Laden	2,050	2,241	30,717	34,348
Total	2,393	2,711	36,390	41,993

In terms of goods transported in a southbound direction on the Suez, 89,729,000 tons was shipped in 1980, an increase over the 1979 figure of 81,919,000 tons. Of the total, oil and oil products totaled 13,994,000 tons, a 56% increase over the 1979 figure of 8,970,000 tons. This increase was due primarily to a tripling in the crude oil quantities shipped. In 1980, 571,000 tons of metal and ores were carried southbound through the Suez, a 37.7% drop from the 1979 level of 916,000 tons. Southbound coal shipments transiting the Suez amounted to 194,000 tons in 1980, as compared with 192,000 tons in 1979.

With regard to northbound movement of commodities through the Suez, 86,547,000 tons were carried in 1980, a 9.9% increase over the 1979 figure. Of the total northbound 1980 commodity volume, crude oil and oil products accounted for 28,474,000 tons or 32.9%. This constitutes a 4.4% increase over the 1979 figure. Northbound metals and ores moved on the Suez increased from 9,906,000 tons in 1979 to 11,989,000 tons in 1980. Finally, whereas 2,201,000 tons of northbound coal and coke transited the Suez in 1979, 2,676,000 tons did so in 1980.

PIPELINES

Limitations of time and space preclude comprehensive assessment of international pipeline activities. Major projects in individual countries are treated in the various country chapters.

PRICES

Comprehensive data on world prices for crude minerals and mineral products are not available; tables 13, 14, and 15 summarize major nonferrous metal prices in the United States, the United Kingdom, and Canada, respectively, for 1978-81 inclusive, with monthly data provided for 1981. A brief review of the 1981 average prices on each of the three markets, comparing them with 1980 average prices, shows that of the

metals shown, only aluminum on the U.S. market and zinc in all three areas averaged a higher price in 1981 than in 1980. Other 1981 average prices were below those of 1980. There was no clearly discernable pattern across the spectrum of nonferrous metals during the year; each metal in each market area fluctuated with seeming independence, which can be better demonstrated by examining the actual figures in the tables rather than by elaborate textual description.

As in 1980, there is no detailed presentation here of world gold prices; these remained subject to considerable variation both across the year within any single market and across the various markets for any given time period. However, it is worthy of note that the speculative price levels attained in early 1980 were not approached in the daily 1981 fluctuations.

Regarding oil prices, final published returns such as were cited in last year's edition of this chapter were not available in time for inclusion here, but it was clear that the oversupply of crude oil on a worldwide basis mitigated against any significant increases in sale prices for that commodity. Readers seeking details should refer to the Department of Energy's 1981 International Energy Annual, which should be available by the time this chapter is published.

STATISTICAL SUMMARY OF WORLD PRODUCTION AND TRADE OF MAJOR MINERAL COMMODITIES

The final 24 tables of this chapter, tables 16-39, extend the statistical series on production that was started in the 1963 edition of the International Area Reports volume of the Minerals Yearbook and was subsequently updated and expanded in the 1965 and 1967-80 editions. They are primarily a supplement to other statistical data within this chapter but also serve as a summary of international production data for major mineral commodities covered in greater detail, on a commodity basis, in volume I of the 1980 Minerals Yearbook and on a country basis in volume III.

In this edition, the data presented in these tables, in most instances, correspond with the data in the individual commodity world production tables appearing in volume I and may differ somewhat from a total that might be obtained by adding figures presented for any single commodity in each of the country chapters of volume III. This apparent disparity results from problems of scheduling compilation of tables in the numerous commodity and country tables in the two volumes. In an effort to provide the user with the most up-to-date information possible, data received after completion of worldwide commodity production tables have been included in many of the individual country production tables. Limitations of time, however, have prevented the incorporation of these revisions in the abbreviated versions of the world commodity tables included here. Thus, a more precise figure for total world production of any commodity could be obtained by adding figures presented in the individual country chapters. For summary purposes, however, it is felt that tables 16-39 of this chapter are sufficiently correct without the inclusion of these generally minor revisions.

The series of data on world trade in major mineral commodities that has appeared in most previous editions of this chapter (tables 57-69 in the 1976 edition) could not be included owing to scheduling problems. It is hoped that these tables will be resumed in the 1982 edition.

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[1]Senior foreign mineral specialist, Division of Foreign Data.

[2]Foreign mineral specialist, Division of Foreign Data.

Table 2.—Value of world export trade in major mineral commodities[1]

(Million U.S. dollars)

Commodity group	1976[r]	1977[r]	1978[r]	1979[r]	1980
Metals:					
All ores, concentrates, scrap	15,692	15,669	16,478	23,466	29,390
Iron and steel	44,720	46,703	57,117	70,628	75,949
Nonferrous metals	21,546	24,235	27,729	37,182	52,573
Subtotal	81,958	86,607	101,324	131,276	157,912
Nonmetals, crude only	6,279	7,009	7,795	9,654	11,815
Mineral fuels	199,592	222,116	222,833	333,876	477,349
Total	287,829	315,732	331,952	474,806	647,046
All commodities	989,261	1,124,883	1,298,411	1,638,302	1,993,312

[r]Revised.

[1]Data presented are for selected major commodity groups of the Standard International Trade Classification Revised (SITC-R) and as such exclude some mineral commodities classified in that data array together with other (nonmineral) commodities. SITC-R categories included are as follows: All ores, concentrates, and scrap—SITC Div. 28; iron and steel—SITC Div. 67; nonferrous metals—SITC Div. 68; nonmetals (crude only)—SITC Div. 27; and mineral fuels—SITC Div. 3. Major items not included are the metals, metalloids, and metal oxides of SITC Group 513; mineral tar and other coal-, petroleum-, and gas-derived crude chemicals of SITC Div. 52; manufactured fertilizers of SITC Div. 56; and nonmetallic mineral manufactures of SITC Groups 661, 662, 663, and 667. Data include special category exports, ships' stores and bunkers, and other exports of minor importance, and exclude the intertrade of the centrally planned economy countries of Asia and trade between the Federal Republic of Germany and the German Democratic Republic.

Source: United Nations. Monthly Bulletin of Statistics. V. 35, No. 5, May 1981, pp. xxxiv-lvi.

Table 3.—Distribution of value of world export trade in major mineral commodity groups, by commodity group[1]

(Percent)

Commodity group	1976	1977	1978	1979	1980
Metals:					
All ores, concentrates, scrap	5.5	5.0	5.0	5.0	4.6
Iron and steel	15.5	14.8	17.2	14.9	11.7
Nonferrous metals	7.5	7.7	[r]8.4	7.8	8.1
Total	28.5	27.5	[r]30.6	27.7	24.4
Nonmetals, crude only	2.2	2.2	2.3	2.0	1.8
Mineral fuels	69.3	73.3	[r]67.1	70.3	75.8

[r]Revised.

[1]For detailed definition of groups, see footnote 1, table 2.

Table 4.—Growth of value of world export trade in major mineral commodity groups[1]

(Percent change from that of previous year)

Commodity group	1976	1977[r]	1978[r]	1979	1980
Metals:					
All ores, concentrates, scrap	+9.2	-0.1	+5.2	+42.4	+25.2
Iron and steel	[r]-2.2	+4.4	+22.3	+23.7	+7.5
Nonferrous metals	+15.3	+12.5	+14.4	+34.1	+41.4
All metals	+4.0	+5.7	+17.0	+29.6	+20.3
Nonmetals, crude only	+.8	+11.6	+11.2	+23.8	+22.4
Mineral fuels	[r]+18.7	+11.3	+.3	+49.8	+43.0
All major mineral commodity groups	+13.7	+9.7	+5.1	+43.0	+36.3
All commodities	+13.5	+13.7	+15.4	+26.2	+21.7

[r]Revised.

[1]For detailed definition of groups, see footnote 1, table 2.

Table 5.—Annual investment expenditure in the steel industry for selected countries

(Million dollars unless otherwise specified)

Country or country group	1976	1977	1978	1979	1980
EEC[1]	3,293	2,360	2,022	r2,098	2,375
EFTA[2]	816	476	364	r509	799
Other countries:					
Australia	164	140	132	122	220
Canada	392	416	309	r319	487
Japan	3,443	3,824	4,338	r2,916	2,865
New Zealand	NA	NA	NA	6	NA
Spain	420	476	309	294	237
Turkey	271	304	387	NA	NA
United States	3,255	2,850	2,595	3,367	3,400
Total[3]	12,054	10,846	10,456	9,631	10,383

rRevised. NA Not available.

[1]Source reports that values for European Economic Community (EEC) countries are in terms of "million units of account." For the Federal Republic of Germany (included in EEC in this tabulation), the source indicates that for 1976, 823.1 million "units of account" was equivalent to $885.3 million (no conversion rate given for other countries for 1976 and no conversion rate given for any country for 1977-80, and no further explanation is offered).

[2]European Free Trade Association (EFTA) figures exclude data for Switzerland.

[3]Figures have been totaled as if EEC data were in U.S. dollars, in keeping with totals appearing in a graph in source publication (see footnote 1).

Sources: Organization for Economic Cooperation and Development. The Iron and Steel Industry in 1977. Paris, 1979, p. 25; The Iron and Steel Industry in 1978. Paris, 1980, p. 25; The Iron and Steel Industry for 1979. Paris, 1981, p. 22; and The Iron and Steel Industry for 1980. Paris, p. 25.

Table 6.—Market economy country petroleum industry capital and exploration expenditures, by geographical area

(Million dollars)

Area and type of expenditure	1976	1977	1978	1979	1980
United States:					
Capital	22,085	22,400	24,475	32,200	42,900
Exploration	1,375	1,645	1,975	2,600	3,850
Total	23,460	24,045	26,450	34,800	46,750
Other Western Hemisphere:					
Capital	6,615	8,705	11,400	13,625	16,525
Exploration	385	650	760	1,200	1,675
Total	7,000	9,355	12,160	14,825	18,200
Western Europe:					
Capital	8,950	10,875	12,475	14,075	18,625
Exploration	325	450	475	550	750
Total	9,275	11,325	12,950	14,625	19,375
Africa:					
Capital	2,425	3,550	4,650	4,800	5,275
Exploration	175	300	375	350	500
Total	2,600	3,850	5,025	5,150	5,775
Near East:					
Capital	4,675	7,800	7,650	8,425	11,525
Exploration	75	125	150	175	200
Total	4,750	7,925	7,800	8,600	11,725
Far East:					
Capital	3,575	5,050	5,375	6,600	7,875
Exploration	200	225	300	450	650
Total	3,775	5,275	5,675	7,050	8,525
Foreign flag tankers	8,400	3,200	2,350	1,900	2,800
World:					
Capital (including foreign flag tankers)	56,725	61,580	68,375	81,625	105,525
Exploration	2,535	3,395	4,035	5,325	7,625
Grand total	59,260	64,975	72,410	86,950	113,150

Source: Chase Manhattan Bank, Energy Economics Div. 1980 Capital Investments of the World Petroleum Industry. New York, December 1980, Schedule 4.

Table 7.—Market economy country petroleum industry capital expenditures, by industry sector

(Million dollars)

Sector	1976	1977	1978	1979	1980
Production:					
Crude oil and natural gas	23,860	28,680	33,675	44,500	61,300
Natural gasoline plants	1,915	3,780	4,030	4,565	5,575
Pipelines	7,575	6,660	5,780	5,775	6,475
Marine	8,675	3,700	2,950	2,250	3,400
Refineries	6,910	8,290	10,675	11,775	13,475
Marketing	2,180	2,670	3,240	3,750	5,050
Chemical plants	4,500	6,375	6,650	7,235	8,300
Other	1,110	1,425	1,375	1,775	1,950
Total	56,725	61,580	68,375	81,625	105,525

Source: Chase Manhattan Bank, Energy Economics Div. 1980 Capital Investments of the World Petroleum Industry. New York, December 1980, Schedule 4.

Table 8.—Salient statistics on U.S. foreign investment in mineral industry activities

(Million dollars)

	1979	1980	1981
Direct foreign investment:			
Mining, smelting, refining	5,941	r6,755	7,404
Petroleum	38,744	r47,595	52,107
Reinvested earnings of incorporated affiliates:			
Mining, smelting, refining	232	405	130
Petroleum	5,414	4,633	4,033
Equity and intercompany account flows:			
Mining, smelting, refining	-156	47	394
Petroleum	3,120	-2,596	-1,939
Income:			
Mining, smelting, refining	1,148	r1,321	813
Petroleum	13,413	r13,185	13,168

rRevised.

Sources: U.S. Department of Commerce. U.S. Direct Investment Abroad in 1981, in Survey of Current Business, August 1982, pp. 11-29, for 1980 and 1981 figures; computer printouts furnished by Department of Commerce for 1979 figures.

Table 9.—World merchant fleet distribution, by type[1]

	1975	1976	1977	1978	1979	1980
Number of vessels:						
Tankers	5,311	5,383	5,333	5,233	5,260	5,359
Bulk carriers	4,272	4,570	4,932	4,651	4,714	4,798
Freighters[2]	12,575	12,923	13,176	14,141	14,329	14,242
Other[3]	714	710	655	487	495	468
Total	22,872	23,586	24,096	24,512	24,798	24,867
Gross tonnage:						
Tankers, thousand metric tons	163,731	179,116	185,405	182,367	183,130	183,858
Bulk carriers, do.	88,194	95,451	103,741	104,291	105,341	106,927
Freighters[2], do.	75,284	77,939	81,414	87,700	89,643	90,674
Other[3], do.	5,833	5,697	5,268	4,551	4,535	4,252
Total, do.	333,042	358,203	375,828	378,909	382,649	385,711
Deadweight tonnage:						
Tankers, do.	302,217	335,600	349,976	344,780	345,880	346,329
Bulk carriers, do.	150,080	163,298	178,633	180,436	182,319	185,311
Freighters[2], do.	101,248	104,639	109,857	117,953	120,494	121,252
Other[3], do.	3,027	2,962	2,753	2,319	2,209	2,017
Total, do.	556,572	606,499	641,219	645,488	650,902	654,909

[1]Maritime Administration classification. Tankers include whaling tankers. Vessels shown here as "Other" include combination passenger and cargo and combination passenger and refrigerated cargo. The contribution of these vessels to mineral commodity trade is regarded as unimportant. Data are as of Dec. 31 of year indicated.
[2]Includes refrigerated freighters.
[3]Excludes refrigerated freighters.

Source: U.S. Department of Commerce, Maritime Administration. Merchant Fleets of the World. Annual issues covering 1975 through 1977, and unpublished data supplied by the same agency for 1978-80.

Table 10.—World shipping loadings and unloadings

(Million metric tons)

	1976	1977	1978[r]	1979[r]	1980
Loadings:					
Tanker cargo	[r]1,843	[r]1,891	1,956	2,044	1,851
Dry cargo	1,523	[r]1,577	1,666	1,785	1,881
Total	[r]3,366	[r]3,468	3,622	3,829	3,732
Unloadings:					
Tanker cargo	[r]1,834	[r]1,906	1,942	2,032	1,845
Dry cargo	1,518	1,536	1,632	1,782	1,877
Total	[r]3,352	[r]3,442	3,574	3,814	3,722

[r]Revised.

Source: United Nations. Monthly Bulletin of Statistics. V. 36, No. 6, June 1982, p. xxxi.

Table 11.—World shipping of dry cargo, by geographical area

(Million metric tons)

Area	Loadings			Unloadings		
	1978	1979	1980	1978[r]	1979	1980
Market economy countries:						
Developed:						
Australia and New Zealand	178	[r]172	197	20	[r]21	18
Canada	112	130	(1)	44	49	(1)
Japan	81	83	84	297	[r]332	361
South Africa, Republic of	52	[r]64	69	7	[r]7	10
United States	[r]272	[r]323	363	167	[r]163	143
Western Europe	[r]362	372	378	576	[r]641	674
Other	[r]5	5	[1]141	7	[r]4	[1]60
Total	[r]1,062	[r]1,149	1,232	1,118	[r]1,217	1,266
Developing:						
Caribbean	[r]41	[r]43	38	11	[r]11	18
Venezuela	[r]17	15	16	11	13	12
Other Latin America	[r]161	[r]175	191	60	[r]66	72
Far East	[r]167	[r]172	175	161	[r]187	195
Near East	[r]14	[r]17	15	73	[r]73	76
Northern Africa	[r] 29	[r]30	30	43	46	46
Other Africa	[r]58	[r]62	59	35	36	40
Other	8	[r]9	8	2	[r]2	4
Total	[r]495	[r]523	532	396	[r]434	463
Centrally planned economy countries:						
U.S.S.R.	[r]49	[r]53	51	38	44	48
Other	[r]60	[r]60	66	80	[r]86	100
Total	[r]109	[r]113	117	118	[r]130	148

[r]Revised.
[1]Canada apparently included with "Other" in source publication.

Source: United Nations. Monthly Bulletin of Statistics. V. 36, No. 6, June 1982, pp. xxxi-xxxv.

Table 12.—World shipping of tanker cargo, by geographical area

(Million metric tons)

Area	Loadings			Unloadings		
	1978[r]	1979[r]	1980	1978	1979	1980
Market economy countries:						
Developed:						
Australia and New Zealand	3	2	3	16	[r]18	18
Canada	4	4	[1]	[r]17	18	[1]
Japan	--	--	--	[r]261	[r]276	252
South Africa, Republic of	--	1	--	[r]7	[r]7	10
United States	2	3	3	[r]379	[r]385	308
Western Europe	128	165	156	[r]576	[r]641	674
Other	[2]	2	[1]5	[r]173	[r]161	[1]69
Total	137	177	167	[r]1,429	[r]1,506	1,331
Developing:						
Caribbean	148	149	136	[r]189	[r]188	164
Venezuela	99	95	97	--	--	--
Other Latin America	33	42	56	67	76	
Far East	207	210	202	[r]128	144	150
Near East	907	916	780	[r]19	[r]8	17
Northern Africa	202	208	187	[r]48	[r]48	52
Other Africa	103	129	105	[r]18	[r]18	17
Other	[2]	--	1	[r]5	[r]1	66
Total	1,699	1,749	1,564	[r]474	[r]483	466
Centrally planned economy countries:						
U.S.S.R.	102	97	99	[r]6	[r]7	8
Other	18	21	111	[r]33	[r]35	40
Total	120	118	210	[r]39	[r]42	48

[r]Revised.
[1]Canada apparently included with "Other" in source production.
[2]Revised to zero.

Source: United Nations. Monthly Bulletin of Statistics. V. 35, No. 3, March 1981, pp. xxix-xxxiii.

Table 13.—Nonferrous metal prices in the United States

(Average cents per pound unless otherwise specified)

Year and month	Aluminum[1]	Copper[2]	Lead[3]	Zinc[4]	Tin[5]	Silver[6]
1978	53.075	65.510	33.653	30.971	586.674	540.089
1979	59.395	92.334	52.642	37.296	713.253	1,109.379
1980	69.566	[r]101.416	42.456	37.428	773.437	2,063.150
1981:						
January	76.000	87.475	33.793	41.187	659.700	1,475.200
February	76.000	84.671	30.422	41.250	633.700	1,302.400
March	76.000	85.982	35.056	41.304	627.700	1,233.800
April	76.000	86.633	37.519	43.562	617.600	1,143.700
May	76.000	84.398	36.413	45.195	589.400	1,084.800
June	76.000	83.826	37.973	46.117	576.500	1,000.100
July	76.000	83.012	40.985	46.247	614.300	863.100
August	76.000	85.987	43.890	47.469	672.100	892.500
September	76.000	83.322	40.323	48.715	679.000	1,003.600
October	76.000	80.912	37.049	45.871	690.800	925.100
November	76.000	79.816	33.875	46.148	710.900	854.700
December	76.000	78.893	31.071	42.589	793.500	843.200
Average	76.000	83.744	36.531	44.555	655.400	1,051.900

[r]Revised.
[1]Unalloyed ingot, 99.5%, delivered United States.
[2]Electrolytic copper, domestic refineries, on Atlantic seaboard.
[3]Refined lead, nationwide.
[4]Prime Western slab, f.o.b. East St. Louis.
[5]Straits tin, New York.
[6]Cents per troy ounce, 999 fine, New York.

Source: American Bureau of Metal Statistics, Inc.

Table 14.—Nonferrous metal prices in the United Kingdom[1]

(Average U.S. cents per pound unless otherwise specified)

Year and month	Aluminum[2]	Copper[3]	Lead[4]	Zinc[5]	Tin[6]	Silver[7]
1978	60.060	61.826	29.803	26.870	583.912	541.883
1979	72.724	90.113	54.520	33.588	702.678	1,110.965
1980	80.753	99.297	41.213	34.482	763.087	r2,087.200
1981:						
January	64.849	84.766	31.948	35.217	650.100	1,473.600
February	65.882	81.703	31.236	33.105	618.400	1,308.100
March	65.524	82.492	33.063	34.328	618.400	1,232.400
April	62.028	82.615	34.382	37.312	606.200	1,150.800
May	58.786	79.028	31.584	38.500	574.500	1,086.100
June	55.843	77.111	32.302	38.062	571.700	999.500
July	53.255	76.290	35.548	39.210	605.900	859.300
August	55.862	81.066	37.343	43.276	657.000	889.700
September	53.022	77.583	34.609	42.567	677.500	1,004.400
October	51.656	75.580	32.467	40.414	685.500	924.500
November	49.082	74.906	30.183	39.744	718.300	853.300
December	51.226	75.084	30.555	38.314	723.600	846.700
Average	57.274	79.488	33.296	38.932	650.000	1,052.400

rRevised.
[1]London Metal Exchange average settlement prices.
[2]Unalloyed ingot, 99.5%.
[3]Electrolytic copper.
[4]Refined lead.
[5]Slab.
[6]Straits tin.
[7]Cents per troy ounce, 999 fine.

Source: American Bureau of Metal Statistics, Inc.

Table 15.—Nonferrous metal prices in Canada

(Average U.S. cents per pound unless otherwise specified)

Year and month	Copper[1]	Lead[2]	Zinc[3]	Silver[4]
1978	66.376	32.213	29.966	540.555
1979	92.884	51.133	36.888	r1,108.600
1980	100.596	42.174	37.453	r2,063.700
1981:				
January	87.358	35.529	40.727	1,475.100
February	84.844	30.832	40.469	1,302.800
March	86.169	35.711	40.995	1,233.800
April	86.930	37.469	42.823	1,143.900
May	84.772	37.469	45.296	1,085.400
June	83.606	37.979	45.678	1,000.500
July	82.510	41.150	45.431	864.300
August	85.977	43.998	48.476	895.000
September	83.716	41.955	49.549	1,003.900
October	81.673	37.431	46.140	925.500
November	80.638	35.017	46.750	856.100
December	79.488	31.664	45.003	846.800
Average	83.973	37.183	44.778	1,052.800

rRevised.
[1]Electrolytic wirebar, f.o.b. delivered Canadian points. Canadian domestic producer delivered price for cathode in 1980.
[2]Pig lead.
[3]Commencing with September 1980, Cominco changed its base grade to High Grade instead of Prime Western and from then, Prime Western carried a 0.50 cent premium over High Grade. Data furnished here for 1978 through August 1980 are prices for Prime Western grade; those included in the 1980 average for September 1980 through December 1980, inclusive, are for special high grade, while those for all of 1981 are regular high grade.
[4]U.S. cents per troy ounce, average price of Cominco, Ltd.

Source: American Bureau of Metal Statistics, Inc.

Table 16.—Leading world producers of bauxite[1]

(Gross weight, thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
Australia	26,086	24,293	27,583	27,178	25,541
Guinea[e]	10,841	10,456	13,700	10,330	[2]12,100
Jamaica	[r]11,390	[r]11,739	11,618	12,054	11,664
U.S.S.R.[e 3]	6,180	6,180	6,180	6,180	6,180
Brazil	1,120	1,160	2,388	1,892	5,300
Suriname	4,805	5,188	5,010	4,696	3,728
Greece	[r]2,885	[r]2,663	2,812	3,286	3,300
Yugoslavia	2,044	2,565	3,012	3,138	[2]3,249
Hungary	2,949	2,899	2,976	2,950	[2]2,914
India	1,519	1,663	1,934	1,740	2,100
France	2,059	1,978	1,970	1,892	[2]1,871
Guyana[e]	2,731	2,425	2,312	2,471	1,680
United States	2,013	1,669	1,821	1,559	[2]1,510
China[e]	1,500	1,500	1,500	1,500	1,500
Total[2]	[r]78,122	[r]76,378	84,816	80,866	82,637
Other	[r]5,389	[r]5,012	4,541	6,686	4,906
Grand total[2]	[r]83,511	[r]81,390	89,357	87,552	87,543

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available as of June 23, 1982.
[2]Reported figure.
[3]Includes bauxite equivalent of nepheline syenite concentrates and alunite ore (produced in the U.S.S.R. only).

Table 17.—Leading world producers of aluminum[1]

(Thousand metric tons)

Country	1977	1978	1979	1980	1981[p]
United States	4,118	4,358	4,557	4,654	4,489
U.S.S.R.[e]	1,640	1,670	1,750	1,760	1,790
Canada	973	1,049	860	1,074	1,123
Japan	1,188	1,058	[r]1,010	1,091	770
Germany, Federal Republic of	742	740	[r]741	731	728
Norway	622	639	660	651	636
France	[r]399	391	395	432	435
Spain	211	212	259	386	396
Australia	248	263	[r]270	303	379
China[e]	[r]350	360	360	360	360
United Kingdom	350	347	359	375	339
Italy	260	270	269	291	274
Venezuela	44	76	[r]228	327	[e]272
Netherlands	241	261	[r]258	262	262
Brazil	167	186	238	260	257
Romania	209	213	217	241	251
India	[r]179	[r]214	211	185	213
Total	[r]11,941	[r]12,307	[r]12,642	13,383	12,974
Other	[r]1,838	[r]1,828	[r]1,928	2,044	2,097
Grand total	[r]13,779	[r]14,135	[r]14,570	15,427	15,071

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 21, 1982.

Table 18.—Leading world producers of chromite[1]

(Gross weight, thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
South Africa, Republic of	3,059	[r]3,144	3,297	3,414	[2]2,867
U.S.S.R.[e]	2,180	2,300	2,300	2,450	2,400
Albania[e]	880	990	1,015	1,077	1,140
Zimbabwe	677	478	542	552	526
Philippines	[r]538	[r]540	556	496	445
Finland	[r]402	[r]407	435	341	413
Brazil	310	[r]269	340	287	408
Turkey[e]	508	375	450	400	400
India	[r]353	266	309	319	336
Total	[r]8,907	[r]8,769	9,244	9,336	8,935
Other	[r]541	[r]493	441	413	341
Grand total	[r]9,448	[r]9,262	9,685	9,749	9,276

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 9, 1982.
[2]Reported figure.

Table 19.—Leading world producers of mine copper[1]

(Cu content of ore, thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
United States[2]	1,364	[r]1,368	1,444	1,181	1,538
Chile[2]	1,056	1,036	1,061	1,068	1,080
U.S.S.R.[e 2]	830	865	885	900	950
Canada[2]	759	659	636	716	[3]718
Zambia[2]	656	643	588	596	588
Zaire[2]	482	424	400	459	497
Peru[2]	[r]338	366	391	367	[3]328
Poland	289	321	325	346	315
Philippines	273	263	298	305	289
Australia	222	222	238	232	[3]223
South Africa, Republic of	208	[r]206	191	201	209
China[e]	195	200	200	200	200
Papua New Guinea	182	199	[2]171	147	165
Total	[r]6,854	[r]6,772	6,828	6,718	7,100
Other	[r]885	[r]856	846	938	1,053
Grand total	[r]7,739	[r]7,628	7,674	7,656	8,153

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 23, 1982.
[2]Recoverable.
[3]Reported figure.

Table 20.—Leading world producers of gold[1]

(Thousand troy ounces)

Country	1977	1978	1979	1980[p]	1981[e]
South Africa, Republic of	22,502	22,649	22,617	21,669	[2]21,121
U.S.S.R.[e]	7,850	8,000	8,160	8,300	8,425
Canada	1,734	1,735	1,644	1,627	[2]1,513
United States	1,100	999	964	970	[2]1,378
Brazil	280	301	319	1,300	1,200
Philippines	559	587	535	590	670
Papua New Guinea	740	751	630	452	[2]540
Australia	[r]624	648	597	544	530
Dominican Republic	343	343	353	370	413
Zimbabwe	402	399	388	368	[2]371
Ghana	481	402	362	353	330
Total	[r]36,615	36,814	36,569	36,543	36,491
Other	[r]2,291	[r]2,169	2,200	2,598	4,294
Grand total	[r]38,906	[r]38,983	38,769	39,141	40,785

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 2, 1982.
[2]Reported figure.

Table 21.—Leading world producers of iron ore, iron ore concentrates, and iron ore agglomerates[1]

(Thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
U.S.S.R	241,851	[r]246,252	241,739	244,714	[2]242,000
Brazil	82,001	84,985	96,112	114,732	99,980
Australia	95,923	83,134	91,717	95,542	86,000
United States	[r]56,645	82,892	87,092	70,730	[2]74,348
China[e]	50,000	70,000	75,000	75,000	70,000
Canada	57,637	41,751	59,888	48,754	[2]50,644
India	42,598	38,837	39,535	40,670	41,120
South Africa, Republic of	[r]26,480	24,206	31,565	26,313	[2]28,318
Sweden	[r]24,838	21,486	26,168	27,184	23,225
France	36,630	[r]33,453	31,627	28,980	21,600
Liberia	17,660	17,989	18,345	18,187	19,704
Venezuela	13,683	13,515	15,260	16,102	[2]15,531
Mauritania	9,794	6,934	9,373	8,725	[2]8,881
Spain	[r]8,328	8,580	8,826	9,227	8,565
Mexico	[r]5,381	[r]5,333	6,061	7,631	[2]8,020
Korea, North[e]	6,900	7,100	7,400	8,000	8,000
Chile	[r]7,656	[r]6,802	7,118	8,269	8,000
Total	[r]784,005	[r]793,249	852,826	848,760	813,936
Other	[r]57,097	[r]54,029	51,446	47,112	46,845
Grand total	[r]841,102	[r]847,278	904,272	895,872	860,781

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 30, 1982.
[2]Reported figure.

Table 22.—Leading world producers of crude steel[1]

(Thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
U.S.S.R	146,678	[r]151,435	149,099	147,940	[2]148,960
United States	113,700	124,312	123,687	101,455	[2]108,782
Japan	102,405	102,105	111,748	111,395	[2]101,695
Germany, Federal Republic of	38,985	41,253	46,040	43,838	[2]41,613
China	23,740	31,780	34,430	37,120	[2]36,290
Italy	23,334	24,283	24,250	26,501	[2]24,561
France	22,094	22,841	23,360	23,115	[2]21,264
Poland	17,841	19,251	19,218	19,485	15,700
United Kingdom	[r]20,410	20,311	21,438	11,277	[2]15,596
Czechoslovakia	15,064	15,294	14,817	15,225	15,240
Canada	13,631	[r]14,899	16,078	15,887	[2]14,806
Brazil	11,164	12,107	13,893	15,318	13,218
Romania	11,457	11,779	12,909	13,175	13,000
Spain	11,102	[r]11,269	12,304	12,586	12,882
Belgium	11,256	12,601	13,442	12,320	[2]12,283
India	9,918	9,987	9,996	9,420	[2]10,780
South Africa, Republic of	7,376	7,902	8,868	9,068	[2]8,943
Australia	7,313	7,589	8,125	7,584	7,530
Total	[r]607,468	[r]640,998	663,702	632,709	623,143
Other	[r]65,326	[r]73,111	81,312	81,678	81,194
Grand total	[r]672,794	[r]714,109	745,014	714,387	704,337

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Steel ingots and castings. Table includes data available through June 2, 1982.
[2]Reported figure.

Table 23.—Leading world producers of mine lead[1]

(Pb content of ore, thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
United States[2]	[r]538	[r]530	526	550	[3]446
U.S.S.R.[e]	405	410	410	410	410
Australia	432	400	422	297	[3]392
Canada	281	320	311	397	[3]332
Peru[2]	[r]176	183	174	189	[3]187
Mexico[2]	[r]164	171	174	146	[3]157
China[e]	135	145	155	155	155
Morocco	93	100	116	115	125
Yugoslavia	130	129	130	121	120
Bulgaria[e]	117	117	116	116	116
Korea, North[e]	110	105	100	100	100
Total	[r]2,581	[r]2,610	2,634	2,596	2,540
Other	[r]764	[r]763	767	832	813
Grand total	[r]3,345	[r]3,373	3,401	3,428	3,353

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 16, 1982.
[2]Recoverable.
[3]Reported figure.

Table 24.—Leading world producers of manganese ore[1]

(Gross weight, thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
U.S.S.R	8,591	9,057	10,244	9,750	9,400
South Africa, Republic of	5,048	4,317	5,182	5,695	[2]5,039
Brazil	1,516	1,917	2,259	2,360	1,896
China[e]	[r]1,150	1,300	1,500	1,600	1,600
India	1,865	1,619	1,755	1,645	1,500
Gabon	1,851	[r]1,710	2,300	2,147	[2]1,488
Australia	1,389	1,249	1,698	1,961	[2]1,409
Mexico	487	523	493	447	[2]578
Ghana	292	316	272	252	225
Morocco	114	126	136	131	[2]110
Hungary	120	114	83	88	83
Total	[r]22,423	[r]22,248	25,922	26,076	23,328
Other	[r]447	338	303	314	245
Grand total	[r]22,870	[r]22,586	26,225	26,390	23,573

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 30, 1982.
[2]Reported figure.

Table 25.—Leading world producers of mine nickel[1]

(Thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
Canada	233	[r]128	126	185	[2]160
U.S.S.R.[e]	[r]147	[r]149	151	154	160
New Caledonia	[r]113	[r]65	80	87	[2]74
Australia	86	82	70	74	[2]74
Cuba[e]	37	35	32	38	40
Philippines	37	30	33	38	37
Indonesia	33	[r]31	31	31	26
South Africa, Republic of	[r]23	[r]29	30	26	26
Total	[r]709	[r]549	553	633	597
Other	[r]119	[r]107	126	112	103
Grand total	[r]828	[r]656	679	745	700

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 5, 1982.
[2]Reported figure.

Table 26.—Leading world producers of mine tin[1]

(Sn content of ore, metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
Malaysia	58,703	62,650	62,995	61,404	[2]59,938
U.S.S.R.[e]	33,000	34,000	35,000	36,000	36,000
Indonesia	25,926	27,411	29,440	32,527	[2]34,869
Thailand	24,205	30,186	33,962	33,685	32,000
Bolivia	33,740	30,881	27,648	27,272	[2]29,801
China[e]	13,000	14,000	14,000	14,600	15,000
Australia	10,634	11,864	12,871	10,835	12,000
Brazil	[r]6,287	[r]6,341	7,005	6,930	9,000
United Kingdom	[r]4,100	[r]3,132	2,708	3,291	[2]3,890
South Africa, Republic of	2,864	2,886	2,697	2,913	[2]2,811
Nigeria	3,267	2,935	2,750	2,527	2,500
Zaire	5,073	4,390	3,879	3,000	2,200
Total	[r]220,799	[r]230,676	234,955	234,984	240,009
Other	[r]9,895	[r]10,406	10,993	11,509	12,500
Grand total	[r]230,694	[r]241,082	245,948	246,493	252,509

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 9, 1982.
[2]Reported figure.

Table 27.—Leading world producers of mine zinc[1]

(Zn content of ore, thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
Canada	[r]1,071	1,067	1,100	895	[2]1,097
U.S.S.R.[e]	735	770	770	785	790
Australia	492	473	532	494	[2]508
Peru	405	[r]403	432	488	[2]497
United States	408	303	267	317	[2]312
Japan	276	275	243	238	242
Mexico	266	245	246	238	[2]212
Sweden	140	163	170	167	[2]181
Spain	98	147	143	183	180
China[e]	[r]155	160	160	160	160
Poland[e]	188	194	183	188	[2]147
Korea, North[e]	150	145	145	140	140
Ireland	116	176	212	229	120
Yugoslavia	112	104	102	[e]94	118
Germany, Federal Republic of	111	97	97	100	[2]92
Bulgaria	87	88	85	87	90
Greenland	77	82	87	87	[2]86
Total	[r]4,887	[r]4,892	4,974	4,890	4,972
Other	[r]1,033	[r]954	893	885	869
Grand total	[r]5,920	[r]5,846	5,867	5,775	5,841

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 7, 1982.
[2]Reported figure.

Table 28.—Leading world producers of hydraulic cement[1]

(Thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
U.S.S.R.	[r]127,056	126,956	123,019	125,049	127,006
Japan	73,138	[r]84,882	87,804	87,957	84,831
China	55,649	65,239	73,900	79,859	84,005
United States	72,627	77,546	77,931	69,589	[2]66,163
Italy	[r]38,204	[r]38,232	39,289	41,772	42,000
Germany, Federal Republic of	33,408	[r]35,303	36,664	35,546	[2]33,029
Spain (including Canary Islands)	27,995	30,233	28,460	28,460	28,600
Brazil	[r]21,123	[r]22,280	24,874	27,193	28,500
France	28,829	28,025	28,825	29,104	28,227
India	[r]19,060	[r]19,560	18,264	17,700	20,760
Mexico	13,227	14,056	15,178	16,260	17,000
Korea, Republic of	14,196	15,133	16,413	15,631	[2]15,617
Romania	13,875	14,688	15,598	15,611	14,750
Poland	21,300	21,700	19,176	18,443	14,225
Turkey	13,833	[r]15,344	13,784	12,875	14,000
United Kingdom	15,456	15,916	16,140	14,805	[2]13,263
German Democratic Republic	12,102	12,521	12,273	12,444	12,500
Total	[r]601,078	[r]637,614	647,592	648,298	644,476
Other	[r]196,006	[r]215,373	222,745	236,049	243,585
Grand total	[r]797,084	[r]852,987	870,337	884,347	888,061

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 23, 1982.
[2]Reported figure.

Table 29.—Leading world producers of diamond[1]

(Thousand carats)

Country	1977	1978	1979	1980[p]	1981[e]
U.S.S.R.[e]	10,300	10,550	10,700	10,850	10,600
South Africa, Republic of	7,643	7,727	8,384	8,520	[2]9,526
Zaire	11,214	11,243	8,734	10,235	7,500
Botswana	2,691	[r]2,799	4,394	5,101	[2]4,961
Namibia	2,001	1,898	1,653	1,560	[2]1,248
Ghana	1,947	1,423	1,253	1,258	1,000
Total	35,796	[r]35,640	35,118	37,524	34,835
Other	[r]3,863	[r]3,983	4,282	4,583	4,286
Grand total	[r]39,659	[r]39,623	39,400	42,107	39,121

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Gem and industrial grades undifferentiated. Table includes data available through May 7, 1982.
[2]Reported figure.

Table 30.—Leading world producers of nitrogen in ammonia[1]

(N content, thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
United States	13,347	[r]12,910	13,989	14,736	[2]14,196
U.S.S.R.	10,744	11,300	12,199	12,477	12,610
China[e]	5,620	6,750	7,170	7,500	7,440
India[3]	2,037	[r]2,220	2,256	2,221	[2]2,947
France	2,034	[r]2,020	2,150	2,085	[2]2,250
Canada	1,764	1,926	1,981	1,996	[2]2,181
Romania	1,792	2,257	2,334	2,248	2,177
Netherlands	2,140	2,148	2,036	1,991	[2]1,970
Germany, Federal Republic of	1,989	1,955	2,161	2,044	[2]1,961
Japan	2,292	2,454	2,323	2,149	[2]1,850
United Kingdom	1,631	1,600	1,666	1,633	[2]1,780
Mexico	780	[r]1,304	1,359	1,548	[2]1,725
Poland	1,665	1,611	1,525	1,542	1,497
Italy	1,168	[r]1,443	1,431	1,397	[2]1,200
German Democratic Republic	1,129	1,137	1,078	1,182	1,188
Total	[r]50,132	[r]53,035	55,658	56,749	56,972
Other	[r]15,986	[r]12,848	14,104	14,573	14,494
Grand total	[r]66,118	[r]65,883	69,762	71,322	71,466

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Erroneously captioned in 1978-79 edition of this chapter. Table includes data available through May 12, 1982.
[2]Reported figure.
[3]Data given are for years beginning Apr. 1 of that stated.

Table 31.—Leading world producers of phosphate rock[1]

(Thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
United States	47,256	50,037	51,611	54,415	[2]53,624
U.S.S.R.[e 3]	[r]26,925	[r]27,712	28,405	29,450	30,950
Morocco[4]	17,804	19,713	20,032	18,824	[2]19,696
China[e]	4,000	4,500	5,500	5,500	5,500
Tunisia	3,615	3,712	4,154	4,582	[2]4,596
Jordan	1,782	2,303	2,825	3,911	[2]3,523
South Africa, Republic of	2,403	2,699	3,221	3,282	[2]2,910
Togo	2,857	2,827	2,920	2,933	[2]2,244
Total	[r]106,642	[r]113,503	118,668	122,897	123,043
Other	[r]12,680	[r]15,144	14,255	15,465	15,617
Grand total	[r]119,322	[r]128,647	132,923	138,362	138,660

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes output of all major crude mineral sources of phosphate. Table includes data available through Apr. 17, 1982.
[2]Reported figure.
[3]Includes material described as sedimentary rock in Soviet sources.
[4]Includes output from Western Sahara.

Table 32.—Leading world producers of marketable potash[1]

(K_2O equivalent, thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
U.S.S.R	8,347	8,193	6,635	8,064	8,350
Canada	5,764	6,340	7,074	7,532	[2]6,815
German Democratic Republic	3,229	3,323	3,395	3,422	3,490
Germany, Federal Republic of	2,341	2,470	2,616	2,737	[2]2,591
United States	2,229	2,253	2,225	2,239	2,156
France	1,580	1,795	1,850	1,735	[2]1,969
Total	23,490	24,374	23,795	25,729	25,371
Other	[r]1,762	[r]1,739	1,882	1,944	1,986
Grand total	[r]25,252	[r]26,113	25,677	27,673	27,357

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Apr. 21, 1982.
[2]Reported figure.

Table 33.—Leading world producers of salt[1]

(Thousand metric tons)

Country	1977	1978	1979	1980[p]	1981[e]
United States (including Puerto Rico)	39,407	[r]38,914	41,567	36,630	[2]35,303
China[e]	17,100	19,530	14,770	17,280	18,325
U.S.S.R.[e]	14,300	14,500	14,300	14,600	14,600
Germany, Federal Republic of	12,322	12,658	15,089	[e]12,970	12,260
Canada	6,039	6,452	6,881	7,029	7,285
India	5,332	6,700	7,036	[e]7,262	7,260
Mexico	4,899	5,635	6,169	6,575	7,000
United Kingdom	8,202	7,310	7,819	7,155	6,810
France	5,776	6,283	8,057	[e]7,103	[2]6,636
Australia	4,715	5,766	5,172	5,315	5,300
Romania	4,536	4,739	4,720	5,055	5,000
Italy	[r]4,620	4,931	[e]5,669	5,267	4,900
Brazil	[r]2,774	[r]3,299	3,555	3,838	4,000
Spain	[r]3,101	[r]3,369	3,447	3,508	3,600
Netherlands	3,111	2,939	3,951	[2]3,464	3,500
Poland	4,357	4,393	4,429	4,534	3,390
German Democratic Republic	2,643	2,741	3,051	3,128	3,160
Argentina	[r]1,148	700	620	1,004	1,094
Japan	1,056	1,073	1,090	1,102	1,000
Bahamas	1,670	1,633	440	684	[2]970
Colombia	[r]941	[r]837	752	838	715
Turkey	777	929	1,130	626	700
Bangladesh	346	786	674	700	700
Pakistan	499	640	704	605	700
Egypt	597	755	616	636	650
Total	[r]150,268	[r]157,512	161,708	156,908	154,858
Other	[r]11,308	[r]13,911	11,805	11,727	11,169
Grand total	[r]161,576	[r]171,423	173,513	168,635	166,027

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 8, 1982.
[2]Reported figure.

Table 34.—Leading world producers of elemental sulfur[1]

(Thousand metric tons)

Country	1978				1979				1980[p]				1981[e]			
	Native	From pyrites	Byproduct	Total	Native	From pyrites	Byproduct	Total	Native	From pyrites	Byproduct	Total	Native	From pyrites	Byproduct	Total
United States	[2]5,648	301	5,226	11,175	[2]6,357	400	5,344	12,101	[2]6,390	322	5,154	11,866	[2 3]6,348	[3]307	[3]5,490	[3]12,145
U.S.S.R.[e]	[4]3,500	3,500	3,550	10,550	[4]3,500	3,500	3,550	10,550	[4]3,700	3,550	3,750	11,000	[4]3,775	3,600	3,840	11,215
Canada	--	5	7,242	7,247	--	12	7,015	7,027	--	[4]12	7,393	7,405	--	12	6,830	6,842
Poland	[4]5,051	--	350	5,401	[4]4,830	--	345	5,175	[4]5,185	--	330	5,515	[4]4,722	--	330	5,052
Japan	--	327	2,401	2,728	--	300	2,591	2,891	--	311	2,473	2,784	--	293	2,200	2,493
China[e]	200	1,605	350	2,155	200	1,682	400	2,282	200	1,700	400	2,300	200	1,700	400	2,300
Mexico	[2]1,650	--	[r]268	[r]1,918	[2]1,773	--	352	2,125	[2]1,700	--	552	2,252	[2]1,652	--	550	2,202
France	--	--	[r]2,221	[r]2,221	--	--	2,284	2,284	--	--	2,213	2,213	--	--	2,156	2,156
Germany, Federal Republic of	--	221	[r]1,380	[r]1,601	--	203	1,447	1,650	--	198	1,577	1,775	--	200	1,495	1,695
Spain	--	1,046	130	1,176	--	1,091	133	1,224	--	1,096	140	1,236	--	1,100	150	1,250
Iraq	[2]600	--	40	640	[2]550	--	70	620	[2]700	--	70	770	[2]700	--	70	770
South Africa, Republic of	--	[r]219	125	344	--	243	125	368	--	493	125	618	--	502	127	629
Saudi Arabia	1	--	14	15	1	--	125	126	1	--	460	461	NA	--	600	600
Italy	[r]104	330	[r]250	684	19	302	[r]250	571	23	331	250	604	22	310	235	567
Romania	--	400	120	520	--	400	130	530	--	400	140	540	--	400	150	550
Finland	--	87	262	349	--	151	293	444	--	144	277	421	--	150	280	430
Sweden	--	233	148	381	--	282	166	448	--	249	170	419	--	249	170	419
Yugoslavia	--	[r]171	[r]205	376	--	190	205	395	--	189	205	394	--	190	204	394
Bulgaria	--	310	70	380	--	315	75	390	--	300	70	370	--	300	70	370
German Democratic Republic	--	10	350	360	--	10	350	360	--	10	350	360	--	10	350	360
Belgium	--	--	267	267	--	--	270	270	--	--	270	270	--	--	270	270
Korea, North	--	255	10	265	--	255	10	265	--	255	10	265	--	255	10	265
Norway	--	[r]150	43	193	--	119	46	165	--	193	46	239	--	190	46	236
Australia	--	93	[r]150	243	--	29	151	180	--	29	151	180	--	30	151	181

India	--	26	122	148	--	29	122	151	--	34	120	154	--	31	119	150
Iran	150	--	300	450	75	--	200	275	70	--	150	220	50	--	100	150
Netherlands	--	--	r84	84	--	--	78	78	--	--	112	112	--	--	105	105
Total	r16,904	r9,289	r25,678	r51,871	17,305	9,513	26,127	52,945	17,969	9,816	26,958	54,743	17,469	9,829	26,498	53,796
Other	r138	r512	r1,166	r1,816	149	474	1,177	1,800	166	481	1,245	1,892	170	431	1,272	1,873
Grand total	r17,042	r9,801	r26,844	r53,687	17,454	9,987	27,304	54,745	18,135	10,297	28,203	56,635	17,639	10,260	27,770	55,669

eEstimated. pPreliminary. rRevised. NA Not available.

[1]Includes all recorded production of sulfur, regardless of the form in which it is recovered. Thus, it includes elemental sulfur, whether mined by conventional methods or by the Frasch process, as well as (1) elemental sulfur and the S content of compounds such as H_2S, SO_2, and H_2SO_4 recovered as a principal product of pyrite mining and as a byproduct of the recovery of crude oil and natural gas and as a byproduct of petroleum refining, coal treatment, and metal smelting and/or refining; and (2) sulfur recovered from tar sands, spent oxides, and other miscellaneous sources. Table includes data available through May 1982.

[2]Entirely Frasch process sulfur.

[3]Reported figure.

[4]Includes Frasch process sulfur as follows, in thousand metric tons: Poland: 1978—4,546, 1979—4,310, 1980—4,667, and 1981-4,250; the U.S.S.R. (estimated): 1978—800, 1979—800, 1980—900, and 1981-925; and total of individually listed countries and grand total: 1977—13,080, 1978—13,412, 1979—14,277, 1980—14,007 and 1981—13,875. The balance is mined elemental sulfur.

Table 35.—Leading world producers of coal (all grades)[1]

(Million metric tons)

Country	1978			1979			1980[p]			1981[e]		
	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total
United States	33	r566	r599	38	671	709	42	711	753	2 47	2 700	2 747
U.S.S.R	166	557	723	165	554	719	163	553	716	164	540	2 704
China	(3)	618	618	(3)	635	635	(3)	620	620	(3)	620	2 620
German Democratic Republic	253	(4)	253	256	--	256	258	--	258	2 267	--	2 267
Germany, Federal Republic of	124	84	208	131	86	217	130	87	217	2 131	2 88	2 219
Poland	41	193	234	38	201	239	37	193	230	2 36	2 163	2 199
Australia	33	80	113	33	83	116	33	85	118	2 33	2 112	2 145
India	4	102	106	3	104	107	5	114	119	6	125	2 131
South Africa, Republic of	--	90	90	--	104	104	--	115	115	--	2 130	2 130
United Kingdom	(5)	124	124	(5)	122	122	--	130	130	--	2 126	2 126
Czechoslovakia	96	28	124	97	28	125	96	28	124	2 96	2 28	2 124
Yugoslavia	39	(4)	39	42	(4)	42	47	(4)	47	52	(4)	52
Korea, North[e]	(3)	44	44	(3)	44	44	(3)	45	45	(3)	45	45
Canada	5	25	30	5	28	33	6	31	37	2 7	2 37	2 44
Romania	r22	7	r29	25	8	33	27	8	35	27	8	35
Bulgaria	26	(4)	26	28	(4)	28	31	(4)	31	30	1	31
Greece	22	--	22	24	--	24	23	--	23	27	--	27
Hungary	23	3	26	23	3	26	23	3	26	23	3	26
France	3	20	23	2	19	21	3	18	21	3	18	21
Total	r890	2,541	r3,431	910	2,690	3,600	924	2,741	3,665	949	2,744	3,693
Other	r34	r95	129	33	97	130	38	99	137	49	105	154
Grand total	r924	r2,636	r3,560	943	2,787	3,730	962	2,840	3,802	998	2,849	3,847

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Sept. 30, 1982.
[2]Reported figure.
[3]Output small; included under "Bituminous and anthracite."
[4]Less than 1/2 unit.
[5]Revised to zero.

Table 36.—Leading world producers of marketed natural gas[1]

(Billion cubic feet)

Country	1977	1978	1979	1980[p]	1981[e]
United States	20,025	19,975	20,373	19,992	[2]20,241
U.S.S.R	12,219	13,144	14,359	15,369	[2]16,421
Netherlands	3,422	3,133	3,292	3,267	3,240
Canada	3,161	3,128	3,335	3,068	[2]3,006
United Kingdom	1,416	1,382	1,410	1,317	[2]1,321
Mexico	600	745	915	1,129	[2]1,214
Romania	1,204	1,212	1,161	1,199	1,200
Norway	111	526	759	922	[2]920
Algeria	305	490	916	[e]900	900
Indonesia	200	384	399	696	[2]739
Germany, Federal Republic of	638	707	[e]725	665	[2]666
Venezuela	524	520	576	589	[2]584
Saudi Arabia	159	335	[e]400	[e]450	500
Italy	485	485	476	443	493
China	[e]425	485	512	504	450
Australia	[r]238	259	296	338	[2]401
Pakistan	180	196	240	287	[2]316
Brunei	314	308	310	316	310
German Democratic Republic	300	302	302	302	302
United Arab Emirates (Abu Dhabi and Dubai)	143	208	220	292	298
Argentina	275	260	284	270	280
France	272	278	274	266	[2]250
Hungary	253	259	230	217	[2]212
Poland	258	282	259	224	[2]218
Iran	[e]795	687	500	[r e]230	200
Total	[r]47,922	[r]49,690	52,523	53,252	54,682
Other	[r]1,765	[r]1,794	2,201	2,042	1,949
Grand total	[r]49,687	[r]51,484	54,724	55,294	56,631

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Comprises all gas collected and utilized as a fuel or as a chemical industry raw material as well as that used for gas lift in fields, including gas used in oilfields and/or gasfields as a fuel by producers, even though it is not actually sold. Excludes gas produced and subsequently vented, flared, or reinjected to reservoirs. Table includes data available through Sept. 30, 1982.

[2]Reported figure.

Table 37.—Leading world producers of natural gas liquids[1]

(Million 42-gallon barrels)

Country[2]	1977	1978	1979	1980[p]	1981[e]
United States	591	572	579	572	577
U.S.S.R.[e]	114	119	122	126	134
Saudi Arabia	70	91	100	105	140
Canada	106	[r]104	123	115	[3]121
Mexico	38	44	57	[3]71	[3]88
Algeria	21	32	34	34	68
United Arab Emirates (Abu Dhabi and Dubai)	8	5	15	36	40
Kuwait	21	19	22	34	31
Venezuela	28	22	25	22	[3]20
Total	[r]997	[r]1,008	1,077	1,115	1,219
Other	[r]77	[r]78	66	71	80
Grand total	[r]1,074	[r]1,086	1,143	1,186	1,299

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Every effort has been made to include only those natural gas liquids produced by natural gas processing plants and to exclude natural gas liquids obtained from field treatment facilities including wellhead separators, because the latter are normally blended with crude oil and thus are included in crude oil output statistics. In some cases, however, sources do not clearly specify whether data presented represent only output of natural gas processing plants or if they include field output. Thus, some of the figures may include field condensate. Table includes data available through Sept. 30, 1982.

[2]In addition to the countries listed, China, Czechoslovakia, the German Democratic Republic, the Federal Republic of Germany and Italy may also produce natural gas liquids in substantial quantities, but available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

Table 38.—Leading world producers of crude oil[1]

(Million 42-gallon barrels)

Country	1977	1978	1979	1980[p]	1981[e]
U.S.S.R	[r]4,012	4,201	4,304	4,434	[2]4,476
Saudi Arabia[3]	3,358	3,030	3,479	3,624	3,630
United States	3,009	3,178	3,114	3,147	[2]3,129
Mexico	358	441	533	708	[2]844
Venezuela	817	790	860	793	[2]768
Nigeria	761	697	841	754	750
China	[e]684	760	775	773	[2]739
United Kingdom	279	389	562	586	[2]651
Indonesia	615	597	580	577	586
United Arab Emirates	730	668	668	624	548
Iran	2,067	1,913	1,121	550	490
Canada	482	478	545	523	[2]469
Kuwait[3]	719	778	913	609	415
Libya	753	[r]724	763	700	[2]408
Iraq	857	[r]953	1,252	969	326
Algeria	421	424	421	362	[2]287
Egypt	151	176	180	227	234
Argentina	157	165	173	180	[2]181
Norway	102	127	140	182	[2]175
Qatar	162	177	185	173	[2]146
Australia	157	158	160	140	[2]135
Oman	124	115	108	104	[2]120
India	76	[r]93	94	76	[2]117
Romania	109	103	92	86	[2]86
Malaysia	67	79	103	101	[2]84
Brazil	[r]61	[r]61	62	68	83
Ecuador	67	78	78	75	[2]77
Peru	33	55	70	71	70
Trinidad and Tobago	84	84	78	78	[2]69
Brunei	77	77	84	88	[2]64
Syria	64	62	69	61	59
Gabon	79	76	71	64	[2]54
Total	[r]21,492	[r]21,707	22,478	21,507	20,270
Other	[r]403	[r]390	431	405	544
Grand total	[r]21,895	[r]22,097	22,909	21,912	20,814

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Sept. 30, 1982.

[2]Reported figure.

[3]Includes the country's share of production from the Kuwait-Saudi Arabia Partitioned Zone.

Table 39.—Leading world producers of refined oil[1]

(Million 42-gallon barrels)

Country	1977	1978	1979	1980[p]	1981[e]
United States (including Puerto Rico and Virgin Islands)	5,923	5,957	5,860	5,619	5,219
U.S.S.R	3,325	3,412	3,513	3,620	3,655
Japan	1,701	1,688	1,696	1,611	[2]1,464
Germany, Federal Republic of	772	788	953	875	776
France	874	928	978	881	757
Italy	856	865	885	721	698
Canada	659	664	712	694	[2]686
United Kingdom	638	726	725	637	[2]577
Mexico	309	327	358	425	[2]471
China[e]	650	600	470	470	450
Brazil	358	400	418	405	400
Netherlands	448	427	470	400	[2]363
Spain (including Canary Islands)	355	351	355	367	360
Saudi Arabia[3]	275	294	315	336	[2]345
Venezuela	356	362	369	341	[2]319
Singapore	217	250	264	262	260
Belgium	269	[r]247	247	239	230
India	181	196	203	191	[2]225
Netherlands Antilles	198	215	222	225	223
Australia	226	226	232	213	[2]216
Argentina	177	173	182	190	[2]190
Korea, Republic of	158	174	189	183	[2]183
Romania	157	175	182	182	182
German Democratic Republic	134	139	142	144	147
Kuwait[3]	126	133	163	142	124
Indonesia	113	[r]103	120	130	120
Algeria	34	57	58	[e]95	120
Czechoslovakia	116	119	125	122	120
South Africa, Republic of	106	106	105	[e]110	110
Greece	79	86	113	105	109
Egypt	77	83	98	104	108
Taiwan	93	109	107	113	106
Sweden	109	115	125	133	105
Yugoslavia	95	100	109	105	104
Poland	110	113	110	106	101
Iran	274	249	[e]224	150	100
Total	[r]20,548	[r]20,957	21,397	20,646	19,723
Other	[r]1,679	[r]1,718	1,760	1,734	1,657
Grand total	22,227	22,675	23,157	22,380	21,380

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Sept. 30, 1982.

[2]Reported figure.

[3]Includes the country's share of production from the Kuwait-Saudi Arabia Partitioned Zone.

The Mineral Industry of Albania

By Walter Steblez[1]

In 1981, the Albanian Government was less forthcoming with yearend planned industrial output results than in previous years. The main reported indicators for the year were national income and gross industrial production, which increased 6% and 7%, respectively, over 1980 levels, and were consonant with published centrally planned targets for 1981.

The last routine Albanian yearend industrial production data were reported in 1973. Subsequently, yearend production results, for the most part, were reported as a percentage growth of output over that of preceding years or as a percentage share of total output for a given year; i.e., mine and/or smelter production were presented as weighted shares of gross industrial output. For 1981, performance results of individual industries were generally not disclosed by Albanian authorities.

Government Policies and Programs.—The Albanian Government set high growth rates for industry for the seventh 5-year plan period (1981-85). Total industrial production was to increase 34% to 36% over that of 1980, although labor productivity was to grow by 2.5% to 2.8% annually during this time. Mining, metallurgy, and machine-building industries were given the highest development priorities during the new 5-year period. Compared with that of 1980, mining output would grow 9.7% annually, and in 1985, the machine-building industry would produce 49% to 51% more machinery and equipment. The planned output of primary energy in 1985 was to increase by about 38% compared with the level of 1980. Furthermore, geological survey work and exploration reportedly would be intensified for both metallic and nonmetallic raw materials. By 1985, the country planned to add 50 new mines to the 60 operating mines in 1980.

Specific production goals for industrial branches in 1982, as in 1981, were not published; however, total industrial production was to increase 8.5% over that of 1981, and the value of foreign trade, 16.9%.

PRODUCTION

Albania's totally nationalized mineral industry produced a wide variety of industrial minerals. Chromite, copper, and nickeliferous iron ore as well as coal and other mineral fuels remained the industry's most important products in terms of production scale as well as export value. Other commodities produced included phosphate, bauxite, nickel ore, dolomite, kaolin, and marble.

Despite reported planned production successes in the mineral industry for the first half of 1981, plan nonfulfillment was reported in a number of mining sectors owing to mismanagement, wornout equipment, absenteeism and other problems. Copper production was reported as having fallen most seriously short of goals for these reasons.

Table 1.—Albania: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
Asphalt and bitumen, natural[e 3] thousand tons	1,500	1,600	1,650	1,780	1,800
Cement, hydraulic do.	750	800	840	1,000	1,100
Chromium: Chromite, gross weight	880,000	990,000	1,015,000	1,077,000	1,140,000
Coal: Lignite[e] thousand tons	1,000	1,200	1,430	1,540	1,600
Cobalt, mine output, metal content[e 4]	306	306	306	330	340
Copper:					
Mine output, metal content[e]	10,000	11,500	14,000	15,300	15,500
Metal, primary and secondary:					
Smelter[e]	9,000	9,500	9,700	9,900	10,000
Refined[e]	7,000	7,000	7,500	7,700	9,000
Gas, natural, gross production[e 5] million cubic feet	12,370	12,500	13,000	13,200	13,500
Iron and steel:					
Iron ore: Nickeliferous:					
Gross weight	510,000	510,000	530,000	550,000	600,000
Iron content	178,500	178,500	85,500	192,500	200,000
Ferroalloys: Ferrochromium[e]	NA	NA	NA	3,500	28,000
Semimanufactures[e]	26,000	27,000	28,000	30,000	31,000
Nickel, mine output, metal content[e]	5,000	5,100	5,300	5,500	5,600
Nitrogen: N content of ammonia	65,000	76,000	72,000	75,000	76,000
Petroleum:					
Crude:					
As reported million tons	1,900	r1,900	1,600	1,700	1,700
Converted thousand 42-gallon barrels	12,676	r12,700	10,700	11,300	11,300
Refinery products:[e]					
Gasoline do.	1,488	1,500	1,600	1,700	1,700
Kerosine do.	465	470	500	540	600
Distillate fuel oil do.	2,238	2,250	2,270	2,400	2,300
Residual fuel oil do.	2,330	3,400	3,600	3,800	3,500
Lubricants do.	84	90	100	105	120
Other do.	2,400	2,500	2,600	2,700	3,000
Total[6] do.	9,005	10,210	10,670	11,245	11,220
Salt[e]	50,000	50,000	62,500	66,500	66,500
Sodium compounds, n.e.s.: Sodium carbonate, calcined (soda ash)[e]	23,000	23,200	23,300	25,000	25,500

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Sept. 22, 1982.

[2]In addition to the commodities listed, a variety of crude construction materials (common clay, sand and gravel, and stone) are undoubtedly produced, but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels. Also, metallic nickel production reportedly began in 1978, but data on the level of production are not available.

[3]Includes petroleum-refinery-produced asphalt and bitumen.

[4]Calculated from reported and estimated weight of nickeliferous ore; the amount of cobalt recovered, if any, is conjectural.

[5]Separate data on marketable production are not available, but gross and marketed output are regarded as nearly equal.

[6]Sums of listed products only; no estimates have been made for other products produced.

TRADE

In 1981, Albania continued to forbid foreign credit borrowing and employed barter as a basis for foreign trade. Although Yugoslavia remained Albania's chief trading partner, mineral trade increased with Western market economy countries during the year. Exports of Albanian ferrochromium increased significantly to such countries as Italy, the Federal Republic of Germany, Sweden, and the Netherlands. Also, commercial contacts with Finland for the purpose of purchasing Finnish mining equipment and technology were reported.

During the 1981-85 5-year plan period, 73% of Albania's mineral exports were to be domestically processed prior to shipment. New commodities scheduled for export were to include nickel, steel, bauxite, selenium, dolomite, quartz, and refractory bricks.

Table 2.—Albania: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Unwrought	--	25	--	All to Italy.
Semimanufactures	--	2	--	All to Saudi Arabia.
Chromium ore and concentrate	867,562	509,122	78,177	Sweden 61,075; Poland 40,870; Italy 39,102.
Copper metal including alloys:				
Unwrought	918	1,429	--	Austria 597; Italy 398; Turkey 300.
Semimanufactures	376	805	--	Turkey 779; Italy 26.
Iron and steel:				
Ferroalloys	155	3,359	--	Italy 1,505; Netherlands 1,000; Sweden 645.
Semimanufactures:				
Bars, rods, angles, shapes, sections	1,067	1,651	--	All to Saudi Arabia.
Universals, plates, sheets	--	19	--	Pakistan 17.
Rails and accessories	--	14	--	All to Saudi Arabia.
Tubes, pipes, fittings	13	300	--	Saudi Arabia 284.
Castings and forgings, rough	9	32	--	All to Saudi Arabia.
Lead metal including alloys, unwrought	--	5	--	All to Sweden.
Mercury 76-pound flasks	--	203	--	All to Italy.
Silver waste and sweepings[2] value, thousands	$445	NA	NA	NA.
Tin metal including alloys:				
Unwrought	--	12	--	All to Italy.
Semimanufactures	1	NA	NA	NA.
Other:				
Alkali, alkaline-earth, rare-earth metals	--	12	--	All to Saudi Arabia.
Base metals including alloys, all forms	2	NA	NA	NA.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	2	NA	NA	NA.
Cement	33,678	69,144	--	Algeria 29,213; Yugoslavia 28,904; Saudi Arabia 10,021.
Clay products:				
Nonrefractory	--	65	--	All to Saudi Arabia.
Refractory	--	341	--	Do.
Fertilizer materials: Manufactured, nitrogenous	2,151	10,590	--	Yugoslavia 6,419; Greece 3,151.
Graphite, natural	--	7	--	All to Saudi Arabia.
Pyrites, unroasted	--	22,914	--	Italy 15,853; Yugoslavia 7,061.
Salt and brine	22,948	9,794	--	All to Yugoslavia.
Sodium and potassium compounds, n.e.s.: Caustic soda	2,615	201	--	All to Saudi Arabia.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	4,661	3,667	--	Poland 1,616; Algeria 1,595; Italy 417.
Worked	974	405	--	All to Saudi Arabia.
Gravel and crushed rock	4	NA	NA	NA.
Sulfur, elemental, crude	--	987	--	All to Turkey.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,602	2,312	--	Yugoslavia 2,209; Austria 65.
Coal, anthracite and bituminous	--	27	--	All to Saudi Arabia.
Petroleum refinery products:				
Gasoline 42-gallon barrels	361,114	413,279	--	Italy 392,777; Netherlands 20,409.
Kerosine and jet fuel do.	473	1,109	--	Hungary 1,093.
Distillate fuel oil do.	218,265	234,863	--	Italy 157,928; Greece 56,166; Turkey 20,769.
Residual fuel oil do.	--	9,717	--	All to Turkey.
Lubricants do.	--	22,078	--	Spain 22,050.
Other:				
Petroleum coke do.	--	46,377	--	Yugoslavia 30,300; Egypt 16,077.
Bitumen and other residues do.	691,604	487,303	--	Italy 231,971; Greece 119,685; Algeria 114,789.
Bituminous mixtures do.	27,809	NA	NA	NA.
Unspecified do.	322,000	438,000	--	All to Poland.

[p]Preliminary. NA Not available.

[1]Owing to the lack of official trade data published by Albania, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from various sources, which include United Nations information and data published by the partner trade countries.

[2]May include waste and sweepings of other precious metals.

Table 3.—Albania: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	--	188	--	Yugoslavia 93; Austria 82.
Metal including alloys:				
Scrap	--	10	--	All from Greece.
Unwrought	595	707	--	Hungary 496; Greece 201.
Semimanufactures	793	976	--	Hungary 398; Greece 193; Yugoslavia 186.
Chromium: Oxides and hydroxides	--	36	--	All from Italy.
Copper:				
Sulfate	100	300	--	All from Yugoslavia.
Metal including alloys:				
Scrap	--	399	--	Do.
Unwrought	26	38	--	West Germany 35.
Semimanufactures	190	767	--	Italy 345; Yugoslavia 157; West Germany 108.
Iron and steel:				
Pig iron, cast iron, powder, shot	--	1,125	--	West Germany 1,100; Italy 25.
Ferroalloys	4,818	4,637	--	Yugoslavia 4,599; France 36.
Steel, primary forms	--	1,699	--	All from Spain.
Semimanufactures:				
Bars, rods, angles, shapes, sections	[r]51,093	65,558	--	Czechoslovakia 23,000; Poland 17,778; Yugoslavia 14,224.
Universals, plates, sheets	10,096	27,093	--	Greece 18,776; Hungary 2,988; Poland 2,554.
Hoop and strip	[r]314	1,201	--	Greece 666; Yugoslavia 368.
Rails and accessories	--	7,723	--	All from Yugoslavia.
Wire	615	830	--	Greece 496; Austria 200; Turkey 73.
Tubes, pipes, fittings	--	19,226	--	Greece 8,083; Yugoslavia 3,389; West Germany 1,790.
Lead:				
Oxides	--	1	--	All from West Germany.
Metal including alloys:				
Unwrought	190	501	--	All from Yugoslavia.
Semimanufactures	166	25	--	Yugoslavia 18; West Germany 7.
Magnesium metal including alloys, semimanufactures	4	NA	NA	NA.
Manganese:				
Ore and concentrate	4,072	NA	NA	NA.
Oxides	1	NA	NA	NA.
Mercury 76-pound flasks	1,073	290	--	All from Algeria.
Nickel metal including alloys, unwrought	8	4	--	All from Netherlands.
Silver metal including alloys, unwrought and partly wrought value, thousands	$6	$83	--	West Germany $72; Italy $11.
Tin metal including alloys:				
Unwrought	--	10	--	All from West Germany.
Semimanufactures	--	2	--	All from Yugoslavia.
Zinc:				
Oxides	67	83	--	All from Italy.
Metal including alloys:				
Unwrought	194	82	--	All from Yugoslavia.
Semimanufactures	116	85	--	Yugoslavia 83.
Other metals:				
Ores and concentrates	[r]148,903	182,077	--	All from Algeria.
Metalloids	--	1	--	All from Yugoslavia.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	5	NA	NA	NA.
Artificial: Corundum	--	4	--	All from Italy.
Grinding and polishing wheels and stones	67	75	--	Yugoslavia 71.
Asbestos, crude	1,675	2,602	--	Yugoslavia 2,310; Austria 252.
Boron materials, oxide and acid	7	3	--	All from West Germany.
Cement	--	20	--	All from Greece.
Clay and clay products:				
Crude	13	211	--	France 160; Yugoslavia 50.
Products:				
Nonrefractory	1	53	--	Italy 33; Yugoslavia 20.
Refractory	25,157	17,437	--	Yugoslavia 11,009; Greece 2,707; Hungary 1,992.
Feldspar, fluorspar, etc	2,336	1,754	--	France 1,750.
Fertilizer materials:				
Crude, phosphatic	62,160	38,954	--	All from Algeria.
Manufactured:				
Nitrogenous	2	1	--	All from West Germany.
Potassic	4,378	1	--	Do.
Ammonia	1	NA	NA	NA.

See footnotes at end of table.

Table 3.—Albania: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Magnesite	8	9	--	All from West Germany.
Pigments, mineral: Iron oxides and hydroxides, processed	--	35	--	Do.
Precious and semiprecious stones, synthetic value, thousands	--	$75	--	All from Greece.
Salt and brine	1	4	--	All from West Germany.
Sodium and potassium compounds:				
Caustic soda	2	37	--	All from Yugoslavia.
Caustic potash	34	1	--	All from West Germany.
Soda ash	2	1	--	Do.
Stone, sand and gravel:				
Dimension stone, worked	--	25	--	All from Italy.
Quartz and quartzite	27	17	--	All from West Germany.
Sand excluding metal-bearing	957	2,999	--	All from Yugoslavia.
Sulfur: Sulfuric acid	974	3,624	--	All from Greece.
Talc, steatite, soapstone, pyrophyllite	886	1,865	--	Turkey 1,000; Yugoslavia 810.
Other nonmetals, crude	199	95	--	All from Greece.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	3	11	--	All from West Germany.
Coal, anthracite and bituminous	261,076	159,358	113,697	West Germany 45,661.
Coke and semicoke	21,246	14,585	--	All from United Kingdom.
Petroleum refinery products:				
Gasoline 42-gallon barrels	8,016	6,945	--	All from Italy.
Kerosine and jet fuel do.	82,290	NA	NA	NA.
Distillate fuel oil do.	22,753	NA	NA	NA.
Residual fuel oil do.	4,143	2,631	--	Belgium-Luxembourg 2,298; Yugoslavia 333.
Lubricants do.	32,991	24,269	--	Italy 10,710; Austria 7,329; Belgium-Luxembourg 6,209.
Other:				
Liquefied petroleum gas do.	--	23	--	All from West Germany.
Mineral jelly and wax do.	2,377	810	--	Yugoslavia 779.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	5	NA	NA	NA.

[p]Preliminary. [r]Revised. NA Not available.

[1]Owing to a lack of official trade data published by Albania, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from various sources, which include United Nations information and data published by the partner trade countries.

COMMODITY REVIEW

METALS

Bauxite.—Information on bauxite deposits and mining was scant; the mineral was mined in the Dajti area, and the deposits were claimed sufficient to develop an aluminum industry. Albania's sufficiency of hydroelectric power and fuel is expected to provide the energy basis for the industry's development.

Chromite.—The principal chromite mining areas in Albania consisted of four deposits in the eastern part of the country along the Yugoslav border: the Tropoje-Kukës area in the north; the Batër-Martanesh area in central Albania; the Pogradec-Lake Ohrid area, also in central Albania; and the Korçë area in the south.

Albania was a leading world chromite producer, ranking third among the major producers of this commodity. The ore deposits were podiform, and the Cr_2O_3 content ranged from 17% to 43%. The ore was generally marketed with a 42% Cr_2O_3 content.

Tropoje-Kukës and Batër-Martanesh were the major chromite-producing areas during the year. At Tropoje, the Kam Mine had a reported capacity of 25,000 tons per year of ore with a 25% to 35% Cr_2O_3 content; the Kalimash Mine had a 100,000-ton-per-year capacity with a Cr_2O_3 content ranging from 17% to 20%. In the Batër-Martanesh district, the largest producer was the 350,000-ton-per-year Belqizë Mine, where deposits containing 40% to 43% and 25% Cr_2O_3 were worked; the Batër I Mine had a reported capacity of 150,000 tons per

year with a Cr_2O_3 content of about 40%, whereas the 100,000-ton-per-year Batër II Mine produced ore with a 25% Cr_2O_3 content.[2]

In 1981, Albania reported the startup of the third stage of the Belqizë chrome ore concentrator in the Dibra district. The added capacity will increase concentrate production by 50,000 tons per year. Midyear production results indicated that the concentrator was operating above planned norms. The industry, however, reported unsatisfactory exploration and prospecting results during the midyear period.

Chromite remained the country's chief export commodity and most important source of foreign exchange. A significantly larger share of the chromite than in previous years was used to manufacture ferrochrome. In the area of ferroalloys, Albania significantly increased its production of ferrochromium. The country's ferrochromium plant in Burrel produced over 25,000 tons of this alloy. The major importers of Albanian ferrochrome in 1981 were the Federal Republic of Germany, 8,725 tons; Italy, 6,078 tons; the Netherlands (January-October 1981), 5,752 tons; Sweden, 3,543 tons; Belgium-Luxembourg, 3,478 tons; and Spain, 607 tons. In July 1981, the Swedish firm Fondmetall AB signed a multiyear contract with Albania to market Albania's annual ferrochrome production. Chrome production in 1985 was to increase 29% over that of 1980.

Copper.—Most of Albania's low-grade sulfide ore was produced in the Midrite, Krujë, Kukës, Pukë, and Shkodër areas in northern Albania. The ore grade ranged from 3% copper at Kukës to 0.7% to 1.2% at Kurbnesh. Metallurgical facilities were located at Kukës, Fierze-Rubic, and Laç.

The 1981 production plan was not met owing to what was described as negligence by management and professional staffs. A new smelter in Korçë was not put into operation on schedule, thereby reducing planned blister production by 3,200 tons. The only enterprise singled out for praise during the year was the Gjegjan copper mine in the Kukës district for exceeding its production quota by midyear.

The 1981-85 plan called for a 52% copper ore and a 28% blister copper production increase by 1985, compared with that of 1980. During this period, four new copper mines were to be developed in the Kukës area.

Iron Ore (Nickeliferous).—The principal iron ore mines were located in the Pogradec, Librazhd, Kukës, and Dibre areas. The Guri-i-Kuq Mine in Pogradec was rated at about 400,000 tons per year of ore containing about 40% iron and 0.6% to 0.9% nickel; the Prrenjas Mine, also in the Pogradec area, was rated at 400,000 tons per year with an ore content of 40% iron and 1.2% nickel. The Bustrice Mine in the Dibre area had a reported capacity of 400,000 tons per year. The entire output from this mine reportedly was shipped to Czechoslovakia.[3]

A new mine under development during the year was the Bitincke Mine near the Greek border. The ore assayed 40% to 45% iron and 1% nickel; upon completion, this mine would raise nickeliferous iron ore production to about 2 million tons per year. The planned production of nickeliferous iron ore in 1985 was to be 250% greater than that of 1980.

Nickel was reportedly leached out of the ore, and the remaining iron ore fed into blast furnaces. The cobalt content of the ore was about 0.06% and, reportedly, a unit was planned for the production of electrolytic nickel and cobalt salts.[4]

Iron and Steel.—The major developments in the steel industry included the construction and trial runs of the second blast furnace at the 700,000-ton-per-year Elbasan steel complex, as well as the purchase of a merchant mill from the Italian Danieli Co.

The 1981-85 plan set a 67% increase of rolled steel output and an 80% rise of ferrochrome production, compared with that of 1980.

NONMETALS

Cement.—Albania's cement industry was based in the western part of the country at Elbasan, Fushe-Kruje, Shkoder, Tirana, and Vlore. No new capacities were announced during the year. The V. I. Lenin cement works in Vlore, however, was cited for having exceeded the annual plan as well as for having increased efficiency.

Fertilizer Materials.—Albania remained a net importer of fertilizer materials. Although phosphate mining was reported to have commenced, no other data were provided on the scale of the operations or the P_2O_5 content of the rock. Phosphate fertilizer continued to be produced at Laç and Durres, and nitrogenous material was manufactured at the Fier ammonia plant. No new capacities were reported to have been added in the industry during the year.

MINERAL FUELS

Albania continued to be a net exporter of energy. Both electric energy and petroleum continued to be exported in 1981. Electricity was sold to Greece and Yugoslavia, as in previous years, and negotiations with Greece over the construction of a second 200-kilometer powerline were announced during the year. In 1981, work continued on the construction of the 600-megawatt Koman hydropower station. Albania's estimated primary energy balance is presented in table 4.

Coal.—The country's four main lignite deposits were near Durres in the central coastal area, in Krrabe in the central part of the country, at Memaliaj in the south, and in the Korçë vicinity in the southwest. Run-of-mine coal was rated at 2,500 to 3,000 kilocalories per kilogram; after beneficiation, the calorific value increased to 4,500 to 5,000 kilocalories per kilogram.

In 1981, at the end of the 9-month period, January to September, the industry's top producers were the Memaliaj Mine in the Tepelenë area, the Manza Mine in the Durres area, and the Bezhan Mine in Kolonja; these mines reportedly exceeded the production plan for this period by 2,800, 1,200, and 1,000 tons, respectively. The 1981-85 5-year plan envisages a 48% increase in coal production over that of 1980.

Table 4.—Albania: Estimated total primary energy balance

(Million tons of standard coal equivalent)[1]

	Total primary energy	Coal (lignite, anthracite, bituminous) and coke	Crude oil and petroleum products	Natural and associated gas	Hydropower
1981:					
Production[2]	3.12	0.80	1.50	0.50	0.32
Imports	.12	.12	--	--	--
Exports	.18	.01	.10	--	.07
Apparent consumption	3.06	.91	1.40	.50	.25
1980:					
Production[2]	3.65	.79	2.06	.49	.31
Imports	.12	.12	--	--	--
Exports	.19	.01	.10	--	.08
Apparent consumption	3.58	.90	1.96	.49	.23

[1]1 ton of standard coal equivalent (SCE)=7,000,000 kilocalories. Conversion factors used are lignite, 0.7; crude oil, 1.47; natural gas, 1.33 (per 1,000 cubic meters); hydroelectric power, 0.125 (per kilowatt-hour).
[2]Estimated based on data from various Albanian sources.

Source: United Nations, World Energy Supplies. Statistical Papers, Series J, No. 18, 1976.

Petroleum and Natural Gas.—Petroleum and natural gas production continued to be developed in 1981. As in previous years, Albania claimed the discovery of new but unspecified gas deposits. Petroleum continued to be produced in the Fier and Ballsh areas and continued to be exported. It was also used in the domestic chemical industry, as was domestic natural gas. The Albanian Government set a planned 56% to 58% petroleum production increase by 1985, compared with the 1980 production level.

[1]Foreign mineral specialist, Division of Foreign Data.
[2]Canellopoulos, G. P., and G. N. Panagiotou. (The Mineral Wealth of Albania.) Mineral Wealth (Athens), March-April 1982, pp. 15-34; abs. in Mining Magazine (London), September 1982, pp. 245-246.
[3]Work cited in footnote 2.
[4]Work cited in footnote 2.

The Mineral Industry of Algeria

By Suzann C. Ambrosio[1]

Algeria's mining industry, composed largely of iron ore, lead, zinc, mercury, and phosphates, contributed approximately 2% of the 1981 gross domestic product (GDP), estimated at $42 billion.[2] The mineral fuels sector, however, provided an estimated 30% of Algeria's nominal GDP in 1981, down 6% from that of 1980. The 1981 value of hydrocarbon exports was estimated to be similar to 1980 receipts of $12 billion. Factors responsible for the apparent stagnation included pricing disputes, declines in projected natural gas sales, and diminishing crude oil production.

The 1981 GDP, not including hydrocarbons, increased at an approximate 7% real rate and an estimated 11% rate including the hydrocarbon sector. It was estimated that nearly 20% of the overall growth of the GDP was from hydrocarbons, 37% from material production, and 43% from services, including custom duties and import taxes. Inflation remained at the approximate annualized rate of 11%, stemming in part from 12% to 15% wage increases for workers in the Government and agricultural sectors. Nearly all of the hydrocarbon and other mineral enterprises were Government owned and operated.

Even with the decline in crude production, Algeria's oil exports comprised nearly 90% of the nation's total 1981 exports. Although Algeria is not a major world producer of crude oil, 1981 production accounted for 2% of the total world output, 4% of the production by the Organization of Petroleum Exporting Countries (OPEC), and 6% of the Arab world's output. Natural gas production and the continued expansion of natural gas processing facilities held the greatest promise for sustaining Algeria's economic growth.

Algeria's energy consumption patterns have changed over the past decade. Natural gas comprised 51% of the total energy consumed during 1981, representing a near quadrupling of domestic consumption since 1970. The relatively large population growth of 3.2% per year, combined with increasing per capita energy consumption, will require more of Algeria's hydrocarbon production to be diverted from export into domestic markets.

The 1981 Algerian budget was $18 billion, and 1982 expenditures were expected to increase to approximately $21 billion. Of the total 1981 budget, petroleum-based revenues accounted for 60%, and these revenues were projected to constitute the same proportion in 1982. Nonpetroleum revenues (taxes on income and profits, taxes on production and consumption, and customs duties) provided the remaining 40% of revenues in 1981. This represented a near 20% increase over the 1980 revenue share.

Major items in both the 1981 and the proposed 1982 budget included education, defense, and health. The development budget priorities, as outlined in the current 1980-84, 5-year plan, emphasized education, community development, communications, and water. Despite large expenditures in the domestic economy, the Government claimed a 1981 budget surplus of approximately $75 million, an increase of 22% over the reported 1980 budget surplus.

The 5-year plan slated $137 billion for project assistance and capital investments by yearend 1984. Nearly 30% of the investments were earmarked for projects that were expected to be completed after 1984,

and 50% were for projects that commenced prior to 1980. The 1981 investment program called for $16 billion, and 1982 investments were expected to increase 35% to $22 billion.

Although the Government budget retained a surplus in 1980-81, Algeria's current account continued to deteriorate between 1978 and 1981. The 1981 current account, estimated at $800 million, was in deficit for the first time since 1974. The 1981 deficit was largely due to the increased servicing of the foreign debt. Interest and loan repayments were estimated at $2.8 billion in 1981. Algeria decided in 1979 against contracting new loans on the international capital market. This policy was expected to continue into the forseeable future. Debt service payments declined from 25.6% of total exports in 1979 to 20% in 1981. Algeria had maintained a trade surplus since 1979, and the 1981 balance of trade was estimated at $2 billion. Algeria's capital account continued to be in the black, but the 1981 estimated account balance of $300 million was slightly less than one-half the 1980 level.

Although the Algerian Government continued to control most sectors of the economy, a change in investment policies was evident in 1981. The private sector, already involved primarily in agriculture and the building construction fields, was encouraged to increase productive investments. The only legal political party in Algeria passed a resolution that allowed privately owned firms to import spare parts and equipment directly rather than placing orders with state import agencies.

The emphasis on heavy industry and large hydrocarbon complexes was shifted towards a decentralized and diversified economy. The Ministry of Finance and the state-owned banking system were charged with responsibility for implementing the structural changes in the economy. Formerly the largest Government organization, Societe Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocabures (SONATRACH) was separated into three agencies in 1980 and restructured into seven technical service entities during 1981. Eight other state-run agencies were also restructured in line with the new decentralization policy.

PRODUCTION AND TRADE

Algeria's nonfuel mineral production continued to be focused on import substitution and on raw material inputs for local construction and agricultural industries. Total production by the mining and quarrying sector was estimated to have increased 9% by volume during 1981. Output of iron ore, steel, lead, mercury, cement, and fertilizer materials continued to increase. Despite an overall growth in domestic consumption of Algeria's nonfuel mineral production, approximately 50% of these products were exported. Plans were under way to continue to increase the output of cement, fertilizers, and iron and steel products. Production of various other minerals showed stagnation and/or decline because of diminished exploration and development investments and near exhaustion of previously developed mines.

Despite a slight increase in iron ore production between 1980 and 1981, both domestic consumption and exports of iron ore during the same period increased by 55% and 19%, respectively. Public sector demand for iron and steel constituted 75% of total domestic demand. Algeria's national steel company, Société Nationale de Sidérurgie (SNS), continued to import about 10 million tons of cast iron during the year, thereby conserving domestic supplies, which have a high manganese content and were desirable for higher industrial value production. SNS marketed and exported limited amounts of cast iron, zinc, and other unclassified products. Cast iron was expected to continue to be imported in the near future, in concert with various steelwork expansion projects. Algerian iron and steel imports were composed of a range of specific products that were not produced domestically in sufficient quantities. The El Hadjar steelworks was expected to meet most of the nation's steel product needs by 1986.

Algeria continued importation of fertilizer materials, although the country became an exporter of ammonia for the first time in 1981. All of Algeria's potash requirements were imported, mostly in the form of potassium sulfate. Potash imports nearly tripled between 1979 and 1980; Spain was the largest supplier. During 1980 and 1981, Algeria substantially increased the volume of triple superphosphate imports from the United States.

With the recent completion of two fertilizer facilities and expansion plans for the Djebel phosphate mine, Algeria was expected to decrease phosphate rock exports and increase phosphate fertilizer processing. Production from the mine and adjacent Annaba and Tebessa fertilizer facilities was transported 161 kilometers by rail to Mediterranean ports. An engineering study was completed in 1980 to construct a 1,500-kilometer mining railroad to provide additional service to the area and also bring service to the Gara Djebel iron ore deposit. A new export harbor located at the mouth of the Macta River on the Mediterranean was also under consideration.

The overall volume of mineral fuel production declined by roughly 5% between 1980 and 1981, owing primarily to the 21% decline in crude oil output. Natural gas production increased 8% over the same period. Algeria produced both nonassociated gas and gas associated with oil. Only nonassociated gas was sold. Associated gas was either flared or used to repressure oil reservoirs to aid in the recovery of additional oil.

Domestic consumption of gas increased to approximately 210 billion cubic feet annually, equivalent to roughly 13% of Algeria's 1981 gross production. Over the past decade, increasing demands at home and abroad for alternative energy sources encouraged SONATRACH to develop the means for producing and exporting more natural gas.

Various natural gas liquefaction units completed during the year resulted in the near doubling of liquefaction capacity to approximately 100 billion cubic feet per year. Algeria's excess liquefaction capacity, resulting in part from the world energy supply glut, caused SONATRACH to shelve plans for three additional liquefaction units. It was estimated that sales contracts were reduced 60% over 1980 levels to roughly 220 billion cubic feet in 1981. Construction schedules for tripling the annual marketable capacity of natural gas from 30 billion cubic feet in 1981 to 100 billion cubic feet in 1984 may change after price negotiations and export volumes are reevaluated.

The decline in revenues from natural gas and crude petroleum exports were partially offset by the increased revenues from exports of refined products (condensate and liquid petroleum products), combined with increased prices for most Algerian hydrocarbons over 1980 price levels. The reduction in hydrocarbon revenues was buffered unintentionally by the strength of the American dollar. Algerian receipts for hydrocarbon exports were paid in dollars and were utilized for imports, primarily in European and Japanese markets. Bartering oil for necessary imported goods has become another means by which the Algerians hope to diminish the impact of the revenue loss.

Algeria's 1981-82 trade objectives were to reduce imports of nonessential goods to shrink the foreign debt and limit the dependence on industrialized nations. During 1980, Algeria's major import suppliers, in descending order by value, consisted of the European Communities (EC), Japan, and the United States. Similarly, Algeria's major export partners were the United States, the EC, and Japan. In general, there has been a recent trend to diversify and shift trade toward developing and socialist countries. More specifically, the Algerian Government expressed interest in expanding trade with sub-Saharan Africa, northwest Africa, Spain, and Eastern Europe. Of particular interest to the mineral industry was the recent trade agreement, signed in 1981, between Zambia and Algeria for a steel and metals trade exchange.

Table 1.—Algeria: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Antimony (content of ores and concentrates)	60	60	60	--	NA
Cadmium, refined	133	175	185	150	200
Copper concentrate:					
Gross weight	1,500	679	870	1,048	1,090
Metal content	345	157	200	240	250
Iron and steel:					
Iron ore, gross weight thousand tons	3,182	3,052	3,200	3,300	3,406
Metal:					
Pig iron do	429	[r]480	396	400	430
Crude steel do	410	[r]417	416	534	550
Lead concentrate:					
Gross weight	1,362	2,837	3,594	3,750	3,900
Metal content	875	1,825	2,300	2,400	2,600
Mercury 76-pound flasks	30,429	30,603	14,736	24,425	25,000
Silver[e] thousand troy ounces	40	75	100	100	110
Zinc:					
Concentrate:					
Gross weight	5,762	9,981	10,210	17,100	12,900
Metal content	2,748	4,790	4,900	8,200	6,200
Metal, smelter	[r]16,000	25,700	27,300	30,000	33,200
NONMETALS					
Barite, crude	48,066	73,087	[e]90,000	[e]90,000	90,000
Cement, hydraulic thousand tons	1,777	2,697	3,768	4,000	4,500
Clays:					
Bentonite	24,400	35,664	[e]36,500	36,500	38,000
Fuller's earth	4,367	4,847	[e]5,000	5,000	5,100
Kaolin	11,465	17,423	[e]18,100	18,000	19,000
Diatomite	4,100	4,025	4,400	4,400	4,500
Gypsum and plasters[e 3] thousand tons	175	175	191	200	200
Lime, hydraulic do	40	[e]50	[e]82	90	90
Phosphate rock do	1,173	1,136	1,084	1,025	1,250
Salt do	147	171	[e]165	170	170
Sodium compounds: Caustic soda	688	[e]700	[e]700	700	700
Strontium minerals: Celestite, gross weight	5,100	5,822	[e]5,400	5,400	5,400
Sulfur, elemental[e]	10,000	15,000	15,000	14,000	15,000
MINERAL FUELS AND RELATED MATERIALS					
Coal	--	--	--	--	NA
Gas, natural:					
Gross million cubic feet	939,118	1,148,322	1,539,006	1,497,511	[4]1,613,873
Marketed (including liquefied) do	304,905	490,095	916,023	[e]900,000	900,000
Natural gas plant liquids (condensate)[e] thousand 42-gallon barrels	20,800	32,200	33,872	34,000	68,000
Petroleum:					
Crude do	[5]420,577	[r]423,838	421,121	361,599	[4]287,288
Refinery products:					
Gasoline do	9,892	10,914	11,315	NA	NA
Jet fuel and kerosine do	3,066	4,453	4,380	NA	NA
Distillate fuel oil do	9,746	15,732	16,790	NA	NA
Residual fuel oil do	7,337	12,447	12,775	NA	NA
Lubricants do	228	362	365	NA	NA
Other do	2,033	7,594	10,220	NA	NA
Refinery fuel and losses do	2,008	5,365	2,555	NA	NA
Total do	34,310	56,867	58,400	[e]95,000	120,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 20, 1982.

[2]In addition to the commodities listed, secondary aluminum, secondary lead, and secondary copper may be produced in small quantities, ammonia is produced, and crude construction materials additional to those listed presumably are produced for local consumption, but output is not reported and available information is inadequate to make reliable estimates of output level.

[3]Includes approximately 50,000 tons of plasters each year.

[4]Reported figure.

[5]Includes lease condensate.

Table 2.—Algeria: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, scrap	50	54	--	All to France.
Copper:				
Ore and concentrate	985	--		
Matte and speiss	40	69	--	All to France.
Metal including alloys, scrap	1,144	1,124	--	Do.
Iron and steel:				
Scrap	60,333	65,513	--	Italy 52,408; Denmark 6,603; Spain 6,437.
Pig iron including cast iron	84,070	128,699	--	U.S.S.R. 67,683; Italy 60,434; Tunisia 582.
Steel, primary forms	19,893	19,383	--	All to Italy.
Semimanufactures:				
Bars, rods, angles, shapes, sections	--	1	--	All to France.
Universals, plates, sheets	2,493	--		
Tubes, pipes, fittings	9	8	--	Do.
Lead: Ore and concentrate	3,720	4,556	--	All to Tunisia.
Mercury 76-pound flasks	16,303	10,762	--	East Germany 8,848; Japan 1,595; Albania 290.
Nickel:				
Matte and speiss	4,055	--		
Metal including alloys, scrap	--	178	--	All to France.
Silver metal including alloys, unwrought and partly wrought value, thousands	--	$4	--	All to Switzerland.
Zinc metal including alloys:				
Unwrought	8,571	24,182	--	U.S.S.R. 7,500; United Kingdom 5,005; Yugoslavia 3,701.
Semimanufactures	15	--		
Other:				
Ores and concentrates thousand tons	2,352	1,475	--	Belgium-Luxembourg 784; Italy 228; Albania 182; Czechoslovakia 133.
Ash and residue containing nonferrous metals	585	2,139	--	Belgium-Luxembourg 1,412; France 727.
Alkali, alkaline-earth, rare-earth metals	--	47	--	All to East Germany.
Base metals including alloys, all forms	40	--		
NONMETALS				
Cement	--	8,450	--	All to Mali.
Diamond: Industrial value, thousands	$387	$215	--	All to Ireland.
Diatomite and other infusorial earth	1,850	400	--	All to France.
Fertilizer materials, crude: Phosphatic	836,122	807,828	--	Finland 120,586; France 196,614; Hungary 112,563.
Graphite, natural	112	109	--	All to France.
Salt and brine	3,480	2,000	--	All to Benin.
Stone, sand and gravel: Dimension stone, crude and partly worked	--	540	--	All to Tunisia.
Sulfur: Sulfuric acid, oleum	23,648	--		
Other: Crude	--	5,385	--	All to U.S.S.R.
MINERAL FUELS AND RELATED MATERIALS				
Gas, natural, liquefied[1] thousand tons	9,664	5,704	2,192	France 1,524; Spain 1,151; United Kingdom 677.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	415,226	356,459	190,682	West Germany 54,237; France 41,521; Italy 21,855.
Refinery products:				
Gasoline do.	7,315	17,052	488	Netherlands 11,719; United Kingdom 1,422; France 1,290.
Kerosine and jet fuel do.	2,171	658	--	Netherlands 356; Benin 108; Turkey 83.
Distillate fuel oil do.	2,664	10,624	--	Netherlands 6,741; France 1,659; Italy 1,504.
Residual fuel oil do.	11,555	14,681	11,594	Japan 1,255; Netherlands 947; Italy 422.
Lubricants do.	--	(2)	(2)	
Mineral jelly and wax do.	169	--		
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	--	10,007	--	All to France.

[1]Liquefied natural gas and liquefied petroleum gas, not differentiated.
[2]Less than 1/2 unit.

Table 3.—Algeria: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	26	1,142	--	Switzerland 600; France 510; West Germany 17.
Metal including alloys:				
Scrap	79	5	--	All from West Germany.
Unwrought	1,948	3,741	--	Egypt 1,002; United Kingdom 920; Romania 831.
Semimanufactures	8,206	8,016	366	Italy 1,500; France 1,422; Norway 999.
Chromium: Oxides and hydroxides	174	12	--	France 7; Switzerland 4.
Copper metal including alloys:				
Scrap	16	--		
Unwrought	2,398	5,418	1	Zambia 4,057; Canada 985; France 312.
Semimanufactures	7,325	15,045	12	Italy 4,428; West Germany 3,285; France 1,955.
Iron and steel:				
Pyrite, roasted value	--	$1,000	--	All from Switzerland.
Metal:				
Scrap	1	356	4	France 315; West Germany 34.
Pig iron, cast iron, powder, shot	7,505	10,789	15	West Germany 7,491; Canada 2,450; Sweden 158.
Ferroalloys	4,416	6,902	--	Belgium-Luxembourg 2,335; Iceland 600; Norway 600.
Steel, primary forms	405,434	530,083	27	West Germany 205,986; Belgium-Luxembourg 114,525; Netherlands 71,394.
Semimanufactures:				
Bars, rods, angles, shapes, sections	320,995	530,053	27	Italy 222,627; Belgium-Luxembourg 122,749; West Germany 70,546.
Universals, plates, sheets	135,108	148,883	1,322	West Germany 82,102; France 34,767; Belgium-Luxembourg 18,605.
Hoop and strip	33,214	13,470	89	West Germany 8,974; France 2,327; Belgium-Luxembourg 1,821.
Rails and accessories	7,767	502,649	(1)	West Germany 500,156; France 1,449.
Wire	36,771	47,076	14	Italy 13,714; Belgium-Luxembourg 11,999; West Germany 10,901.
Tubes, pipes, fittings	332,216	173,838	4,196	West Germany 42,120; Belgium-Luxembourg 35,624; France 26,504.
Castings and forgings, rough	703	2,658	--	West Germany 1,971; Tunisia 453; Italy 21.
Lead:				
Oxides and hydroxides	1,643	1,928	--	West Germany 790; France 786; United Kingdom 350.
Metal including alloys:				
Unwrought	5,495	8,843	--	West Germany 3,560; Belgium-Luxembourg 2,395; Canada 1,068; Tunisia 1,033.
Semimanufactures	84	249	--	Belgium-Luxembourg 194; France 53.
Magnesium metal including alloys, all forms	6	38	--	France 22; United Kingdom 8; West Germany 7.
Manganese: Oxides and hydroxides	1,571	1,329	--	Greece 720; West Germany 355; France 250.
Mercury 76-pound flasks	203	29	--	Mainly from West Germany.
Molybdenum metal including alloys, all forms	9	3	--	Do.
Nickel:				
Matte and speiss value	--	$1,000	--	All from Spain.
Metal including alloys:				
Unwrought	2	--		
Semimanufactures	40	61	(1)	West Germany 36; Belgium-Luxembourg 9; France 6.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$1,250	$599	--	United Kingdom $428; Switzerland $85; France $78.
Silver metal including alloys, unwrought and partly wrought do	$2,783	$3,243	$30	Belgium-Luxembourg $2,691; Switzerland $322; France $91.
Tin metal including alloys:				
Scrap	92	123	--	Spain 45; Malaysia 40; United Kingdom 27.
Semimanufactures	58	100	4	France 56; Belgium-Luxembourg 27; Spain 10.
Titanium: Oxides and hydroxides	4,561	7,516	--	West Germany 6,849; Belgium-Luxembourg 600; France 53.
Tungsten metal including alloys, all forms	4	22	1	West Germany 19.

See footnotes at end of table.

Table 3.—Algeria: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	55,475	30,491	--	Belgium-Luxembourg 7,956; Peru 6,553; Sweden 6,240.
Oxides and hydroxides	732	199	1	West Germany 75; Italy 40; Netherlands 40.
Metal including alloys:				
Unwrought	--	3	--	All from France.
Semimanufactures	987	1,179	--	France 702; Belgium-Luxembourg 336; West Germany 124.
Other:				
Ores and concentrates	6,702	1,427	755	Australia 451; Belgium-Luxembourg 98; Italy 75.
Ash and residue containing nonferrous metals, value	$4,000	--		
Alkali, alkaline-earth, rare-earth metals	123	25	2	Italy 15; France 3; Switzerland 3.
Metalloids	--	2	2	
Base metals including alloys, unwrought and semimanufactures	271	33	(1)	Belgium-Luxembourg 30; West Germany 2.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	51,247	63,398	--	Italy 56,438; Spain 6,951.
Artifical: Corundum	32	51	--	France 34; Italy 14; West Germany 3.
Dust and powder of precious and semiprecious stones, value, thousands	$13	$6	--	France $5; United Kingdom $1.
Grinding and polishing wheels and stones	578	1,477	5	France 500; Italy 286; China 156.
Asbestos, crude	10,234	21,305	(1)	Canada 12,566; West Germany 3,394; Italy 98.
Barite and witherite	68,092	37,258	--	Italy 33,416; North Korea 3,842.
Boron materials: Oxide and acid	281	358	21	France 240; West Germany 51; Italy 35.
Cement, thousand tons	1,128	962	2	Spain 418; France 204; Greece 183.
Chalk	5,497	7,932	38	France 5,649; Italy 2,152; West Germany 59.
Clay and clay products:				
Crude	24,756	16,475	20	Spain 6,000; United Kingdom 4,314; West Germany 4,274.
Products:				
Nonrefractory	5,129	3,415	--	Spain 2,248; Italy 736; France 223.
Refractory including nonclay brick	20,515	27,882	102	Italy 8,493; West Germany 8,482; France 3,122.
Diamond:				
Gem, not set or strung, value, thousands	$7	--		
Industrial, do	$1,114	$1,384	$30	Zaire $1,096; Ireland $247.
Diatomite and other infusorial earth	238	66	10	France 49; West Germany 5; Iceland 2.
Feldspar, fluorspar, nepheline	4,891	6,635	--	Italy 4,084; West Germany 1,159; Norway 1,115.
Fertilizer materials:				
Crude: Phosphatic	--	39	--	France 36; West Germany 3.
Manufactured:				
Nitrogenous	117,319	173,669	--	Netherlands 88,492; Romania 82,866; Italy 2,050.
Phosphatic	5,990	147,621	68,017	Tunisia 69,104; Romania 10,500.
Potassic	42,420	47,047	--	Spain 25,415; Italy 21,630.
Other including mixed	3	97,189	35,511	Greece 20,750; Spain 15,185; France 14,866.
Ammonia	50,012	48,853	17,251	U.S.S.R. 13,619; United Kingdom 10,221; Ireland 7,700.
Graphite, natural	248	312	--	West Germany 151; United Kingdom 109; France 51.
Gypsum and plasters	4,716	1,716	--	France 1,010; Spain 497; Japan 207.
Lime	8,280	3,015	--	France 1,315; Spain 1,136; Belgium-Luxembourg 300.
Magnesite	669	803	--	Austria 700; West Germany 96.
Mica:				
Crude including splittings and waste	3,100	205	--	Fiji 203.
Worked including agglomerated splittings	50	99	--	West Germany 94; France 3.
Pigments, mineral: Iron oxides, processed	978	974	--	West Germany 952; France 12; Belgium-Luxembourg 10.

See footnotes at end of table.

Table 3.—Algeria: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Precious and semiprecious stones other than diamond: Synthetic value, thousands	$62	$193	--	Austria $184; Czechoslovakia $5; France $3.
Salt and brine	552	25	--	West Germany 13; Switzerland 6; France 5.
Sodium and potassium compounds, n.e.s: Caustic potash	22	37	(1)	West Germany 17; France 16; United Kingdom 2.
Caustic soda	17,065	12,464	2	Italy 6,471; Spain 3,534; France 1,219.
Soda ash	15,049	21,762	--	Spain 8,614; Portugal 6,500; France 4,389.
Stone, sand and gravel: Dimension stone: Crude and partly worked	4,589	1,595	--	Mainly from Albania.
Worked	76	5	--	Mainly from France.
Dolomite, chiefly refractory-grade	2,955	2,739	--	Spain 1,700; West Germany 550; Italy 270; France 193.
Gravel and crushed rock	15,271	36,252	--	Italy 36,104; West Germany 84; France 43.
Limestone other than dimension value	--	$6	--	All from Sweden.
Quartz and quartzite	1,958	2,962	--	Belgium-Luxembourg 1,522; Netherlands 1,223; Italy 100.
Sand, excluding metal-bearing	2,450	5,869	357	Belgium-Luxembourg 895; Switzerland 213; France 179.
Sulfur: Elemental: Other than colloidal	69,736	52,117	--	Canada 46,258; Poland 5,827; West Germany 32.
Colloidal	5,926	6,990	--	Spain 6,985; France 5.
Sulfuric acid, oleum	1,188	67,267	5,746	West Germany 19,978; Italy 14,421; Portugal 6,303.
Talc, soapstone, pyrophyllite	2,106	1,428	--	Italy 583; Austria 405; France 251.
Other: Crude	796	35	--	France 17; West Germany 9; U.S.S.R. 8.
Slag and dross, not metal-bearing	(1)	86	--	Netherlands 85.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	71	30	--	West Germany 29.
Halogens excluding chlorine	1	12	1	Italy 6; West Germany 3; Switzerland 1.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	16,241	15,284	1	France 7,036; Austria 4,190; Spain 1,101.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,352	4,555	--	All from Netherlands.
Carbon black	2,189	2,901	22	Spain 1,410; West Germany 1,159; France 310.
Coal: Anthracite and bituminous coal excluding briquets	91,455	510,132	358,893	West Germany 126,839; U.S.S.R. 24,400.
Coke and semicoke	206,228	93,012	(1)	Italy 56,644; United Kingdom 19,368; Australia 17,090.
Peat including briquets and litter	5	2,059	--	France 1,983; West Germany 76.
Petroleum refinery products: Gasoline thousand 42-gallon barrels	1,376	1,085	94	Italy 973; Netherlands 17.
Kerosine and jet fuel do	77	141	(1)	Netherlands 52; U.S.S.R. 45; France 21.
Distillate fuel oil do	320	339	5	Italy 334.
Residual fuel oil do	418	470	(1)	Italy 453; Spain 16.
Lubricants do	503	497	1	United Kingdom 242; Italy 214; West Germany 27.
Other: Liquefied petroleum gas do	1,021	1,730	(1)	Saudi Arabia 840; Libya 365; United Kingdom 218.
Mineral jelly and wax do	67	91	--	West Germany 68; Japan 22.
Bitumen and other residues do	411	561	--	Spain 252; West Germany 122; Albania 115.
Bituminous mixtures do	81	48	(1)	France 45; Netherlands 1.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	15,882	21,207	--	France 14,908; United Kingdom 6,000; West Germany 286.

[1]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Algeria continued to import the bulk of its aluminum metal requirements from European countries. Joint-venture plans to construct the 140,000-ton-per-year M'Sala aluminum smelter were suspended. The Algerian Government and the U.S.S.R. were keeping information confidential on the proposed aluminum project.

Iron Ore.—Output from the Ouenza iron ore mining complex located in northeast Algeria has remained relatively stable during the past few years. Khanguet, the smallest of the three mines comprising the Ouenza complex, had ores averaging 55% iron, but reserves were nearly exhausted. Ouenza reserves were estimated at 100 million tons with a 53% average grade of iron, and the adjacent Bou Khadra ores stood at 50 million tons with a 58% grade.

The three open pit mines had ore beds of 10 to 15 meters thickness and required moving 2 to 3 tons of overburden for every ton of ore mined. Expansion plans were made for the Ouenza and Bou Khadra Mines. Chemical analyses indicated that the Ouenza ores were slightly calcareous and the Bou Khadra ores slightly siliceous, but no impurities were detected that would inhibit steel production.

Current annual production, rated approximately 3 million tons, was expected to increase to 5 million tons by the second half of the decade. An ambitious target was set, to produce 13 million tons of iron ore per year by 1990. Increased production will be required for cost-effective expansion of the El Hadjar steel mill and to accommodate the future Jijel steelworks.

The Gara Djebilit and Mercheri Abudul Aziz iron ore deposits in southwest Algeria continued to be evaluated by the Algerian and the U.S.S.R. Governments. Despite the large magnitude of the iron ore resources, estimated at 3 billion and 2 billion tons of medium-grade ore for the Gara Djebilit and Mercheri Abudul Aziz deposits, respectively, high transportation costs have inhibited development.

Iron and Steel.—The El Hadjar steelworks commissioned its No. 3 converter and No. 2 blast furnace during 1981. Expansion plans to raise annual production capacity from 500,000 tons to 2 million tons included replacing the No. 2 converter and installing a continuous caster. An agreement was signed between Nippon Steel Corp. (Japan) and Algeria's state-run SNS for the former to lend technical advice on the El Hadjar expansion. The technical cooperation agreement, which replaced a similar accord signed in 1977, covered operations, facility improvements, quality control, and production management.

Construction of the 2-million-ton-per-year Jijel direct-reduction steelworks was 2 years behind schedule. Bidding was closed in 1981, and Belgium's Tractionale and Japan's Nippon Steel Corp. were awarded the engineering services contract. Construction plans included a pelletizing plant, electric-furnace shop, and a bloom and billet mill.

SNS was negotiating a $20 million loan from the World Bank to help finance various steel projects. The loan application was withdrawn by yearend 1981, but no other details were made public. The Algerian Government allocated $1.4 billion to expand the El Hadjar steelworks over the current 1980-84, 5-year-plan period.

Other Metals.—Lead and zinc ores continued to be produced at the El Abed Mine and the smaller Bou Caid and Ain Barbar Mines. Algeria operated two zinc concentrators at El Abed and Zerzer-Yousof and a zinc smelter at Ghazaout. All of the plants have been constructed since 1973, but no information was available on current production efficiencies, estimated to be low during 1980-81.

Mercury continued to be mined at Azzaba. Recoverable reserves, estimated at 500,000 flasks, were projected to last until 1990. The state-run Société Nationale de Recherches et d'Exploitations Minières, (SONAREM) envisioned mining wolframite ore, located at Laouni in the Hoggar Mountains, by 1984. The feasibility of constructing a ferrotungsten smelter rated at 500 tons per year was being considered. The remoteness of the Hoggar area and the lack of water resources may continue to postpone development.

NONMETALS

Cement.—Despite recent efforts to expand cement production through construction of numerous new facilities, domestic demand exceeded supplies and approximately 1 million tons of cement was imported in 1981. The annual production tar-

get was set at 12.5 million tons of cement per year by 1984, but some construction schedules have been delayed. For example, the 1-million-ton-per-year Sour El Ghozlane plant currently being constructed by F. L. Smidth (France) was originally scheduled for startup in 1982 and was pushed back to 1983. The current 5-year plan allocated $2.1 billion for the building materials industry and $1.4 billion to increase annual cement production capacity from approximately 6 million tons in 1980 to 10 million tons by 1984.

Fertilizer Materials.—*Nitrogenous.*—SONATRACH operated two ammonia fertilizer units during 1981, both at the Arzew facility. The first 272,000-ton-per-year nitrogen unit was being refurbished during 1981 and was expected to be back onstream by 1982-83. A second ammonia unit, rated at 330,000 tons per year, was brought into production at Arzew in January 1981. Two ammonium nitrate units were also operating at Arzew by yearend 1981, with a combined production capacity of nearly 200,000 tons per year. Cruesot Loire (France) completed construction of a third ammonia unit with production capacity similar to that of Arzew. The unit, located within the Annaba fertilizer complex, was not operational by yearend 1981.

Downstream facilities for the Arzew ammonia production units in 1980, included a 132,000-ton-per-year nitric acid plant, a 55,000-ton-per-year ammonium nitrate plant, and a 61,000-ton-per-year urea plant. These facilities were recently expanded, but a relatively low output efficiency of 30% was reported for 1980-81. The Annaba fertilizer complex included plans for a 350,000-ton-per-year ammonium phosphate plant and a 260,000-ton-per-year nitric acid plant.

Construction of a fourth ammonia unit with similar production capacities was being considered. The proposed location for this facility was at Skikda. The projected startup date was set for 1987. Tentative plans also included the expansion of ammonia-consuming downstream plants and storage facilities. Storage capacity during 1981 was 20,000 tons at Arzew and 6,000 tons at Annaba.

Phosphate.—Algeria's major phosphate deposit and mine was located at Djebel Onk, where reserves were estimated at 200 million tons. The older Kouif deposit, located adjacent to Djebel Onk in the northeast corner of the country, continued to be mined, but reserves were estimated to be near depletion. SONAREM planned to expand output from the Djebel Onk Mine by approximately 2 million tons per year by 1986. Expansion of phosphate processing facilities was being considered to diminish exporting the lower valued raw materials.

The new phosphate facilities at the Annaba fertilizer complex were rated at approximately 230,000 tons per year of diammonium phosphate, 200,000 tons per year of monoammonium phosphate product, 165,000 tons per year of phosphoric acid, and 530,000 tons per year of sulfuric acid. Technical difficulties were reported during 1980-81.

Two more phosphate units, with capacities of 165,000 tons per year of phosphoric acid and 280,000 tons per year of triple superphosphate (P_2O_5), were planned as part of the $400 million Tebessa fertilizer complex. Marubeni Corp. and Hitachi Corp. (Japan) won the contract for the P_2O_5 plant, utilizing the Nissan Chemical process; Polimex-Cekop (Poland) won the contract for the associated 530,000-ton-per-year sulfuric acid plant. The anticipated startup date for the entire Tebessa complex was 1983.

MINERAL FUELS

Petroleum and Natural Gas.—The output of natural gas increased approximately 8% over 1980 output levels. Algeria's commercially proven reserves of 132 trillion cubic feet comprised roughly 5% of the world's natural gas reserves as of January 1, 1981. These reserves were projected to last approximately 370 years at the current production rate.

Petroleum production declined 20% between 1980 and 1981. Proven reserves, estimated at 8.2 billion barrels, were projected to sustain current production levels for only 20 years. Oil liftings declined from 1 million barrels per day in early 1981 to 600,000 barrels per day in October 1981. Despite world market conditions, Algeria continued to maintain one of the highest crude prices throughout 1981, along with Libya and Venezuela. Algerian blend (44° API) was selling at $37.50 per barrel, and condensate exports (63° to 64° API) were increased to $36.70 per barrel in November 1981.

Algeria attempted to negotiate oil barter deals to sell its high-priced crude. Spain's Hispanoil and Cespa Brasileira de Petróleos SA were granted a 4-year crude oil supply contract in exchange for an exploration agreement. The contracts called for an 18,000-barrel-per-day oil supply for Hispan-

oil in return for a $42 million exploration effort in Algeria's Rhadames region. Cespa agreed to purchase 15,000 barrels per day and was obligated to spend $40 million on exploration within Algeria.

Liquefied Natural Gas.—SONATRACH operated four liquefied natural gas (LNG) gas processing plants with total combined gas capacity of 5.3 billion cubic feet per day and gas throughput of 4.3 billion cubic feet per day. The two Hassi R'Mel plants contributed 86% of the gas throughput while facilities at the northern coastal areas Arzew and Skikda continued to be refurbished and completed. Pullman Kellog Algeria Inc., the main contractor at Skikda, completed constructing the fourth through seventh lines at Skikda LNG-2. The annual liquefaction capacity was raised from 583 billion cubic feet to nearly 1.1 trillion cubic feet.

Some of the Arzew facilities were damaged by the severe Mediterranean storm late in December 1980. A tanker was aground at LNG-1, but the LNG port itself was not damaged. In February, only two LNG trains at LNG-1 and LNG-2 were operating. Later in the year, two out of six LNG-1 trains were available for export; three of the lines were slated for the Arzew industrial zone and one was reserved for standby. LNG-2 units continued to be constructed, and the second train was tested in April 1982. Pullman Kellog Algeria Inc. submitted and won a contract in December 1981 to complete the 1-billion-cubic-foot-per-day LNG-2 plant. The planned annual production capacities were 2.6 million barrels propane, 2.2 million barrels butane, and 1.6 million barrels natural gasoline. The company was also bidding for a 3-year technical services contract for all LNG-2 operation phases. Problems were encountered in the startup of the third LNG-2 train, owing primarily to a shortage of nitrogen. Four out of the six LNG-2 trains were completed and tested by yearend 1981.

Liquefied Petroleum Gas.—Despite the emphasis in expanding production of LNG, plans were made to increase the output of liquefied petroleum gas (LPG). Kobe and Marubeni Corp. (Japan) won the $272 million turnkey contract for a LPG recovery plant. The 1.2-million-ton-per-year LPG plant was expected to be constructed at the Hassi R'Mel Gasfield within the Algerian Sahara. The scheduled completion date was 1985. Another $57 million contract was awarded to the Japanese company Mitsubishi to construct an associated gas treatment plant. The planned objective was to recover natural gas liquids and LPG from associated gas and reinject dry gas back into the field. Financing was arranged through Japan's EXIM Bank (60%) and a group of seven Japanese commercial banks (40%), with the loan disbursement period running through June 1984.

SONATRACH planned to start up a 2,300-barrel-per-day lube complex at Arzew in 1982. The engineering contract was awarded to Foster Wheeler (United States). Construction was to be handled by a European firm.

Petroleum and Natural Gas Contracts.—Algeria's natural gas pricing negotiations with several European countries and the United States were for the most part inconclusive by yearend 1981. Belgium was the only country that finalized a long-term supply agreement with Algeria during the year.

Distrigas of Belgium signed a 20-year supply contract in April 1981 for 88 billion cubic feet in 1982, increasing to 177 billion cubic feet from 1986 through the remainder of the 20-year period. The base price agreed upon was $4.80 per million British thermal units (Btu).

In December 1981, it was announced that Gaz de France and Algeria had achieved an agreement on the political level. France was seeking to renegotiate a 20-year supply contract slightly above the 1972 contract price of $3.70 per million Btu. Discussions were under way to develop a price index based on the average price of a basket of crudes. Deliveries under a new contract were expected to commence early in 1982. In the meanwhile, France's Compagnie Français des Petróles (CFP) was granted a 1-year, 60,000-barrel-per-day crude contract to replace the previous 220,000-barrel-per-day agreement.

Negotiations with Italy's state oil group, Ente Nazionale Idrocarburi (ENI) were faltering, despite the recent completion of the $3 billion trans-Mediterranean (Transmed) pipeline project. The pipeline, running from Algeria's Hassi R' Mel Fields through Tunisia, underwater to Sicily, and overland to Naples, was partially financed by Italy. ENI argued against Algeria's price proposals on the basis that Transmed gas was cheaper to transport than LNG, and gas should be indexed against oil product prices rather than crude oil prices. The initiation of the Transmed pipeline will likely hinge

on an acceptable natural gas price. Expansion plans, including a second underwater pipeline and an extension to Bologna in northern Italy, were temporarily shelved. Italy's original 1977 contract was for an eventual delivery of 412 billion cubic feet annually at a base price of $1 per million Btu indexed to a 1975 basket of crudes to $3.42 per million Btu at the Algerian-Tunisian border.

The British Gas Corp. agreed on an interim contract that allowed for an increase in Algerian LNG exports in three stages after the first 9 months of 1981. The average price of $4.60 per million Btu was agreed upon. The Netherlands and Greece were also involved in LNG supply negotiations.

Algeria continued discussions with various U.S. firms throughout the year. There was a deadlock in the El Paso LNG negotiations during February, and no information was available at yearend on the Consolidated Natural Gas Co., Columbia Gas Systems Inc., and Southern Natural Resources Inc. expected replacement of El Paso's intended deliveries.

Trunkline LNG Co. (United States) was scheduled to receive deliveries in August 1981. No deliveries were made by yearend owing to the Trunkline's unfinished LNG facilities and the price dispute. The Trunkline facilities, located in Lake Charles, La., were designed to handle 165 billion cubic feet per year of LNG tanker deliveries. The Trunkline complex also included a regasification plant.

The 1977 United States-Algerian LNG contract called for total deliveries of 3.3 trillion cubic feet of gas over 20 years. The contract price was $3.94 per million Btu f.o.b. and a delivered price of $7.22 per million Btu. Interestingly, the 1977 contract provided for formal price negotiations after 1 month of full volume deliveries. Full volume was equivalent to 4.3 million cubic feet tanker deliveries every 7 days. This volume was never achieved.

Pipelines.—Algeria possessed three natural gas pipelines with a combined annual capacity of 1 trillion cubic feet in 1981. The 1,070-kilometer Transmed pipeline completed in mid-1981 has an annual capacity of 412 billion cubic feet. Algeria concluded additional oil and gas pipeline contracts during the year.

In July 1981, an agreement was signed between the Algeria and Soviet state oil companies for the latter to complete a 421-kilometer section of one of the Hassi R'Mel gas pipelines. In additions, SONATRACH contracted Canadian Bechtel Ltd. to complete a 502-kilometer, 44-inch natural gas network at Rhouda Nouss by 1982.

Bechtel Ltd. (United States) was also contracted to engineer a 510-kilometer, 24-inch and an 11-kilometer, 14-inch LPG line from Hassi R'Mel to Arzew by 1983. A 632-kilometer, 30-inch oil pipeline was expected to connect in Amenas to Haoud El Hamra. The contractor expected a completion date of March 1982. Another 523-kilometer, 30-inch crude oil line between Ohanet and Haoud El Hamra was expected to be constructed by March 1982.

Uranium.—Progress was made on developing the remote Hoggar Mountain uranium deposits. Reserves were estimated between 25,000 and 50,000 tons, and production was envisioned at 1,000 to 1,200 tons of uranium oxide per year. The Davy-McKee Group (United States) was contracted during 1980 to construct the ore treatment plant. Plans were being made to utilize an alkaline leach process, which requires a minimum amount of water. The Union Minière Group (Belgium) was expected to provide technical assistance in mining the deposits. A consortium of Belgian, United States, Swiss, and French international firms was expected to conclude the turnkey contracts by 1982. Initially, plans were made to develop two open pits at Abankor and Daira and an underground mine at Timgaouine. The total estimated cost of the project, including the construction of an airstrip and a small town, was estimated at $300 million.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Algerian dinars (DA) to U.S. dollars at the rate of DA4.3158=US$1.00 for 1981.

The Mineral Industry of Angola

By George A. Morgan[1]

In 1981, mineral production levels overall remained low compared with 1974 preindependence levels and relatively unchanged compared with those of 1980. Reactivation of several small-scale mining operations continued.

The economy underwent severe strain during the year owing to a decline in oil revenue and the high cost of internal security and defense. Crude oil sales were the principal source of foreign exchange, accounting for 78% of the value of all exports, followed by diamond and coffee sales. The reduction in revenue led to a decline in foreign exchange reserves from the $308 million recorded at yearend 1980.[2] Military expenditures due to the civil war were estimated to account for over one-half of the material budget. The gross domestic product (GDP) at current prices was $3.34 billion, and about $1 billion at constant 1973 prices. External debt was up sharply at yearend 1981 to $2.3 billion, necessitating short-term borrowing.

The national plan for 1982 development was changed to reflect a 40% reduction in Government-directed investment from 1980. Imports were limited and emphasis was being placed on upgrading management skills which still suffered from the loss of experienced personnel. Food availability remained a severe problem, and all crop production and fish harvest levels were well below 1974 levels. The country's plants were estimated to be operating at less than 30% capacity. Absenteeism was reported to be a severe problem.

Negotiations were conducted with several countries, and agreements were signed for foreign involvement in projects in the agricultural, iron and steel, and mining sectors.

PRODUCTION AND TRADE

Official production and trade data for most mineral commodities were unavailable. Production data for Angola were generally estimated on the basis of best available information. The fall in output of oil was primarily due to technical problems and the exhaustion of reserves in the oldest oilfields. Only a small portion of the associated gas produced was marketed; the remainder continued to be flared.

The decline in price of crude oil sold caused substantial changes in the Government's investment program for other industries, including mining. Attention was to be directed to increasing the efficiency of operation of existing facilities. Diamond production increased modestly from that of 1980, but a number of problems still remained, such as (1) lack of technical personnel and spare parts and (2) poor security.

Electrical power shortages were reported to have occurred frequently in Luanda and other cities. Old equipment and management inefficiencies were cited for the power failures. Several contracts were let to modify damsites for expanding powerplant output. However, most of the power produced was supplied from diesel-powered generators.

The Journal De Angola, the official news organ of the Angolan Government, reported candidly on the shortcomings of the minerals and other sectors of the economy.[3] Failure to achieve goals set in previous years for

various mineral commodities was attributed to a lack of knowledge and realism regarding numerous factors involved in each project undertaken. Reference was made to the successful exploitation for export of quartz crystal and granite as facing stone, but output levels were not confirmed.

Table 1.—Angola: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Iron and steel: Crude steel[e]	5,000	10,000	10,000	10,000	10,000
NONMETALS					
Cement, hydraulic thousand tons	300	400	[e]400	240	250
Clays: Kaolin	500	--	--	--	--
Diamond:					
Gem thousand carats	265	525	630	1,125	1,200
Industrial do	88	175	210	375	400
Total do	353	700	840	1,500	1,600
Gypsum[e]	20,000	25,000	25,000	25,000	20,000
Salt[e]	50,000	50,000	50,000	50,000	50,000
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural[e]	25,000	25,000	25,000	25,000	25,000
Gas, natural:[e]					
Gross million cubic feet	42,400	46,500	48,600	58,000	55,000
Marketable do	2,500	2,500	2,500	2,500	2,500
Petroleum:					
Crude thousand 42-gallon barrels	62,437	47,450	49,640	55,034	52,000
Refinery products:					
Gasoline do	526	510	[e]500		
Jet fuel do	441	480	[e]450		
Kerosine do	163	160	[e]160		
Distillate fuel oil do	1,469	1,567	[e]1,500	NA	NA
Residual fuel oil do	3,725	3,796	[e]3,700		
Other do	143	189	[e]150		
Refinery fuel and losses do	229	368	[e]300		
Total do	6,696	7,070	[e]6,760	NA	NA

[e]Estimated. [p]Preliminary. NA Not available.

[1]Table includes data available through Sept. 27, 1982.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and broken stone) presumably is produced for local consumption, but information is inadequate to make reliable estimates of output levels.

COMMODITY REVIEW

METALS

Copper.—Renewed interest in copper mines located in northwest Angola near the border with the Congo was announced by the Government. The Movoio Mine, 28 kilometers from Maquelo do Zambo, was mentioned for possible reactivation. The mine was worked in the 1940's and 1950's by Empreso do Cobre Angola (ECA). Early extensive research had been conducted over the region to determine the source of the oxidized ores, principally malachite, which accounted for most of the original output. Productive deposits were generally believed to be small and relatively shallow residual formations derived from the leaching of overlying cupriferous, argillaceous sandstones. Byproduct gold and silver were also produced.

In 1966, a drilling program reportedly resulted in the discovery of 10 million tons of ore grading 3% to 4% copper at considerable depth in the vicinity of Titelo near Aigl. Output of 20,000 tons of concentrate was reported from Titelo in 1973. A small furnace was also operated by ECA for production of black copper as early as 1949.

Iron Ore.—Austromineral, a subsidiary of Voest-Alpine A.G. of Austria, completed a study of iron ore deposits in the vicinity of Cassinga. The Cassinga North (Jamba) area had 21.7 million tons of measured recoverable detrital iron ore amenable to opencast mining using scrapers. Run-of-mine ore at the deposit contained 44% iron. Reactivation of production of Cassinga, which ceased in late 1975, was anticipated to begin in 1983. About 150,000 tons of previously stockpiled ore, of which 40,000 tons was from Jamba, was shipped in a single lot from the port at Mocamedes to the steel

plants of Voest-Alpine. A 600-meter-long pier with a shiploader capable of loading a 160,000-dead-weight-ton vessel at 5,000 tons per hour was reported operational at Mocamedes.

NONMETALS

Cement.—An agreement reached between Empresa de Cimentos de Angola (CIMANGOLA) and Danish interests provided for refurbishing of the cement plant at Luanda. The company was in poor financial condition with heavy debt and high short-term finance charges. Interest due on short-term bank loans was $1.2 million.[4]

Actual production data have been revised downward to indicate the low-level of capacity utilization, estimated at about 31%. At this level, only about 72% of the production goal was achieved. Sales during fiscal year 1980, including drawdowns from stocks, were 243,000 tons.

Diamond.—Diamond recovery operations in Luanda Norte Province continued to increase in efficiency with a modest rise in output. Several production goals were reported to have been exceeded. Extensive training programs to upgrade worker skills were conducted by Companhia de Diamantes de Angola. Further exploration was also underway.

Serious problems of diamond theft and general security were reported by the Government to have resulted in a substantial portion of production entering the black market.

Phosphate Rock.—Production of phosphate rock commenced at Quindonacache in Zaire Province in late 1981. Production capacity was small at 15,000 tons per year of phosphate containing in excess of 30% P_2O_5 from an open pit operation.

The mine, plant, and infrastructure were designed and built by Bulgargeomin of Bulgaria. Approximately 720 square kilometers were surveyed by Bulgarian geologists in Zaire Province prior to mine and plant development.

Exploration of phosphate in Cabinda Province was planned by Energet of Yugoslavia according to terms of an agreement between the Governments of Angola and Yugoslavia.

MINERAL FUELS

Petroleum and Natural Gas.—Technical difficulties and the drop in world oil prices adversely affected output of crude oil in Angola. Production was about 140,000 barrels per day compared with an expected 178,000 barrels per day. About 60% of the total came from offshore Cabinda Province; most of the remainder was from the Congo Basin. Some oil wells, as in the Kwanza Basin south of Luanda, required special technical maintenance, such as artificial lift methods. Secondary recovery projects using reinjected gas and water were underway at two reservoirs in the Congo Basin. An oil-storage facility, with capacity for 800,000 barrels, was under construction to reduce long loading periods and high demurrage.

A major enhanced-recovery project began in the Cabinda Oilfield involving wildcat and development wells and gas reinjection. Output from the older wells was in a steep decline because of falling pressure gradients. Approximately 78 million cubic feet per day of gas was to be reinjected into two fields beginning in May 1982. Natural gas liquids extraction was also to take place. In addition, fractionators were to be installed to produce propane, butane, and natural gasoline. Liquefied petroleum gas would be moved by pipeline to a refrigerated storage vessel prior to transport. Natural gasoline would be mixed with crude oil and sent ashore for storage via pipeline. A banking syndicate headed by Morgan Guaranty Trust Co. of the United States provided a loan of $50 million while the Export-Import Bank approved $85 million for financing the gas injection, enhanced-recovery project.

In 1981, about 21,500 tons of bottled butane was consumed by 120,000 families, mainly in Luanda. Upgrading of equipment was underway to increase the supply to 60,000 tons per day by 1990.

At yearend 1981, the country's sole refinery at Luanda, with a capacity of 33,000 barrels per day, was damaged by sabotage. Several storage tanks and one of the distillation units were destroyed, necessitating the import of refined products from Gabon and the Canary Islands.

The Sociedade Nacional de Combustiveis de Angola (Sonangol) was constructing a major service and supply center on Kwanda Island, 5 kilometers from Soyo in Zaire Province. Facilities were to include worker housing, warehouses, workshops, and pipe storage facilities. Construction of a quay with 200 meters of berthing area and deepening of Pululu Channel were underway.

Sonangol also announced that it intended to market all crude oil directly without intermediaries wherever possible. Total employment in the state-owned company was 2,100 people.

[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been estimated to be convertible from Angolan kwanza to U.S. dollars at the rate of 31.25 kwanza = US$1.00 for 1980 and 1981.

[3]Journal De Angola (Luanda). Consultative Council Reviews Nation's Industrial Situation. Sept. 13, 1981, p. 2.

[4]Marches Tropicaus et Mediterraneins (Paris). Precarious Financial Situation of Cement Plant. Sept. 4, 1981, p. 2291.

The Mineral Industry of Argentina

By Pablo Velasco[1]

The Argentine economy, dominated for many years by the agricultural sector, was in recession in 1981. The Nation's gross domestic product (GDP) fell by about 6% to $131 billion[2] at current prices, according to estimates released by the Central Bank. This recession, which started in 1980, became more pronounced during the second quarter of 1981 because of the adoption of adjustment measures that would help to attain continued economic development from 1982 onwards.

Mining in Argentina continued in its incipient stage of growth. Although a wide range of minerals is known to occur in the country, this industry is small by international standards and only iron ore, coal, oil, and natural gas are produced on an economically significant scale, with small output of other minerals including barite, bentonite, borax, copper, fluorspar, gold, gypsum, lead, manganese, salt, silver, sulfur, talc, tin, and zinc. Argentina is one of the few world producers of borax (sodium borate).

Argentina was undertaking an ambitious public investment program, especially in the energy and mining sectors, estimated by the Ministry of Economics at about $115 billion during the 10-year period 1980-89. Foreign investment in all sectors of the economy exceeded $4.5 billion. The principal source was the United States, followed by the Netherlands, Italy, and the Federal Republic of Germany.

Exports of minerals, mineral products, and metals in 1981 decreased 24% to $54.2 million compared with 1980 values. The aluminum industry output declined 6% in 1981 compared with the 1980 output. The prospects for refined aluminum exports would depend upon the availability of a surplus after domestic demand is met.

The Comisión Nacional de Energía Atómica (CNEA) reported that the Government of Argentina has given high priority to the development of the Nation's uranium potential, and that by 1985, CNEA plans to survey between 50,000 and 100,000 square kilometers including test drilling. The Sierra Pintada uranium mine and processing plant was expected to start production in 1983 at an estimated rate of 700 tons per year of U_3O_8 concentrate.

To reduce its dependency on imports of copper, the Government was considering the development of three large ore deposits using domestic and foreign capital. One of those deposits, Farallón Negro in the Province of Catamarca, was producing gold, silver, and manganese. Unlike the two other deposits to be offered, Farallón Negro is for national bidders only, but up to 49% of total equity can be of foreign interest that could supply the necessary technology. Ten kilometers south of Farallón Negro, another deposit, Bajo la Alumbrera, will be put up for international bidding. The Bajo la Alumbrera deposit has already been explored, and reserves of 350 million tons of ore containing copper and gold have been identified. The last of the three deposits to be tendered by the first quarter of 1982 is a 30-square-kilometer deposit, Nevados de Famatina. This deposit in the Province of La Rioja has not yet been explored.

The hydrocarbons sector has been traditionally dominated by two Government agencies: Yacimientos Petrolíferos Fiscales (YPF)—active in onshore and offshore oil and gas exploration, production, and refining; and Gas del Estado—operator of the natural gas transmission system. Argentina's current drive is to attain self-sufficiency by 1985. To accomplish this, YPF

was loosening its tight grip on the industry to allow private operators to carry out a larger share of the work. Over 30 areas have been turned over to private consortia through public bidding, and three offshore risk contracts have been awarded to private groups. The most important gas and petroleum discoveries were made by YPF and two international oil companies in Neuquén Province and in Tierra del Fuego in the south of the country.

A 20-year hydroelectric power plan was underway to make Argentina one of the world's most impressive users of water power for electricity and irrigation. When the plan is completed in 1999, hydroelectricity will provide more power to Argentina's growing industrial complex than fossil fuels and nuclear energy combined. Argentina's largest hydroelectric project on the Paraná River is called Paraná Medio. Construction of the first two dams will be initiated in 1985 with an installed capacity of 5,600 megawatts.

Government Policies and Programs.—Argentina has one of the largest mineral reserves in the world that is still largely unexploited. Considering that during the last decade the mining sector has not developed significantly, the Government revised the Mining Code and promulgated a new Mining Promotion Law in October 1979. This law, No. 22,095, contemplates the following objectives in Chapter I:

1. Promotion of mining activities is ruled by the provisions of this law and the regulations that the Government may issue accordingly. To this effect it shall arrange by agreement with the Provincial Governments the exercise of respective constitutional powers.

2. General objectives: (a) to contribute to the development of the country by increasing the production of minerals and their byproducts; (b) to ensure the rational exploitation of mineral resources in the national territory; (c) to strengthen and support the expansion of mining enterprises of national capital, whatever their legal nature may be; (d) to ensure the development of mining projects required by national defense and security; (e) to establish new opportunities for employment particularly in frontier areas; (f) to improve working conditions, raise the standard of living, and upgrade training of the mining work force; (g) to determine the country's mining potential and ensure its proper management; (h) to promote small- and medium-size mining activities and provide technical assistance; (i) to promote the establishment and development of consulting enterprises of Argentine capital and technical staff; and (j) to ensure that decisions in the mining sector are under national control.

3. Particular objectives: (a) to intensify mineral exploration of the national territory; (b) to supply domestic demand with local raw materials and substitute imports of minerals, ordinary metals, and mineral products of primary processing and products of the chemical industry derived from minerals; (c) to increase mineral exports, provided domestic supply can be satisfied by existing ore reserves, stimulating particularly those mineral products with added value and in accordance with national policies with regard to strategic minerals; (d) to integrate the exploitation of deposits with regional siting of beneficiation plants; (e) to increase productivity of mining operations; (f) to research and develop national technology throughout all stages of mining activity; (g) to promote mining enterprises by attracting domestic savings and investment of foreign capital; (h) to promote free marketing, at international market prices, of mining production; and (i) to promote cooperation and the establishment of consortia among mining producers in order to furnish services or carry out projects of common interest.

4. The National Executive Office is empowered to accumulate stockpiles of strategic minerals and related products in such volume as the Ministries of Economics and Defense deem necessary for the security and defense of the Argentine Nation.

The remaining chapters of Law No. 22095 cover the following: II—Beneficiaries of This Law; III—General Promotion Measures; IV—Special Promotion Measures; V—Mining Promotion Fund; VI—Application Authority; VII—Penalties and Other Remedies for Noncompliance; and VIII—Miscellaneous.

The changes contemplated in the new law provide stimuli for the development of mining by recognizing the value of private initiative acting alongside or complementing the State's efforts in carrying out mine exploration and production.

PRODUCTION

Production of metallic minerals during 1981 amounted to 1.1 million metric tons, a 46% decrease compared with 1980 output; nonmetallic minerals amounted to 5.8 million metric tons, 2% less than in 1980; and output of construction-related minerals was 60 million metric tons, 2% more than in 1980.

The steel industry output in 1981 decreased 6% compared with that of 1980, resulting in imported products totaling 467,000 metric tons. Most of the imported steel products came to Argentina from Japan and Brazil.

Argentina's aluminum industry, which had been growing steadily since startup in 1974, experienced a 6% decrease in output in 1981 compared with that of 1980.

Production of cement has been increasing steadily since 1976 and achieved record levels in 1981. Installed capacity for the cement industry in 1981 was 10.5 million metric tons.

Yacimientos Carboníferos Fiscales (YCF) continued production of coal from the Rio Turbio deposits in the southernmost part of Argentina in Santa Cruz Province, but it was not adequate to meet domestic demand. One-half of the coal consumed in Argentina was supplied by cheaper imports.

Argentina has been almost self-sufficient in oil for several years. Output in 1981 increased 6.3% compared with that of 1980. Argentina continued as the third largest producer of crude oil and natural gas in Latin America. Production of uranium has increased markedly over the last 3 years.

Table 1.—Argentina: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum metal:					
Primary	49,875	53,098	125,408	137,581	130,000
Secondary[e]	6,500	8,000	10,000	8,000	8,000
Beryllium: Beryl concentrate:					
Gross weight	165	22	12	31	[3]30
BeO content	18	2	1	3	[3]3
Bismuth kilograms	--	300	--	--	--
Chromium: Chromite, gross weight	--	--	165	169	150
Columbium-tantalum concentrates, gross weight:					
Columbite kilograms	614	--	1,918	1,500	1,500
Tantalite do	170	--	--	--	--
Cadmium: Smelter	40	22	36	18	20
Copper:					
Mine output, metal content	169	319	89	182	200
Mine, smelter[e]	70	NA	NA	NA	NA
Gold, mine output, metal content troy ounces	5,509	5,600	10,140	10,956	10,900
Iron and steel:					
Ore and concentrate, gross weight thousand tons	1,030	909	611	437	495
Metal:					
Pig iron and sponge iron do	[r]1,385	[r]1,825	1,938	1,806	1,720
Ferroalloys, electric furnace:					
Ferromanganese	[r]36,092	25,115	37,498	35,000	34,000
Silicomanganese	6,152	10,281	16,659	15,000	14,000
Ferrosilicon	15,313	10,343	15,180	14,000	13,000
Other	[r]1,118	[r]612	2,539	2,400	2,300
Total	[r]58,675	[r]46,351	71,876	66,400	63,300
Crude steel thousand tons	[r]2,684	[r]2,786	3,203	2,687	2,500
Semimanufactures[4] do	[r]2,798	2,566	3,010	2,582	2,300
Lead:					
Mine output, metal content	[r]33,601	30,253	31,775	34,000	[3]33,362
Metal:					
Smelter, primary[e]	38,000	30,000	27,600	21,500	20,000
Refined:					
Primary	38,000	[r]19,700	32,000	26,700	30,000
Secondary	7,000	[r]10,000	15,000	12,000	9,000
Total	45,000	[r]29,700	47,000	38,700	39,000
Manganese ore and concentrate, gross weight	82,385	18,497	10,190	6,146	3,100
Silver, mine output, metal content thousand troy ounces	[r]2,450	[r]2,164	2,209	2,305	2,300

See footnotes at end of table.

Table 1.—Argentina: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]		1977	1978	1979	1980[p]	1981[e]
METALS —Continued						
Tin:						
Mine output, metal content		537	362	386	351	340
Metal, smelter[e]		100	[r]100	100	200	150
Tungsten, mine output, metal content		70	97	59	35	50
Uranium, mine output, U_3O_8 content	kilograms	217,898	168,832	877,930	284,900	300,000
Zinc:						
Mine output, metal content		39,155	36,585	37,509	33,681	[3]37,258
Mine, smelter, primary		29,000	23,900	36,700	25,400	23,000
NONMETALS						
Abrasives: Garnet		600	NA	3	7,200	8,000
Asbestos		686	1,069	1,371	1,261	1,400
Barite		30,571	45,685	54,928	49,623	49,279
Boron materials, crude		83,051	127,187	132,655	155,849	167,431
Cement, hydraulic	thousand tons	[r]6,002	[r]6,316	6,667	7,133	7,500
Clays:						
Ball clay (plastic clay), n.e.s	do	1,812	2,441	2,198	1,953	1,980
Bentonite		114,836	106,957	157,382	131,384	158,100
Foundry earth		([5])	--	41,082	44,871	45,899
Fuller's earth (decolorizing clay)		4,129	3,482	5,445	4,772	5,200
Kaolin		74,284	45,940	132,107	91,417	103,397
Laterite (aluminous)		59,363	43,410	68,580	73,110	77,610
Refractory		117,299	88,030	132,399	176,682	175,425
Other[6]		565,066	435,481	577,226	693,950	628,248
Diatomite		12,337	7,227	7,321	6,527	6,793
Feldspar		42,921	41,824	33,550	32,529	32,852
Fluorspar		43,792	26,746	38,076	15,468	19,480
Graphite		85	8	10	5	7
Gypsum, crude		546,968	611,158	587,432	932,149	678,394
Lithium, spodumene, and amblygonite, gross weight		412	803	106	80	90
Mica:						
Sheet		302	356	360	218	192
Waste and scrap		1,840	2,276	1,140	616	730
Nitrogen: N content of ammonia		42,000	47,200	60,576	65,355	40,000
Pigments, mineral, natural: Ocher		209	484	874	955	948
Precious and semiprecious stones: Amethyst	kilograms	--	307	8,000	1,000	1,000
Pumice and related volcanic materials		64,961	21,544	46,324	36,509	39,782
Salt:						
Rock	thousand tons	2	1	1	1	1
Solar	do	1,146	699	619	1,003	1,093
Total	do	1,148	700	620	1,004	1,094
Sand and gravel:						
Sand:						
Construction	do	16,178	14,773	15,348	17,047	17,380
Ferruginous-titaniferous	do	1,833	307	410	1,630	2,000
Silica sand (glass sand)	do	284	313	329	202	262
Gravel	do	9,214	11,320	11,796	10,657	11,910
Stone:						
Alabaster		--	50	--	--	--
Basalt	thousand tons	3,075	3,549	3,277	3,721	3,883
Calcareous:						
Calcite, nonoptical		11,153	8,887	12,376	17,888	14,160
Calcium carbonate (chalk)		52,997	7,419	13,174	32,706	12,504
Dolomite		225,792	184,800	289,940	220,521	241,560
Limestone	thousand tons	14,081	15,956	15,238	14,322	14,986
Marble:						
Aragonite, broken		7,701	12,444	10,902	7,342	9,452
Onyx, in blocks and broken		24,364	22,149	22,919	23,638	23,536
Travertine, in blocks and broken		9,367	6,020	13,239	16,297	17,316
Unspecified, in blocks and broken		61,166	60,271	108,857	105,415	106,743
Flagstone		73,505	67,258	113,182	161,219	139,788
Granite:						
In blocks		25,944	28,991	38,646	41,005	41,985
Crushed	thousand tons	4,932	5,588	7,310	7,837	6,511
Quartz, crushed		103,438	81,794	96,393	76,692	81,725
Quartzite, crushed	thousand tons	1,327	1,903	1,594	1,675	1,902
Rhodochrosite		47	42	73	87	96
Sandstone		129	67	89,388	187	220
Serpentine, crushed		27,449	32,359	32,376	30,248	30,957
Shell marl		428,908	671,427	663,472	671,336	677,200
Tuff, tufa	thousand tons	1,971	1,707	2,646	1,974	2,100
Strontium minerals: Celestite		839	1,195	122	268	268
Sulfates, natural:						
Aluminum (alum)		29,421	44,425	48,454	34,735	36,184
Iron (melanterite)		10	--	10	100	130

See footnotes at end of table.

Table 1.—Argentina: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Sulfates, natural —Continued					
Magnesium (epsomite)	5,487	7,801	11,909	8,556	9,200
Potassium (kalinite)	--	250	300	--	--
Sodium (mirabilite)	36,022	40,690	36,458	18,931	24,773
Sulfur:					
Native, from caliche	26,953	17,771	--	--	--
Byproduct, all sources[e]	20,000	20,000	20,000	NA	NA
Total	46,953	37,771	20,000	NA	NA
Talc and related materials:					
Pyrophyllite	10,947	4,731	9,886	5,226	6,779
Steatite	454	964	882	2,930	3,120
Talc	43,306	41,117	24,059	24,575	23,120
Total	54,707	46,812	34,827	32,731	33,019
Vermiculite	4,825	4,426	5,877	9,907	7,306
Water, mineral-containing	71,629	73,271	97,489	125,746	110,406
Zeolite	15	12	25	30	36
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural	6,339	5,880	873	960	850
Carbon black[e]	30,000	NA	NA	NA	NA
Coal, bituminous thousand tons	533	434	727	389	498
Coke, all types, including breeze do.	727	686	650	546	440
Gas, natural:					
Gross million cubic feet	411,867	406,265	452,570	475,535	490,000
Marketed do.	274,992	259,678	283,560	270,000	280,000
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	72	24	NA	NA	NA
Butane do.	1,209	1,630	[e]1,500	[e]1,400	1,500
Propane do.	985	1,260	[e]1,200	[e]1,200	1,500
Total do.	2,266	2,914	NA	NA	NA
Peat, agricultural	6,207	4,447	3,516	4,560	4,300
Petroleum:					
Crude thousand 42-gallon barrels	157,248	165,138	172,554	179,676	[3]181,310
Refinery products:					
Gasoline do.	35,916	38,948	39,770	44,009	[3]44,685
Kerosine do.	5,872	5,107	4,078	4,587	[3]3,293
Jet fuel do.	4,054	4,506	4,865	6,072	[3]6,101
Distillate fuel oil do.	46,189	49,079	50,688	55,100	[3]55,928
Residual fuel oil do.	58,234	56,640	56,826	51,159	[3]50,360
Lubricants do.	1,986	1,791	2,145	1,939	[3]1,857
Other do.	16,789	8,482	19,202	21,400	21,817
Refinery fuel and losses do.	7,808	8,597	4,800	5,350	5,724
Total do.	176,848	173,150	182,374	189,616	189,765

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through June 30, 1982.

[2]In addition to the commodities listed, cadmium, lime, and perlite are produced, but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Hot-rolled semimanufactures only; excludes castings and cold-rolled semimanufactures produced from imported hot-rolled semimanufactures.

[5]Revised to none.

[6]Includes plastic, semiplastic, and/or ferruginous clays used totally in the manufacture of portland cement.

TRADE

As a result of devaluations of the peso during 1981, exports rose 12% from $8.0 billion in 1980 to $9.1 billion in 1981, while the total value of imports declined from $10.4 billion to $9.1 billion, a 12% decrease.

According to statistics published by the Dirección Nacional de Economía Minera within the Ministerio de Economía, exports of minerals, mineral products, and metals in 1981 earned $54.2 million, a decrease of

24% compared with 1980 values. On the other hand, the volume of mineral exports in 1981 increased 32% to 167,760 metric tons compared with that of 1980.

The most valuable metallic minerals exported in 1981 were 17,712 tons of lead concentrate to the United States, Australia, Bulgaria, and Belgium for a total of $15.7 million. Second in importance was 5,883 tons of tin and silver concentrate to England for a total value of $7.5 million, followed by 16,032 tons of zinc concentrate to England, Holland, and Yugoslavia for a total value of $4.1 million.

Exports of nonmetallic minerals in 1981 were as follows: In first place, 15,833 tons of boron minerals to Brazil for a total value of $12.0 million, followed by 49,090 tons of cement to Paraguay, Chile, Bolivia, and Uruguay for a total value of $4.2 million.

Exports of petroleum products and residual oil in 1981 were valued at $626 million, a 113% increase compared with the 1980 value.

Petroleum imports during 1981 decreased 46% to 9 million barrels, valued at $542 million.

Natural gas imports during 1981, chiefly from Bolivia, increased 8% to 2.2 billion cubic meters. Coal imports during 1981 decreased 19% to 706,000 metric tons.

Argentina imported minerals for a total value of $45.1 million, including iron ore from the Republic of South Africa, Brazil, Bolivia, Canada, United States, Peru, and Venezuela; calcined bauxite from Brazil, United States, Guyana, and China; and lead and tin concentrates from Bolivia. Manganese and coal were imported chiefly from Brazil and the United States, respectively.

Table 2.—Argentina: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	--	2	--	Paraguay 1; Uruguay 1.
Metal including alloys:				
Unwrought	7,585	29,422	--	Japan 27,017; Uruguay 1,781; Brazil 490.
Semimanufactures	1,595	4,543	937	India 1,491; Uruguay 883; Mexico 393.
Beryllium: Beryl ore and concentrate	113	37	37	
Chromium oxides and hydroxides	(1)	1	--	All to Peru.
Copper metal including alloys:				
Unwrought				
value, thousands	$1	--		
Semimanufactures	86	118	(1)	Ecuador 58; Paraguay 27; Bolivia 18.
Iron and steel metal:				
Powder, shot, grit	--	3	--	All to Ecuador.
Ferroalloys	1,614	1,947	503	Japan 1,005; Dominican Republic 250; Netherlands 129.
Steel, primary forms	181,104	233,368	--	Venezuela 81,871; Pakistan 56,186; Uruguay 24,506.
Semimanufactures:				
Bars, rods, angles, shapes, sections	197,861	137,148	21,088	Saudi Arabia 46,320; Paraguay 24,129; Bolivia 16,910.
Universals, plates, sheets	245,042	32,612	--	Brazil 13,734; West Germany 8,924; Paraguay 5,982.
Hoop and strip	539	426	185	Guatemala 90; Uruguay 61; Paraguay 36.
Rails and accessories	2,317	35	--	Paraguay 24; Uruguay 11.
Wire	2,406	5,049	--	Paraguay 2,028; China 1,599; Bolivia 905.
Tubes, pipes, fittings	147,348	129,147	8,750	China 50,517; U.S.S.R. 21,739; Algeria 9,968.
Castings and forgings, rough	(1)	63	--	All to Paraguay.
Lead:				
Ore and concentrate	10,056	6,234	300	Brazil 3,204; Belgium-Luxembourg 2,730.
Oxides and hydroxides	47	(1)	--	All to Paraguay.
Metal including alloys:				
Unwrought	1,147	628	--	Uruguay 627; Paraguay 1.
Semimanufactures	3	6	--	Paraguay 5; Uruguay 1.
Manganese ore and concentrates	3	16	(1)	West Germany 15.
Mercury value, thousands	--	$2	--	All to Uruguay.
Nickel metal including alloys, semimanufactures				
value, thousands	$1	$1	--	NA.
Platinum-group metals including alloys, unwrought and partly wrought do	$118	--		

See footnotes at end of table.

Table 2.—Argentina: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS —Continued				
Silver:				
Waste and sweepings[2] value, thousands	--	$161	$161	
Metal including alloys unwrought and partly wrought -- do	$386	$3,308	$531	United Kingdom $1,305; France $747; West Germany $725.
Tin:				
Ore and concentrate	r1,217	--		
Metal including alloys, semimanufactures	6	1	--	Mainly to Uruguay.
Titanium oxides and hydroxides	1	6	--	Bolivia 5; Paraguay 1.
Tungsten metal including alloys, all forms value, thousands	$6	$1	--	All to Uruguay.
Zinc:				
Ore and concentrate	--	19,009	--	Romania 9,507; U.S.S.R. 9,502.
Oxides and hydroxides	5	34	--	Brazil 30; Paraguay 4.
Metal including alloys:				
Unwrought	6,495	481	--	Brazil 361; Honduras 100; Uruguay 20.
Blue powder	6	18	--	All to Uruguay.
Semimanufactures	3	24	--	Do.
Other:				
Metalloids	--	167	--	France 165; Uruguay 2.
Base metals including alloys:				
Scrap	812	115	--	United Kingdom 95; Netherlands 19.
Unwrought and semimanufactures	10	10	--	United Kingdom 9; Netherlands 1.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	1	--		
Dust and powder of precious and semiprecious stones value, thousands	$1	--		
Grinding and polishing wheels and stones	41	19	--	Uruguay 10; Bolivia 3; Paraguay 3.
Asbestos, crude	--	6	--	Paraguay 3; Uruguay 3.
Boron materials:				
Crude natural borates	r14,807	5,967	--	Brazil 5,867; Peru 100.
Oxide and acid	1,556	1,348	483	Brazil 643; Uruguay 100; Mexico 74.
Cement	5,966	4,490	--	Bolivia 3,241; Chile 444; Congo 410.
Chalk	r726	539	--	All to Paraguay.
Clays and clay products:				
Crude	10,553	9,653	--	Brazil 6,696; Chile 930; Paraguay 746.
Products:				
Refractory including nonclay brick	408	553	62	Bolivia 376; Paraguay 97; Uruguay 11.
Nonrefractory	1,216	1,170	--	Bolivia 614; Paraguay 548; Chile 8.
Diamond: Industrial value, thousands	$3	$31	--	All to Belgium-Luxembourg.
Diatomite and other infusorial earth	r16	20	--	Paraguay 10; Uruguay 10.
Feldspar, fluorspar, leucite, nepheline	310	264	--	Peru 128; Bolivia 60; Chile 60.
Fertilizer materials:				
Crude:				
Nitrogenous	5	13	--	All to Paraguay.
Other including mixed	20	23	--	All to West Germany.
Manufactured:				
Nitrogenous	232	798	--	Uruguay 655; Paraguay 103; Bolivia 40.
Phosphatic	8	495	--	All to Brazil.
Potassic	3	100	--	All to Bolivia.
Other including mixed	647	85	--	Bolivia 75; Lebanon 6; Chile 4.
Ammonia	205	226	--	Uruguay 162; Chile 56; Paraguay 5.
Gypsum and plasters	r9,749	10,021	--	Paraguay 7,820; Uruguay 2,201.
Lime	3,430	13	--	Paraguay 7; Bolivia 6.
Mica:				
Crude including splittings and waste	r3,069	2,202	--	West Germany 1,800; United Kingdom 374; Uruguay 27.
Worked including agglomerated splittings value, thousands	--	$1	--	NA.
Pigments, mineral:				
Crude, natural	--	10	--	All to Paraguay.
Iron oxides, processed	r162	124	--	Uruguay 93; Bolivia 20; Paraguay 9.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$4	$48	$4	West Germany $32; Italy $9; Canada $2.
Synthetic do	--	$1	--	All to Canada.

See footnotes at end of table.

Table 2.—Argentina: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
NONMETALS —Continued				
Salt and brine	r23,590	27,665	--	Paraguay 25,853; Uruguay 1,312; Nigeria 500.
Sodium and potassium compounds, n.e.s:				
Caustic potash	1	(1)	--	All to Uruguay.
Caustic soda	r120	159	--	Bolivia 140; Chile 10; Paraguay 3.
Soda ash	r7	250	--	All to Bolivia.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	r11,750	13,329	70	Italy 8,937; Japan 2,079; Spain 1,123.
Worked	1,562	1,131	36	Japan 667; Mexico 91; Liberia 80.
Dolomite, chiefly refractory grade	r2,851	1,677	--	All to Chile.
Gravel and crushed rock	r124	139	--	Paraguay 105; Bolivia 33.
Quartz and quartzite	57	57	--	Paraguay 27; Chile 20; Bolivia 10.
Sand other than metal-bearing	19	317	--	Greece 150; Brazil 120; Bolivia 42.
Sulfur:				
Elemental, all forms	24	7	--	All to Paraguay.
Dioxide	--	12	--	Chile 11; Bolivia 1.
Sulfuric acid, oleum	98	673	--	Uruguay 642; Paraguay 31.
Talc, steatite, soapstone, pyrophyllite	r191	217	--	Paraguay 137; Chile 80.
Other:				
Crude	r1,139	934	--	Brazil 930; Paraguay 1.
Slag, ash, and similar material, not metal-bearing	1,838	968	--	United Kingdom 843; Japan 53; Belgium-Luxembourg 50.
Oxides, hydroxides, and peroxides of barium, magnesium, strontium	--	1	--	All to Paraguay.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	2,519	2,362	--	Bolivia 1,357; Paraguay 749; Chile 183.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	r296	--		
Carbon black	3,900	5,762	--	Brazil 4,500; Uruguay 795; Chile 409.
Coal, all grades, including briquets	r656	1	--	All to Paraguay.
Coke and semicoke	14,543	47,695	--	Netherlands 42,600; Brazil 5,003.
Gas, natural thousand cubic feet	286,493	53	--	All to Paraguay.
Hydrogen, helium, rare gases	7	4	--	Ecuador 3.
Peat including briquets and litter	5	--		
Petroleum refinery products:				
Gasoline 42-gallon barrels	4,029	3,094	--	All to Paraguay.
Kerosine do	34,914	1,124	--	Do.
Distillate fuel oil do	6,326	157	--	Japan 142; North Korea 15.
Residual fuel oil do	2,388,835	1,802,369	406,473	Italy 382,211; Netherlands 359,687; Uruguay 334,485.
Lubricants do	24,367	36,624	266	Uruguay 31,045; Paraguay 3,353.
Other:				
Mineral jelly and wax do	41,081	32,188	--	Bolivia 9,050; Ecuador 6,375; Colombia 5,517.
Nonlubricating oils do	77	133	--	Paraguay 63; Bolivia 42; Uruguay 28.
Petroleum coke do	2,292,444	1,309,182	359,640	Brazil 364,578; Belgium-Luxembourg 208,329; Netherlands 167,140.
Bitumen and other residues do	39,935	29,894	--	Uruguay 23,428; Chile 2,945; Brazil 1,818.
Bituminous mixtures do	71,405	16,726	--	Paraguay 16,483; Bolivia 200.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	12,840	5,750	--	Netherlands 3,072; West Germany 1,708; Uruguay 919.

rRevised. NA Not available.
1Less than 1/2 unit.
2May include platinum-group metals.

Table 3.—Argentina: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	18,560	21,630	2	Guyana 10,433; Brazil 4,214; China 4,000.
Oxides and hydroxides	86,859	229,685	1,667	Australia 160,680; Austria 57,116; West Germany 6,920.
Metal including alloys:				
Unwrought	1	18	17	United Kingdom 1.
Semimanufactures	301	772	206	West Germany 141; Brazil 121; United Kingdom 82.
Arsenic: Oxide and acid	132	--		
Chromium:				
Ore and concentrate	1,985	5,164	5,063	Republic of South Africa 100.
Oxides and hydroxides	21	82	14	Poland 30; U.S.S.R. 30; West Germany 7.
Cobalt oxides and hydroxides	11	11	2	Belgium-Luxembourg 9.
Copper:				
Ore and concentrate	440	68,897	--	Sweden 68,837; Bolivia 60.
Metal including alloys:				
Scrap	--	716	484	Chile 98; Hong Kong 84; Canada 50.
Unwrought	31,197	47,525	60	Chile 40,254; Peru 5,751; Belgium-Luxembourg 700.
Semimanufactures	652	837	172	West Germany 346; Italy 63; United Kingdom 53.
Gold metal including alloys, unwrought and partly wrought, troy ounces	26,139	NA		
Iron and steel:				
Ore and concentrate, thousand tons	2,395	2,919	(1)	Brazil 2,426; Peru 273; Liberia 74; Norway 55.
Metal:				
Scrap	16,391	6,399	4,399	Chile 2,000.
Pig iron, cast iron, spiegeleisen	r39,600	185,483	--	Brazil 157,133; Spain 22,050; West Germany 6,300.
Powder, grit, shot	1,359	2,047	1,299	Brazil 322; West Germany 245; Netherlands 63.
Ferroalloys	3,336	3,070	6	Republic of South Africa 1,429; West Germany 626; Brazil 424.
Steel, primary forms	351,519	503,579	1	Japan 269,169; Italy 69,641; France 35,444; Brazil 34,295.
Semimanufactures:				
Bars, rods, angles, shapes, sections	20,237	20,554	2,944	West Germany 6,656; Japan 2,958; Brazil 2,479.
Universals, plates, sheets	109,119	148,797	12,240	West Germany 27,348; Japan 26,158; Belgium-Luxembourg 11,359.
Hoop and strip	3,095	7,590	1,269	Brazil 1,934; United Kingdom 1,014; West Germany 937.
Rails and accessories	18,093	4,267	120	Austria 2,068; Canada 1,632; West Germany 245.
Wire	2,268	2,851	86	Uruguay 980; Sweden 447; Republic of South Africa 438.
Tubes, pipes, fittings	34,907	14,270	4,061	Brazil 3,724; Japan 1,747; Sweden 1,344.
Castings and forgings, rough	172	495	33	Spain 200; Brazil 72; Belgium-Luxembourg 52.
Lead:				
Ore and concentrate	--	60	--	All from Bolivia.
Oxides and hydroxides	79	182	1	West Germany 70; Peru 55; Mexico 40.
Metal including alloys:				
Scrap	15	1,031	632	Chile 399.
Unwrought	45	4,711	353	Peru 2,457; Mexico 1,860; France 40.
Semimanufactures	3	62	12	Brazil 50.
Magnesium metal including alloys, unwrought and semimanufactures	236	580	434	Norway 144; West Germany 2.
Manganese:				
Ore and concentrate	43,509	87,334	--	Brazil 86,824; Bolivia 470; France 19.
Oxides and hydroxides	1,470	--		
Mercury, 76-pound flasks	841	1,857	551	Mexico 493; Canada 290; Netherlands 261.
Molybdenum metal including alloys, all forms	8	4	2	Austria 1; West Germany 1.
Nickel metal including alloys:				
Scrap	1	4	--	All from Uruguay.
Unwrought	629	825	405	Canada 147; Norway 115; Republic of South Africa 81.
Semimanufactures	219	295	30	West Germany 98; United Kingdom 54; France 38.

See footnotes at end of table.

Table 3.—Argentina: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals including alloys, unwrought or partly wrought value, thousands	$374	$461	$12	West Germany $292; France $71; U.S.S.R. $49.
Silver metal including alloys, unwrought and partly wrought do.	$2,305	$1,439	$18	Belgium-Luxembourg $797; West Germany $168; Peru $146.
Tantalum metal including alloys, all forms do.	$18	$12	$7	United Kingdom $5.
Tin:				
Ore and concentrate	100	226	--	All from Bolivia.
Oxides and hydroxides	--	6	--	All from United Kingdom.
Metal including alloys:				
Unwrought	664	980	26	Bolivia 519; Brazil 435.
Semimanufactures	4	22	2	Bolivia 17; Italy 1; United Kingdom 1.
Titanium:				
Ore and concentrate	2,493	748	--	Australia 650; Republic of South Africa 98.
Oxides and hydroxides	695	1,205	63	West Germany 449; Belgium-Luxembourg 295; United Kingdom 208.
Tungsten:				
Ore and concentrate	--	1,052	--	All from Republic of South Africa.
Metal including alloys, all forms	8	32	1	Brazil 25; Japan 4.
Zinc:				
Oxides and hydroxides	290	491	87	Uruguay 190; United Kingdom 103; Belgium-Luxembourg 69.
Metal including alloys:				
Scrap value, thousands	$1	--		
Unwrought	(1)	1	--	Mainly from Italy.
Blue powder	499	2,388	--	Peru 1,740; Canada 647.
Semimanufactures	37	185	1	Mexico 155; Peru 20; Belgium-Luxembourg 6.
Other:				
Ores and concentrates	r1,720	398	--	Bolivia 348; Peru 30; Chile 20.
Metals:				
Alkali, alkaline-earth, rare-earth metals	17	38	4	Brazil 30; United Kingdom 4.
Metalloids	2,900	3,517	1,094	West Germany 1,569; Norway 377; Brazil 187.
Base metals including alloys:				
Scrap	16	323	320	Hong Kong 3.
Unwrought and semimanufactures	130	246	16	Republic of South Africa 138; Belgium-Luxembourg 38; Mexico 10.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	163	439	264	Uruguay 170; Italy 5.
Artificial: Corundum	3,078	4,829	(1)	Brazil 3,538; France 550; West Germany 402.
Dust and powder of precious and semiprecious stones value, thousands	$402	$307	$186	Belgium-Luxembourg $117; United Kingdom $2.
Grinding and polishing wheels and stones	212	134	44	Italy 41; United Kingdom 27; West Germany 7.
Asbestos, crude	13,368	21,800	82	Canada 11,446; Republic of South Africa 9,732; West Germany 500.
Barite and witherite	1,480	4,293	44	Bolivia 4,249.
Boron materials: Oxide and acid	9	39	1	Belgium-Luxembourg 22; Netherlands 15.
Cement	3,166	199,903	595	Spain 75,041; Brazil 36,392; Chile 35,210; Uruguay 32,706.
Chalk	254	424	--	Switzerland 226; France 98; Belgium-Luxembourg 97.
Clays and clay products:				
Crude	20,028	22,199	19,068	Republic of South Africa 1,609; Spain 443; Chile 300.
Products:				
Refractory including nonclay brick	r11,309	41,946	9,609	Austria 18,108; Brazil 6,129; West Germany 3,791.
Nonrefractory	r21,874	45,531	57	Italy 22,092; Brazil 16,856; Uruguay 5,627.

See footnotes at end of table.

Table 3.—Argentina: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
NONMETALS —Continued				
Cryolite and chiolite	2	23	--	Denmark 22; Belgium-Luxembourg 1.
Diamond:				
Gem, not set or strung value, thousands	$97	$265	$39	Belgium-Luxembourg $118; France $78; Switzerland $13.
Industrial ---do---	$316	$128	$32	Belgium-Luxembourg $95; United Kingdom $1.
Diatomite and other infusorial earth	2,636	3,390	1,542	Mexico 1,523; Chile 325.
Fertilizer materials:				
Crude:				
Nitrogenous	5,530	3,455	--	Chile 3,075; Mexico 305; Poland 50.
Phosphatic	4,000	8	--	All from Tunisia.
Manufactured:				
Nitrogenous	5,416	15,808	4,019	Venezuela 5,072; West Germany 4,580; Belgium-Luxembourg 1,036.
Phosphatic	12,886	53,805	45,138	Brazil 4,420; Uruguay 3,250; Israel 797.
Potassic	12,269	18,948	8,161	West Germany 6,395; Israel 2,200.
Other including mixed	46,564	81,237	70,545	Brazil 4,100; West Germany 3,525; Chile 2,280.
Ammonia	--	1	(1)	Mainly from West Germany.
Graphite, natural	387	505	153	Brazil 179; Norway 56; Austria 50.
Gypsum and plasters	12	13	--	Japan 9; Belgium-Luxembourg 2; United Kingdom 2.
Lime	--	2,000	--	All from Brazil.
Magnesite	5,360	25,729	6,382	Brazil 10,000; Greece 6,500; Austria 2,600.
Mica:				
Crude including splittings and waste	16	12	3	France 8; West Germany 1.
Worked including agglomerated splittings	16	14	2	West Germany 5; Belgium-Luxembourg 3; France 2.
Pigments, mineral:				
Crude, natural	2	25	(1)	Belgium-Luxembourg 15; West Germany 10.
Iron oxides, processed	586	452	16	Spain 161; Netherlands 111; West Germany 97.
Precious and semiprecious stones, other than diamond:				
Natural ----- value, thousands	$149	$189	$22	China $91; France $42; Switzerland $34.
Synthetic ---do---	$6	$8	$1	Belgium-Luxembourg $5; Switzerland $2.
Pyrites, unroasted	24	96	--	Brazil 60; West Germany 36.
Salt and brine	11	43	14	West Germany 26.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	503	842	3	France 257; Belgium-Luxembourg 148; Italy 136.
Caustic soda	43,987	51,318	24,117	France 11,393; Brazil 11,371; Netherlands 1,930.
Soda ash	142,952	213,080	34,817	France 51,377; Romania 46,068; Bulgaria 24,926.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	7,813	12,589	--	Italy 5,086; Republic of South Africa 4,760; Brazil 1,654.
Worked	26	147	1	Brazil 65; Italy 55; France 23.
Dolomite, chiefly refractory grade	3,525	4,595	--	Uruguay 2,405; Italy 2,041; United Kingdom 149.
Gravel and crushed rock	60	1,538	197	Uruguay 1,255; Brazil 48.
Quartz and quartzite	435	525	--	Switzerland 503; Belgium-Luxembourg 20; Brazil 2.
Sand, other than metal-bearing	29,961	78,219	3,828	Uruguay 73,671; Brazil 700.
Sulfur:				
Elemental:				
Other than colloidal	71,200	125,649	34,918	Canada 45,191; Switzerland 18,491; Netherlands Antilles 14,823; Poland 11,700.
Colloidal	88	190	130	Mexico 50; United Kingdom 5; West Germany 5.
Dioxide ------ value, thousands	--	$1	$1	
Sulfuric acid, oleum	1,381	374	2	Uruguay 362; West Germany 8; Mexico 2.
Talc, steatite, soapstone, pyrophyllite	245	551	22	Brazil 202; China 155; West Germany 53.

See footnotes at end of table.

Table 3.—Argentina: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
NONMETALS —Continued				
Other:				
Crude	3,303	3,803	421	Mexico 2,384; Japan 661; Australia 170.
Slag, ash and similar materials not metal-bearing	175	151	--	All from Brazil.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	156	271	84	West Germany 58; United Kingdom 53; Brazil 21.
Halogens	81	88	1	Israel 77; Chile 6.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	91	276	42	Italy 70; West Germany 62; Belgium-Luxembourg 49.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	29	75	75	
Carbon black and gas carbon	1,601	2,220	975	Mexico 958; West Germany 143; Canada 57.
Coal and briquets:				
Anthracite and bituminous coal	952,239	405,159	319,665	Colombia 37,301; Canada 27,500; Poland 17,793.
Briquets of anthracite and bituminous coal	2,113	528,048	470,157	Poland 28,100; Canada 26,000; West Germany 2,000.
Lignite including briquets	311	129	129	
Coke and semicoke	4,702	1,801	--	Italy 1,800; Australia 1.
Gas, hydrocarbon[2] thousand tons	2,085	1,907	(1)	Bolivia 1,408; Saudi Arabia 195; Chile 87.
Hydrogen, helium, rare gases	23	204	3	Brazil 200.
Peat including briquets and litter	135	165	--	West Germany 105; Netherlands 60.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	r14,345	12,875	835	Gabon 3,034; Congo 2,925; Venezuela 2,522; Angola 2,382.
Refinery products:				
Gasoline do	56	2,745	(1)	Netherlands Antilles 706; Netherlands 451; Venezuela 249.
Kerosine and jet fuel do	207	3,051	(1)	Netherlands Antilles 1,061; Italy 668; Canada 552.
Distillate fuel oil do	1,404	3,860	--	Canada 1,035; Netherlands Antilles 995; Bahamas 553.
Lubricants do	254	95	86	West Germany 3; United Kingdom 2.
Other:				
Mineral jelly and wax 42-gallon barrels	3,274	7,799	3,785	United Kingdom 1,055; Brazil 834.
Nonlubricating oils do	1,834	1,106	511	West Germany 210; Belgium-Luxembourg 147.
Petroleum coke do	169,592	336,254	336,254	
Pitch and pitch coke do	63,521	140,810	152	West Germany 111,874; Brazil 16,871.
Bituminous mixtures do	497	854	515	West Germany 158; Brazil 127.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	55,700	71,066	70,199	France 350; Spain 170; Republic of South Africa 129.

rRevised. NA Not available.

[1]Less than 1/2 unit.

[2]The gas reported, imported by Argentina, is presumed to be liquefied petroleum gas except that imported from Bolivia and Chile, which is presumed to be natural gas.

COMMODITY REVIEW

METALS

Aluminum.—Aluminio Argentino S.A.I.C. (ALUAR), which commenced operations in July 1974, continued as the sole producer of primary aluminum. The aluminum plant located at Puerto Madryn, Province of Chubút, has a capacity of 144,000 tons per year. In 1981, ALUAR produced an average of 11,000 tons monthly, considerably above that of prior years when energy was not fully supplied from the Futaleufu hydroelectric plant.

The domestic market for primary aluminum was not expected to expand significantly during 1982, and export trade, although increasing, was expected to be limited. Nevertheless, in view of projected growth in world demand for aluminum over the coming 20 years, ALUAR was planning to expand its production capacity by 25% to 50%. Final plans will depend upon energy costs. Work was planned to begin soon and expected to take up to 2 years to complete.

Table 4.—Argentina: Aluminum statistics

(Metric tons)

Year	Primary production	Secondary production	Imports	Apparent[1] consumption
1970	--	5,500	50,701	56,596
1971	--	8,000	59,337	67,743
1972	--	8,000	72,800	88,801
1973	--	8,000	69,030	81,297
1974	999	9,500	85,556	95,277
1975	23,710	10,500	45,813	79,761
1976	43,122	9,500	20,232	70,741
1977	49,875	6,500	108	54,133
1978	53,098	8,000	--	54,136
1979	r125,408	10,000	--	r83,492
1980	r137,581	8,000	--	r73,466
1981	e130,000	e8,000	--	NA

eEstimated. rRevised. NA Not available.
[1]Excludes stock variations.

Source: Consejo Técnico de Inversiones S.A. (Buenos Aires). Anuario-1980 (The Argentine Economy 1980), p. 223.

Copper.—In the last 10 years, Argentina has targeted its largest exploration effort on locating large disseminated copper deposits. This effort has proven to be successful for both the private as well as the public entities involved, resulting in the identification of three large copper deposits: El Pachón located in the San Juan Province, Bajo de la Alumbrera in Catamarca Province, and Nevados de Famatina in La Rioja Province.

The El Pachón project received official approval in November 1979 for development by the St. Joe Minerals Corp. through its Argentine subsidiary Cía. Minera Aguilar S.A. (CMA) which will act as the manager and operator of this project. The project consists of a fully integrated operation to produce 100,000 tons per year of electrolytic copper (at a mining rate of 35,000 tons per day); 350,000 tons per year of sulfuric acid; 1,700 tons per year of molybdenum concentrate; and 200 tons per year of anodic bars with values in silver, gold, selenium, and tellurium. El Pachón's ore reserves were estimated at 800 million tons averaging 0.67% copper and 0.016% molybdenum, together with minor gold values. Development of this project has been delayed pending the issuance of the Argentine Mining Promotion Law. Other major mining companies and the state have been invited to participate in this project.

Information released by the Government of San Juan Province and company representatives indicated that the El Pachón project would be initiated in mid-1982, but production would not come onstream until 1985 or 1986. In the meantime, construction of certain infrastructure elements has been undertaken.

The estimated cost to build and start the El Pachón complex is $1.75 billion. It was estimated that about 40% to 50% of such

expenditures will be for local procurement.

The first of two mining projects to be available for bidding is Nevados de Famatina. The Argentine Government has approved, by Decree No. 2234 of 1981, the bid documents to govern the international and local tender. The bid offer covers geological exploration of the area in the first stage, with an option in the second stage for its exploitation and beneficiation of molybdenum and copper minerals and other byproducts found in the deposit. The reserves are estimated at 200 million tons of ore, with grades of 0.06% molybdenum and 0.17% copper.

The second mining project planned for bidding is Bajo La Alumbrera. The bid documents will require completion of the feasibility study, with the option to exploit the deposit. Reserves have been estimated at 300 million tons, with an average grade of 0.56% copper, 0.68 grams of gold per ton, 2.5 grams of silver per ton, and 0.008% molybdenum. Conditions for this project appear to be favorable because of its location, altitude, and the proximity of access routes such as railways and roads.

Argentina has a number of other copper deposits with a potential for development such as Paramillo Sur with estimated reserves of 140 million tons of ore with an average grade of 0.46% copper and 0.016% molybdenum; Campana Mahuida in Neuquén Province with estimated reserves of 27.5 million tons with an average grade of 0.63% copper; and the Amendel Quantum deposit with a mine known as Mi Vida in Catamarca Province.

Iron Ore.—According to the studies done by the Secretaría de Estado de Minería and Fabricaciones Militares, iron ore reserves in Argentina total almost 1 billion tons as detailed in table 5.

Table 5.—Argentina: Iron ore reserves

(Thousand metric tons)

Deposit	Location (Province)	Reserves	Average grade (percent)	Metal content
Sierra Grande	Rio Negro	265,000	55	145,750
Santa Barbara	Salta	455,000	30	133,000
Unchime	do	270,000	35	94,500
Zapla:				
Puesto Viejo	Jujuy	[1]92,000	41	37,720
Cerro-Labrado	Salta			
Tacuru	Misiones	23,000	31	7,130
San Blas[2]	do	2,700	51	1,370
Total		1,107,700	XX	419,470

XX Not applicable.
[1]Includes reserves of Puesto Viejo and Cerro-Labrado.
[2]Ferrotitaniferous sands with 16% TiO_2.

Mine output of Hierro Patagónico Sociedad Anónima Minera (HIPASAM) in 1981 was reduced in accordance with the lowered rate of production of the pelletization plant. HIPASAM had reduced earnings because of a decrease in sales of pellets to Sociedad Mixta Siderúrgica Argentina (SOMISA) and increased financial debt at high interest rates.

Of the total output of iron ore in 1981, 364,000 tons were in pellet form. In 1981, HIPASAM contracted for the professional services of Studiengesellschaft fur Eisenerzaufberietung de Othfresen Laboratories of the Federal Republic of Germany to improve the quality of pellets produced. To satisfy the requirements of the blast furnaces, the phosphorus content has been decreased, particularly in the last shipment of the year, to below the admissible level.

Fabricaciones Militares was continuing development of the Nueve de Octubre and Puesto Viejo iron mines in Jujuy and Salta Provinces, respectively, by opening up new drifts and tunnels. Two new plants are to be set up to improve the beneficiation of the ore for use by the Zapla steel plant.

Imports of iron ore and pellets in 1981 came mostly from Brazil (90%) and other countries such as Peru, Venezuela, and the Republic of South Africa. Imports of iron ore declined 13% to 2,350,000 tons compared with the 1980 volume.

Iron and Steel.—Crude steel production declined 7% in 1981 compared with that of 1980. During 1981, installed plant capacity was utilized at only the 50% level for blast furnaces and a slightly higher level for

direct-reduction plants. SOMISA's No. 1 blast furnace was shut down for repair and maintenance and scheduled to resume operation in 1982. During the first half of 1981, SOMISA completed expansion work on the existing hot-rolling mill to increase capacity by 300,000 tons per year, at investment cost of some $25 million.

Primary iron production declined 6%—comprising 936,000 tons of pig iron and 759,000 tons of sponge iron.

ACINDAR S.A. was planning to increase production capacity by 1 million tons, at a cost of some $250 million, to be expended over the coming 5 years. The No. 2 Morgan Line was scheduled to be expanded and modernized during the first half of 1981 at an investment cost of some $30 million. The direct reduction steel plant was to be increased in capacity by 200,000 tons per year to 700,000 tons per year.

Four Argentine steel companies officially merged in October 1981 within ACINDAR S.A., the largest of the group, including GURMENDI S.A., GENARO GRASSO S.A., and SANTA ROSA S.A. ACINDAR shareholders will hold 66.6% of the merged entity.

Imports of steel in 1981 declined in line with the economy's recession.

Table 6.—Argentina: Iron and steel production

(Thousand metric tons)

Year	Pig iron	Sponge iron	Crude steel	Hot-rolled steel		Cold-rolled steel
				Nonflats[1]	Flats[1]	Flats[2]
1978	1,435	390	2,684	1,388	r836	800
1979	r1,135	803	r2,786	1,576	1,017	905
1980	1,048	758	3,203	1,445	745	690
1981e	936	759	2,687	1,125	485	527

eEstimated. rRevised.
[1]Includes structural steel.
[2]Includes plate and tin plate.

Source: La Siderugia Argentina 1980-1981, Centro de Industriales Siderúrgicos, Buenos Aires.

Lead, Silver, and Zinc.—In July, Argentina joined the International Lead and Zinc Study Group (ILZSG), which has 32 member countries. Until then, Argentina had observer status in the ILZSG. Argentina produced enough lead and zinc to meet the needs of the Nation with some surplus for exports.

Production of zinc and lead concentrate in 1981 declined 5% and increased 16%, respectively. Silver was recovered as a by-product.

CMA, a fully owned subsidiary of St. Joe (Fluor Corp.), continued as Argentina's main lead-zinc producer from its mine in Jujuy Province. In 1981, CMA produced 33,300 tons of lead concentrate, 37,700 tons of zinc concentrate, and 1.65 million troy ounces of silver contained in the concentrate.

The Secretaría de Estado de Minería provided a $600,000 loan to Cía. Minera El Colorado S.A. to further explore the Sentazon deposit in San Juan Province, as part of its efforts to promote mining in the private sector.

Manganese.—Argentina has numerous and widely distributed manganese deposits, but none are known to be of the size and grade of ore to be economically feasible. Production of manganese has been erratic, reaching the greatest output in 1959. Most of the production of manganese ore comes from the mines of Farallón Negro (Catamarca), 9 de Julio and 25 de Mayo (Cordoba), Don Luis (Mendoza), La Negra and La Clemira (Santiago del Estero).

Among these, the most important mine is Farallón Negro. The Farallón Negro Mine, operated by Yacimientos Mineros de Agua de Dionisio (YMAD), the state-owned entity, was exploiting one of a number of vein deposits occurring within a 343-square-kilometer area containing manganese together with gold and silver. The Farallón Negro ore body has reached the most advanced stage of development. Production was 350 tons per day of ore using cut-and-fill mining methods. The manganese concentrate contains about 44% manganese. The ore is subjected to cyanidation for the recovery of gold and silver. Annual produc-

tion was reported at about 25,000 tons of manganese concentrate, 620 kilograms of gold, and 2,500 kilograms of silver.

Proven reserves at Farallón Negro were reportedly about 800,000 tons grading 9 grams of gold per ton, 160 grams of silver per ton, and 16% manganese. Within the Farallón Negro area, there is potential for additional reserves at Alto de La Blenda.

The Secretaría de Estado de Minería approved a loan of $125,000 to a private company in Córdoba Province to further explore for manganese at the 24 de Septiembre Mine located in the Sobremonte Department of this Province. The state will assume the risk of 80% of the loan in case the exploration proves to be unsuccessful.

Tin.—Production of tin concentrate in 1981 was 10% higher than in 1980. The tin and silver production from the Pirquitas Mine in the Province of Jujuy continued active in 1981. Sociedad Minera Pirquitas-Picchetti y Cía. S.A., the major producer, has been producing tin and silver since 1936. During the period of 1936-78, Pirquitas produced 79,100 metric tons of tin concentrate with a tin content from 14% to 20% and 7,200 metric tons of silver. The Sociedad Minera Pirquitas was exploring a large disseminated tin deposit in an area near the Pirquitas Mine.

NONMETALS

Boron Minerals.—Production of boron minerals, which increased by 7% in 1981, was from the deposits of Francisca, Grupo Rosario, Cigarra, Inundada in Jujuy Province, and Tincalayú in Salta Province in the north of Argentina.

Boroquimica S.A.M.I.C.A.F. was developing the Tincalayú deposit in the peninsula Tincalayu near the Salar del Hombre Muerto. The ore deposit measures 1,000 meters long by 150 meters wide with a thickness between 10 to 15 meters.

Cement.—With the addition of three new cement plants, which began production in 1980, the cement industry in Argentina comprised 18 plants scattered over the country with an installed capacity of 10.3 million tons per year. During 1981, two new cement plants were under construction. The first is located in Puesto Viejo, Jujuy Province controlled by Juan Minetti S.A. with a capacity of 720,000 tons per year, and the second is located in Rio Juramento, Salta Province, and is controlled by Cementos Nord Oeste Argentino with a capacity of 625,000 tons per year.

Total consumption of cement in 1980, including imports reached 7.3 million tons, representing an increase of 8.2% compared with that of 1979.

Fluorspar.—Minera Patagónica S.A. began mining fluorspar from deposits located 15 kilometers southwest of Sierra Grande in Rio Negro Province.

The mining project is based on the Delta deposit, the most important, and 30 other smaller ore bodies. The project includes construction of milling, flotation, and briquetting plants at Puerto Madryn, Chubút Province, along with loading and shipping facilities. The Spanish construction firm Dycasa will construct the facilities estimated to cost $18 million using Japan's Kurimotor Iron Works equipment. Open pit mining and subsequent underground mining will be used to exploit the deposit. Operations were scheduled to begin at the end of 1982 at the rate of 150,000 tons per year. The reserves were estimated at over 4 million tons with an average grade of 52% CaF_2. The reserves of the Delta deposit, plus contributions from other mines and local purchases to be made in Chubút, assure a 40-year life of the project.

Drilling at the Delta Mine was performed by Dresser Atlas Co. of Dallas, Tex., and Kaiser Chemical & Aluminum Co. Ore reserve calculations and milling and flotation tests were made by Gallagher Co. of Salt Lake City, Utah, and the School of Mines of San Juan, in Argentina. Extensive briquetting test were performed in Japan. Process flowsheets and construction plans were reviewed by the Austin Co., Cleveland, Ohio. Fluorspar production in 1981 increased 21% compared with that of 1980.

Lithium Minerals.—The existence of a lithium deposit was reported at the Salar del Hombre Muerto. Lithium content on the order of 500 to 1,000 grams of LiO_2 per ton and 0.1% to 0.2% of K_2O was estimated by the National Economic Geology Committee for special investigations. Reserve estimates were not available, but a large figure was indicated. Current production of lithium comes from operations in San Luis, Catamarca, and Cordoba Provinces. Output in 1981 was 10% higher than in 1980.

MINERAL FUELS

Unlike many developing countries, Argentina does not have a deficiency of energy resources. It is nearly self-sufficient in oil and has large gas reserves. The Government has drawn up an energy strategy for

the next two decades. Its aim is to switch the emphasis from oil and gas to hydroelectric and nuclear power and achieve self-sufficiency in oil by 1985, rather than by 1982 as targeted in earlier programs. Total investment needed has been conservatively put at $55 billion, including all energy sectors.

Coal.—The production and development of coal mines in Argentina was controlled by the state entity, YCF, mainly from the remote Rio Turbio deposits in the southern region of Argentina in Santa Cruz Province. The known bituminous coal reserves at Rio Turbio were estimated at some 484 million tons. Record output in Argentina was achieved in 1979, reaching 1.4 million metric tons. During 1980, there was a slowdown in production and sales of coal owing to reduced demand upon the thermal power centers. In 1981, run of mine production increased by 17%.

High production costs in domestic mines have discouraged purchase of locally produced coal; consequently, 50% of the demand for coal is met by cheaper imports from the United States and Poland. YCF announced plans to invest nearly $400 million in coal mining during the 1980-85 period in order to obtain output of 4 million tons per year by 1985. Demand for coal was expected to increase with the startup in 1984 of the thermal powerplant in Bahía Blanca.

Imports of bituminous coal in 1981 declined 19% to 705,800 tons from the United States (85%), Poland (8%), and Colombia (2%)—an experimental shipment.

Natural Gas.—Gas del Estado continued to expand its gas pipeline network to take advantage of Argentina's growing natural gas reserve. Almost one-half of all the gas extracted continued to be lost because of the lack of facilities for piping it to consumption centers.

During 1981, piped natural gas increased by 9.7%, and imported gas went up 13.3% in volume and 96% in cost, to $221 million. In view of the abundance of Argentina's natural gas, negotiations were in process to export gas to Uruguay and Brazil by extending pipelines to the respective borders. Exports of natural gas could provide a significant source of foreign exchange earnings.

The country's proven reserves of natural gas have tripled in the last 5 years, to 22.6 trillion cubic feet as of December 31, 1980. At the current rate of consumption, the proven reserves will supply the country's demand for over 60 years. Probable reserves were estimated at 250 billion cubic meters, a figure that could be expanded in view of the intense exploration activity underway.

The most important gas discoveries were made in the remote part of southern Argentina in Neuquén Province and Tierra del Fuego, and a very substantial investment in pipeline, totaling up to 3,000 kilometers in length, will be needed to carry gas to the densely populated area in the north. A 180-kilometer pipeline across the Straits of Magellan will be required to tap a 52-billion-cubic-meter gasfield on Tierra del Fuego.

YPF of Argentina and Litton Energy Systems of the United States agreed to form a joint venture company for the construction and operation of a 563-kilometer pipeline from the Loma de la Lata Gasfield to the liquefaction plant to be located at Puerto Madryn. The planned plant capacity is about 600 million cubic feet of natural gas per day.

Considering Argentina's excellent availability of hydrocarbons, especially gas, the Government has adopted decisive measures to develop the petrochemical industry. To this end, industrial centers or poles for petrochemical plants were being built in Bahía Blanca and Ensenada (Buenos Aires Province), Rio Tercero (Cordoba Province), San Lorenzo (Santa Fé Province), Luján de Cuyo (Mendoza Province), and in Neuquén Province. These poles, when completed, will supply local needs and provide a large volume for exports, especially to Latin American countries.

The main plant in the Bahía Blanca Petrochemical Pole was scheduled for startup at the end of 1980. Its production capacity will be 200,000 tons of ethylene per year obtained by processing the ethane that will be supplied by the recently opened Gas del Estado plant in General Cerri, at a distance of 10 kilometers from the Bahía Blanca plant. The complex will consist of four plants, one of which, owned by Polisur S.M., will start producing 190,000 metric tons per year of low-density polyethylene. Additional plants by Petropol S.M. and Vinivlor S.M. will produce 20,000 tons of high-density polyethylene and 130,000 tons of vinyl chloride per year, respectively. The plants were planned to be in production by 1983.

Petroleum.—Argentina has been almost self-sufficient in oil for several years. Out-

put continued in an upward trend in 1981, increasing by 6.3%. About 15% of the output was derived from older wells by secondary recovery. YPF controls two-thirds of the wells in production and has trimmed its work force from 50,000 to 30,000. Foreign as well as private Argentine companies are now participating in exploration and development projects on a risk-contract basis. The rate of oil drilling was about 800 new wells per year, but the target has been increased to 7,000 new wells to be drilled by 1984. Oil reserves have been estimated at 7.3 billion barrels.

A new oil discovery, considered to have the largest volume of those currently in production, was announced by YPF. It is located in the north of the Patagonia region, in the Province of Neuquén, and has been identified as Loma de la Lata. The new well achieved an initial production of 1,038 barrels per day. Several other YPF discoveries of oil were announced at Madregones in Salta Province near the Bolivian border.

Exploration was underway in the South Atlantic Ocean in the region of Rio Gallegos and the Straits of Magellan using the offshore platform Interocean II belonging to the Shell Hydrocarbons B.V. Co. The General Mosconi platform, operated by Esso Exploradora y Productora Argentina Co., was exploring in the area assigned to it by YPF opposite Tierra del Fuego. Another risk-contract to explore nearly 4,400 square kilometers in Rio Norte Province was awarded to a group comprised of Cities Service Co., Aminoil, and Petrolar.

Uranium.—Argentina has assigned high priority to the development of the country's uranium potential and was nearing completion of its program to control the full nuclear cycle based on natural uranium. The National Atomic Energy Commission (CNEA) plans to increase its exploration and exploitation efforts by surveying between 50,000 and 100,000 square kilometers by 1985. With test drilling, CNEA hopes to prove a reserve of about 60,000 tons of U_3O_8.

CNEA initiated discussions with foreign companies regarding participation in its development program. Foreign companies operating under risk contracts would be authorized under certain conditions to export 25% of the eventual production of uranium. Uranium exports would be conditional upon finding sufficient reserves to assure the provision of natural uranium for the nuclear plants in operation and those planned for the next 10 years on the basis of 30 years of useful life of such plants.

According to CNEA's calculations, the country's uranium reserves exceed the requirements of the Argentine nuclear plan up to 1999. These reserves can supply more than nine plants of 500-megawatt capacity each during their 30 years of useful life. Actually six plants have been planned, including: Atucha-I (350 megawatts) in operation; Embalse (600 megawatts), to start operating by 1982; Atucha-II (600 megawatts), to be ready in another 4 to 5 years; and three additional plants expected to be operating by 1999.

According to CNEA, the main ore body at Sierra Pintada contains 16,800 metric tons of uranium oxide, with 4,000 metric tons in smaller formations. The Sierra Pintada uranium mine and processing plant was expected to begin commercial production in 1983 at an estimated rate of 700 tons per year of uranium concentrate. Los Gigantes deposit in Cordoba Province was under development.

By late 1981, CNEA was scheduled to have a purifying plant in operation at Cordoba that would eliminate the need to send the uranium abroad for upgrading. The fuel-element plant at Ezeiza, near Buenos Aires Airport, will obviate the present need to import fuel elements from the Federal Republic of Germany. The pilot heavy-water plant at Arroyito was planned for completion in 1982.

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[1]Physical scientist, Branch of Latin America and Canada, Division of Foreign Data.

[2]Where necessary, values have been converted from Argentine pesos (M$N) to U.S. dollars at the average exchange rate for 1981 of M$N4,402=US$1.00. The exchange as of Dec. 31, 1981, was M$N7,248=US$1.00.

The Mineral Industry of Australia

By Charlie Wyche[1]

Overall, the Australian minerals industry in 1981 experienced a difficult year, and production of many major commodities declined from the 1980 level. High interest rates caused a weakening in consumer spending, and the low demand for goods and services all contributed negatively to the industry's performance.

In the aluminum industry a number of companies deferred making commitments to major investments in new smelters because of serious market deterioration. Pilbara iron ore mines operated at less than 70% capacity and some expansion plans were dropped. Although zinc, coal, tin, and uranium performed well, they were the exception. In the case of zinc, the industry benefited from a strong demand, high energy costs in traditonal smelting countries, and a worldwide shortage of zinc concentrates.

Foreign investments in the Australian minerals industry continued at a high level. In mineral processing, the Government will be seeking maximum opportunities for Australian equity. At present, mineral processing does not come under the Government requirement whereby at least 50% of new mining ventures should be under Australian ownership and control, except for uranium mining where the level is 75% Australian equity. There is sufficient flexibility, however, to ensure that worthwhile projects are not delayed where Australian equity is not available. The projects in either the committed or final feasibility stages increased from $33.3 billion[2] in December 1980, to $35.5 billion in June 1981. The 1981 value was for a total of 366 projects.

PRODUCTION

Mine production of most of the approximately 70 minerals produced in Australia in 1981 was below the level for 1980. Strong growth continued throughout the Australian coal industry and a new production record was achieved. Tin and zinc output, although affected by industrial disputes at several important mining centers, was higher than that in 1980. Mine output of gold was slightly higher than that in 1980, but output of lead, copper, iron ore, nickel, and silver was lower. Production of uranium oxide almost doubled because of output from the new mine and concentrator at Ranger, Northern Territory. Mine production of bauxite was adversely affected by a strike at Weipa, Queensland. The economic depression in the world steel industry resulted in reduced demand for Australian iron ore and manganese; however, there was a slight increase in demand for Australian steel products. Because of reduced demand for rutile supplies some Australian mineral-sands operators decreased production, particularly on the east coast.

Table 1.—Australia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS					
Aluminum:					
Bauxite, gross weight ----- thousand tons	26,086	24,293	27,585	27,178	26,500
Alumina ----- do	6,659	6,776	7,415	7,246	7,079
Metal, refined ----- do	248	263	270	303	379
Antimony, Sb content of antimony and lead concentrates -----	2,089	1,519	r1,539	1,184	1,200
Bismuth, mine output, metal content -----	r932	1,054	1,189	e900	e850
Cadmium:					
Mine output, metal content -----	1,567	1,528	r1,843	1,738	1,785
Metal, smelter (refined) -----	670	747	804	1,012	1,050
Chromium: Chromite, gross weight -----	--	776	r1,855	NA	NA
Cobalt:					
Mine output, analytic content of:					
Nickel ore -----	2,077	2,418	r2,202	2,632	e2,170
Nickel concentrate -----	1,125	882	762	983	e890
Zinc concentrate -----	122	93	r82	84	e70
Total -----	3,324	3,393	r3,046	3,699	3,130
Recoverable cobalt[e] -----	1,000	1,350	1,500	1,600	1,600
Columbium-tantalum concentrates, gross weight	r346	r306	r379	351	543
Copper:					
Mine output, metal content -----	221,579	222,111	r237,610	243,540	223,352
Metal:					
Smelter:					
Primary -----	167,664	164,395	166,260	174,920	173,494
Secondary -----	4,096	2,803	r6,194	7,104	5,015
Refined:					
Primary -----	151,955	152,621	137,689	144,828	164,241
Secondary -----	31,113	26,321	34,800	21,146	15,832
Gold:					
Mine output, metal content ---troy ounces	624,270	647,579	r596,910	547,591	563,345
Metal, refined (excluding recovery from scrap) do	552,317	578,327	533,798	474,576	481,939
Iron and steel:					
Iron ore:					
Gross weight ----- thousand tons	95,923	83,134	r91,717	95,542	84,781
Iron content ----- do	60,463	52,825	r57,846	60,270	57,600
Metal:					
Pig iron ----- do	6,753	7,337	7,811	6,963	6,800
Ferroalloys:[2]					
Ferromanganese, high-carbon -----	71,012	95,393	86,875	r e86,000	e85,500
Ferrosilicon -----	18,667	18,943	18,990	r e18,900	e18,500
Silicomanganese -----	23,430	--	19,596	r e19,200	e19,000
Total -----	113,109	114,336	125,461	r e124,100	e123,000
Crude steel ----- thousand tons	7,313	7,589	8,125	7,584	7,570
Semimanufactures ----- do	6,743	6,975	7,043	5,513	5,500
Lead:					
Mine output, metal content -----	432,204	400,291	r421,581	397,491	393,113
Metal:					
Primary:					
Bullion, for export -----	156,403	151,964	r169,452	160,174	134,350
Refined -----	181,501	204,022	r205,584	200,451	209,668
Total -----	337,904	355,986	r375,036	360,625	344,018
Secondary (excluding remelt)[e] -----	36,500	35,100	r42,000	32,187	32,500
Manganese ore:					
Gross weight ----- thousand tons	1,389	1,249	r1,698	1,961	1,397
Manganese content ----- do	708	608	r809	945	670
Mercury ----- 76-pound flasks	1	--	2	2	--
Nickel:					
Mine output, metal content -----	85,868	r82,359	r69,709	74,323	74,000
Metal, smelter (refined metal and metal content of oxide) -----	34,140	37,327	r39,341	35,309	42,505

See footnotes at end of table.

Table 1.—Australia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS —Continued					
Platinum-group metals:[3]					
Palladium, metal content ____troy ounces__	9,581	r7,395	r6,880	10,545	9,000
Platinum, metal content _____do____	3,697	r2,958	r2,765	2,058	2,400
Ruthenium _____do____	225	e300	e200	150	150
Total _____do____	13,503	r10,653	r9,845	12,753	11,550
Rare-earth metals, monazite concentrate:					
Gross weight _____	9,379	14,992	r16,340	14,079	13,296
Monazite content _____	8,507	13,938	r15,139	13,075	12,358
Silver:					
Mine output, metal content thousand troy ounces__	27,525	26,123	r26,756	25,375	23,247
Metal, refined _____do____	9,006	9,599	9,469	9,761	10,776
Tin:					
Mine output, metal content _____	10,634	11,864	r12,571	11,588	12,083
Metal, refined:					
Primary _____	5,561	5,129	5,423	4,686	4,230
Secondary _____	205	320	r485	e490	e400
Titanium concentrates, gross weight:					
Ilmenite _____ thousand tons__	1,033	1,255	1,150	1,309	1,317
Leucoxene _____	10,621	16,104	21,773	23,943	19,647
Rutile _____	325,281	257,075	278,901	293,748	239,251
Tungsten, mine output, metal content _____	2,358	2,707	r3,193	3,575	3,318
Uranium: Mine output, metal content _____	356	516	706	1,516	2,860
Vanadium: Mine output, metal content _____	--	--	--	--	85
Zinc:					
Mine output, metal content _____	491,608	473,293	r529,157	495,879	504,210
Metal, smelter:					
Dust _____	6,411	7,343	r7,763	e8,000	e8,000
Primary _____	249,741	290,066	305,394	300,994	457,130
Secondary[e] _____	6,700	4,700	4,700	4,800	5,500
Zirconium concentrates, gross weight _____	398,229	391,606	r444,975	491,547	425,064
NONMETALS					
Abrasives, natural:					
Beach pebble _____	1,290	1,578	1,568	r e1,600	1,650
Garnet (sales) _____	1,104	1,583	1,080	3,629	5,450
Asbestos _____	50,601	62,744	r79,721	92,418	e92,000
Barite[4] _____	11,675	13,790	r94,066	38,633	e40,000
Cement, hydraulic _____ thousand tons__	5,022	4,993	5,243	5,387	6,007
Clays:					
Bentonite and bentonitic clay _____	5,603	4,656	r6,626	r e7,500	e8,500
Brick clay and shale _____ thousand tons__	7,885	8,563	r8,050	9,429	e9,500
Cement clay and shale _____do____	372	436	275	r e350	e460
Damourite clay (sales) _____	1,798	1,505	2,606	r e3,000	e3,000
Fire clay _____ thousand tons__	349	356	459	r e450	e480
Fuller's earth _____	50	68	e50	e50	e50
Kaolin and ball clay _____	88,884	89,200	r145,326	r e130,000	e135,000
Other[5] _____ thousand tons__	446	509	2,650	2,500	e2,500
Diatomite _____	1,288	2,821	r3,529	328	e400
Diamond: Industrial _____ thousand carats__	--	--	--	48	50
Feldspar _____	1,877	3,185	r3,869	3,150	e3,200
Gem stones _____ value, thousands__	$63,100	$86,257	$89,349	e$90,000	e$100,000
Gypsum _____ thousand tons__	916	940	r1,230	1,295	1,300
Lime[6] _____	857,322	890,032	1,089,000	1,200,000	1,300,000
Magnesite _____	18,531	21,350	r29,301	31,493	31,500
Nitrogen: N content of ammonia _____	316,500	294,300	308,300	353,000	355,000
Perlite, crude _____	2,115	1,417	2,063	r e2,500	3,000
Phosphate rock _____	449,631	248,328	r7,557	6,621	4,937
Pigments, mineral, natural: Ocher _____	62	281	222	r e225	250
Pyrites including cuprous, gross weight _____	225,657	204,724	44,910	--	--
Salt _____ thousand tons__	4,715	5,766	5,171	5,665	5,400
Sillimanite _____	550	568	568	661	660
Sodium carbonate[e] _____	160,000	165,000	165,000	185,000	190,000
Stone, sand and gravel:					
Construction sand[5] _____ thousand tons__	25,600	23,264	24,290	e26,000	27,000
Gravel[5] _____do____	15,483	14,176	16,005	e16,000	17,000
Dolomite _____do____	537	638	r747	819	950
Limestone:					
For cement _____do____	7,399	7,693	7,872	e8,000	e8,000
For other uses _____do____	3,152	3,232	3,579	r e3,700	e3,700
Silica in the form of quartz, quartzite, glass sand _____do____	1,224	1,290	1,068	e1,300	e1,300
Other:					
Crushed and broken stone _____do____	54,398	56,910	56,498	r e60,000	e61,000
Dimension stone[7] _____do____	84	115	122	r e150	e175
Unspecified[8] _____do____	33,116	28,905	30,776	r e35,000	e37,000

See footnotes at end of table.

Table 1.—Australia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Sulfur:					
S content of pyrites	107,731	92,714	21,799	--	--
Byproduct:					
Metallurgy	121,140	e140,000	e140,000	e140,000	e130,000
Petroleum	10,590	r10,130	r15,501	16,000	16,000
Total	239,461	r242,844	r177,300	156,000	146,000
Talc, soapstone, pyrophyllite	112,920	146,954	r157,475	170,964	171,000
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous and subbituminous thousand tons	78,367	79,827	r83,160	84,625	111,700
Lignite do	29,250	32,860	32,597	32,895	32,963
Total do	107,617	112,687	r115,757	117,520	144,663
Coke:					
Metallurgical do	4,834	5,103	r4,725	4,372	4,403
Gashouse (including breeze) do	65	65	70	e80	80
Total do	4,899	5,168	r4,795	4,452	4,483
Fuel briquets do	941	1,129	1,157	1,230	1,008
Gas, natural, marketed million cubic feet	237,599	258,511	296,006	337,995	400,648
Natural gas liquids:[9]					
Ethane thousand 42-gallon barrels	695	e900	e1,000	NA	NA
Propane do	7,979	e8,160	e8,500	NA	NA
Butane do	8,734	e8,840	e9,100	NA	NA
Condensate do	41	e40	e50	NA	NA
Total do	17,449	17,940	18,650	18,172	18,699
Peat do	6,433	6,424	r14,248	12,211	13,200
Petroleum:					
Crude do	157,157	158,421	159,560	139,885	135,143
Refinery products:					
Gasoline:					
Aviation do	333	352	428	730	92,922
Motor do	86,875	86,957	88,183	88,885	
Jet fuel do	14,001	13,932	14,586	14,040	15,136
Kerosine do	2,069	1,635	1,654	1,891	2,984
Distillate fuel oil do	55,702	57,011	59,010	53,257	51,899
Residual fuel oil do	29,380	28,738	28,964	22,258	21,732
Lubricants do	3,573	3,717	3,717	NA	NA
Other:					
Refinery gas[10] do	711	667	377	NA	NA
Liquefied petroleum gas do	4,522	4,132	4,038	3,828	3,816
Solvents do	1,472	1,377	1,384	NA	NA
Bitumen do	3,340	3,013	3,283	NA	NA
Unspecified do	7,195	6,768	5,522	NA	NA
Refinery fuel and losses do	16,525	18,103	20,633	NA	NA
Total do	225,698	226,402	231,779	[11]213,000	[11]215,800

e Estimated. p Preliminary. r Revised. NA Not available.

[1] Includes data available through Sept. 27, 1982.

[2] Data are for years ending Nov. 30 of that stated for plants owned by the Broken Hill Pty. Co. Ltd.

[3] Western Australia only. Metal content of nickel ore.

[4] Beginning with 1979, production from Western Australia and Northern Territory is included.

[5] Excludes production from Western Australia.

[6] Data are for years ending June 30 of that stated.

[7] Excludes production from Northern Territory and Australian Capital Territory.

[8] Excludes production from Northern Territory, Australian Capital Territory, and Western Australia.

[9] Excludes natural gasoline and liquefied petroleum gas, which are produced on Barrow Island, off the Western Australia coast. An unspecified portion of the liquefied petroleum gas extracted is apparently marketed locally, but this quantity is limited. The bulk of the liquefied petroleum gas and all of the natural gasoline is blended with crude oil and presumably is counted with crude oil from that area. Gross production of liquefied petroleum gas on Barrow Island was as follows, in thousand barrels: 1977—31, 1978—29, 1979-81—not available; and of natural gasoline: 1977—26, 1978—33, 1979-81—not available. Natural gas liquid output from several gasfields in Western Australia is excluded for similar reasons. Condensate production from these fields was as follows, in thousand barrels: 1977—23, 1978—19, 1979-81—not available.

[10] Residual fuel oil equivalent.

[11] Reported figure.

TRADE

Australia produces a wide variety of commodities, most of which are primarily for the export markets. In 1981, a record high mineral export value of $7.1 billion was established. The value was greatly enhanced by revenue from bituminous coal, which offset the decline in revenue from other minerals. The value of Australia's exports of coal was $2.3 billion, about 33% of all mineral exports. Other large export earners were iron ore and pellets, alumina, copper, lead, nickel, and zinc.

The value of mineral imports rose to $2.4 billion. The imports of crude oil and other refinery feedstock valued at $2.1 billion was the largest single category.

Table 2.—Australia: Exports and reexports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Destinations, 1979-80	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides, gross weight thousand tons	6,428	7,303	NA	NA.
Metal including alloys:				
Scrap	10,509	12,725	20	Japan 11,462; Taiwan 294.
Unwrought	81,111	57,201	--	Japan 28,817; China 9,981; Philippines 8,902.
Semimanufactures	10,265	18,649	7,505	New Zealand 2,028; Republic of Korea 1,468; Japan 1,099.
Antimony: Ore and concentrate, gross weight	2,120	1,446	--	Belgium-Luxembourg 1,381.
Cadmium metal including alloys, all forms	823	683	400	France 108; United Kingdom 79.
Chromium: Ore and concentrate, gross weight	38	155	--	West Germany 90; Malaysia 59.
Columbium (niobium) and tantalum ore and concentrate, gross weight	138	481	342	Netherlands 81; Japan 50.
Copper:				
Ore and concentrate, gross weight	135,679	164,180	2,911	Japan 128,648; Republic of Korea 16,144; West Germany 11,133.
Matte	4,387	8,719	--	West Germany 4,508; Republic of South Africa 3,002.
Dross, speiss, ash, residues:				
Copper-lead dross and speiss	5,129	5,602	5,602	
Ash and residue	--	284	17	Spain 157; Belgium-Luxembourg 76.
Metal including alloys:				
Scrap	383	621	--	United Kingdom 292; India 87; Japan 78.
Unwrought:				
Blister and cement	12,094	24,664	3,707	Belgium-Luxembourg 17,262; Japan 3,392.
Refined, unalloyed	53,320	47,737	--	United Kingdom 13,195; West Germany 9,559; France 8,678.
Alloys, including master alloys	358	218	70	New Zealand 90; Indonesia 25; Malaysia 19.
Semimanufactures:				
Unalloyed	27,970	27,472	1,787	New Zealand 7,677; Malaysia 5,476; Republic of South Africa 2,989.
Alloyed	4,630	3,723	114	Hong Kong 986; Singapore 840; New Zealand 838.
Gold:				
Ore and concentrate value, thousands	$14	$36	$12	Italy $12.
Waste and scrap do	$3,006	$2,921	--	United Kingdom $2,550; New Zealand $284.
Metal including alloys:				
Bullion, refined and unrefined do	$22	$64	$38	NA.
Other do	$85,292	$122,966	$809	United Kingdom $75,455; Hong Kong $24,361.

See footnotes at end of table.

Table 2.—Australia: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Destinations, 1979-80	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Ore and concentrate, thousand tons	79,585	78,967	78	Japan 56,970; West Germany 5,607; China 4,164.
Metal:				
Scrap	596,747	599,917	NA	NA.
Pig iron, sponge iron, powder, shot	785,425	618,970	29,140	China 403,770; Japan 63,195; Bangladesh 52,255.
Ferroalloys	43,605	28,398	16,546	Indonesia 3,398; Singapore 3,374; China 2,000.
Steel, primary forms, thousand tons	1,248	654	--	Hong Kong 137; Philippines 114; Italy 54.
Semimanufactures:				
Bars, rods, angles, shapes, sections	331,303	277,937	--	China 149,304; New Zealand 38,253; Indonesia 18,129.
Universals, plates, sheets	590,450	572,560	95,921	Italy 63,148; India 54,162; Bangladesh 52,399.
Hoop and strip	33,187	43,178	--	Taiwan 17,353; New Zealand 11,859; Philippines 4,352.
Rails and accessories	30,915	20,792	--	New Zealand 13,389; Malaysia 4,337; Indonesia 2,791.
Wire	23,096	20,313	74	New Zealand 9,672; Hong Kong 1,184.
Tubes, pipes, fittings	92,142	85,469	NA	NA.
Castings and forgings, rough	3,490	4,510	1,204	Singapore 1,418; Hong Kong 521.
Lead:				
Ore and concentrate, gross weight	87,231	68,988	9,875	United Kingdom 36,763; Belgium-Luxembourg 15,710.
Slag and residue	18,262	12,354	--	Canada 7,518; West Germany 1,934; United Kingdom 1,808.
Oxides and hydroxides	3,349	5,902	--	China 2,555; Singapore 722; Malaysia 713.
Metal including alloys:				
Scrap	7,936	9,916	--	Taiwan 7,585; Philippines 823.
Unwrought:				
Bullion	159,637	180,189	--	United Kingdom 152,630.
Refined	152,240	166,714	20,904	India 36,140; China 24,487; Italy 17,898.
Other	10,401	8,783	--	Malaysia 3,692; Indonesia 1,690; New Zealand 806.
Semimanufactures	2,635	1,380	--	Singapore 337; Thailand 263; Malaysia 160.
Manganese: Ore and concentrate[2], thousand tons	r1,157	1,328	120	Japan 625; Republic of Korea 131.
Molybdenum: Ore and concentrate (disulfide), gross weight	24	96	NA	NA.
Nickel:				
Ore and concentrate, value, thousands	$3,126	$26	NA	NA.
Matte, speiss, similar materials, do.	$143,983	$325,033	NA	NA.
Metal including alloys:				
Waste and scrap, do.	$996	$121	--	United Kingdom $38; India $27; Japan $21.
Unwrought, do.	$104,188	$139,705	NA	NA.
Semimanufactures, do.	$10,918	$3,222	NA	NA.
Platinum-group metals including alloys, unwrought and partly wrought[3], troy ounces	9,999	7,708	--	Hong Kong 2,507; West Germany 2,283; United Kingdom 2,081.
Silver:				
Ore and concentrate[4], value, thousands	$7,802	$2,501	$1,716	United Kingdom $603.
Waste and sweepings[4], do.	$1,539	$2,285	$133	United Kingdom $1,669.
Metal including alloys:				
Refined bullion, do.	$18,826	$56,710	$41	United Kingdom $40,722; Japan $10,893.
Other, do.	$9,200	$41,140	--	Japan $19,843; United Kingdom $9,958; New Zealand $6,018.
Tin:				
Ore and concentrate, gross weight	18,027	16,908	5	Malaysia 15,958.
Metal including alloys:				
Waste and scrap	940	851	--	United Kingdom 454; Papua New Guinea 265.
Unwrought	1,811	2,119	150	United Kingdom 852; Netherlands 517; New Zealand 207.
Semimanufactures	29	531	219	New Zealand 111; Republic of South Africa 64; Italy 36.

See footnotes at end of table.

Table 2.—Australia: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Destinations, 1979-80	
			United States	Other (principal)
METALS —Continued				
Titanium ores and concentrates, gross weight:				
Ilmenite excluding beneficiated ilmenite ____ thousand tons__	892	1,115	248	United Kingdom 207; U.S.S.R. 170; Japan 88.
Leucoxene ____	10,644	27,796	21,661	Netherlands 4,108; Japan 2,000.
Rutile ____	364,121	534,267	250,381	United Kingdom 83,539; Netherlands 55,705; Japan 36,025.
Tungsten ores and concentrates, gross weight:				
Scheelite ____	4,082	3,628	79	West Germany 1,992; Sweden 585; Japan 392.
Wolframite ____	1,836	124,388	106	West Germany 123,919.
Uranium and thorium ores and concentrates, gross weight:				
Monazite ____	35,493	35,784	28,479	France 5,499; United Kingdom 1,770.
Others ____	r2,220	1,327	411	United Kingdom 394; Canada 308; Japan 214.
Vanadium: Ore and concentrate, gross weight[5] ____	r528	7,878	5,300	Japan 1,607; Republic of Korea 269; Belgium-Luxembourg 179.
Zinc:				
Ore and concentrate, gross weight __	485,726	489,534	3,783	Japan 308,004; United Kingdom 45,208; Republic of Korea 4,031.
Oxides, hydroxides, peroxides ____	606	341	__	Philippines 135; Indonesia 75; Papua New Guinea 40.
Slag and residues ____	3,476	11,872	__	Taiwan 7,938; India 1,725.
Metal including alloys:				
Waste and scrap ____	70	751	__	India 539; Taiwan 170.
Unwrought ____	194,424	173,761	27,624	India 26,295; Indonesia 22,124; Taiwan 21,025.
Semimanufactures ____	15,016	1,726	__	New Zealand 490; India 284; Singapore 224.
Zirconium: Ore and concentrate, gross weight ____	450,767	609,267	74,781	Japan 181,961; Italy 159,525; Netherlands 38,812.
Other:				
Ores and concentrates value, thousands__	r$139,407	NA	NA	NA.
Waste and scrap containing nonferrous metals ____	3,685	16,577	__	Republic of Korea 13,874; Singapore 1,951.
Oxides, hydroxides, peroxides value, thousands__	$12,907	$19,093	$6,676	Taiwan $4,282; Republic of Korea $2,003; New Zealand $1,750.
Metals including alloys, all forms:				
Tungsten, molybdenum, tantalum, magnesium ____	201	38	22	New Zealand 4; Netherlands 3.
Unspecified value, thousands__	$411	$135	__	India $64; New Zealand $30.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc ____ do____	$1,840	$2,191	__	Thailand $2,159.
Artificial: Corundum ____	__	8	NA	NA.
Dust and powder of precious and semi-precious stones value, thousands__	$43	$32	__	New Zealand $21.
Grinding and polishing wheels and stones ____ do____	$1,014	$889	__	Thailand $382; New Zealand $235; Pakistan $56.
Asbestos, crude ____	38,348	56,711	550	India 16,336; Japan 10,639; Singapore 5,687.
Barite and witherite ____	1,002	21,351	20,451	New Zealand 638.
Cement ____	103,726	247,712	123,138	Saudi Arabia 91,142; Singapore 13,881; Papua New Guinea 10,741.
Clays and clay products:				
Crude ____	9,687	3,243	__	United Kingdom 1,776; Japan 1,014.
Products:				
Nonrefractory value, thousands__	$831	$729	__	Singapore $198; Papua New Guinea $167; Malaysia $96.
Refractory including nonclay brick:				
Brick ____	7,585	7,402	__	Indonesia 2,987; New Zealand 2,970.
Other _ value, thousands__	$1,170	$1,190	__	New Zealand $441; Indonesia $222; Singapore $218.

See footnotes at end of table.

Table 2.—Australia: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Destinations, 1979-80	
			United States	Other (principal)
NONMETALS —Continued				
Diamond:				
Gem, not set or strung ____ carats	16,415	11,404	476	Hong Kong 2,389; Israel 1,993; New Zealand 1,859.
Industrial ____ do ____	233,684	345,865	10,480	Ireland 227,490; Hong Kong 54,214; Philippines 32,796.
Diatomite and other infusorial earth ____ value	$2,242	$21,173	NA	NA.
Fertilizer materials:				
Crude	121,122	486	--	Philippines 266; Western Samoa 110; New Zealand 41.
Manufactured:				
Nitrogenous	8,239	24,204	11	New Zealand 10,429; Indonesia 10,000; Papua New Guinea 296.
Phosphatic	2,105	1,441	--	Philippines 1,000; Solomon Islands 287.
Potassic	35	112	--	Singapore 103.
Other including mixed	3,132	4,217	--	Papua New Guinea 4,116.
Ammonia ____ value, thousands	$471	$367	--	New Zealand $316.
Graphite, natural	17	58	--	New Zealand 14.
Gypsum and plasters	263,567	368,934	--	Indonesia 149,678; New Zealand 73,095; Singapore 50,513.
Lime	1,031	730	--	Indonesia 685.
Magnesite, other magnesium carbonate, magnesium oxide	3,598	5,585	1,054	New Zealand 3,859; Philippines 306.
Mica: Worked including agglomerated splittings ____ value	$65,024	$65,750	--	New Zealand $39,004; Indonesia $17,830.
Pigments, mineral: Iron oxides, processed	192	237	--	New Zealand 126; Indonesia 32; Papua New Guinea 21.
Precious and semiprecious stones, except diamond:				
Opal ____ value, thousands	$32,417	$28,698	$4,879	Hong Kong $9,934; Japan $7,050; West Germany $3,221.
Sapphires ____ do ____	$16,059	$16,092	$300	Thailand $11,683; France $1,068.
Other ____ do ____	$2,878	$3,756	$462	Hong Kong $674; Singapore $655; New Zealand $349.
Pyrites, gross weight	347	585	--	New Zealand 287; Malaysia 162.
Salt and brine ____ thousand tons	4,512	4,914	--	Japan 3,609; Taiwan 655; Republic of Korea 517.
Sodium and potassium compounds, n.e.s.:				
Caustic potash including sodic and potassic peroxides	18	17	NA	NA.
Caustic soda[6]	98	743	--	Saudi Arabia 309; New Zealand 191; Papua New Guinea 100.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,086	2,762	--	Italy 1,973; Japan 739.
Worked ____ value	$32,512	$33,432	--	Japan $16,716.
Dolomite, chiefly refractory-grade	20,119	--		
Gravel and crushed rock	936	332	--	Indonesia 108; New Zealand 93; Hong Kong 53.
Limestone except dimension	11,351	389	--	Indonesia 350.
Sand, silica	657,887	715,009	30,000	Japan 591,027; Republic of Korea 73,908.
Sulfur: Sulfuric acid	1,428	349	--	Indonesia 137; Papua New Guinea 84; Fiji 67.
Talc, steatite, soapstone, pyrophyllite	118,047	98,339	--	Japan 75,674; Netherlands 13,461.
Other:				
Crude:				
Quartz, mica, feldspar, fluorspar, cryolite	152	436	--	Japan 180; Republic of South Africa 162.
Unspecified ____ value, thousands	$37,834	$1,538	$376	Japan $493; United Kingdom $244.
Oxides, hydroxides, peroxides of strontium, magnesium, barium	4	4	NA	NA.
Slag, dross, similar waste, not metal-bearing ____ value	$23,543	$23,402	--	Taiwan $15,602.
Building materials of asphalt, asbestos and fiber cements, unfired non-metals ____ value, thousands	$11,488	$16,748	$3,261	New Zealand $4,316; Canada $4,060; Bahrain $3,847.

See footnotes at end of table.

Table 2.—Australia: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Destinations, 1979-80	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	39,950	46,313	--	Indonesia 14,183; Thailand 12,217; Taiwan 7,120.
Coal, all grades including briquets:				
Bituminous coal and briquets thousand tons	39,103	42,575	83	Japan 28,564; United Kingdom 2,456; Republic of Korea 2,289.
Lignite, peat, and briquets thereof	52,474	114,016	--	Japan 105,930; Norway 6,600.
Coke and semicoke	147,397	165,591	--	Philippines 76,197; Japan 39,737; Algeria 17,000.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	2,330	798	--	New Zealand 414; People's Democratic Republic of Yemen 329.
Refinery products:				
Gasoline do.	2,475	2,075	--	New Zealand 971; Fiji 343; Indonesia 223.
Jet fuel do.	1,913	1,258	--	New Zealand 700; Fiji 514.
Kerosine do.	530	1,394	--	New Zealand 956; New Caledonia 91.
Distillate fuel oil do.	5,424	4,343	--	New Zealand 850; Japan 776; Fiji 601.
Residual fuel oil do.	1,593	2,214	--	Japan 1,345; Singapore 497.
Lubricants do.	1,616	1,572	111	New Zealand 328; Singapore 208; Thailand 159.
Other:				
Mineral jelly and wax do.	5	11	--	Taiwan 6.
Unspecified[7] do.	r742	12	--	New Zealand 5.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals value, thousands	$17,156	$10,670	--	New Zealand $8,750; Thailand $1,132.

rRevised. NA Not available.

[1]Data are for fiscal years beginning July 1.

[2]Data are for calendar years 1979 and 1980; principal destinations in 1979 were Japan (601,828 tons) and the United States (119,876 tons).

[3]Ore and concentrate and waste and sweepings are included in those of silver.

[4]May include platinum-group metals.

[5]Some quantity of molybdenum may be included.

[6]Excludes quantity valued at $2,242 in 1978-79 and $383,354 in 1979-80.

[7]Excludes quantity valued at $31,391 in 1978-79 and $309,803 in 1979-80.

Table 3.—Australia: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Sources, 1979-80	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	15,634	11,051	22	China 7,852; India 3,113.
Oxides and hydroxides	8,610	7,534	2,875	Japan 3,375; United Kingdom 492.
Metal including alloys:				
Scrap	1,223	2,516	180	New Zealand 2,095; Singapore 94.
Unwrought	3,392	2,996	1,865	New Zealand 620; United Kingdom 394.
Semimanufactures	5,258	12,071	5,788	New Zealand 2,618; United Kingdom 1,359; Japan 1,236.
Antimony:				
Oxides	212	237	12	United Kingdom 158; China 45.
Metal including alloys, all forms	29	46	--	Mainly from China.
Arsenic: Trioxide, pentoxide, acids	744	1,078	--	France 847; China 148.
Beryllium metal including alloys, all forms value	$7,848	$32,318	--	France $25,631.
Bismuth metal including alloys, all forms	25	15	--	United Kingdom 12.
Chromium:				
Ore and concentrate	10,746	13,715	1,500	Philippines 8,000; Republic of South Africa 4,195.
Oxides, hydroxides, trioxides	889	1,375	481	West Germany 451; U.S.S.R. 289; Japan 104.
Metal including alloys, all forms	53	61	--	Japan 35; United Kingdom 20.

See footnotes at end of table.

Table 3.—Australia: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Sources, 1979-80	
			United States	Other (principal)
METALS —Continued				
Cobalt:				
Oxides and hydroxides	13	15	4	Canada 4.
Metal including alloys, all forms	44	36	6	Belgium-Luxembourg 15; Canada 5; United Kingdom 5.
Copper:				
Ore and concentrate	(2)	16	NA	NA.
Matte	--	36	--	All from Papua New Guinea.
Sulfate	162	35	--	New Zealand 29.
Metal including alloys:				
Scrap:				
Unalloyed	500	722	--	New Zealand 220; United Kingdom 215; Papua New Guinea 102.
Alloyed	662	12,275	--	Fiji 11,498; Taiwan 270; Papua New Guinea 242.
Unwrought	4,576	1,511	15	Belgium-Luxembourg 1,005; New Zealand 327.
Semimanufactures				
value, thousands	$18,874	$22,063	$3,326	Japan $6,759; United Kingdom $5,297; West Germany $1,890.
Gold:				
Ore and concentrate ---do---	$20	$1	NA	NA.
Metal including alloys:				
Crude bullion, gold content				
troy ounces	19,110	31,277	--	Fiji 17,333; Papua New Guinea 7,719; Hong Kong 5,957.
Refined bullion ---do---	42	1,210	--	New Zealand 1,153.
Other including waste and sweepings				
value, thousands	$1,344	$9,903	$67	Fiji $4,894; Papua New Guinea $1,916; New Zealand $1,006.
Iron and steel:				
Ore and concentrate including roasted pyrites	42,783	15,354	--	Canada 14,832; Japan 500.
Metal:				
Scrap	1,049	1,255	--	Papua New Guinea 907; New Zealand 203.
Sponge iron, powder, shot	8,786	9,810	1,499	Sweden 4,061; Japan 1,670.
Spiegeleisen	60	36	--	All from West Germany.
Ferroalloys:				
Powder:				
Ferromanganese	319	1,990	--	Japan 1,894; West Germany 48.
Other	157	227	1	France 99; Brazil 35; Sweden 29.
Shot:				
Ferrochromium	10,178	18,328	36	Republic of South Africa 15,012; Sweden 3,132.
Ferromanganese	7,314	15,459	34	Japan 6,536; Republic of South Africa 5,834; India 2,607.
Ferromolybdenum	133	285	236	West Germany 20; Switzerland 10.
Ferrosilicon	5,620	13,756	4,334	Republic of South Africa 6,407; Norway 1,005; West Germany 988.
Silicon metal	3,573	4,888	70	Republic of South Africa 4,055; Italy 520.
Ferronickel	--	271	--	All from New Caledonia.
Other	2,579	4,831	98	United Kingdom 1,561; Japan 1,066; Spain 773.
Steel, primary forms	16,014	813	6	Japan 434; Austria 102; France 68.
Semimanufactures:				
Bars, rods, angles, shapes, sections	55,054	119,358	2,175	Japan 57,357; United Kingdom 13,401; Sweden 6,860.
Universals, plates, sheets	r224,131	225,627	1,321	Japan 181,415.
Hoop and strip	19,860	15,360	1,577	Japan 9,229; United Kingdom 2,254.
Rails and accessories	891	3,711	124	Japan 3,585.
Wire	11,153	22,284	604	Japan 13,408; Republic of South Africa 3,287; United Kingdom 1,447.
Tubes, pipes, fittings[3]	131,272	106,082	8,340	Japan 68,480; Thailand 4,869; United Kingdom 4,511.
Castings and forgings, rough	553	496	1	Taiwan 419; United Kingdom 54.

See footnotes at end of table.

Table 3.—Australia: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Sources, 1979-80	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	177	139	7	Mexico 72; Republic of South Africa 31; China 18.
Metal including alloys:				
Scrap	285	1,563	--	Fiji 1,292; New Zealand 229.
Unwrought and semimanufactures	10,037	879	39	Fiji 295; New Zealand 239.
Magnesium metal including alloys:				
Waste and scrap	167	230	230	
Unwrought and semimanufactures	2,596	3,565	1,486	Norway 1,896; Canada 176.
Manganese:				
Ore and concentrate:				
Battery-grade	1,500	2,155	--	Gabon 2,003.
Metallurgical-grade	85	210	102	Republic of South Africa 108.
Oxides	1,245	1,709	370	Japan 1,284.
Metal including alloys, all forms	939	1,329	--	Republic of South Africa 915; Japan 380.
Mercury 76-pound flasks	2,089	1,531	--	China 841; Japan 330; Spain 330.
Molybdenum:				
Ore and concentrate	334	200	59	Switzerland 55; Canada 54.
Metal including alloys:				
Wire	11	6	5	NA.
Other value, thousands	$18	$1,381	$1,270	West Germany $91.
Nickel:				
Oxides	(2)	30	--	Canada 17; France 13.
Matte, speiss, similar materials	1,575	2,777	--	Canada 2,748.
Metal including alloys:				
Scrap	--	12	NA	NA.
Unwrought	1,642	797	(2)	Canada 721.
Semimanufactures	3,970	1,672	751	West Germany 476; United Kingdom 318.
Platinum-group metals including alloys, unwrought and partly wrought[4] troy ounces	112,534	895,154	736,248	France 105,000; United Kingdom 47,160.
Silver:				
Waste and sweepings[5] value, thousands	$142	$2,669	$133	Hong Kong $978; Singapore $501.
Metal including alloys, unwrought and partly wrought troy ounces	112,534	468,918	63,176	Singapore 115,742; United Kingdom 75,940; Hong Kong 46,972.
Tin:				
Oxides and hydroxides	12	1	NA	NA.
Metal including alloys:				
Scrap	24	4	NA	NA.
Unwrought	204	204	--	Malaysia 202.
Semimanufactures	17	24	1	United Kingdom 9; France 8; West Germany 4.
Tungsten metal including alloys, all forms	7	8	2	West Germany 2; United Kingdom 2.
Zinc:				
Ore and concentrate	1	4	NA	NA.
Oxides and peroxides	1,180	950	266	West Germany 279; Canada 275; Singapore 70.
Metal including alloys, all forms	307	244	57	Japan 50; West Germany 45.
Other:				
Ores and concentrates:				
Of columbium, tantalum, titanium, vanadium, zirconium	45	16	--	Mainly from United Kingdom.
Unspecified	1,874	8,127	631	Philippines 3,500; Guyana 3,000; India 795.
Ash and residue containing nonferrous metals	1,066	975	24	New Zealand 609; United Kingdom 182; Fiji 90.
Oxides, hydroxides, peroxides	739	531	171	Japan 113; China 95; Norway 53.
Metals:				
Metalloids	2,506	2,844	89	Canada 1,329; Republic of South Africa 939; United Kingdom 471.
Alkali, alkaline-earth, rare-earth metals	116	116	46	West Germany 28; Canada 17.
Base metals including alloys, all forms	138	601	45	Norway 450; Republic of South Africa 70.

See footnotes at end of table.

Table 3.—Australia: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Sources, 1979-80	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	666	1,012	684	Republic of South Africa 96; Japan 50.
Artificial: Corundum	2,872	3,541	635	France 682; United Kingdom 672; Japan 649.
Dust and powder of precious and semiprecious stones, except diamonds ____ kilograms	298	514	NA	NA.
Grinding and polishing wheels and stones	1,372	1,322	106	United Kingdom 225; Japan 224; Italy 152.
Asbestos, crude	29,442	23,490	731	Canada 17,976; Republic of South Africa 4,745.
Barite and witherite	620	1,324	--	China 1,251; West Germany 54.
Boron materials:				
Crude natural borates	19	194	NA	NA.
Oxides and acids	2,757	2,256	2,156	U.S.S.R. 88.
Cement	28,582	49,880	1,822	Singapore 23,549; Japan 11,496; United Kingdom 6,173.
Chalk	3,755	4,555	8	United Kingdom 4,167; France 343.
Clays and clay products:				
Crude:				
Bentonite	44,306	67,935	57,157	Canada 8,142; Indonesia 1,306; Singapore 1,236.
Fire clay and ball clay	1,409	3,699	171	Republic of South Africa 2,771; United Kingdom 608.
Andalusite, mullite, dinas earth, kyanite, sillimanite	2,544	4,383	4,156	Republic of South Africa 207.
Kaolin (china clay)	5,640	8,267	7,838	United Kingdom 391.
Chamotte	3,583	2,744	--	Republic of South Africa 2,632; United Kingdom 98.
Other	38,391	27,318	23,026	Singapore 2,311; Mozambique 1,004.
Products:				
Nonrefractory value, thousands	$43,632	$58,211	$30	Italy $30,957; Japan $19,434.
Refractory including nonclay brick[6]	23,238	33,354	6,206	Japan 18,134; United Kingdom 4,516; Austria 2,280.
Cryolite and chiolite	175	91	--	Mainly from Denmark.
Diamond:				
Gem, not set or strung ____ carats	63,606	60,704	3,982	India 19,119; Israel 17,845; Belgium-Luxembourg 13,886.
Industrial ____ do ____	352,093	352,315	10,318	Ireland 238,865; Republic of South Africa 71,771.
Dust and powder ____ do ____	868,783	791,430	448,897	Ireland 315,989; Republic of South Africa 18,886.
Diatomite and other infusorial earth	7,041	6,453	6,197	Philippines 173.
Feldspar, leucite, nepheline syenite	2,722	29,044	65	Canada 28,733.
Fertilizer materials:				
Crude:				
Nitrogenous	1,260	597	--	Belgium-Luxembourg 561.
Phosphatic ____ thousand tons	2,380	2,209	245	Nauru 1,130; Christmas Island 741.
Potassic	5	36	NA	NA.
Manufactured:				
Nitrogenous	28,999	78,668	45,314	Norway 12,352; Canada 11,527; Japan 7,275.
Phosphatic	66,253	48	19	United Kingdom 9.
Potassic	174,032	226,159	25,833	Canada 197,603; West Germany 2,087.
Other including mixed	5,263	21,782	16,285	West Germany 1,825; Belgium-Luxembourg 1,567.
Ammonia ____ value	$6,727	$10,030	NA	NA.
Fluorspar	33,532	30,909	--	China 16,108; Republic of South Africa 7,628; Thailand 6,668.
Graphite, natural	2,275	2,018	18	Sri Lanka 830; China 681; Republic of Korea 264.
Gypsum and plasters	1,969	1,027	171	United Kingdom 674; West Germany 108.
Iodine	19	37	5	Japan 23; Indonesia 4.
Lime ____ value, thousands	$55	$193	--	Japan $148; United Kingdom $17.
Magnesite	34,569	17,762	706	Japan 16,902.

See footnotes at end of table.

Table 3.—Australia: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Sources, 1979-80	
			United States	Other (principal)
NONMETALS —Continued				
Mica:				
Crude including splittings and waste	393	934	27	China 484; India 334.
Worked including agglomerated splittings[7] value, thousands	$709	$733	$371	Switzerland $127; West Germany $81; United Kingdom $77.
Pigments, mineral:				
Natural, crude	954	1,118	50	Austria 811; United Kingdom 183.
Iron oxides, processed	8,414	9,649	397	West Germany 7,959; Spain 792.
Precious and semiprecious stones, except diamond:				
Natural value, thousands	$9,209	$8,427	$426	Thailand $1,901; Hong Kong $1,120; West Germany $1,114.
Manufactured do	$907	$723	$11	Austria $201; West Germany $197; Switzerland $116.
Pyrites, unroasted	17	115	93	NA.
Salt and brine	20,007	39,631	99	United Kingdom 22,783; New Zealand 16,289.
Sodium and potassium compounds, n.e.s.:				
Caustic potash including sodic and potassic peroxides	2,739	3,317	169	Japan 1,919; United Kingdom 648.
Caustic soda value, thousands	$57,487	$45,732	NA	NA.
Soda ash	134	209	106	United Kingdom 75.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Calcareous	2,391	2,707	--	Italy 2,406; Portugal 212.
Slate	2,973	10,144	--	Republic of South Africa 6,770; India 2,234; China 574.
Unspecified	2,479	2,026	20	Republic of South Africa 597; Italy 588; Finland 465.
Worked value, thousands	$3,065	$3,563	--	Italy $1,613; Taiwan $1,040.
Dolomite, chiefly refractory-grade	85	13	NA	NA.
Gravel and crushed rock	67,457	108,961	275	Japan 107,010; New Zealand 854; Italy 682.
Limestone excluding dimension thousand tons	1,321	1,238	--	Japan 1,188; Philippines 50.
Quartz and quartzite	368	177	--	West Germany 135; Belgium-Luxembourg 24.
Sand excluding metal-bearing	941	880	156	Sweden 425; Republic of South Africa 123.
Sulfur:				
Elemental:				
Other than colloidal	424,659	597,128	89,028	Canada 494,849; Iran 13,122.
Colloidal	136	346	111	West Germany 129; Yugoslavia 97.
Sulfuric acid	5,702	10,779	--	Japan 10,777.
Talc, steatite, soapstone, pyrophyllite	431	576	254	China 250.
Vermiculite	3,016	2,928	--	Republic of South Africa 2,207; China 684.
Other:				
Crude	915	1,315	125	New Zealand 656; United Kingdom 298; China 110.
Fluorine and bromine	36	39	36	NA.
Slag, dross, similar waste, not metal-bearing:				
From iron and steel manufacture	88	122	--	West Germany 79; New Zealand 43.
Unspecified	1,479	2,586	1,590	United Kingdom 983.
Oxides, hydroxides, peroxides of strontium, magnesium, barium	5,157	3,406	54	Japan 3,253.
Building materials of asphalt, asbestos and fiber cements, unfired non-metals value, thousands	$1,129	$951	$324	United Kingdom $292; Spain $115.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,299	693	613	Trinidad and Tobago 70.
Carbon black	732	1,144	433	United Kingdom 240; Japan 180; Canada 172.
Coal, all grades including briquets	15,380	12,756	660	Canada 10,527; Republic of South Africa 1,012.
Coke and semicoke	19,951	15,306	4,158	Japan 7,000; New Zealand 4,134.
Hydrogen, helium, rare gases	27	64	62	Canada 1.
Peat including briquets and litter	12,591	6,824	--	West Germany 4,587; New Zealand 784; Canada 767.

See footnotes at end of table.

Table 3.—Australia: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Sources, 1979-80	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	33,983	60,597	--	Saudi Arabia 27,386; Kuwait 8,284; Indonesia 8,165.
Refinery products:				
Gasoline ---------- do	5,347	4,745	30	Bahrain 2,333; Singapore 1,444.
Kerosine and jet fuel --- do	1,327	1,454	46	Singapore 904; Bahrain 213; Bahamas 131.
Distillate fuel oil ----- do	3,084	4,274	8	Singapore 3,050; Bahrain 478; Italy 283.
Residual fuel oil ------ do	47,050	26,751	60	Singapore 8,002; Kuwait 7,882; Saudi Arabia 5,054.
Lubricants ---------- do	348	449	145	Netherlands Antilles 142; Singapore 67; United Kingdom 55.
Other:				
Liquefied petroleum gas 42-gallon barrels	2,199	1,574	645	France 480; Netherlands 217.
Mineral jelly and wax do	59,342	54,897	15,455	Japan 17,632; China 6,520; West Germany 3,166.
Bitumen, bituminous mixtures, other residues[8] do	27,351	25,658	4,826	Singapore 16,779; Canada 2,422.
Petroleum coke --- do	632,280	673,986	594,538	Canada 79,448.
Unspecified ------ do	24,963	21,576	14,952	West Germany 2,900; Italy 2,580.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals value, thousands	$4,296	$9,866	$6,746	Japan $1,418; Pakistan $737.

r Revised. NA Not available.
[1] Data are for fiscal years beginning July 1.
[2] Less than 1/2 unit.
[3] Excludes quantity valued at $17,139,377 in 1978-79 and $16,235,694 in 1979-80.
[4] Ore and concentrate and waste and sweepings of platinum-group metals are included with those of silver.
[5] Including those of platinum-group metals.
[6] Excludes quantity valued at $1,960,000 in 1978-79 and $222,880 in 1979-80.
[7] May include some finished articles.
[8] Excludes quantity valued at $55,000 in 1978-79 and $18,945 in 1979-80.

COMMODITY REVIEW

METALS

Aluminum, Alumina, and Bauxite.— Australia's bauxite and alumina production in 1981 declined for the third time in 18 years, but aluminum production continued the upward trend. The decline of bauxite was attributed to industrial unrest at the mine of one major producer. For some years Australia has been the world's leading producer of bauxite from mines located at Weipa, Gove, Northern Territory, and the Darling Range, Western Australia. The main cause for the decline in alumina production was the general downturn in the world alumina market. Alcoa of Australia Ltd. cut production by 10% at its two existing alumina refineries at Pinjarra and Kwinana. Slight increases in output by Queensland Alumina Ltd. (QAL) at Gladstone and by Nabalco Pty. Ltd. at Gove failed to offset the decline in Western Australia. Expanded smelter capacity by Alcan Australia Ltd. at Kurri Kurri, New South Wales, and Alcoa's smelter at Point Henry, Victoria, resulted in a record output of primary aluminum in 1981.

At Weipa on Cape York Peninsula, Comalco Pty. Ltd. produced about 15% of the Western World's total bauxite output. At Comalco, which is owned 45% by Conzinc Riotinto of Australia Ltd. (CRA), 45% by Kaiser Aluminum and Chemical Corp., and 10% by the Australian public, output was below that of 1980. Both production of bauxite and shipments from Weipa in 1981 were below the level of 1980 owing to an industrial dispute that curtailed operations for 9 weeks. In 1981, the company shipped approximately 8 million tons of bauxite to international markets, principally Japan and Europe. The largest single outlet was the Gladstone alumina refinery operated by QAL. Comalco supplied the total bauxite demand for QAL which in 1981 totaled about 5 million tons. All of Alcoa's bauxite output was converted to alumina at nearby refineries located at Pinjarra and Kwinana,

which have a combined annual capacity of 3.4 million tons. Roughly one-half of Nabalco's bauxite was exported. The remainder was refined to alumina in an adjacent refinery at Gove, which has an annual capacity slightly in excess of 1 million tons.

Australia's three aluminum smelters operated at near capacity throughout 1981 and production increased during the year. Production of primary aluminum by Alcan and Alcoa was appreciably higher than that of 1980. This increase resulted from new potlines commissioned in 1980 by both companies. The annual rated capacities of the three plants were Camalco at Bell Bay, 112,000 tons; Alcoa at Point Henry, 165,000 tons; and Alcan at Kurri Kurri, 68,000 tons.

Prospects for Australia to occupy a more prominent position in the world aluminum smelting industry continued to improve. Higher prices for crude petroleum have made some oil-fired power stations uneconomic as sources of energy for aluminum production. As a result, Australia's extensive coal resources were recognized as having valuable potential for thermal power generation. Consequently, a number of new aluminum smelting ventures that would use power from coal-fired stations were under consideration. Comalco's new aluminum smelter at Gladstone proceeded on schedule and it is expected to begin production in February 1982. When the full production is achieved in late 1982, the smelter will operate 2 potlines with a total of 480 smelting pots and a production capacity of 206,000 tons annually. In April, final Government approval was given for the Tomago smelter to be built by a consortium comprising Aluminum Pechiney Australia Pty. Ltd. and Gove Alumina Ltd. as major partners. The smelter, with a total capacity of 220,000 tons annually and costing about $600 million, will start production in 1983. Alcoa began a feasibility study for a smelter, probably to be located in the Pinjarra-Wagerup-Bunbury district of Western Australia. Alcoa was considering a minimum economic capacity of 100,000 tons annually that could be increased to 200,000 to 240,000 tons. The project will depend on the availability and cost of power and ultimately will involve an expenditure of about $900 million.

Australia has large resources of bauxite, and production from Comalco's Weipa deposit was a significant source of the Western World's requirements. The company's measured, indicated, and inferred ore reserves in 1981 consisted of 3.0 billion tons with recoverable bauxite content of 2.5 billion tons. The grade of recoverable bauxite in the 599 million tons of measured reserves ranged from 53% to 56% alumina. The alumina content in the indicated reserves was in the range of 48% to 56%.

Copper.—Despite stagnation and weakening world economies, the Australian copper industry showed improvement in all categories during 1981. Increased mine production by Mount Morgan Ltd. in Queensland, Woodlawn Mines Joint Venturer in New South Wales, and Peko-Wallsend Ltd., Northern Territory offset the drop in production by Mount Isa Mines Ltd. (MIM) in Queensland. High production was also reported for both primary refined and primary smelter copper.

Lower mine output by MIM was attributed to a decline in both the quantity and grade of ore treated. MIM is expected to treat 3% less ore in 1982 at 3.4% copper compared with 3.8% in 1981. The company announced that it would spend about $55 million at Mount Isa to sink a new shaft in order to mine an ore body estimated to contain 30 million tons containing 4.2% copper. The shaft sinking could begin in mid-1983 and should be completed by 1986. Production of ore is expected in 1991.

The increased output at the refineries was attributed primarily to the completed modernization at MIM. MIM's refinery at Townsville, Queensland, receives unrefined copper from Mount Isa in the form of anodes. Conversion of blister copper to anodes in the Townsville refinery's reverberatory furnaces has ceased and all furnaces were dismantled. The anode-shaft furnace installed to treat anode scrap produced in the tankhouse was fully operational and performed to design parameters in 1981.

In October, Peko-Wallsend decided to close its Tennant Creek copper smelter and Gecko Mine because of heavy financial losses. The smelter had been reopened in October 1980 after modification. The company also announced that its copper prospect at Goonumble, New South Wales, has a much higher copper grade than previously thought. Using a 0.3% copper cutoff, drilling has indicated measured resources of 86 million tons of 0.62% copper, 0.02 troy ounce of gold per ton plus 166 million tons of 0.74% copper, 0.004 troy ounce of gold per ton, and 0.054 troy ounce of silver per ton.

The Teutonic Bore, a Western Australia mine, was officially opened in June 1981. Owned jointly by Seltrust Mining Corp. Pty., Ltd., 60%, and MIM Holdings, Ltd.,

40%, the mine is expected to produce 300,000 tons of ore annually.

Although one new mine began operating and some old mines could be reopened in 1982-85, the most significant copper production may involve new mines, particularly the Olympic Dam project in South Australia and the Benambra deposit in Victoria. The Western Mining Corp. Ltd. (WMC) is conducting a feasibility study at Olympic Dam that is expected to be completed by 1983. The extent of the ore body is unknown since WMC continues to locate mineralized areas extending northwest and southwest from the main center of operations. Some estimates, however, indicate that the ore body is at least 500 million tons with an average grade of 1.5% to 2% copper, 0.05% uranium, and about 0.02 troy ounce of gold per ton. If economically feasible, Olympic Dam could begin producing by the end of this decade at about 160,000 tons annually.

Output of the principal copper producers in recent years is summarized as follows:

Table 4.—Australia: Major copper production,[1] by company

(Metric tons)

Company	1979	1980[r]	1981
Mines:			
Mount Isa Mines Ltd	152,000	158,732	143,000
Mount Morgan Ltd	1,916	2,302	4,500
Cobar Mines Pty. Ltd	8,100	6,593	4,600
Mount Lyell Mining & Railway Co. Ltd	19,405	19,835	20,339
Peko-Wallsend Ltd	4,330	11,835	17,128
Smelters:[2]			
Mount Isa Mines Ltd	152,400	148,260	137,200
Mount Morgan Ltd	5,800	6,393	6,964
Electrolytic Refining and Smelting Co. of Australia Ltd.[3]	17,100	18,754	18,000
Refineries:[4]			
Mount Isa Mines Ltd	[r]132,091	141,800	132,310
Electrolytic Refining and Smelting Co. of Australia Ltd.[3]	[r]12,737	13,140	12,200

[r]Revised.
[1]Metal content of ore.
[2]Primary blister copper.
[3]Treats concentrates from Cobar.
[4]Primary electrolytic copper.

Gold.—Although the Australian gold industry was faced with progressively weaker gold prices in 1981, mine output showed a slight gain. Exploration, new development, and redevelopment continued at a reasonably high level with the major emphasis in Western Australia and Queensland.

Increased production was reported by Peko-Wallsend at Tennant Creek, Northern Territory, because of renewed emphasis on gold rather than copper production. Kia Ora Gold Corp. NL, operator of the Marvel Lock Mine near Southern Cross, Western Australia, also increased output. Since reopening in 1980, production has steadily increased as a result of mine and plant improvements and higher average-head grades. Output by Central Norseman Gold Corp. Ltd., Telfer Mine, and Mount Charlotte Mine—all in Western Australia—approximated the 1980 level.

The Kalgoorlie area in Western Australia was again the main center of redevelopment and exploration activity. The Kalgoorlie Mining Association made steady progress on the reopening of some of their Fimiston leases and opened a $15 million treatment plant at Oroya to handle expanded gold production. Development at Mount Charlotte involved deepening the supply shaft and establishing additional access to the Mount Charlotte ore bodies. Site work also started on the new 1,200-meter shaft at Mount Charlotte. North Kalgoorlie Mines Ltd. continued redeveloping its Fimiston lease areas. Consolidated Gold Mining Areas NL announced a $14.3 million redevelopment program. The program involves rehabilitation of a shaft and construction of a 130,000-ton-per-year mill with production scheduled for 1982. The operation will be based on reported reserves of 735,000 tons measured plus inferred ore grading 0.2 troy ounce of gold per ton.

WMC commissioned a 500,000-ton-per-year gold-treatment circuit at its Kambalda plant in late 1981. WMC has been mining ore at Sand King, 75 kilometers north of Kalgoorlie, in preparation for the new mill. The Hunt Mine at Kambalda has been producing gold with nickel as a byproduct. WMC was also developing the Victory Mine,

south of Kambalda.

Placer Exploration Ltd. announced completion of its feasibility study in 1981 of the Kidston deposit located near Townsville, Queensland. Work has already established a resource of 38.3 million tons of measured and inferred ore averaging 0.06 troy ounce of gold per ton and 0.07 troy ounce of silver per ton.

Peko-Wallsend closed the Mount Morgan Mine in Queensland because the ore has been exhausted. However, the company has begun installing bucket wheel dredges to recover gold from the tailings dam. Production has also been increased at the Mount Chalmers Mine. The company has announced that extensive drilling and exploration in the Goonumble area near Parkes, New South Wales, has confirmed a major new porphyry-copper-gold deposit. To date, seven separate but related centers of mineralization have been delineated, and resources are inferred to be in excess of 250 million tons of ore averaging 0.7% copper and 0.01 troy ounce of gold per ton.

The Wattle Gully Mine, Victoria, operated by the consortium Chewton Gold Associates, was officially reopened in December 1980, but production was lower than planned as more development than originally foreseen was required. In 1981, further exploration and development was undertaken at the mine by CRA in a joint venture with the consortium.

Gold from domestic mines accounted for about 75% of Australia's output in 1981 and refined gold produced from imported crude bullion and domestic and imported scrap accounted for the remainder. The Perth Mint which refines crude gold bullion from mines in Western Australia and the Northern Territory, as well as bullion and scrap from overseas, was the largest domestic refinery of gold. Other gold refiners were Matthey Garrett Ltd. in Sydney, and Engelhard Industries Ltd. in Melbourne. Most of the crude bullion from Fiji and Papua New Guinea was refined by Matthey Garrett. Base metal refineries were the other sources of refined gold. In 1981, the Electrolytic Refining and Smelting Co. recovered about 13,000 troy ounces of gold from tankhouse sludges resulting from electrolytic refining of copper at Port Kembla, and Broken Hill Associated Smelters Pty., Ltd. (BHAS), recovered about 8,000 troy ounces from lead concentrates refined at Port Pirie, South Australia.

Iron and Steel.—In 1981, demand for Australian iron ore decreased owing to a further fall in world steel output. Iron ore production, which was also adversely affected by industrial disputes, decreased by about 10%. Production declined at most mining centers, and because of reduced sales, most producers increased waste removal, mine development, and stockpiles in readiness for a recovery in demand.

Pig iron was also adversely affected by industrial disputes as well as depressed export demand. The weak export market resulted in delayed recommissioning of a blast furnace after being shut down for repair and modification in April. As in recent years, most of the iron ore was produced in the Pilbara region in northwest Western Australia. In this area five major companies produced about 90% of Australia's iron ore. They were Hamersley Iron Pty. Ltd. at Mount Tom Price and Paraburdoo; Mount Newman Iron Ore Pty. Ltd. at Whaleback Hill; Cliffs Western Australian Mining Co. Pty. Ltd. at Robe River; Goldsworthy Mining Ltd. at Mount Goldsworthy, Shay Gap, and Sunrise Hill; and Dampier Mining Co. Ltd. at Koolan Island and Yampi Sound. In addition to the Pilbara region, iron ore was mined at Kollyanobbing by Dampier for use in the Kwinana blast furnace. In South Australia, Broken Hill Pty. Co. Ltd. (BHP) produced ore from the Middleback Ranges for steel plants in Whyalla, South Australia, and in New South Wales, Newcastle, and Port Kembla. In a relatively small project, the iron ore at Savage River, Tasmania, was slurried and pumped to a pelletizing plant at Port Latta for shipment to Japan.

Continuing depression in the world steel industry was reflected in a drop of 26% in Hamersley's iron ore production. Sales to Japan decreased significantly and actual shipments represented only 66% of the minimum-base contractual tonnages. The European Economic Community shipments also declined, but sales to Asian markets, other than Japan, were generally in accordance with long-term contracts.

The salable production from the Tom Price and Paraburdoo Mines was 29.2 million tons compared with 39.5 million tons in 1980. The reduction was due primarily to a union-called strike at the mines. Operational performance of both mines and crushing and screening plants was satisfactory when not impacted by strikes and industrial limitations.

Mount Newman operated at the reduced

rate of that of 1980. Sales totaled 27.7 million tons consisting of about equal quantities of lump ore and fines. The principal market for ore produced by Mount Newman was the Far East, which received 19.3 million tons. The remainder consisted of 5.7 million tons shipped to Australian ports for domestic consumption and 2.7 million tons delivered to Europe.

The principal Australian iron ore producers and their output in 1981 were as follows, in thousand tons:

Table 5.—Australia: Major iron ore production, by company

(Thousand metric tons)

Company	Location	Products	Output	
			1980	1981
Hamersley Iron Pty. Ltd	South Australia	Lump and pellets	r39,439	29,219
Mount Newman Mining Co. Pty. Ltd	Western Australia	Lump	r27,679	27,753
Broken Hill Pty. Co. Ltd	South Australia	Lump and pellets	4,528	3,200
Do	Western Australia	Lump	r2,500	2,720
Goldsworthy Mining Ltd	do	do	r5,991	6,294

rRevised.

Australian reserves of iron ore were estimated at 35 billion tons consisting of 25 billion tons of hematite with 54% or more iron content and 10 billion tons of limonite with 50% or more iron content. Most of Australia's reserves occur in the Pilbara region, which accounted for over 90% of the production in 1981. New mines in the region are being planned since iron ore prices have risen. Australian iron ore exporters and Japanese steelmakers concluded negotiations early in 1981 on prices of iron ore for delivery in the 12 months from April 1981. Japanese sources reported that prices of high-grade fines had been increased by 7.6% and prices of high-grade lump ore had been increased by 9.6%.

BHP remained the only steel producer in Australia with plants at Newcastle and Port Kembla in New South Wales, at Whyalla in South Australia, and at Kwinana in Western Australia. Steel production was also adversely affected by industrial disputes as well as reduced iron availability but, nevertheless, increased by 1% to 7.83 million tons. Total capacity was about 9 million tons per year. Despite idle capacity, BHP was expanding capacity to meet future market estimates.

During the year, some significant developments in energy conservation and oil substitution were continued and additional energy-savings projects were initiated. These included the injection of powdered coal into blast furnaces and firing an oil-coal slurry in the Port Kembla open-hearth furnaces. A reduction in the use of heavy fuel oil was achieved at Port Kembla by the increased substitution of natural gas; similar measures were being undertaken at Newcastle. At BHP's three steelmaking centers, projects to make more efficient use of gases generated in the plant were introduced to reduce purchases of energy from other sources. The most important project involved the recovery of gas from the basic oxygen steelmaking furnaces at Port Kembla.

Lead and Zinc.—Lead production declined in 1981 as a result of curtailment in production during the first quarter by a 3-week strike at the three major Broken Hill mines. Output from Mount Isa and Cobar was also slightly affected by industrial action in early 1981. Production of lead bullion was slightly above the 1980 level despite the shortage of feedstock in the first quarter. Production of primary refined lead by BHAS at Port Pirie was 4% higher than that of 1980. Production of secondary refined lead remained at about the 1980 level.

Mine production of zinc was also affected by industrial stoppage at Broken Hill and Mount Isa, but showed a 2% increase over that of 1980. All refineries continued to operate at near capacity throughout the year producing slightly less refined zinc than that of 1980. Exports of zinc concentrates dropped slightly during the year but were still at relatively high levels reflecting to some extent the continuing worldwide shortage. The shortage was exacerbated by the high incidence of strikes at zinc mines in the United States and Ireland. Exports of refined zinc were considerably below that of 1981 owing to continuing depressed economies in the Western World with the associated drop in demand.

MIM was Australia's largest single producer of lead and zinc. In 1981, 2.4 million tons of lead-zinc ore was mined in 1981 containing 6.2% lead and 6.0% zinc. Mining was concentrated between the 13 level (670 meters) and 15 level (730 meters). The Mount Isa mining methods of cut and fill and open stoping were modified to achieve greater ore recovery and better utilization of workers and equipment. Drilling of the lead-zinc mineralized area continued in the northern part of the Mount Isa Mine throughout 1981.

Considerable preproduction and construction work was done at the Mount Isa Mine in preparation for lead production to be increased by 20% to 180,000 tons annually by 1982 with commensurate increases in zinc and silver output. Modernization of the silver-lead-zinc concentrator was completed during the year. A new heavy medium plant and associated facilities were under construction at yearend. The plant will pretreat the ore by rejecting a large proportion of waste material before it reaches the main concentrator. The overall cost of the modernization and expansion was estimated at $60 million.

The Teutonic Bore zinc-silver-copper project, 80 kilometers south of Agnew, Western Australia, was officially opened in June 1981. Contractors were undertaking the open pit mining operation, which was expected to produce 300,000 tons of ore annually. Underground mining is expected to start by 1985. Concentrate produced on site was being trucked to Leonora, Western Australia, and hauled by rail to the Port of Esperance for delivery to customers. The project is owned by Seltrust Mining Corp. Ltd., 60%, and MIM, 40%.

In 1981, mine output by Australian Mining & Smelting Ltd. and two subsidiaries—Zinc Corp. Ltd. and New Broken Hill Consolidated Ltd. (NBHC)—decreased from the 1980 level. The reduction resulted from industrial action during the 1981 Mines' Industrial Agreement negotiations and a reduction in the grades of ore mined. The first phase of a program to permit mining of large quantities of lower grade ore bodies at NBHC was completed. Although 1982 could result in an increase in tonnage mined at NBHC, the increase will be offset by reduced average grades.

The Woodlawn Mine joint venture, consisting of CRA, and St. Joe Minerals Corp. and Phelps Dodge Corp. of the United States, increased its zinc-concentrate production, but lead-concentrate production declined reflecting a lower lead-head grade. The quality of the lead concentrate was improved because of an additional flotation stage. Mining output increased following the introduction of a 7-day workweek and improvements in drilling and blasting efficiencies.

The BHAS refinery operated at near capacity in 1981, mainly as a result of refining the major portion of lead bullion produced by Sulphide Corp. Pty. Ltd.'s Imperial smelting furnace. Concentrate deliveries from Broken Hill were in short supply in the first half of 1981 owing to industrial problems at the mines. Additional concentrates were acquired from overseas suppliers to maintain production levels. The BHAS lead production totaled 224,696 tons during the year compared with 215,919 tons in 1980. Zinc production in 1981 was 40,712 tons compared with 39,826 tons in 1980.

EZ Industries Ltd. operated two mines—Rosebery and Hercules—both located in Tasmania. These were zinc-lead-copper deposits in association with gold, silver, and pyrite. EZ Industries also treated ore from Aberfoyle Ltd.'s new mine at Que River, Tasmania. Total ore milled came to 540,000 tons producing 96,200 tons of zinc concentrate, 13,300 tons of lead concentrate, and 22,700 tons of copper concentrate together with some gold and silver.

The principal lead and zinc companies and the quantities produced during 1980-81 were as follows:

Table 6.—Australia: Lead-zinc production, by company

(Metric tons)

Company	1980[r]		1981	
	Lead	Zinc	Lead	Zinc
North Broken Hill Ltd	50,150	40,600	46,000	36,500
Zinc Corp. Ltd	75,800	75,750	59,400	52,500
New Broken Hill Consolidated Ltd	71,850	124,400	63,600	112,500
Mount Isa Mines Ltd	163,000	105,000	144,000	99,000
Electrolytic Zinc Co. of Australasia Ltd. (Read-Rosebery)	15,500	54,270	19,400	53,000

[r]Revised.

Manganese Ore.—The Groote Eylandt open pit manganese mine located on an island in the Gulf of Carpentaria accounted for virtually all of Australia's manganese production. Manganese ore production in 1981 by Groote Eylandt Mining Co. Pty. Ltd., a wholly owned subsidiary of BHP, decreased by 28%. BHP announced in October that production was to be scaled down by about 30% because of depressed demand. However, by yearend the production rate at the mine had been reduced to about one-third capacity, in line with decreased consumer requirements. Plans being considered for the expansion of production capacity to about 3 million tons annually were deferred because of the deterioration in market prospects. An expansion in production capacity by 130,000 tons annually to about 2.4 million tons was completed with the installation of a dense-medium-fines beneficiation plant. The plant cost $14 million and produced marketable-grade fines from lower grade fines previously discarded from the fines treatment plant of the Groote Eylandt concentrator.

Exports of manganese ore decreased to 901,000 tons in 1981 and shipments to all major markets including Japan, Europe, the Republic of Korea, and the United States decreased significantly. Exports of ferromanganese decreased from 23,200 tons valued at $6.3 million in 1980 to about 17,500 tons valued at $5.0 million in 1981. Major markets in 1981 were the United States, Indonesia, Qatar, and Thailand.

Australian manganese reserves were estimated at about 889 million tons in 1981; the main part was on Groote Eylandt. The remainder was located principally in the east Pilbara and Peak Hill regions of Western Australia, and at Pernatty Lagoon in South Australia. Known deposits in the Northern Territory were subeconomic. Large secondary enrichment deposits along the outcrop of Marra Mamba iron formation in the Pilbara were being evaluated. These deposits are low in silica and consist of about equal proportions of high-grade ore, 40% manganese, and lower grade ores suitable for beneficiation.

Nickel.—Although the demand for nickel remained at a reduced level, Australia's mine production showed an increase over the 1980 output. An increase in output at Kambalda by WMC and a resumption of nickel production at Mount Windarra and Shell Co. of Australia Ltd. offset decreased output of nickel at Agnew, owned by Selrust Mining Corp. and MIM, and of nickel in ore at Greenvale owned by Queensland Nickel Pty. Ltd. Sulfide-based mines in Western Australia accounted for 60% of production with the remainder coming from the Greenvale lateritic mine in Queensland.

At the end of 1981, the Kambalda Mine at Kalgoorlie was still the principal nickel producer accounting for more than 55% of the Australian production. The Greenvale operation in Queensland was the next largest followed by the Nepean and Agnew Mines in Western Australia, which together produced less than 10% of the Australian total. In 1981, WMC treated 1.4 million tons of ore from its Kambalda operations and produced 344,800 tons of concentrate containing 36,670 tons of nickel. Nickel mining and processing in Western Australia was WMC's main income-producing activity. The operations comprise nine underground mines and a concentrator at Kambalda, a nickel smelter at Kalgoorlie, and a nickel refinery at Kwinana. Late in the year, WMC started production again from the Windarra project. The amount of ore treated came to 31,400 tons at a head grade of 1.63% nickel.

The Agnew project expanded its ore production during the year although lower grades than expected were found. Metallurgical problems also reduced the metal output. The concentrate was sent to WMC's Kalgoorlie smelter and the matte, containing 73% nickel, was sold to AMAX Nickel, Inc., in the United States under a long-term contract. In 1981, about 605,000 tons of ore was mined to produce 14,256 tons of nickel matte.

Mining and refining of nickel was conducted in Queensland by a joint venture of Metals Exploration Ltd. and Freeport of Australia Inc. An ore body at Greenvale, 175 kilometers west of Townsville, containing about 1.57% nickel and 0.12% copper was mined by open cut and the ore taken by rail to a refinery at Yabulu near Townsville for treatment. The operation was severely hit by the increase in the price of fuel oil and has been converted to coal firing. The depressed market for nickel resulted in a loss of nearly $13 million for the 6 months ending December 1981.

Metals Exploration and Freeport also operate a nickel mine at Nepean. The ore was concentrated at WMC's mill at Kambalda. The output of contained nickel for the 6 months ending in December 1981 was 1,601 tons.

Australia's identified nickel resources calculated in 1980 by the Bureau of Mineral Resources (BMR) came to 458.6 million tons of sulfide ore and 155 million tons of lateritic ore. WMC's proved and inferred reserves of sulfide ore came to 24 million tons at a grade of 2.5% nickel plus 4.2 million tons of 3.78% nickel at the Carnilya Hill prospect which was 56% owned by WMC.

Silver.—Most silver was produced as a byproduct of lead-zinc mining with gold and gold-copper mining making a contribution. Total silver production in 1981 was about 12% below the 1980 output. More than 85% of the output came from mines in Mount Isa and Broken Hill. Silver was also produced as a byproduct of copper mining at Tennant Creek, Mount Morgan, Cobar, Woodlawn, and Mount Lyell.

MIM remained Australia's largest producer of silver. In 1981, about 2.47 million tons of lead-zinc ore averaging 5.0 troy ounces of silver per ton was treated to produce 11.8 million troy ounces of silver in concentrates. About 87% of the silver was recovered from lead concentrates, and the remainder from zinc and copper concentrates. The lead concentrates were smelted to lead bullion at Mount Isa and exported to the company's lead refinery at Northfleet, the United Kingdom, where the silver metal was recovered. Over 70% of the zinc concentrate was exported, and the remainder was shipped to the zinc refinery at Risdon, Tasmania. Silver in copper and lead residues from the electrolytic tankhouse slimes from the Townsville copper refinery were either recovered by the Electrolytic Refining and Smelting Co. or exported.

The Broken Hill area remained Australia's second largest source of silver in 1981. Production of silver from the lead-zinc concentrates in 1981 by several companies declined because of industrial action and a lower overall grade of ore mined. The grade of ore treated contained 5.8 troy ounces of silver per ton compared with 6.3 troy ounces per ton in 1980. Most of the silver produced at Broken Hill was contained in lead concentrates that were treated at the BHAS smelting and refining plant at Port Pirie.

EZ Co. produces silver as a byproduct of copper-lead-zinc mining at Rosebery. In 1981, the company treated about 515,680 tons of ore from the Hercules and Rosebery Mines. The Farrell Mine remained on maintenance status. The average silver grade of the complex copper-lead-silver-gold ore treated was 3.8 troy ounces per ton, marginally higher than that of 1980. The tonnage of ore mined was substantially less than in the previous period, mainly owing to strikes by workers.

About 80% of all silver exported in 1981 was contained in lead bullion; lead, zinc, and copper concentrates; blister copper; and various slags, mattes, and residues.

Principal producers of silver and output in thousand troy ounces during 1980-81 were as follows:

Table 7.—Australia: Major silver production, by company

(Thousand troy ounces)

Company	1980	1981
Electrolytic Zinc Co. of Australasia Ltd	2,168	1,930
Mount Isa Mines Ltd	14,592	11,768
New Broken Hill Consolidated Ltd	1,774	1,837
North Broken Hill Ltd	2,703	2,500
Zinc Corp. Ltd	1,650	1,410

Tin.—In 1981, mine production of tin-in-concentrates increased 13% resulting largely from Renison Ltd. reaching full production capacity following completion of its expansion program. However, production of primary refined tin declined 13% as demand for primary tin for use in tin plate fell again. Australia ranks high in the Western World as a producer of tin-in-concentrates, and about one-half of the production was exported.

Renison Ltd. in Western Tasmania, owned by Renison Goldfields Consolidated Ltd., is the world's largest underground tin mine and Australia's largest tin producer. In 1981, the company treated 656,400 tons of ore with an average head-grade of 1.20% tin and recovered 5,546 tons of tin-in-concentrates. The mill recovery of tin metal in concentrates was about 74%. Renison completed expansion of milling capacity to 850,000 tons annually and was in the final phase of commissioning the plant. Following successful matte-fuming trials on low-grade material, a detailed engineering study continued to assess the feasibility of a fuming plant. Renison's combined proved and probable ore reserves were estimated at about 1.3 billion tons in 1981, but the tin grade dropped from 1.13% to 1.12%. The increase in tonnage and reduction in grade was largely a result of adding several million tons of lower grade ore to the reserves.

Aberfoyle Ltd., Australia's second largest tin mining group, operated the Cleveland tin mine at Luina, Tasmania, and the Ard-

lethan Mine in New South Wales. The company has disposed of its unprofitable Aberfoyle and Storeys Creek operation to Forestwood Australia Ltd. Forestwood spent $2.2 million on rehabilitating the mine and then decided it could not be profitably operated and the mine was closed. Aberfoyle's production figures for 1981 were 1,430 tons of tin-in-concentrates from Ardlethan and 578 tons of tin-in-concentrates from Cleveland. The company constructed an experimental matte-fuming plant at Kalgoorlie to develop a method of treating fine-grain ore in its deposits near Zeehan, Tasmania.

Greenbushes Tin NL continued to operate its new electric arc furnace at its plant south of Perth, Western Australia, treating its tin concentrates and some from the Northern Territory. The smelter produces metallic tin- and tantalum-bearing slags. Greenbushes has tantalite resources totaling 21.8 million tons of ore assaying 0.11% tin and 0.044% tantalum over a deposit width of 14.7 meters. At present this is augmented by 9.7 million tons of inferred ore assaying 0.15% tin and 0.06% tantalum. In addition to production of primary refined tin, the new smelter produced about 130 tons of antimonial tin, 99.5% tin.

Associated Tin Smelters Pty. Ltd. (ATS) operating at Alexandria, New South Wales, was the other primary tin smelter. The smelter is owned equally by O. T. Lempriere & Co. Ltd., Consolidated Tin Smelters (Australia) Pty. Ltd., and Australian Iron & Steel Pty. Ltd. Output of the smelter is limited by the low average grade of concentrates currently available and its capacity of about 7,000 tons of refined tin. In 1981, production by ATS, affected by industrial disputes, was 4,200 tons of primary refined tin. Plants in Sydney, Wollongong, and Melbourne produced nearly 400 tons of secondary tin from tinplate scrap and plating wastes.

Titanium and Zirconium.—In contrast to the high demand for titanium and zirconium in 1980, indications of mineral oversupply developed in the latter part of 1981. The economic downturn in the United States and Europe during 1981 reduced demand for rutile, particularly in the pigment section. In contrast, zircon recovered its competitive position as a foundry sand and as a source of high-quality refractories. Although domestic output was reduced in 1981, shipments of zircon concentrates from Australia were maintained nearly at the record level of 1980. Despite the availability of about 200,000 tons of zircon from other sources in 1981, world prices of zircon advanced. This increase resulted in a relative increase in the importance of zircon as a revenue earner in the mineral sand industry on the west coast where the zircon-rutile output ratio is about 3:1 compared with the east coast where the ratio is about 1:1.

World demand for rare-earth oxides firmed with a market shift toward metallurgical applications, particularly in the use of rare-earth oxides in high-strength, low-alloy steels. Australia's output was maintained at about the 1981 level, of which almost 95% was recovered as a byproduct of mineral sand operations in Western Australia. Renewed interest has also been shown in xenotime and monazite concentrates as a source of yttria for use in phosphorus for color television tubes.

As in recent years, virtually all of the rutile, zircon, and monazite output was exported along with about 80% of the ilmenite concentrates. The remainder of the ilmenite was consumed within Australia for the production of titanium dioxide pigments and for the production of synthetic rutile. The principal destinations for the products were Japan, Western Europe, and the United States.

For a number of years, Australia has dominated world production and exportation of heavy mineral sands of rutile, ilmenite, zircon, and monazite. The deposits consist of placer formations on present or ancient shore lines and are usually worked by dredging operations.

The east coast deposits in New South Wales and Queensland still provide the bulk of the country's output of rutile concentrates, but the new mines at Capel and Eneabba in Western Australia were the country's major suppliers of ilmenite, zircon, and monazite. On the east coast, Associated Minerals Consolidated Ltd., Consolidated Rutile Ltd., Mineral Deposits Ltd., and Rutile & Zircon Mines Ltd. accounted for most of the output. On the west coast, Allied Eneabba Pty. Ltd. and Westralian Sands Ltd. supplied most of the output of mineral sands.

Australia has considerable reserves of mineral sands. According to the BMR 1981 assessment, identified resources of ilmenite total about 62 million tons. About one-third of these resources has too high a chromium content or otherwise is not suitable for titanium oxide pigment production by the

current sulfate process. Economically recoverable reserves of other mineral sands include about 9 million tons of rutile, 14 million tons of zircon, and 384,000 tons of monazite. According to recent forecasts, these reserves could maintain Australian production at gradually declining levels until the end of the century. BMR forecasts Australian ilmenite production slipping to 1.2 million tons annually by 1990 and to 900,000 tons by the year 2000, and a similar trend for rutile peaking in 1985 with 295,000 tons and dropping to 150,000 tons by the end of the century. BMR expects zircon production to begin declining in the next couple of years reaching 400,000 tons annually in 1985 and 330,000 tons in the year 2000. BMR has also forecast a marked upturn in the amount of mineral sands processed within Australia. In keeping with its policies to encourage more domestic processing of local mineral production, the Australian Government has been cooperating with the state governments and the mineral sands industry to study the possible creation of new industries using mineral sands as a raw material.

NONMETALS

Diamond.—CRA and its Ashton joint-venture associates have made significant progress in the development of the Argyle diamond prospect in the Kimberly region of Western Australia. A wholly owned CRA subsidiary, Argyle Diamond Mines Pty. Ltd., has been incorporated to be the manager and operator on behalf of the joint ventures. In 1981, a total of 34,300 tons of ore from kimberlite pipe AK-1 was treated and 152,004 carats of diamonds recovered. This included diamonds liberated by recrushing to a smaller size, some previously treated kimberlite samples, and also processing some weathered kimberlite and eroded country rock overlying AK-1. Structural drilling indicated AK-1 to be a substantial body of kimberlite in excess of 100 million tons. Two kimberlite types have been delineated—sandy and nonsandy—with varying diamond grades and qualities.

Work started in November on a definitive feasibility study. This could result in a decision by the joint ventures to construct a large-scale commercial plant. Engineering studies indicate a proposal for a plant with an initial capacity of approximately 2.25 million tons annually. This would result in production of approximately 20 million carats annually beginning in 1985.

Phosphate Rock.—Production of phosphate rock from Phosphate Hill, about 65 kilometers south of Duchess, Queensland, resumed in November 1981. Approximately 32,000 tons of phosphate rock were produced from the operation, which had been on maintenance status for almost 3 years. Western Mining Corp. Holdings Ltd., through its 80.2% ownership of BH South Ltd., now effectively controls the Duchess deposits. The company announced that production of direct-shipping-grade rock (about 31% P_2O_5) would resume at a rate of 200,000 tons annually; at least 100,000 tons annually is committed to the Australian market.

At present, mining is taking place in the high-grade deposit areas where rock can be produced with a 30% P_2O_5 content after washing and screening. The bulk of the deposits are of lower grade rock and will require upgrading onsite before it can be transported and marketed on an economic basis. The company has been actively involved in testing various methods of upgrading rock and this work is to be intensified with the intention of establishing an economic upgrading facility. Upgraded rock would be gradually phased into the market and become the main product in the future.

The main markets for Australian rock will be Australian phosphate fertilizer manufacturers and countries in Southeast Asia. The other two phosphate exporting countries in the Oceania area—Nauru and Christmas Island—both face rapidly declining reserves that are expected to be mined out in a few years. In 1981, these countries were the principal suppliers of phosphate rock to Australia and New Zealand.

An estimated 8,000 tons of phosphate rock was produced in South Australia in 1981 but was unsuitable for superphosphate manufacture because of its high iron and aluminum content and was used directly as fertilizer.

Salt.—In 1981, export and production of salt declined owing to a recession in the chemical industry in Japan. Three companies—Dampier Salt Ltd., Leslie Salt Co., and Shark Bay Salt Pty. Ltd. (all based in Western Australia)—produced more than 80% of the total domestic output. Producers in South Australia, Victoria, and Queensland supplied the remainder. Production was by solar evaporation from seawater, saline lake water, and underground brines; salt was also harvested from dry lake beds. Virtually the entire Western Australian output was exported mainly to

Japan, while salt produced in Queensland, Victoria, and South Australia was generally consumed locally. Less than 5% of Australia's output was consumed as table salt.

Western Australia produced about 4.8 million tons of salt in 1981 and exports totaled 3.2 million tons. Dampier Salt, with operations at Dampier and Lake McLeod, was the principal producer supplying 3.3 million tons. Production from the Dampier operation was 2.42 million tons with the Lake McLeod Field producing 0.89 million tons. The Lake McLeod Field returned to full operational capacity in early 1981 and the first shipment from Cape Cuvier was made in March. This was after a 2-year closure in which the field was upgraded in conjunction with the rebuilding of the shiploading facilities damaged by Cyclone Hazel. Both production sites were seriously affected by interruptions due to industrial activity during the second half of the year. The industrial disputes affected the company's operations and prevented shiploading from Dampier causing loss of sales. Dampier's output comes from evaporation pans at Lake McLeod, north of Carnarvon, where extensive reserves of evaporites occur in brines over a 225,000-hectare area.

Cargill, Inc., formerly Leslie Salt Co., of Minneapolis, Minn., United States, produced 1.3 million tons of salt in 1981. The company operated at full capacity after reconstruction of the concentrator system, which was severely damaged as a result of three cyclones in 1980. The damage sustained in the concentrator system disrupted the flow of brine to the crystallizer. The levees and ponds were repaired in late 1980, and $3.8 million were spent in 1981 to add further clayfill to the levees.

Shark Bay Salt Pty. Ltd. produced about 650,000 tons of salt from its Useless Loop operation in 1981. The company has steadily increased its production in recent years, mainly by improving brine flows within the pond system and enlarging stockpile areas. Output from Shark Bay was exported to Japan, Kenya, Malaysia, the Philippines, and Taiwan.

Salt requirements for Australian industry were supplied mainly by producers in Queensland, Victoria, and South Australia. The principal producer in South Australia and Queensland was Imperial Chemical Industries of Australia and New Zealand Ltd., which operated solar evaporation projects. In Victoria, virtually all of the State's output was produced by Cheetham Salt Ltd.

Australia's consumption of salt in 1981 was estimated at 950,000 tons, of which about 680,000 tons was used by the chemical industry for producing sodium hydroxide and sodium carbonate and 270,000 tons was used in industrial applications, in food processing, and in households.

Sulfur.—Australia has no known deposits of elemental sulfur, but pyrite was mined for its sulfur content at several locations. About 95% of the sulfur was consumed in the form of sulfuric acid to produce fertilizer, particularly superphosphate. Approximately 75% of the sulfuric acid production was from imported brimstone, and 25% was from emissions of various indigenous metal sulfide smelters. Small quantities of elemental sulfur, 14,438 tons in 1981, some of which was used for manufacturing acid, were recovered from crude oil refineries.

Sulfur was also obtained from petroleum by Petroleum Refineries (Australia) Pty. Ltd. at Altona, Victoria, and Hallett's Cove, South Australia; Shell Refining (Australia) Pty. Ltd. at Clyde, New South Wales, and Geelong, Victoria; Australian Oil Refining Pty. Ltd. at Kernell, New South Wales; and Amoco (Australia) Pty. Ltd. at Bulwer Island, Queensland. The combined capacity of the plants was up to 52,000 tons per year, but the total output from petroleum in 1981 was about 15,500 tons.

Only Electrolytic Zinc Co. of Australasia Ltd., at Rosebery, and the Mount Lyell Mining and Railway Co. Ltd. produced pyrite for acid production as a byproduct of base metal mining. Acid from this pyrite was produced at Burnie, Tasmania, by North-West Acid Pty. Ltd., in which the mining companies each have a one-half interest. The production by North-West Acid totaled 275,000 tons of sulfuric acid in 1981 compared with 273,018 tons in 1980. The new No. 6 acid plant was completed during 1981.

Exploration continued on pyrite black slate occurrences near Port Sorell and at Dial Range, both located in Tasmania. Tin deposits at Mount Bischoff and Renison Bell, also in Tasmania, are associated with enormous deposits of pyrite and pyrrhotite and were being investigated.

MINERAL FUELS

Coal.—Strong growth occurred throughout the coal industry in 1981 and record production, consumption, and export levels were achieved. Most of the output was from deposits in the Sydney Basin of New

South Wales, and in the Bowen Basin of Queensland. There were smaller operations in the Collie Field of Western Australia and in Tasmania. Subbituminous coal at Leigh Creek in South Australia was mined for power generation use.

Domestic consumption rose slightly, but growth was restricted by engineering difficulties in electricity-generating equipment in New South Wales. Although consumption of coal in steelmaking rose, continued recession in the steel industry restricted growth in that area.

New South Wales coal production showed a record of 60.8 million tons or 19% more than that of 1980. The coal production from underground mines came to 46.1 million tons, up 25.5%, and from open pit mines, 14.7 million tons, up 4.8%. New South Wales coal exports, although hampered by lack of adequate ports and by industrial disputes, came to 23.3 million tons or 1.6% more than that of 1980. Steam coal exports rose by 8.6% to 9.8 million tons, but coking coal fell 2.3% to 14.4 million tons.

Queensland coal production in 1981 was 34.6 million tons, 21% more than that of 1980. At the end of 1981, coal was being won from 23 open pit mines and 26 underground mines. Two new projects to come into production were the open pit mines at German Creek and Yarrahee in central Queensland. Development of new mines continued. A new underground mine developed for the coking coal export trade was expected to begin production in early 1982. Two open pit coking coal projects were progressing and a third one was at an advanced stage of planning. A combined steam and coking coal mine was in the early development stage. The steam coal from this mine will augment power station supplies in the State while coking coal will be exported. The upsurge in surface mining began in Queensland in the early 1970's when Utah Development Co., owned 89.2% by Utah International, Inc., of the United States and 10.8% by Utah Mining Australia Ltd., started coal production. The company operated three open pit coal mines on the western side of the Bowen Basin at Goonyella, Peak Downs, and Saraji in the Mackay coal mining district, producing over 60% of Queensland's coal output, most of which was exported.

Another Queensland coal producer, Thiess Dampier Mitsui Coal Pty., Ltd., continued a $25 million expansion program to boost output at its Moura-Kianga surface mine from 3 to 5 million tons by 1985. The company also planned to develop two new underground mines in addition to its two existing underground mines. The company exported coal only to Japan but was examining the prospects in other markets, including the Republic of Korea, Taiwan, Europe, the United States, and the Pacific Basin.

Economic resources of black coal reserves in Australia were estimated at 308.3 billion tons at yearend 1981; of this total, 36.3 billion tons was measured and 272 billion tons inferred. Reserves in New South Wales totaled 16.2 billion tons; in Queensland, 17.4 billion tons; in Western Australia, 1.9 billion tons; in South Australia, 720 million tons; and in Tasmania, 120 million tons. Substantial deposits of coal have also been delineated in areas not being mined, notably in the Surat Basin, Queensland, at Lake Phillipson in the Arckaringa Basin, South Australia, and in the Corrabin-Oalands Basin, New South Wales.

Lignite.—Victoria was the only State that produced lignite in 1980. The major deposits in Victoria were in the Latrobe Valley, 130 to 200 kilometers southeast of Melbourne, where the State Electricity Commission at Yallourn and Morwell produced more than 95% of the State's total output. The remainder was produced by privately owned mines at Anglesea and Bacchus Marsh. Output increased during the year following the commissioning of an additional dragline. Coal was won by large draglines with an excavating capacity of 2,500 tons per hour. The Yallourn open pit produced at a rate of 16 million tons annually. Traditionally, production from Yallourn has been used to produce a high-grade solid fuel in the form of briquets for domestic and industrial use. However, briquets were also used for the production of high-grade char, gas, liquid-fuel products, and other chemical industry feedstock.

Several governments and private companies continued research on methods of producing oil from coal. Japanese interests were reported to be willing to establish a demonstration plant for conversion of Victorian lignite into solvent-refined coal suitable for steelmaking. Establishment of a full-scale plant was proposed if the demonstration proves successful.

In 1981, brown coal reserves were estimated at 106 billion tons, 39 billion tons indicated and 67 billion tons inferred. Although South Australia has some brown coal deposits, Victoria accounted for all of

Australia's brown coal production and about 99% of the country's reserves and resources.

Petroleum and Natural Gas.—Production of both crude oil and natural gas increased compared with that of 1980. However, industrial actions involving production, shipping, and refining resulted in some cutbacks during the year. Production from Bass Strait of 133 million barrels was 93% of the indigenous production. The remainder came from Barrow Island, Western Australia, and the nearly exhausted field at Moonie, Queensland. Total oil production represented about 67% of current domestic requirements. With recent discoveries and revised estimates of reserves, it was estimated that this degree of self-sufficiency could be maintained until the mid-1980's.

Crude oil processed at Australian refineries totaled about 216 million barrels in 1981. Indigenous crude oil comprised over 65% of this total, the remainder was supplied principally from the Middle East.

A total of 158 exploration wells were drilled, of which 128 were onshore. Of the onshore total, 75 were in Queensland, 22 in South Australia, and 31 in Western Australia. In addition, 80 development wells were drilled. A total of $480 million was spent in 1981 on exploration and the overall success ratio for exploration wells was 1:4. The Government plans to continue exploration and expects to reverse the decline in indigenous crude oil resources that is projected to occur in the mid-1980's.

Australia's massive North West Shelf Natural Gas Development Project in Western Australia continued to move ahead with one platform scheduled for production in 1984 and another in 1987. A consortium comprising BHP, Shell Oil Co., Woodside Petroleum Co., British Petroleum Co., and California Asiatic Oil Co. would begin exporting to Japan in 1986. The North West Shelf project will produce gas and condensate from the North Rankin Field, pipe it to shore, and process it into pipeline-quality gas, liquefied natural gas (LNG), and condensate suitable for markets in Australia and abroad. In 1979, the Federal Government approved the export of 55% of the current estimated reserves from the project. Approximately 6.5 million tons of LNG could thus be exported annually over a 20-year period. A contract was signed between the consortium and the Western Australian State Energy Commission for the sale of up to 375 million cubic feet of gas per day over a 20-year period. This would be delivered to customers in the southwest of the State through a 1,300-kilometer pipeline from Dampier. Current estimates of the cost of the project now range about $8 billion.

The exploration forecast for 1982 is very optimistic with between 280 and 300 exploration wells planned. The budget for onshore drilling total $450 million with $420 million for offshore exploration. Fifteen drilling vessels and more than 40 land rigs would be used.

Uranium.—Production of U_3O_8 in 1981 was almost double that of 1980 owing to output from the new mine and concentrator at Ranger, Northern Territory, which began production in September. Mary Kathleen Uranium Ltd. (MKU), Australia's oldest uranium mine, was nearing the end of its economic life. Exploration at the mine and in the surrounding district was not successful. WMC's Yeelirrie deposit in Western Australia continued small-scale mining of ore for use in a research plant at Kalgoorlie. WMC's plant could begin production of U_3O_8 by 1986.

In 1981, MKU produced 824.7 tons of U_3O_8, slightly less than the 835 tons produced in 1980. Operations were affected by abnormally heavy rainfall and by an industrial stoppage in early 1981. The company announced that the mine would be closed in September 1982 when the contracted tonnage of uranium oxide has been mined. However, the treatment plant was expected to operate until December 1982 with some U_3O_8 to be stockpiled to meet contract deliveries that will extend until 1984.

Queensland Mines Ltd. (Nabarlek) produced 1,426 tons of U_3O_8 during 1981. The company has a contract with the Kyushu Electric Power Co. and the Shekoku Electric Power Co., both of Japan, for the supply of U_3O_8 during the next 10 years. The grade of ore is about 2% U_3O_8 and was mined by open pit methods. The mill has a capacity of 200 tons per day and the operation has a life of approximately 10 years.

Energy Resources of Australia Ltd., Ranger, began production of U_3O_8 during the year and output totaled 1,122.2 tons at yearend. Energy Resources of Australia has a contract with the Swedish electric power utility, Oskarshamnsverkets Kraftgrupp Aktiebolag, for the sale of 3.150 tons of U_3O_8 over the period 1982-96.

Precontinental Mining Ltd., Jabiluka, reached an agreement with the Northern Land Council concerning Aboriginal rights

in early 1981. The company can now commit itself to the development of the mine and the sale of U_3O_8. Denison Mines Ltd., Koongarra, was going through environmental procedures, and the company was negotiating with the Aboriginal landowners on terms and conditions of mining.

Measured reserves in four large deposits in the Northern Territory total 252,000 tons U_3O_8 comprising Jabiluka, 127,000 tons; Ranger, 100,000 tons; Koongarra, 15,000 tons; and Nabarlek, 10,000 tons.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Australian dollars ($A) to U.S. dollars at the rate of $A1.00=US$1.14.

The Mineral Industry of Austria

By George A. Rabchevsky[1]

Austria's gross domestic product (GDP) declined slightly in 1981 after expanding by 3.6% in 1980. A decline in private consumption and gross asset formation, coupled with weaker export performance, caused the drop.

Of the 8 major industrial enterprises making up the state Österreichische Industrieverwaltungs AG (Austrian Industries Management Co.), with a total of 112,800 employees, only 2 showed a profit in 1981. Most of the nationalized enterprises recorded a deficit for the first time in 1980 and showed an even higher deficit in 1981. The profits derived from Chemie-Linz and the state-owned oil company, Österreichische Mineralölverwaltungs AG (OMV), did not equal the losses sustained by the other state industries. In addition to Chemie-Linz, capital investment was urgently needed by the steel mills, the Bleiberg lead and zinc mining company, and the continually crisis-plagued nonferrous metal group of Vereinigte Metallwerke Ranshofen-Berndorf. The poorest results in 1981 were registered by the Vöest-Alpine AG (VA) steel enterprise, United Austrian Iron and Steel Works Co., employing some 60,000 workers.

The state-owned enterprises, which have previously contributed to Austrian employment stability through job protection, were finally drained financially in 1981 and coincidentally suffered technological setbacks. Major reorganizations of all industrial enterprises may thus be needed in the future to slow down and if possible halt the seemingly irreversible bankruptcies. Such a reorganization was proposed in 1970 by the Austrian Industries Management Co. and again in 1981 by its present director general, Oscar Gruenwald. Doubt was expressed, however, that the State and Provincial governments would implement the unpopular measures required.[2]

Because of the lackluster performance of Austrian industry, the Austrian economy would have approached a state of collapse without the tourist industry.

PRODUCTION

Austria is traditionally known for its production of iron ore, magnesite, salt, and graphite, but in Europe, in 1981, it was also a significant producer of talc, olivine, gypsum, calcium carbonate, silica sand, kaolin, dolomite, and micaceous iron oxide pigments. Basic refractories were among the principal industrial mineral exports in 1981.

Table 1 gives production of minerals and metals in Austria for 1977-81.

Table 1.—Austria: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS					
Aluminum metal:					
Primary	91,815	91,284	92,693	94,393	94,219
Secondary	39,773	38,382	41,984	31,926	46,343
Antimony, mine output, metal content of concentrate	512	509	571	662	604
Cadmium metal	26	33	34	36	55
Copper:					
Smelter, secondary	21,500	19,800	21,800	26,100	27,100
Refined:					
Primary[e]	9,707	11,485	8,812	8,788	8,395
Secondary[e]	22,000	20,000	24,000	[r]22,498	20,000
Total	31,707	31,485	32,812	[r]31,286	28,395
Germanium, metal content of concentrates kilograms	4,000	4,270	4,500	4,500	4,000
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	3,449	2,788	3,200	3,200	3,050
Metal content do	1,069	866	999	986	[e]970
Metal:					
Pig iron do	2,965	3,077	3,702	3,485	3,477
Ferroalloys, electric furnace do	7	7	9	[e]8	[e]8
Crude steel do	4,093	4,335	4,917	4,624	4,656
Semimanufactures do	3,348	3,724	3,992	3,818	3,673
Lead:					
Mine output, metal content of concentrate	4,292	4,633	4,499	4,316	4,320
Metal:					
Smelter:					
Primary	6,315	5,772	5,981	5,418	3,343
Secondary	10,536	9,315	10,825	11,547	13,016
Total	16,851	15,087	16,806	16,965	16,359
Refined:					
Primary	8,400	7,100	[r]5,200	5,500	5,400
Secondary	10,700	10,500	[r]17,700	12,400	11,000
Total	19,100	17,600	[r]22,900	17,900	16,400
Manganese, Mn content of domestic iron ore	64,734	51,351	58,969	47,216	55,876
Tungsten, mine output, metal content of concentrate	1,116	1,179	1,496	1,495	1,434
Zinc:					
Mine output, metal content of concentrate	19,702	22,479	20,539	19,117	18,181
Metal, refined	16,744	21,655	23,238	22,102	22,674
NONMETALS					
Barite	192	242	305	249	--
Cement, hydraulic thousand tons	[r]5,629	[r]5,880	[r]5,611	5,455	5,288
Clays:					
Illite	464,888	395,103	379,042	504,812	331,448
Kaolin:					
Crude	272,250	275,695	330,094	340,980	315,560
Marketable	74,147	77,000	78,553	83,882	[e]80,000
Other	[2]68,060	[r]32,538	46,073	61,635	52,173
Diatomite	242	536	--	--	--
Feldspar, crude	3,645	2,886	6,594	10,946	10,357
Graphite, crude	35,288	40,501	40,519	36,699	23,807
Gypsum and anhydrite, crude	809,101	765,965	798,108	833,417	833,417
Lime thousand tons	969	1,016	1,022	1,100	[e]1,100
Magnesite:					
Crude do	1,003	982	1,104	1,318	1,159
Sintered or dead-burned do	372	421	423	427	361
Caustic calcined do	123	127	121	132	106
Nitrogen: N content of ammonia do	465	470	520	490	500
Pigments, mineral: Micaceous iron oxide	9,805	10,560	12,298	10,959	11,320
Pumice (trass)	8,847	8,944	8,162	8,162	8,308
Salt:					
Rock thousand tons	1	1	1	1	1
In brine:					
Evaporated do	323	321	380	410	462
Other do	[r]178	[r]188	247	261	264
Total do	[r]502	[r]510	628	672	727

See footnotes at end of table.

Table 1.—Austria: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Sand and gravel:					
Quartz sand thousand tons	872	821	885	878	869
Industrial sand do	NA	NA	NA	NA	NA
Other sand and gravel do	8,329	[r]10,791	9,900	9,229	9,413
Total do	9,201	[r]11,612	10,785	10,107	10,282
Sodium compounds, n.e.s.:[e]					
Sodium carbonate, synthetic do	168	170	170	170	170
Sodium sulfate, synthetic do	55	55	55	55	55
Stone:[3]					
Dimension do	NA	NA	NA	NA	NA
Quartz and quartzite do	155	203	218	219	184
Other, quarry and broken do	NA	NA	NA	NA	NA
Total do	NA	11,772	13,042	13,105	12,897
Sulfur:					
Byproduct:					
Of metallurgy	7,774	8,836	9,644	8,731	9,133
Of petroleum and natural gas	24,624	22,586	23,989	18,733	27,861
From gypsum and anhydrite	26,776	26,775	27,102	23,836	25,143
Total	59,174	58,197	60,735	51,300	62,137
Talc and soapstone	103,743	106,848	[r]116,420	116,708	116,425
MINERAL FUELS AND RELATED MATERIALS					
Coal, brown, and lignite thousand tons	3,127	3,076	2,741	2,865	3,061
Coke do	1,458	1,484	1,686	1,689	1,606
Gas, natural:					
Gross million cubic feet	84,502	85,247	81,647	67,211	50,730
Marketed do	[r]72,580	[r]71,856	68,790	55,443	[e]50,000
Oil shale	420	970	1,160	950	[e]700
Petroleum:					
Crude thousand 42-gallon barrels	12,462	12,486	[r]12,039	10,290	9,324
Refinery products:					
Gasoline do	12,903	13,189	14,934	15,115	15,200
Jet fuel do	732	1,003	904	1,053	[e]1,100
Kerosine do	183	--	84	35	[e]35
Distillate fuel oil do	17,546	19,683	20,978	18,970	[e]19,000
Residual fuel oil do	23,684	28,560	29,544	28,974	[e]29,000
Lubricants do	1,198	1,171	1,211	1,070	[e]1,100
Liquefied petroleum gas do	1,414	1,416	[r]1,844	1,757	[e]1,800
Bitumen do	2,385	2,214	2,284	2,173	[e]2,200
Unspecified do	3,591	3,976	3,766	3,630	[e]3,600
Refinery fuel and losses do	2,524	3,539	735	656	[e]650
Total do	66,160	74,751	[r]76,284	73,433	[e]73,685

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through July 19, 1982.
[2]Excluding clay sand.
[3]Excluding stone used by the cement and iron and steel industries.

TRADE

Most of Austria's raw ore requirements were imported in 1981, including the mineral fuels, except lignite and some nonmetals. The processing of ores, the manufacturing of finished products, and mining engineering services continued to be major contributions to the balance of payments.

Tables 2 and 3 report the mineral trade of Austria for 1979 and 1980, the latest years for which official data were available.

Table 2.—Austria: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	27	92	--	All to West Germany.
Oxides and hydroxides including artificial corundum	47,421	55,719	1,736	Romania 12,262; Poland 11,472; Italy 6,723.
Metal including alloys:				
Scrap	38,864	32,736	--	Italy 20,434; West Germany 12,133.
Unwrought	10,306	9,797	--	West Germany 6,176; Bulgaria 1,326.
Semimanufactures	72,425	63,564	1,917	West Germany 14,304; Switzerland 4,540; France 3,462.
Antimony ore and concentrate	493	291	NA	NA.
Cadmium metal including alloys, all forms	25	31	--	Czechoslovakia 20.
Chromium:				
Chromite	1,028	291	--	West Germany 274.
Oxides	1	27	--	U.S.S.R. 17.
Columbium and tantalum: Tantalum metal including alloys, all forms	15	10	NA	NA.
Copper:				
Ore and concentrate	116	4	NA	NA.
Sulfate	864	67	--	Italy 66.
Metal including alloys:				
Scrap	3,242	3,713	--	West Germany 2,194; Switzerland 381.
Unwrought	20,142	19,340	--	Italy 9,256; West Germany 6,438.
Semimanufactures	15,470	15,041	11	Italy 3,581; West Germany 2,754; France 1,844.
Gold metal including alloys, unwrought and partly wrought troy ounces	24,274	22,763	--	West Germany 13,921.
Iron and steel:				
Ore and concentrate, except roasted pyrite	2	118	--	West Germany 102.
Metal:				
Scrap	13,904	12,721	--	Italy 7,847; Switzerland 3,047.
Pig iron, ferroalloys, similar materials	12,848	12,235	NA	NA.
Steel, primary forms	506,501	408,539	3,737	West Germany 222,979; Italy 78,265; Yugoslavia 50,331.
Semimanufactures:				
Bars, rods, angles, shapes, sections	366,715	378,006	3,959	West Germany 102,707; Italy 95,939; Switzerland 44,856.
Universals, plates, sheets thousand tons	1,172	1,148	4	U.S.S.R. 393; West Germany 310; Italy 111; Yugoslavia 60.
Hoop and strip	105,488	93,082	179	West Germany 23,182; Switzerland 15,832; Syria 8,628.
Rails and accessories	118,877	84,840	--	Switzerland 27,937; Yugoslavia 19,120; Uruguay 12,357.
Wire	65,993	61,115	42	West Germany 20,908; Italy 11,034; Switzerland 6,341.
Tubes, pipes, fittings	194,084	205,051	134	West Germany 44,805; Sweden 23,353; United Kingdom 22,892.
Castings and forgings, rough	12,744	14,945	781	West Germany 4,357; Switzerland 2,523; Italy 1,722.
Lead metal including alloys, all forms	492	394	--	West Germany 379.
Magnesium metal including alloys, all forms	694	805	--	West Germany 384; Italy 299.
Manganese oxides	58	14	NA	NA.
Mercury 76-pound flasks	438	151	--	West Germany 70; Netherlands 38.
Molybdenum metal including alloys, all forms	1,101	1,017	NA	NA.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	5,755	10,288	--	West Germany 5,626; Romania 1,993.
Silver metal including alloys:				
Bullion thousand troy ounces	1,523	877	--	West Germany 524; Switzerland 311.
Other (powder) do.	3	28	--	West Germany 21; Switzerland 6.
Partly wrought do.	r1,112	531	--	Yugoslavia 438.
Tin metal including alloys, all forms	96	30	--	West Germany 23.
Titanium oxides	37	29	--	Iran 22.
Tungsten:				
Ore and concentrate	25	--	--	
Metal including alloys, all forms	848	1,111	NA	NA.
Zinc:				
Oxides	636	616	--	Hungary 592.
Metal including alloys, all forms	1,339	2,429	--	Yugoslavia 1,171; Czechoslovakia 850.

See footnotes at end of table.

Table 2.—Austria: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates	54	134	--	West Germany 66; Italy 40.
Ash and residue containing nonferrous metals	68,290	73,724	--	Italy 54,806; West Germany 14,145.
Waste and sweepings of precious metals including old metals kilograms	40,698	44,543	--	West Germany 44,199.
Oxides, hydroxides, peroxides	1,044	733	--	Italy 525; West Germany 142.
Base metals including alloys, all forms	2,975	609	--	Italy 230; West Germany 191; United Kingdom 105.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	11	11	NA	NA.
Grinding and polishing wheels and stones	12,792	14,032	29	West Germany 2,141; Italy 1,611; France 1,140.
Dust and powder of semiprecious stones including diamonds value	$1,271	$8,656	NA	NA.
Asbestos, crude	2	4	NA	NA.
Cement	20,631	32,632	--	West Germany 23,982; Yugoslavia 6,491.
Chalk	3,406	2,495	--	Hungary 1,831; Italy 249.
Clays and clay products:				
Crude:				
Kaolin (china clay)	25,269	29,075	--	Hungary 13,201; Italy 12,561.
Other	155	1,365	--	Hungary 1,144.
Products:				
Refractory including nonclay brick	172,887	188,414	--	Romania 7,676; Czechoslovakia 2,205.
Nonrefractory	85,589	79,908	--	West Germany 74,384.
Diamond:				
Industrial value	$38,674	$11,284	NA	NA.
Gem:				
Crude do	$35,907	$59,823	--	All to Switzerland.
Worked carats	5,00	25,000	--	West Germany 15,000.
Diatomite and other infusorial earth	1,031	1,135	--	Yugoslavia 970; Czechoslovakia 83.
Fertilizer materials: Manufactured, phosphatic	15,077	10,058	--	Hungary 10,056.
Graphite, natural	17,870	16,576	--	Poland 9,050; West Germany 4,610; East Germany 741.
Gypsum and plasters	250,801	136,888	--	West Germany 108,848.
Lime	1,424	1,404	--	West Germany 1,104.
Magnesite	112,021	137,836	--	West Germany 40,348; Poland 32,546; Hungary 13,340.
Mica, all forms	312	365	--	Greece 155; Czechoslovakia 33.
Pigments, mineral including processed iron oxides	7,788	6,301	71	West Germany 2,338; Netherlands 940; United Kingdom 91.
Precious and semiprecious stones:				
Crude, other than diamond thousand carats	5,355	3,200	NA	West Germany 1,030; Italy 1,020.
Manufactured including diamond do	9,600	7,465	1,870	West Germany 725; Switzerland 695.
Pyrite	93	19	NA	NA.
Salt	90	153	--	Italy 140.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	30	3	NA	NA.
Soda ash	2,665	471	--	Yugoslavia 297; Hungary 146.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Calcareous including marble and limestone	75,222	105,549	--	West Germany 100,598; Switzerland 4,842.
Slate	27	46	NA	NA.
Other	44,951	47,771	--	West Germany 47,273.
Worked:				
Paving stone and flagstone	25,429	20,864	--	West Germany 12,203; Switzerland 8,498.
Slate	46	59	NA	NA.
Other	2,334	2,379	157	West Germany 1,895.
Dolomite, chiefly refractory-grade	10,597	6,865	--	West Germany 4,652.
Gravel and crushed rock	486,511	441,312	--	West Germany 218,256; Switzerland 214,614.

See footnotes at end of table.

Table 2.—Austria: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Limestone, except dimension	48	469	--	West Germany 442.
Quartz and quartzite	93	57	NA	NA.
Sand excluding metal-bearing	160,860	149,885	--	West Germany 88,009; Switzerland 57,094.
Sulfuric acid, oleum	12,074	5,486	--	Yugoslavia 3,005; Italy 2,227.
Talc, steatite, soapstone, pyrophyllite	98,139	97,760	--	West Germany 52,481; Italy 14,059.
Other:				
Crude	4,905	4,914	54	West Germany 3,692; Italy 412.
Slag, dross, and similar waste, not metal-bearing	42,395	174,295	--	Yugoslavia 92,348; West Germany 75,557.
Oxides, hydroxides, peroxides of strontium, barium, magnesium kilograms	100	300	NA	NA.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	72	134	--	West Germany 100.
Carbon black and gas carbon	13	203	--	West Germany 199.
Coal:				
Anthracite and bituminous coal including briquets	97	98	NA	NA.
Lignite and lignite briquets	11,581	24,071	--	West Germany 23,984.
Coke and semicoke	12,090	1,655	--	West Germany 905; Italy 464.
Hydrogen, helium, rare gases thousand cubic feet	68,216	138,596	--	Hungary 81,354; Czechoslovakia 19,896; Yugoslavia 12,912.
Peat including briquets and litter	290	836	--	West Germany 493; Italy 342.
Petroleum refinery products:				
Gasoline, aviation and motor thousand 42-gallon barrels	126	51	--	Switzerland 33; Yugoslavia 18.
Kerosine and jet fuel do	(1)	1	--	NA.
Distillate fuel oil do	3	2	--	Czechoslovakia 1.
Residual fuel oil do	5	1	--	NA.
Lubricants do	551	445	--	Czechoslovakia 190; Yugoslavia 86; Poland 82.
Mineral jelly and wax do	188	175	--	Netherlands 117; West Germany 37.
Liquefied petroleum gas do	484	673	--	Italy 502; Czechoslovakia 41.
Other do	64	100	--	Yugoslavia 50; Poland 21.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r17,282	18,108	--	West Germany 11,903.

rRevised. NA Not available.
1Less than 1/2 unit.

Table 3.—Austria: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	40,231	41,706	NA	NA.
Oxides and hydroxides	203,507	237,761	NA	West Germany 9,258; France 1,532.
Metal including alloys:				
Scrap	44,137	52,632	NA	NA.
Unwrought	30,663	35,182	353	West Germany 17,590; Norway 5,216; Hungary 3,590.
Semimanufactures	36,294	38,947	118	West Germany 20,879; Switzerland 5,864.
Antimony:				
Ore and concentrate	351	467	25	Canada 345.
Sulfide	20	--		
Metal including alloys, all forms	56	63	--	Belgium 48.
Arsenic trioxide, pentoxide, acids	7	15	--	NA.
Beryllium metal including alloys, all forms kilograms	3	NA	NA	NA.
Cadmium metal including alloys, all forms	3	5	--	France 2.

See footnotes at end of table.

Table 3.—Austria: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Chromium:				
Chromite	57,077	77,407	--	Republic of South Africa 39,928; Turkey 12,709.
Oxides and hydroxides	424	697	--	West Germany 293; U.S.S.R. 166.
Cobalt oxides and hydroxides	2	4	--	Belgium 3.
Columbium and tantalum: Tantalum metal including alloys, all forms	42	37	12	West Germany 11; Japan 6; Italy 6.
Copper:				
Ore and concentrate	147	(1)	NA	NA.
Sulfate	431	562	--	Italy 357; West Germany 88.
Metal including alloys:				
Scrap	23,280	20,112	62	West Germany 8,853; Hungary 3,459; U.S.S.R. 1,593.
Unwrought	12,890	15,648	24	Chile 3,046; Republic of South Africa 2,738; Namibia 2,689.
Semimanufactures	52,541	61,579	60	West Germany 30,837; Italy 7,308; France 6,431.
Gold metal including alloys, unwrought and partly wrought troy ounces	137,219	27,296	--	West Germany 15,239; Switzerland 7,266.
Iron and steel:				
Ore and concentrate, except roasted pyrite thousand tons	3,963	3,336	25	Brazil 1,259; Canada 949; U.S.S.R. 616.
Roasted pyrite	44,854	48,448	--	West Germany 23,738; Yugoslavia 17,934.
Metal:				
Scrap	134,169	143,216	153	West Germany 82,152; U.S.S.R. 27,104; Bulgaria 18,861.
Pig iron, cast iron, spiegeleisen, powder, shot	94,475	103,294	8	U.S.S.R. 37,317; West Germany 13,421; Romania 6,511.
Ferroalloys:				
Ferromanganese	26,275	23,070	52	Norway 14,055; West Germany 6,570.
Other	61,788	51,403	136	Yugoslavia 11,378; West Germany 5,473.
Steel, primary forms	150,961	185,941	63	West Germany 46,183; Bulgaria 32,270; Poland 30,597.
Semimanufactures:				
Bars, rods, angles, shapes, sections, etc	208,435	241,153	27	West Germany 112,340; Italy 61,381; Belgium-Luxembourg 21,559.
Universals, plates, sheets	182,479	227,436	211	West Germany 124,338; Belgium-Luxembourg 26,312; France 20,248.
Hoop and strip	62,527	75,722	27	West Germany 53,947; Belgium-Luxembourg 8,220; France 3,611.
Rails and accessories	2,520	4,908	--	West Germany 2,198; Italy 1,178; Belgium-Luxembourg 485.
Wire	27,626	27,217	1,169	West Germany 11,168; France 4,053; Belgium-Luxembourg 4,005.
Tubes, pipes, fittings	152,045	159,224	61	West Germany 88,861; Italy 23,373; Switzerland 7,373.
Castings and forgings, rough	10,031	12,598	9	West Germany 9,344; Switzerland 880; Italy 420.
Lead:				
Ore and concentrate	6,193	4,156	--	Italy 4,155.
Oxides	297	282	18	West Germany 251.
Metal including alloys:				
Scrap	1,920	2,628	--	Switzerland 1,508; Hungary 1,027.
Unwrought	29,538	32,396	51	West Germany 16,986; United Kingdom 3,802; Denmark 3,657.
Semimanufactures	565	941	--	West Germany 836.
Magnesium metal including alloys, all forms	2,249	2,228	624	Norway 808; Italy 285.
Manganese:				
Ore and concentrate	433	1,726	--	Hungary 1,329.
Oxides	129	111	--	West Germany 66; Belgium 45.
Mercury 76-pound flasks	690	566	--	China 252; U.S.S.R. 122; Japan 122.
Molybdenum:				
Oxides	1,639	1,527	NA	NA.
Metal including alloys, all forms	366	366	172	Canada 110.
Nickel:				
Matte, speiss, and similar materials	1,533	1,279	415	Netherlands 408; Cuba 269.
Metal including alloys:				
Scrap	1,504	1,597	272	U.S.S.R. 606; West Germany 347.
Unwrought	2,849	2,378	393	Canada 354; Republic of South Africa 302; Philippines 219.
Semimanufactures	555	548	191	West Germany 206.

See footnotes at end of table.

Table 3.—Austria: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	38,774	26,460	193	West Germany 19,837.
Silver metal including alloys:				
Bullion thousand troy ounces	3,757	2,702	156	West Germany 612; Switzerland 556; Spain 530.
Other (powder) do	4	3	--	Mainly from West Germany.
Partly wrought do	2,566	1,642	2	West Germany 1,489.
Tin:				
Oxides and hydroxides	10	13	--	West Germany 11.
Metal including alloys, all forms	650	752	--	West Germany 316; Thailand 216.
Titanium oxides	8,964	8,728	--	West Germany 5,024; United Kingdom 876; France 823.
Tungsten:				
Ore and concentrate	4,853	4,297	NA	NA.
Oxides and hydroxides	167	159	NA	NA.
Metal including alloys, all forms	728	418	114	West Germany 135; United Kingdom 64; Belgium 47.
Uranium and thorium oxides	607	876	--	India 550; France 219.
Zinc:				
Ore and concentrate	5,621	8,594	--	West Germany 4,071; Czechoslovakia 1,821.
Oxides	841	1,103	--	West Germany 925; France 119.
Metal including alloys:				
Scrap	579	339	--	Hungary 317.
Blue powder	1,266	1,016	--	France 337; Belgium 312; United Kingdom 119.
Unwrought	4,469	4,074	--	West Germany 2,499; Yugoslavia 934; Zambia 578.
Semimanufactures	1,763	1,688	--	West Germany 1,269.
Other:				
Ore and concentrate	10,757	10,411	2,060	Netherlands 3,139; United Kingdom 1,074; Australia 1,056.
Ash and residue containing nonferrous metal	128,618	136,378	1,305	U.S.S.R. 66,351; Hungary 18,543; East Germany 16,994.
Waste and sweepings of precious metals including old metals kilograms	16,132	1,412	--	Yugoslavia 830; United Kingdom 350.
Oxides, hydroxides, peroxides	3,707	3,366	80	Republic of South Africa 2,745.
Rare-earth metals: Yttrium and scandium	6	2	NA	NA.
Base metals including alloys, all forms	3,879	1,929	--	Republic of South Africa 453; U.S.S.R. 394; West Germany 244.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	185	224	--	Italy 142.
Artificial: Corundum	6,500	8,595	1,577	West Germany 3,544; France 1,968; Poland 868.
Dust and powder of precious and semiprecious stones including diamonds kilograms	223	301	262	Switzerland 31.
Grinding and polishing wheels and stones	1,058	1,367	16	West Germany 646.
Asbestos, crude	23,912	20,241	13	Canada 8,376; Italy 4,098; Republic of South Africa 3,620.
Barite and witherite	3,228	5,752	--	West Germany 3,631; Ireland 1,200.
Boron materials:				
Crude natural borates	16,044	18,094	6,930	Turkey 11,066.
Oxide and acid	1,025	1,144	--	France 896; United Kingdom 129.
Cement	37,235	39,266	363	West Germany 12,506; Italy 11,322.
Chalk	6,590	11,062	--	Italy 6,001; France 4,001.
Clays and clay products:				
Crude:				
Bentonite	594	883	182	West Germany 466; Yugoslavia 74.
Kaolin	111,887	101,643	10,529	Czechoslovakia 46,565; United Kingdom 32,480.
Other	95,798	104,494	151	West Germany 56,596; Czechoslovakia 34,388.
Products:				
Refractory including nonclay brick	19,971	27,501	9	West Germany 19,250.
Nonrefractory	263,022	277,865	--	Italy 165,252; West Germany 83,818.
Cryolite and chiolite, natural	261	204	--	Denmark 201.

See footnotes at end of table.

Table 3.—Austria: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Diamond:				
Industrial ——— value	$161,430	$357,242	--	Belgium $136,265; West Germany $106,276.
Gem:				
Crude ——— do	$273,115	$209,692	--	Belgium $142,835; United Kingdom $33,467.
Worked ——— carats	80,000	125,000	NA	Belgium 70,000; West Germany 20,000; Switzerland 20,000.
Diatomite and other infusorial earth	7,856	8,691	2,262	Hungary 3,663; Denmark 1,043.
Feldspar	4,564	6,111	--	Sweden 3,274; West Germany 2,215.
Fertilizer materials:				
Crude:				
Phosphatic	410,100	409,810	NA	NA.
Potassic	16,302	12,216	--	West Germany 11,876.
Other including mixed	4,588	5,282	--	Italy 2,459; West Germany 1,927.
Manufactured:				
Nitrogenous	53,479	36,594	--	France 16,717; West Germany 13,356.
Phosphatic	100,205	91,967	102	France 44,009; Luxembourg 29,490; West Germany 14,256.
Potassic	294,098	296,203	NA	NA.
Other including mixed	106,488	143,318	439	West Germany 129,128.
Ammonia	9,638	17,486	--	Czechoslovakia 12,987.
Fluorspar	18,369	17,298	--	East Germany 10,037; West Germany 5,927.
Graphite, natural	1,710	2,301	--	North Korea 1,758; West Germany 354.
Gypsum and plasters	4,558	4,715	--	West Germany 3,626.
Lime	2,040	3,470	--	West Germany 3,059.
Magnesite	113,186	125,518	5,276	Turkey 31,863; Italy 25,854; Greece 23,139.
Mica:				
Crude including splittings and waste	250	318	--	West Germany 218; United Kingdom 25.
Worked including agglomerated splittings	106	127	14	Belgium 42; Switzerland 26.
Pigments, minerals: Iron oxides, processed	3,086	3,164	--	West Germany 3,026.
Precious and semiprecious stones:				
Crude, other than diamond thousand carats	55,970	29,640	215	West Germany 13,620; Republic of South Africa 3,560; Italy 3,335.
Synthetic including diamond do	70,605	51,280	1,115	Switzerland 35,000; France 11,280.
Pyrite (gross weight)	3,264	3,834	--	U.S.S.R. 3,018.
Salt and brine	49,453	1,277	--	West Germany 1,203.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	85,151	85,660	--	West Germany 61,430; Switzerland 10,797.
Caustic potash	1,338	1,591	--	West Germany 482; France 388; Romania 342.
Soda ash	1,784	1,387	--	East Germany 1,238.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Calcareous including marble and limestone	6,024	8,732	--	Italy 6,131; West Germany 1,263.
Slate	1,082	697	--	France 362; West Germany 244.
Other	35,827	36,364	--	Italy 22,958; Republic of South Africa 6,668.
Worked:				
Paving stone and flagstone	13,406	14,178	--	Italy 5,472; Yugoslavia 3,327; Romania 2,461.
Slate	426	379	--	West Germany 78; Norway 63; Republic of South Africa 59.
Other	34,725	35,525	--	Italy 28,086; West Germany 5,916.
Dolomite, chiefly refractory-grade	5,633	4,674	--	Italy 3,540.
Limestone, except dimension	2,934	266	--	All from West Germany.
Quartz and quartzite	20,556	24,502	--	West Germany 13,900; Hungary 9,325.
Volcanic material (trass)	985	1,162	--	All from West Germany.
Gravel and crushed rock	391,279	303,451	--	West Germany 278,980; Italy 23,336.
Sand excluding metal-bearing	586,965	522,065	--	West Germany 279,633; Czechoslovakia 187,220.

See footnotes at end of table.

Table 3.—Austria: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental, all forms	112,082	124,810	--	Poland 81,004; West Germany 42,232.
Sulfuric acid, oleum	5,023	14,569	--	Hungary 5,234; East Germany 5,163; West Germany 3,630.
Talc, steatite, soapstone, pyrophyllite	2,746	2,118	--	Belgium 750; Norway 716; Italy 269.
Other:				
Crude	64,229	61,024	1,797	West Germany 23,412; Hungary 23,231.
Slag, dross, and similar waste, not metal-bearing	33,818	36,659	537	Italy 21,403; West Germany 12,524.
Oxides, hydroxides, peroxides of magnesium, strontium, barium	645	859	--	West Germany 798.
Halogens	6,369	5,158	--	Italy 4,644.
Unspecified	10,425	10,488	--	West Germany 6,135; Czechoslovakia 1,672.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,796	2,876	30	Trinidad and Tobago 2,686.
Carbon black and gas carbon	26,750	27,915	1,072	West Germany 14,197; Italy 10,599.
Coal and briquets:				
Anthracite	43,424	52,840	--	U.S.S.R. 44,882; West Germany 7,958.
Bituminous coal -- thousand tons	2,750	2,805	190	Poland 1,003; Czechoslovakia 787; U.S.S.R. 726.
Briquets of anthracite and bituminous coal	29,729	20,208	--	West Germany 19,330.
Lignite and lignite briquets	498,084	588,850	--	Yugoslavia 244; East Germany 197,922; West Germany 117,827.
Coke and semicoke -- thousand tons	1,174	986	--	Czechoslovakia 420; Poland 249; West Germany 193.
Gas, natural -- million cubic feet	102,507	106,972	--	U.S.S.R. 105,831; West Germany 1,141.
Hydrogen, helium, rare gases thousand cubic feet	128,244	125,187	682	West Germany 105,181.
Peat including peat briquets and litter	54,078	64,339	--	U.S.S.R. 29,183; West Germany 26,919.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	65,601	61,771	--	Iraq 17,455; Saudi Arabia 15,424; U.S.S.R. 10,402.
Refinery products:				
Gasoline, aviation and motor do	6,117	7,309	--	Italy 3,206; West Germany 2,528.
Kerosine and jet fuel do	130	111	--	Netherlands 50; Italy 29.
Distillate fuel oil do	1,694	2,942	(1)	West Germany 1,547; Italy 824.
Residual fuel oil do	5,741	6,903	--	West Germany 1,996; Hungary 1,697; Czechoslovakia 1,126.
Lubricants do	906	882	6	Yugoslavia 165; West Germany 121; Netherlands 112.
Mineral jelly and wax do	116	128	1	West Germany 78; Hungary 24.
Liquefied petroleum gas do	725	707	--	West Germany 403; Hungary 141; U.S.S.R. 72.
Other do	729	2,149	3	U.S.S.R. 598; Hungary 463; West Germany 303.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	19,202	15,518	69	West Germany 7,792; Netherlands 2,898.

NA Not available.
[1]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Austria is not endowed with rich metalliferous deposits, and in 1981, no significant new finds were made. The mining of metals of domestic significance continued at Mittersill near Salzburg for tungsten ore (scheelite), at Bleiberg for lead-zinc ore, and for magnesite at various small mines. Some exploration was considered for scheelite minerals. Underground mining at Bleiberg ceased during the year and only low-grade ore and dump material was reprocessed.

The Treibacher Chemische Werke (TCW), located in Treibach, a small village a few kilometers from the Yugoslav and Italian borders in the foothills of the Austrian

Alps, completed a major expansion in 1981 at a cost of about $62.5 million[3] over 5 years. The company's main products were ferroalloys of molybdenum, tungsten, and vanadium; titanium, normally one of the main products, was not produced in 1981 owing to poor market conditions. Slags for a vanadium pentoxide plant were imported from Highveld in the Republic of South Africa, molybdenum oxide came from north Africa and the Republic of South Africa, and a large part of TCW's tungsten ores came from China and Australia. TCW also had a small stake in Australia's Queensland Wolfram Mine. However, not all of TCW's products were low-volume, high-value items. One of its most successful postwar developments was the fused alumina-abrasives plant at nearby Selbach. In 1981, abrasive-grade bauxite, used in production of brown fused alumina, was imported from Australia and Guinea, while Bayer alumina was used for making white fused alumina. Production was about 50,000 tons in 1981; nominal capacity was 60,000 tons. Various grades were produced including grinding wheel material, coated abrasives, and refractory and sandblasting products.

Iron and Steel.—In 1981, steel production was stagnant. The major problems that faced the nationalized industry were the unfavorable world steel market, the large volume of low-priced imports, the outdated operations, identical production lines in too many locations, and overstaffing. The only profit made in 1981 by the entire industry came from sales of a number of flat products and from finished goods such as complete industrial facilities, equipment for the generation of hydroelectric power, and from mining and oilfield equipment. The losses, however, by far outweighed profits in 1981.

To compensate for the financial losses suffered in 1981 by the two nationalized steel companies, VA and Vereinigte Edelstahlwerke AG (VEW), and to enable them to close their accounts without drawing on basic capital (reportedly reserves were no longer adequate to cover the losses), the Austrian Government reportedly assisted the ailing companies by subsidizing them in the amount of about $169 million. A sum of about $75 million was earmarked for the specialty steel producer VEW, and $94 million was made available to VA. Together with the earlier grants allocated to assist VEW, the Government's assistance to the depressed steel industry may have increased to $281 million by 1981.

The world steel recession adversely affected VA, by far the largest steel and engineering enterprise in Austria. Formed by the merger of two companies in 1973, VA was followed 2 years later by the merger of all speciality steel plants under the newly created VEW; this, combined with the shift from crude and rolled steel output to engineering and finished goods, helped in a small way to improve the steel industry's position. Investments at $1.3 billion since 1973 and the closure of obsolete blast furnaces also contributed to international competitiveness. Nevertheless, VA posted considerable losses in 1981, despite a 10% rise in 1980 turnover.

The international steel crisis, the increased reliance on compensation and countertrading, and especially the lack of expected orders from East Europe and China all contributed to the deterioration of profits. The fact that there were six different special steel plants in operation and the fact that, for example, the obsolete plant at Judenburg in Styria had not been closed down, were also major negative factors. VA, especially its special steel sector, has also been burdened by a legacy of weakness in the mining and industrial base that was hopelessly uncompetitive because of geography. This especially applied to upper Styria, an industrial region with a population of 400,000 where steel, special steel, magnesite, paper, and pulp dominated the industry. In Styria about 30% of the industrial labor force was employed by the nationalized industries. The proportion dropped to 13% in Lower Austria and to 7.3% and 5.5% in Carinthia and Upper Austria, respectively. Unemployment in Carinthia reached 11.6% during the winter of 1981.[4]

The poor performance of VA was not surprising. Herbert Koller, former VA executive, had warned since the early 1970's that steel production in Austria was no longer competitive. Franz Geist, director of the Austrian Industries Management Co. at that time, had also pressed for reorganization, just as did the U.S. consulting firm of Booz, Allen & Hamilton Inc., which recommended plant shutdowns in their report.[5]

Tungsten.—Tungsten ore in Austria was mined by Wolfram Bergbau und Hutten GmbH in 1981 as scheelite from a mine at Mittersill, near Salzburg. Since the mine opened in 1976, it had become one of the world's largest opencast tungsten mines. Reserves in this East Field were low, howev-

er, and the ore may be mined out by the mid-1980's. Exploration in the West Field and more efficient underground mining was planned with a view to tripling the ore output to an average of 450,000 tons annually. Because of the complex geology, the mining was extremely difficult and slow, affecting all aspects of extraction, from excavation and haulage to storage, as well as environmental considerations.[6]

Wolfram GmbH was jointly owned and operated by VA of Austria and Metallgesellschaft of the Federal Republic of Germany. The ore was processed by TCW in a plant located near the Italian border. TCW did not operate any domestic mines; all of its tungsten ore was from imports and the Mittersill Mine, in which it had no financial interest.

NONMETALS

Graphite.—The production of graphite in Austria continued to decline in 1981. The two companies, Graphitbergbau Kaisersberg Franz Mayr-Melnhof & Co. and Pryssok & Co. KG, operated four mines and produced mostly amorphous graphite for use in the foundry industry. Most of the production was exported, mainly to the Federal Republic of Germany, Italy, and Eastern Europe. At one time Austria had been one of the largest producers of graphite in the world.[7]

Iron Oxide Pigment.—Austria mined a unique commercial deposit of micaceous iron oxide at Waldenstein in Carinthia. Previously, iron oxide had been mined there principally as a source of iron. Although production was small, about 10,000 tons annually, paints containing that material were used throughout the world. Reportedly, other European mines were in operation but the Austrian material was renowned for its consistently high quality and its platy nature. Virtually all the production was used in the manufacture of corrosion-resistant paints, and as much as 99% of the total output was exported. Extensive drilling was completed around the mine area in 1981 to delineate further reserves, even though the existence of extensive resources in the region was already known. Granular and crystalline iron oxide was also present at the mine, but it was not extracted.

Magnesite.—Internationally, Austria is probably best known as the home of the magnesite industry. In 1981, magnesite continued to be Austria's most important nonmetallic mineral and its major mineral export commodity. Magnesite deposits occur in the Paleozoic limestones of the Northern Greywacke Zone and in limestones of undetermined age in the synclines of the upper Austro-Alpine Basement and of the Tauern Window. Two companies dominated the production and marketing of the product in 1981, Veitscher Magnesitwerke AG (a subsidiary of Magnesia AG of Switzerland) and Österreichische-Amerikanische Magnesit AG (OEAMAG), a subsidiary of the U.S. company General Refractories Inc. The two other smaller companies were Magindag AG, partly owned by Veitscher, and Tiroler Magnesit AG, the latter owned by OEAMAG. There were five operating mines, from which total production was about 1,300,000 tons in 1981. From this crude magnesite, dead-burned magnesite and caustic-calcined magnesite were produced for use as bricks in lining steel furnaces, as monolithic refractory products, as oxychloride cements in abrasives, as slag conditioners, and in other lesser applications.[8]

MINERAL FUELS

Austria continued to be a net exporter of electrical power in 1981. Despite its electricity surplus, however, and the existence of a small but rapidly declining reserve of oil and natural gas, Austria in 1981 continued to be heavily dependent on imports of energy. In 1980, 80% of its coal was imported, as against 73% in 1976; 89% of oil (against 80%); and 59% of gas (against 41%). Overall, net imports accounted for 63% of energy supply in 1973-74, and for 68% for 1979-80. There were also problems of the security of supply. A contract with Iran, for example, for the supply of 63.5 billion cubic feet of natural gas annually starting in 1984, was uncertain owing to political developments in that country. Algerian supplies were too expensive, and additional imports from the Soviet Union were still under negotiation.

Soviet bloc countries in recent years usually took first place as suppliers of all major fuels (oil, gas, and coal)—a fact that reflected both Austria's geographical position on the eastern fringe of West Europe and its political position as a country pledged to maintain neutrality. All together, Soviet bloc imports in recent years accounted for about 45% of Austria's energy imports, with 37% coming from the Organization of Petroleum Exporting Countries and 18% from other sources, including West

European oil companies. Furthermore, experts suggested that deliveries of fuels to Austria by the Soviet bloc countries could be as high as 50% in the near future. The main objectives of Austrian energy policy, therefore, were to reduce oil imports, to switch to alternate fuels, and to conserve. The major fuels intended to replace oil were coal for power generation and district heating, and natural gas for space heating and other domestic uses. Between 1973 and 1980, coal use increased by 30% and gas by more than 20%.

Coal.—Austria had no deposits of anthracite coal and very little, or exhausted, bituminous coal. Government estimates of certain and probable lignite coal reserves were put at 114 million tons. However, economically recoverable reserves were estimated at only 50 million tons and were rapidly declining.

In 1981, production was expected to continue at the 1980 level until 1983, when it was projected to increase by some 300,000 tons annually as a result of the inauguration of a new open pit mine. The new Oberdorf lignite mine at Barnbach near Graz was to increase production to about 3.2 million tons in 1983 and 1984. Coal consumption was increasing owing to the greater use of coal in heating, higher production of metallurgical coal, and the increased use of coal in industry, and was expected to grow substantially in the 1980's, as several large coal-fired powerplants came online, and as industrial consumers of oil and gas switched to coal because of higher prices and concern about the availability of adequate supplies.

Because of the anticipated higher consumption, Austrian coal imports were expected to be at high levels throughout the 1980's, approaching 5 million tons annually. Beginning in 1984, Austria was to receive at least 1 million tons of steam coal annually from Poland under terms of a 20-year contract signed in 1980 by the two countries. The United States accounted for about 2% of Austrian coal imports in 1980, primarily from one West Virginia mine controlled by the Austrian steel giant VA, and these imports were expected to rise in 1981. Czechoslovakia was the other major exporter of coal to Austria. Because of uncertain deliveries of coal, Austria needed to diversify its sources of supply and develop new supply routes. In this regard, the completion of the Rhine-Main-Danube Canal was expected to improve the competitive position of coal from Western European sources and ports.

Natural Gas.—Remaining proven and probable gas reserves of Austria were increased by about 2.5% in 1981 and equaled almost 6 years of production. The ratio of domestic proven plus probable reserves to total gas requirements in 1981 was about 2.4. Austria produced about one-half of its own natural gas requirements.

Production policy and administration of gas reserves was managed similarly to that of oil, mainly through direct agreements between the Austrian Government and OMV and some privately owned companies. As in previous years, about 99% of gas imports came from the Soviet Union. Negotiations for future supplies were continuing with the Soviet Union and Algeria. The gas storage and supply network was expanded during 1980-81 and underground reservoir storage totaled about 71 billion cubic feet, almost 6 months of average supplies.

Gas requirements were expected to expand in the future, by annual growth of 1.6%, which could be accommodated without major problems with the existing internal gas supply network. Gas prices to consumers were fairly high in 1981, reflecting the high proportion of imported gas in total consumption. Despite the prime quality of gas as a fuel, the Government was attempting to keep its price as low as possible to displace imported oil in significant quantities in the future.

The high level of Austrian dependence on the Soviet Union for gas imports caused some concern that supply sources should be diversified. The possibilities under consideration included purchasing gas from Algeria, and interest was also shown in North Sea gas. A contract with Iran for the supply of about 65 billion cubic feet of gas beginning in 1984 was, however, considered unlikely to be concluded. According to some forecasts, Austria's annual demand for natural gas will continue to increase and was expected to reach a total of about 175 billion cubic feet by 1985 and about 245 billion cubic feet by 1990.

Petroleum.—The Austrian state oil company, OMV, produced about 80% of all domestic oil and owned and operated the only refinery in Austria. About 15% of the country's crude oil demand was covered from domestic sources. Reportedly, proven and probable oil reserves were increased by about 1% in 1981 to 140 million barrels.[9]

According to production projections, the Austrian crude oil output was expected to decline to 10 million barrels in 1985 and to 7 million barrels in 1990. On the other hand, other reports estimated that overall requirements for petroleum products were to increase at an average rate of 2.3% per year through 1985.

Exploration for oil and gas was directed by OMV, which owned exploration rights to 84% of Austria's prospective areas. On January 1, 1981, the Government concluded several exploration agreements with OMV and for development and storage of crude oil. The agreements also included requirements for minimum levels of exploration. A second company, Rohöl-Aufsuchungs GmbH, owned by Mobil Oil Co. and Shell Oil Co., also conducted exploration in Austria and made similar agreements with the Government on minimum levels of activity. Negotiations with a third company were also planned.

The Austrian oil depletion policy was based on the objective of maximizing long-term recovery from the oilfields. Enhanced recovery methods were applied where appropriate, and the Government retained the right to demand the application of such methods by the oil companies under certain conditions.

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[1]Physical scientist, Division of Foreign Data.
[2]Die Zeit (Hamburg). Apr. 16, 1982, p. 31.
[3]Where necessary, values have been converted from Austrian schillings (AS) to U.S. dollars at the average rate of AS15.9 = US$1.00.
[4]Financial Times (London). Jan. 26, 1981, Sec. 3.
[5]Work cited in footnote 2.
[6]Mining Annual Review (London). 1981, p. 545.
[7]Industrial Minerals (London). February 1981, pp. 21-41.
[8]Work cited in footnote 6.
[9]Petroleum Economist (London). May 1981, pp. 197-198.

The Mineral Industry of Belgium-Luxembourg

By William Keyes[1]

BELGIUM

The Belgian economy has been in a chronic recession since 1974, showing the ravages of high labor costs and insufficient export competitiveness. Continuing Government deficits tended to maintain purchasing power, but consequent borrowing and a policy of defending the exchange rate of the Belgian franc (BF) kept interest rates very high and inhibited industrial investments. Gross national product increased 6.7% in 1981 to $98.6 billion,[2] but this actually represented a slight decline in real terms.

The ailing steel industry was a major drain on the public treasury. During the year, funding of close to BF40 billion (about $1.1 billion) was tentatively authorized for the industry, subject to ultimate approval by the European Economic Community (EEC). An unprofitable zinc smelter was closed. Coal production continued to be subsidized. The petroleum refining industry was afflicted by low demand for its products in the export market, while the Government struggled to extricate itself from an unfavorable contract for crude entered into with Saudi Arabia a year earlier. Other mineral production in Belgium was minor by world standards, although some of its nonmetallic products, such as calcareous rocks and siliceous blocks, were well known and had a favorable world market.

PRODUCTION

The general production index (excluding construction), which averaged 125.6 in 1980, dropped to 120.3 for the first 9 months of 1981. The coal index, for the leading extractive industry, declined from 40.3 to 38.5 during the same period, while the nonferrous metals and steel indexes also declined. The nonferrous metals index fell from 154.3 in 1980 to 119.6 in 1981, and the steel index fell from 101.6 in 1980 to 82.6 in the period ending July 1981. The metals production industry clearly suffered from the low level of Belgian, and especially European, demand.

Production of minerals and metals in Belgium from 1977 to 1980 and estimates for 1981 are given in table 1.

Table 1.—Belgium: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum metal, secondary only	3,600	3,579	4,593	4,272	4,200
Cadmium, smelter	1,440	1,164	1,440	1,308	1,300
Copper:					
Blister:					
Primary[e]	13,000	9,000	1,500	700	500
Secondary[e]	48,600	46,900	47,800	49,300	47,500
Total	61,600	55,900	49,300	50,000	48,000
Refined, primary and secondary, including alloys	464,700	388,600	368,800	373,700	373,500
Iron and steel:					
Ore and concentrate thousand tons	47	43	--	--	--
Pig iron do	8,924	10,260	10,776	9,845	[3]9,788
Ferroalloys: Electric furnace ferromanganese do	55	87	90	85	90
Steel:					
Crude do	11,256	12,601	13,442	12,320	[3]12,283
Semimanufactures do	9,387	10,518	10,354	9,517	9,500
Lead metal:					
Primary	104,000	104,200	80,200	105,900	101,900
Secondary	18,796	20,840	33,200	23,000	30,000
Total	122,796	125,040	113,400	128,900	131,900
Selenium[e] kilograms	60,000	60,000	60,000	60,000	60,000
Tin metal:					
Primary	3,520	3,295	2,165	2,543	2,500
Secondary	1,484	1,901	1,743	2,200	2,100
Total	5,004	5,196	3,908	4,743	4,600
Zinc:					
Slab zinc:					
Primary	247,628	233,916	256,720	239,014	247,200
Secondary (remelted zinc)	10,600	[r]7,600	9,100	10,200	10,200
Total	258,228	[r]241,516	265,820	249,214	257,400
Zinc powder	43,632	32,904	28,300	30,100	30,100
Other, nonferrous:					
Precious metals, unworked, n.e.s.[4] thousand troy ounces	29,373	29,732	29,732	56,931	50,000
Base metals, unspecified[5]	3,432	[e]2,576	NA	NA	NA
NONMETALS					
Cement, hydraulic thousand tons	7,764	7,576	7,703	7,482	7,500
Clays: Kaolin do	120	120	120	120	120
Gypsum and anhydrite, calcined	167,436	183,492	192,936	174,088	165,000
Lime and dead-burned dolomite:					
Quicklime thousand tons	2,316	[r]2,384	2,484	2,328	2,100
Dead-burned dolomite do	172	167	164	165	165
Nitrogen: N content of ammonia do	584	[r]540	532	542	500
Phosphates: Thomas slag, gross weight do	841	853	1,052	893	800
Sodium compounds:					
Sodium carbonate	441,444	427,443	400,248	326,928	350,000
Sodium sulfate[e]	250,000	250,000	250,000	250,000	250,000
Stone, sand and gravel:					
Calcareous:					
Dolomite thousand tons	2,524	3,489	3,354	3,324	3,100
Limestone do	29,076	27,048	29,084	29,659	29,000
Marble:					
In blocks cubic meters	3,048	3,612	4,368	4,252	4,400
Crushed and other	3,132	5,508	456	756	700
Petit granite (Belgian bluestone):					
Quarried cubic meters	679,656	693,024	687,996	878,364	700,000
Sawed do	68,292	71,328	64,944	72,180	70,000
Worked do	9,612	11,856	18,725	9,735	10,000
Crushed and other do	577,080	554,160	673,334	955,333	800,000
Porphyry, all types thousand tons	5,726	5,374	5,926	5,653	6,000
Quartz and quartzite	244,580	315,179	244,580	222,863	210,000
Sandstone:					
Rough stone including crushed thousand tons	2,494	2,303	2,504	2,279	2,300
Paving and mosaic stone	2,845	19,272	22,690	21,963	20,000
Sand and gravel:					
Construction sand thousand tons	9,364	7,981	8,286	7,595	7,500
Foundry sand do	1,039	1,043	1,919	775	700

See footnotes at end of table.

Table 1.—Belgium: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Stone, sand and gravel —Continued					
Sand and gravel —Continued					
Dredged sand ____ thousand tons	1,242	923	NA	NA	NA
Glass sand ____ do.	1,661	1,602	1,825	1,997	2,000
Other sand ____ do.	1,956	1,915	1,736	1,721	1,700
Gravel, dredged ____ do.	7,686	5,566	4,976	4,452	4,500
Sulfur, byproduct:					
Elemental ____ do.	88	110	110	110	110
Other forms ____ do.	169	157	160	160	160
Total ____ do.	257	267	270	270	270
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e] ____	2,000	2,000	2,000	2,000	2,000
Coal:					
Anthracite ____ thousand tons	796	628	511	375	[3]321
Bituminous ____ do.	6,272	5,963	5,614	5,949	[3]5,815
Total ____ do.	7,068	6,591	6,125	6,324	[3]6,136
Coke, all types ____ do.	5,568	5,748	6,450	6,048	6,000
Fuel briquets, all kinds ____ do.	126	125	152	82	100
Gas:					
Manufactured ____ million cubic feet	23,561	24,554	NA	25,000	25,000
Natural ____ do.	1,362	[r]1,360	1,389	1,352	1,350
Petroleum refinery products:					
Gasoline ____ thousand 42-gallon barrels	43,155	40,928	43,288	46,801	
Jet fuel ____ do.	14,024	11,968	12,120	13,656	
Kerosine ____ do.	1,008	[r]697	1,116	178	
Distillate fuel oil ____ do.	86,230	80,038	88,043	75,704	NA
Residual fuel oil ____ do.	84,482	[r]72,114	62,045	61,672	
Lubricants ____ do.	714	616	686	440	
Other ____ do.	26,038	[r]27,930	27,207	25,837	
Refinery fuel and losses ____ do.	13,079	13,086	12,096	14,840	
Total ____ do.	268,730	[r]247,377	246,601	239,128	230,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through June 23, 1982.

[2]In addition to the commodities listed, Belgium produces a number of other metals for which only aggregate output figures are available. These aggregates are included under "Other, nonferrous."

[3]Reported figure.

[4]Known to include gold and silver and may include platinum-group metals.

[5]Derived by subtracting aluminum data from a reported total for unspecified base metals.

TRADE

Exports and imports of minerals and metals in Belgium are given in tables 2 and 3, respectively, for the years 1979 and 1980, the latest years available, with principal destinations and sources. Mineral trade with the United States is highlighted.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite ____	4,531	1,787	--	France 1,727; West Germany 35; Netherlands 25.
Ash and residue containing aluminum	7,508	7,647	NA	West Germany 6,561; France 688.
Oxides and hydroxides ____	1,151	744	--	United Kingdom 259; France 248; Netherlands 107.
Metal including alloys:				
Scrap ____	33,532	36,800	--	France 16,615; West Germany 8,706; Netherlands 78.
Unwrought ____	10,842	19,582	12	West Germany 10,218; France 6,966; Netherlands 1,365.
Semimanufactures ____	242,534	219,828	2,039	France 57,453; West Germany 40,534; Netherlands 30,034.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Antimony:				
Ore and concentrate	5	50	--	NA.
Metal including alloys, all forms	6	10	--	NA.
Beryllium metal including alloys, all forms kilograms	4	--		
Cadmium metal including alloys, all forms	809	870	NA	West Germany 379; France 200; United Kingdom 13.
Chromium:				
Chromite	19	30	--	West Germany 27.
Oxides and hydroxides	97	185	NA	France 126.
Metal including alloys, all forms	509	464	15	West Germany 249; France 118; United Kingdom 39.
Copper:				
Ore and concentrate	733	716	--	Netherlands 343; West Germany 220; Spain 83.
Sulfate	13,095	9,219	NA	Netherlands 2,747; West Germany 2,430; China 1,500.
Ash and residue containing copper	1,886	844	NA	West Germany 551; Spain 273.
Oxides and hydroxides	146	605	NA	West Germany 184; Denmark 163; Australia 54.
Metal including alloys:				
Scrap	26,846	26,355	--	West Germany 10,671; France 5,809; Italy 4,422.
Unwrought	306,934	314,035	90	France 120,365; West Germany 78,104; United Kingdom 25,448.
Semimanufactures	282,518	278,474	1,477	France 101,726; West Germany 78,834; Netherlands 31,942.
Gold:				
Waste and sweepings value, thousands	$806	$1,456	--	Netherlands $879; West Germany $378.
Metal including alloys, unwrought and partly wrought thousand troy ounces	583	876	(1)	Switzerland 420; United Kingdom 234.
Iron and steel:				
Ore and concentrate	3,172	60,237	--	West Germany 32,861; France 27,163.
Pyrites, roasted	154,153	148,865	--	West Germany 137,463; Spain 11,402.
Metal:				
Scrap	550,135	536,640	--	France 163,649; West Germany 95,117; East Germany 80,599.
Pig iron including cast iron	22,617	7,678	--	Netherlands 4,278; West Germany 2,535; United Kingdom 38.
Sponge iron, powder, shot	776	549	NA	West Germany 173; France 72; Spain 45.
Spiegeleisen	61	85	NA	NA.
Ferroalloys:				
Ferromanganese	44,152	37,281	4,924	France 17,614; West Germany 6,792; Turkey 2,000.
Other	45,607	36,670	57	France 23,068; West Germany 7,479; United Kingdom 1,138.
Steel, primary forms thousand tons	3,224	2,894	6	France 1,282; Italy 544; West Germany 463.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	4,177	4,078	354	West Germany 1,045; France 688; Netherlands 409.
Universals, plates, sheets do	r5,328	5,123	356	France 1,285; West Germany 1,188; Netherlands 475.
Hoop and strip	739,778	789,589	318	West Germany 297,639; France 184,594; Switzerland 71,724.
Rails and accessories	85,715	82,065	7,318	France 23,292; Italy 16,641; West Germany 3,022.
Wire	476,195	471,029	45,502	West Germany 96,722; France 76,404; Netherlands 48,502.
Tubes, pipes, fittings	370,176	362,227	11,546	West Germany 86,560; Netherlands 57,748; France 57,590.
Castings and forgings, rough	r14,008	11,321	339	Netherlands 7,436; France 1,315; West Germany 983.
Lead:				
Ore and concentrate	1,196	8,058	--	U.S.S.R. 4,658; Italy 3,400.
Ash and residue containing lead	4,678	4,565	NA	France 1,299; undetermined 3,266.
Oxides and hydroxides	5,406	5,638	3	Netherlands 2,754; West Germany 2,058; France 466.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Lead —Continued				
Metal including alloys:				
Scrap	22,531	16,718	--	France 13,594; West Germany 1,673; Netherlands 643.
Unwrought	74,180	84,262	1,170	West Germany 24,531; Netherlands 22,112; France 12,781.
Semimanufactures	6,597	7,792	13	Netherlands 6,102; France 579; Finland 165.
Magnesium metal including alloys:				
Scrap	524	484	32	Netherlands 227; West Germany 205; Spain 13.
Unwrought	2	6	--	Netherlands 6.
Semimanufactures	1	2	--	France 1.
Manganese:				
Ore and concentrate	6,107	5,929	--	Netherlands 2,176; Iran 1,700; United Kingdom 1,192.
Metal including alloys, all forms	26	306	--	All to United Kingdom.
Mercury 76-pound flasks	516	577	--	West Germany 232; United Kingdom 87; Italy 37.
Molybdenum:				
Ore and concentrate	5,945	5,542	NA	West Germany 1,576; Netherlands 1,175; Italy 834.
Oxides and hydroxides	105	176	NA	Japan 79; United Kingdom 52.
Metal including alloys, all forms	177	116	1	Netherlands 52; France 27; Austria 22.
Nickel:				
Ore and concentrate	--	928	--	All to West Germany.
Ash and residue containing nickel	105	1,947	NA	Canada 1,041; Finland 629.
Oxides and hydroxides	3	6	NA	NA.
Matte and speiss	1	11	NA	NA.
Metal including alloys:				
Scrap	1,656	1,440	164	India 477; West Germany 413; Netherlands 177.
Unwrought	406	312	28	United Kingdom 116; Netherlands 41; West Germany 39.
Semimanufactures	1,040	1,002	4	West Germany 710; France 104; Netherlands 97.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	113,239	132,009	65,436	West Germany 30,314; Netherlands 12,341; France 7,955.
Silver:				
Waste and sweepings[2] value, thousands	$5,256	$14,852	--	United Kingdom $10,443; West Germany $2,970; France $1,161.
Metal including alloys, unwrought and partly wrought thousand troy ounces	21,262	48,601	4,286	United Kingdom 22,224; Switzerland 13,819; West Germany 1,045.
Tin:				
Ore and concentrate	75	--		
Ash and residue containing tin	1,668	2,116	379	United Kingdom 718; West Germany 510; Spain 501.
Oxides and hydroxides kilograms	300	(1)	NA	NA.
Metal including alloys:				
Scrap	92	208	--	West Germany 59; India 56; Netherlands 47.
Unwrought	2,372	2,954	170	France 702; Netherlands 586; West Germany 510.
Semimanufactures	23	67	(1)	West Germany 17; Greece 12; Netherlands 10.
Titanium:				
Ore and concentrate	r3,426	2,814	--	All to West Germany
Oxides and hydroxides	23,304	22,156	500	West Germany 7,274; Brazil 2,087; Italy 2,008.
Metal including alloys, all forms	191	110	3	Italy 26; Finland 15; Spain 14; Netherlands 2.
Tungsten:				
Ore and concentrate	9	--		
Ash and residue containing tungsten	16	38	--	NA.
Metal including alloys, all forms	159	166	(1)	West Germany 92; Netherlands 59; Austria 6.
Uranium:				
Ore and concentrate	403	156	--	All to France.
Metal including alloys, all forms value, thousands	NA	$1	--	All to West Germany.
Vanadium oxides	211	143	NA	Czechoslovakia 78; East Germany 35; United Kingdom 29.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	60,645	25,108	--	France 20,196; Netherlands 4,911.
Ash and residue containing zinc	32,243	37,365	NA	France 16,387; West Germany 15,402.
Matte	2,484	2,458	NA	France 1,354; West Germany 844.
Oxides and peroxides	7,119	5,054	--	Hungary 1,171; France 1,170; West Germany 678.
Metal including alloys:				
Scrap	5,369	6,202	182	France 2,689; Netherlands 2,157; West Germany 718.
Blue powder	18,765	17,390	NA	West Germany 10,284; Netherlands 1,663; France 1,276.
Unwrought	193,626	168,178	5,281	West Germany 68,093; France 52,537; Italy 6,630.
Semimanufactures	9,294	9,424	NA	West Germany 5,455; Netherlands 1,844; France 876.
Zirconium ore and concentrate	37	180	NA	NA.
Other:				
Ores and concentrates:				
Of columbium, tantalum, vanadium	79	30	--	All to West Germany.
Of base metals	r2	72	3	France 40; Netherlands 29.
Ash and residue containing nonferrous metals	r57,173	111,015	8,336	France 55,830; West Germany 8,065; United Kingdom 1,344.
Oxides, hydroxides, peroxides	r2,554	2,661	246	Netherlands 1,149; West Germany 437; Italy 215.
Metals:				
Metalloids:				
Arsenic and tellurium	22	7	NA	West Germany 4; France 2.
Other	162,617	178,586	NA	Netherlands 111,722; France 49,317.
Alkali, alkaline-earth, rare-earths	20	69	NA	NA.
Cermets	290	414	16	West Germany 156; Austria 115; Denmark 36.
Base metals including alloys, all forms	r15	15	4	United Kingdom 6; France 3.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	1,137	1,549	NA	Netherlands 1,333; France 99; Czechoslovakia 45.
Corundum, artificial	480	550	NA	Netherlands 332; France 129.
Dust and powder of precious and semiprecious stones kilograms	1,080	1,827	262	Switzerland 293; Israel 96; United Kingdom 85.
Grinding and polishing wheels and stones	2,358	2,612	4	France 1,592; West Germany 305; Romania 204.
Asbestos, crude	130	56	--	Netherlands 30; Algeria 15; Zaire 11.
Barite and witherite	429	13,657	NA	Netherlands 7,285; United Kingdom 5,570.
Boron materials:				
Crude natural borates	13,982	20,727	--	West Germany 11,301; Netherlands 7,634; Denmark 596.
Oxides and acids	242	453	19	Italy 117; France 116; West Germany 100.
Bromine	412	1,923	NA	Netherlands 1,794.
Cement thousand tons	2,871	2,928	12	Netherlands 1,678; West Germany 522; France 314.
Chalk	57,203	79,175	--	Saudi Arabia 19,177; Netherlands 16,860; West Germany 146.
Clays and clay products:				
Crude:				
Bentonite	11,574	10,831	NA	France 5,647; West Germany 3,777.
Fuller's earth, chamotte	82	365	NA	NA.
Kaolin	10,345	12,605	NA	West Germany 8,130; Netherlands 1,057; Republic of South Africa 398.
Andalusite, kyanite, sillimanite	192	402	NA	NA.
Other	20,387	9,090	NA	Netherlands 7,938; France 916.
Products:				
Refractory including nonclay brick	107,505	109,687	39	France 46,317; West Germany 24,281; Italy 12,919.
Nonrefractory	264,327	291,533	224	Netherlands 120,781; West Germany 85,162; France 78,340.
Cryolite and chiolite	50	94	--	Netherlands 54; Nigeria 20; Malta 15.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Diamond:				
Gem:				
Unworked — thousand carats	r22,807	24,868	449	United Kingdom 10,889; India 8,847; Switzerland 449.
Worked — do	2,875	2,603	686	United Kingdom 300; Hong Kong 276; Switzerland 265.
Industrial:				
Unworked — do	9,140	8,063	2,245	United Kingdom 2,426; Ireland 811; West Germany 595.
Worked — do	11	7	1	West Germany 4; United Kingdom 1.
Diatomite and other infusorial earth	1,350	7,806	--	Netherlands 5,842; France 1,724; Iraq 124.
Feldspar, leucite, nepheline, nepheline syenite	7,462	6,591	--	Netherlands 6,371.
Fertilizer materials:				
Crude:				
Nitrogenous	11,999	19,778	--	Italy 10,187; West Germany 6,104; France 3,175.
Phosphatic	18,434	11,291	--	France 8,426; Netherlands 1,468; West Germany 1,162.
Potassic	1,568	1,628	--	Netherlands 1,578; United Kingdom 30; West Germany 20.
Manufactured:				
Nitrogenous — thousand tons	1,771	1,804	16	France 713; West Germany 392; United Kingdom 123.
Phosphatic — do	1,512	1,532	--	West Germany 809; France 522; Netherlands 55.
Potassic — do	605	662	15	France 150; Netherlands 98; Japan 80.
Other including mixed — do	1,728	1,622	5	France 951; West Germany 157; United Kingdom 89.
Ammonia	94,507	57,844	--	France 56,548; West Germany 457.
Fluorspar	4,984	4,926	NA	West Germany 4,779.
Graphite, natural	49	24	NA	NA.
Gypsum and plasters	97,048	100,607	5	Netherlands 53,239; West Germany 44,777.
Iodine	4	47	NA	Spain 18; West Germany 10; France 7.
Lime	662,265	761,665	--	Netherlands 552,587; France 122,891; West Germany 60,568.
Magnesite	4,696	34,458	--	Netherlands 31,114; France 3,010; West Germany 276.
Mica:				
Crude including splittings and waste	160	65	--	Romania 40; France 9; Italy 6.
Worked including agglomerated splittings	(1)	66	62	France 3.
Pigments, mineral:				
Natural, crude	37	30	NA	NA.
Iron oxides, processed	11,633	13,955	609	France 8,911; West Germany 1,179; Italy 909.
Precious and semiprecious stones:				
Natural:				
Unworked — grams	13	6	NA	Mainly to Switzerland.
Worked:				
Gem — kilograms	2,553	204	6	West Germany 73; Netherlands 44; Denmark 18.
Industrial — grams	129	2,656	--	Singapore 2,630; Lebanon 26.
Manufactured — kilograms	1,695	5,493	271	West Germany 2,157; Republic of Korea 1,032; Switzerland 293.
Pyrites (gross weight)	522	32	--	Morocco 30.
Salt and brines	144,224	115,385	6	France 97,529; Netherlands 15,140; Upper Volta 1,502.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	r8,257	10,840	2,346	Netherlands 4,533; West Germany 2,023; Denmark 811.
Caustic soda	r552,848	421,029	29,535	Netherlands 198,681; France 70,006; West Germany 46,155.
Soda ash	r31,799	54,393	--	China 41,632; France 5,449; West Germany 3,811.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	611,729	683,020	64	Netherlands 664,783; West Germany 9,285; France 7,605.
Worked	21,073	19,703	144	Netherlands 8,257; West Germany 5,241; France 3,423.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Dolomite, chiefly refractory-grade thousand tons	1,646	1,569	--	Netherlands 688; West Germany 585; France 278.
Gravel and crushed rock ---do---	7,946	8,910	--	Netherlands 4,181; France 4,176; West Germany 551.
Limestone excluding dimension	537,662	553,260	--	Netherlands 361,559; France 190,401.
Quartz and quartzite	13,557	12,940	4	West Germany 7,455; Netherlands 3,058; France 1,235.
Sand excluding metal-bearing thousand tons	3,104	3,422	(1)	Netherlands 1,003; France 994; Italy 422.
Sulfur:				
Elemental:				
Other than colloidal	11,579	14,032	10	France 7,308; West Germany 3,466; Netherlands 509.
Colloidal	42	148	--	Netherlands 33; Venezuela 26; France 23; Italy 23.
Sulfuric acid, oleum	190,805	197,065	(1)	France 100,952; Netherlands 39,487; bunkers 19,500.
Talc, steatite, soapstone, pyrophyllite	21,186	23,331	--	West Germany 5,567; Sweden 3,621; France 3,448.
Other:				
Crude:				
Vermiculite, perlite, chlorite	1,338	328	NA	NA.
Other	151,478	570,884	(1)	Netherlands 537,550; France 19,694; West Germany 9,277.
Slag, dross, and similar waste, not metal-bearing thousand tons	2,181	2,413	--	France 914; Netherlands 891; West Germany 605.
Oxides and hydroxides of barium, magnesium, strontium	153	617	350	West Germany 137; France 111.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals thousand tons	1,784	1,020	3	Netherlands 573; France 199; West Germany 146.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	9,254	16,435	--	France 16,152; Netherlands 102; Italy 33.
Carbon black	686	390	--	Netherlands 113; France 107; West Germany 54.
Coal and briquets:				
Anthracite and bituminous	445,248	538,043	1,629	West Germany 324,487; France 68,609; Netherlands 64,397.
Briquets of anthracite and bituminous	58,927	25,380	--	France 21,666; West Germany 1,304; Switzerland 1,275.
Lignite including briquets	138	38	--	Netherlands 25; France 13.
Coke and semicoke	638,510	871,067	87,224	Romania 348,314; France 195,775; West Germany 150,257.
Gas:				
Natural ---million cubic feet	7	2,242	--	France 2,240.
Manufactured value, thousands	--	$1	--	NA.
Hydrogen, argon, rare gases	43,100	51,432	NA	France 32,204; West Germany 14,170; Netherlands 484.
Peat including briquets and litter	4,394	2,257	--	Netherlands 1,070; France 778; West Germany 280.
Petroleum:				
Crude---42-gallon barrels	r22	12	--	All to Netherlands.
Refinery products:				
Gasoline---thousand 42-gallon barrels	r34,116	40,635	375	West Germany 11,791; United Kingdom 7,154; Netherlands 5,847.
Kerosine ---do---	r11,533	12,299	151	West Germany 4,047; bunkers 3,023; Nigeria 1,251.
Distillate fuel oil ---do---	26,704	32,115	(1)	West Germany 12,275; Netherlands 5,854; Denmark 2,611.
Residual fuel oil---do---	29,894	37,642	(1)	Bunkers 9,432; Netherlands 7,140; France 5,480.
Lubricants ---do---	r2,676	2,599	1	Netherlands 803; West Germany 263; France 251.
Other:				
Liquefied petroleum gas do---	2,781	3,115	--	Netherlands 1,455; West Germany 600; Portugal 297.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Other —Continued				
Mineral jelly and wax, thousand 42-gallon barrels	32	31	1	France 12; Italy 4; Netherlands 4.
Petroleum coke, do.	14	12	--	France 11; West Germany 1.
Bitumen and other residues, do.	1,105	1,657	--	Netherlands 877; Sweden 289; West Germany 218.
Bituminous mixtures, do.	72	81	--	Netherlands 29; France 28; West Germany 10.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r318,715	289,871	26,884	West Germany 109,429; France 97,250; Netherlands 32,511.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]May include other precious metals.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	40,902	35,936	(1)	China 12,026; Australia 7,864; Guyana 6,156.
Ash and residue containing aluminum	3,335	3,768	89	West Germany 1,916; Netherlands 631; Poland 75.
Oxides and hydroxides	23,869	21,519	395	West Germany 14,784; France 2,454; Italy 1,827.
Metal including alloys:				
Scrap	26,556	33,316	7,843	Netherlands 5,982; West Germany 5,871; France 5,760.
Unwrought	252,770	252,500	7,676	Netherlands 117,714; France 32,079; West Germany 24,469.
Semimanufactures	84,328	86,054	2,792	West Germany 32,676; Netherlands 19,219; France 18,917.
Antimony:				
Ore and concentrate	6,662	5,177	NA	Bolivia 2,401; Turkey 644; Canada 599; United Kingdom 317.
Oxides and hydroxides	240	193	NA	Turkey 157.
Metal including alloys, all forms	335	32	--	France 24; China 8.
Beryllium:				
Oxides and hydroxides, value, thousands	$1	$1	NA	NA.
Metal including alloys, all forms, do.	$36	$27	$4	West Germany $18; France $3; Switzerland $2.
Cadmium metal including alloys, all forms	1,166	1,028	NA	Netherlands 211; Italy 169; China 112; Finland 89.
Chromium:				
Chromite	1,903	1,671	--	Netherlands 1,537; Republic of South Africa 89; West Germany 25.
Oxides and hydroxides	570	1,443	5	West Germany 1,073; China 107; Italy 89.
Metal including alloys, all forms	543	275	NA	United Kingdom 125; Japan 38; France 21.
Cobalt oxides and hydroxides	54	43	--	United Kingdom 16; France 12; West Germany 6.
Copper:				
Ore and concentrate	1,774	2,628	--	Morocco 1,942; Australia 522; Cyprus 162.
Sulfate	1,233	1,190	NA	France 379; U.S.S.R. 268; Netherlands 192.
Ash and residue containing copper	26,803	61,791	16,808	Sweden 12,501; France 12,466; Spain 1,685.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Copper —Continued				
Oxides and hydroxides	36	48	NA	NA.
Metal including alloys:				
Scrap	100,384	124,528	24,515	France 28,233; Netherlands 27,861; United Kingdom 10,920.
Unwrought	518,510	509,756	14,476	Zaire 253,411; Chile 34,100; Canada 27,776.
Semimanufactures	49,046	43,770	582	West Germany 23,665; France 9,708; Italy 4,017.
Gold:				
Waste and sweepings value, thousands	$1,224	$4,838	NA	Netherlands $4,300.
Metal including alloys, unwrought and partly wrought thousand troy ounces	781	1,856	891	Switzerland 528; United Kingdom 108; West Germany 84.
Iron and steel:				
Ore and concentrate thousand tons	26,144	22,182	--	France 6,840; Sweden 5,863; Brazil 3,320; Liberia 1,269.
Pyrites, roasted	r183,669	106,519	--	West Germany 100,331; France 3,104; Sweden 3,038.
Metal:				
Scrap	r970,474	859,318	15,419	Netherlands 296,043; West Germany 296,017; France 167,711.
Pig iron including cast iron	r104,926	97,604	8	France 54,580; West Germany 23,567; Canada 7,021.
Sponge iron, powder, shot	8,034	18,893	26	Venezuela 8,204; Netherlands 4,704; France 2,267.
Spiegeleisen	173	892	NA	United Kingdom 880.
Ferroalloys	r192,696	162,742	2,156	Norway 54,363; France 37,828; West Germany 28,521.
Steel, primary forms thousand tons	1,168	1,036	5	Netherlands 372; France 264; West Germany 187.
Semimanufactures:				
Bars, rods, angles, shapes, sections	884,031	895,889	4,972	France 326,485; West Germany 231,554; Netherlands 148,328.
Universals, plates, sheets	r587,614	652,236	7,369	Netherlands 195,298; West Germany 157,618; France 126,718.
Hoop and strip	r137,534	117,904	97	France 60,720; West Germany 47,691; Netherlands 3,041.
Rails and accessories	r45,004	46,856	1	France 36,895; West Germany 8,348; United Kingdom 826.
Wire	r61,997	61,667	96	West Germany 27,797; France 18,906; Netherlands 12,468.
Tubes, pipes, fittings	r223,011	262,760	1,473	West Germany 80,863; France 67,486; Netherlands 59,605.
Castings and forgings, rough	r68,120	66,709	2,560	France 21,951; West Germany 20,672; Netherlands 16,578.
Lead:				
Ore and concentrate	82,218	75,709	--	Australia 16,482; Peru 13,706; Ireland 13,327.
Ash and residue containing lead	70,557	52,520	21,285	France 7,644; United Kingdom 3,615; Spain 668.
Oxides and hydroxides	1,309	1,160	22	France 730; West Germany 373; Mexico 18.
Metal including alloys:				
Scrap	12,632	11,944	398	Netherlands 6,649; Ireland 1,512; West Germany 1,147.
Unwrought	57,800	54,286	9,150	France 15,780; Australia 10,722; United Kingdom 9,114.
Semimanufactures	3,438	6,136	(1)	West Germany 5,497; Netherlands 380; France 186.
Magnesium metal including alloys:				
Scrap	178	36	--	Lebanon 11; Nigeria 10; Netherlands 5.
Unwrought	1,252	1,404	426	France 390; Netherlands 241; Canada 97.
Semimanufactures	440	312	87	West Germany 105; France 47; Switzerland 39.
Manganese:				
Ore and concentrate	432,140	299,848	543	Republic of South Africa 122,097; Congo 63,467; Zaire 33,634.
Oxides and hydroxides	3,350	4,856	442	Greece 2,043; Ireland 1,268; Japan 778.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Manganese —Continued				
Metal including alloys, all forms	1,133	1,178	65	Republic of South Africa 729; Netherlands 79.
Mercury 76-pound flasks	3,481	6,502	--	Spain 2,912; Finland 1,346; Netherlands 1,015.
Molybdenum:				
Ore and concentrate	15,856	15,922	3,074	Canada 5,528; Chile 3,299; West Germany 2,701.
Oxides and hydroxides	28	17	NA	United Kingdom 11.
Metal including alloys, all forms	189	149	8	Netherlands 100; West Germany 23; France 7.
Nickel:				
Ore and concentrate	79	(1)	--	All from France.
Ash and residue containing nickel	297	361	NA	France 148; United Kingdom 69.
Oxides and hydroxides	402	164	NA	Netherlands 63; Australia 40; France 29.
Matte and speiss	177	300	--	Netherlands 219; Australia 44; Republic of South Africa 35.
Metal including alloys:				
Scrap	753	519	17	Netherlands 191; West Germany 141; France 29.
Unwrought	4,250	3,061	516	Republic of South Africa 804; Netherlands 371; Cuba 315.
Semimanufactures	1,488	1,797	119	West Germany 990; United Kingdom 232; France 187.
Niobium metal including alloys, all forms	10	3	NA	West Germany 1.
Platinum-group metals including alloys, unwrought and partly wrought thousand troy ounces	83,965	85,970	(1)	United Kingdom 49,878; West Germany 10,899.
Selenium, elemental	r24	36	NA	Japan 30.
Silver:				
Ore and concentrate[2] value, thousands	$3,348	$19,713	$4,820	Chile $10,988; Canada $2,644; United Kingdom $1,103.
Waste and sweepings[2] do	$80,875	$207,732	$191,007	United Kingdom $8,823; Netherlands $5,809.
Tin:				
Ore and concentrate	2,912	3,151	--	Zaire 2,380; Rwanda 682; Niger 54.
Ash and residue containing tin	2,392	869	NA	Netherlands 812; Italy 20.
Oxides and hydroxides	15	15	NA	France 7; Netherlands 5.
Metal including alloys:				
Scrap	175	182	--	Netherlands 164; West Germany 8; Italy 6.
Unwrought	2,793	2,988	5	Malaysia 1,001; West Germany 411; Zaire 366.
Semimanufactures	268	245	(1)	Netherlands 123; West Germany 49; France 48.
Titanium:				
Ore and concentrate	r102,094	78,108	NA	Canada 77,103; Netherlands 845.
Oxides and hydroxides	9,742	8,051	1,699	West Germany 3,050; France 1,213; United Kingdom 1,207.
Metal including alloys, all forms	4,097	1,421	940	West Germany 74; Italy 29; United Kingdom 28.
Tungsten:				
Ore and concentrate	r(1)	3	--	Austria 1; France 1.
Ash and residue containing tungsten	37	31	NA	NA.
Oxides and hydroxides	35	9	NA	NA.
Metal including alloys, all forms	299	224	1	Netherlands 157; West Germany 46; France 12.
Uranium:				
Ore and concentrate value, thousands	$45	$128	--	All from United Kingdom.
Metal including alloys, all forms do	--	$21	$2	France $19.
Vanadium:				
Ash and residue containing vanadium	6,272	7,001	NA	Netherlands 4,044; Mozambique 1,994; Czechoslovakia 912.
Oxides and hydroxides	1,169	1,535	NA	Republic of South Africa 769; West Germany 318.
Metal including alloys, all forms	--	1	NA	NA.
Zinc:				
Ore and concentrate	554,133	429,909	1,322	Canada 137,718; Peru 64,181; Ireland 54,986.
Ash and residue containing zinc	63,977	60,598	9,180	West Germany 20,759; France 12,564; Netherlands 5,238.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc —Continued				
Matte	2,696	2,179	NA	West Germany 1,058; Netherlands 492.
Oxides and peroxides	7,276	6,465	NA	France 2,113; Netherlands 2,067; United Kingdom 1,269.
Metal including alloys:				
Scrap	6,648	6,618	19	Netherlands 2,772; France 1,802; West Germany 993.
Blue powder	1,166	652	NA	West Germany 356; Netherlands 220.
Unwrought	51,484	45,576	10,856	Netherlands 15,893; Canada 6,689; West Germany 6,666.
Semimanufactures	20,730	21,333	NA	France 19,985; West Germany 130.
Zirconium:				
Ore and concentrate	2,228	2,431	NA	Netherlands 1,028; Australia 801; West Germany 346.
Metal including alloys, all forms	117	124	85	West Germany 9; United Kingdom 9.
Other:				
Ores and concentrates:				
Of columbium, tantalum, vanadium	2,245	2,537	458	Canada 1,761; West Germany 169.
Of base metals	r18,839	38,459	NA	Norway 37,937; Australia 177; Netherlands 163.
Ash and residue containing nonferrous metals, n.e.s	r29,319	20,483	3,569	France 10,257; Spain 348; Japan 179.
Oxides, hydroxides, peroxides	r777	915	21	West Germany 634; France 21; Netherlands 10.
Metals:				
Metalloids:				
Tellurium and arsenic	115	100	14	Sweden 56; France 16; Netherlands 7.
Other	3,782	6,059	25	France 4,306; Netherlands 617; Norway 204.
Alkali, alkaline-earth, rare-earths	124	160	NA	France 105; West Germany 28; United Kingdom 10.
Pyrophoric alloys	r1	30	NA	NA.
Base metals including alloys, all forms, n.e.s	r15	(1)	NA	NA.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	37,261	40,854	202	West Germany 40,069; France 172; Netherlands 133.
Corundum, artificial	5,735	6,410	57	West Germany 2,444; France 2,294; Austria 960.
Dust and powder of precious and semiprecious stones kilograms	2,262	2,633	1,165	Switzerland 746.
Grinding and polishing wheels and stones	3,441	3,470	96	West Germany 916; Austria 747; Netherlands 509.
Asbestos, crude	50,754	47,880	8,238	Canada 23,107; Republic of South Africa 8,238; U.S.S.R. 6,748.
Barite and witherite	8,082	8,407	--	France 4,020; West Germany 3,538; Netherlands 352.
Boron:				
Crude, natural borates	31,028	94,187	554	Turkey 47,593; Netherlands 41,214; West Germany 2,906.
Oxides and acids	1,899	3,747	73	France 3,142; Turkey 336; West Germany 78.
Bromine	828	1,972	NA	Israel 1,803.
Cement	297,440	248,675	53	West Germany 162,382; Netherlands 72,396; France 11,991.
Chalk	109,712	124,705	--	France 89,847; Netherlands 34,573; West Germany 272.
Clays and clay products:				
Crude:				
Bentonite	24,553	38,519	7,886	Netherlands 11,531; Greece 7,807; West Germany 6,109.
Dinas earth	356	364	NA	NA.
Fuller's earth, chamotte	120,458	111,226	8,893	West Germany 76,829; France 18,828; Mozambique 1,984.
Kaolin	290,084	259,510	NA	United Kingdom 88,115; Netherlands 70,721; West Germany 37,084.
Andalusite, kyanite, sillimanite	2,013	3,078	1,268	Republic of South Africa 632; United Kingdom 140.
Other	107,905	141,124	6,087	West Germany 90,723; Netherlands 13,940; France 9,241.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products —Continued				
Products:				
Refractory including nonclay brick	173,009	164,058	838	West Germany 86,823; France 33,333; United Kingdom 16,562.
Nonrefractory	973,898	504,370	28	Netherlands 160,732; West Germany 140,554; France 96,515.
Cryolite and chiolite	61	63	--	Denmark 49; West Germany 12.
Diamond:				
Gem:				
Unworked thousand carats	r24,911	26,513	NA	United Kingdom 17,634; Netherlands 9.
Worked do.	2,225	2,098	91	India 603; U.S.S.R. 399; United Kingdom 245.
Industrial:				
Unworked do.	11,308	9,381	1,699	United Kingdom 1,632; Ireland 1,542; Congo 955.
Worked do.	1	7	NA	United Kingdom 2; West Germany 1.
Diatomite and other infusorial earth	11,348	9,039	896	France 3,806; Spain 1,990; Denmark 1,821.
Feldspar, leucite, nepheline syenite	67,186	60,807	--	France 27,049; Norway 24,565; Netherlands 2,433.
Fertilizer materials:				
Crude:				
Nitrogenous	24,613	39,082	--	Chile 31,478; Sweden 6,742; Netherlands 822.
Phosphatic thousand tons	2,155	2,326	358	Morocco 1,450; U.S.S.R. 89; Togo 24.
Potassic	r47,441	34,260	--	West Germany 18,942; France 15,214.
Manufactured:				
Nitrogenous	r520,280	628,164	181,081	West Germany 208,535; Netherlands 121,617; France 90,789.
Phosphatic	r181,458	124,648	71,312	Netherlands 27,362; France 6,123; Morocco 5,221.
Potassic thousand tons	r1,051	1,134	--	West Germany 657; U.S.S.R. 232; East Germany 140.
Other including mixed	517,062	365,432	136,870	West Germany 77,030; France 61,162; Netherlands 43,335.
Ammonia	2,707	2,301	2	Netherlands 1,357; West Germany 918; Switzerland 20.
Fluorspar	14,549	16,876	--	France 5,299; China 5,085; Mexico 3,415.
Graphite, natural	1,842	5,832	(1)	Sweden 5,061; West Germany 389; Netherlands 129.
Gypsum and plasters	387,716	421,626	83	France 374,327; West Germany 28,316; Netherlands 17,948.
Iodine	102	97	7	United Kingdom 28; Japan 25; Chile 18.
Lime	130,228	91,982	4	France 86,483; West Germany 4,801; Netherlands 679.
Magnesite	24,204	22,907	101	Italy 7,324; United Kingdom 4,640; Austria 2,606.
Mica:				
Crude including splittings and waste	1,803	5,006	4	India 3,141; Madagascar 630; United Kingdom 424.
Worked including agglomerated splittings	56	78	--	Switzerland 34; Netherlands 21; United Kingdom 10.
Pigments, mineral:				
Natural, crude	443	413	NA	Republic of South Africa 297.
Iron oxides, processed	8,030	7,276	76	West Germany 5,489; France 885; Spain 246.
Precious and semiprecious stones:				
Natural:				
Unworked grams	201	63	NA	West Germany 14.
Worked:				
Gem kilograms	6,267	14,443	NA	West Germany 675; France 377; India 261; undetermined 12,849.
Industrial do.	413	201	NA	Republic of Korea 174.
Manufactured do.	3,851	751	257	Switzerland 69; undetermined 425.
Pyrites (gross weight)	195,210	189,433	--	Spain 182,738; Morocco 5,000; Portugal 1,119.
Salt and brines thousand tons	1,219	988	(1)	Netherlands 651; West Germany 311; France 25.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	2,671	1,150	3	West Germany 457; United Kingdom 230; Spain 169.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Sodium and potassium compounds, n.e.s. —Continued				
Caustic soda	103,300	110,070	205	West Germany 56,773; Netherlands 31,788; France 18,305.
Soda ash	48,847	140,853	1,734	France 63,220; West Germany 44,962; Netherlands 12,652.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	121,928	115,742	25	France 56,321; West Germany 17,015; Portugal 9,308.
Worked	103,565	117,702	37	France 30,925; Italy 30,041; Netherlands 21,645.
Dolomite, chiefly refractory-grade	46,593	51,454	--	West Germany 29,062; France 15,967; Netherlands 6,044.
Gravel and crushed rock thousand tons	7,409	9,139	(1)	Netherlands 4,457; United Kingdom 2,540; West Germany 1,106.
Limestone excluding dimension	r385,059	261,864	--	United Kingdom 229,777; France 21,945; Spain 5,695.
Quartz and quartzite	r149,918	111,753	612	West Germany 79,756; France 15,930; Norway 8,597.
Sand excluding metal-bearing thousand tons	10,640	10,735	1	Netherlands 9,394; West Germany 787; United Kingdom 238.
Sulfur:				
Elemental:				
Other than colloidal	549,346	481,737	238,151	Poland 71,068; Canada 47,189; West Germany 46,693.
Colloidal	5,128	1,353	4	West Germany 661; Netherlands 355; France 237.
Sulfuric acid, oleum	342,488	446,096	--	West Germany 183,248; France 143,141; Netherlands 110,516.
Talc, steatite, soapstone, pyrophyllite	36,915	52,903	17,149	Australia 19,012; France 7,555; Austria 3,084.
Other:				
Crude:				
Vermiculite, perlite, chlorite	58,090	64,475	NA	U.S.S.R. 30,257; Greece 23,301; West Germany 3,958.
Other thousand tons	1,347	1,046	(1)	France 681; Spain 161; West Germany 137.
Slag, dross, and similar waste, not metal-bearing do	1,195	1,115	--	France 910; West Germany 105; Netherlands 99.
Oxides and hydroxides of magnesium, strontium, barium	1,283	1,872	63	Netherlands 485; United Kingdom 480; West Germany 445.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	r967,625	970,714	477	Netherlands 591,820; West Germany 228,260; France 102,399.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	126,077	94,981	362	France 90,082; Netherlands 3,591; West Germany 489.
Carbon black and gas carbon	35,994	38,637	946	West Germany 14,849; Netherlands 9,761; France 9,311.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	10,035	10,590	4,230	West Germany 2,238; Republic of South Africa 2,092; Netherlands 2,063.
Lignite including briquets	71,093	179,608	--	West Germany 177,849; Netherlands 1,740.
Coke and semicoke thousand tons	3,706	3,614	211	West Germany 2,938; Netherlands 250; Canada 80.
Gas:				
Natural million cubic feet	447,876	413,440	NA	Netherlands 338,549; Norway 69,864.
Manufactured do	539	512	--	France 511.
Hydrogen, argon, rare gases	9,793	8,886	252	Netherlands 5,480; West Germany 1,234; France 146.
Peat including briquets and litter	153,165	141,525	52	Netherlands 98,517; West Germany 33,485; U.S.S.R. 9,084.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	230,656	219,850	--	Saudi Arabia 137,673; Iraq 13,551; Nigeria 10,902.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products:				
Gasoline and petroleum spirits thousand 42-gallon barrels	r17,528	22,720	(1)	Netherlands 8,808; U.S.S.R. 3,131; France 1,420.
Kerosine ——do——	r754	676	(1)	Italy 224; Netherlands 188; United Kingdom 108.
Distillate fuel oil ——do——	32,112	20,712	1	Netherlands 13,547; U.S.S.R. 3,079; West Germany 1,097.
Residual fuel oil ——do——	30,698	35,163	(1)	Netherlands 10,816; U.S.S.R. 5,994; Saudi Arabia 4,239.
Lubricants ——do——	r4,985	3,877	210	Netherlands 1,268; France 915; West Germany 541.
Other:				
Liquefied petroleum gas do	4,886	4,597	NA	Netherlands 2,434; West Germany 549; United Kingdom 463.
Mineral jelly and wax do	151	148	3	West Germany 75; France 35; Netherlands 12.
Petroleum coke ——do——	1,453	795	660	Netherlands 54; United Kingdom 47; West Germany 33.
Bitumen and other residues do	464	291	(1)	France 157; Netherlands 105; West Germany 28.
Bituminous mixtures do	149	190	7	Netherlands 84; France 67; West Germany 23.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r129,591	163,922	321	West Germany 59,806; Netherlands 42,898; France 31,876.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]May include other precious metals.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Crude steel production continued in 1981 at the same depressed level as that of 1980, about 12 million tons. The financial picture worsened, however, because of continued soaring costs.

Early in 1981, the Belgian Government and the Commission of the EEC received a report prepared by Nippon Steel Corp. as part of another effort to find a way to make the decisions necessary to put the Belgian steel industry back on its feet. Nippon Steel examined a proposal to merge Cockerill S.A., the large Liège producer, with the "triangle" of Hainant-Sambre S.A. and Forges de Thy-Marcinelle et Providence, S.A., all in the Charleroi area. The report stated that the combined 10-million-ton-per-year capacity (out of a total Belgian capacity of 17 to 18 million tons) should be cut to 8 million tons, of which 60% would be flat rolled products. No recommendations were made as to closures of individual plants. It was warned that the breaking point of the proposed Cockerill-Sambre would remain high without rapid improvement of operating techniques, elevation of labor productivity, and other measures to back up nationalization of production. The plants were found to be considerably less productive than Japanese plants in terms of yield, energy consumption, and manpower.

Government funding of BF40 billion for the merger was tentatively authorized in April, in the form of BF15 billion for fresh capital and BF25 billion to convert debts owed to the state into capital. BF3 billion of this was made immediately available by the private banks to pay wages, but a further BF65 billion emergency credit was questioned by the EEC, which demanded strict conditions of restructuring in coordination with the loan. In this, the EEC was supported by the independent Belgian Steel Association, Eisa.

Cockerill-Sambre S.A. (CS), the new combined firm, was formed on June 26, and considerable stress was generated by its financial problems amid the reluctance of private banks to lend additional money without Government guarantees and by the political problem of growing Flemish (Dutch

speaking) reluctance to acquiesce in a massive Government funding of the Walloon (French speaking) steel industry. The new firm was to have a capacity of 8.5 million tons annually and would be controlled about 80% by the Belgian Government.

Outlook for profitability of the new firm continued poor, and the new chairman of CS said he expected that state aid would be necessary even as far into the future as 1985 and later. It was estimated in business circles that aid in the period 1981-85 would approach BF250 billion.

In November, a general election led to the formation of a new national Government in which the influence of Flemish parties unsympathetic to further aid to the Walloon industry was much stronger. The new premier, Wilfrid Martens, pledged strict adherence to the EEC (actually the European Coal and Steel Community, a constituent body of the EEC) regulation of August 7, 1981, on subsidies to steel industries. The EEC Commission in November vetoed further Belgian state aid by withholding approval of BF8 billion of the Government aid package; the EEC could eventually bring Belgium before the European Court if its wishes are flouted. The EEC was under continuous pressure from other EEC members to take steps to reduce Belgian capacity because the bulk of this steel is exported; only 25% can be consumed in Belgium. This action by the EEC put the Belgian Government in a difficult position because of budgetary problems and the fact that the steel industry would not be able to meet its payroll. The Government would require EEC assistance, and thus approval, to help the industry. At yearend, the caretaker government had not yet arrived at a decision.

Lead and Zinc.—Metallurgie Hoboken-Overpelt S.A., the second largest Belgian zinc producer, commissioned a new furnace at Overpelt to produce secondary zinc from low-grade copper-zinc scrap, such as from junked automobiles. About 25,000 tons per year will be produced by a new technique developed by the Huron Valley Steel Corp. of the United States. Feed will consist mainly of the heavy nonferrous part of the nonmagnetic fraction proceeding from the automobile shredders. Density separation will also be used. Remelted zinc from this operation will be fed to the zinc distillation columns of the refinery. Total cost was expected to be BF80 million (about $2 million).

Société de Prayon, S.A. (actually its subsidiary Société Industrielle de Prayon, S.A.), the smallest Belgian zinc producer, shut down its unprofitable electrolytic zinc plant at Ehein, near Liège, in May. It then attempted to sell its zinc division (capacity 60,000 to 70,000 tons per year) to a number of companies, including Noranda Mines, Ltd., of Canada. Failing in these attempts, it decided to liquidate all assets of the zinc division. An iron oxide plant at Ehein, which produces a high-grade oxide product, remained in operation and would probably be improved with support from the regional development agency, Société Regionale d'Investissement de Wallonie. Also, Prayon's chemical and fertilizer production facilities at nearby Engis were transferred to a newly formed company, Société Chimique Prayon, S.A. Prayon's metallurgical division at Trooz, where cadmium is produced, also was being offered for sale.

Tin.—Metallurgie Hoboken-Overpelt, the only producer of primary tin in Belgium, ceased processing imported cassiterite ores because of the unreliability of supplies, caused by political problems in supplier countries.

An extensive review of the Belgian nonmetallic minerals industry was published.[3]

Nonmetals.—*Barite.*—Production of barite started up again recently, on a moderate scale, although the sole mine also operated from 1890 to 1928. NL Baroid Inc. of the United States purchased the mine, at Fleurus, near Namur, from Kali Chemie AG of the Federal Republic of Germany and Mines de Garrot S.A. of France. Current production, at a rate of about 100,000 tons annually, goes largely to North Sea drilling companies. About one-half of the production, which must be upgraded by flotation, is shipped to GBO Holland BV at IJmuiden, Netherlands, for grinding. Reserves are estimated at about 1 million tons.

Limestone and Other Calcareous Minerals.—Limestone quarrying is the major extractive industry in Belgium. Output is largely from the Meuse Valley and around Tournai, and main uses are for aggregate and for iron and steel production. Of the approximately 30 million tons produced each year, about 6 million tons are exported, of which approximately 4 million go to France and 1.5 million to the Federal Republic of Germany, according to statistics of the 1980 report of the Union des Producteurs Belges de Chaux, Calcaires, Dolomies et Produits Connexes. The largest producer was of the Lhoist-Dumont Group including S.A. Etablissements Leon Lhoist;

S.A. Carrieres et Fours a Chaux Dumont-Wautier; and S.A. des Dolomies de Marcheles-Darnes. Another large producer is S.A. Carrieres et Fours a Chaux de la Meuse (Carmeuse), which also has three subsidiary companies. Both Lhoist-Dumont and Carmeuse have production capacities ranging from 5 to 10 million tons per year.

Belgium has historically been an important marble producer. A variety similar to marble, currently produced in large quantities, is known as petit granite (not a granite) or Belgian bluestone. About 80% of production is concentrated in the Neufvilles-Sognies-Ecaussines area, south of Brussels, where six companies operate quarries. A second producing area is around Sprimont and Pouleseur, south of Liège, where about a dozen producers are active.

Quartz Sand.—Belgium is a major European producer and exporter of several varieties of quartz sand, including exceptionally high-quality sand used in the production of crystal ware and silicon carbide. Belgium has a very important glass industry based on this resource. The largest producer is S.A. SCR Sibelco N.V., which has large operations in both the Mol and Maasmechelen areas in the northeast near the Netherlands border, with an annual production of about 3.5 million tons. The other major producer is De Niewe Zandgroeven van Mol N.V. (in French, Les Nouvelles Sablieres de Mol S.A.), which also produces high-quality sand (about 1.5 million tons) for the glass industry, at Mol and Maasmechelen. Like Sibelco, it exports the bulk of its production.

Silex.—Belgium is a major, and the traditional, producer of this chalcedonic silica, largely used for grinding blocks in mills. A typical analysis of gray-blue Belgium silex is SiO_2, 98.7%; Al_2O_3, 0.3%; CaO, 0.4%; MgO, 0.1%; and others, 0.5%. The material is considered very high grade, and Belgium can compete with other producers (China, Spain, and Yugoslavia) in spite of a higher price.

The major Belgian producer is Siminal S.A., with quarries at Eben-Emael, north of Liège. A second company, Carrieres de Tuffeau, S.p.r.l. (Marnebel), also produces silex in the vicinity. In this area, silex is a by-product of the production of a local limestone (mergel) used in fertilizers. Additional silex production is by S.p.r.l. Freres Evrard near Eben-Emael, four or five smaller producers in Hainaut Province (Mons area), and one in Namur Province (Fraire, south of Charleroi).

Sulfur.—A 36,000-ton-per-year sulfur recovery unit was installed in the petroleum refinery of Albatros Oil Processing GmbH in Antwerp. The refinery, controlled by Albatros GmbH of the Federal Republic of Germany, had a capacity of about 90,000 barrels per day.

Mineral Fuels.—Belgium imports 84% of its total energy supplies, of which one-half is petroleum. Belgian industry is of the heavy, energy-intensive type, and total primary energy requirements per capita are among the highest in Europe. Domestic production of energy is largely from coal mines, which are being exhausted and are heavily subsidized, and from important nuclear capacity. The latter will permit Belgium to decrease its dependence on imported energy to 77% by 1985.

Total primary energy consumption in Belgium has nevertheless been declining for a decade and in 1980 reached the level of 1973, or 46.7 million tons of oil equivalent (68.6 million tons of coal equivalent), owing primarily to economic slowdown in the steel and other energy-intensive industries. Higher prices and better efficiency in such industries as transportation have also played a part.

Successive Belgian Governments have attempted to implement policies outlined in a series of energy papers, appearing in April 1979, June 1979, and March 1980, which called for reducing dependence on oil to less than 50% of total energy demand by 1985 and for reducing growth of energy consumption to 1.5% per year between 1980 and 1990. In July 1981, the first significant conservation measures were taken, with announcement of a series of tax concessions for industry and domestic consumers to encourage investments in insulation and energy efficiency.

Coal.—Over the past few years, demand for coal in Belgium has not been steady. Increased production of hydroelectricity and nuclear-generated electricity together with a negative growth of electricity consumption in 1980 have held down demand. Belgium will, in addition, have four new nuclear power installations onstream by 1985, and this will further soften the demand for steam coal. Countering this to some extent was the effect of the economic recession during 1981, which slowed down increases in the price of imported coal. This, and what was felt to be an inevitable increase in the present low level of steel production, led to some optimism about sales of imported as well as high-cost domestic coal. Belgian buyers nevertheless com-

plained about low quality and transportation bottlenecks in U.S. shipments to Belgium, while recognizing that these problems were related to the great expansion of U.S. exports to Europe in recent years.

A new coal terminal was being built in Ghent to handle expected larger imports, principally from South Africa, by the Rand London Corp. and Anglo International Mining Corp. It will be able to handle 1,000 tons per hour from ships up to 65,000 tons of capacity.

Belgian coal seams are friable and wet, the country rock is not very competent, and the unconsolidated overburden is thick (400 to 600 meters). Mining, under difficult conditions, is at depths of 700 to 1,040 meters. About 85% of the coal is extracted by an advancing method, using chocks (square wooden supports filled with waste), with powered supports at the coal face. Methane is extracted through boreholes at a rate of about 500 to 800 cubic meters per hour per face from about one-third to one-half of the faces; about 60% of this is used at the mines. Over 95% of Belgian coal is mined by N.V. Kempense Steenkolenmijnen in the northeastern Limbourg Province.

Just after the end of 1981, the first ignition took place at the site of the underground coal gasification project near Thulin.

Petroleum.—The contract for the supply of Saudi Arabian crude to Belgium, which began in 1980 and was to extend through 1982, came under study by the new Belgian Government installed near the end of the year. Saudi Arabian officials agreed publicly to consider renegotiation of the price and delivery terms, but this reportedly would involve heavy penalty clauses.

Initially, the contract appeared to be a sound business decision that enabled private suppliers of crude oil to Belgium, including major oil companies, to fulfill requirements and avoid purchases on the spot market. As much as 60% of the crude acquired by Distrigaz, the Belgian Government's semiofficial agency, was taken by the private companies. However, prices declined in 1981, and competitive sales prices set by the Ministry of Economic Affairs were only 89% to 95% of the cost to Distrigaz. It was projected late in 1981 that losses for Distrigaz were at least $16 per ton (over $2 per barrel).

Several additional disadvantages to Belgium to be brought up in the renegotiations were as follows: The contract made Belgium even more heavily dependent on Saudi Arabia (61% in 1981); the Belgian Government, with a heavy financial deficit and requirements for assistance to other industries, such as coal and steel, could ill afford to subsidize its crude oil supply; and the Saudi Arabian contract prevented the Belgian Government from selling the contracted crude outside Belgium.

Uranium.—The plant of Umipray, S.A., a subsidiary of Société de Prayon, Union Miniere S.A., and Metallurgie Hoboken-Overpelt, became operational during the first half of 1980, and work continued according to schedule during 1981. "Operational" as reported by the company meant that the uranium was recovered in some form from the raw material phosphate rock; yellow cake is scheduled to be produced by 1985.

LUXEMBOURG

Metals.—*Iron Ore.*—Domestic production of iron ore declined again in 1980, by 11%, to 560,000 tons, as the last reserves were slowly being mined out. Like the nearby French ores, Luxembourg ores were originally both calcareous and siliceous, but since 1977 only siliceous ore has been mined; this "minette" ore in 1980 had an average iron content between 33% and 34%, with 8.6% CaO, 17% SiO_2, 0.7% P, 0.1% S, and 0.3% Mn. In 1980, only 2 mines remained active compared with 29 in 1950. One of these was an open pit and one (Thillenberg) was underground.

Iron and Steel.—Steel production by Acieries Reunies de Burbach-Eich-Dudelange S.A. (Arbed) fell about 18%, to 3.8 million tons in 1981, which was also a considerable decline from Arbed's peak year, 1974, when Luxembourg steel production was 6.4 million tons.

The Luxembourg Government early in the year approved Arbed's 23.2 billion franc (Lux F)[4] investment plan, to which the Government would contribute Lux F8.0 billion initially, possibly rising to Lux F11 billion. In return Arbed agreed to maintain the work force at 16,500 until 1984 and keep the Government informed about any new commitments. The main features of the proposed plan included a new 650,000-ton-per-year cold rolling mill at Dudelange and a 50,000-ton-per-month medium section mill at Esch-Belval. It was recognized, however,

that the investment program had to be approved by the EEC which might wish Arbed to coordinate with the nearby French mills of Sacilor and Sollac.

In May, another tripartite agreement (Arbed, Government, labor unions) was reached on holding down labor costs by deferral of increases and reducing indexation of certain classes of employees; the Government was also to finance a greater share of the anticrisis division, which provides employment for displaced workers, saving Arbed Lux F600 million.

[1]Chief, Branch of Europe and U.S.S.R., Division of Foreign Data.

[2]Where necessary, values have been converted from Belgian francs (BF) to U.S. dollars at the 1981 average exchange rate of BF37 = US$1.00.

[3]Pettifer, L. The Industrial Minerals of Belgium. Indust. Miner. (London), September 1981, pp. 21-45.

[4]The Luxembourg franc has the same value as the Belgian franc.

Table 4.—Luxembourg: Production of mineral commodities[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
Cement, hydraulic	291	311	318	325	300
Gas, manufactured: Blast furnace (0.026 teracalorie per million cubic feet) million cubic feet	[e]247,000	217,000	213,000	200,000	200,000
Gypsum and anhydrite, crude tons	2,693	990	1,044	856	900
Iron and steel:					
Ore and concentrate	1,537	835	830	560	500
Pig iron (including blast furnace ferroalloys)	3,568	3,721	3,802	3,569	[3]2,888
Steel:					
Crude	4,329	4,790	4,950	4,618	[3]3,791
Semimanufactures	3,468	3,800	3,931	3,746	3,400
Phosphates: Thomas slag, gross weight	713	771	730	677	700
Sand and gravel:					
Foundry sand tons	4,942	2,771	1,400	--	--
Other sand except glass sand	638	615	747	709	700
Gravel	183	213	229	216	200
Stone:					
Construction:					
Crushed thousand cubic meters	778	715	745	674	700
Dimension:					
Rough cut do	6	7	4	[4]14,600	[4]14,000
Facing thousand square meters	5	3	4	4	4
Finished cubic meters	6	72	90	282	200
Flagstone:					
Polished square meters	5	4	4	[4]590	[4]600
Rough tons	1	1	([5])	297	300
Paving stone thousand pieces	13	14	--	--	--
Slate slabs do	1,383	1,363	1,171	1,212	1,200
Industrial:					
Dolomite	407	271	294	385	300
Limestone tons	NA	169,036	140,950	--	--
Quartz, quartzite, glass sand do	9,940	20,550	79,600	21,000	20,000

[e]Estimated. [p]Preliminary. NA Not available.

[1]Table includes data available through June 23, 1982.

[2]In addition to the commodities listed, refractory clays and manufactured phosphatic fertilizers other than Thomas slag are produced, but data are not published, and information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Unit changed to metric tons.

[5]Less than 1/2 unit.

The Mineral Industry of Bolivia

By Pablo Velasco[1]

The downtrend in economic growth that began in 1977 continued during 1981, owing to chronic political instability and social unrest, as well as adverse conditions in world mineral markets.

The economy suffered from effects of recession, work stoppages, higher costs, and declining mineral production. The gross domestic product grew in real terms by only 0.5% or less in 1981 to the equivalent of $7 billion,[2] calculated at current prices. The rate of inflation increased from 18% in 1978 to 52% in 1981, one of the highest in recent years.

The tin industry remained the cornerstone of the economy, although it has been in decline since 1977. Production of many other minerals has also been declining while operating costs have risen and world metal prices have been depressed. State-owned Corporación Minera de Bolivia (COMIBOL) continued as Bolivia's major mineral producer and the most important generator of foreign exchange. In 1981, COMIBOL continued in financial difficulties that were hampering its part in the implementation of the national investment plan for 1981-85. The plan provides for restructuring the mineral sector at an estimated cost of $637 million and argues for an increase in the role of the private sector in exploration and marketing.

COMIBOL has been relying on outside financing to cover annual deficits in excess of $30 million for some years. In 1981, a former COMIBOL official declared that the nationalized mines were on the "edge of bankruptcy" with the exception of the Huanuni Mine as the only profitable mine among COMIBOL's 14 mining companies. Both COMIBOL and the private mining sector complained that the high charges of the state smelting firm, Empresa Nacional de Fundiciones (ENAF), lowered revenues of the mine producers.

The private mining sector included relatively efficient, well-managed medium miners, some small miners, and mining cooperatives.

Besides tin, Bolivia was an important world producer of antimony and tungsten and a significant producer of silver, zinc, and lead.

Bolivia has become an important producer and exporter of natural gas. In 1981, earnings from natural gas exports were next in importance after those from tin exports.

In the past, Bolivia has been a net exporter of crude petroleum, but in 1981 it was necessary to import certain petroleum products, especially fuel oil and diesel oil. The replacement of fuel oil and diesel oil by natural gas would represent a considerable saving for the country. To accomplish that goal, the Inter-American Development Bank (IDB) in 1981 approved a loan of $97 million to help build a gas pipeline from the gasfields near Santa Cruz to the main industrial and mining centers of Cochabamba, Oruro, and La Paz.

Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), the state oil company, proposed a new 5-year development program aimed at halting the decline in petroleum production. YPFB received formal proposals from 5 foreign oil companies, out of 38 invited, to pursue petroleum exploration under operational contracts governed by the 1977 General Hydrocarbons Law. The five companies are Perez Co. (Argentina), Anschutz Corp., BMF Chemical Corp., Occidental Boliviana Inc., and Tesoro Bolivia Petroleum Co. from the United States. The

two latter companies were already established in Bolivia with operational contracts. Both were producing natural gas and condensate.

Government Policies and Programs.—On December 8, 1981, the long-awaited Investment Law was approved. The law was intended to encourage investments and does not distinguish between national and foreign investors, except that the foreign investor is assured the right of repatriation of profits. The law applies to new investments as well as to reinvestment in agriculture, industry, construction, mining, and tourism. Basically, it provides for duty-free imports of materials and machinery not produced in Bolivia and for various other tax benefits depending on the geographical zone and nature of the investment. The new law provides all the guarantees granted by the Bolivian Constitution and allows for the necessary contractual requirements specified in investment insurance agreements made by foreign governments.

Bolivia was trying to revive its mining sector, which was going through a very difficult period, with output and investment inhibited by political and economic problems. Nevertheless, a promising new mining development plan was agreed upon in July at the country's first top-level meeting in Tarija of Government and private mining representatives. Problems discussed included the friction between tin-mining companies and ENAF, the tax system, the mine leasing system, metals and minerals marketing sales, and the foreign investment policy.

The July meeting resulted in several constructive measures. A major advance was the agreement to work toward reforming the taxation system. The first step is to rationalize and unify the accounting system used by the mines, but this was expected to take at least a year. Meanwhile, many mining companies must still be taxed on "assumed profits," based on the Government's assessment of their operating costs. It was also agreed that mining companies should have better access to potential mining areas restricted to the Government. Suggestions were made regarding joint COMIBOL-private mining projects. This measure could help COMIBOL, which has no funds for new projects, and might also enable private mining concerns to gain access to ore reserves presently closed to them. It was also agreed that there would be freedom to negotiate with ENAF over its smelter charges.

The Government also agreed that $637 million would be invested in the mineral sector in 1981-85, with $130 million earmarked for private miners. It appeared that Bolivia would have to raise this money abroad. The agreements were ratified and converted into the National Mining Policy contained in supreme Decree No. 18509 approved by the President and Ministers on July 23, 1981. The state, through the Ministry of Mines and Metallurgy, will provide strict supervision of the state-owned companies of this sector in the areas of production, research, technology, marketing, procurement, and financing. The National Mining Policy established a program of investment priorities covering the whole gamut of mineral development from exploration to beneficiation.

The 16 separate policies specified in Decree No. 18509 cover (1) exploration, (2) mine development, (3) beneficiation, (4) radioactive minerals, (5) nonmetallic minerals, (6) metallurgy, (7) iron and steel, (8) taxation, (9) financing, (10) investment, (11) pricing, (12) marketing, (13) technical assistance and promotion, (14) basic and applied research, (15) legislation, and (16) social policy.

The $637 million global investment plan for the 5-year period 1981-85 outlined in Decree No. 18509 allocates $130 million to the private mining sector. COMIBOL's investment requirements during this period for exploration, mine development, and beneficiation facilities take up a large share of the global investment plan. The overall investment allocations were programed as follows: exploration, $127 million; mine development, $130 million; and beneficiation facilities, $380 million.

PRODUCTION

Production of virtually all metals continued in a depressed phase that began in 1979 with negative consequences for the national economy. The most important causative factors were: (1) the slow depletion of ore reserves, (2) lack of investment by the public and private mining sector in exploration and development of new ore deposits, and (3) lack of new mining and plant equipment. Management problems affected all of the nationalized mines. Labor unrest and strikes in the larger mines

reduced productivity, especially in the last 3 years.

As detailed in table 1, mineral production in the past 4 years was generally at a lower level than that of 1977, except for gold and silver, which responded to higher world prices. Production of antimony and tin continued its upward trend reflecting better utilization of installed smelter capacity. Mine production of tin, which dropped 1.4% in 1980 compared with the 1979 output, increased 9.3% in 1981. COMIBOL was the most important tin producer in the country, accounting for 70% of output in 1981.

Silver ore production continued its upward trend since 1979, increasing 15% in 1981. The major silver producer was COMIBOL, contributing an average of 85% of the total in the 1979-81 period.

Antimony production, following an increase of 19% in 1980, decreased 1.1% in 1981. The medium- and small-miners groups were the only producers of this metal. Production of zinc in Bolivia, mostly from COMIBOL, decreased 6.4% in 1981.

Production of oil has been falling steadily since 1978 when Bolivia ceased to export crude oil in order to supply rapidly increasing domestic consumption. Oil output reported in 1981 decreased 8% while natural gas output increased 4%.

Table 1.—Bolivia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
METALS[3]					
Antimony:					
Mine output, metal content	16,340	13,337	13,019	15,465	15,296
Metal	1,431	2,391	2,500	5,099	5,116
Arsenic, mine output, white arsenic equivalent[e]	NA	--	--	--	2
Bismuth:					
Mine output, metal content	651	307	10	11	11
Metal	586	292	--	41	6
Cadmium, mine output, metal content[4]	150	93	90	173	165
Copper, mine output, metal content	3,191	2,853	1,797	1,884	2,637
Gold, mine output, metal content[5] troy ounces	24,293	24,660	30,319	52,075	66,372
Iron ore:[6]					
Gross weight	6,800	55,450	25,000	5,600	6,504
Metal content	4,328	35,313	15,900	3,570	4,113
Lead:					
Mine output, metal content	18,937	18,039	15,359	17,747	16,757
Metal including alloys	75	489	588	500	232
Manganese ore:					
Gross weight[e]	8,586	1,237	10,500	4,500	[e]8,000
Metal content	2,576	371	3,150	1,350	[e]3,600
Silver, mine output, metal content thousand troy ounces	5,813	6,285	5,742	6,099	6,602
Tin:					
Mine output, metal content	33,740	30,881	27,648	27,272	29,801
Metal, smelter	13,045	16,254	14,950	18,191	20,005
Tungsten, mine output, metal content	3,063	3,073	3,114	3,359	3,449
Zinc, mine output, metal content	61,406	53,923	51,621	50,260	47,029
NONMETALS					
Barite	[e]2,157	[e]2,889	[e]2,228	8,694	2,130
Calcite	--	--	--	302	271
Cement, hydraulic	266,876	254,254	251,000	318,200	[e]317,000
Feldspar-related minerals: Sodalite	6	NA	NA	--	--
Gypsum, crude	[e]1,000	[e]1,000	[e]1,000	1,200	748
Salt[e]	10,000	10,000	10,000	10,000	10,000
Sulfur	6,276	14,229	15,000	11,244	10,202
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross million cubic feet	149,075	154,769	[r]159,961	168,818	175,420
Marketable do	70,536	61,297	[r]66,294	78,639	[e]81,700
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	43	40	--	768	768
Liquefied petroleum gas do	643	815	820	[e]850	NA
Petroleum:					
Crude do	12,676	11,844	10,174	8,704	8,032
Refinery products:					
Gasoline do	2,649	4,133	4,472	3,684	3,330
Jet fuel do	485	605	541	713	704
Kerosine do	1,050	1,169	1,033	1,021	725

See footnotes at end of table.

Table 1.—Bolivia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Distillate fuel oil					
thousand 42-gallon barrels	1,679	1,847	1,830	1,587	1,390
Residual fuel oil ---------- do	1,500	1,525	720	97	87
Lubricants ---------- do	88	100	156	181	150
Other:					
Liquefied petroleum gas ---- do	1,729	292	355	584	1,112
Unspecified ---------- do	NA	36	[7]1,771	1,898	1,360
Refinery losses[8] ---------- do	127	108	73	12	9
Total ---------- do	9,307	9,815	10,951	9,777	8,867

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through July 26, 1982.

[2]In addition to the commodities listed a variety of crude construction materials (clays, crushed and broken stone, dimension stone, and sand and gravel) are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Unless otherwise specified, data represent actual production by COMIBOL and small- and medium-scale mines.

[4]Cadmium contained in zinc concentrates produced by COMIBOL. (Cadmium is not recovered in elemental form in Bolivia.)

[5]COMIBOL output plus sales by placer mines. (Small- and medium-scale mines cannot legally export gold.)

[6]Data represent exports and are regarded as being virtually equal to production.

[7]Includes topped crude (presumably further processed outside of refineries reported in this table, or used without further processing) as follows, in thousand 42-gallon barrels: 1979—669 and 1980—481.

[8]Refinery fuel not reported separately, if at all, in recorded data.

Table 2.—Bolivia: COMIBOL's total mineral output

(Metric tons of metal content unless otherwise specified)

Commodity	1977	1978	1979	1980	1981	Change, percent (1980-81)
Bismuth	631	305	[r]2	11	9	-18
Cadmium	138	108	[r]88	134	122	-9
Copper	3,643	2,733	[r]1,753	1,797	2,623	+46
Gold[1] ---------- troy ounces	492	9,480	NA	NA	NA	--
Lead	14,366	12,646	[r]9,501	[r]10,152	9,598	-5
Silver ---------- thousand troy ounces	5,433	[r]5,691	[r]4,758	[r]5,112	5,498	+8
Tin	23,306	21,443	[r]18,994	[r]18,765	20,804	+10
Tungsten (WO_3)	1,056	[r]989	[r]1,217	[r]1,664	1,424	-14
Zinc	35,190	38,639	[r]30,244	29,953	27,218	-9

[r]Revised. NA Not available.

[1]COMIBOL has not reported production of gold since 1978.

Source: COMIBOL, 1978, 1979, 1980, and 1981 operations reports.

Table 3.—Bolivia: Principal minerals produced by the medium miners group

(Metric tons of metal content unless otherwise specified)

Commodity	1977	1978	1979	1980	1981	Change, percent (1980-81)
Antimony	9,868	8,801	[r]10,493	11,552	12,155	+5
Lead	2,186	3,308	3,467	3,994	4,359	+9
Silver ---------- thousand troy ounces	378	550	740	664	787	+19
Tin	6,967	6,537	5,930	5,899	6,335	+7
Tungsten (WO_3)	1,602	1,677	1,504	1,558	1,765	+13
Zinc	26,097	19,263	16,728	16,748	17,731	+6

[r]Revised.

Source: Boletin Estadistico Minero, No. 96, December 1981, Ministerio de Minería y Metalurgia.

TRADE

The mining and metallurgical activity in Bolivia, considered as a whole, had an unfavorable performance in 1981, as far as the value of exports is concerned. This outcome was due mainly to a sharp decline in world prices for tin, Bolivia's most important export commodity. As shown in table 5, exports of metallic ores and metals amounted to $556 million in 1981, a decrease of 13.3% compared with that of 1980. While the quantity of silver exports rose 15% in 1981, the earnings decreased 39% because of falling prices.

The value of COMIBOL's exports of concentrates of tin, copper, lead, zinc, tungsten (WO_3), and silver declined 39% in 1981 compared with that of 1980, as shown in table 5.

The metallurgical industry and, in particular, tin smelting has been the only major growth area of the Bolivian mineral export sector in recent years. The country now has the capacity to refine all of the tin that is produced in the mines as concentrate. During 1981, ENAF exports of tin, antimony, and special alloys of tin, lead, antimony, copper, bismuth, and arsenic increased almost 8% compared with that of 1980.

The value of exports of natural gas to Argentina increased 48% to $326.2 million in 1981. Natural gas exports ranked second in importance in Bolivia's export economy after tin metal and concentrate exports. Exports of refinery products of petroleum declined to $2.1 million in 1981.

According to YPFB, Bolivia expects to export 400 million cubic feet of gas per day to Brazil over a period of 20 years; it is already exporting more than 220 million cubic feet per day to Argentina. Before committing itself to selling gas to Brazil, however, Bolivia must verify reserves of at least 3 trillion cubic feet in addition to the reserves it needs for current markets.

Table 4.—Bolivia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1980	1981	Destinations, 1981
METALS			
Antimony:			
Ore and concentrate	12,622	11,713	NA
Metal including alloys, all forms	1	6,587	
Bismuth:			
Ore and concentrate	NA	2	
Metal including alloys, all forms	NA	NA	
Copper ore and concentrate	1,676	2,545	
Iron ore and concentrate	--	4,113	
Lead ore and concentrate	15,936	15,613	
Silver ore and concentrate thousand troy ounces	5,684	6,547	
Tin:			
Ore and concentrate	NA	5,525	
Metal including alloys, all forms	721	18,725	
Tungsten ore and concentrate	3,435	3,091	
Zinc ore and concentrate	46,237	44,681	
Other metals including alloys, all forms	78	721	
NONMETALS			
Barite	8,649	2,130	
Gypsum and plaster	1,200	748	
Stone:			
Calcite	302	271	
Sodalite	315	2	
Sulfur, elemental	11,243	10,202	

NA Not available.

Source: Boletin Estadistico Minero, No. 96, December 1981, Ministerio de Minería y Metalurgia, p. 10.

Table 5.—Bolivia: Value of mineral exports, by mining group

(Million dollars, c.i.f. value, unless otherwise specified)

Mining group	1980	1981	Percent of total (1981)	Change, percent (1980-81)
COMIBOL	234.8	142.8	26	-39.2
Medium miners	64.8	68.7	12	+6.0
Small miners	64.8	50.5	9	-22.1
Other	11.0	7.2	1	-34.6
Smelters (ENAF)	265.7	286.8	52	+7.9
Total	641.1	556.0	100	-13.3

Table 6.—Bolivia: Leading mineral and mineral fuel exports

(Million dollars, c.i.f. value, unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]	Percent of grand total (1981)	Change, percent (1980-81)
Minerals:							
Tin	[r]328.8	373.7	[r]395.7	378.1	343.1	35.1	-9.3
Silver	30.8	33.8	58.3	[r]117.3	71.7	7.3	-39.0
Tungsten (WO_3)	45.1	39.5	[r]35.2	47.4	42.9	4.4	-9.5
Zinc	44.7	31.4	42.7	36.7	40.4	4.1	+10.1
Antimony	18.0	16.6	29.6	26.4	34.3	3.5	+30.0
Other	25.3	20.0	22.6	34.2	23.5	2.4	-31.3
Total	[r]492.7	515.0	[r]584.1	640.1	555.9	56.9	-13.2
Mineral fuels:							
Natural gas	66.8	78.5	[r]104.9	[r]220.9	326.2	33.4	+47.7
Petroleum	[r]67.5	42.3	[r]44.2	22.6	2.1	.2	-90.7
Total	[r]134.3	120.8	[r]149.1	[r]243.5	328.3	33.6	+34.8
Other exports	[r]93.1	86.6	118.1	[r]149.7	93.1	9.5	-37.8
Grand total	[r]720.1	722.4	[r]851.3	[r]1,033.3	977.3	100.0	-5.4

[p]Preliminary. [r]Revised.

Source: Banco Central de Bolivia; Ministry of Mines; YPFB, 1982.

Table 7.—Bolivia: Exports of mining and metallurgical products, by market group

Market group	1981 (million dollars)	Percent of value
United States	249.9	45
European Economic Community	190.2	34
European Free Trade Association	42.1	8
Council for Mutual Economic Assistance	31.6	6
Asia	17.5	3
Andean Pact	14.2	2
Latin American Integration Association	9.3	2
Other	1.2	--
Total	556.0	100

COMMODITY REVIEW

METALS

Antimony.—Bolivia was one of the world's leading producers of antimony ore and metal. In 1981, the Bolivian producers formed a new organization known as Comité Boliviano de Productores de Antimonio (CBPA). This was set up with the aim of including all of the world's producers. CBPA called a meeting on September 22-25 to which it invited producers from Austria, Canada, China, Italy, Mexico, Morocco, Peru, the Republic of South Africa, Spain, Thailand, Turkey, and the United States.

The aim of the meeting was to discuss common problems of world antimony producers and to initiate cooperative measures that would encourage the development and progress of the antimony industry, establish an International Council of Antimony, finance promotion and technical developments in new applications of all forms of antimony, organize a statistical and economic secretariat, define trading policies, and protect and establish world antimony prices.

From the total production of 1981, 78% corresponded to the medium-sized mining sector and 22% corresponded to the small-sized mining sector. Empresa Minera Unificada S.A. mined two-thirds of the antimony produced by the medium mining sector or one-half of the national total. Metallic antimony production in 1981 from ENAF's Vinto antimony smelter reached almost 100% of full capacity at 5,116 tons of antimony and 628 tons of antimony trioxide. In 1981, Bolivia's antimony exports increased by 41% in volume and 30% in value.

Gold.—Gold production in Bolivia showed a 26% increase in 1981 compared with that of 1980; 76% of the total corresponds to the small-miners group made up of gold cooperatives with operations in the rivers of

Tipuani, Guanay, and Cangalli. The balance was accounted for by South American Placers Inc. (SAPI). In 1977, a local firm, Cía. Minera del Sur S.A., bought 100% of SAPI shares. There are indications that gold may exist in the north of La Paz, El Beni, and Pando Departments and in the Provinces of Ayopaya and Chapare in Cochabamba Department. These potential sites are in undeveloped areas with little or no infrastructure. Bolivia has not exported gold since 1974. By law, the Banco Minero de Bolivia (BAMIN) purchases all gold produced in the country by cooperatives and small mines and in turn sells it to authorized jewelers and to the Bolivian Central Bank, which is the only institution that can directly export gold.

Bolivia's first gold symposium, held in La Paz in early 1981, strongly recommended special legislation that would have the effect of attracting domestic and foreign capital to develop the country's gold resources. The symposium also recommended a mining investment law that would financially reinforce the gold prospecting and mining activities to be carried out by the Bolivian Geological Service and provide funds for mining and exploration by COMIBOL.

The Government established a commission to study gold legislation to promote the auriferous industry in the country, although incentives existed for the exploration of gold. There was no tax on the production of gold by small-scale operators and cooperatives. Large-scale operators such as SAPI were subject to production taxes. No large-sized operation, highly mechanized, can be expected to develop a gold project that is too risky unless a definite, stable, and uniform taxation law for gold is promulgated by the Government.

Gold cooperatives in the Yungas area near La Paz were in the process of modernization. Access roads have been built, and the World Bank (International Bank for Reconstruction and Development) has provided credit to BAMIN to buy tractors and scrapers. Most of the gold was produced by hand panning and from dangerous shallow shafts and drifts driven into old alluvium. The Tipuani cooperatives comprised about 6,000 miners. Their working methods were considered to be inefficient, and over two-thirds of the gold potential of the river, which could be recovered by modern methods and systematic use of geological surveys, is lost.

Iron Ore.—Empresa Siderúrgica Boliviana S.A. (SIDERSA) continued exporting iron ore from the alluvial deposits of Mutún to the San Nicolas smelter in the Rosario Province of Argentina. In 1981 the limited exports of iron ore amounted to 4,113 tons, 15% higher than that of 1980. The export of this ore was made through Brazilian territory by train to Rio Paraná and then by barge to Argentina. No significant new developments in iron mining were reported in 1981.

Iron and Steel.—Five firms were prequalified by SIDERSA and the National Institute for Pre-Investment to update the feasibility study on the iron and steel complex at Santa Cruz performed by A. G. McKee of Cleveland, Ohio, in 1977. The proposed $60 million, 100,000-ton-per-year rolling mill was to be reviewed as part of the overall study of the firms prequalified. Two were U.S. firms: Morrison Knudsen and United States Steel Corp. The three Brazilian firms were Internacionál de Ingenieros; Hidroservice, in conjunction with the Bolivian firm Consultores Nacionales; and Cía. Brasileira de Proyectos Industriaís (COBRAPI).

In September 1981, SIDERSA announced that COBRAPI, the Brazilian firm, was selected to conduct the updating and complementing of the existing feasibility study. The complementary studies required will address the following topics: (1) internal and foreign markets, (2) transportation systems, (3) ore pelletization, (4) selection of plant sites, (5) urban development; (6) economic and financial study of the entire project, (7) socioeconomic study, and (8) personnel requirements. The updating and complementary study was estimated to cost $700,000 for completion in 6 months. IDB was expected to finance this new study.

Lead.—Lead production decreased 6% in 1981. The largest producer of lead was COMIBOL with 57% of the total, followed by the medium miners with 26% and small miners with the remainder. The Bolivar Mine, which is a zinc-lead-tin mine of COMIBOL, has been under extensive exploration drilling since it was reclaimed from the private sector. This program has helped to make Bolivar Mine one of the most successful ventures that COMIBOL has undertaken in recent years. The Bolivar Mine was expected to supply lead concentrate to the new smelter being built at Karachipampa near Potosí.

The concern of COMIBOL-ENAF officials in 1981 was whether there are sufficient ore reserves in the vicinity of the smelter to allow it to operate at 80% of capacity or better. The Maria Luisa and Chiroma deposits were inadequate, and COMIBOL was concerned whether the Bolivar Mine has

sufficient ore reserves to meet the smelter's requirements.

According to an official order by the Ministry of Mines and Metallurgy, Bolivia was to suspend exports of lead and silver concentrates beginning in January 1983 to ensure adequate supplies for the Karachipampa smelter, which is expected to be in full operation by the end of 1983. From the beginning of 1983, Bolivia's entire production of lead and silver concentrate will be sold to Karachipampa, and any export licenses for those materials will require approval by the company operating the Karachipampa smelter, Sociedad del Complejo Metalúrgico de Karachipampa.

The Ministry of Mines and Metallurgy stated that by November 1982 the terms for purchases of concentrates including treatment charges and deductions would be established. Miners will be guaranteed that total treatment charges will be set on a competitive basis, in accord with the Government's policy on metallic minerals.

The $164 million Karachipampa smelter was being constructed as a joint venture of COMIBOL-ENAF by Sidech S.A. of Belgium and Klöckner Industrie Anlagen GmbH of the Federal Republic of Germany. The smelter was designed to produce annually about 24,000 tons of lead, 200 tons of silver, 800 tons of tin, 2,000 tons of antimony, 3,300 tons of zinc, and some copper and bismuth from a feed of about 50,000 tons of concentrates. The scheduled completion date was the end of 1982 with the smelter ready for operation in 1983.

Silver.—Production of silver ore increased 8% in 1981. COMIBOL was the major producer of silver during the 1979-81 period with an average of 85% of the national total; the medium miners group contributed 12% of the total, and the small miners group contributed 3%.

The value of silver ore exports decreased to $72 million, the second highest among the metallic minerals and third after tin and natural gas among all mineral exports.

Tin.—The tin industry continued as the cornerstone of the Bolivian economy, although its output has been in decline since 1977. Bolivia's overall position as tin producer in the world in 1981 continued in fourth place after Malaysia, Indonesia, and Thailand.

Output of tin, of which about 70% was accounted for by the state-owned mining corporation, COMIBOL, increased 9.3% in 1981 compared with that of 1980. The increase in production was significant, in spite of labor conflict in the tin mines during the year.

The second most important producer of tin was the group of medium-sized miners with a contribution of about 21% of the total. Its output increased almost 8% in 1981. The small-sized miners were the only group that did not increase production in 1981 and experienced a decline of 5%.

In January, the London Metal Exchange opened with a price of $6.50 per pound of fine tin but this fell to $5.70 per pound in the middle of the year. During the second half of the year the price trend reversed, climbing to $7.20 per pound. Tin production provided most of the income of COMIBOL, which benefited from the higher prices during the second half of 1981. During the first half of the year, however, COMIBOL was reported to be losing $1.04 per pound of tin sold, that is the difference between the average cost of production, $7.10 per pound, and the average sale price of $6.06 per pound.

Empresa Minera Huanuni continued as the most important tin producer of the 12 subsidiary companies of COMIBOL and was the only company that earned a profit when the tin price was not unusually high. Its mining costs are one-half of COMIBOL's average costs. The grade of tin mined was still relatively high, 1.0% to 1.1% tin content compared with the other mines of COMIBOL. The ore was easier to concentrate, and the level of recovery was higher than the other COMIBOL mines.

During recent years, Huanuni has intensified exploration and development by taking advantage of greater budget allocations from COMIBOL. As a result of the drilling programed, the company has discovered a continuation at greater depth of several veins worked in upper levels of the mine. Huanuni's production of tin has increased 100% in recent years. The company was planning to improve the haulage and drainage facilities in the mine, to expand the mill capacity, and to add a preconcentration plant to feed 3% tin concentrates to a proposed volatilization plant at Machacamarca, several kilometers west of the mine site.

Empresa Minera Catavi, located at Llallagua, Siglo XX, Department of Potosí, 40 kilometers southeast of the Huanuni Mine, formerly owned by Patiño Mines and E. C. I. and called capitol of the tin industry of Bolivia, continued to experience serious financial problems. The ore grade in its mines was below 0.4% tin content and

declining. Output fell in 1981, and financial losses accumulated. In 1981, losses were reported reaching almost $2 million per month.

Japan's agency of international cooperation in 1981 made an assessment of the Catavi Mines in connection with a request for financial aid to purchase new equipment and machinery. New areas for block cave mining were outlined, and conventional underground exploitation was being extended to lower levels. Open pit mining has been put aside owing to the low average grade of 0.19% tin content.

Empresa Minera Unificada del Cerro de Potosí, another of the famous mines of COMIBOL, also had serious operating problems. The Cerro Rico tin and silver ore deposit, discovered in 1545, has been mined first for silver and afterwards for tin. Currently, the upper ore body is exploited by some 300 small miners and cooperatives operating approximately 575 small mines. The lower part of the Cerro Rico is exploited by COMIBOL. It operated five sectors: Pailaviri, Ingenio Velarde, Colavi, Conutillas, and La Palca. At La Palca, 20 kilometers from Potosí, construction continued on a Soviet-designed tin volatilization plant.

Empresa Minera Quechisla, the most southern mining company of COMIBOL, located 632 kilometers south of La Paz, is formed by a large group of small mines that produce a large variety of different minerals including tin. This group is centered around Telamayu where COMIBOL's bismuth smelter-refinery is located, which in 1981 was shut down.

ENAF, which was set up in the early 1970's, operated three smelters: a high-grade tin smelter with a capacity of about 21,000 tons per year that is 10 years old, a new low-grade tin smelter undergoing trials in 1981, and the antimony smelter built in 1975. The three smelters are located at Vinto, 7 kilometers from Oruro.

The high-grade smelter treated over two-thirds of the tin concentrate produced in 1981. According to Government requirements, COMIBOL and the private mining sector are obligated to supply ENAF with tin concentrate and export only that which cannot be treated by ENAF. ENAF's smelting charge for high-grade, 43% tin concentrate was $630 per ton of contained tin, almost $200 higher than the Texas City smelter in the United States. Low-grade, 25% tin concentrate was $660 per ton, $200 higher than that of Capper Pass smelter in the United Kingdom. Adding other costs for marketing, ENAF's charges totaled $850 per ton.

The La Palca volatilization plant, owned by COMIBOL and designed and built by Machino Export of the Soviet Union at a cost of over $70 million, has a capacity of 400 tons per day of concentrate with 3% to 6% tin content. The plant was undergoing trials and was expected soon to supply tin dust feed to the new low-grade refinery at Vinto. This 10,000-ton-per-year plant, which came onstream in April 1980, still experienced startup problems but nevertheless produced some tin during 1981 to augment COMIBOL's refined tin output. COMIBOL was engaged in repairing the low-grade refinery after its electric furnace broke down in February.

The La Palca plant was expected to be running at full capacity from April 1982. Serious local environmental pollution problems have occurred since the plant was fired up in mid-December 1981. In addition to pollution problems, pipes used in the arsenic exhaust stage were of small, fragile size that are not recommended by the Soviets. Soviet technicians had also recommended an exhaust stack 200 meters high, but the Bolivians reduced the height to 120 meters.

Tungsten.—Despite the worldwide economic recession, tungsten demand remained strong until the latter part of 1981. Bolivia maintained its position as the leading producer in Latin America. Output in 1981 increased by 3% compared with that of 1980. Of the total output, 51% corresponded to the medium miners, 41% to COMIBOL, and 3% to the small miners.

The International Mining Co. from its mines at Chojlla and Enramada produced almost all, 85%, of the tungsten credited to the medium miners group and has played a leading role in recent meetings of the International Association of Tungsten Producers. Exports of tungsten concentrate (WO_3) decreased 10% in volume and declined 9.3% in value in 1981 compared with 1980 exports. The medium miners group exported 47% of the total volume, followed by COMIBOL with 39% and the remainder by the small miners group and others.

Zinc.—Production of zinc in Bolivia in 1981 declined 6.4% compared with that of 1980. The decline in production was due to slow depletion of ore reserves in the producing mines, the lack of private and public investment in exploration, lack of equipment replacement in the mines and processing plants, and labor unrest. COMIBOL

continued as the largest zinc producer in the country with 58% of the total, followed by the medium miners group with 36% and the small miners group with 6%. The Karachipampa zinc smelter, under construction by Klöckner Industrie under the joint venture of COMIBOL-ENAF, was expected to be ready for operation in 1983.

NONMETALS

Cement.—There were three cement companies operating in Bolivia: (1) Cía. Boliviana de Cementos S.A.M., located in Irpa-Irpa, Department of Cochabamba, with a production capacity of 100,000 tons per year; (2) Fabrica Nacional de Cementos S.A., located at Cal Orko, Department of Sucre, with a production capacity of 300,000 tons per year; and (3) Sociedad Boliviana de Cementos S.A., located in Viacha, Department of La Paz, with a capacity of 225,000 tons per year. The total cement capacity for the country amounted to 625,000 tons per year. A fourth cement plant with an initial capacity of 150,000 tons per year was under construction at Yacuces, Department of Santa Cruz. Production from this plant will help meet the growing demand for cement on the domestic market. Under the terms of an economic cooperation agreement signed with Brazil in 1974, a certain percentage of production is expected to be exported to that country during the early years of operation. The $101 million project was under the direction of the Santa Cruz Public Works Committee, and IDB was envisaged as a possible lending source.

Salt.—A technical work published in La Paz in Spanish provides a good description of the salt deposits in Bolivia's Altiplano with a special focus on the Salar de Uyuni.[3]

The Salar de Uyuni is considered to be the largest salt crust in the world (10,000 square kilometers). It originated in the Tauca dried lake and is located in the central depression of the Bolivian Altiplano. The thickness of the crust is about 12 to 13 meters. Reserve estimates indicate that this salt deposit contains 5 million tons of lithium (an amount similar to the total known world reserves to date), 3 million tons of boron, and 100 million tons of potassium.

Twenty smaller salt deposits were also covered in the cited work such as (1) sodium carbonate deposits (Collpa Laguna, Hedionda Sur, Cachi Laguna, and Khara Laguna) with about 100,000 to 150,000 tons of Na_2CO_3; (2) sodium sulfate deposits (Canapa, Laguna Colorada) with about 100,000 recoverable tons of Na_2SO_4; and (3) borate deposits-ulexite (Rio Grande, north of Uyuni salt deposits, Challviri, Capina, Pastos Grandes, and Laguani). Rio Grande is the largest with 1,600,000 tons of boron; the other deposits contain about 3 million tons of boron. Lithium reserves, often associated with the boron, are chiefly located in the Rio Grande deposit as well as the other small salt deposits.

Sulfur.—Nonmetallics have been traditionally of minor importance in the mineral industry of Bolivia. The most important nonmetallic mineral has been sulfur. Sulfur is mined by small miners in the western Cordillera of the Andes along the border of Chile. The occurrence of sulfur in Bolivia is almost always associated with volcanic activity. Output of sulfur continued in a downtrend.

MINERAL FUELS

In 1981, the Consejo Nacional de Asesoramiento y Legislación (CONAL) introduced their final recommendation on the national medium-term hydrocarbons policy through the Minister of Energy and Hydrocarbons for further consideration. CONAL strongly recommended the preparation of a sound general energy policy emphasizing conservation of energy and promotion of studies on the application of alternative sources of energy. CONAL also recommended the establishment of a multidisciplinary commission of high professional level, under the responsibility of the Minister of Energy and Hydrocarbons, in charge of supervision and control of the gas pipeline Santa Cruz-São Paulo project.

Natural Gas.—Natural gas production continued its upward trend since 1977 and increased almost 4% to 175.4 billion cubic feet in 1981. Revenues from natural gas exported to Argentina in 1981 increased 48% to $326.2 million compared with that of 1980. Bolivian natural gas production was determined by the export volume to Argentina since internal consumption was minimal. Just over 50% of the gross output is marketed; the other one-half is reinjected, flared, or vented.

Gas del Estado of Argentina and YPFB were scheduled to resume negotiations in January 1982 to set natural gas prices for the first semester of 1982. While the Bolivians were expected to press for price increases from the December 1981 level of $3.82 per thousand cubic feet, Argentina was expected to seek a decrease in the contracted volume.

Bolivia and Brazil awarded a basic engineering contract for the 1,940-kilometer Santa Cruz-São Paulo pipeline, estimated to cost $1.2 billion, to Italy's Snamprogetti/S.p.A. The engineering study was scheduled for completion by March 1982. A final routing for the gasline is to be selected in the joint meeting of the technical committee in Rio de Janeiro, Brazil.

Plans call for 570 kilometers of pipeline to be constructed in Bolivia and 1,370 kilometers in Brazil. In addition, Bolivia will have to invest $700 million more to upgrade its gas production and transportation facilities. Construction is to be completed by 1987. Exports of gas should continue to provide Bolivia with much needed foreign exchange earnings. The agreement with Brazil provided the most promising long-term export outlet for Bolivia's gas.

Reserves of natural gas were sufficient to support plans for a large expansion of the domestic distribution network as well as for an increase of exports. Plans envisaged a more than doubling of domestic natural gas use in the next 4 years, with a production of 53 million cubic feet per day seen for 1985.

Omnium Technique des Transports par Pipelines of France reported YPFB awarded it a global contract in connection with a 794-kilometer gas pipeline to transport gas from the Santa Cruz area to La Paz. Initial capacity is to be 42 million cubic feet per day, rising eventually to 97 million cubic feet per day.

In late 1981, IDB approved a loan of $97 million for the construction of a 900-kilometer pipeline to supply an additional 33 million cubic feet of gas per day to the three largest cities on the Altiplano-Cochabamba-Oruro and La Paz.

The expanded domestic gas pipeline system emanating from the Santa Cruz area would make a new energy source available to the mining and smelting facilities in Bolivia's mining industry.

Petroleum.—In 1981, production of crude oil and condensate fell by 8% to about 8.0 million barrels compared with the 1980 drop of 14%. The 8-year downtrend brought oil production to a level just below domestic consumption of 24,000 barrels per day. Oil export revenues fell 65% to $8.6 million in 1981 compared with that of 1980.

In 1981, production of crude oil plus condensate averaged 22,311 barrels per day, and YPFB, together with the contracted firms of Occidental, Tesoro, and Anschutz, expects to average 26,600 barrels per day in 1982.

According to YPFB's production schedule projected for 1982, the main producing field will be Rio Grande with a daily average production of 7,540 barrels, followed in order of importance by Porvenir, Monteagudo, La Vertiente, La Peña, and Caranda. In addition, 2,100 barrels per day of natural gasoline will be extracted and processed in the refineries.

Foreign sales of liquid hydrocarbons consisted mostly of natural gas liquids or condensate and yellow gasoline. The decline in oil export revenues was more than offset by increasing income from natural gas exports to Argentina. YPFB's $181 million investment budget for 1982 contemplates the following: exploration, $53.6 million; development, $72.8 million; industrial activity, $3.3 million; transport by pipelines, $38 million; and marketing, $13 million.

Despite the fact that Bolivia's current hydrocarbons law is considered one of the most accommodating in the world, the Government announced in March 1981, that such law will be thoroughly revised in order to facilitate the entry of foreign oil companies. Bolivia does not have the financial capacity to exploit its hydrocarbon potential without foreign capital.

In 1980, the Phillips-Penzoil-Victory Group relinquished Block VII in the El Beni area, northwest of Santa Cruz, after drilling three dry holes. Exxon Company U.S.A. and Amoco Oil Co. were reported by the Minister of Energy and Hydrocarbons to be interested in exploration and production of oil in Bolivia. Occidental and Tesoro were the only two foreign operators that produced oil and gas in the country during 1981.

At the end of 1981, proven crude oil reserves were estimated at 181 million barrels. YPFB was planning to construct several petrochemical plants using the natural gas from Santa Cruz.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Bolivian pesos ($b) to U.S. dollars at the rate of $b25=US$1.00.

[3]Ballivián, O., and F. Risacher. Los Salares del Altiplano Boliviano. Métodos de Estudio y Estimación Económica (Salt Deposits of the Bolivian High Plateau. Methods of Study and Economic Estimates), La Paz, 1981.

Table 8.—Bolivia: Production of crude oil and condensate by YPFB and contractor, by field[1]

(Thousand 42-gallon barrels unless otherwise specified)

Field	1977	1978	1979	1980	1981	Change, percent (1980-81)
Rio Grande	5,080	4,660	r4,230	3,758	3,258	-13
Monteagudo	1,486	1,267	1,290	1,077	893	-17
La Vertiente	--	17	80	345	514	+49
Tita	--	919	1,042	730	501	-31
La Peña	2,208	1,829	r1,062	634	478	-25
Caranda	1,165	853	r647	454	420	-7
Colpa	841	630	r554	r462	366	-21
Porvenir	--	--	1	--	361	--
Camiri	512	465	441	373	323	-13
Palmar	--	261	145	289	293	+1
Espino	--	--	7	106	241	+127
Tatarenda	207	143	137	96	85	-11
Bermejo-Toro	88	82	105	85	83	-2
Cambeiti	178	202	154	96	78	-19
Caigua	641	355	176	91	34	-63
Guairuy	35	32	30	43	33	-23
Camatindi	36	33	26	25	28	+12
San Alberto	44	35	29	25	25	--
Other	[2]155	[3]61	r[4]17	r[5]15	[6]18	+20
Total	12,676	11,844	[7]10,174	8,704	8,032	-8

rRevised.

[1]In 1978, Occidental produced from the new Tita Field and Tesoro from the new La Vertiente Field; in 1979, Occidental's Porvenir Field started production.

[2]Includes output from Los Monos, Buena Vista, Montecristo, and Espejos.

[3]Includes output from Buena Vista, Espejos, and a small amount from Tigre. Los Monos was shut down.

[4]Includes output from Vuelta Grande, Buena Vista, and Tacobo.

[5]Includes output from Buena Vista, Los Monos, Vuelta Grande, and Montecristo.

[6]Includes output from Buena Vista, Vuelta Grande, and San Roque.

[7]Data do not add to total shown because of independent rounding.

The Mineral Industry of Botswana

By Kevin Connor[1]

There was a dramatic change in Botswana's economic fortunes during 1981, caused by a slump in the world diamond market and depressed prices for copper and nickel. Average real growth for the country's economy was 1.7%, considerably down from the previous few years. The country's balance of payments deficit moved from an overall surplus of $81 million at the end of 1980, to a deficit of about $68 million in 1981.[2] The majority of the deficit problem was directly attributable to the slump in their diamond industry, which in 1980 accounted for roughly 62% of total Botswana export revenues, but dropped to approximately 42% in 1981. The depressed market conditions in 1981 resulted in an estimated loss of $110 million in diamond sales revenues to the country's diamond agency, Debswana. Botswana's BCL Ltd. nickel-copper mine at Selebi-Phikwe experienced serious financial difficulties during the year also. The BCL 1981 annual report showed that total sales of nickel-copper matte were down by approximately $60 million below that of 1980.

Planning continued in 1981 for the proposed $800 million trans-Kalahari Desert railroad line, which would link land-locked Botswana with Namibia's Walvis Bay Port. The new rail section would connect the existing line that runs along Botswana's eastern border between Zimbabwe and the Republic of South Africa, and Namibia's network that extends as far east as Gobabis. About 850 kilometers of new track in Botswana would be needed for the project, with an additional 110 kilometers of track needed to stretch from Botswana's western border to Gobabis in Namibia. Results of a 1979 study indicated that the transport of 10 million tons per year of export coal alone would be enough to make the construction of the rail line from Palapye to Gobabis economically feasible. Other countries such as Zambia, Zaire, and Zimbabwe would find the new transportation route extremely useful also. It is estimated that the railway and new ore terminal for load-out at Walvis Bay, would take approximately 5 years to construct from the project startup date.

Regarding the existing rail line on Botswana's eastern border, which is owned and operated by the Government of Zimbabwe, Botswana's plans for this railroad call for complete nationalization by the end of 1986. In yet another area of transportation, the official opening of Botswana's north-south blacktop road between Lobatse and Ramatlabama was held on October 30, 1981. A milestone achievement, the 45-kilometer road cost approximately $12 million to build, and was financed 60% by the Botswana Government and 40% by the European Communities.

To temporarily alleviate the growing power supply shortage in the Gaborone area, a small-scale, 6-megawatt extension unit is being built onto the existing facilities at the Gaborone Power Station. The project is considered an interim measure to deal with the pressing problem of electrical generating capacity, which was predicated to result in widespread loadshedding by early 1982. The project is estimated to cost $9.45 million and is scheduled for completion by late 1982. As a longer term solution to Botswana's power supply needs, planning for a 180-megawatt generating station at Palapye-Morupule was near completion in 1981. Initial construction was set for Janu-

ary 1982. The plant is to be coal-fired, with an initial output of 90 megawatts by 1986, and an additional 90 megawatts by 1989. The plant will supply most of the country through a high-voltage transmission network, the initial portion of which will be built to Gaborone. Cost of the project is estimated at $230 million.

PRODUCTION

Mineral production for Botswana in 1981 remained at about the same level as that of 1980. Diamond production decreased about 3%, and mining and smelter output of nickel-copper matte increased about 14%, while coal production remained the same. The combined outputs from the Orapa and Lethakana diamond mining complex was 9,631,000 tons of ore yielding 4,960,252 carats. The Orapa production for the year was 7,402,000 tons of ore yielding 4,530,720 carats, at a recovery grade of 61.21 carats per 100 tons. The Letlhakane Mine produced a total of 2,229,000 tons of ore yielding 429,532 carats, for a recovery grade of 19.27 carats per 100 tons.[3] High-grade nickel-copper-cobalt matte production for the year was 46,565 tons. The contained metal in the matte averaged 39.2% nickel, 38.3% copper, and 0.55% cobalt. Total production was from the Selebi-Phikwe underground mines. Coal production from Botswana's only coal operation, the Morupule Colliery, was approximately 370,000 tons in 1981.

Table 1.—Botswana: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
Coal, not further described	294,039	314,486	355,115	371,395	370,000
Cobalt, Co content of nickel-copper matte[2]	165	261	294	226	[3]254
Copper:					
Mine output, metal content[4]	16,160	17,235	17,419	[e]18,600	20,000
Cu content of nickel-copper matte[2]	11,788	14,615	14,563	15,553	[3]17,819
Diamond:					
Gem[e] thousand carats	404	420	659	765	740
Industrial[e] do.	2,287	2,379	3,735	4,336	4,220
Total do.	2,691	2,799	4,394	5,101	[3]4,960
Gem stones, semiprecious, rough, not further described kilograms	50,000	10,000	5,000	20,000	NA
Nickel:					
Mine output, metal content[4]	19,859	21,859	22,109	[e]21,100	22,000
Ni content of nickel-copper matte[2]	12,094	16,049	16,173	15,442	[3]18,273
Nickel-copper matte, gross weight	30,772	39,517	39,823	40,099	[3]46,565
Sand and gravel cubic meters	135,840	133,553	229,856	201,925	NA
Stone, crushed, not further described do.	127,983	141,415	228,526	222,033	NA
Talc	288	313	104	78	70

[e]Estimated. [p]Preliminary. NA Not available.
[1]Table includes data available through Aug. 2, 1982.
[2]Figures approximate recoverable mine output and have been used as such in world production tables appearing in volume 1 of Minerals Yearbook.
[3]Reported figure.
[4]Analytic content of ore milled.

TRADE

Botswana's two major export commodities are diamonds and nickel-copper matte, which combined accounted for 65% of Botswana's total export revenues of approximately $400 million in 1981. In 1980 these figures were slightly over 85% and $500 million, respectively, a result of the strong diamond market early in the year. Little changed in 1981 regarding mineral trading partners, with diamond production going to De Beers Consolidated Mines Ltd. of the Republic of South Africa, the world's leading diamond cartel; and the nickel-copper matte going to the U.S. refiner, AMAX Nickel Inc. Negotiations late in 1981 where being held between Botswana's BCL agency and Rio Tinto Mining of Zimbabwe (RTMZ), to draw up a minerals cooperation agreement between the companies for sending nickel and copper matte from Botswana to

Zimbabwe for refining, starting in 1982. This mining-related agreement, which involves the cooperation of the Botswana and Zimbabwe Governments, if reached will be the first such arrangement between two members of the nine-nation Southern African Development Corrdination Conference.[4] The attempted contract is welcomed by both Governments as an exercise in regional economic cooperation. Preliminary tonnage estimates of matte shipment to the RTMZ refinery are 4,200 tons per year, which was calculated by RTMZ as needed additional feedstock for operating its Eiffel Flats refinery near Gatooma, at full capacity. This should reduce the costs of finished product produced at the refinery. The arrangement will also help BCL, which has been asked by its contractual refiner, AMAX Nickel, to reduce nickel and copper matte shipments to its Braithwaite, La., plant by 25% in 1982.

COMMODITY REVIEW

METALS

Copper-Nickel-Cobalt.—Since commencing operations in 1973, the Botswana RST Ltd.'s (BRST) Selebi-Phikwe nickel-copper mine and smelter operation has been beset by problems. In the earlier years, the problems were mostly of a metallurgical processing nature. Now that those technical problems have been solved, a major supply-and-demand problem has arisen. The industrial demands for nickel and copper were so weak in 1981, that the BRST operation's contractual refiner has asked for major cuts in smelter matte prices and shipped tonnages in 1982. A 25% reduction in nickel and copper matte shipments came as a strong request from the refiner, AMAX Nickel, in late 1981, as a result of reported 9 months earnings that were 40% lower than the same period in 1980.[5] AMAX Nickel owns approximately 25% of the BRST operation, and the operating subsidiary BCL, and it has been speculated that during 1981 AMAX Nickel offered to sell their share of BCL to the other major partner, Anglo American Corp. of South Africa Ltd. To meet the requested 25% reduction of approximately 10,000 tons of matte per year, negotiations are underway with RTMZ to take 4,000 tons of matte for their Eiffel Flats refinery, and with Falconbridge Nickel Mines Ltd. of Canada to take the other 6,000 tons for their refinery in Kristianland, Norway. The nickel and copper matte that comes from the Selebi-Phikwe Mines, contains about 40% nickel, 40% copper, and 0.6% cobalt. The average level of ore from the mines that was milled in 1981 at the smelter complex was 200,000 tons per month; with 135,000 tons of that coming from the Phikwe underground workings and 65,000 tons from Selebi, which is 14 kilometers away. The new No. 3 shaft is now finished at Phikwe and full production at the shaft should begin in the first half of 1982.

NONMETALS

Diamond.—Botswana produced approximately 4.9 million carats of diamond in 1981; down about 200,000 carats from the 1980 total. The slight decrease in production was attributed to the present slump in diamond prices, which began in 1980 and persisted with increasing severity throughout 1981. A prime example of this condition, was the plummeting of the price for a 1-carat, D-flawless, brilliant-cut diamond, which dropped from an average price of $62,000 in 1980 to an average of $27,000 in 1981. The end result for Botswana was a loss in revenues of $110 million during 1981 compared with that of 1980, and a forecast for 1982 that is bleaker.

The De Beers Co., which controls over 80% of the world's diamond sales, is caught in a binding cash-flow situation. The company's key gem suppliers, of which Botswana is a major contributor, are pressuring De Beers to maximize their purchases of rough gems from them, so that shortfalls in revenues like that experienced by the Botswana Government in 1981 can be avoided. In 1981, De Beers sales dropped 46% to $1.4 billion, and the value of their stockpiles of unsold diamonds doubled to well over $1 billion. This is a tremendous decrease in sales and increase in stocks for that short period of time, and has left De Beers facing its greatest financial strains since the depression years of the 1930's. Influenced by De Beers problems, Debswana, the diamond-controlling company in Botswana, held back almost $150 million worth of marketable diamonds in 1981.

At what could not be a more inopportune time, Debswana is opening up a new operation, the Jwaneng Mine; which is scheduled to begin production early in 1982. Development of this mine began almost 5 years ago, at a time when feasibility studies for new diamond ventures were indicating strong future markets. This will be Botswa-

na's third diamond mine, and biggest producer; promising to double Botswana's diamond production within 2 years of opening. Full-scale production of 400,000 tons of ore per month is due to be achieved by mid-1982, and by early 1983 Botswana should be producing diamonds at twice its output rate of 1981, which equates to well over 9 million carats per year. Because of the current flooded market conditions, it is expected that a considerable portion of the production from the Jwaneng Mine will have to be stockpiled by Debswana in Botswana's capitol city of Gaborone.

During mid-1981, De Beers was forced to set quotas on diamond purchases from its producing countries owing to its own large stockpiles of unsold diamonds.[6] To prevent losing marketing agreements and its marketing monopoly, De Beers is attempting to buy as much of Southern Africa's diamond production as possible. The company's present buying quotas are geared to production statistics and will automatically increase for Botswana as a whole with the opening of the Jwaneng Mine. De Beers would like to see the Botswana Government voluntarily cut back on planned production quotas at the new mine, but understands the Government's concern with unemployment figures and preference to operate at full production.

MINERAL FUELS

Coal.—Botswana contains some of the largest and most economically recoverable coal deposits in Africa. Exploration drilling done over the past several years by Shell Coal Botswana Ltd., Charbonnage de France International Botswana, British Petroleum Botswana Ltd., and AMAX Exploration Inc., has outlined economically recoverable reserves of 3.5 billion tons, with an additional 13 billion tons indicated.[7] Several foreign concerns are showing interest in the exploit and export potential for the coal reserves, much of which is medium-quality steam coal. However, before landlocked Botswana can become an international supplier of this fuel, the difficult question of how to get the coal to an ocean port will have to be resolved. Three different routes, all by rail, are under serious study. The routes are through Zimbabwe to the Mozambique Port of Maputo, through the Republic of South Africa to Richards Bay Port, or westward across the Kalahari Desert to Walvis Bay in Namibia. All three routes have major technical and financial problems, but negotiations are underway with neighboring foreign governments and financial backers alike and most parties concerned feel a viable solution can be found. Another important technical question yet to be answered is where the abundant water supplies needed to wash the coal will come from. The coal is high in ash and sulfur, and water supplies for the coal regions are limited.

At present there is only one active coal operation in Botswana, the Morupule Colliery, which produced over 370,000 tons in 1981. This tonnage was used to fire the power station at Selebi-Phikwe, which at 60 megawatts is the major power supply for Botswana. Owing to the critical need for increased electrical generating capacity, the ever-increasing costs of importing oil, and the potential for coal export, the Government is forging ahead with plans to open a second, much larger mine, near the Morupule Colliery between the towns of Serowe and Palapye. Tentative startup date for the mine is 1984-85. In the short term, the Government hopes to expand the Morupule Colliery to 500,000 tons in 1982.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Botswana pula (P) to U.S. dollars at the rate of P0.85=US$1.00.

[3]De Beers Consolidated Mines Ltd. Annual Report to Dec. 31, 1981, 94th. Ann. Rept., p. 22.

[4]Financial Times (London). Feb. 16, 1982, No. 28701, p. 24.

[5]Metals Bulletin Magazine. No. 6633, Oct. 23, 1981, p. 13.

[6]State Department, Washington, D.C. State Department Telegram 109626, Apr. 28, 1982, p. 1.

[7]U.S. Embassy, Gaborone, Botswana. State Department Airgram A-06, Apr. 13, 1982, p. 4.

The Mineral Industry of Brazil

By Travis Q. Lyday[1]

The Brazilian economy declined 3.5% in real terms during 1981, suffering the sharpest setback since figures on national accounts were first compiled in 1947. Brazil's gross domestic product (GDP) in current prices expanded to an estimated $242 billion.[2] As a result of restrictive fiscal and monetary policies adopted late in 1980, which were aimed at reducing the balance-of-payments deficit and controlling inflation, the economy achieved a $1.2 billion trade surplus in 1981, the first such surplus since 1927. The inflation rate, which hit a historic peak of 122% in March, was moderately reduced to 95% on an annualized basis, compared with the 110% rate recorded a year earlier.

In 1981, Brazil attained further progress in lessening its dependence on foreign oil by reducing consumption through price control and rationing, switching some industrial oil users to alternative energy sources, and increasing domestic oil production.

Although Brazil's mining sector, excluding petroleum, produced only about 2% of the total GDP, its share of total exports was about 10%. The inclusion of metals processing and fabrication increases the metal and mining share to about 17% of GDP.

Brazil continued to be an important producer and exporter of iron ore, manganese, beryl, ferroalloys (particularly ferrocolumbium), electronic-grade quartz crystal, and gem stones during 1981.

Government Policies and Programs.—The major policy of the Government concerning the minerals sector during 1981 focused on the development of the large and varied resources of the Carajás mineral province, Pará State, in the south Amazon Basin under the 10-year development plan for the 1981-90 period approved in November 1980. In particular, this plan denotes greater priority to the mining sector than did its predecessor, and if forecast targets are achieved, Brazil was expected to become self-sufficient in a number of mineral commodities by the end of the decade. In addition to having the world's largest high-grade iron ore reserves (18 billion tons averaging 66% iron), Carajás contains substantial reserves of high-grade manganese ore (60 million tons with above 40% manganese) that can be used for the production of ferroalloys, large amounts of copper ore (1 billion tons containing 0.5% to 1% copper), metallurgical-grade bauxite (4.5 billion tons of 40% alumina), and nickel ore (47 million tons of 1.2% to 2.2% nickel), as well as large, but as yet not fully evaluated, deposits of gold, lead, silver, tin, and zinc.

The Grande (Greater) Carajás Development Project, including mineral and agricultural projects, was expected to cost an estimated $61 billion and should provide Brazil with about $15 billion in export earnings per year by 1990.

At the beginning of 1981, the Government announced a major shift in economic policy that would result in the abandonment of directing growth through large-scale projects. Although investments would be channeled into bringing into operation those works that were already well advanced, future funds would be made available only for certain select, and generally small-scale, development projects. Although development of the Grande Carajás program and projects initiated to achieve greater energy self-sufficiency would remain priorities, it was announced that growth would now center on smaller developments that use local raw materials. Moreover, such projects would have to meet stringent requirements

for generating foreign exchange in the shortest time possible.

Although many government agencies and private sector mining companies believe that Brazil has not been adequately explored, recent increases in reserve levels indicate an upswing in exploration activity. Preliminary estimates indicate that $48 to $50 million was spent on exploration in 1981, of which Rio Doce Geológia e Mineração, the Government-owned exploration company and a subsidiary of the Brazilian state mining company Cia. Vale do Rio Doce (CVRD), accounted for $22 million, primarily for projects in the Amazon region.

Mining companies operated under a mining code established in 1967 under Decree Law No. 227, which provides a sound basis for the development of Brazil's mineral wealth. The Departamento Nacional da Produção Mineral (DNPM) (the National Department of Mineral Production) within the Ministry of Mines and Energy was responsible for the implementation of mining policy, enforcement of the mining code, and issuance of exploration and mining licenses. The Government continued to actively promote both domestic and especially private participation in the minerals sector during 1981 through the provision of tax, financial, and customs incentives.

As a result of the war between Iran and Iraq that broke out in late 1980, thus slashing imports of Iranian crude from the top of Brazil's trade list to zero, official policy was set during 1981 to diversify foreign sources as much as possible to avoid a repetition of the economic bind that was generated from relying on only a few sources.

PRODUCTION

Preliminary data indicate that the value of mineral production, including mineral fuels, in 1981 increased 20% in real terms, to $6.5 billion from the 1980 figure of $5.4 billion. The latest available official data reported by DNPM[3] show that the value of mineral output grew by 41% in real terms in 1980 compared with the revised growth figure of 11% in 1979.

During 1980, the latest year for which official data are available, 94% of the value of all metallic mineral production was accounted for by six commodities: iron ore, 55.7%; gold, 14.2%; pyrochlore, 6.7%; bauxite, 6.0%; tin, 5.7%; and manganese, 5.7%. Over 81% of the value of all nonmetallic mineral production was comprised of granite, 28.3%; limestone, 22.1%; phosphate rock, 12.8%; sand, 7.7%; clay, 5.8%; and asbestos, 4.3%. Crude petroleum represented 84.1% of the total fossil fuel value, followed by natural gas, 9.4%, and coal, 6.5%.

Fossil fuels contributed 41.6% of the total value of mineral output in 1980, followed by metallic minerals, 31.6%; nonmetallic minerals, 25.8%; and diamond and gems, 1.0%.

Table 1 provides reported and revised production data for 1977-81. Where reported data were not available for certain minerals in 1981, estimates are given.

Table 1.—Brazil: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum:					
Bauxite, dry basis, gross weight	1,119,510	1,160,112	2,387,741	4,696,000	5,300,000
Alumina	340,800	352,100	449,100	493,000	485,000
Metal:					
Primary	167,100	186,365	238,009	260,600	256,000
Secondary	33,500	31,817	37,905	44,100	45,000
Antimony, mine output, metal content	262	196	67	65	65
Beryllium: Beryl concentrate, gross weight	496	739	453	500	550
Chromium:					
Crude ore	683,147	957,798	891,543	833,935	1,300,000
Concentrate	250,281	203,107	229,836	187,936	310,000
Marketable product[3]	309,995	269,870	340,385	287,000	410,000

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS —Continued					
Columbium-tantalum ores and concentrates, gross weight:					
Columbite and tantalite	137	203	374	536	500
Djalmaite concentrate	19	19	10	18	20
Pyrochlore concentrate	15,613	17,900	28,909	30,700	32,000
Copper:					
Mine output, metal content	25	59	5,262	1,403	18,000
Metal, secondary	45,947	45,000	53,100	63,000	45,000
Gold:					
Mine output troy ounces	121,048	128,860	107,158	131,500	150,000
Garimpeiros (prospectors)[4] do	158,472	172,038	212,100	1,168,500	1,050,000
Total do	279,520	300,898	319,258	1,300,000	1,200,000
Iron and steel:					
Ore and concentrate (marketable product):[3]					
Gross weight thousand tons	82,001	84,985	96,112	114,732	98,700
Iron content do	53,301	55,240	67,654	80,000	78,000
Metal:					
Pig iron[5] do	9,739	10,331	11,918	12,960	10,931
Ferroalloys, electric-furnace:					
Ferroboron	33	11	26	27	NA
Ferrocalcium silicon	4,500	5,790	6,639	8,025	10,140
Ferrochromium	65,969	62,170	84,514	93,443	117,280
Ferrocolumbium	6,809	10,251	13,913	17,530	14,632
Ferromanganese	128,922	117,843	133,563	140,496	128,300
Ferromolybdenum	1,177	1,690	1,469	802	NA
Ferronickel	10,860	10,976	11,355	11,280	10,744
Ferrophosphorus	--	--	148	354	NA
Ferrosilicochrome	4,121	4,698	7,239	8,086	10,155
Ferrosilicomanganese	75,108	106,249	127,503	134,243	122,315
Ferrosilicon	60,290	72,842	75,712	109,140	123,000
Ferrosilicon magnesium	7,443	9,968	14,432	13,734	NA
Ferrosilicon zirconium	--	--	--	488	NA
Ferrotitanium	654	436	795	698	NA
Ferrotungsten	141	336	396	217	NA
Ferrovanadium	366	456	851	807	NA
Silicon metal	4,885	5,831	5,654	12,379	13,960
Total	371,278	409,547	484,209	551,749	550,526
Steel, crude, excluding castings thousand tons	11,164	12,107	13,893	15,318	[6]13,218
Semimanufactures, flat and nonflat do	8,412	10,126	11,693	12,985	NA
Lead:					
Mine output, metal content	24,039	31,203	27,927	27,460	29,600
Metal:					
Primary	48,303	47,236	55,084	44,519	34,657
Secondary	29,001	33,220	42,200	40,431	31,100
Manganese ore and concentrate (marketable),[3] gross weight	1,515,673	1,917,120	2,259,331	2,360,000	2,300,000
Nickel:					
Mine output, metal content	4,241	3,600	2,964	5,800	6,500
Ferronickel, Ni content	2,530	2,228	2,463	2,500	[6]2,340
Rare-earth metals: Monazite concentrate, gross weight	2,441	[r]2,540	1,890	1,205	1,500
Silver[7] thousand troy ounces	372	506	1,065	837	800
Tin:					
Mine output, metal content	6,287	[r]6,341	7,003	6,930	9,000
Metal, smelter, primary	7,421	9,309	10,133	8,642	7,600
Titanium concentrates, gross weight:					
Ilmenite	13,268	20,077	22,657	16,839	17,000
Rutile	128	365	439	428	400
Tungsten, mine output, metal content	1,212	1,165	1,177	1,136	1,200
Zinc:					
Concentrate and salable ore	205,671	209,719	344,389	392,148	400,000
Mine output, metal content	57,588	58,721	89,886	101,000	103,000
Metal, smelter:					
Primary	47,032	56,097	63,494	78,303	91,944
Secondary	8,532	12,200	12,700	17,666	19,000
Zirconium: Zircon concentrate, gross weight[8]	4,649	4,301	3,605	3,933	4,000
NONMETALS					
Asbestos:					
Crude ore	1,512,997	2,080,371	2,422,420	2,362,000	2,400,000
Fiber	92,773	122,815	138,457	135,000	138,400
Barite:					
Crude	39,575	238,257	489,997	420,000	480,000
Beneficiated	39,353	87,145	73,014	62,085	70,000
Marketable product[3]	49,528	107,492	108,042	92,000	105,000

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Calcite	6,281	18,467	16,922	NA	NA
Cement, hydraulic thousand tons	21,123	23,187	24,874	27,193	28,500
Clays:					
Bentonite	108,395	167,614	212,503	247,954	250,000
Kaolin:					
Crude	939,666	1,595,482	1,343,005	1,156,447	1,240,000
Beneficiated	259,836	294,459	349,446	410,197	440,000
Marketable product[3]	372,488	370,062	943,589	1,110,000	1,190,000
Other:					
Crude thousand tons	3,514	4,457	3,900	NA	NA
Beneficiated do	1,575	1,029	1,620	NA	NA
Diamond:					
Gem[e] thousand carats	r236	r236	236	253	6163
Industrial[e] do	r384	r384	384	414	6926
Total[e 9] do	r620	r620	620	667	61,089
Diatomite:					
Crude	11,204	32,940	136,669	140,000	NA
Beneficiated	4,966	10,709	6,650	10,807	13,300
Marketable product[3]	9,559	12,030	16,547	17,000	17,000
Feldspar and related materials:					
Feldspar, marketable product[3]	96,187	103,597	142,000	123,000	96,400
Leucite, marketable product[3]	8,232	8,075	511	5,000	NA
Sodalite, crude, marketable product	982	687	2,610	3,000	NA
Total	105,401	112,359	145,121	131,000	NA
Fluorspar:					
Crude	115,960	126,232	163,179	86,347	NA
Marketable products:					
Direct-shipping crude ore (sales)	13,162	465	106	100	NA
Concentrates:					
Acid-grade	27,280	31,174	26,852	32,729	36,200
Ceramic-grade	476	--	--	--	--
Metallurgical-grade	27,663	30,161	25,547	22,640	17,400
Total marketable products	68,581	61,800	52,505	55,469	53,600
Graphite:					
Crude	53,603	47,845	135,977	234,883	NA
Marketable products:					
Direct-shipping crude ore	--	859	85,130	6,000	NA
Concentrate	9,187	10,357	12,476	16,411	23,000
Total	9,187	11,216	97,606	22,411	NA
Gypsum and anhydrite, crude	543,046	474,732	464,730	605,824	630,000
Kyanite:					
Crude	110	6,908	8,193	18,296	NA
Beneficiated	17	1,356	1,299	4,056	NA
Marketable products[3]	17	1,773	1,750	1,750	1,800
Lime, hydrated, and quicklime[e] thousand tons	4,500	r4,630	4,720	4,810	5,000
Lithium mineral concentrates:					
Amblygonite	489	431	187	182	200
Lepidolite	579	50	58	51	200
Petalite	1,028	1,996	1,501	2,487	2,500
Spodumene	112	885	--	98	100
Total	2,208	3,362	1,746	2,818	3,000
Magnesite:					
Crude[10]	481,154	409,936	591,107	728,713	800,000
Beneficiated	205,719	217,270	265,067	315,851	350,000
Mica, all grades[11]	1,955	4,551	4,073	4,000	NA
Nitrogen: N content of ammonia	145,500	202,900	265,500	351,600	376,000
Phosphate rock including apatite:					
Crude:					
Mine product thousand tons	3,425	5,967	12,478	20,400	NA
Of which, sold directly do	26	27	39	40	40
Concentrate:					
Gross weight do	650	1,023	1,589	2,432	2,570
P_2O_5 content do	195	367	589	900	950
Pigments, mineral: Ocher, crude	6,630	6,199	7,532	7,600	7,600

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Precious and semiprecious stones excluding diamond, crude and worked:[11]					
Agate ---- kilograms	1,346,803	1,770,874	1,595,201	NA	NA
Amethyst ---- do	202,338	357,384	328,007	NA	NA
Aquamarine ---- do	1,179	2,546	1,564	NA	NA
Cat's-eye ---- do	12	68	3	NA	NA
Citrine ---- do	33,830	49,796	60,858	NA	NA
Emerald ---- do	2,266	16,729	7,471	NA	NA
Garnet ---- do	177	2,907	840	NA	NA
Opal ---- do	342	619	1,383	NA	NA
Ruby ---- value	$5,500	$505	$7,504	NA	NA
Sapphire ---- kilograms	--	1	([12])	NA	NA
Topaz ---- do	3,850	4,231	15,741	NA	NA
Tourmaline ---- do	526	2,536	2,144	NA	NA
Turquoise ---- value	$4,221	--	$337	NA	NA
Other ---- kilograms	524,602	482,769	406,379	NA	NA
Quartz crystal, all grades[11] ----	1,609	2,406	4,743	NA	NA
Salt:					
Marine ---- thousand tons	2,481	2,727	2,866	3,042	3,200
Rock ---- do	293	572	689	796	800
Silica (silex) ----	3,594	5,721	7,005	NA	NA
Sodium compounds:					
Caustic soda ----	291,212	289,233	645,143	NA	NA
Soda ash, manufactured (barilla) ----	141,022	120,651	118,659	130,000	130,000
Stone, sand and gravel:					
Dimension stone:					
Marble, rough-cut ----	145,257	160,229	177,290	NA	NA
Slate ----	4,670	186,995	34,957	NA	NA
Crushed and broken stone:					
Basalt ---- thousand tons	NA	324	198	NA	NA
Calcareous shells ----	246,240	243,153	1,002,692	NA	NA
Dolomite ---- thousand tons	1,663	1,092	1,712	NA	NA
Gneiss ---- do	NA	2,012	1,230	NA	NA
Granite[13] ---- do	51,815	NA	NA	NA	NA
Limestone ---- do	39,303	46,283	44,664	NA	NA
Quartz[14] ----	45,530	95,720	57,920	NA	NA
Quartzite:					
Crude ----	255,247	212,066	379,253	NA	NA
Processed[15] ----	148,304	109,497	50,358	NA	NA
Shale ----	529,449	540,381	587,428	NA	NA
Sand ---- thousand tons	4,875	NA	NA	NA	NA
Sulfur, elemental, byproduct ----	44,351	r56,503	92,061	130,641	150,000
Talc and related materials:					
Talc, marketable product[3] ----	180,474	190,674	310,397	380,000	328,000
Pyrophyllite, marketable product[3] ----	73,408	69,846	55,081	55,000	56,000
Other: Agalmatolite, marketable product ----	71,541	68,624	101,281	NA	NA
Vermiculite:					
Crude ----	6,833	19,611	10,496	17,640	35,000
Marketable product[3] ----	3,617	4,031	7,382	8,000	10,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e] ----	110,000	NA	NA	NA	NA
Coal, bituminous (marketable)[3] ---- thousand tons	3,646	5,050	7,604	8,300	NA
Coke, metallurgical, all types ---- do	3,349	3,417	3,930	4,049	5,700
Gas, natural:					
Gross ---- million cubic feet	63,835	68,271	67,045	77,868	NA
Marketed ---- do	37,311	40,074	e43,000	50,000	NA
Natural gas liquids ---- thousand 42-gallon barrels	2,050	2,088	2,012	2,063	NA
Petroleum:					
Crude ---- do	60,740	60,615	62,444	68,496	80,200
Refinery products:					
Gasoline ---- do	82,692	89,944	84,780	68,301	NA
Jet fuel ---- do	11,252	25,484	20,046	20,278	NA
Kerosine ---- do	4,522			4,095	NA
Distillate fuel oil ---- do	96,624	106,927	111,091	121,846	NA
Residual fuel oil ---- do	101,801	111,959	113,179	105,392	NA
Lubricants ---- do	2,378	3,664	3,285	4,233	NA

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Other ------- thousand 42-gallon barrels	48,897	62,354	85,253	69,692	NA
Refinery fuel and losses ---------- do	9,774			11,252	NA
Total ---------- do	357,940	400,332	417,634	405,089	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Oct. 13, 1982.

[2]In addition to the commodities listed, molybdenite, bismuth, and uranium oxide are produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[3]Figure represents sum of (1) crude material sold directly and (2) production of concentrate. Sale of crude material in any given year may exceed production in that year as a result of the sale of stocks of crude material mined but not sold or beneficiated in previous years. Similarly, output of concentrates in any given year may exceed the amount of crude material mined in that year owing to treatment of previously mined but not yet processed ores.

[4]All figures except those for 1978 differ substantially from those appearing in the latest available official Brazilian sources owing to inclusion of estimates for unreported production by small prospectors (garimpeiros). Officially reported figures are as follows: Major mines: 1977—121,047; 1978—128,860; 1979—107,158; 1980—131,500; 1981—not available; garimpeiros: 1977—51,120; 1978—172,038; 1979—36,234; 1980—357,650; 1981—not available.

[5]Includes sponge iron as follows, in thousand metric tons: 1977—358; 1978—270; 1979—324; 1980—275.

[6]Reported figure.

[7]Smelter and/or refined metal.

[8]Includes baddeleyite-caldasite.

[9]Figures represent officially reported output plus official Brazilian estimates of output by nonreporting miners; officially reported output was as follows, in thousands of carats: 1976—76; 1977—65; 1978—86; 1979—83.

[10]Includes the following quantities sold directly without beneficiation, in metric tons: 1976—110; 1977—2,650; 1978—6,051; 1979—5,177; 1980—not available.

[11]Exports.

[12]Less than 1/2 unit.

[13]Listed under dimension stone in previous editions, but only a small part of the 1976 total and none of the output for the other years was dimension stone. Data on output in gravimetric units are not available for 1978 and later years, but output on a volumetric basis was reported as follows, in thousand cubic meters: 1978—37,842; 1979—42,684; 1980—not available.

[14]Apparently includes crude quartz used to produce quartz crystal (listed separately in this table) as well as additional unreported quantities of common quartz.

[15]Produced from a portion of the crude quartzite listed above; crude quartzite processed was as follows, in metric tons: 1976—206,036; 1977—157,531; 1978-80—not available.

TRADE

Despite a trade deficit of $2.8 billion in 1980, a slowing world economy, and an apparent increase in trade protectionism in 1981, Brazil registered an unprecedented $1.2 billion trade surplus during 1981.

Total exports increased almost 16% to $23.3 billion, while imports declined 4% to $22.1 billion. Brazil's imports of oil and other fuels increased in value slightly to $10.9 billion, although the net bill was about $10 billion, considering that Brazil exported some $0.9 billion of petroleum derivatives. The value of oil was the only major category of imports to increase in 1981, and this was entirely due to higher average prices. Iron ore continued to be the major mineral export, accounting for almost 8% of the total value of all exports.

Table 2.—Brazil: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate thousand tons	516	2,679	807	Canada 1,518.
Oxides and hydroxides	534	88	--	Uruguay 50; Colombia 20; Japan 15.
Metal including alloys, semimanufactures	4,224	8,033	712	Chile 2,586; Argentina 1,761; West Germany 936.
Antimony metal including alloys, all forms	4	4	--	All to Uruguay.
Beryl: Ore and concentrate	452	500	498	Japan 2.
Chromium:				
Chromite	45,215	--		
Oxides and hydroxides	50	190	--	United Kingdom 138; Finland 50.
Cobalt metal including alloys, all forms	50	4	4	
Columbium and tantalum:				
Ore and concentrate:				
Columbite	25	17	17	
Tantalite	280	411	218	West Germany 105; United Kingdom 80.
Unspecified	23	28	2	West Germany 17; Netherlands 6.
Metal including alloys, all forms:				
Tantalum kilograms	--	4	--	All to Bolivia.
Copper:				
Matte including cement	1,645	1,210	--	West Germany 1,000.
Metal including alloys, all forms	4,763	3,079	695	United Kingdom 672; Uruguay 637.
Gold metal including alloys, unwrought and partly wrought troy ounces	--	1	--	All to Iraq.
Iron and steel:				
Ore and concentrate including roasted pyrite thousand tons	75,588	78,958	2,072	Japan 28,707; West Germany 13,021.
Metal:				
Scrap and waste	--	7	--	All to West Germany.
Pig iron including cast iron	989,343	841,331	90,850	Romania 197,642; Italy 141,900; Argentina 99,320.
Sponge iron, powder, shot	1,097	685	--	Uruguay 170; Argentina 163; Venezuela 78.
Ferroalloys:				
Ferrochrome	48,205	45,921	8,111	Japan 23,500; Canada 9,900.
Ferrocolumbium	12,787	14,566	4,248	Netherlands 3,216; Italy 1,530; Japan 1,154.
Ferromanganese	40,256	37,833	11,400	Venezuela 18,150.
Ferromolybdenum	426	--		
Ferrosilicon	19,642	29,664	17,400	Japan 7,779.
Other	47,993	41,818	12,952	Japan 16,329; Netherlands 7,596.
Steel, primary forms	478,318	284,804	1,394	Greece 104,295; Argentina 75,862; Italy 74,065.
Semimanufactures:				
Bars, rods, angles, shapes, sections	383,685	214,503	37,936	Nigeria 45,368; Iraq 23,574.
Universals, plates, sheets	444,484	743,982	395,033	Argentina 69,172; Italy 55,424; Mexico 40,076.
Hoop and strip	6,020	26,541	36	Argentina 14,062; Mozambique 7,808.
Rails and accessories	4,115	2,903	4	Iraq 2,118.
Wire	24,058	15,521	1,612	Colombia 3,148; Nigeria 1,463; Mozambique 1,329.
Tubes, pipes, fittings	150,480	258,204	75,021	China 52,760; Chile 40,886; Mexico 30,073.
Castings and forgings, rough	887	1,091	51	Liberia 1,000.
Lead:				
Pentoxide	1	--		
Metal including alloys, all forms	247	2,235	--	Republic of South Africa 1,421; Japan 400.
Magnesium: Oxides, hydroxides, peroxides	28	11	--	Argentina 10.
Manganese:				
Ore and concentrate thousand tons	1,187	1,037	--	Norway 153; Japan 143; Czechoslovakia 126.
Oxides	1,822	2,246	1	Argentina 1,495; Colombia 700.
Molybdenum metal including alloys, all forms kilograms	196	148	--	Chile 142.
Nickel metal including alloys, all forms	6	8	5	Uruguay 1.
Platinum-group metals including alloys, unwrought and partly wrought:				
Platinum troy ounces	r6	--		
Paladium do	225	100	--	All to Mexico.
Unspecified do	1,286	--		
Rare earth:				
Oxides kilograms	120,127	400	--	Colombia 200; Italy 200.
Metals including alloys, all forms	4	18	(1)	Argentina 10; Japan 7.
Silicon: Elemental	1,759	6,921	(1)	Japan 4,245; U.S.S.R. 2,000.

See footnotes at end of table.

Table 2.—Brazil: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Silver metal including alloys, unwrought and partly wrought value, thousands	[2]$12	$2,904	--	Switzerland $1,656; West Germany $1,183.
Tin metal including alloys, all forms	4,727	3,812	2,839	Argentina 302.
Titanium:				
Ore and concentrate kilograms	--	200	--	All to Italy.
Oxides and hydroxides do	560	3	--	All to Chile.
Metal including alloys, all forms do	--	81	--	All to Sweden.
Tungsten:				
Ore and concentrate	538	782	102	Sweden 360; West Germany 216.
Metal including alloys, all forms kilograms	435	105	--	Mexico 49; Bolivia 30.
Zinc:				
Ore and concentrate	9,108	--		
Oxides and hydroxides	17	74	--	Argentina 70.
Metal including alloys, all forms	103	230	--	Mozambique 160; Argentina 56.
Other:				
Ash and residue containing nonferrous metals	3,521	451	76	Netherlands 218; France 110.
Oxides, hydroxides, peroxides kilograms	560	696	470	Argentina 100.
Waste and sweepings of precious metals value, thousands	$1,044	$258	--	All to West Germany.
Metals:				
Pyrophoric alloys	601	451	254	France 86; Netherlands 53.
Metalloids	--	6	--	All to Bolivia.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	51	1	--	NA.
Artificial: Corundum	13,648	19,190	1,595	Japan 5,430; Mexico 3,941; Argentina 3,932.
Grinding and polishing wheels and stones	1,124	1,479	15	Chile 268; Philippines 203; Mexico 171.
Asbestos, crude kilograms	120	30,034	--	Argentina 30,000.
Barium: Natural compounds	43,520	18,125	--	Trinidad and Tobago 9,250; Venezuela 8,875.
Boron:				
Crude natural borates kilograms	700	--		
Oxides and acids do	1,250	1,460	--	All to Paraguay.
Cement	215,244	220,832	--	Paraguay 133,182; Argentina 55,726; Bolivia 31,817.
Clays and clay products:				
Crude:				
Bentonite	23	149	--	Paraguay 60; Chile 51; Argentina 38.
Kaolin	46,543	183,025	--	Netherlands 66,683; Italy 51,500; Japan 27,100.
Other	4,914	3,239	--	Netherlands 2,628.
Products:				
Nonrefractory	80,882	128,560	7,635	Argentina 53,993; Paraguay 31,121.
Refractory including nonclay brick	18,185	18,087	--	Argentina 8,259; Colombia 1,882.
Diamond:				
Gem, not set or strung carats	1,740	2,825	105	Switzerland 1,680; Israel 305.
Industrial do	15	2,575	--	All to Spain.
Dust and powder do	1,100	7,700	7,550	Uruguay 150.
Fertilizer materials:				
Manufactured:				
Nitrogenous	177	444	--	Ivory Coast 262; Paraguay 162.
Phosphatic	7,031	3,435	--	Argentina 2,700; Paraguay 735.
Potassic	1,732	653	--	Uruguay 450; Paraguay 203.
Other including mixed	8,627	5,285	--	Argentina 2,528; Uruguay 1,132; Paraguay 1,083.
Ammonia	108	130	--	Uruguay 77; Paraguay 34.
Feldspar	--	4,051	--	Italy 4,050.
Graphite, natural	3,437	7,741	5,131	Japan 2,170.
Gypsum and plasters	48	3,544	--	Paraguay 3,525.
Lime	8,842	7,757	--	Paraguay 5,077; Argentina 2,612.
Magnesite	104,399	88,847	--	Poland 34,772; India 19,550.
Mica:				
Crude including splittings and waste	4,074	4,818	127	United Kingdom 2,940; West Germany 1,360.
Worked including agglomerated splittings kilograms	1,753	171	--	Lebanon 152.
Pigments mineral: Iron oxides, processed	275	797	179	Argentina 256; Chile 247.

See footnotes at end of table.

Table 2.—Brazil: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Precious and semiprecious stones excluding diamond:				
Natural:				
Crude:				
Agate ---------- value	$2,605,159	$3,367,266	$525,756	West Germany $1,119,271; Japan $536,561; Taiwan $451,859.
Amethyst ---------- do	$2,779,686	$2,216,027	$481,632	Japan $666,346; West Germany $460,833; France $232,975.
Aquamarine ---------- do	$543,308	$213,733	$46,585	West Germany $96,435; Japan $46,238.
Cat's-eye ---------- do	$40	--	--	
Citrine ---------- do	$1,799,321	$998,566	$118,670	West Germany $480,861; Japan $238,258.
Emerald ---------- do	$540,671	$1,268,378	$971,022	India $153,114; Switzerland $76,391.
Garnet ---------- do	$5,301	$444	--	Spain $296; France $50; Israel $50; Switzerland $48.
Opal ---------- do	$248,185	$431,097	$11,202	Hong Kong $375,000.
Ruby ---------- do	$2,275	--	--	
Sapphire ---------- do	$144	--	--	
Topaz ---------- do	$160,366	$126,251	$104,119	West Germany $20,732.
Tourmaline ---------- do	$89,753	$284,820	$154,159	Switzerland $46,984; Japan $39,848.
Other ---------- do	$1,333,223	$1,421,642	$136,803	West Germany $438,067; Japan $212,517.
Worked:				
Agate --- thousand carats	30,521	23,312	--	France 15,170; West Germany 5,254.
Amethyst ---------- do	2,757	1,183	861	Japan 169.
Aquamarine ---------- carats	r47,276	421,925	238,200	France 52,460; Japan 39,770; West Germany 39,565.
Cat's-eye ---------- do	4,240	2,100	340	Japan 1,450; West Germany 285.
Citrine -- thousand carats	1,072	1,261	321	Japan 777.
Emerald ---------- carats	66,675	62,120	20,020	Switzerland 24,745; Japan 7,065.
Garnet ---------- do	39,375	48,010	34,365	France 4,175.
Opal ---------- do	9,355	22,275	5,090	Japan 10,510; West Germany 5,425.
Ruby ---------- do	10	250	--	Argentina 135; West Germany 115.
Sapphire ---------- do	190	245	35	French Guiana 145.
Topaz ---------- do	122,410	182,335	146,045	Japan 13,565.
Tourmaline ---------- do	152,560	257,170	71,190	West Germany 132,880.
Other ---------- do	893,940	932,885	335,990	Switzerland 456,460.
Manufactured, crude and worked ---- do	600,125	482,475	--	West Germany 381,475; Japan 101,000.
Salt and brine ----------	138,240	178,777	57,000	Uruguay 81,848.
Sodium and potassium compounds, n.e.s	37,953	24,126	--	Argentina 15,342; Uruguay 3,997; Mozambique 3,600.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked ----------	85,270	123,526	254	Italy 82,879; Japan 21,603.
Worked ----------	4,179	10,057	945	Italy 2,403; Japan 2,366; Mexico 1,587.
Dolomite, chiefly refractory-grade ---	5	5	--	All to Ecuador.
Gravel and crushed rock ----------	1,471	104	--	All to Chile.
Limestone excluding dimension ----	2,698	1,066	--	Paraguay 871; Uruguay 160.
Quartz and quartzite ----------	4,764	5,845	519	West Germany 2,482; Belgium-Luxembourg 1,216.
Sand excluding metal-bearing ------	701	4,109	--	Argentina 2,358; Peru 1,500.
Sulfur: Sulfuric acid ----------	15,839	175	--	Bolivia 139; Paraguay 33.
Talc, steatite, soapstone, pyrophyllite ---	320	496	23	Venezuela 149; Paraguay 105; Peru 100.
Vermiculite ----------	17	1,176	1,099	West Germany 60.
Other:				
Crude ----------	1,163	2,175	(1)	Netherlands 2,000.
Slag, dross, similar waste, not metal-bearing ----------	400	446	--	Chile 400.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	122	139	--	Paraguay 113; Argentina 24.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural ---- kilograms	75	6,570	--	Argentina 4,220; Paraguay 2,350.
Carbon black ----------	4	729	--	France 334; Uruguay 201; Chile 181.
Coal, all grades including briquets ----	125	505	--	Uruguay 380; Argentina 75.
Coke and semicoke ----------	--	68	--	West Germany 40; Paraguay 28.
Hydrogen, helium, rare gases ----------	189	278	--	Argentina 270.
Petroleum and refinery products:				
Crude and partly refined ---- thousand 42-gallon barrels	--	430	430	

See footnotes at end of table.

Table 2.—Brazil: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products —Continued				
Refinery products:				
Gasoline, motor thousand 42-gallon barrels	4,709	1,911	--	Argentina 985; Zaire 208.
Kerosine and white spirit do	1,773	1,321	--	Zaire 918; Argentina 194; Congo 162.
Distillate fuel oil do	1,965	2,935	--	Zaire 1,118; Paraguay 679; Congo 505; Uruguay 383.
Residual fuel oil do	66	2,597	1,469	Sweden 510; Netherlands 265; Bahamas 253.
Lubricants do	6	95	85	Paraguay 8.
Mineral jelly and wax do	r97	34	(1)	United Kingdom 9; Mexico 8; Netherlands 5; Peru 5.
Other:				
Liquefied petroleum gas do	739	426	--	Paraguay 160; Suriname 91; Uruguay 73; Morocco 59.
Nonlubricating oils do	--	692	--	Argentina 377; Zaire 167; Nigeria 80.
Bitumen do	66	53	--	Paraguay 43.
Bituminous mixtures do	27	2	--	Mainly to Paraguay.
Paraffin oil do	3	10	7	Paraguay 2.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	3,868	2,222	--	Argentina 1,591; Uruguay 459.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]Silver metal exported in 1979 totaled 2,765 troy ounces.

Table 3.—Brazil: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	15,574	13,175	(1)	Guyana 12,975.
Oxides and hydroxides	70,614	64,108	500	Suriname 60,797.
Metal including alloys:				
Scrap	22,764	11,745	9,518	Canada 780; Norway 749.
Unwrought	51,816	46,702	22,611	Canada 11,898; Venezuela 8,020.
Semimanufactures	17,928	18,628	9,282	Netherlands 2,331; West Germany 2,067.
Antimony:				
Ore and concentrate	1,641	NA	NA	NA.
Trioxide and pentoxide	597	NA	NA	NA.
Metal including alloys, all forms	177	NA	NA	NA.
Arsenic:				
Trioxide, pentoxide, acids	860	NA	NA	NA.
Metal including alloys, all forms	59	NA	NA	NA.
Beryllium metal including alloys, all forms value, thousands	--	$9	$1	West Germany $8.
Bismuth:				
Trioxide and pentoxide kilograms	194	NA	NA	NA.
Metal including alloys, all forms	44	NA	NA	NA.
Cadmium:				
Oxides and hydroxides	108	NA	NA	NA.
Metal including alloys, all forms	248	NA	NA	NA.
Chromium:				
Chromite	24,575	31,437	--	Philippines 21,600; Republic of South Africa 9,837.
Oxides and hydroxides	429	238	(1)	Poland 150; West Germany 78.
Metal including alloys, all forms	130	NA	NA	NA.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Cobalt:				
Ore and concentrate	5	NA	NA	NA.
Oxides and hydroxides	52	51	26	West Germany 20.
Metal including alloys, all forms	237	NA	NA	NA.
Copper:				
Sulfate	4,526	NA	NA	NA.
Metal including alloys:				
Scrap	2,326	3,435	3,198	Chile 150; Canada 69.
Unwrought	190,225	208,232	3,040	Chile 126,146; Peru 33,878; Zaire 24,107.
Semimanufactures	1,357	1,961	767	West Germany 635; United Kingdom 211.
Gold:				
Ore and concentrate value, thousands	$56,436	NA	NA	NA.
Metal including alloys, unwrought and partly wrought troy ounces	150,530	NA	NA	NA.
Iron and steel:				
Ore and concentrate	27	37	30	Switzerland 6.
Metal:				
Scrap	30	21,909	18,744	Canada 3,150.
Sponge iron, powder, shot	7,694	12,131	2,784	West Germany 7,580.
Ferroalloys	1,555	2,503	219	France 843; West Germany 307; Netherlands 300.
Steel, primary forms	115,652	61,418	19,997	Japan 28,027; West Germany 6,269.
Semimanufactures:				
Bars, rods, angles, shapes, sections	36,720	53,727	5,451	West Germany 17,980; Spain 10,061; Japan 6,558.
Universals, plates, sheets	361,400	425,973	96,099	France 119,572; Japan 105,603; West Germany 50,760.
Hoop and strip	8,188	9,886	2,055	Japan 2,392; West Germany 2,314; France 1,128.
Rails and accessories	17,574	32,659	15,931	Japan 13,512.
Wire	6,665	4,376	534	Uruguay 1,962; Japan 950.
Tubes, pipes, fittings	48,779	76,128	2,349	Japan 38,433; Romania 8,163.
Castings and forgings, rough	398	430	65	West Germany 291.
Lead:				
Ore and concentrate	41,994	34,801	12,505	Greenland 11,228; Ireland 4,250; Republic of South Africa 3,800.
Oxides and hydroxides	310	369	1	Mexico 358.
Metal including alloys, all forms	2,586	1,472	1,410	Peru 50.
Lithium: Oxides and hydroxides	356	NA	NA	NA.
Magnesium metal including alloys, all forms	13,339	13,093	8,221	Norway 4,736.
Manganese:				
Ore and concentrate	101,395	28,501	6,405	Gabon 15,000; Mexico 6,196.
Oxides and hydroxides	155	27	(1)	Japan 25.
Metal including alloys, all forms	1,105	NA	NA	NA.
Mercury 76-pound flasks	4,596	5,831	348	Mexico 5,454.
Molybdenum:				
Ore and concentrate	8,534	NA	NA	NA.
Oxides and hydroxides	45	NA	NA	NA.
Metal including alloys, all forms	208	115	26	Sweden 71; West Germany 11.
Nickel:				
Oxides and hydroxides	42	NA	NA	NA.
Matte, speiss, similar materials	1,499	2,735	39	Canada 2,478.
Metal including alloys:				
Scrap	5	6	6	
Unwrought	3,080	5,747	2,730	Republic of South Africa 1,297.
Semimanufactures	r889	634	136	West Germany 208; Republic of South Africa 171.
Platinum-group metals:				
Ore and concentrate value	$303,908	NA	NA	NA.
Metals including alloys, unwrought and partly wrought troy ounces	27,200	(2)	NA	NA.
Selenium: Elemental	32	NA	NA	NA.
Silicon: Elemental	10	NA	NA	NA.
Silver:				
Waste and sweepings value, thousands	NA	$18	$18	
Metal including alloys, unwrought and partly wrought thousand troy ounces	6,928	(3)	NA	NA.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Sodium: Elemental	18	NA	NA	NA.
Tellurium: Elemental kilograms	485	NA	NA	NA.
Tin:				
Ore and concentrate	7,542	3,605	--	Bolivia 3,263; Singapore 342.
Oxides and hydroxides	37	NA	NA	NA.
Metal including alloys, all forms	12	35	10	Bolivia 10; West Germany 7; Netherlands 5.
Titanium:				
Ore and concentrate	59,379	NA	--	NA.
Oxides and hydroxides	9,414	4,276	369	Belgium-Luxembourg 1,311; West Germany 1,039; France 631.
Metal including alloys, all forms	130	NA	NA	NA.
Tungsten:				
Ore and concentrate	--	2,216	463	Chile 1,629.
Oxides and hydroxides kilograms	4	NA	NA	NA.
Metal including alloys, all forms	36	44	15	West Germany 10; Austria 9.
Uranium and thorium oxides including rare-earth oxides	101	NA	NA	NA.
Vanadium:				
Oxides and hydroxides	1,215	NA	NA	NA.
Metal including alloys, all forms kilograms	40	NA	NA	NA.
Zinc:				
Ore and concentrate	11	36,215	--	Peru 19,797; Argentina 9,272; Mexico 7,146.
Oxides and hydroxides	325	180	9	Uruguay 100; West Germany 33; Netherlands 27.
Metal including alloys:				
Unwrought including scrap	60,058	59,519	--	Mexico 26,768; Canada 18,441; Peru 11,961.
Semimanufactures including blue powder	61	11	1	West Germany 8.
Zirconium and hafnium:				
Ore and concentrate	1,249	NA	NA	NA.
Oxides and hydroxides	392	NA	NA	NA.
Other:				
Ores and concentrates	(1)	63,409	41	Australia 61,340.
Ash and residue containing nonferrous metals	7,115	3,419	1,065	Canada 1,575; Venezuela 779.
Oxides, hydroxides, peroxides	916	NA	NA	NA.
Alkali, alkaline-earth, rare-earth metals	13	90	22	France 35; West Germany 31.
Metalloids	11	7,415	7,136	West Germany 83; United Kingdom 78; Canada 71.
Pyrophoric alloys kilograms	14	NA	NA	NA.
Base metals including alloys, all forms	5	1,989	396	Republic of South Africa 858; Mexico 270.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	663	1,039	372	Italy 616.
Artificial: Corundum	1,265	895	166	Japan 316; France 193; West Germany 166.
Dust and powder of precious and semiprecious stones value, thousands	$3,785	$4,834	$3,612	West Germany $816; Ireland $397.
Grinding and polishing wheels and stones	323	362	156	West Germany 82; United Kingdom 38.
Asbestos, crude	35,763	24,799	189	Canada 18,117; Republic of South Africa 3,497; Italy 2,553.
Barite and witherite	156	175	12	United Kingdom 100; West Germany 60.
Boron materials:				
Crude natural borates	9,625	6,455	2,433	Peru 1,900; Netherlands 1,570.
Oxides and acids	4,812	5,702	3,260	Argentina 1,776.
Bromine: Elemental	32	NA	NA	NA.
Cement	100,700	26,342	1,559	Uruguay 11,350; France 5,671; Peru 4,500.
Chalk	611	525	--	Belgium-Luxembourg 300; France 120; West Germany 76.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products:				
Crude	27,924	18,378	13,794	Argentina 3,764.
Products:				
Nonrefractory	2,257	364	(1)	Italy 142; Uruguay 127; West Germany 87.
Refractory including nonclay brick	14,821	23,729	5,296	Japan 6,697; Republic of South Africa 6,185.
Cryolite and chiolite	86	83	3	Denmark 80.
Diamond excluding dust:				
Gem, not set or strung value, thousands	$3,554	$4,476	$194	Belgium-Luxembourg $2,364; Israel $1,241.
Industrial do	$1,003	$1,669	$434	Ireland $834; Belgium-Luxembourg $262.
Diatomite and other infusorial earth	1,634	1,535	274	Mexico 743; West Germany 507.
Feldspar and fluorspar	6	10,931	--	Mexico 10,887.
Fertilizer materials:				
Crude:				
Nitrogenous	21,800	18,030	--	All from Chile.
Phosphatic	753,687	772,154	139,382	Morocco 413,889; Israel 170,193.
Other including mixed	2	1,001	--	Italy 995.
Manufactured:				
Nitrogenous thousand tons	1,406	1,429	896	West Germany 198; Netherlands 171.
Phosphatic:				
Thomas slag	11,840	7,501	--	Egypt 4,950; Argentina 2,551.
Other	411,366	410,649	285,354	Israel 46,500.
Potassic thousand tons	1,830	2,186	577	Canada 809; East Germany 458.
Other including mixed	551,501	513,503	452,628	Chile 59,297.
Ammonia	172,167	234,895	73,679	Mexico 130,556.
Graphite, natural	112	69	2	Madagascar 31; Norway 24.
Gypsum and plasters	628	1,706	6	Bolivia 1,700.
Iodine	130	NA	NA	NA.
Lime	40	40	--	All from Belgium-Luxembourg.
Magnesite	48	3,193	129	United Kingdom 1,621; Japan 1,004.
Mica:				
Crude including splittings and waste	99	153	2	Canada 143.
Worked including agglomerated splittings	78	112	55	Switzerland 17; France 15; Belgium-Luxembourg 12.
Pigments, mineral:				
Crude, natural	5	NA	NA	NA.
Iron oxides, processed	2,592	2,662	141	West Germany 2,275.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$511	$354	$109	Switzerland $199.
Synthetic do	$170	$120	$50	Switzerland $62.
Pyrites, unroasted	81	129	109	West Germany 20.
Salt and brines	1	4	(2)	Mainly from United Kingdom.
Sodium and potassium compounds, n.e.s.:				
Caustic potash including sodic and potassic peroxides	2,558	8,157	5,712	France 1,261.
Caustic soda	18,840	11,954	3,415	West Germany 4,736.
Soda ash	200,702	224,645	130,629	France 59,874; West Germany 23,724.
Sodium sulfate	132,683	NA	NA	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	148	356	--	All from West Germany.
Worked	81	109	--	Mainly from Italy.
Dolomite, chiefly refractory-grade	5,520	6,425	--	Uruguay 5,575.
Gravel and crushed rock	20	6	2	West Germany 4.
Limestone other than dimension	25,000	(4)	NA	
Quartz and quartzite	19	13	11	West Germany 1.
Sand other than metal-bearing	1,117	2,554	67	Canada 2,084.
Sulfur:				
Elemental:				
Other than colloidal	686,041	939,092	121,576	Canada 663,546.
Colloidal	317	657	646	West Germany 11.
Dioxide	97	NA	NA	NA.
Sulfuric acid	26,112	96,734	2,730	West Germany 41,510; Norway 38,643.
Talc, steatite, soapstone, pyrophyllite	111	117	97	Norway 20.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other:				
Crude	6,520	11,707	1,093	Republic of South Africa 5,163; Australia 4,613.
Slag, dross, similar waste, not metal-bearing	1,411	1,800	--	All from West Germany.
Halogens other than chlorine	NA	201	--	Chile 149; Japan 25; Israel 24.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	2,676	436	134	West Germany 205.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	2,659	335	11	Uruguay 137; Japan 109; United Kingdom 71.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	291	287	193	Argentina 94.
Carbon black and gas carbon:				
Carbon black	7,786	8,680	2,606	Argentina 3,612; West Germany 1,195.
Gas carbon	--	3	(1)	France 2.
Coal and briquets:				
Anthracite and bituminous coal excluding briquets thousand tons	4,479	44,526	2,939	Poland 946; Canada 559.
Lignite including briquets	25	48	48	
Coke and semicoke	315,127	449,361	30,458	Japan 283,324; United Kingdom 38,098.
Hydrogen, helium, rare gases	38	45	43	Japan 1.
Petroleum:				
Crude thousand 42-gallon barrels	370,242	321,184	--	Iraq 131,054; Saudi Arabia 76,367.
Refinery products:				
Gasoline do	967	641	--	Netherlands Antilles 525; Italy 67.
Kerosine and jet fuel do	--	(1)	(1)	
Distillate fuel oil do	1,249	3,564	(1)	Venezuela 1,018; Argentina 559; Gabon 489.
Residual fuel oil do	1,301	7,273	--	Gabon 1,546; Iran 1,474; Mexico 1,162.
Lubricants do	1,861	1,009	526	Netherlands Antilles 231; Romania 199.
Other:				
Liquefied petroleum gas do	886	1,334	(1)	Saudi Arabia 373; Mexico 263; Venezuela 252.
Mineral jelly and wax do	12	10	7	Republic of South Africa 2.
Nonlubricating oils do	334	1,935	1,864	Romania 63.
Petroleum coke do	1,018	835	592	Argentina 210.
Bitumen and other residues do	(1)	--		
Bituminous mixtures do	1	(1)	(1)	Mainly from Japan.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	138	25,742	24,483	United Kingdom 517.

rRevised. NA Not available.

[1]Less than 1/2 unit.

[2]Value only reported at $8,309,000, of which $3,699,000 was from West Germany, $1,645,000 was from the United States, and $1,163,000 was from the Netherlands.

[3]Value only reported at $67,105,000, of which $35,645,000 was from Mexico, $12,670,000 was from Chile, $11,549,000 was from Peru, and $2,114,000 was from the United States.

[4]Value only reported at $2,000, all from the United States.

COMMODITY REVIEW

Of all the known mineral resources of Brazil, especially those in Amazonia, none is more potentially lucrative now than the minerals of the Serra dos Carajás. The magnitude of Brazil's known reserves in many of its important minerals provides the country with a long-term economic base. Brazilian officials estimated that the Carajás iron ore alone could bring in as much as $700 million per year in foreign exchange earnings. Recent discoveries of large bauxite reserves in the Amazon region have increased Brazil's world ranking to third, after Guinea and Australia. The recently discovered Serra Pelada and Serra dos Andorinhas gold deposits east of Carajás were estimated to contain more than 100 tons of gold.

The major mining projects to date in the Carajás region have been located near commercial waterways or in coastal areas, including the Trombetas bauxite project, Pará State, which has access to the Amazon River; the Alumina do Norte do Brasil S.A. (ALUNORTE) alumina refinery and the Aluminio Brasileiro S.A. (ALBRAS) aluminum smelter, both located in Barcarena, near Belém; and the Alcoa Aluminio do Brasil S.A. refinery and smelter complex near São Luis do Maranhão. The corresponding infrastructure, such as rail and road transportation systems and storage and port facilities, will also aid in opening up the Serra dos Carajás area.

METALS

As a result of increasing exploration activities by Government agencies and private sector companies, DNPM reported substantial increases in the measured reserves of metallic minerals, headed by silver, 2,462%; and followed by gold, 92%; chromium, 45%; and tungsten, 24%.[4] Measured reserve figures published by DNPM are those that are officially approved by the Government on the basis of annual mine reports and final reports on exploration work.

Alumina-Aluminum-Bauxite.—Brazil again was the major producer of primary aluminum in Latin America, producing 256,000 tons. However, this was a decrease of almost 2% from that produced in 1980. Aluminum imports in 1981 decreased 47% from 77,075 tons in 1980.

Brazil was still a modest bauxite producer in 1981 after entering the international market in 1979. DNPM estimated, however, that by 1990 Brazil's production of bauxite would be 17 million tons, of which 15 million tons would be supplied from the northern Amazon region, and the remaining 2 million tons would be from the southeast region. Estimated alumina output for 1990 was 4.35 million tons, with 3.6 million tons being produced in the Amazon region and 750,000 tons from the southeast. Brazil ranks third in world bauxite reserves, behind Guinea and Australia, with 4.5 billion tons, or about 15% of world reserves.

Early in 1981, the Brazilian Government prevented the Aluminum Co. of America (Alcoa) from purchasing the huge bauxite reserves, formerly held by the American industrialist Daniel K. Ludwig, in the Amazon region. Instead, the reserves will be jointly exploited by a group of companies, including Alcoa. Ludwig's reserves, in Parã State, were estimated at about 226 million tons of bauxite.

A major step during 1981 to further advance the development of Brazil's aluminum industry was the creation of Aluminio do Maranhao S.A., a joint venture of Alcoa Aluminio do Brasil S.A. (60%) and two subsidiaries of the Royal Dutch/Shell group, Shell do Brasil S.A. and Billiton BV, to install the Itaqui bauxite refining and aluminum smelting facilities in São Luis, Maranhão State, for the processing of bauxite from the Trombetas River region deposits. The Itaqui production facilities were scheduled to begin operations in 1985, with an annual output of 500,000 tons of alumina and 100,000 tons of primary aluminum. Possible expansion of the facilities was already being considered at yearend, increasing annual production to 3 million tons of alumina and 300,000 tons of aluminum by the end of the decade. Production in excess of domestic demand would be exported.

Brazil's fifth aluminum smelter was expected to come online in early 1982 at Santa Cruz, 40 kilometers southwest of Rio de Janeiro. The 86,000-ton-per-year facility was owned by Valesul Aluminio S.A. (VALESUL), a joint venture of CVRD (53%), Shell do Brasil S.A. (44%), Reynolds Metals Co. (2%), and the State of Rio de Janeiro (1%). The smelter will be fed initially with alumina imported from Guyana and Suriname. The ALUNORTE alumina refinery at Barcarena, Pará State, scheduled for a June 1985 startup to produce 800,000 tons of alumina per year, was subsequently to be the supplier of alumina to both the VALE-

SUL smelter and the ALBRAS smelter, also planned to be onstream in 1985 at Barcarena. CVRD owned 60% of the ALUNORTE alumina refinery and 51% of the ALBRAS aluminum smelter, and Japan's Nippon Amazon Aluminum Co. owned 40% and 49% of the projects, respectively.

Columbium (Niobium).—The pyrochlore deposit at the Araxa carbonatite complex, located 6 kilometers south of the city of Araxa in the State of Minas Gerais, contains the world's largest known reserves of columbium minerals, representing more than 70% of the world's economically extractable reserves. Total reserves consist of 460 million tons of ore containing 2.5% Cb_2O_5, of which 131 million tons are in the measured category.

The mine, operated by Cia. Brasileira de Metalurgia e Mineração (CBMM), has been producing since the early 1960's and for the last 15 years has supplied more than 60% of the Western world's columbium consumption. CBMM is owned by Cia. Metropolitana de Comercio e Participações (52.65%) and Molycorp, Inc., of the United States (47%), with the remaining 0.35% equity held by private Brazilians.

The major part of the columbium produced at Araxa was exported as ferrocolumbium for use in high-strength, low-alloy steels. No pyrochlore concentrates were exported during 1981.

During 1981, CBMM developed a process and constructed a plant to produce especially pure grades of Cb_2O_5 (+99% Cb_2O_5) for optical and electronic applications.

Also during the year, new crushing and concentrating facilities were completed on a site 3.2 kilometers from the open pit mine, with a design capacity of 3,500 tons per day of ore. The rated annual production of the new facilities will be 42,000 tons of pyrochlore concentrates containing 60% Cb_2O_5, or the equivalent of 55 million pounds of contained Cb_2O_5. An expansion, doubling the concentrator capacity to 84,000 tons per year, has been planned, with ore silos, concentrator building, and a second ball mill already completed. In addition, the crushing facilities and all necessary infrastructure have been built for six times the current capacity of the concentrator.

Copper.—A group of Brazilian companies formed a consortium with Corporacion Nacional del Cobre de Chile, the Chilean state copper mining company, for the development of copper deposits in Brazil and Chile. The consortium, named ANDIBRAS, included Tecnica Nacional de Engenharia S.A., Brasil-Invest, Andrade Gutierrez, Caraiba Metais, S.A., and Interbras, the trading subsidiary of Petróleo Brasileiro S.A. (PETROBRAS), the Brazilian state-owned oil company. ANDIBRAS will initially operate on a trial basis for 1 year. Among the first projects planned was a feasibility study of mining the El Abra copper deposit in northern Chile and processing the ore into finished products in Brazil.

Caraiba Metais S.A. brought onstream its new 25,000-ton-per-year underground copper mine at Jaquari in Bahia State. The operation was to be expanded to 75,000 tons per year of copper eventually. The ore, mainly chalcopyrite, was treated at the company-owned concentrator at Camaçari, in Bahia, and subsequently sent to the company's smelter-refining complex, also at Camaçari.

Reportedly, Cia. Brasileira de Cobre S.A. modernized its Camaqua Mine in Rio Grande do Sul to produce 12,000 tons per year of copper concentrate.

Gold.—In the latest available minerals report, DNPM stated 1980 gold output was 489,150 troy ounces, of which 131,500 troy ounces was from mine operations by Morro Velho Mineração S.A. and Mineração Tejucana S.A., with the remainder from many small prospectors (garimpeiros).[5] DNPM noted that the output of the garimpeiros represents only the amount purchased by local agencies of the Federal Government. Bureau of Mines figures in table 1 include estimates for unreported production by the garimpeiros.

In a study published by DNPM, it was reported that the Tapajos region of Pará State contains indicated reserves of ore containing about 29 million troy ounces of gold. The report noted that the deposit is of high grade and suitable for commercial exploitation.

Iron Ore.—Iron ore continued to be the principal mineral mined in Brazil, with an estimated decrease in production of 14% from that of 1980, as well as the principal mineral exported. In 1981, Brazil replaced Australia as the leading iron ore exporting country in the world.

Brazil currently has the largest reserves of iron ore after the Soviet Union in the world; however, after the Carajás region is fully assessed, Brazil may surpass the U.S.S.R. in iron ore reserves. Most of the iron ore deposits of Carajás are located along two flanks of the Serra dos Carajás Range, the Serra Norte and Serra Sul, about 35 kilometers apart. Estimated at 18

billion tons, the iron ore reserves represent the largest concentration of high-grade iron ore, averaging 66% iron, in the world. When smaller lower grade deposits, averaging less than 54% iron, are included, the total iron ore potential of Carajás increases to about 32 billion tons. The Carajás iron ore project was scheduled to come onstream in 1985, with an initial production of 15 million tons per year of ore and to expand to 35 million tons by 1987.

Construction of the single-track, 1.6-meter-gauge, 890-kilometer railway from the minesite, designated N4E, to the new port being built at Ponta da Madeira, on the island of São Luis in Maranhão State, proceeded smoothly during the year. At yearend, most of the right-of-way had been cleared. Ties and rails will be laid at the rate of 2.5 kilometers per day beginning in late 1982. The route follows predominantly flat terrain, which will lower construction costs and eliminate the need for tunnels. The only important bridge will be 2,330 meters in length, passing over the Tocantins River.

Amazonia Mineração S.A., the wholly owned CVRD subsidiary that was charged with implementing the Carajás project, was incorporated into CVRD early in 1981. Thus, the project came under the direct control of CVRD through the establishment of the Superintendencia de Implementação do Projeto Carajás, which reports to the Director of Planning.

The pilot beneficiation plant at the Carajãs minesite became operational in February to characterize the sinter feed and lump ore products, to test the performance of beneficiation equipment, and to train operating personnel.

In addition to the Carajás iron ore reserves, Brazil has substantial reserves of somewhat lower grade iron ore in the Quadrilatero Ferrifero (Iron Quadrangle) region of Minas Gerais State.

In its 1981 annual report, CVRD reported that its total iron ore production decreased 17% to 56.2 million tons, of which 2.1 million tons was iron ore pellets. Exports of iron ore and pellets in 1981 by CVRD generated foreign exchange earnings of $844 million, a gain of 6.6% over that of 1980, with an increase in volume of 3.1%.

Iron and Steel.—Crude steel production in Brazil, Latin America's major producer, declined nearly 14% to 13.2 million tons in 1981. As a result, Brazil dropped to the number 13 producer in the world. Crude steel capacity was estimated at 15.8 million tons, of which the Government-owned sector, held primarily by Siderurgica Brasileira S.A. (SIDERBRAS), had 66%. The private sector, including over 30 firms, had 34% of the capacity.

Of the SIDERBRAS group of nine companies, only three—Usinas Siderúrgicas de Minas Gerais S.A., Cia. Siderúrgica Paulista (COSIPA), and Cia. Siderúrgica Nacional (CSN)—were coke-based works. These three companies had a joint capacity of 9.1 million tons, or 58% of Brazil's capacity. During 1981, 7.1 million tons of crude steel was produced by them, with the remaining 6.1 million tons produced divided about equally between charcoal-fired works and electric furnaces using scrap.

During 1981, the CSN and COSIPA works were being expanded to add 2.7 million tons of capacity. In addition, SIDERBRAS was constructing two new coke-based integrated works, to be operated by Acos de Minas Gerais S.A. and Cia. Siderúrgica de Tubarão, which will add an additional 5.0 million tons of capacity by the end of 1983.

Brazil's pig iron production also declined during 1981, from 13.0 million tons in 1980 to 10.9 million tons in 1981. With an output of 4.2 million tons in 1981, 39% of the country's total, Brazil's charcoal-fired steel sector was the world's largest.

Manganese.—Brazil was one of the top five producers of manganese ore in the world, with production in 1981 estimated at 2.3 million tons, about 8% of world production. The largest producer was Industria e Comercio de Minerios S.A., a joint venture of Cia. Auxiliar de Empresas de Mineração and Bethlehem Steel Corp. of the United States, with mining operations in Serra do Navio in Amapá Territory. Cia. Meridional de Mineração S.A. and Cia. Mineração Urandi S.A. were also small manganese producers in Brazil.

NONMETALS

As of yearend 1980, DNPM reported substantial increases in the measured reserves of diamond, 69%; magnesite, 32%; mica, 31%; limestone, 15%; and talc, 14%.[6]

Asbestos.—The main producer of asbestos fiber in Brazil was S.A. Mineração de Amianto, whose Cana Brava Mine and mill located at Uruacu in Goiás State began limited exports during the year. Although the capacity at Cana Brava is 180,000 tons of crysotile fiber per year, output during 1981 was less than 145,000 tons. Two smaller producers, Sana S.A. Industria e Comercio with a mine and mill in Piauí State

and Cimento Amianto S.A. with a mine and mill in Goiás State, produced less than 2,000 tons each of asbestos in 1981.

Brazil ranked sixth worldwide in the production of asbestos and was the leading producer in Latin America.

Cement.—Cement production in Brazil increased 5% in 1981 to 28.5 million tons. There were 60 cement-producing plants dispersed among the major population centers.

Diamond.—In Brazil, the most important producing state was Minas Gerais, but Bahia State was of particular interest for its black carbonado diamond output. About one-half of Brazil's production was of industrial-grade quality and one-half was gem quality.

The two major mining companies involved were Mineração Brasileria Comercial Ltda. and Mineracão Tejucana S.A. St. Joe Minerals Corp. of the United States was investigating two promising alluvial properties, the Alto Coite and the potentially much larger Araguaia. The major part of Brazil's diamond production was again derived by garimpeiros, however.

Emerald.—Mining was resumed at the Fazenda Belmont placer mine, 18 kilometers from Itabira in Minas Gerais State, at the end of October. The mine was reportedly closed in December 1980 because of theft by miners. As a protective measure during the 10-month hiatus, the deposit was buried under tons of waste.

Belmont Gemas Ltda. was formed to market renewed production, of which an estimated 80% to 90% would be exported.

Potassium.—Construction of the Taquari-Vassouras potash project at Carmopolis in Sergipe State continued during 1981. The mines, scheduled for startup in 1984, will be operated by PETROBRAS Mineração S.A. (PETROMISA), a subsidiary of PETROBRAS. Production, to be achieved in 1987, was designed for 300,000 tons per year of potassium oxide.

PETROMISA continued exploratory drilling for potash during the year in the Amazon Basin southeast of Manaus, Amazonas State.

Brazil currently lacks any domestic production of potash.

MINERAL FUELS

Alcohol Fuel Program.—The Brazilian Government rescheduled its well-advertised alcohol fuel program, which originally was targeted to produce 10.7 billion liters of alcohol by 1985, to reach the 10.7-billion-liter level by 1987. The program, originally budgeted for $5 billion for 1980-84 and now expected to cost $6 billion, has had financing problems associated with developing both industrial and agricultural projects related to the program. To date, the Government has signed contracts for production facilities to provide 8.9 billion liters of alcohol, although there are estimates indicating that only 70% of the needed cane can be made available to meet the production target. However, attractive interest rates and subsidies for cane and alcohol producers appear to have led to a nearly complete industrial package for the desired target.

Brazil continued to increase its efforts to promote the sale of alcohol-fueled cars during 1981 despite the fact that the sale of alcohol-fueled cars declined from 80% of new car sales at the end of 1980 to 10% at yearend 1981, owing to public doubts concerning long-term alcohol supplies.

In 1981, alcohol production was 4.3 billion liters, an increase of 26% over that of 1980.

Coal.—Estimated coal production during 1981 was 5.7 million tons. Although Brazil has made ambitious plans to produce 19.5 million tons by 1985, budgetary and technical restraints have limited the allocation of needed funds.

The Leao I Mine, Brazil's first mechanized mine with one longwall face and located 100 kilometers from Pôrto Alegre in Rio Grande do Sul State, was scheduled to begin production in early 1982. The nearby Leao II Mine, which will provide coal to a 350-megawatt power station on the Jaqui River, was also being developed. Under present plans it will have five longwall faces. Two other major projects underway during 1981 were both located in Rio Grande do Sul State—the development of a 1.5-million-ton open pit mine at Ijuí and the expansion of the Candiota open pit mine from 400,000 tons per year to 2.8 million tons per year by 1983.

Although Rio Grande do Sul State, the southernmost State, contains over 80% of Brazil's estimated 23 billion tons of coal reserves, more coal has been mined in Santa Catarina State, which has most of the remaining reserves. Brazilian coal deposits are almost all of low grade (high sulfur and ash content); thus, Brazil needs to blend its coal with imported coal for use in steel mills.

Natural Gas.—Production of natural gas in 1981 increased 13% over that of 1980 to a new record of 88 million cubic feet. Onshore fields produced 52% and offshore fields

Table 4.—Brazil: Crude oil production by Petróleo Brasileira S.A.

(Thousand 42-gallon barrels)

Area	Production		Share, percent		Change, percent
	1980	1981	1980	1981	
Alagoas	1,183	1,076	r1.7	1.3	-9.0
Bahia	r31,021	28,876	r45.3	35.9	-6.9
Ceará	1,076	2,541	1.6	3.2	+136.2
Espírito Santo	2,848	5,768	r4.2	7.2	+102.5
Rio de Janeiro	10,460	19,687	r15.3	24.5	+88.2
Rio Grande do Norte	4,894	5,183	r7.1	6.5	+5.9
Sergipe	17,014	17,190	r24.8	21.4	+1.0
Total	r68,496	80,321	100.0	100.0	+17.3
Onshore	r41,161	43,771	r60.1	54.5	+6.3
Offshore	r27,335	36,550	r39.9	45.5	+33.7

rRevised.

Source: Annual Report of Petróleo Brasileira S.A., 1981.

produced 48% of gas output. The onshore production was an increase of 5.8% over that of 1980, owing mainly to the contribution from the Espirito Santo and Bahia Fields. Offshore production increased almost 22% over that of 1980, with the most significant increases in the fields off Rio de Janeiro and Ceará States.

At yearend, natural gas reserves increased to 2.129 trillion cubic feet, an improvement of about 15% compared with that of 1980. The increase was derived primarily from the Campos Basin off Rio de Janeiro State but also to a lesser extent from onshore finds in the Upper Amazon region and in Alagoas State.

Petroleum.—As a result of intensified exploration activities, continued efforts to expand domestic production, and progress in energy substitution and conservation measures, Brazil in 1981 further reduced its dependence on foreign energy sources. Brazil's crude oil output increased more than 17% over that of 1980. Production increased from an average of 182,000 barrels per day in 1980 to a record 220,000 barrels per day in 1981, with 46% of the production coming from Continental Shelf fields. In December, a record 260,000 barrels per day was attained.

PETROBRAS continued to give priority to its exploration program in 1981 and was rewarded by increasing recoverable crude oil and natural gas liquids reserves almost 12% to 1.49 billion barrels, after production during the year of 80 million barrels of oil and natural gas liquids. Domestic crude production trimmed oil imports to 41% of supply, from 50% in 1980. Consumption during 1981 averaged 1 million barrels per day, a 9% decrease from the 1980 level.

The exploration effort of PETROBRAS, the state oil monopoly, included 148 wells drilled in 8 land basins as well as 79 wells on the Continental Shelf, including 40 in the Campos Basin off the coast of Rio de Janeiro State. Among the onshore wells, 34 were found to be oil-producing and 8 gas-producing. Of the 79 offshore wells, 17 were found to be oil-producing and 1 gas-producing. Success rates for all exploratory wells were 12.7% onshore and 8.6% offshore. By yearend, Brazilian oil and gas production was from 2,035 wells—2,009 oil and 26 gas.

During 1981, PETROBRAS exploration and development programs accounted for approximately 83% of the company's total investments. The drilling of wells occurred in 13 of the Federal units from Roraima Territory to Santa Catarina State and along the coast from Amapá Territory to Rio de Janeiro State using 81 rigs, 31 of which were offshore.

For the first time, the mark of 1 million meters drilled in 1 year was reached during 1981. Total drilling was 1,063,000 meters, an increase of 31% over that of 1980, of which 525,000 meters were for exploration.

By yearend, PETROBRAS had signed another 22 risk contracts, increasing to 102 the number of contracts signed since 1976 when risk contracts were first introduced. Also, the first commercially viable oilfield in an area operated under a risk contract was discovered during the year. This find occurred in the pioneer well Bahia Submersible, 10 kilometers offshore of Bahia State, operated by the Pectin-Chevron-Union Oil consortium.

During the year, PETROBRAS increased the flexibility of its refineries by starting a program known as "Scraping the Barrel," which called for, among other things, the addition of naphtha hydrodesulfurization, kerosine and diesel units, and sulfur recovery units at its São Jose dos Campos refin-

ery in São Paulo State. The program was intended to allow Brazil's refineries to handle heavier, cheaper crudes.

Shale Oil.—A new method for shale oil retorting was developed that is reportedly simpler and less expensive than the well-known Petrosix process created by PETROBRAS. The Tenenge process, named for the São Paulo-based firm, differs from that of PETROBRAS in that gas is heated indirectly, requires little water or electricity, does not release polluting ash or gases, and costs only $29 per barrel compared with PETROBRAS' $39 per barrel.

PETROBRAS prototype Irati plant for processing oil shale, located in Paraná State and running since 1972, operated about 80% of the year, producing 157,000 barrels of oil and 3,000 tons of sulfur.

Uranium-Nuclear Energy.—During the year, the initial consignment of yellow cake was delivered to Brazil's first nuclear reactor, the 626-megawatt Angra I located near Rio de Janeiro, from the New Osamu Utsumi uranium mine and processing plant, Brazil's first.

The Osamu Utsumi Mine is located in the Poços de Caldas alkaline ring complex in Minas Gerais State. Extractable reserves of U_3O_8 have been estimated at 21,000 tons. Mine production will be 2,500 tons per day of ore, matching the design throughput of the adjacent plant, but there are already plans to raise capacity of both mine and plant to 5,000 tons per day of ore.

Work continued on the 1,245-megawatt Angra II nuclear reactor, located on the same site at Angra do Reis, which was scheduled for completion in 1987. A third reactor, Angra III, is planned to eventually be constructed on this site for the combined generation of about 3,000 megawatts. Two plants are scheduled for São Paulo State, and plans have been made to have completed at least eight nuclear reactors, each having a 1,250-megawatt capacity, by the end of the century.

Since its formation in 1974, Empresas Nucleares Brasileiras S.A., the state-owned company controlling Brazil's nuclear program, including exploration and mining, has increased total reserves of uranium from 11,000 tons to more than 235,000 tons of yellow cake. As a result, Brazil now ranks at least fifth in terms of world reserves and possibly fourth. Seven major deposits are now known, with the more significant ones located in the States of Ceará and Bahia in northern Brazil. In Ceará, promising deposits have been located at Itataia, where the uranium is associated with phosphate and occurs in collaphanite. Reportedly, reserves of U_3O_8 are in excess of 122,000 tons, and a pilot plant could be in operation by 1984 or 1985. Another promising deposit is located at Logoa Real in southern Bahia, where the uranium occurs in uraninite. Reserves were estimated to be about 27,000 tons, and an underground operation, producing 1,000 to 2,000 tons of U_3O_8, was under consideration for possible startup by 1986 or 1987.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Brazilian new cruzeiros (NCr$) to U.S. dollars at the average rate of NCr$93.00 = US$1.00 in 1981.

[3]Departamento Nacional da Produção Mineral. Anuário Mineral Brasileiro-1981. Annual report covers 1980 data.

[4]Work cited in footnote 3, p. 24.

[5]Departamento Nacional da Produção Mineral. Sumá Mineral-1982, p. 70.

[6]Work cited in footnote 3, p. 25.

The Mineral Industry of Bulgaria

By Tatiana Karpinsky[1]

In 1981, Bulgaria's national economy continued to develop at a steady rate. According to Bulgarian sources, national income increased 7.2% and reached 22 billion leva (L) in current prices.[2] Most of this increase was attributed to a rise in labor productivity. The fixed capital in the national economy was L82.7 billion. Investment in the economy reached L6.7 billion. Bulgaria's industrial output in 1981 increased in comparison with that of 1980 by 5.6%.[3] Base metal production provided some 6% of Bulgaria's industrial output.

In 1981, with Soviet assistance, 20 projects and separate installations were put into operation. The most important were as follows: The Elatsite ore-dressing complex, one of Bulgaria's largest nonferrous metal projects for increasing copper production; a fourth power block, with a capacity of 210 megawatts, installed at the Maritsa-East III thermal power station, which increased total capacity to 840 megawatts; a plant for producing sulfuric acid at the Damyanov copper-smelting factory in Srednegorie, as well as a number of workshops at metallurgical complexes in Kremikovtsi and Pernik. Complete equipment was supplied for expanding the Kozloduy atomic powerplant from 880 to 1,760 megawatts; and equipment for the Assarel copper-dressing complex and Zdravets coal mine was also delivered.

Government Policies and Programs.—In December 1981, the National Assembly approved the plan for Bulgaria's economic development in 1982. The targets set for 1982 appeared to be scaled down from those of 1981. As compared with that of 1981, the plan provided for a 3.6% increase in national income, a 3.5% increase in labor productivity, and a 4.5% increase in the volume of industrial output. The volume of capital investment was to be L7.2 billion. A large part of the capital investment was for renovation and modernization of existing plants. Foreign trade was scheduled to increase by 4% compared with that of 1981.

By the end of the century, 23 beneficiation plants were to be in operation for ferrous and nonferrous metal ores. These are to include nine for lead-zinc ore, eight for copper and copper-pyrite ore, one for tungsten ore, one for placer gold, one for copper slag, two for iron ore, and one for manganese ore.[4]

PRODUCTION

Bulgaria's plan for overall industrial output was reportedly fulfilled. However, the plan's goals were not met in the production of pig iron, ingot steel, alloy steel, mineral fertilizers, calcinated soda, and coal.

In 1981, in comparison with that of 1980, generation of electric energy increased by 6.8%, and ferrous metallurgy, by 6.4%, but the planned increase for ferrous metallurgy was 10.1%. Chemical industry increased by 11%, and metal processing, by 6.6%.

In 1981, an extensive program for the development of the iron and steel industry was underway. In addition, prospecting was intensified, and promising deposits of iron ore, manganese, copper, lead, and zinc were to be developed during 1981-85.

Table 1.—Bulgaria: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
METALS					
Cadmium metal, smelter[e]	200	210	210	210	210
Copper:					
Mine output, metal content	57,000	58,000	58,000	58,000	58,000
Metal, primary and secondary:					
Smelter	60,000	64,000	64,000	64,000	64,000
Refined	58,000	62,000	62,000	62,000	62,000
Iron and steel:					
Iron ore:					
Gross weight thousand tons	2,270	2,452	2,103	1,886	1,754
Fe content do	707	762	651	590	537
Iron concentrates do	1,055	1,080	960	921	912
Metal:					
Pig iron do	1,614	1,493	1,450	1,527	1,514
Ferroalloys, electric-furnace, all types do	50	46	45	45	55
Crude steel do	2,589	2,470	2,482	2,567	2,483
Semimanufactures, rolled do	2,931	3,050	3,128	3,213	3,351
Lead:					
Mine output, metal content	117,000	117,000	116,000	116,000	[e]116,000
Metal, smelter, primary and secondary	120,000	120,000	119,000	119,000	[e]119,000
Manganese ore:					
Gross weight	40,000	40,000	42,000	49,000	45,321
Mn content	11,400	11,000	12,300	14,200	13,207
Molybdenum, mine output, metal content[e]	150	150	150	150	150
Silver, mine output, metal content[e] thousand troy ounces	840	900	920	930	930
Zinc:					
Mine output, metal content	87,000	88,000	85,000	87,000	[e]87,000
Metal, smelter, primary and secondary	90,000	91,000	89,000	90,000	90,000
NONMETALS					
Asbestos	500	700	600	700	[e]700
Cement, hydraulic thousand tons	4,665	5,149	5,401	5,429	5,443
Clays: Kaolin	194,000	199,000	202,000	208,000	221,422
Gypsum and anhydrite:					
Crude thousand tons	295	340	309	311	350
Calcined	57	82	80	88	[e]85
Lime: Quicklime thousand tons	1,725	1,782	1,868	1,870	1,773
Nitrogen: N content of ammonia	[r]815,900	[r]787,200	[r]779,820	827,000	752,840
Pyrites, gross weight[e]	693,000	705,000	715,000	680,000	680,000
Salt, all types	87,000	87,000	86,000	87,000	[e]87,000
Sodium compounds, n.e.s.:					
Caustic soda thousand tons	100	106	115	168	[e]168
Sodium carbonate, calcined do	1,218	1,294	1,498	1,479	1,469
Sulfur:					
S content of pyrites	305,000	310,000	315,000	300,000	300,000
Byproduct, all sources	65,000	70,000	75,000	70,000	70,000
Total	370,000	380,000	390,000	370,000	370,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, marketable:					
Anthracite thousand tons	103	102	104	97	246
Bituminous do	185	171	170	170	
Brown do	5,748	5,797	5,855	5,793	5,654
Lignite do	19,139	19,733	22,100	24,153	23,324
Total do	25,175	25,803	28,229	30,213	29,224
Coke do	1,446	1,411	1,351	1,348	1,381
Natural gas, marketed million cubic feet	365	1,140	4,820	6,714	4,840
Petroleum:					
Crude:					
As reported thousand tons	129	180	[e]180	180	180
Converted thousand 42-gallon barrels	942	1,314	[e]1,314	1,314	1,314
Refinery products:					
Gasoline do	14,450	14,620	[e]14,700	14,700	NA
Kerosine do	1,472	1,550	[e]1,600	1,600	NA
Distillate fuel oil do	23,872	24,618	[e]24,700	24,700	NA
Residual fuel oil do	35,298	36,630	[e]36,800	36,800	NA
Lubricants do	700	770	[e]750	750	NA
Liquefied petroleum gas do	650	754	[e]750	750	NA
Asphalt including natural do	2,975	3,636	[e]3,700	3,700	NA
Total do	79,417	82,578	83,000	83,000	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Sept. 21, 1982.

[2]In addition to the commodities listed, bismuth, chromite, gold, palladium, platinum, tellurium, uranium, barite, fluorspar, magnesite, and a variety of crude construction materials (common clays, sand and gravel, dimension stone, and crushed stone) are produced, but available information is inadequate to make reliable estimates of output levels.

TRADE

Bulgaria's foreign trade in 1981 reached L19.8 billion, a 15% increase over that of 1980. Exports increased by 10.5%, while imports rose by 19.7%. The centrally planned economy countries accounted for 72% of the total; the Soviet Union's share amounted to 52%. The trade with the U.S.S.R. rose by 11.2%.

In 1981, imports of machinery and equipment accounted for about 34% of the total value of Bulgaria's imports; fuels, minerals, and metals accounted for about 44%; chemical products, 4%; and building materials, about 1%.

Exports of machinery and equipment comprised about 46% of the value of total exports in 1981; fuels, minerals, and metals, about 15%; chemical products, 4%; and building materials, about 2%.

In 1981, value of imports of fuels, minerals, and metals increased by 24% over that of 1980. The increase by volume in imports was as follows: bituminous coal, 3.9%; pig iron, 5.1%; and iron ore, 2%. The import of coke decreased 9%, and steel, 10%.

The U.S.S.R. and Bulgaria signed an agreement on trade for 1982. The Soviet Union was to supply Bulgaria with iron ore, ferrous and nonferrous metals, natural gas, crude oil, petroleum products, coal, and electrical energy, approximately in the same amounts as in 1981.

Table 2.—Bulgaria: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate -- value, thousands	--	$8	--	All to Uruguay.
Oxides and hydroxides	165	NA		
Metal including alloys:				
Scrap	384	604	--	West Germany 304; Italy 217; Austria 83.
Unwrought	5,066	4,817	--	Japan 4,066; Austria 534.
Semimanufactures	12	606	--	Poland 304; West Germany 211.
Bismuth metal including alloys, all forms	23	NA		
Cadmium metal including alloys, all forms	65	52	--	West Germany 40; Czechoslovakia 12.
Copper:				
Matte	--	17	--	All to Turkey.
Sulfate[2]	30	--		
Metal including alloys:				
Scrap	836	646	--	West Germany 327; France 160; Turkey 139.
Unwrought	1,201	1,969	--	Italy 848; West Germany 679; Turkey 204.
Semimanufactures	408	526	--	Morocco 311; Turkey 135; Italy 79.
Iron and steel:				
Ore and concentrate	--	4	--	All to West Germany.
Metal:				
Scrap	[3]130,000	[3]155,000	--	Italy 99,787; Austria 18,861; Yugoslavia 17,443.
Pig iron, cast iron, powder, shot	[4]12,300	[4]34,400	--	Poland 7,782; undetermined 25,361.
Ferroalloys	[3]22,000	[3]23,000	--	West Germany 4,704; undetermined 14,059.
Steel, primary forms	605,343	387,508	--	Italy 82,716; Belgium-Luxembourg 67,078; West Germany 38,748.
Semimanufactures:				
Bars, rods, angles, shapes, sections	[3]189,000	[3]155,000	--	Egypt 79,049; Poland 27,628; Thailand 11,001.
Universals, plates, sheets	[3]430,000	[3]545,000	--	West Germany 94,297;[2] Romania 53,306;[2] Poland 34,301.[2]
Hoop and strip	12,935	[5]22,287	--	Greece 15,512; France 2,945; United Kingdom 2,630.
Rails and accessories	440	51	--	All to Italy.
Wire[3]	32,000	30,000	--	NA.
Tubes, pipes, fittings	[4]69,600	[4]65,000	--	Poland 13,344; Italy 3,999; undetermined 43,354.
Castings and forgings, rough	11,926	1,143	--	Poland 1,071; Saudi Arabia 32.
Lead:				
Ore and concentrate	[6]6,000	NA		
Oxides	2,678	1,810	--	Yugoslavia 611; Egypt 548; West Germany 299.
Metal including alloys:				
Scrap	33	NA		
Unwrought	10,852	7,882	--	Yugoslavia 3,826; Greece 2,423; Italy 1,239.
Semimanufactures	--	7	--	All to Saudi Arabia.

See footnotes at end of table.

Table 2.—Bulgaria: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Manganese ore and concentrate	[4]5,600	[4]5,600	--	Mainly to Czechoslovakia.
Molybdenum ore and concentrate	54	NA		
Nickel metal including alloys:				
Scrap	26	22	--	West Germany 20.
Unwrought	150	NA		
Semimanufactures	([7])	NA		
Platinum-group metal including alloys, unwrought and partly wrought value, thousands	$96	$1	--	All to Austria.
Silver:				
Waste and sweepings[8] do	$1,529	$4	--	All to Switzerland.
Metal including alloys, unwrought and partly wrought do	$4,595	$3,055	--	Switzerland $2,211; West Germany $538; Netherlands $273.
Tin metal including alloys:				
Scrap	4	NA		
Unwrought	1	NA		
Zinc:				
Oxides	15	NA		
Metal including alloys:				
Scrap	29	18	--	All to Greece.
Unwrought	13,216	10,388	--	Czechoslovakia 5,000; Yugoslavia 1,642; France 1,495.
Semimanufactures	102	NA		
Other metals:				
Ash and residues, nonferrous	136	13	--	All to Switzerland.
Oxides and hydroxides	24	17	--	West Germany 7; Netherlands 5; United Kingdom 5.
Metalloids	37	32	--	All to West Germany.
Base metal including alloys, all forms	7	14	--	Belgium-Luxembourg 8; Switzerland 2; United Kingdom 2.
NONMETALS				
Boron materials, crude, natural borates	2,660	NA		
Cement[2]	454,500	444,200	--	Switzerland 172,800; Libya 36,600; Yugoslavia 12,300.
Clays and clay products:				
Crude:				
Kaolin	7,531	5,625	--	Poland 4,500; Hungary 1,024.
Unspecified	6,041	5,568	--	Greece 4,006; Italy 1,050; Tunisia 512.
Products:				
Nonrefractory	[r]3,404	[9]2,528	--	Yugoslavia 1,220; Saudi Arabia 728; Finland 468.
Refractory	[r]318	21	--	Italy 20.
Diamond:				
Gem, not set or strung value, thousands	$284	$153	--	All to United Kingdom.
Industrial do	$2,005	$3,950	--	United Kingdom $2,132; Belgium-Luxembourg $1,818.
Fertilizer materials:				
Crude, nitrogenous[2]	7,412	6,644	--	U.S.S.R. 2,000; Czechoslovakia 992; Spain 922.
Manufactured:				
Nitrogenous[2]	572,223	622,824	--	Syria 68,788; Egypt 63,999; Vietnam 59,948.
Phosphatic	18,402	6,025	--	Egypt 6,005.
Potassic	506	NA		
Other including mixed	79	853	--	All to Italy.
Gypsum and plasters	24	NA		
Lime	15,165	5,111	--	All to Hungary.
Mica, crude including splittings and waste	--	10	--	All to Turkey.
Pigments, mineral: Iron oxides and hydroxides, processed	--	61	--	Italy 60.
Precious and semiprecious stones:				
Natural value, thousands	--	$60	--	Italy $30; West Germany $26.
Synthetic do	--	$16	--	All to West Germany.
Sodium and potassium compounds:				
Caustic potash	135	NA		
Caustic soda	[4]2,100	[4]47,200	--	Greece 17,623; Yugoslavia 10,193; France 3,528.
Soda ash[2] thousand tons	1,125	1,116	--	U.S.S.R. 460; Hungary 99; West Germany 75.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,654	8,775	--	Italy 4,922; Poland 2,280; Spain 657.
Worked	14,370	[10]5,954	--	West Germany 4,030; Saudi Arabia 1,526; Italy 275.
Gravel and crushed rock	3,961	3,045	--	Hungary 2,936.
Limestone excluding dimension	600	NA		
Quartz and quartzite	2	NA		

See footnotes at end of table.

Table 2.—Bulgaria: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Sand excluding metal-bearing	[r]4,447	10,411	--	All to Greece.
Sulfur and sulfuric acid[2]	2,284	50	--	All to Romania.
Other nonmetals:				
Crude	9,249	10,872	--	Hungary 9,782; West Germany 1,030.
Slag and dross, not metal-bearing	23	NA		
Halogens	4,978	NA		
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	15	54	--	Italy 50.
Coal and briquets:				
Anthracite and bituminous coal	[4]13,600	74	--	All to Italy.
Lignite including briquets	102	20	--	Do.
Coke and semicoke	39	NA		
Peat including briquets	35	93	3	Greece 90.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	698	[11]495	--	Netherlands 252; Portugal 243.
Kerosine and jet fuel do.	322	44	--	Italy 17; Hungary 14; Spain 7.
Distillate fuel oil do.	1,519	3,168	--	Turkey 2,494; Italy 364; Greece 188.
Residual fuel oil do.	5,260	6,147	--	Italy 3,913; Turkey 733; Yugoslavia 713.
Lubricants do.	199	346	--	Yugoslavia 144; Austria 140; Finland 57.
Other:				
Liquefied petroleum gas do.	398	475	--	Yugoslavia 412; Italy 57.
Mineral jelly and wax do.	23	25	--	Italy 18; Turkey 4; Yugoslavia 2.
Nonlubricating oils do.	305	NA		
Bitumen and other residues do.	36	NA		
Unspecified do.	181	153	--	All to Poland.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	3,888	6,963	--	Yugoslavia 2,323; Spain 1,360; Austria 1,044.

[p]Preliminary. [r]Revised. NA Not available.

[1]Owing to a lack of official data published by Bulgaria, this table should not be taken as a complete presentation of this country's mineral exports. Unless otherwise specified, these data have been compiled from various sources, which include United Nations information, data published by the partner trade countries, and partial trade statistics of Bulgaria.

[2]Official trade statistics of Bulgaria.

[3]Quarterly Bulletin of Steel Statistics for Europe, United Nations, New York.

[4]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[5]Excludes imports by Israel valued at $129,000.

[6]Lead and Zinc Statistics, Monthly Bulletin of the International Lead and Zinc Study Group, London, United Kingdom.

[7]Less than 1/2 unit.

[8]May include waste and sweepings of other precious metals.

[9]Excludes imports by Cyprus valued at $70,000.

[10]Excludes imports by Cyprus valued at $37,000.

[11]Excludes imports by Israel valued at $13,853,000.

Table 3.—Bulgaria: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	84	21	--	Hungary 20.
Oxides and hydroxides	154	658	--	Italy 375; Austria 226; France 50.
Metal including alloys:				
Unwrought	5,025	9,573	--	Hungary 8,125; Austria 1,326; West Germany 49.
Semimanufactures	[r]11,268	9,109	--	West Germany 2,888; Greece 1,870; Hungary 1,121.
Antimony:				
Ore and concentrate	--	150	--	All from Netherlands.
Metal including alloys, all forms	200	200	--	All from Yugoslavia.
Chromium: Oxides and hydroxides	350	NA		
Cobalt metal including alloys, all forms	1	NA		

See footnotes at end of table.

Table 3.—Bulgaria: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Copper:				
Ore and concentrate	985	890	--	All from Italy.
Ash and residues containing copper, metal content	NA	3,173	3,173	
Sulfate[2]	8,677	8,027	--	All from U.S.S.R.
Metal including alloys:				
Unwrought	1,071	1,118	--	Belgium-Luxembourg 1,000; West Germany 118.
Semimanufactures	[r]2,451	3,407	([3])	West Germany 1,902; Yugoslavia 302; Austria 295.
Iron and steel:				
Ore and concentrate[2] thousand tons	2,107	2,235	--	All from U.S.S.R.
Metal:				
Scrap	[r]878	360	--	West Germany 295; Canada 65.
Pig iron, cast iron, powder, shot[2]	356,444	413,478	--	U.S.S.R. 403,478.
Ferroalloys[4] thousand tons	19	26	--	NA.
Steel, primary forms do	[4]386	[4]595	--	France 66; Belgium-Luxembourg 24; undetermined 496.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	[4]376	[4]359	--	U.S.S.R. 73;[2] Belgium-Luxembourg 35; West Germany 24; undetermined 115.
Universals, plates, sheets[2]	253,215	274,668	--	U.S.S.R. 139,850; France 44,913; West Germany 31,776.
Hoop and strip[2]	5,626	5,892	--	U.S.S.R. 4,591; West Germany 649; Poland 309.
Rails and accessories thousand tons	[4]54	[4]63	--	Austria 11; West Germany 3; undetermined 49.
Wire do	[4]23	[4]18	--	Austria 6; West Germany 3; undetermined 7.
Tubes, pipes, fittings do	[5]90	[5]82	--	West Germany 21; Spain 12; Yugoslavia 7; undetermined 26.
Castings and forgings, rough do	[4]19	[4]18	--	Hungary 2; undetermined 15.
Lead:				
Ore and concentrate	23,818	24,526	--	Yugoslavia 8,165; Greece 7,000; Morocco 3,211.
Metal including alloys:				
Unwrought	--	3,455	--	All from France.
Semimanufactures	--	9	--	All from Italy.
Magnesium metal including alloys:				
Unwrought	--	[6]70	--	Yugoslavia 50; France 20.
Semimanufactures	3	4	--	All from West Germany.
Manganese:				
Ore and concentrate	[5]99,900	[5]99,700	--	All from U.S.S.R.
Oxides	290	182	([3])	Greece 100; Ireland 60.
Mercury 76-pound flasks	([3])	NA		
Molybdenum ore and concentrate	50	85	--	All from West Germany.
Nickel metal including alloys:				
Unwrought	--	1	--	All from United Kingdom.
Semimanufactures	175	120	--	West Germany 52; France 41; Austria 21.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$1,839	$3,235	--	West Germany $1,660; France $1,037; Italy $534.
Silver metal including alloys, unwrought and partly wrought do	$2,575	$887	--	West Germany $509; Switzerland $184; France $133.
Tin:				
Oxides	--	12	--	All from Austria.
Metal including alloys:				
Unwrought	638	25	--	All from Belgium-Luxembourg.
Semimanufactures kilograms	1,200	423	--	All from Switzerland.
Titanium:				
Ore and concentrate	1,046	3,290	--	Netherlands 2,169; West Germany 1,121.
Oxides	2,624	667	--	West Germany 364; Spain 300.
Metal including alloys	--	13	--	All from West Germany.
Tungsten metal including alloys, all forms	2	38	30	Japan 6; Netherlands 2.
Zinc:				
Ore and concentrate	29,253	34,059	--	Greece 9,048; Yugoslavia 7,492; Canada 6,518.
Metal including alloys:				
Unwrought	--	203	--	All from Yugoslavia.

See footnotes at end of table.

Table 3.—Bulgaria: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc —Continued				
Metal including alloys —Continued				
Semimanufactures	--	300	--	West Germany 200; Belgium-Luxembourg 100.
Zirconium ore and concentrate	604	1,829	--	All from West Germany.
Other metals:				
Ores and concentrates	61	(7)		
Ash and residues, nonferrous	18,869	33,341	--	Yugoslavia 28,033; Belgium-Luxembourg 5,308.
Oxides and hydroxides	32	79	--	West Germany 52; Netherlands 18; Japan 6.
Metalloids	2,130	1,795	--	Yugoslavia 1,384; France 411.
Alkali, alkaline-earth, rare-earth metals	34	2	--	All from Austria.
Base metals including alloys, all forms	183	58	--	Turkey 50; West Germany 2; United Kingdom 2.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	40	41	--	All from Italy.
Artificial: Corundum	1,696	2,351	--	Yugoslavia 1,285; Hungary 586; Italy 442.
Dust and powder of precious and semiprecious stones value, thousands	$158	$266	--	United Kingdom $172; Belgium-Luxembourg $85.
Grinding and polishing wheels and stones	759	[8]483	--	Austria 231; Yugoslavia 102; Italy 82.
Asbestos, crude	3,333	449	--	All from Canada.
Boron materials:				
Crude, natural borates	3,415	6,560	--	All from Turkey.
Oxide and acid	200	100	--	All from Italy.
Cement	[5]236,000	[5]80,600	--	U.S.S.R. 64,000.
Chalk	--	15	--	All from Switzerland.
Clays and clay products:				
Crude	1,404	1,526	20	United Kingdom 1,491.
Products:				
Nonrefractory	438	843	--	Italy 810; France 17; West Germany 15.
Refractory	40,281	37,671	--	U.S.S.R. 19,436; West Germany 6,310; Greece 4,020.
Diamond:				
Gem, not set or strung value, thousands	$7	NA		
Industrial do	$4,303	$6,953	--	Belgium-Luxembourg $3,905; United Kingdom $2,735.
Diatomite and other infusorial earth	99	354	--	France 151; West Germany 105; Iceland 98.
Feldspar, fluorspar, etc	267	253	--	All from West Germany.
Fertilizer materials:				
Crude, phosphatic[2] thousand tons	1,483	1,215	--	U.S.S.R. 803; Morocco 175.
Manufactured:				
Phosphatic	r [5]95,000	241,067	57,981	U.S.S.R. 183,086.
Potassic, K_2O content	[5]59,300	[5]87,100	--	All from U.S.S.R.
Other including mixed	23	48	--	All from West Germany.
Ammonia	--	10	--	All from United Kingdom.
Graphite, natural	--	95	--	All from West Germany.
Lime	23	61	--	Do.
Magnesite	180	20,241	--	Czechoslovakia 20,000; France 191.
Mica:				
Crude including splittings and waste	28	18	--	All from West Germany.
Worked including agglomerated splittings	12	28	--	Spain 20; Austria 6.
Pigments, mineral: Iron oxides and hydroxides, processed	307	529	--	West Germany 301; Japan 221.
Precious and semiprecious stones:				
Natural value, thousands	$85	$56	--	West Germany $47; Austria $9.
Synthetic do	$15	$56	--	Austria $25; Switzerland $22.
Pyrites, unroasted	--	289,675	--	U.S.S.R. 243,000; Yugoslavia 35,675.
Salt and brine	49,800	44,404	--	Tunisia 44,332; West Germany 70.
Sodium and potassium compounds:				
Caustic potash	560	60	--	Belgium-Luxembourg 40; France 20.
Caustic soda	4,196	4,139	(9)	Italy 3,951; West Germany 187.
Soda ash	--	1	--	All from Switzerland.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	410	1,854	--	Yugoslavia 1,231; Greece 621.
Worked	80	77	--	Yugoslavia 53; Italy 24.

See footnotes at end of table.

Table 3.—Bulgaria: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Dolomite, chiefly refractory-grade	--	2	--	All from Italy.
Gravel and crushed rock	89	342	--	Yugoslavia 243; Italy 99.
Quartz and quartzite	518	458	--	All from Sweden.
Sand excluding metal-bearing	2,244	420	--	Netherlands 320; West Germany 100.
Sulfur:				
Elemental:				
Crude	3,492	59,000	--	Poland 56,000; Greece 2,000.
Refined	5	9	--	All from France.
Sulfuric acid	84	49	--	West Germany 48.
Talc, steatite, soapstone, pyrophyllite	55	80	--	West Germany 63; Italy 16.
Other nonmetals:				
Crude	566	1,718	--	Italy 1,223; Greece 470.
Oxides and hydroxides of barium, magnesium, strontium	152	153	--	All from France.
Halogens	1	1	--	All from Switzerland.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2	11	--	Italy 7; West Germany 4.
Carbon black[2]	25,861	32,253	--	U.S.S.R. 31,040; West Germany 162.
Coal, anthracite and bituminous thousand tons	[5]6,358	[5]6,711	--	U.S.S.R. 4,900;[2] Czechoslovakia 121.
Coke and semicoke[2] do	345	446	--	U.S.S.R. 338; Poland 25; Czechoslovakia 23.
Gas, natural million cubic feet	[9]141,758	[9]202,555	--	All from U.S.S.R.
Hydrogen, helium, rare gases	--	18	--	All from France.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	[9]95,550	[9]95,550	--	Mainly from U.S.S.R.
Refinery products:				
Gasoline 42-gallon barrels	60	3,332	--	Austria 3,264.
Kerosine and jet fuel do	13,152	9,106	--	Hungary 7,859; Greece 1,225.
Distillate fuel oil do	9,601	8,825	--	Greece 7,736; Yugoslavia 604; Italy 440.
Residual fuel oil do	[r]508,672	999	--	All from Greece.
Lubricants do	26,313	36,827	70	Greece 6,265; United Kingdom 5,264; France 4,865.
Other:				
Liquefied petroleum gas do	8,770	23	--	All from France.
Mineral jelly and wax do	543	2,180	--	West Germany 1,495; Austria 315; United Kingdom 165.
Bitumen and other residues do	18,362	30,282	--	All from Hungary.
Unspecified do	30,120	NA		
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	9,868	7,427	--	U.S.S.R. 6,647; West Germany 759.

[p]Preliminary. [r]Revised. NA Not available.

[1]Owing to a lack of official trade data published by Bulgaria, this table should not be taken as a complete presentation of this country's mineral imports. Unless otherwise specified, these data have been compiled from various sources, which include United Nations information, data published by the partner trade countries, and partial official trade statistics of Bulgaria.

[2]Official trade statistics of Bulgaria.

[3]Less than 1/2 unit.

[4]Quarterly Bulletin of Steel Statistics for Europe, United Nations, New York.

[5]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[6]Excludes exports from Norway, valued at $749,000.

[7]Value of unspecified ores and concentrates exported from Australia was $513,000.

[8]Excludes exports from Hungary, valued at $38,000.

[9]1980 Yearbook of World Energy Statistics, United Nations, New York.

COMMODITY REVIEW

METALS

Aluminum.—The Shuman Aluminum Combine produced more than 700 types of rolled sections, a large range of pipes from 10 to 100 millimeters in diameter, and metal sheet from 50 to 100 micrometers thick. By 1990, the combine was expected to process over 100,000 tons of aluminum per year. The raw material for the Shuman Combine was supplied by the U.S.S.R. and Yugoslavia. The combine output almost completely met the national demand for aluminum products. A research team from the Niproruda Institute in Bulgaria developed original technology and built equipment for processing slag resulting from aluminum production.

Copper.—In 1981, the plan for the copper industry was fulfilled, and production of copper was slightly greater than that of 1980. Most of the country's copper ore production came from the Medet, Elatsite, and Tsar Arsen open pit mines. The rest, about 10% of the country's copper ore, came from the Chelopech underground mine, the Burgas Mine, and a few other mines. The first stage of the Elatsite complex was completed in 1981, and it included a strip mine with projected capacity of 5 million tons per year of copper ore, a dressing plant, and a 6.5-kilometer tunnel and belt conveyer. The ore was mined in the mountains at an elevation of 1,120 meters and then transported to the ore-dressing plant, located at an 814-meter elevation. The mine was designed with Soviet cooperation; investment reached about L240 million. It was expected that the Elatsite mining complex would produce more than one-half of the national requirement of copper concentrate. The recovery of copper at the Medet beneficiation plant reached 85.22%. The copper concentrates contained 22% copper, and the pyrite concentrates contained 47% to 51% sulfur. The main minerals were chalcopyrite, pyrite, and molybdenite. Electrolytic copper was produced at the Georgi Damyanov plant in Pirdop. Reconstruction and enlargement of the electrolytic copper facilities at the Damyanov plant continued in 1981 and will be one of the major construction projects in 1982.

Bulgaria continued development of the Assarel mining complex. Assarel was a new large copper ore deposit situated at the Sredna Gora Mountain, which in terms of ore available ranked first in the country. The Assarel Mine began operating in 1981. Installations for the complex were designed by Bulgarian and Soviet specialists.

Iron and Steel.—In 1981, the iron and steel industry accounted for 4.4% of the national industrial output. Capitalization exceeded L1.9 billion.

Iron ore was extracted from the Kremikovtsi, Krumovo, and Martinovo deposits. Kremikovtsi remained the principal iron ore center of Bulgaria. Output of iron ore was insufficient to satisfy domestic needs, and 2.3 million tons of iron ore was imported from the U.S.S.R. Indigenous production of iron ore continued to decline.

The Ministry of Metallurgy and Mineral Resources planned to expand geological prospecting for iron ore and for raw materials for ferroalloys and refractories and to open, in 1986, a new iron ore mine near the village of Dryanovo in the Yambol region. It was also planned to begin construction of the mining and processing metallurgical combine in Obrochishte, Tolbukhin region, during the 5-year-plan period 1981-85. Production of pig iron and steel in 1981 was below the 1980 level; however, output of rolled steel increased about 4%.

The Lenin metallurgical complex at Pernik and the Kremikovtsi complex near Sofia continued under renovation in 1981. Additional electric arc furnaces and continuous casting machines at the Lenin plant were scheduled to be completed in 1985. Renovation of the first agglomeration plant at the Kremikovtsi complex was completed, the blooming mill was partially modernized, and new technology was introduced to purify the gases in the production of ferroalloys. A fourth coke battery was expected to be commissioned by 1985. The Kremikovtsi plant supplied some 80% of domestic demand in steel and exported about 30% of its production.

The construction of the country's third metallurgical combine, with a 1-million-ton-per-year capacity, 18 kilometers west of Burgas, started in 1981. The first stage of the combine, a rolling mill with a capacity of 640,000 tons per year, was scheduled to go onstream in 1985.

Lead and Zinc.—The output of lead-zinc ores was concentrated in the Gorubso Fields in the Rhodopes region, in the vicinity of Madan and Rudozem. The principal mining centers of the Gorubso enterprise were Madan, Rudozem, Leki, Madjarovo, and Ustrem. All Bulgarian lead-zinc ores were mined underground at depths of 400 to 500 meters. The main deposits were of the vein

type, and the others were stratified masses or bedded deposits. The complexity of the vein deposits did not permit introduction of advanced technology in the mines; productivity of miners was low, only 4.29 cubic meters per miner per shift and 1.20 cubic meters per underground working per shift. The mining cost was L25.3 per ton, not including concentrator costs.[5]

The development of the Osogovo lead-zinc deposits and construction of an ore concentrator continued in 1981. The recovery of lead at the Rudozem beneficiation plant reached 93.3%, and the recovery of zinc, 84.7%. The lead concentrates contained 70.3% metal, and the zinc concentrates contained 48.9% metal. The typical minerals mined were galena, sphalerite, and anglesite. Lead and zinc concentrates were processed at the Kurdjali and Plovdiv smelters. Recovery of lead at the Plovdiv smelter reached 96%, and at the Kurdjali smelter, 94.8%; recovery of zinc was 94.5% and 86.2%, respectively.

Large investments were made in the mining and metallurgical industry in 1981 to renovate many lead-zinc mines and plants. Lead and zinc metals were processed at the Dimitri Ganew complex of nonferrous metals in Sofia.

NONMETALS

Fluorspar.—Deposits of fluorspar occurred in different parts of Bulgaria. The main deposits were located in central Rodopi.

Domestic fluorspar output came from hydrothermal-metasomatic deposits with a fluorspar content of about 35%. Exploitation of fluorspar yielded concentrates of 40% to 70% CaF_2. The low-grade fluorspar was upgraded by flotation to 85% to 95% CaF_2. Because of limited resources of high-grade fluorspar, plans were to concentrate on low-grade deposits.

Kaolin.—There were large deposits of high-quality kaolin in the northern part of the country. Production of kaolin was concentrated at two mining enterprises Stachanov at Kaolinovo in Kolarovgrad region near Silistra and D. Blagoev at Senovo in the Rasgradsko region. The kaolin deposits were located at depths of about 0.5 to 30 meters with thicknesses of 40 to 50 meters. Kaolin was produced by opencast methods. The mineralization was in the form of kaolin sands, which were mainly composed of quartz and kaolinite. The deposits contained 14% to 22% pure kaolin. It was estimated that total reserves of kaolin in Bulgaria approximate several hundred million tons. More than 10 grades of kaolin were produced to meet the requirements of the ceramics, refractories and porcelain, and paper industries.

Perlite.—Production of crude perlite was carried out at two mines in the southeastern part of the country. Total reserves of perlite were estimated at several million tons. Perlite was processed and used as construction material.

MINERAL FUELS

Coal.—In 1980, coal production fell short of the 5-year plan of 38 million tons by 6.5 million tons. In 1981, the coal mining industry did not achieve the production level of 1980 by 2.3 million tons. The drop was mainly due to the vast scale of reconstruction and renovation of opencast and underground mines. Coal production was to reach 46 million tons in 1985 and 62 million tons in 1990. Deep-mine production was expected to increase from 6.5 million tons in 1980 to 10.6 million tons in 1985. Some L0.688 million was to be invested in the coal industry for the 1980-85 period, mostly for extension and modernization of production capacity already in operation. In 1981, about 80% of all coal mined in Bulgaria was low-calorie lignite with high ash and moisture content. The East Maritsa Basin produced 81% of the lignite; Marbas Basin, 10%; G. Dimitrov, 8%; and Bobov Dol, 1%.[6]

In 1981, about 59% of the brown coal production came from the G. Dimitrov Basin, 30% from Bobov Dol, and 11% from the Balcanbas and Pirin Basins. Bituminous coal was produced in the Balcanbas Basin, and anthracite, in the G. Dimitrov Basin in the Anthracite Mine. The economically recoverable reserves in the East Maritsa Basin were estimated at 3 billion tons. About 80% of the lignite production was used for electric power production. Planned investments at East Maritsa included the construction of a fourth powerplant and expansion of existing powerplants. Electric power capacity was planned to increase from 1,730 megawatts in 1981 to 3,360 megawatts in 1990. Plans also called for wider application of new technology for firing wet lignite, which has been used only in the Maritsa-East III plant.

Recently deposits of high-grade coal were discovered in the Dobrudja region, northeastern Bulgaria, but the seams were at depths of 1,300 to 2,000 meters under layers

of water-bearing limestone. Deposits were estimated to contain 1.2 billion tons of hard coal with a calorific value of 7,000 kilocalories. About 30% to 40% of the Dobrudja coal was estimated to be coking coal. Mining of the Dobrudja coal was scheduled to start in 1990, and production was expected to reach about 3 million tons per year in the 1990's. Cost of the development was estimated at approximately $850 million, of which about $500 million would be required from abroad.

Natural Gas.—Bulgaria relied principally on gas imports from the U.S.S.R. The domestic output, which was small, was utilized for the gas-producing area's own requirement. Bulgaria expected to increase gas imports from the Soviet Union from about 200 billion cubic feet in 1980 to 350 billion cubic feet in 1985. In 1981, work continued on the southern branch of the main U.S.S.R.-Bulgaria gasline crossing the Balkan Range near the town of Karnobat, running towards Plovidiv. It was expected to reach Sofia, where it will join the northern branch by the end of 1985.

Petroleum.—Bulgaria's production of crude oil was negligible. Petroleum supplies came mainly from the U.S.S.R. Indigenous production of crude oil was concentrated at five oil deposits in northern Bulgaria. The country hoped to develop oil and gas deposits in the Black Sea. Exploratory drilling was proceeding with Soviet assistance, but no results were published. An agreement for cooperation in petroleum development, signed with Occidental Petroleum Co. of the United States in 1980, was languishing, but the Bulgarians were purchasing modest amounts of oil-drilling and seismic equipment. Bulgaria also signed an agreement with Romania on cooperation up to 1985 for prospecting and development of oil- and gasfields on the continental shelf of the Black Sea.

The capacity of Bulgaria's three refineries, at Burgas, Pleven, and Russe, was reported to be about 110 million barrels per year. In 1981, the catalytic cracking plant at the Burgas Petrochemical Combine was completed, and trial operations were in progress. Production of high-octane gasoline, diesel fuel, and other derivatives was expected to increase by several thousand tons.

The refinery had a total annual capacity of about 95 million barrels of crude oil; almost all oil for the refinery was received from the Soviet Union via the Druzhba port, which accommodated tankers up to 75,000 tons. Soviet deliveries of crude oil were expected to remain at a steady level for the near future.

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[1]Foreign mineral specialist, Division of Foreign Data.
[2]Official exchange rate for the Bulgarian lev (L) for 1981 was L0.95 = US$1.00.
[3]Rabotnichesko Delo (Labor Review), Sofia. Feb. 3, 1982, pp. 1-2.
[4]Rudodobiv (Ore Mining), Sofia. No. 10, October 1981, pp. 1-5.
[5]Tsvetnye Metally (Nonferrous Metals), Moscow. No. 10, October 1981, pp. 14-19.
[6]V'Glischa (Coal), Sofia. No. 2, February 1981, pp. 3-6.

The Mineral Industry of Burma

By Gordon L. Kinney[1]

Burma's most important mineral production during 1981 was crude oil and natural gas. Production was sufficient for Burma to maintain petroleum self-sufficiency albeit at the cost of some consumer shortages. In addition to the mineral fuels, Burma also produced economically important amounts of lead, zinc, tin, tungsten, silver, barite, and precious stones. Nineteen other minerals were produced commercially, mostly for domestic consumption.

Prior to World War II, Burma was an important supplier of metals and ores to the world economy. Subsequently, Burma's mineral sector underwent a decline which was only arrested in the last 5 years. Since 1975, Burma's Ministry of Mines has successfully stimulated a major recovery of the mining sector through new investments and rehabilitation of old facilities. Significant loans from bilateral and multilateral sources have been the chief catalysts in the process.[2]

The Burmese plan for fiscal year (FY) 1980-81[3] called for an allocation of $107 million[4] in the mining sector. According to provisional data, however, $161 million was actually spent during the year, exceeding the original allotment by $54 million. The reason for the excess was an increase in expenditure for oil exploration and development, the Monywa copper project, the direct-reduction iron project, and the new Metallurgical Research and Development Center (Ela) of the Department of Geological Survey and Mineral Exploration. The mining expenditure accounted for 15.8% of total public investment in FY 1980-81.[5] The FY 1981-82 plan allocated 14% of capital investment for the mining industry.

In spite of these very significant investments, the Ministry of Mines was unable to maintain the momentum of the general recovery in FY 1980-81. As a result, the overall production results were mixed. Some of the major mining operations still suffer from inefficiency and energy shortages, particularly since the last quarter of 1980. Some of the mining sector renovation projects were slow to come online and delayed expected production increases.

The mining sector employed about 69,000 persons, or 0.5% of the active labor force in 1981. Less than 3% of the total mining work force were employed in private or cooperatively owned mines. The remaining 97% worked in the state-owned mining companies. Mining accounted for just over 2% of the net output of goods and services.

The general policy of the Government in regard to the mining industry was that all the economically important mining operations would be owned and operated by the state. Foreign equity investment was not allowed. However, foreign help was accepted on new projects wherever the technology was needed and funding was available. The mining industry had the highest FY 1981-82 goal set by the Government of any sector, to increase production by 31%. The goal could be reached if sufficient petroleum supplies were available during the period.

Over the past 5 years, Burma has enjoyed a modest economic boom and reversed a previous long period of decline. Growth, as measured in gross domestic product (GDP), has averaged 6.5% in the last 5 years and in FY 1980-81 reached 8.3%, the highest since Burma became independent in 1947. In constant 1970 prices, GDP was $2.91 billion in FY 1978-79, $3.07 billion in FY 1979-80, and $3.32 billion in FY 1980-81. In current prices, GDP was $5.62 billion in FY 1980-81.

Inflation has declined to less than 5% in

recent years, providing a measure of stability not seen since 1962. In the unofficial market, however, the inflation rate is higher than 5%. Per capita income has risen 30% in constant-dollar terms to $170 over the last 4 years.

The Government was predicting a modest growth rate of 5.7% for FY 1981-82. Long-term growth will depend on political stability and the flexibility of Burmese economic planners in the face of changing world conditions.

The Government announced the opening of Burma's first metallurgical research and development laboratory after a 20-month construction period. The laboratory is in Ela, 325 kilometers north of Rangoon. The laboratory will be able to do complete mineral analyses and will also help in the training of metallurgists, chemists, and geologists. The Japanese International Cooperation Agency financed the $8.4 million project.

The electric power sector was a key factor in the economic growth of the country. Burmese planners have programed a steady increase in capacity since 1975 and have built a power system composed of a diversified group of generating facilities. The 1981 plants of the state-owned Electric Power Corp. (EPC) were distributed by type and capacity as follows: Hydroelectric plants, 168,000 kilowatts; thermal powerplants, 74,000 kilowatts; gas-turbine plants, 177,000 kilowatts; and diesel plants, 82,000 kilowatts. Burma has by far the highest proportion of gas-turbine-powered capacity of any of the Southeastern Asian countries. In addition to the EPC capacity, other Burmese organizations had a captive generating capacity totaling 218,000 kilowatts in 1981. The total installed capacity of 719,000 kilowatts was a 19% increase over the 1980 capacity.[6] Over 1.2 billion kilowatt-hours of power was generated in FY 1980-81, or 12% more than in FY 1979-80. Much of the transmission system is old and in poor repair, and 27% of the overall power generated was lost in transmission and distribution.

The EPC was striving to lower this excessively high loss factor by renovation and improvement of the distribution network. Capital investment in the power sector in FY 1980-81 was $74 million, or 7.2% of total public investment. The Government plan called for a 20.5% growth in the power sector for FY 1981-82. A number of projects were underway that will contribute to an increase in both the amount of electric power produced and the reliability of the power supply. The continued aggressive growth of the power sector will contribute to the mining industry by making a reliable electric power source available where and when it is needed.

The No. 4 Mining Corp. was abolished in a reorganization of the Government-owned mining companies. The No. 1 Mining Corp. was unchanged and controlled the lead, zinc, silver, and copper output. The No. 2 Mining Corp. picked up the responsibility for the antimony mines and retained control of the tin and tungsten operations. The No. 3 Mining Corp. retained the coal mines and the steel plant and assumed control of the industrial minerals, including limestone, gypsum, and barite. The Government's Myanma Gem Corp. operates independently.

PRODUCTION

In FY 1980-81, the mining sector produced 84% of the Government's planned output. The value of the output of the mineral sector rose for the fifth consecutive year, according to one Burmese Government source.[7] In current prices, the value of nonfuel minerals totaled about $115 million in FY 1979-80 and $120 million in FY 1980-81. In addition, the value of natural gas production in FY 1980-81 was estimated at over $40 million, and crude oil production would be valued at more than $340 million at world market prices. Technical problems at the oilfields restricted production of crude oil in the last quarter of FY 1980-81.

The Government planned a 31% increase in mineral production for 1982. This goal should be relatively easy to achieve considering that the iron pellet plant was completed late in 1981, the Monywa copper project was scheduled to start up in early 1982, and several other mineral projects were to start operating during the year. The main constraint would be if the problems in the petroleum industry were not resolved and fuel shortages restricted the normal operation of the mining sector.[8]

Table 1.—Burma: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Antimony, mine output:					
Gross weight	1,331	1,477	1,690	1,094	875
Sb content[e]	530	590	680	440	350
Copper:					
Mine output, metal content	45	56	67	56	77
Matte, gross weight	99	125	148	123	170
Iron and steel: Crude steel[e]	40,000	40,000	--	--	NA
Lead:					
Mine output, metal content[e]	8,250	9,900	14,500	14,200	15,600
Metal:					
Refined including secondary	4,833	4,975	6,237	6,014	7,500
Antimonial lead (18% to 20% Sb)	120	127	185	185	190
Nickel:					
Mine output, metal content[e]	17	18	18	14	15
Speiss, gross weight	69	70	67	57	60
Silver, mine output thousand troy ounces	355	377	340	587	590
Tin, mine output, metal content:					
Of tin concentrate	114	346	573	540	530
Of tin-tungsten concentrate	248	411	660	750	780
Total	362	757	1,233	1,290	1,310
Tungsten, mine output, metal content:					
Of tungsten concentrate	108	189	276	305	275
Of tin-tungsten concentrate	170	282	416	518	540
Total	278	471	692	823	815
Zinc, mine output, metal content	1,834	2,645	3,028	4,079	4,500
NONMETALS					
Barite[3]	16,096	35,320	39,486	39,689	30,000
Cement, hydraulic	269,000	254,000	390,606	386,159	380,000
Clays:[3]					
Ball clay	4,674	4,573	4,294	4,390	4,200
Bentonite	975	1,377	1,446	1,347	1,200
Fire clay[4]	4,627	4,878	4,413	3,711	3,600
Industrial white clay	3,449	2,000	6,876	4,626	4,500
Feldspar[3]	1,422	2,000	2,004	1,689	2,400
Graphite[3]	96	280	268	199	300
Gypsum[3]	33,511	35,431	38,265	37,132	39,000
Pigments, mineral, natural: Iron oxide	230	461	369	330	350
Precious and semiprecious stones: Jadeite[3] kilograms	6,532	12,454	7,707	7,953	8,000
Salt thousand tons	230	304	258	268	270
Stone:[3]					
Dolomite	431	1,616	1,882	2,450	2,600
Limestone, crushed and broken thousand tons	1,159	1,437	1,259	1,151	1,300
Quartz	73	--	122	143	130
Talc and related materials: Soapstone[3]	201	391	394	333	300
MINERAL FUELS AND RELATED MATERIALS					
Coal	23,926	33,113	36,064	26,919	37,000
Gas, natural:					
Gross million cubic feet	16,000	17,000	18,000	[e]24,000	28,000
Marketed[3] do.	8,784	[r]9,892	12,030	20,016	23,000
Petroleum:					
Crude thousand 42-gallon barrels	9,178	9,995	10,822	10,480	11,200
Refinery products:[5]					
Gasoline do.	1,864	1,864	2,008	[e]2,080	2,060
Jet fuel do.	248	[e]280	[e]300	[e]300	300
Kerosine do.	909	744	548	[e]450	570
Distillate fuel oil do.	2,351	2,500	2,626	[e]2,570	2,770
Residual fuel oil do.	1,279	1,532	1,396	[e]1,540	1,610
Lubricants do.	133	140	[e]140	[e]140	140
Other do.	179	[e]223	[e]220	[e]220	220
Total do.	6,963	7,283	7,238	[e]7,300	7,670

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through June 30, 1982.

[2]In addition to the commodities listed, pottery clay, common sand, glass sand, other varieties of crude construction stone, and other varieties of gem stones are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Data are for fiscal years beginning Apr. 1 of that stated.

[4]Includes fire clay powder.

[5]Data exclude products used as fuel in refineries.

TRADE

Total foreign trade has had a dramatic increase in recent years. Exports have improved substantially, and total trade has gone from $400 million in FY 1975-76 to $1,200 million in FY 1980-81 and should reach $1,500 million in FY 1981-82. This would be the first time that trade exceeded in constant-dollar value the levels attained before the Socialist government assumed power in 1962.

The main reason for the improvement has been a large input of foreign capital in the form of concessional loans. These loans have enabled Burma to purchase necessary capital equipment and spare parts to rehabilitate old industries and to create new production capabilities.

In 1979-80, Burma's annual balance of trade was in deficit about $250 million, and a similar deficit was forecast for 1981. The large amounts of loan and grant aid helped offset Burma's trade deficits and provided small net surpluses in overall balance of payments in FY 1979-80 ($67 million) and in FY 1980-81 ($49 million).[9]

According to provisional data, 17% of total exports were minerals and gems, while 23% of imports were classed as raw materials in FY 1979-80. Burma's mineral exports (excluding petroleum products) exceeded $52 million in FY 1980-81 compared with $38 million in the year before. The increases were a result of better world market prices and also expanded sales of silver, lead, copper matte, and zinc and tungsten concentrates.

COMMODITY REVIEW

METALS

Copper.—Burma's plans for greatly increasing its copper production appeared to be going well during 1981. Construction activity at the Government-owned Monywa copper project was reportedly ahead of schedule, and production from the mines and concentrator could begin in early 1982. Currently about 100 tons of copper-in-concentrate is believed to be produced as byproduct from the Bawdwin lead mine each year.

RTB Bor of Yugoslavia is providing the design and technology for the mines and copper concentrator. It will also provide operating assistance in the early startup stages. The Kyesintaung and Sabetaung ore bodies are being developed just west of the Chindwin River, opposite the railhead town of Monywa. Overburden removal at the open pits was well underway. Mining and milling capacity was expected to be 12,000 tons per day of chalcocite ore containing 1% to 1.5% copper. Earlier plans had called for a capacity of 8,000 tons per day. Proved reserves are reported to total 250 million tons.

The No. 1 Mining Corp. of Burma was studying the possibility of constructing a flash smelter for production of blister copper or copper cathodes. Estimated cost would be $30 million, and the output would be for export.

Iron and Steel.—In October 1981, the Danieli Co. of Italy completed a 20,000-ton-per-year-capacity Kinglor Metor direct-reduction steel plant. The plant is located in northern Burma at Anisakan in Maymyo Township and is the first commercial application of this noncoking-coal and natural gas-based direct-reduction process outside Italy. A nearby iron ore mine with a small reserve of good ore will supply the plant. Coal, limestone, and natural gas will also be supplied from domestic sources. A 15- to 17-ton-capacity electric arc furnace was apparently still under construction at yearend.

In November 1981, Burma reportedly signed a contract with Danieli for a second direct-reduction stage, doubling the plant's capacity to 40,000 tons per year. In addition, an outdated steelmaking plant will be replaced. The second stage will incorporate a two-strand continuous-casting line for billet production. The completed plant will have a capacity of 25,000 tons per year of reinforcing rods and will supply most of Burma's needs for pig iron.

Lead, Zinc, and Silver.—The Bawdwin mining complex at Namtu in northern Shan State is Burma's only source of lead and zinc ore and refined silver. In FY 1980-81, the mine produced about 250,000 tons of ore assaying 4% zinc, 5% lead, and about 4 ounces of silver per ton of ore. In recent years, the refining capacity of the smelter at Namtu has dropped significantly, lowering the overall productivity of the Bawdwin complex. A new refinery was completed early in the year, and opening ceremonies were conducted by the Minister of Mines on

April 2, 1981.

According to No. 1 Mining Corp. officials, the new plant will handle 500 tons of ore per day and produce 3,000 tons of zinc concentrate, 2,300 tons of refined lead, and 160,000 ounces of silver annually. The Ministry of Mines financed the new facility through a loan from the Federal Republic of Germany. It took 3 years to complete and replace the old smelter, which was built at the turn of the century.

The No. 1 Mining Corp. still had plans to change the underground mine to an open pit operation. The high-grade ore zones have been worked out, but there is still a considerable tonnage of lower grade ore that is readily minable by open pit methods. Conversion to open pit mining would allow an increase of about 60,000 tons per year of ore production.

Tin and Tungsten.—The No. 2 Mining Corp. under Burma's Ministry of Mines took delivery of its new offshore tin dredge Heinze. The dredge was constructed by Far East Livingston Co. of Singapore. Design problems were encountered, and the dredge required extensive alterations. It presumably operated along the Tenasserim coast in southern Burma at least during the last of the fair weather season in 1981.

The Burmese Government officially reported the completion in FY 1980-81 of the Heinda Mine expansion project under the No. 2 Mining Corp.[10] The mine and equipment were ready for a test run and were expected to have an output of 1,000 tons of tin concentrate per year. The mine is located 35 miles east of Tavoy in southern Burma.

The Heinda fossil placer tin deposit is an unusual, tightly cemented series of coarse to fine conglomerate layers. Each ore layer is about 8-meters thick and grades from very coarse at the base to sand and clay at the top. The cassiterite occurs mostly in the coarse basal material. This causes problems in handling the ore horizon, which contains solid granite boulders up to 2 meters in diameter. The entire deposit requires drilling and blasting, and the bigger boulders require secondary blasting. The distribution of the cassiterite in the ore body is highly uneven, varying from 0.05 to 3.0 kilograms SnO_2 per cubic yard. In addition, there is a very wide range of cassiterite grain sizes evenly distributed from 150 millimeters down to 0.075 millimeter causing further complications in the milling process. Reported recoverable ore reserves were put at about 7,000 tons of contained tin metal at Heinda.

The nearby underground Hermyingyi Mine was being rehabilitated, and a detailed ore reserve estimate was being made by the Department of Geological Survey and Mineral Exploration.

Construction began in 1981 on a small (1,000-ton-per-year) tin smelter in Syriam, a southeast suburb of Rangoon. The work was being done with financial and technical assistance from North Korea. Most of the plant's output will be exported and will provide a considerable increase in foreign exchange earnings to the Burmese Government.

The Department of Geological Survey and Mineral Exploration continued a comprehensive survey of the tin and tungsten resources of southern Burma both onshore and offshore.

The FY 1981-82 plan called for production of 1,750 tons of 65% SnO_2 concentrate and 700 tons of 65% WO_3 concentrate. The plan also called for an output of 700 tons of mixed tin-tungsten concentrates. Statistics for the first 8 months of calendar 1981 showed production was proportioned quite differently from the plan. Tin concentrates totaled just over 400 tons and tungsten concentrates just under 400 tons. The mixed tin-tungsten concentrates, however, came to nearly 1,600 tons by the end of August.

The officially reported tin and tungsten production figures are believed to be far less than the actual tonnage mined in Burma each year. Many of the small mines are operated by tribute miners and are located in remote rugged jungle terrain. Political instability in the mining area and a very low price paid to the miners for the tribute concentrates combine to make smuggling both easy and profitable. Some sources believe the true output to be nearly double the official figures.

NONMETALS

Burma began to develop its nonmetallic minerals after 1962 in an effort to become self-sufficient in a number of key areas and to promote local ceramic and cement industries. With the exception of some specialized clays used in ceramics and barite production, this effort has been highly successful, and over the long term, there have been steady production increases.

Barite.—Burma's barite comes from the Maymyo area in Mandalay Div., where this mineral has been extracted over the past decade. Burma mines barite principally to supply the domestic petroleum sector, but

neither the No. 3 Mining Corp. nor the Myanma Oil Corp. (MOC) operates an efficient barite mud production facility. The Canadian International Development Agency had originally planned to construct such a plant and to upgrade the barite mining operation but dropped the project 2 years ago.

Since that time at least one U.S. firm has expressed interest in building such a facility, but negotiations over the price and Burmese difficulties in moving the ore from northern Burma to Rangoon have stalled the discussion.

Fertilizers.—Burma produces urea fertilizer from natural gas at plants in Pagan and Sale. Consumption, however, has gone up faster than production in recent years, and increasing amounts of expensive nitrogenous fertilizers have had to be imported. The Government authorized construction of additional capacity in order to reduce imports and use more of Burma's abundant natural gas resources. It was reported in September 1981 that Petrochemical Industries Corp. of Rangoon awarded a contract to UHDE GmbH of the Federal Republic of Germany to engineer and procure equipment for an ammonia and urea plant complex to be built at Kyawzwa, near Prome, about 350 kilometers north of Rangoon. Urea production capacity is to be 200,000 tons per year. Scheduled completion is for late 1984.

Other Nonmetals.—Limestone and gypsum are mined for cement production, and roughly 90,000 tons of crude clay is used for brick production each year. A French-financed, 200,000-ton-per-year cement plant was under construction during 1981 at Paan in Karen State about 170 kilometers east of Rangoon. In addition to the new mill, the Burmese Government reported that an extension project at the old Kyangin cement mill was progressing on schedule.[11] The report did not explain if new capacity was being added or if the old plant was being reconditioned.

MINERAL FUELS

Coal.—Burma exploits some small deposits of poor-quality coal. The new steel plant reportedly will use this domestic coal in the direct-reduction process. Production from the Kalewa coal mine, the country's largest, presumably will increase as steel production gets underway.

Natural Gas.—Natural gas use has increased at a substantial rate and will continue to do so as more industries take advantage of its relatively low cost and abundance. Several new gas-turbine electric generators were completed during the year, and three 18,000-kilowatt units are planned for completion in 1982. Natural gas also powers a widening variety of industries. Completion of the direct-reduction steel complex should boost consumption of natural gas even further in 1982. The FY 1981-82 plan called for consumption of over 23 billion cubic feet.

Petroleum.—Burma's oil industry ran into serious production problems at the end of FY 1980-81. Press reports indicated that the Mann Oilfield, the country's largest, was overproduced in an effort to increase output beyond its optimum flow. As a result, gas pressurization was reduced and considerable water was mixed with the oil. Official production figures use wellhead flow which includes the water content. Actual crude oil production may have been 10% less than official data.

The production loss came at a time of increasing demand and caused economic hardships, stalled a number of major development projects, and forced the Government to introduce fuel rationing in Rangoon.

Not only was the domestic economy affected, Burma's reemergence as an oil-exporting nation was upset as the Government was unable to fulfill a 1-million-barrel crude oil export contract with Japan. Export of a heavy semirefined fuel oil from the Chauk refinery was unaffected, however, and deliveries to Japan and North Korea continued.

To avoid problems of paying for expensive foreign oil, Burma has refused to import crude oil or refinery products since 1975. Lubricants and aviation fuel, not produced in the country, were imported in small amounts.

The newly completed 6,000-barrel-per-day extension of the 26,000-barrel-per-day Syriam refinery was closed early in 1981 because of the crude oil shortage.

Construction continued on the much delayed 25,000-barrel-per-day refinery at Mann. The plant, under construction by Mitsubishi Heavy Industries of Japan, was rescheduled for completion in late 1982. It now faces the prospect of insufficient crude oil feed if there is no significant increase in the current production rate.

Not all of the news was bad during the year. According to the Prime Minister, MOC has made three important onshore strikes. Two of the strikes were at Tantabin

and Kyontani villages in the northern Irrawaddy Delta. These discoveries mark the first time petroleum and gas have been found in limestone reservoirs in Burma. Four of nine wells at Tantabin struck oil and gas. The oil is sulfur-free and has a gravity of 48.5° API. One well drilled at Kyontani to a Burmese record depth of 4,100 meters struck a 105-meter-thick limestone horizon with recoverable oil and gas reserves and similar characteristics to the Tantabin structure.

The third strike was at Tuyintaung, 8 kilometers east of Pagan in central Burma. The well struck sulfur-free 30.4° API gravity crude from six oil- and gas-bearing sands between 2,440 and 2,990 meters deep. Considerable evaluation work will be necessary to determine the commercial viability of these discoveries.

After 4 years without drilling offshore, Burma is to resume its search by testing the Gulf of Martaban area. Protracted negotiations between the Government and the Japanese National Oil Corp. (JNOC) have resulted in an agreement to form a joint venture to explore four offshore concession blocks south and east of Rangoon. JNOC and 11 private Japanese companies were to work with MOC under a complicated financing arrangement. The consortium was hoping to begin drilling early in 1982. Twenty offshore wells were drilled in 1975-76 with no commercial oil being found. Some natural gas was found but in a location impractical for exploitation.

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[1]Physical scientist, Division of Foreign Data.

[2]U.S. Embassy, Rangoon, Burma. Industrial Outlook Report—Minerals. State Department Airgram A-36, July 13, 1981, p. 2.

[3]Burmese fiscal year runs from April 1 to March 31.

[4]Where necessary, values have been converted from Burmese kyats (K) to U.S. dollars at the rate of K6.62=US$1.00.

[5]Ministry of Planning and Finance. Report to the Pyithu Hluttaw on the Financial, Economic, and Social Conditions of the Socialist Republic of the Union of Burma for 1981-82. 1981, p. 242.

[6]Page 130 of work cited in footnote 5.

[7]Page 21 of work cited in footnote 5.

[8]Central Statistical Organization, Rangoon, Burma. Selected Monthly Economic Indicators. Statistical Paper 3, July-August 1981, p. 31.

[9]U.S. Embassy, Rangoon, Burma. Foreign Economic Trends and Their Implications to the United States. FET 81-069, July 1981, p. 4.

[10]Page 242 of work cited in footnote 5.

[11]Page 244 of work cited in footnote 5.

The Mineral Industry of Canada[1]

By Harold R. Newman, P.E.[2]

In 1981, the Canadian economy displayed a relatively strong economic growth during the first half of the year but experienced a decline in activity with a drop in real output in the second-half of the year. The gross national product rose by approximately 3% to an estimated $331 billion[3] at current prices. The unemployment rate averaged 7.5% for the year, and the consumer price index rose by 12.5%.

The recession of the national economy was reflected in the economic performance of the Canadian mineral industry. The value of output of the mineral industry decreased by 6% in response to the national and worldwide recession. The industry was undergoing production cutbacks in most of the mineral commodities as a result of the depressed domestic and world demand and falling mineral prices.

The Canadian mining industry has suffered from uncoordinated tax legislation, weak markets, high transportation costs, high costs of labor and production, and trade and tariff barriers for its mineral exports and is now closely observing the emergence of the Canadian Government's National Energy Program (NEP). The publicized goal of NEP was to reduce foreign ownership of Canadian oil. The Canadian mining industry has always been predominantly Canadian owned even though there was major foreign capital investment in some Canadian exploration and development projects. The impact of the NEP on the nonfuel mineral sector was uncertain and Government policy was unclear at yearend. Politics notwithstanding, Canada was certain to maintain its prominent position as a world class mineral-producing country.

Government Policies and Programs.—The Canadian mining industry has faced a complex tax regime. It offered incentives to the industry, but also was not without its pitfalls and shortcomings. There was a three-tier tax structure on mining income. First, the Federal Government levied an income tax on the total profits of a mining company. This income tax, which consisted of a basic tax and a surtax, reflected tax incentives for the mining industry that consisted of a resource allowance of 25% of income, computed before deductions of interest and the writeoff for exploration and development costs; an earned depletion allowance, generally $1 for each $3 spent on exploration and new mine assets; an immediate writeoff of exploration and development costs as incurred, and a 30% or better deduction on equipment costs, computed on a declining balance basis. These rules enabled most new mining operations to recover most of their capital costs for revenue before they started paying any significant Federal income tax.

The second element in the three-tier structure was the provincial income tax that was similar, to the Federal tax, however different approaches were used by the various Provinces.

The third tax element was the provincial mining tax and again different approaches to rates and provisions were used by the various Provinces. Theoretically the mining tax applied only to profits from the extraction of ores.

In summary, the mine operators tax burden was the total amount of these three separate tax elements. The combination of taxes and incentives plus various provincial

policies resulted in a complex tax system.[4]

The Foreign Investment Review Agency (FIRA) was setup in 1974 to screen investment proposals of foreign companies seeking to acquire or establish a Canadian business. Investment proposals are evaluated by FIRA against a "significant benefit" to Canada criterion. This phrase, while not clearly defined, appears to include such concepts as the amount of Canadian research and development expenditures in Canada, export prospects, product innovation, processing of natural resources in Canada and an overall appropriateness to Canadian economic policy objectives. The agreements entered into by foreign firms with FIRA are considered legally enforceable and may be subject to monitoring to ensure compliance. FIRA reviews may take from 60 days to years to complete. The proceedings are not disclosed, and the grounds for disapproval are not usually provided. A large majority of proposals are approved; however, a significant number of delays have occurred.

Firms whose proposals are rejected are invited to resubmit revised proposals that provide greater benefits for Canada. It was announced in 1981 by the Canadian Government that a review of FIRA's administrative procedures was under way to determine what changes and streamlining might be warranted.

The NEP, as announced in October 1980 and subsequently amended in September 1981, consisted of a series of measures that increased the role of the Central Government in energy development and established three specific aims. These aims are at least 50% Canadian ownership of oil and gas production capacity by 1990, Canadian control of a significant number of larger oil and gas firms, and an early increase in the share of the oil and gas sector owned by the Government of Canada. The oil and gas industry voiced strong criticism of NEP in what they maintained were discriminatory features of the tax and incentive proposals, and the specifics of the "Canadianization" objective.

The negative reaction of Canada's oil and gas industry to the Government policy was perhaps exemplified by the number of active drilling rigs departing Canada. In October 1980, prior to the introduction of the NEP, Canada had about 434 rigs, the second largest number of active rigs in the world, the bulk of them Canadian owned. One year later, this number had fallen to 214 rigs.

A 1981 study by Canada's National Energy Board indicated that the NEP's oil self-sufficiency goal by 1990 was unlikely considering the NEP's current formulation. Without modifications that return attractive incentives to the industry, improve Canada's investment image to foreign investment, and make nonconventional fuel development economically viable, the NEP may only promote continued and possible growing dependence by Canada upon world oil markets and impair Canada's ability to meet its oil import reduction targets.

Canadian proponents of NEP disagreed with the above analysis. They maintained that the NEP and the Petroleum Incentives Program (PIP), which qualifies firms and individuals for incentives, with preference to Canadian firms and individuals, would induce Canadian-owned firms to increase exploration on Federal lands. The Canadian Minister of Energy, Mines, and Resources stated in May 1981 that under the PIP, the aftertax cost of $1 spent on exploration of the Canada lands will be $0.07 for a 75% Canadian-owned firm and $0.28 for a totally foreign-owned firm.

In 1981, the Canadian Government and the Province of Alberta entered into an agreement for a two-tier pricing system for petroleum. The basic provisions of the agreement were that the price of old oil, previously discovered, would not exceed 75% of the world price level, and new oil, newly discovered and synthetic, would receive world-level prices. It was felt that this two-tier price system would encourage production and reduce consumption.

PRODUCTION

According to the Canadian Department of Energy, Mines, and Resources, the total value of Canada's mineral production in 1981 reached an alltime high of $33 billion, an increase of almost 4% over the previous year's value. The value of output of mineral fuel commodities increased about $1.1 billion although the volume of petroleum and natural gas declined. Metallic mineral output declined $299 million, or 3.1%. The value of output of nonmetallics and of structural materials increased 11.9% and 10.4%, respectively.

Performance of the nonfuel mineral industries was mixed. Copper output increased in volume marginally, but since copper

prices fell, the value of copper output declined about 14%. Iron ore values in 1981 remained about the same as the previous year. Zinc increased about 12% in output, and 39% in value. Gold output was down 7% in volume, and 28% in value. The platinum-group metals increased 48% in volume and 41% in value. Nickel production declined 16%, while producers operated well below capacity.

Asbestos production declined about 14% in volume and 5% in value. Potash output fell 5.4% in volume, but rose 3% in value. The major structural materials, cement and sand and gravel, increased 8% and 17% in volume and value, respectively.

The value of mineral output increased in 8 of the 10 Provinces and in both Territories. The Province of Alberta alone, with its large oil and gas output, accounted for approximately 53% of Canada's total mineral value in 1981. Production values of the Provinces and Territories follow:

Province or Territory	Value, billion dollars	
	1980	1981
Alberta	14.3	17.6
Ontario	4.0	4.3
British Columbia	2.4	3.0
Quebec	2.1	2.4
Saskatchewan	2.0	2.4
Newfoundland-Labrador	.9	1.2
Manitoba	.7	.7
New Brunswick	.3	.5
Northwest Territories	.3	.5
Yukon Territory	.3	.3
Nova Scotia	.2	.3
Prince Edward Island	(1)	(1)
Total	27.5	33.2

[1]Less than 1/2 unit.

Source: Department of Energy, Mines, and Resources, Ottawa, Canada. Annual Report, 1981.

In 1981, more than 60 commodities were produced from mining activities conducted in every region of the country. The values of the principal mineral production follow:

Commodity	Value, million U.S. dollars	
	1980	1981
METALS		
Iron ore	1,419	1,645
Copper	1,551	1,327
Nickel	1,249	1,180
Zinc	716	595
Gold	972	735
Uranium (U)	586	642
Silver	691	406
Molybdenum	250	265
Lead	228	223
Total	7,662	7,418
NONMETALS		
Potash, K_2O	851	876
Cement	485	568
Asbestos	516	491
Lime	108	124
Salt	102	113
Clay products	90	100
Gypsum	33	39
Total	2,185	2,311
MINERAL FUELS		
Petroleum	7,538	7,850
Natural gas	5,129	5,135
Coal	777	872
Total	13,444	13,857

Source: Department of Energy, Mines, and Resources, Canada; Statistics Canada, 1981.

Table 1.—Canada: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS					
Aluminum:					
Alumina, gross weight ____ thousand tons	1,061	1,054	r953	1,202	1,208
Metal:					
Primary	973,524	1,048,469	r860,256	1,074,500	1,238,000
Secondary	48,308	74,752	75,000	75,000	80,000
Antimony[e 2]	3,175	3,005	2,954	2,361	e1,600
Bismuth[3]	165	145	139	171	e123
Cadmium[4]	1,185	r1,265	1,460	1,303	1,300
Calcium ____ kilograms	490,856	574,674	455,713	531,000	566,000
Cobalt:					
Mine output, metal content[5]	1,485	1,234	r1,640	1,603	2,270
Metal[6]	459	519	475	470	636
Columbium and tantalum:					
Columbium concentrate (pyrochlore):					
Gross weight[e]	4,182	4,122	4,186	3,884	4,544
Cb content	1,754	1,729	1,756	1,629	2,810
Tantalum concentrate:					
Gross weight[e]	270	283	355	350	337
Cb content	8	8	9	9	6
Ta content	120	126	130	104	101
Copper:					
Mine output, recoverable metal content[7]	759,423	659,380	636,383	716,400	718,100
Metal, primary and secondary:					
Blister and anode	500,274	425,300	384,500	492,700	693,188
Refined	508,767	446,278	397,263	505,238	473,633
Gold ____ thousand troy ounces	1,734	1,735	r1,644	1,552	1,592
Iron and steel:					
Iron ore:[8]					
Gross weight ____ thousand tons	57,638	41,751	r59,617	50,866	49,844
Iron content ____ do	36,168	26,228	37,681	32,045	31,402
Metal:					
Pig iron ____ do	9,661	10,340	10,906	11,183	9,870
Ferroalloys ____ do	193	200	175	289	281
Crude steel ____ do	13,631	14,898	16,078	15,887	14,807
Semimanufactures[9] ____ do	10,461	11,894	12,235	13,030	12,500
Lead:					
Mine output, metal content	280,955	319,809	310,745	296,641	332,074
Metal, refined:					
Primary	187,457	194,054	r183,769	162,463	168,450
Secondary	53,100	51,800	68,600	71,117	69,658
Magnesium metal, primary	7,633	8,309	9,015	8,899	8,775
Molybdenum	16,568	13,943	11,174	12,198	14,134
Nickel:					
Mine output, metal content[10]	232,512	128,310	126,481	194,947	155,175
Metal, smelter	151,967	89,231	83,747	152,299	e115,000
Platinum-group metals ____ troy ounces	465,371	346,212	197,943	410,757	e608,098
Selenium, refined[11] ____ kilograms	410,552	392,777	511,704	e453,600	e420,000
Silver ____ thousand troy ounces	42,236	40,733	36,874	34,401	38,677
Tellurium, refined[11] ____ kilograms	37,021	45,299	r47,204	45,000	e44,800
Tin, mine output, metal content	328	360	337	264	248
Titanium:					
Ilmenite, gross weight ____ thousand tons	1,442	1,810	1,219	e1,320	--
Sorel slag (70% to 72% TiO_2)	692,341	850,032	477,040	874,717	762,000
Tungsten, mine output, W content	1,812	2,289	r2,597	3,179	1,993
Uranium oxide (U_3O_8)	6,824	8,211	7,701	7,509	7,746
Zinc:					
Mine output, metal content	1,070,515	1,066,902	1,099,926	894,575	1,097,192
Metal, refined, primary	494,888	495,420	580,449	591,565	618,650
NONMETALS					
Asbestos ____ thousand tons	1,517	1,422	1,493	1,323	1,133
Barite	116,950	87,996	67,131	85,000	84,600
Cement, hydraulic[12] ____ thousand tons	9,640	10,318	r11,765	10,497	10,368
Clays and clay products[13] ___ value, thousands	$103,360	$109,635	$142,356	$133,611	$120,174
Diatomite	1,239	2,184	1,452	e2,000	e2,000
Fluorspar (70% CaF_2)	59,500	--	--	--	--
Gypsum and anhydrite ____ thousand tons	7,234	8,074	8,098	7,209	7,800
Lime ____ do	1,900	2,034	2,034	2,554	2,554
Magnesite, dolomite, brucite _ value, thousands	$6,290	$5,990	r$8,990	$10,405	$8,775
Nepheline syenite	574,558	599,121	605,699	592,000	e600,000
Nitrogen: N content of ammonia	1,763,600	1,926,200	1,981,300	e1,995,800	e2,000,000
Pigments, mineral: Iron oxides, natural	--	--	2,700	e2,800	e2,800
Potash, K_2O equivalent ____ thousand tons	5,764	6,340	7,074	7,532	6,805
Pyrites and pyrrhotite, gross weight	24,119	9,203	31,032	32,000	e11,000
Salt ____ thousand tons	6,039	6,452	6,881	7,700	7,430
Sand and gravel ____ do	262,905	272,092	285,221	276,452	287,468
Silica (quartz) ____ do	2,317	2,165	2,368	2,252	2,321

See footnotes at end of table.

Table 1.—Canada: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Sodium compounds, n.e.s.:					
Sodium carbonate[e]	450,000	450,000	450,000	450,000	450,000
Sodium sulfate	394,795	376,563	443,279	496,000	553,000
Stone[14] thousand tons	120,163	122,144	109,719	103,366	94,577
Sulfur:					
Elemental byproduct:					
Of smelter gases do	736	676	667	903	720
Of sour natural gas do	6,475	6,248	5,935	6,000	5,700
Of refineries do	160	200	200	190	160
Of tar sands do	100	118	213	300	230
S content of pyrite and pyrrhotite[e] do	12	5	12	12	12
Talc, soapstone, pyrophyllite	72,400	61,661	90,330	89,000	90,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e]	134,000	130,000	135,000	135,000	143,002
Coal:					
Bituminous and subbituminous thousand tons	23,201	25,419	28,006	30,576	36,695
Lignite do	5,479	5,058	5,011	5,976	7,494
Coke, high-temperature do	4,906	4,968	5,775	[e]5,200	5,036
Gas, natural:					
Gross million cubic feet	3,588,500	3,569,046	3,780,145	3,541,024	3,470,942
Marketed do	3,160,525	3,128,056	3,334,618	3,067,711	3,006,356
Natural gas liquids:					
Gross:					
Butane thousand 42-gallon barrels	22,976	21,133	22,820	21,292	20,443
Propane do	34,695	32,792	35,844	34,188	33,471
Pentanes plus do	47,468	42,423	42,038	38,089	36,491
Ethane do	NA	6,329	20,612	20,475	29,377
Condensate do	1,138	1,174	1,255	1,186	1,257
Total do	106,277	103,851	122,569	115,230	121,039
Returned to formation, all types do	400	397	[e]400	NA	NA
Peat	386,408	435,457	480,087	466,000	485,000
Petroleum:					
Crude[15] thousand 42-gallon barrels	482,021	478,435	545,465	523,441	468,765
Refinery products:					
Gasoline:					
Aviation do	1,481	1,460	1,572	1,472	1,556
Other do	225,593	230,616	240,554	241,778	256,285
Jet fuel do	25,597	28,100	30,867	30,537	28,813
Kerosine do	26,064	23,557	24,991	24,184	28,749
Distillate fuel oil do	169,728	166,974	184,002	181,930	175,532
Residual fuel oil do	112,791	108,665	113,730	102,124	86,751
Lubricants do	4,287	4,551	5,366	5,720	5,570
Other:					
Liquefied petroleum gas do	11,360	13,070	13,485	13,520	13,057
Petrochemical feedstocks do	23,497	29,683	35,059	32,894	32,391
Asphalt do	18,422	18,628	21,241	20,907	19,154
Petroleum coke do	1,269	1,258	1,029	1,218	1,157
Unspecified do	7,217	3,711	5,440	5,310	5,270
Refinery fuel and losses do	31,697	33,742	34,491	32,035	31,970
Total do	659,003	664,015	711,827	693,629	686,255

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 30, 1982.

[2]Sb content of antimonial lead alloys, flue dust, and doré slag estimated on the basis of reported gross production.

[3]Refined metal and bullion from domestic ores plus recoverable Bi content of exported concentrates.

[4]Refined metal from domestic ores plus recoverable Cd content of exported ores and concentrates.

[5]Actual output not reported. Data represent Co content of all products derived from ores of Canadian origin, including nickel oxide sinter shipped to the United Kingdom and nickel-copper-cobalt matte shipped to Norway for further processing.

[6]Actual output not reported. Data represent the output within Canada of metallic cobalt from ores of both Canadian and non-Canadian origin.

[7]Blister copper from domestic ores plus recoverable Cu content of exported matte and concentrates.

[8]Series revised to reflect actual mine production rather than sales, which were reported as production in previous editions. Sales figures, on a gross weight basis, in thousand metric tons, follow: 1976—55,416; 1977—53,621; 1978—42,931; 1979—59,617; 1980—50,866; 1981—49,844.

[9]Includes shipments of ingots from primary plants for rolling elsewhere.

[10]Refined nickel from domestic ores plus Ni content of oxide produced and recoverable Ni content of exported matte.

[11]From all sources, including imports and secondary sources.

[12]Cement shipped and/or used by producers.

[13]Includes bentonite,products from common clay, stoneware clay, fire clay, and other clays.

[14]Crushed, building, ornamental, paving, and similar stone.

[15]Including synthetic crude (from oil shale and/or tar sands).

TRADE

In 1981, Canada exported about 44% of its crude mineral production to more than 90 countries. Export values of crude and fabricated mineral products were estimated at $26.9 million or 32% of Canada's total commodity exports.

For reasons of economics and geographical distribution of the resources, Canada also imported large quantities of minerals. Crude mineral imports were valued at $11.2 billion for 1981. Some of the mineral imports were already being produced in the country; oil, coal, and iron ore were the most important. The mineral fuels accounted for about 79% of all mineral imports. Others included bauxite, alumina, phosphate rock, various metals such as chromium, manganese, tin, and some industrial minerals.

Table 2.—Canada: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Alumina excluding abrasive grades, Al content	26,543	39,541	33,287	Italy 2,127; United Kingdom 1,784.
Metal including alloys:				
Scrap	70,465	78,616	49,839	Japan 22,444; West Germany 1,724.
Unwrought	552,150	784,817	438,092	Japan 125,008; Netherlands 36,469; China 29,994.
Semimanufactures[1]	36,585	42,264	29,385	Colombia 4,435; United Kingdom 694.
Cadmium metal including alloys, all forms	1,293	1,096	783	United Kingdom 312.
Calcium metal	377	408	304	Mexico 64; Australia 33.
Cobalt:				
Oxides and salts, gross weight	559	1,091	--	United Kingdom 1,066; Norway 25.
Metal including alloys, all forms	302	327	230	Netherlands 64; West Germany 14.
Columbium ore[2]	510	656	656	
Copper:				
Ore and matte, Cu content	315,211	286,075	3,179	Japan 178,913; U.S.S.R. 24,188; Norway 19,723.
Slag, skimmings, sludge, Cu content	243	322	306	Spain 16.
Metal:				
Scrap:				
Unalloyed	15,896	19,892	14,061	Belgium-Luxembourg 1,672; Spain 1,546.
Alloyed	24,665	23,223	11,768	Belgium-Luxembourg 5,157; Taiwan 1,238.
Unwrought, unalloyed	191,226	335,196	126,868	United Kingdom 74,558; West Germany 29,495.
Semimanufactures:				
Unalloyed	29,741	28,575	15,519	Venezuela 2,137; Pakistan 1,843.
Alloyed	18,786	11,861	10,734	United Kingdom 177; West Germany 117.
Gold:				
Ore and concentrate, Au content troy ounces	199,928	202,170	21,279	Japan 121,229; United Kingdom 23,008.
Metal, unwrought and partly wrought:				
Unalloyed thousand troy ounces	1,589	1,886	1,682	United Kingdom 146; Belgium-Luxembourg 23.
Alloyed troy ounces	201,415	38,446	34,295	Trinidad-Tobago 2,535; Italy 1,302.
Iron and steel:				
Ore and concentrates thousand tons	48,849	39,021	17,263	Netherlands 6,211; Japan 3,998; United Kingdom 3,687.
Metal:				
Scrap do	1,033	785	454	Italy 133; Spain 70.
Pig iron and related material	393,857	740,703	248,559	Netherlands 230,055; Spain 136,804.
Ferroalloys:				
Ferromanganese	12,043	11,298	11,209	Malaysia 53.
Ferrosilicon	40,732	52,377	21,609	Japan 21,209; India 3,116.
Other	9,964	8,418	4,463	Japan 1,741; United Kingdom 1,659.
Steel, primary forms	120,787	327,139	97,988	Indonesia 21,380; Japan 21,179; Colombia 20,746.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	864	1,151	800	China 139; Egypt 38.
Universals, plates, sheets, strip do	930	1,314	733	Thailand 76; India 75; Italy 75.
Rails and accessories	233,221	253,772	138,400	Mexico 72,599; Italy 39,820.
Wire	85,339	96,274	93,006	Hong Kong 865.
Tubes, pipes, fittings	421,415	409,239	376,483	United Arab Emirates 9,933; Trinidad-Tobago 5,274.
Castings and forgings, rough	190,150	133,354	131,541	United Kingdom 690.

See footnotes at end of table.

Table 2.—Canada: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate, Pb content	151,494	147,007	13,381	Japan 89,631; West Germany 18,281.
Metal:				
Scrap, including alloy scrap	21,882	21,106	2,664	West Germany 10,640; Brazil 1,575; Sweden 1,536.
Unwrought, unalloyed	117,992	126,539	32,972	West Germany 15,394; U.S.S.R. 11,664; Italy 8,348.
Semimanufactures including alloys	9,682	4,682	3,786	United Kingdom 216; Denmark 214.
Magnesium metal	6,051	5,317	1,182	Japan 1,548; West Germany 975; United Kingdom 657.
Mercury[2] 76-pound flasks	397	NA	NA	NA.
Molybdenum ore and concentrate, Mo content[3]	11,482	14,584	742	Belgium-Luxembourg 4,098; Japan 4,033; United Kingdom 2,216.
Nickel:				
Ore, matte, speiss, Ni content	42,735	42,647	--	Norway 25,094; United Kingdom 17,552; Japan 1.
Oxide, Ni content	17,190	16,989	7,632	NA.
Metal including alloys:				
Scrap	2,401	2,664	1,737	West Germany 429; United Kingdom 218.
Unwrought	85,460	92,396	50,510	NA.
Semimanufactures	12,298	19,086	10,538	Finland 4,633; Belgium-Luxembourg 1,316.
Platinum-group metals:				
Concentrates, residues, mattes, metal content troy ounces	157,719	397,656	2,730	United Kingdom 394,926.
Metals including alloys:				
Scrap do	53,520	46,017	42,875	United Kingdom 1,522.
Unwrought and partly wrought do	57,196	47,469	26,028	Brazil 14,328; Japan 4,750; West Germany 2,000.
Selenium metal and salts, Se content	289	307	153	United Kingdom 94; New Zealand 20.
Silver:				
Ore and concentrate, Ag content thousand troy ounces	13,366	12,754	6,240	Japan 3,846; Belgium-Luxembourg 785.
Metal, refined including alloys, unwrought and partly wrought do	29,679	28,506	28,144	Belgium-Luxembourg 144; France 52.
Tin ore and concentrate, Sn content	713	870	548	United Kingdom 165; Mexico 156.
Titanium: Ilmenite and ilmenite sand[2 4]	139,447	9,239	9,239	
Uranium and thorium concentrates value, thousands	$324,340	$193,071	$175,758	United Kingdom $8,637; Japan $6,726.
Zinc:				
Ore and concentrate, Zn content	598,279	434,177	62,318	Japan 124,258; Belgium-Luxembourg 113,098.
Metal including alloys:				
Scrap, dross, ash	15,443	22,195	13,186	United Kingdom 2,894; Belgium-Luxembourg 2,395.
Blue powder	3,642	3,645	3,394	Ecuador 135; Greece 49.
Unwrought	429,367	471,949	278,226	United Kingdom 50,479; Venezuela 19,974.
Semimanufactures	1,955	3,722	3,250	Brazil 192; Belgium-Luxembourg 177.
Other:				
Ores and concentrates, gross weight	343,731	78,172	29,302	Austria 20,044; Japan 9,151.
Ash and residue containing nonferrous metals	18,674	20,532	9,449	Taiwan 7,111; Belgium-Luxembourg 2,820.
Oxides, hydroxides, peroxides	102,304	132,879	123,256	Australia 8,026.
Metals including alloys:				
Precious metals:				
Waste and sweepings value, thousands	$91,897	$144,221	$62,038	United Kingdom $68,584; France $5,649.
Unwrought and partly wrought troy ounces	8,506	23,670	991	Japan 19,137; United Kingdom 3,542.
Base metals, all forms	1,656	1,974	1,684	Belgium-Luxembourg 126; United Kingdom 84.
NONMETALS				
Abrasives, n.e.s.:				
Natural	165	85	83	St. Pierre-Miquelon 2.
Fused alumina (artificial corundum), crude and grains	183,159	166,328	158,134	United Kingdom 8,044.
Silicon carbide, crude and grains	84,546	72,416	69,722	Japan 2,466; Taiwan 128.
Grinding and polishing wheels and stones value, thousands	$700	$1,978	$1,471	New Zealand $80; Australia $71.
Asbestos:				
Crude	20	--		
Milled fiber, all grades thousand tons	1,461	1,217	325	West Germany 151; Japan 132; United Kingdom 70.

See footnotes at end of table.

Table 2.—Canada: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Barite, crude	2,038	650	650	
Cement, portland thousand tons	2,289	1,528	1,452	Saudi Arabia 69.
Clays and clay products:				
Crude including refractory clays do	1,052	821	821	
Products:				
Refractory including nonclay brick[5]	74,493	68,490	24,218	Venezuela 9,176; Chile 8,196.
Nonrefractory value, thousands	$2,958	$2,526	$2,436	NA.
Diamond:				
Gem carats	34,571	28,929	4,750	Belgium-Luxembourg 10,190; Israel 8,224.
Industrial including dust do	195,265	260,612	203,418	Australia 34,215; Ireland 11,227.
Fertilizer materials:				
Manufactured:				
Nitrogenous thousand tons	1,338	1,317	1,211	India 28; Philippines 26; Australia 21.
Potassic do	10,631	10,565	7,158	Brazil 788; Japan 630; India 490.
Other including mixed	597,831	565,318	435,102	Belgium-Luxembourg 51,254; Taiwan 21,948.
Ammonia	483,939	431,019	431,019	
Gypsum, crude thousand tons	5,475	4,960	4,960	
Lime	490,863	403,172	399,278	Barbados 1,596; Honduras 1,153.
Nepheline syenite	471,057	448,469	406,286	Italy 15,601; Netherlands 9,181.
Pigments, mineral: Processed iron oxides	22,300	15,932	15,584	Poland 224.
Precious and semiprecious stones excluding diamond value, thousands	$5,366	$5,212	$2,750	Taiwan $806; Switzerland $470.
Salt and brine thousand tons	1,822	1,638	1,626	Guyana 5; Cuba 4.
Sodium sulfate	193,347	246,116	236,985	Thailand 2,989; Philippines 2,567.
Stone, sand and gravel:				
Dimension stone, crude and partly worked	304,732	72,900	70,864	Bermuda 1,152; Japan 406.
Limestone, except dimension thousand tons	2,296	2,215	2,214	St. Pierre-Miquelon 1.
Quartzite	60,823	63,166	63,161	Republic of South Africa 5.
Sand and gravel	325,641	386,437	347,564	Bermuda 25,800; Bahamas 12,766.
Sulfur:				
Crude and refined thousand tons	5,155	6,851	1,435	Republic of South Africa 708; Australia 668; Brazil 1,654.
Sulfuric acid	139,425	323,776	323,762	Bermuda 11.
Talc, steatite, soapstone, pyrophyllite[2]	[6]2,096	3,539	3,539	
Other, crude value, thousands	$45,959	$77,153	$28,418	France $12,142; West Germany $11,476; Belgium-Luxembourg $9,572.
MINERAL FUELS AND RELATED MATERIALS				
Coal, bituminous thousand tons	13,853	14,311	22	Japan 10,450; Brazil 1,607; Republic of Korea 1,131.
Coke and semicoke	228,785	342,276	142,809	Belgium-Luxembourg 52,566; Netherlands 41,557; Venezuela 32,139.
Gas, natural million cubic feet	990,493	810,935	810,935	
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	105,260	78,192	78,192	
Refinery products:				
Gasoline do	5,744	4,444	3,576	Netherlands 275; Madagascar 177; Argentina 165.
Distillate fuel oil do	14,940	13,821	914	Netherlands 4,546; Indonesia 1,549; Singapore 1,416.
Residual fuel oil do	14,993	13,093	11,939	Brazil 614; Netherlands 540.
Lubricants do	39	85	47	Belgium-Luxembourg 12; West Germany 7; Cuba 4.
Other:				
Liquefied petroleum gas do	48,965	40,528	38,085	Japan 2,412; Mexico 30.
Asphalt do	1,035	1,004	980	United Kingdom 10; Ivory Coast 3.
Petroleum coke and pitch coke do	690	831	402	Japan 296; Australia 117; Greece 16.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals do	17,364	20,113	19,621	Netherlands 310; France 93; United Kingdom 58.

[r]Revised. NA Not available.
[1]May include relatively minor quantities of certain shapes not normally included among semimanufactures.
[2]Partial figures: Data given are for U.S. imports for consumption only.
[3]Includes some scrap.
[4]Largely, if not all, used in the production of heavy aggregate.
[5]Total excludes quantity valued at $10,551,000 in 1979 and $11,143,000 in 1980.
[6]Total excludes quantity valued at $12,063,000 in 1979.

Table 3.—Canada: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite thousand tons	2,150	3,504	35	Guinea 1,506; Brazil 1,472.
Alumina	952,583	983,971	276,797	Australia 374,058; Japan 171,494; Jamaica 128,666.
Metal including alloys:				
Scrap	30,681	30,724	30,724	
Unwrought	r29,855	13,961	11,883	United Kingdom 1,436.
Semimanufactures	r138,270	114,100	107,053	Venezuela 3,723.
Antimony oxides	794	944	313	United Kingdom 559.
Chromium:				
Ore and concentrate	27,373	28,373	7,769	Mozambique 9,288; Philippines 5,970; Albania 4,719.
Oxide and hydroxide	1,908	1,717	1,624	United Kingdom 57.
Copper:				
Ore and concentrate	r2,653	12,744	6,385	Chile 5,381; Peru 924.
Sulfate	542	142	139	United Kingdom 3.
Metal:				
Scrap including alloys	35,443	35,051	34,935	Peru 75; Haiti 24.
Unalloyed:				
Unwrought	32,541	13,466	8,729	Peru 3,489; Chile 500; Japan 499.
Semimanufactures	r6,565	6,063	4,248	Japan 1,174; Sweden 220; West Germany 167.
Alloys, unwrought and semimanufactures	r18,536	19,937	16,539	West Germany 1,894; United Kingdom 309.
Gold:				
Ore and concentrate value, thousands	$8,129	$33,924	$33,635	Peru $149; Nicaragua $104.
Metal including alloys, unwrought and partly wrought thousand troy ounces	r2,881	2,249	1,854	Switzerland 247; Hong Kong 88.
Iron and steel:				
Iron ore thousand tons	5,913	5,875	5,653	Brazil 222.
Metal:				
Scrap do	1,047	1,015	1,015	
Pig iron and related materials	r19,789	10,751	10,499	West Germany 143.
Ferroalloys:				
Ferrochrome	34,720	41,369	10,515	Republic of South Africa 19,836; Brazil 7,600.
Ferromanganese including spiegeleisen	r83,699	26,704	4,793	Republic of South Africa 12,283; Norway 9,468.
Silicomanganese	21,876	20,901	12,088	Norway 4,050; Republic of South Africa 3,043.
Ferrosilicon	r19,855	18,508	17,177	Brazil 445; Norway 442; France 409.
Ferrotungsten	27	7	2	Portugal 5.
Ferrovanadium	349	520	520	
Other	r6,707	10,506	3,452	Greece 3,794; France 2,101; Brazil 909.
Steel, primary forms	r177,451	104,647	99,368	United Kingdom 5,004.
Semimanufactures:				
Bars, rods, angles, shapes, sections:				
Wire rod	r166,266	106,493	10,668	Japan 47,145; Republic of South Africa 22,889; France 17,519.
Other bars and rods	r133,803	83,410	48,211	United Kingdom 13,740; Japan 7,416; France 4,648.
Angles, shapes, sections	r273,111	207,639	65,402	Belgium-Luxembourg 48,258; Spain 25,524.
Universals, plates, sheets	r1,039,054	582,215	245,826	Japan 134,840; Republic of Korea 24,330; United Kingdom 23,305.
Rails and accessories	20,636	29,689	20,971	Belgium-Luxembourg 3,686; United Kingdom 2,861.
Wire	r60,947	35,270	10,102	United Kingdom 9,617; France 4,185; Belgium-Luxembourg 3,270.
Tubes, pipes, fittings	r285,144	322,111	99,001	Japan 164,338; Republic of Korea 16,823.
Castings and forgings, rough	r139,095	129,363	114,186	United Kingdom 4,552; India 2,243; Spain 2,190.
Lead:				
Oxides	331	926	821	Republic of Korea 60; Mexico 45.
Metal including alloys, all forms	r2,133	2,602	2,593	Japan 5.
Magnesium metal including alloys, all forms	3,147	3,820	3,652	United Kingdom 168.

See footnotes at end of table.

Table 3.—Canada: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Manganese:				
Ore and concentrate	45,150	95,161	8,010	Gabon 36,346; Republic of South Africa 23,508; Brazil 15,360.
Metal including alloys, all forms	8,275	6,957	440	Republic of South Africa 6,413.
Mercury 76-pound flasks	1,471	1,464	1,257	Japan 207.
Molybdenum oxides and hydroxides	336	362	302	West Germany 60.
Nickel:				
Ore and concentrate including scrap metal	19,047	26,149	11,902	Australia 4,254; France 3,568; United Kingdom 2,221.
Metal including alloys:				
Unwrought	r3,108	5,224	3,238	Norway 1,708.
Semimanufactures	r5,353	2,268	1,546	West Germany 501; United Kingdom 112; Sweden 80.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	26,585	34,227	23,524	United Kingdom 10,245.
Silver:				
Ore and concentrates[1] value, thousands	$218,867	$846,299	$734,686	Peru $35,511; Panama $26,609; Nicaragua $17,398.
Metals including alloys, unwrought and partly wrought thousand troy ounces	1,232	10,903	10,492	Peru 297; United Kingdom 82.
Sodium metal	8,237	7,110	7,092	United Kingdom 18.
Tin metal including alloys, all forms	r4,689	4,527	3,153	Bolivia 617; Brazil 279.
Titanium:				
Dioxide, pure	r9,815	6,135	3,817	France 809; United Kingdom 565; Australia 483.
Metal including alloys, all forms	731	986	932	United Kingdom 53.
Tungsten ore and concentrate	11	6	6	
Zinc:				
Ore and concentrate including scrap metal	r11,660	59,542	52,040	Australia 3,432; Bolivia 2,198.
Oxides and peroxides	1,717	1,526	1,335	United Kingdom 180.
Metal including alloys:				
Blue powder	304	234	233	NA.
Unwrought	2,573	724	724	
Semimanufactures	r542	557	278	Belgium-Luxembourg 216.
Zirconium metal including alloys, all forms	312	229	191	France 38.
Other:				
Ores and concentrates including scrap metal	r118,131	151,419	81,164	Australia 38,185; Republic of South Africa 17,803.
Base metals including alloys, unwrought and semimanufactures	r1,841	1,338	1,195	Bolivia 54; United Kingdom 38.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	r155,612	57,513	57,265	West Germany 118; United Kingdom 113.
Grinding and polishing wheels and stones value, thousands	$16,315	$15,710	$10,557	Italy $1,418; Austria $856.
Asbestos, crude	r1,969	1,156	307	Republic of South Africa 849.
Barite, crude	r20,765	48,749	48,523	United Kingdom 101; China 54; Netherlands 54.
Boric material: Oxide and acid	13,606	12,940	9,888	France 1,771; Netherlands 608.
Cement	248,421	223,247	220,656	Japan 1,175; Italy 955.
Clays and clay products:				
Crude:				
Bentonite	r638,307	471,683	345,345	Greece 125,927.
Chamotte (including refractory scrap)	12,544	19,719	19,719	
Fire clay	52,244	39,334	38,980	United Kingdom 354.
Fuller's earth	r1,710	1,385	1,385	
Kaolin (china clay)	273,422	254,350	222,882	United Kingdom 31,468.
Other	129,133	122,416	121,842	United Kingdom 313; France 79; West Germany 72.
Products:				
Refractory including nonclay bricks value, thousands	r$75,818	$88,664	$80,816	West Germany $2,501; United Kingdom $2,035; Austria $1,647.
Nonrefractory do.	$43,530	$54,219	$6,081	Italy $22,603; Spain $7,882; Japan $5,045.
Cryolite, crude	r518	274	38	Denmark 236.

See footnotes at end of table.

Table 3.—Canada: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Diamond:				
Gem, not set or strung ____ carats	137,732	133,308	22,275	Belgium-Luxembourg 43,335; Israel 34,269.
Industrial _____ thousand carats	1,332	1,343	799	Ireland 332; Belgium-Luxembourg 75; United Kingdom 68.
Dust and powder _____ do____	1,134	1,287	1,269	Ireland 18.
Diatomite _____	r28,362	26,577	26,577	
Fertilizer materials:				
Crude: Phosphate rock thousand tons	r3,683	4,207	4,207	
Manufactured:				
Nitrogenous _____	165,108	136,449	119,985	Netherlands 7,992; Chile 7,537.
Phosphatic _____	r381,886	248,381	246,763	Belgium-Luxembourg 1,154; Israel 459.
Potassic _____	71,775	82,852	82,844	NA.
Other including mixed _____	132,857	123,374	122,425	Netherlands 745.
Ammonia _____	56,227	33,855	33,855	
Fluorspar _____	167,905	223,940	17,752	Mexico 108,963; Morocco 39,808.
Gypsum _____	152,463	154,717	35,024	Mexico 119,693.
Iodine _____	260	271	54	Japan 212.
Lime _____	r41,480	40,901	39,005	West Germany 1,000; United Kingdom 878.
Magnesium including dead-burned and sintered _____	88,909	76,600	64,572	West Germany 5,071; Greece 4,300; Netherlands 2,560.
Mica, crude _____	3,131	2,597	2,581	NA.
Pigments, mineral: Iron oxides, processed	r12,303	8,869	6,344	West Germany 1,010; Spain 713.
Precious and semiprecious stones excluding diamond value, thousands	r$23,318	$28,933	$10,443	Japan $4,825; West Germany $2,128; Israel $1,501.
Salt and brine _____ thousand tons	1,276	1,151	730	Mexico 388.
Sodium and potassium compounds, n.e.s.:				
Caustic soda _____	r345,698	217,290	203,257	West Germany 10,342.
Caustic potash, sodic and potassic peroxides _____	3,888	4,188	3,899	NA.
Sodium carbonate including sal soda _	184,585	161,383	161,308	NA.
Sodium sulfate _____	23,156	20,211	675	United Kingdom 19,536.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked _____	r48,961	58,039	40,458	Republic of South Africa 8,978; Italy 7,082.
Worked ___ value, thousands	$3,691	$5,106	$695	Italy $3,993.
Dolomite, calcined _____	3,915	4,316	4,316	
Limestone excluding dimension thousand tons	3,216	2,418	2,418	
Quartz, silex and crystallized _____	1,259	280	277	NA.
Sand, gravel, crushed rock:				
Crushed rock _____	79,329	38,401	38,088	United Kingdom 151; Italy 146.
Silica sand ___ thousand tons	1,652	1,200	1,194	NA.
Sand and gravel, n.e.s __do____	1,202	1,210	1,206	NA.
Sulfur:				
Elemental, all forms _____	1,699	1,767	1,755	West Germany 12.
Sulfuric acid _____	r170,617	18,048	18,048	
Talc, steatite, soapstone, pyrophyllite __	r50,350	50,726	50,498	Italy 125; United Kingdom 63.
Vermiculite, crude _____	37,486	34,597	26,841	Republic of South Africa 7,756.
Other:				
Crude _____ value, thousands	$10,310	$9,807	$7,628	Turkey $1,067; United Kingdom $204.
Oxides, hydroxides, peroxides of magnesium, strontium, barium ___	38,405	28,373	27,683	United Kingdom 275; France 143.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals _____ value, thousands	$4,385	$3,787	$3,478	Belgium-Luxembourg $180.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural __do____	r$1,547	$1,568	$1,417	West Germany $106.
Carbon black _____	r11,663	9,663	9,506	United Kingdom 95; France 35.
Coal, all grades including briquets thousand tons	17,587	16,066	16,066	
Coke and semicoke _____	385,526	403,377	403,377	
Gas, hydrocarbon, natural thousand cubic feet	114	104	104	

See footnotes at end of table.

Table 3.—Canada: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude				
thousand 42-gallon barrels	r222,219	205,736	45,379	Saudi Arabia 75,784; Venezuela 62,945.
Refinery products:				
Gasoline ---------- do	235	1,769	6	Netherlands Antilles 783; Netherlands 493; Philippines 487.
Kerosine ---------- do	3	2	2	
Jet fuel ---------- do	163	394	2	Venezuela 230; Netherlands Antilles 161.
Distillate fuel oil ---------- do	r441	213	16	Netherlands Antilles 197.
Residual fuel oil ---------- do	r5,481	10,174	1,766	Venezuela 6,156; Bahamas 916; Netherlands Antilles 873.
Lubricants ---------- do	r1,089	731	584	Trinidad and Tobago 85; Netherlands 57.
Mineral jelly and wax ---- do	80	64	60	United Kingdom 2.
Naphtha ---------- do	36	28	28	
Asphalt and road oils ---- do	r285	225	225	
Liquefied petroleum gas do	103	1,682	1,681	NA.
Petroleum and pitch coke do	r981	908	890	United Kingdom 18.
Unspecified ---------- do	783	713	712	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r112,872	119,542	74,738	NA.

rRevised. NA Not available.

[1]May contain ores and concentrates of platinum-group metals.

Table 4.—Canada: Value of principal mineral exports

Mineral	Value, million dollars	
	1970	1980
Natural gas[1]	172	3,323
Crude petroleum[1]	541	2,418
Copper and products[2]	575	1,267
Iron ore[1]	397	1,034
Nickel products[2]	646	915
Potash[3]	101	789
Silver[2]	66	741
Coal[1]	25	662
Asbestos[2]	190	523
Zinc and products[2]	180	489
Sulfur[1]	[4]37	[5]453
Molybdenum[1]	51	300
Lead and products[2]	73	204
Uranium[1]	22	192
Platinum metals[2]	39	172
Gold	[6]181	1,203
Total	3,296	14,685

[1]Crude materials (inedible).

[2]Crude materials (inedible) and fabricated materials (inedible).

[3]Fabricated materials (inedible).

[4]Includes value of sulfur in ores ($321,962 in 1980, $1,022,604 in 1970).

[5]Does not include sulfur in ores.

[6]Includes gold, unrefined (117,750 troy ounces=$3,414,797); gold, refined, exported by Canadian mines (766,731 troy ounces=24,198,014); and gold, refined n.e.s. (4,990,239 troy ounces=$153,634,160); gold in ores and concentrates (203,025 troy ounces=$89,620,485); and gold, refined (1,886,003 troy ounces=$11,130,644).

Source: Statistics Canada, 1981.

Table 5.—Canada: Number of producing mines[1] for main minerals produced in 1981

Mineral	Newfoundland	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon Territory	Northwest Territories	Total
Asbestos	--	--	--	--	7	--	--	--	--	1	--	--	8
Coal	--	--	7	7	--	--	--	6	21	3	1	--	45
Copper	1	--	--	--	5	--	--	--	--	6	--	--	12
Copper-molybdenum[2]	--	--	--	--	--	--	--	--	--	6	--	--	6
Copper-zinc[2]	--	--	--	--	4	4	11	1	--	1	--	--	21
Gold[3]	--	--	--	--	16	11	1	--	--	5	--	4	37
Gypsum	1	--	4	1	--	3	1	--	--	1	--	--	11
Iron ore[4]	3	--	--	--	3	4	--	--	--	1	--	--	11
Lead-zinc[2]	1	--	--	2	--	--	--	--	--	3	2	3	11
Limestone	1	--	4	4	--	--	2	--	6	4	--	--	21
Molybdenum	--	--	--	--	--	--	--	--	--	3	--	--	3
Nickel-copper[2]	--	--	--	--	--	11	3	--	--	--	--	--	14
Potash	--	--	--	--	--	--	--	10	--	--	--	--	10
Salt	--	--	2	--	--	2	--	2	2	--	--	--	8
Silica	1	--	2	1	6	1	2	--	--	--	--	--	13
Sodium sulfate	--	--	--	--	--	--	--	7	1	--	--	--	8
Uranium	--	--	--	--	--	5	--	3	--	--	--	--	8
Other[5]	4	--	3	--	6	10	1	1	--	5	1	2	33
Total	12	--	22	15	47	51	21	30	30	39	4	9	280

[1]Producers of clay products and construction materials not shown.
[2]Most nonferrous base metal mines yield varying quantities of precious metals.
[3]Most of the lode gold mines as shown produce some silver.
[4]Includes byproduct producers.
[5]Includes 1 each of: amethyst (Ontario), bentonite (Saskatchewan), zinc (Newfoundland), copper-gold (Yukon Territory), magnesium (Ontario), iron-titania (Quebec), mica (Quebec), niobium (columbium) (Quebec), pyrophyllite (Newfoundland), tantalum (Manitoba), serpentine (Ontario), tungsten (Northwest Territories), brick-shales (Newfoundland), silver-cobalt (Ontario), magnesitic dolomite (2 Nova Scotia and 1 Quebec), soapstone (Quebec); and 6 of barite (3 British Columbia, 1 Newfoundland, 1 Ontario, 1 Nova Scotia).

Source: Mining Association of Canada, Facts and Figures, 1982.

COMMODITY REVIEW

METALS

Aluminum.—Two companies were reported producing primary aluminum metal in Canada—Canadian Reynolds Metals Co., Ltd., and Aluminum Co. of Canada, Ltd. (ALCAN). Canadian Reynolds operated a 154,000-ton-per-year smelter at Baie Comeau, Quebec, while ALCAN had five smelters in Quebec—at Jonquiere, Grand Baie, Isle Maligne, Shawinigan, and Beauharnois—and one at Kitimat, British Columbia. ALCAN had a smelter capacity of 961,000 tons per year and also produced alumina from imported bauxite for use mainly in its Quebec smelters. The Kitimat smelters used alumina imported from Australia.

It was reported that the first 57,000-ton-per-year potline at Grand Baie, Quebec, was officially opened in September, a second line was completed in 1981 and construction was continuing on a third potline. Because of the weakness of the worldwide market ALCAN was to delay indefinitely the start-up of its second 57,000-ton-per-year potline that was completed in 1981.

The 1981 recession was expected to continue into 1982 with aluminum stocks remaining high. If inflation and interest rates decrease, it was expected that additional smelter construction would resume in 1982.

Copper.—The opening of several copper mines in Canada in 1980 was expected to lead to increased production in 1981; however, the depressed world economy caused Canadian producers to reduce output. As the market became weaker in 1981, further production cutbacks and, in some instances, mine closures occurred. This situation was expected to continue unless there is a marked improvement in the price of copper.

The Consolidated Rambler Mines Ltd. copper-gold mine at Baie Verte, Newfoundland, continued to operate through 1981. The mine was expected to operate into the spring of 1982 at a reduced rate, provided there was no futher drop in metal prices. Although the Buchans Mine of ASARCO Incorporated was expected to close in 1981, some additional ore was discovered that should enable the mine to operate for another 2 or 3 years at a reduced rate.

Camchib Resources Inc. maintained operations at its mines at Chibougamau and developed additional ore zones at the Cedar Bay and Henderson No. 2 Mines. Camchib, and others were expected to spend $8 million by mid-1982 on drilling or underground exploration of about 11 mining properties in northwestern Quebec.

Noranda Mines Ltd. announced that it had discovered copper mineralization beneath the town of Murdochville, Quebec, adjacent to its Gaspe division, at a depth of about 700 meters. Noranda also announced that operations would be reduced at its Copper Mountain Mine and concentrator by the end of 1981.

Texasgulf Canada Ltd. was renamed Kidd Creek Mines Ltd. after becoming a wholly owned subsidiary of the Canada Development Corp. Noranda reported its open pit F Group copper-zinc-silver-mine in Ontario was in production early in 1981. The South Bay Mine of Selco Inc., at Confederation Lake, Ontario, was reported closed in 1981 after ore reserves were mined out.

Hudson Bay Mining and Smelting Co. Ltd., Manitoba, was continuing development of the Trout Lake Mine near Flin Flon, Manitoba, the Spruce Point Mine at Reed Lake, and the Rod Mine at Snow Lake.

Tech Corp. reported that its Highmont copper-molybdenum mine in the Highland Valley, British Columbia, was in production.

Gold.—In 1981, gold prices declined and performance was disappointing compared with that of 1980. Weaker gold prices caused the value and volume of production to be reduced from the 1980 level.

In Canada, the reported level of exploration activity that developed in 1980 continued throughout 1981. Claim staking was continued in the older developed gold mining camps, but areas in which new gold discoveries were reported also had substantial staking activity. Exploration of known properties continued with the rehabilitation of old shafts to permit underground exploration and reevaluation of reserve statistics. Much of the exploration has been in the Dawson Mountain range. The Department of Energy, Mines, and Resources reported that the volume of gold production in Canada in 1981 was slightly below that of 1980 as producers continued to mill lower grade ore. The decrease in both volume and unit value of product combined to reduce the value of gold production by 24% from the 1980 level.

At the end of 1981, it was reported that

there were 37 lode gold mines in Canada operated by 28 companies. Four lode gold mines closed during the year.

Several gold mines opened in 1981—three in Quebec, five in British Columbia, and one each in Ontario and the Northwest Territories. Other mines were continuing mill construction and mine development programs and were to be in full-scale production early in 1982. Ontario continued as the leading gold producer, followed by Quebec, British Columbia, and the Northwest Territories.

The Royal Canadian Mint was proceeding with plans for further utilization of gold in their coinage. Canada ranked fourth in the total amount of gold used in coinage with about 914,000 troy ounces used in 1981. The maple leaf 1-ounce coin has been popular and the mint was planning to coin a 0.1-ounce maple leaf. The maple leaf coin, at 999.8 fine gold was considered to have an advantage over other gold coins of lower fineness.

Iron Ore.—Canadian iron ore shipments in 1981 were estimated at about 50 million tons, with a value of $1.9 billion. Shipments in 1980 were 49 million tons valued at $1.7 billion.

The year was marked by a series of production cutbacks and layoffs at several iron ore mines and processing plants in Quebec, Labrador, and Ontario. For most of the industry, 3-year union contracts for iron ore workers were successfully negotiated without work stoppages.

The Iron Ore Co. of Canada suspended operations at its Sept Iles concentrator and pellet plant in Quebec in May 1981 for the balance of the year causing 650 employees to be out of work. Sidbec-Normines Inc., Quebec, was the only company to operate a direct-reduction plant in Canada in 1981. It was estimated that the company produced about 1 million tons of pellets in 1981.

The INCO Ltd. pellet plant at Copper Cliff, Ontario, remained idle in 1981 and the company stated that it had no plans to reopen the facility in 1982.

Iron and Steel.—Production of crude steel in 1981 decreased by almost 8% relative to that of the previous year to approximately 14.8 million tons. The domestic demand for steel during the first half of 1981 was strong and, as a result, all three major steel companies filled orders on an allocation basis. Although there was less demand in the third quarter of the year, domestic producers continued to have difficulty satisfying some orders because of a 4-month strike that affected steel production in one-third of the industry.

The low value of the Canadian dollar relative to the U.S. dollar continued to stimulate exports of Canadian rolled steel products, particularly during the first half of 1981. Exports, expressed in crude-steel equivalent, to all countries were estimated at 4.5 million tons, about the same amount as that of 1980. Imports increased significantly during the last 6 months of the year because of the strengthening of the Canadian dollar, increasing competition, and a shortfall of some domestic products. Accordingly, imports expressed in crude-steel equivalent were reported at 3.8 million tons, an increase of over 80% from that of 1980.

Lead and Zinc.—World economic conditions were not favorable for lead and zinc exports during 1981. Lead and zinc prices weakened in an extremely competitive market and the profits of Canadian producers were not as high as was expected at the beginning of the year.

Refined zinc metal production in Canada has been estimated at 619,000 tons in 1981, compared with 592,000 tons in 1980. Canadian zinc metal producers were operating at an average of 97% capacity.

Brunswick Mining and Smelting Corp. was building a 100,000-ton-per-year zinc reduction plant at Belledune, New Brunswick. Basic engineering and planning was completed and construction was scheduled to start in May 1982, with plant startup targeted for late 1984. The project was estimated to cost about $360 million.

Three zinc metal refineries, Cominco Ltd., Canadian Electrolytic Zinc Ltd., and Kidd Creek Mines Ltd., were in the process of adding to their capacity.

Nickel.—In response to a continued weak world market, Canadian producers operated below capacity and maintained a tight control over production to avoid excessive inventory levels. Temporary shutdowns were necessary in some locations. High interest rates, rising costs, depressed prices, and declining demand had significant a negative impact on revenues.

INCO announced development of a new open pit mine at Thompson to replace the Pipe open pit mine that was expected to be depleted by 1984. The new pit was to be developed in two phases. The first phase was scheduled to be operational by 1984, mining a portion of the ore body to

a depth of about 125 meters. The second phase would develop the remaining ore body with production scheduled by 1991.

Certain development work at Falconbridge Ltd.'s Craig, Lockerby, and Onaping Mines was to be suspended in 1982, although initial production at the Craig deposit continues to be scheduled for 1987.

Exploratory drilling and developmental work continued in 1981 on the New Quebec Raghan Mines Ltd. property in the Ungawa area of northern Quebec.

Platinum-Group Metals.—The platinum-group metals produced in Canada were recovered as a byproduct in the treatment of nickel-copper sulfide ores. INCO and Falconbridge were the two major Canadian producers of platinum-group metals, with INCO the larger of the two. The platinum-group metals recovered from Canadian ores averaged about 43% platinum, 45% palladium, and 12% other metals in the platinum group. It was expected that a strong industrial demand for the platinum-group metals, particularly platinum and ruthenium, would continue through the 1980's.

Silver.—It was reported that silver production in 1981 was valued at approximately $406 million, representing a decrease of about $285 million from the 1980 value. Increased production in New Brunswick and British Columbia offset lower production in Ontario and the Territories.

Canada continued to be a major world producer of silver and ranked third after Mexico and Peru. Production was expected to remain near recent levels; however, the decline in world silver prices will affect expansion and development of existing silver properties and delay exploration. The United States was the major market for Canadian silver in 1981 and accounted for almost three-fourths of Canada's silver exports.

Other Metals.—Consolidated Durham Mines and Resources Ltd. closed Canada's only antimony mines at its Lake George property near Fredericton, New Brunswick, when proven ore reserves were exhausted in early 1981. A new ore body near the existing mine has been discovered with reserves estimated at over 800,000 tons. Options were being investigated to mine the new property.

Production of cobalt increased by about 43% in 1981. Two companies, INCO and Falconbridge, produced cobalt as a byproduct of domestically produced nickel-copper ores while a third, Sherritt Gordon Mines, Ltd., recovered cobalt from tolled and purchased nickeliferous materials. INCO's electrolytic cobalt plant at Port Colborne was expected to come onstream in late 1982 or early 1983. This facility was expected to have a production capacity of about 1,000 tons per year, and will replace the existing production line at Port Colborne.

Two new molybdenum mines, the Kitsanet and Highmont Mines, both in British Columbia, came into production in 1981. As a result of weak demand for molybdenum and an excessive inventory buildup, Placer Development Ltd. initiated a production cutback program at its Endako Mine. Output was reduced by an estimated 30% during 1981. For like reasons the other major producers were expected to initiate or continue production constraints.

NONMETALS

Asbestos.—The soft housing market and slowdown in general construction resulted in weak demand and consequently higher inventories of asbestos fiber in 1981. The decline in shipments of asbestos fiber in 1981 caused reductions in operations and in the work force of the mines. Quebec, the major asbestos producing area in Canada, was especially impacted by the weak market. Continuing environmental concerns were also probably reflected in the weak asbestos market.

Fertilizer Materials.—*Phosphate.*—Canada did not mine phosphate and during 1981 imported its phosphate rock requirement almost entirely from the United States. Sherritt Gordon was conducting exploration and production feasibility studies on a phosphate deposit near Kapuskasing, Ontario, 640 kilometers northwest of Toronto. The property was optioned from International Minerals and Chemical Corp. (Canada) Ltd. (IMCC) in 1979. IMCC had completed an exploration program and reserves were estimated at 56.7 million tons grading 20% P_2O_5.

Potash.—Production and sales were down in 1981, compared with results in 1980. High inventories caused several mines to curtail production. Although prices were declining in the last part of 1981, the major producers in Saskatchewan continued with their various expansion programs, based partly on the assumption that the market would improve in the first quarter of 1982 and that the world demand for potash would continue to grow.

Sulfur.—Canada was the world's largest

exporter of sulfur, accounting for over 40% of the total world sulfur trade. The chief source of sulfur was sour natural gas, produced mainly in Alberta from about 57 sour gas plants. In 1981, Canada's elemental sulfur exports rose 8% over 1980 exports to 8.0 million tons. Although sulfur prices have been volatile over the years, the Canadian sulfur industry was expected to keep pace with the world economy.

Other Nonmetals.—Cement and gypsum production were also moderated by the depressed demand in the construction industry. Total 1981 cement production in Canada was sustained at about the same level as 1980 although exports were estimated to have decreased about 7%. Gypsum was expected to post an overall increase in production and exports of about 6%.

Canada was the world's foremost producer of nepheline syenite, which was mined from extensive deposits near Peterborough, Ontario. Although the value of exports increased in 1981 by an estimated 12%, production remained essentially the same as that of 1980. Canada exported a major portion of its production to the United States for use by the glass industry.

MINERAL FUELS

Coal.—Production and consumption continued to grow in 1981. Development of new mines and expansion of existing properties were proceeding in order for the coal industry to meet growing domestic and foreign demand. Not only were there investments in mines but also in railway and port facilities. Coal liquefaction technology was also receiving attention. The Federal Government was involved through the objectives outlined in the national energy program for finding improved ways to use coal. Increased coal-fired electrical generation plants in Canada were expected to ensure a demand for domestic coal, and an increased demand worldwide for steam and metallurgical coal was expected to create a greatly expanded market in the coming decade.

Natural Gas.—The supply of natural gas exceeded Canada's domestic requirements and authorized export markets in 1981. This factor plus the investment uncertainty created by the introduction of the NEP caused a decline in natural gas in 1981. The Canadian Department of Energy, Mines, and Resources indicated that compared to that of 1980, drilling activity for oil and gas had declined by 25% to 6,800 well completions.

Revenues from the sales of Crown lands decreased by about 40%, geophysical activity was reduced by about 20%, and rig activity in 1981 was expected to decline significantly according to the Department of Energy, Mines, and Resources' estimates.

Petroleum.—Production of crude oil, including synthetic crude and natural gas liquids, was estimated to decline by about 7%. Although refining capacity was reported to remain unchanged, there was an estimated 6% reduction in processing. Recent major oil discoveries in the Beaufort Sea and off the east coast were expected to add to Canada's established reserves estimated at 7.3 billion barrels at yearend.

The investment uncertainty that existed following introduction of the NEP was eased considerably when agreements between the western provincial governments and the Federal Government were signed in late 1981, providing a pricing agreement and other incentives. Revenue-raising measures were also contained in the agreements. This was expected to have a positive effect on exploration and development activity.

Uranium.—The Canadian uranium industry continued to develop. In 1981, there were seven primary uranium producers. Sixty percent of the primary production came from four mines in Ontario with the remainder coming from three mines in Saskatchewan. There was a decrease in exploration activity reflecting the decline in uranium prices and projected lower demand. The Canadian uranium industry was well established and was expected to have no problem competing in the world market.

[1]For more detailed information on the mineral industry of Canada see the Canadian Minerals Yearbooks for 1980 and 1981, and the Canadian Mineral Surveys for 1979 and 1980, both of which were prepared by the Mineral Development Sector, Department of Energy, Mines, and Resources, Ottawa. The U.S. Department of the Interior, Bureau of Mines has arranged to have these Canadian publications placed in libraries in each of the 50 States and Puerto Rico as follows: University of Alabama, Tuscaloosa; E. E. Rasmuson Library, University of Alaska, Fairbanks; University of Arizona, Tuscon; University of Arkansas, Fayetteville; California State Library, Sacramento; A. Lakes Library, Colorado School of Mines, Golden; Wilbur Cross Library, University of Connecticut, Storrs; H. M. Morris Library, University of Delaware, Newark; Strozier Library, Florida State Library, Tallahassee; P. Gilbert Memorial Library, Georgia Institute of Technology, Atlanta; University of Hawaii, Hilo; University of Idaho, Moscow; Morris Library, Southern Illinois University, Carbondale; Indiana University, Bloomington; Iowa State University of Science and Technology, Ames; Watson Library, University of Kansas, Lawrence; M. L. King Library, University of Kentucky, Lexington; University of Southwestern Louisiana, Lafayette; R. H. Folger Library, University of Maine, Orono; Eisenhower Library, John Hopkins University, Baltimore, Md.; Massachusetts Institute of Technology Library, Houghton; Wilson Library, University of Minnesota, Minneapolis; University of Southern Mississippi, Hattiesburg; Rolla Library, University of Missouri, Rolla; Montana College of Mineral Science and Technology, Butte; D. L. Love Library, Nebraska Geological Survey at University of Nebraska, Lincoln; University of Nevada, Reno; University of New Hampshire, Durham; J. C. Dana Library, Rutgers University, Newark, N.J.; New Mexico Institute of Mining and Technology, Socorro; Columbia University, New York, N.Y.; D. H. Hill Library, North Carolina State University, Raleigh; Frity Library, University of North Dakota, Grand Forks; Ohio State University, Columbus; University of Oklahoma, Norman; Multnomah County Library, Portland, Oregon; Pennsylvania State University, University Park; University of Rhode Island, Kingston; University of South Carolina Undergraduate Library, The Horseshoe, Columbia; South Dakota School of Mines and Technology, Rapid City; Tennessee State Library and Archives, Nashville; Main Library University of Texas, Austin; Marriott Library, University of Utah, Salt Lake City; Bailey Library, University of Vermont, Burlington; Virginia Polytechnic Institute, Blacksburg; University of Washington, Seattle; West Virginia University, Morgantown; Memorial Library, University of Wisconsin, Madison; University of Wyoming, Laramie; and University of Puerto Rico, Mayaguez, Puerto Rico.

[2]Mining engineer, Division of Foreign Data.

[3]Where necessary, values have been converted from Canadian dollars (CAN$) to U.S. dollars at the rate of CAN$1.989=US$1.00, the average exchange rate for the year.

[4]Brown, R. D. Current Trends in the Tax Environment for Mineral Development in Canada. AIME Ann. Meeting, Dallas, Tex., Feb. 16, 1982.

The Mineral Industry of Chile

By Pablo Velasco[1]

The Chilean economy entered a period of economic slowdown in the second half of 1981. However, on a full-year basis, the economy grew at an estimated rate of 5%, while inflation was reduced to 9.5%. These figures compare favorably with those of the rest of Latin America.

The Chilean mining sector was affected by depressed world economic conditions, but managed to achieve some growth during 1981. The mining sector, which accounted for 7% of gross domestic product estimated at $32 billion[2] at current prices, grew almost 2% in 1981. This sector was the most important source of Chilean export earnings and was the area with the greatest prospects for major private investment. A new mining law that is favorable to private investment was completed in 1981.

Despite experiencing one of its most disappointing years in international markets, Chile maintained its position as the second largest producer of copper after the United States. Although overall mineral production was maintained in 1981, the sector was seriously affected by price declines. Copper production, which accounted for the major part of mineral output, rose slightly because of a 14% increase in output of small- and medium-size mines. Copper production of Corporación Nacional del Cobre de Chile (CODELCO-Chile), the large state company, fell 1.2%. Chile also ranked second in world output of molybdenum after the United States and second in iodine production after Japan.

Chilean petroleum production exceeded substantially its 1980 level and set a new record. Chile was approximately 45% self-sufficient in petroleum. Production of electrical energy rose almost 6% in 1981. Approximately 80% of Chilean demand for electricity was satisfied by hydroelectric powerplants. The inauguration of the Antuco facility in 1981 expanded electrical generation capacity by one-third. The Colbun-Machicura project, which was under construction, will expand installed capacity by another one-third.

Full production of gold and silver was reached in 1981 at the El Indio gold, silver, and copper mine, owned by the Chilean affiliate of St. Joe International Corp. The mine, developed over a period of several years with an investment of over $200 million, was the largest mining project to be completed under the terms of the 1974 Foreign Investment Law. Sociedad Chilena del Litio Ltda., a joint venture of Foote Minerals Co. and Corporación de Fomento de la Producción (CORFO), initiated a $61 million project to produce 6,350 tons of lithium carbonate from brines located on the Atacama Salt Flats.

Foreign Investment.—Since the enactment in 1974 of the Chilean foreign investment law, which established nondiscriminatory treatment of foreign investors without providing special incentives or disincentives, more than 714 direct foreign investment projects with a total value in excess of $6.5 billion have been authorized by the Chilean Government for all sectors of the economy. U.S. interests accounted for 186 projects or 26% of the total number valued at $5.0 billion or 77% of the total value authorized. Mining projects accounted for almost 85% of the total value. The concentration of investment projects in the mining sector reflected Chilean resource endowment and comparative advantage in mineral development.

In 1981, the number and total value of investment projects as well as the amount of capital actually entering the country showed significant increases that exceeded all previous years since 1974. A total of 185 projects valued at $2.5 billion were author-

ized during 1981, up from 154 projects and $196 million in 1980. While the number of investments increased by 21%, the value soared by almost twelvefold because of the General Electric-Getty Oil $1.5 billion proposal for development of La Escondida copper deposit. Actual investment flow during 1981 increased 25% to $381 million.

Government Policies and Programs.—In December, the Government announced the approval of a proposed new mining law designed to encourage new mining investments in Chile and to modernize its mining legislation. The new mining law was to be sent to the constitutional tribunal for final approval.

In discussing the scope of the new mining law, Government officials expressed the hope that this new mining legislation will stimulate domestic and foreign investment and would result in doubling copper production in the next decade to more than 2 million tons per year. The new mining law provides for the granting of concessions for exploration, exploitation, and marketing of minerals through legal procedures without state intervention. In the past, foreign investors were reluctant to undertake important mining projects because of the possibility of expropriation in which the state unilaterally fixed the amount of compensation or intervened directly in negotiations between the contracting parties.

Concessionaires of exploration or exploitation projects would have the right to be compensated in the event of expropriation for the damages incurred. In the event no agreement is reached, the amount of the compensation would be set by a judge after a report is submitted by experts.

Under the new mining law, the Chilean state-owned copper enterprise, CODELCO-Chile, would continue to own and operate the country's present large-scale copper mining industry, consisting of the Chuquicamata, El Teniente, Andina, and El Salvador Mines. One of the key provisions of the revised mining code establishes the right of private citizens to obtain mining concessions, with the constitutional guarantees of private property (article 19 of the Chilean Constitution concerns private property).

The mining law established two types of concessions—exploration and exploitation. For the first, the concessionaire is given a period of 2 years, subject to another 2-year extension for carrying out exploration work. No time limit is set for exploitation, subject to the payment of an annual license fee. The mining code provides that similar concessions would not be available in the fields of hydrocarbons, lithium, maritime deposits in jurisdictional waters, or in zones regarded as vital to national security.

The owner of a concession is protected by the guarantee of a stable arrangement. Should the state at some time decide to exploit a concession granted to a private investor, it is required to compensate him by paying the commercial value of that concession.

PRODUCTION

Copper production in Chile reached a record level in 1981, the sixth consecutive year of more than 1 million tons of output. CODELCO-Chile production of copper in 1981 declined 1.2% compared with that of 1980, owing to a decrease in ore grade at the Chuquicamata Mines while output at the small- and medium-scale mines increased 14%.

Chilean gold production in 1981 increased by 44% compared with that of 1980. Of the total output, 54% came from the El Indio Mine that is 80% owned by St. Joe International Corp. Production of silver increased 12%.

Production increased in zinc, barite, sodium nitrate, guano, cement, and iodine, but declined in lead, manganese, iron ore, crude steel, potassium, salts, sodium sulfate, and talc. Production of molybdenum, mostly from the CODELCO-Chile El Teniente Mine, increased by 11%.

As for mineral fuels, coal output decreased by 12%, and output of crude petroleum increased almost 20% to a record level.

Table 1.—Chile: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Copper:					
Mine output, metal content[3]	1,056,200	1,035,500	1,060,600	1,067,700	1,080,800
Metal:					
Smelter, primary[4]	888,400	927,400	946,900	953,100	953,900
Refined:[5]					
Fire, primary refined	144,400	151,900	161,800	147,100	140,600
Electrolytic	531,600	597,200	617,700	663,600	635,000
Total	676,000	749,100	779,500	810,700	775,600
Gold, mine output, metal content—troy ounces	116,376	102,287	111,405	219,773	389,255
Iron and steel:					
Ore and concentrate:					
Gross weight—thousand tons	7,656	7,042	7,526	8,835	8,514
Iron content[e]—do	4,670	4,336	4,634	5,440	5,242
Pig iron—do	432	539	611	644	582
Ferroalloys:					
Ferromanganese	4,267	5,853	5,221	5,200	5,000
Silicomanganese	283	132	256	300	250
Ferrosilicon	3,168	2,173	5,063	5,000	4,500
Other	886	66	892	1,000	800
Total	8,604	8,224	11,432	11,500	10,550
Crude steel[6]—thousand tons	548	598	657	712	641
Semimanufactures (hot-rolled)	395	446	503	572	504
Lead, mine output, metal content	116	431	252	461	223
Manganese ore and concentrate	18,001	23,243	24,969	27,701	25,557
Mercury—76-pound flasks	20	--	--	--	--
Molybdenum, mine output, metal content	10,937	13,196	13,560	13,668	15,360
Selenium—kilograms	8,297	8,165	28,290	17,100	15,000
Silver—thousand troy ounces	8,461	8,210	8,740	9,598	10,927
Vanadium, mine output, metal content[e 7]	860	690	450	272	127
Zinc, mine output, metal content	3,918	1,814	1,847	1,134	1,516
NONMETALS					
Barite	65,038	182,422	226,767	225,529	229,375
Borates, crude, natural (ulexite)	4,248	26,544	3,049	3,275	3,135
Cement, hydraulic—thousand tons	1,123	1,177	1,353	1,567	1,847
Clays:					
Kaolin	55,712	48,117	59,222	59,425	56,335
Other (unspecified)	77,086	80,986	129,829	158,391	172,251
Diatomite	480	5,008	763	1,147	352
Feldspar	2,452	903	133	2,150	2,506
Gypsum:					
Crude	147,104	174,143	162,482	198,115	241,853
Calcined	56,447	48,601	54,917	74,435	90,800
Iodine, elemental	1,856	1,922	2,410	2,601	2,678
Lime, hydraulic[e]—thousand tons	620	620	635	635	600
Nitrogen: Natural crude nitrates:					
Sodium	482,110	422,975	467,200	460,000	471,170
Potassium-enriched	81,160	106,670	154,100	160,400	153,230
Phosphates: Guano	7,017	240	--	--	1,100
Pigments, mineral, natural: Iron oxide	8,146	5,263	2,590	4,451	4,890
Potash, K_2O equivalent	[e]16,000	[e]17,000	15,000	15,000	15,000
Pumice (includes pozzolan)	158,928	182,626	220,088	249,805	277,359
Quartz, common	169,771	194,443	141,079	162,663	152,552
Salt, all types	424,165	393,499	589,845	441,105	290,119
Sodium compounds:					
Sodium carbonate[e]	9,900	10,800	10,800	10,800	10,000
Sodium sulfate[8]	44,358	45,783	69,000	71,315	58,677
Stone:					
Limestone—thousand tons	1,918	2,188	2,300	2,766	2,937
Marble	1,413	7,552	3,882	2,505	1,879
Sulfur:					
Native, other than Frasch:					
Refined	4,967	13,520	11,605	13,925	5,727
Caliche	26,942	18,109	65,290	73,510	108,813
Byproduct (from industrial gases)	28,662	20,709	27,287	[e]26,700	28,000
Total	60,571	52,338	104,182	114,135	142,540
Talc	427	432	850	1,139	665
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous and lignite—thousand tons	1,342	1,148	957	1,024	904
Coke:					
Coke oven—do	[e]215	[e]215	[e]190	191	195
Gashouse[e]—do	5	5	5	NA	NA

See footnotes at end of table.

Table 1.—Chile: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Gas, natural:					
Gross ---- million cubic feet	237,273	[r]228,379	202,423	190,557	179,362
Marketed ---- do	133,857	123,588	138,094	[e]135,000	130,000
Natural gas liquids:					
Condensate ---- thousand 42-gallon barrels	746	656	674	[e]650	NA
Natural gasoline ---- do	1,020	920	1,200	[e]1,150	NA
Liquefied petroleum gas ---- do	2,971	3,076	2,971	[e]2,800	NA
Total ---- do	4,737	4,652	4,845	[e]4,600	NA
Petroleum:					
Crude ---- do	7,119	6,281	7,561	12,159	15,104
Refinery products:					
Gasoline:					
Aviation ---- do	98	106	151	25	44
Motor ---- do	7,880	8,488	8,919	8,290	8,806
Jet fuel ---- do	1,080	1,082	1,258	1,227	1,510
Kerosine ---- do	2,666	2,670	2,025	1,761	1,522
Distillate fuel oil ---- do	6,535	6,736	8,724	8,755	7,516
Residual fuel oil ---- do	9,315	10,182	10,900	10,617	8,529
Liquefied petroleum gas ---- do	2,506	2,616	2,718	2,635	2,642
Unspecified ---- do	1,268	1,558	1,277	1,454	1,070
Refinery fuel and losses ---- do	1,233	1,233	837	440	120
Total ---- do	32,581	34,671	36,809	35,204	31,759

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through July 19, 1982.

[2]In addition to the commodities listed, pyrite is also produced, but available information is inadequate to make reliable estimates of output levels.

[3]Figures are the nonduplicative copper content of ores, concentrates, precipitate, metal, and other copper-bearing products measured at the last stage of processing as reported in available sources.

[4]Figures are total blister and equivalent copper output including that blister subsequently refined in Chile and copper produced by electrowinning.

[5]Figures are total refined copper distributed into two classes according to method of refining.

[6]Excludes castings.

[7]Estimated on the basis of reported vanadium content of vanadiferous slags imported by the United States from Chile.

[8]Includes natural sodium sulfate and anhydrous sodium sulfate, coproducts of the nitrate industry.

TRADE

The Chilean trade deficit enlarged to $2.5 billion in 1981, up substantially from the $1.6 billion trade deficit in 1980. Copper's downward price movement, which began in 1980, was the major factor in the decline in the total value of Chilean exports by 18% to $3.9 billion.

In 1981, the value of copper exports decreased by 23% to $1.7 billion while the value of iron ore exports, the second most important mineral export, remained at the level of $158 million. The value of molybdenum exports decreased by 35%. Weak demand in world markets also brought about reduced income from the other traditional mineral exports of nitrates; however, the value of income from iodine exports increased during 1981. Overall, mineral exports dropped 22% in value in 1981 while accounting for 58% of the total value of Chilean exports.

As a result of a maintenance in the level of exports to the United States, while other principal markets declined, the United States emerged as the largest Chilean market during 1981, accounting for about 15% of total exports. The United States was followed by the Federal Republic of Germany, Japan, and Brazil. Chile exported to a total of 97 countries.

Chilean total imports increased in value by almost 10% to $6.4 billion. The country continued to rely heavily on imports of crude petroleum to meet domestic needs, mainly from the United States, Brazil, Iran, and Japan. Chile imported from a total of 33 countries.

Table 2.—Chile: Exports of copper and molybdenum ore, by commodity and country

(Metric tons unless otherwise specified)

Commodity and country of destination	1978	1979	1980
Copper ore and concentrate, copper content:			
Belgium	--	--	3,100
Canada	9,700	--	5,600
Germany, Federal Republic of	20,100	19,300	11,500
Japan	56,500	42,200	55,400
Korea, Republic of	8,100	7,300	7,100
Spain	11,400	10,500	10,800
Taiwan	5,900	4,300	--
Turkey	--	4,100	7,400
United States	200	300	11,000
Unspecified	500	11,100	12,500
Total	112,400	99,100	124,400
Blister copper:			
Austria	2,200	1,900	2,800
Belgium	8,000	7,400	7,500
China	15,300	23,000	14,900
Germany, Federal Republic of	51,200	39,900	29,200
Italy	2,700	5,800	3,100
Japan	7,400	9,600	8,200
Spain	12,200	14,100	13,900
United Kingdom	17,600	14,400	19,100
United States	35,900	32,200	26,200
Yugoslavia	10,600	8,800	21,600
Unspecified	200	6,400	5,000
Total	163,300	163,500	151,500
Refined copper:			
Argentina	28,300	41,700	40,300
Belgium	30,500	29,600	15,900
Brazil	115,200	119,500	128,100
China	8,000	21,000	15,000
Colombia	1,500	2,000	1,400
France	27,100	44,000	71,300
German Democratic Republic	6,100	--	5,000
Germany, Federal Republic of	97,500	122,200	121,200
Greece	2,800	4,400	8,800
Italy	87,400	93,900	97,800
Japan	69,800	53,000	30,500
Korea, Republic of	1,100	4,100	--
Netherlands	5,000	7,900	12,500
Norway	1,300	1,100	800
Spain	2,100	3,300	4,000
Sweden	11,200	13,400	15,700
Switzerland	1,200	1,200	1,000
Taiwan	14,100	12,700	2,700
United Kingdom	67,000	70,500	63,100
United States	117,700	92,500	123,100
Yugoslavia	2,200	1,100	100
Unspecified	5,000	6,800	10,800
Total	702,100	745,900	769,100
Molybdenum ore and concentrate, molybdenum content	5,643	6,687	7,316

COMMODITY REVIEW

METALS

Copper.—Copper production reached a record level in 1981, which marked the sixth consecutive year with output more than 1 million tons. This represented a 1.2% increase over that of the previous year, confirming a trend toward slowly rising production.

Total large-scale mining output at Chuquicamata, El Teniente, El Salvador, and Andina Mines belonging to CODELCO-Chile (Chilean National Copper Corp.) fell 1.2% to 893,000 tons. This was due mainly to a drop in the ore grade mined at Chuquicamata. Copper output at small- and medium-scale mines rose 14% to 186,700 tons. Three mines were largely responsible for the country's production increase. El Teniente had a rise in output of 10% to

291,000 tons, and production at the Exxon Minerals Chile Inc. Disputada de Las Condes Mine was up 38% to 39,500 tons. The third producer, Lo Aguirre Mines, operated by Sociedad Minera Pudahuel Ltda. y Cía. C.P.A., was brought into production and reached some 13,800 tons.

After additional exploration of its Los Bronces deposit, Exxon Minerals decided that more engineering studies must be made before expanding production to 80,000 tons of ore per day. Investment required for the project has risen from $1.0 billion to $2.0 billion. It was estimated that Exxon Minerals lost $70 million in 1981 from development of the Los Bronces project, which is part of the operation of Disputada de Las Condes S.A.

The Empresa Nacionál de Minería (ENAMI) paid Noranda Mines Ltd. $4.5 million as reimbursement for expenditures at the Andacollo Mine and as compensation for losses from the termination of negotiations on its joint development. ENAMI owes Noranda an additional $4.5 million, which will be paid by the end of 1982. Noranda acquired a 49% interest in Andacollo through public bidding in 1977 and entered into a partnership with ENAMI. At the end of 1980 the Government ended negotiations on joint development of the mine and agreed to compensate Noranda.

CODELCO-Chile was expected to transfer its 49% ownership of the Quebrada Blanca copper deposit to ENAMI. The copper project is located 160 kilometers west of Iquique and is 51% owned by Compañía Explorandora Doña Inés., a joint venture of Superior Oil Co., Falconbridge Nickel Mines Ltd., Canadian Superior Oil Ltd., and McIntyre Mines Nevada Ltd. Since 1977, the foreign partners have invested $17.8 million in exploration and feasibility studies. Reserves were estimated at 130 million tons of ore assaying an average of 1.22% copper and 0.014% molybdenum. Over 100,000 meters of drill holes have been completed, and 2,000 meters of tunneling and raises have been driven.

Rio Algón Ltd., a unit of Rio Tinto Zinc Corp., Ltd., was undertaking advanced exploration of the copper deposit, Cerro Colorado, in northern Chile 115 kilometers east of Iquique. The Toronto-based company was in the process of determining the feasibility of developing the reserves estimated at 60 million tons. An assessment will be made to determine the average grade of the copper ore and whether or not the gold is recoverable. Rio Algón planned to produce copper concentrate for the world market.

General Electric Co. and Getty Oil Co. received authorization to carry out a $1.5 billion copper mining investment in Chile. The project will be executed by an equal partnership between Getty Mining (Chile) Inc., a Getty Oil subsidiary, and Minera Utah de Chile S.A., an affiliate of the San Francisco-based Utah International Inc., which in turn is a wholly owned natural resource subsidiary of General Electric. The companies have decided to go ahead with full development of the La Escondida deposit believed to be one of the largest copper deposits in Chile. La Escondida is about 180 kilometers southeast of Antofagasta. During 1981, the property was in an exploratory stage. Reserves have been estimated at 200 million tons. Preliminary exploration has disclosed an enriched zone with copper values between 1.2% and 2.3%.

Approval of the La Escondida project by the Government brought total authorized foreign investment since 1974 in the mining sector to almost $6 billion. Of this figure, $5 billion was accounted for by 30 mining projects. The Los Pelambres copper project under development by The Anaconda Company was the largest approved project to date.

A group of Brazilian companies formed a consortium with CODELCO-Chile, named Andibras, for the development of copper deposits in Chile and Brazil. The groups included Técnica Nacionál de Engenharía, S.A., Brasil-Invest, Andrade Gutierrez, Caraiba Metais, and Interbras, the trading subsidiary of Petróleo Brasileiro, the Brazilian state-owned oil company. The Andibras consortium will initially operate on a trial basis for a period of 1 year. Among the first projects planned by Andibras was the study of the feasibility of extracting copper from the El Abra Mine in Chile and processing it into finished products in Brazil.

Table 3.—Chile: Copper production, by sector and company

(Thousand metric tons of fine copper)

Sector and company	1977	1978	1979	1980	1981
LARGE MINES (CODELCO-Chile)					
Chuquicamata	477.8	500.7	507.2	510.9	472.4
El Teniente	275.7	250.6	278.2	266.0	291.9
El Salvador	80.7	77.5	78.1	74.8	76.5
Andina	58.5	47.7	46.7	52.8	52.8
Total	892.7	876.5	910.2	904.5	893.6
MEDIUM AND SMALL MINES					
Empresa Nacional de Minería (ENAMI)	80.6	77.0	82.4	102.8	99.7
Mantos Blancos	28.5	38.2	36.0	29.7	31.7
Disputada de Las Condes	36.1	28.8	20.9	28.6	39.2
Other	18.3	15.0	11.5	2.1	16.6
Total	163.5	159.0	150.8	163.2	187.2
Grand total	1,056.2	1,035.5	1,061.0	1,067.7	1,080.8

Source: Comisión Chilena del Cobre and CODELCO-Chile Annual Reports.

Table 4.—Chile: Copper production, by type

(Thousand metric tons of fine copper)

Type	1977	1978	1979	1980	1981
Refined	676.0	749.1	781.8	810.7	775.6
Blister	212.4	178.3	167.8	142.4	178.3
Bulk[1]	167.8	108.1	111.4	114.6	126.9
Total	1,056.2	1,035.5	1,061.0	1,067.7	1,080.8

[1]Includes cements, concentrates, slags, and minerals.

Source: Comisión Chilena del Cobre and CODELCO-Chile Annual Reports.

Iron Ore.—Production of iron ore for 1981 was about 4% lower than that of the previous year. Iron ore production was concentrated in deposits belonging to Compañía de Acero del Pacífico (CAP) through acquisition of Compañía Minera del Pacífico S.A., which are, in order of importance, El Algarrobo, El Romerál, and Los Colorados. During 1981, no activity in iron ore production was registered in the small-mining sector. Production of iron ore pellets from the Huasco pellet plant in 1981 was 3.3 million metric tons, an increase of 4% compared with that of 1980.

In 1981, iron ore was shipped to the following domestic consumers:

Consumer	Tons
CAP, Huachipato Steel Plant	987,106
ENAMI	7,359
INACESA	2,544
Manganesos Atacama S.A	838
Total	997,847

A 400-million-ton deposit of iron ore was discovered in the northern Andes of Chile. The ore body consists of volcanic lava that erupted over several centuries from the El Laco volcano. The ore grade is 60% iron and is spread over the hillside and base of the volcano at an altitude between 4,700 and 5,600 meters above sea level. Significant quantities of vanadium are reportedly present.

Iron and Steel.—Crude steel and pig iron production declined 10% in 1981. State-owned CAP was the principal Chilean steel producer. During 1981, CAP acquired Compañía Siderúrgica de Huachipato S.A. as well as Compañía Minera del Pacífico S.A.

During the year, CAP continued to implement the recommendations made by the several consulting firms to improve productivity and raise the energy efficiency of the plant. Advisory services were rendered by Nippon Kokan K.K., the Japanese steelmaking firm.

During 1981, CAP completed its structural reorganization into a holding company comprised of seven wholly owned but independently functioning and separately incorporated companies. The seven subsidiaries include (1) Compañía de Acero de Rengo, which is the operator of the Rengo steel plant; (2) Manganesos Atacama S.A., the country's principal producer of ferromanganese; (3) Pacific Ores and Trading, the

CAP marketing agency for iron ore and pellets; (4) Compañía Siderúrgica Huachipato, operator of the Huachipato steel plant; (5) Compañía Minera del Pacífico, which mines iron ore and runs the Huasco pellet plant; (6) Acero Comercial S.A., which will market steel products; and (7) Abastecimientos CAP S.A., which will act as the purchasing agent for all companies on a commission basis.

Manganese.—Production of manganese decreased 8% compared with that of 1980. Manganesos Atacama S.A. continued as the sole producer of manganese from deposits located at Coquímbo. At yearend, only the Loma Negra Mine operated by Manganesos Atacama was in production, while the Toda La Vida, Los Loros ,and Mina Alta Mines were shut down. Production of manganese from these mines declined because of a decrease in average grade from 35.7% to 33.6%.

The Guayacán plant also shut down at yearend, having processed 12,500 metric tons of ore into 5,000 metric tons of ferromanganese and 61 metric tons of manganese dioxide.

Molybdenum.—Chile continued to rank second after the United States as a world producer of molybdenum and accounted for about 13% of the world total. CODELCO-Chile, the only Chilean producer of molybdenum as a byproduct of copper, increased production 11% compared with that of 1980 from the following mining divisions: Chuquicamata, El Teniente, El Salvador, and Andina. The El Teniente Mine had the greatest increase in output of molybdenum concentrate.

The principal Chilean facility for molybdenum processing is Molibdenos y Metales S.A., a private company that has been in operation for 15 years. Its industrial complex, located in Santiago, produced about 50% of Chile's molybdenum concentrate and 100% of its molybdenum oxide and rhenium. CODELCO-Chile ships molybdenum concentrate, ferromolybdenum, and oxides to purchasers in Western Europe, Canada, and Japan.

Precious Metals.—Chilean gold production in 1981 increased sharply by 44% over that of 1980. Chilean gold and silver production came not only from gold mines but also as byproducts of copper, silver, lead, and zinc mining and refining. Medium and small gold mining accounted for 71% of total output, and copper accounted for 26% of the total.

In 1981, 54% of the gold output was from the El Indio gold, silver, and copper mine, which is the principal Chilean gold and silver producer. El Indio Mine is located east of La Serena, about 500 kilometers north of Santiago at 14,000 feet. El Indio is owned 80% by St. Joe International Corp. (Fluor Corp.) of the United States and is operated by Cía Minera San José, a Chilean subsidiary.

Engineering and construction management of the El Indio Mine and mill completed during 1981 was performed by Fluor Mining and Metals Inc. and its Chilean associate, Hernán Briónes Ltda.

During construction of the mill, St. Joe mined El Indio reserves of rich, direct-shipping ore containing about 11.5 troy ounces of gold per ton, 4.6 ounces of silver per ton, and 2.6% copper. The major part of reserves at El Indio requiring milling were estimated at 3.4 million tons with an average of 0.4 troy ounce of gold per ton. Initially, direct-shipping ore reserves were estimated to be sufficient through 1982. These reserves were subsequently estimated at 77,000 tons, providing for shipments at a rate of about 2,200 tons per month through 1984. St. Joe shipped 14,000 troy ounces of gold in 1979, 130,600 troy ounces in 1980, and about 171,000 troy ounces in 1981, all contained in direct-shipping ore.

A number of gold projects were under exploration. Sancarrón, 20 kilometers north of El Indio, was being explored by a joint venture of St. Joe, Preussag A.G. of the Federal Republic of Germany and the Chilean Angelini Group, each with 29.25% interest, and other private Chilean investors.

NONMETALS

Iodine.—Sociedad Química y Minera de Chile S.A. (SOQUIMICH) continued as the only producer of iodine as a coproduct of nitrate mining from the María Elena and Pedro de Valdivia Mines in northern Chile.

Iodine production in 1981 increased 3.2% compared with that of 1980. The increase in production was due to the startup of the processing plant for weak solutions built by Coya Sur in 1981. A similar plant will be constructed to process the iodine contained in weak solutions from the Pedro de Valdivia Mine.

Lithium Minerals.—Under Government policy established in November 1979 (decree law 2886), lithium was defined as a strategic mineral by Chile, and lithium operations were reserved for the state, falling under the jurisdiction of the Nuclear Energy Com-

mission. Sociedad Chilena del Litio Ltda., formed by the state, with foreign interests, was planning to begin construction of a lithium carbonate plant in northern Chile in early 1982. The new plant will produce 6,350 tons of lithium carbonate from a brine deposit in the Salar de Atacama. Final engineering on the plant is to begin immediately, and completion of construction and start of production were scheduled for 1984. The cost of the project was estimated at $61 million.

Chile has an estimated 4 million tons of metallic lithium, 39% of the world's known reserves, contained in brines located in the Salar de Atacama and Salar de Pedernales areas of the Atacama Desert about 2,000 kilometers north of Santiago.

To determine the extent of reserves, drilling was underway at the Salar de Pedernales 50 kilometers north of the El Salvador Mine in northern Chile. The 400-square-kilometer area, at an altitude of 3,400 meters, is known to contain deposits of lithium, potassium, and borax. Initial drilling of part of this area has confirmed that salt deposits extend down to an aquifer at about 140 meters, which currently supplies much of the process water for the El Salvador Mine. A lithium and potassium deposit was found below the aquifer. If sufficient reserves are confirmed, the deposit will be offered for development by domestic and international firms.

Other Nonmetals.—CORFO was scheduled to invite bids in late 1981 for the construction of a chemical industrial complex that will produce potassium salts and boric acid. Feasibility studies were carried out by the Comité de Sales Mixtas (Mixed Salts Committee) as part of the development function of CORFO. Saline Processors Inc. of the United States acted as technical advisors for this phase. The projected plants will be located in the Atacama Desert salt flats. Production of 500,000 tons per year of potassium chloride, about 145,000 tons per year of potassium sulfate, and 28,000 tons per year of boric acid was planned. SOQUIMICH was expected to buy about 30,000 tons per year of potassium chloride, and the remainder would be exported. These exports would earn $86 million in foreign exchange each year. Total investment in the project was estimated at $120 million.

MINERAL FUELS

Coal.—Production of coal decreased 12% in 1981 compared with that of 1980. During the last 2 years, Chilean coal imports have grown substantially as high local production costs have made some Chilean mines noncompetitive with imports, almost all of which have come from the United States.

Chilean coal production is forecast to decline. The two largest mines, Schwager and Lota, south of Concepción, extend under the Pacific Ocean, and operating costs keep rising as coal veins are mined further under the sea. Chilean coal consumption was estimated at 1.5 million metric tons in 1981 and was expected to decrease to 1.35 million metric tons in 1982 and increase again to 1.7 million tons in 1983 and 1984. CORFO sold its studies, technical data, and other rights in the Pecket coal deposit to Compañía de Carbones de Chile Ltda. (COCAR) for $3.5 million. COCAR is a joint venture of Compañía de Petróleos de Chile S.A. and the English firm, Northern Strip Mining Ltd. COCAR expects to invest $110 million during the next 4 years in development. The investment would enable COCAR to produce 1.5 million to 2 million tons of coal per year. The Pecket deposit is located near Punta Arenas in Chile's far south near the Straits of Magellan. Studies indicate reserves of 116 million tons of subbituminous coal.

Plans called for the construction of two port facilities, one near the deposit for coal shipments and the other in northern Chile to receive the coal. Construction of the Pecket Mine was scheduled to start in mid-1982 with initial yearly production expected to reach 300,000 tons in 1986 and 500,000 in 1987.

COCAR was negotiating a sales agreement with CODELCO-Chile. Substitution of Pecket coal for petroleum at the CODELCO-Chile Chuquicamata copper operations could mean an annual $30 million savings to the corporation. COCAR was also discussing the utilization of Pecket coal with Compañía Chilena de Electricidad S.A. (CHILECTRA), the Chilean electric company, at its Tocopilla and Ventanas powerplants. The Pecket coal has been tested in various thermoelectric plants and was expected to replace 20% to 25% of the country's petroleum imports.

A newly discovered coal deposit, perhaps the largest found in Chile to date, could meet the country's needs for the next 20 years. Using cost-efficient machinery, workers at El Laurél Mine began to extract the inexpensive coal in December 1981. El

Laurél is located in Pupunahue, approximately 53 kilometers from Valdivia, and is operated by Cía. Valparaiso Ltda. Daily production was expected to fluctuate between 300 and 500 tons at full capacity. The quality of the coal makes it suitable for the production of steam. It was reported that only 80 workers are needed to operate the special machinery, a French-Spanish product that cost $100 million. Coal reserves at El Laurél Mine were estimated at 9.5 million tons, which will allow the company 20 to 30 years of operation.

Petroleum and Natural Gas.—Spiteful No. 5, one of the newest platforms that the Empresa Nacionál del Petróleo (ENAP) put into operation during 1981, enabled the company to reach an output of about 49,400 barrels per day, the highest production rate in its history. The 1981 ENAP oil output was 24% higher than that of 1980, and the company expects to increase its petroleum production by at least another 5% during 1982. Practically all the increased output during 1981 was obtained from three new offshore platforms in Bahía Posesión. Spiteful No. 5 came online in early November and was the latest offshore platform to begin operations in the Straits of Magellan. Spiteful No. 4 and No. 2 began operations in June and September, respectively. They joined six other platforms already in operation in the area of the straits.

The successful ENAP hydrocarbon production efforts have played a substantial role in helping the country reduce its expenditures on imports of energy, which reached $811 million for the purchase of approximately 30 million barrels in 1979 and $815 million in 1980. ENAP supplied 45% of the domestic demand for hydrocarbons.

ENAP and the Comisión Nacional de Energía were offering for sale 42 billion cubic meters (1.5 trillion cubic feet) of natural gas from Magallanes Province with a maximum delivery of 7.7 million cubic meters (275 million cubic feet) per day over a period of 15 years. The Government did not wish to participate in either the financing or development of the project. The gas is located in deposits under production both onshore and offshore in the Magellan Straits area.

ENAP was undertaking a varied approach to finding fossil fuel resources. In addition to commitments with foreign private firms, the company has contracted directly for exploration equipment and qualified personnel. ENAP contracted PRAKLA-Seismos GmbH to carry out seismic studies in three separate areas off the Chilean coast.

Another exploratory project was being carried out by Petrolera del Pacífico, Ltda., an ENAP affiliate, on the Pacific continental shelf between San Antonio and the Bío-Bío River outlet.

ARCO Petroleos Chile S.A. and Amerada Hess Petroleos Chile S.A. invested $40 million in petroleum and natural gas exploration over a period of 3 years, according to company officials. Under a contract with ENAP, the joint-venture of ARCO-Amerada Hess has been exploring an area between Chiloe Island and the Gulf of Peñas using the drilling ship Danwood Ice. In early 1981, ARCO-Amerada Hess leased the drilling ship Ben Ocean Lancer. Oil reserves discovered have been estimated by De Goyler and MacNaughton of Dallas, Tex., and by ENAP, but the amount of these reserves has not been published.

Uranium.—Law 16,483, which created the Comisión Chilena de Energía Nuclear (CCEN), established that uranium and thorium radioactive minerals are for state control and that the exploration, development, and exploitation falls under CCEN jurisdiction. CCEN reported that uranium was not mined anywhere in the country, although prospecting was being carried out, particularly in northern Chile. CCEN specified that the only company that had obtained a license for uranium exploration in Chile was the Essex Mineral Co., a U.S. firm, with which the commission was negotiating an agreement.

On the other hand, a private enterprise specializing in analysis of radioactive materials confirmed the existence of uranium in Chile according to analyses run on mineral samples from the northern part of Chile.

A prefeasibility study for the installation of an uranium recovery plant at the Chuquicamata copper mine continued in 1981. Future production of uranium concentrate from this operation, according to CCEN officials, will depend upon the availability of financing.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Chilean pesos (CH$) to U.S. dollars at the rate of CH$39.00 = US$1.00, the exchange rate as of Dec. 31, 1981.

The Mineral Industry of China

By Edmond Chin[1]

In 1978, the State Planning Commission announced a readjustment in China's modernization program whereby heavy industry would assist the acceleration in growth of agriculture and light industry. Changes to the national economic plan for 1979-80 were to be a precursor to the embodiment of a sixth 5-year plan (1981-86), replacing the country's 10-year plan for 1976-85. National plans to resolve the disparity and to coordinate the development between agriculture, light industry, and heavy industry were adopted in 1979. The reassessment resulted in nine major guidelines for the current readjustment program. First, further reduce investment in capital construction; for instance, capital investments planned for 1981 were to be reduced from 55 billion yuan to 30 billion yuan.[2] Second, reduce expenditures for national defense, public programs, and administration. Third, increase the output and efficiency of the agricultural and industrial sectors. Fourth, reduce energy consumption and increase energy conservation. Fifth, consolidate and reorganize existing industries to improve production, eliminate redundancy, and reduce waste. Sixth, stabilize domestic prices. Seventh, improve living standards. Eighth, strengthen management. And last, issue treasury bonds and borrow monies from local governments.

In accordance with the National Economic Plan, minerals and metal commodity output levels for 1981 include steel, 35 million tons; 10 nonferrous metals, 1.08 million tons; cement, 78 million tons; chemical fertilizers, 12.3 million tons; coal, 620 million tons; and petroleum, 106 million tons. However, in early 1981, the planned oil output was revised downward to 100 million tons. Coal production by mines whose outputs were distributed by the state was lowered from 359 million tons to 338 million tons. The steel target was lowered from 35 million tons to 33 million tons, ostensibly to reduce the energy consumed and transport capacity used by this sector for the benefit of light industry.

At the beginning of December 1981, the final national financial accounts for 1980 and the estimates for 1981 were reported by the State Council. In 1980, total revenues were 108.52 billion yuan and expenditures, 121.27 billion yuan. The budget deficit of 12.75 billion yuan was 4.31 billion yuan less than 17.06 billion yuan in 1979. The 1980 deficit was credited to high expenditures for capital construction and was covered by credits of 8 billion yuan borrowed from bank loans and 4.75 billion yuan appropriated from receipts of state treasury bonds issued in 1981. Expenditures during 1980 were primarily for boosting industrial and agricultural production; 216 individual projects and 82 multifaceted projects were completed and commissioned during the year.[3]

Increases in industrial production capacity in 1980 include coal extraction, 8.2 million tons; crude oil extraction, 5.7 million tons; electricity-generating output, 2.8 million kilowatts; iron ore production, 2.7 million tons; railway tracking opened, 1,000 kilometers; and harbor loading capacity, 8.1 million tons.

Towards the end of 1981, the Central Committee and the State Council met on several occasions to review the overall economic situation. Basically, the Government's program to stabilize the economy was by a balanced budget and by stable prices. The former was achieved, more or less, by curtailing expenditures, and the

latter by adopting tighter price controls. The general price index rose slightly during the year, and the prices of basic daily necessities remained relatively stable.

Total revenues for 1981 were estimated at 105.86 billion yuan, of which 97.86 billion yuan was from domestic revenues and 8 billion yuan from foreign loans. Taxes accounted for 60.9 billion yuan of the domestic revenues; the remainder was income from state enterprises.

Total expenditures in 1981 were 108.58 billion yuan, resulting in a deficit of 2.72 billion yuan for the year. Eight billion yuan were drawn from foreign loans for capital construction appropriations. Some major components for the remainder of the domestic expenditure (100.58 billion yuan) were allocated as follows in billion yuan: 25.06 for capital construction appropriations; 5.83 for financing the modernization of existing enterprises and trial manufacture of new products; 7.30 for financial assistance to local enterprises and agricultural projects; 17.00 for culture, education, science, and public health; 16.87 for national defense; and 7.24 for administration. Great efforts were expended to balance the budget by reducing the 1981 deficit to less than a quarter of the 1980 deficit. Moreover, measures for readjusting the economy and balancing revenues and expenditures were to continue.

Highlighting the first year of the new economic plan was a 12% growth in output value of light industry. Moreover, despite natural calamities—drought and flooding—there was a 4% increase in output value for agriculture. The following sectors were given first priority for funding and for raw and semifinished materals: power and transport. Also, products and manufactures of the metallurgical, chemical, and machine-building industries were being systematically reoriented to meet market needs.

Output of nonferrous metals (aluminum, antimony, copper, lead, magnesium, mercury, molybdenum, tin, titanium, and zinc) increased 3% to 1,120,000 tons in 1981. Production of steel, coal, oil, and natural gas exceeded the revised targets for the year. Output of rare metals was up 30%.

Investments in capital construction were severely curtailed from 53.9 billion yuan in 1980 to 38 billion yuan in 1981. During the year, 1,714 projects were slated for suspension or postponement; by midyear, 1,546 projects had been deferred. Adjustments were made in appropriations to favor social programs. Wages and salaries were increased. State Treasury bonds were issued, and borrowing from local authorities was negotiated.

In late March, the International Symposium on World Economy was held at Hangzhou. During this meeting, the weak sectors of the Chinese economy were delineated. Foremost was lagging energy production in respect to rising energy demand. Communications and transport facilities were inadequate. Consumer goods, materials for construction, and packaging were in short supply. Urban infrastructure and public utilities were inadequate. Additionally, while China's basic foundation for iron and steel, nonferrous metals, machine building, and chemical industries was sizable, many of the enterprises in these sectors were old and needed technical renovation. In the late 1970's, the country's financial base was overtaxed as a result of launching simultaneously too many programs in its modernization program. Accordingly, the new priorities for the early 1980's were development of new energy resources; new construction for railways, ports, telecommunications, building materials, and urban and industrial infrastructure; establishing projects that bring a fast return of investments through exports in such sectors as chemicals, metallurgical, and electronics; and modernization of existing enterprises.

Preeminent to China's planning were means to increase foreign exchange earnings and the acquiring of foreign funds, the former from exports of products manufactured by low-investment cottage industries, and the latter by foreign loans, joint ventures, foreign cooperation in offshore oil exploration, compensation trade, and leasing. Loan agreements were reached with the Governments of Japan and Belgium. One Japanese loan was negotiated for financing the construction of two ports, three railways, and one power station. Another Japanese loan was for developing coal mines and oilfields. China negotiated with the International Monetary Fund for a loan for $450 million in special drawing rights and was consulting with the World Bank for loans to be used for constructing power stations, ports, and railways. Also, buyer credit agreements were signed with Argentina, Australia, Belgium, Canada, France, the Federal Republic of Germany, Italy, Norway, Sweden, and the United Kingdom.[4]

There was considerable foreign interest in establishing joint ventures in China. By the end of 1980, 20 joint ventures and 300 contractual ventures had been approved. Also, agreement was reached with foreign business for 350 undertakings in compensation trade (payment in products manufactured), totaling $100 million.

Foreign investment in joint offshore oil development remained the most promising means to utilize foreign funds. Japanese and French companies were prospecting in Bohai Bay and the Beibu Gulf. U.S. oil companies were interested in the Yinggehai Basin. Tenders in other areas were also to be offered. The Ministry of Petroleum Industry was preparing the regulations on foreign cooperation in offshore oil development, which were to be promulgated in late January 1982. Under the regulations, the China National Offshore Oil Corp. (CNOOC), a new entity to be formed, would be in full charge of China's offshore oil development. Obligations of the foreign contractor included providing exploration investment, undertaking exploration operations, and bearing all exploration risks. After a commercial strike of oil and/or natural gas was made, both the foreign contractor and CNOOC were to make investment for cooperative development. The foreign contractor was to be responsible for development and production operations until it relinquished responsibility to CNOOC under the terms to be provided in the petroleum contract.

CNOOC was to announce bidding for offshore oil development in mid-February 1982. Invitation for bidding was to be sent to 46 companies which participated in geophysical surveys of China's offshore areas. The bidding was to be conducted in two phases: The first would concern the northern areas in the southern Yellow Sea and the Zhujiang River estuary; the second phase would cover the southern part of the southern Yellow Sea, Beibu Gulf Basin, and Yinggehai Basin.

As an incentive to discover new geologic finds, the Government rewards individuals who volunteer information on new mineral-producing sites. Discovery of a small mineral find rates a cash reward of 10 to 100 yuan; a medium-size discovery, 100 to 400 yuan; and a large mineral bed, 400 to 800 yuan. In the event of a discovery of a very large mineral bed or of minerals deemed strategic or precious to the Government, such as chromium, diamond, gold, jadeite, platinum, ruby, and uranium, the award may range from 800 to 5,000 yuan.

During 1981, discoveries of 110 mineral occurrences were reported and reserves of another 130 mineral deposits were verified. Existence of an oil- and gas-bearing structure with large reserves was confirmed in northern Sichuan, as were five oil- and gas-bearing strata in north China, the south Songhuajiang-Liaohe plain, Ordos, north Jiangsu, and the Tarim Basin. Brown coal deposits with reserves of about 2 billion tons were discovered in the Baiyuanhua Basin. Also, the reserves at the Yongcheng coal mine in Henan were verified at 1.24 billion tons. Among the new discoveries in 1981 were 13 nonferrous metals, including a large molybdenum deposit in Laiyuan County in Hebei and a tin deposit in Yunnan which had 30 rich veins. Other finds included kaolin in Fujian, graphite near Jixi in Heilongjiang, marble in Beijing, Fangshan, and Miyuan, and attapulgite clay in Luhev, Xuyi, and Jiangsu.

The Income Tax Law Concerning Foreign Enterprises was to become effective on January 1, 1982. The tax rate on foreign enterprises ranged from 20% for annual income below 250,000 yuan to 40% for income over 1 million yuan. In addition, a local tax of 10% on the same taxable income was to be levied. Low-profit ventures might be exempt from income taxes in the first profit-making year; be allowed a 50% reduction in the second and third years; and with the approval of the Ministry of Finance, be allowed a 15% to 30% reduction in taxes after the third year for a period of 10 years. Also, losses incurred in a tax year could be carried over to the following year; or if sequential yearly losses occurred, the deductions could be claimed for a period of up to 5 years.

Because of restricted land and water transport capacity, China was to speed up the construction of rail and port facilities, particularly to alleviate problems for shipment of coal and other export goods. The transport capacity of railways used for coal mining, such as the Beijing-Shanhaiguan Beijing-Tongliao, Qindao-Jinan, and Handan-Changzhi lines, were to be expanded. Six railways were to be electrified: Lianyungang-Xinjiang, Beijing-Baotou, Shijiazhuang-Taiyuan, Xinjiang-Chongqing, Chengdu-Chongqing, and Zhuzhou-Guiyang. China had a total of 50,000 kilome-

ters of operational rail line, and in 1981, freight transported totaled 1,048 million tons. For waterways, port transport capacity was to be expanded; barging was to be increased; more hatchways were to be opened; existing docks built by industrial and mining concerns were to be utilized; new transport facilities were to be developed through joint ventures; cargo containerization was to be improved; and efficiency of existing capacity was to be raised.

Beginning in early 1982, the Government of China was to be restructured and streamlined. Under the proposed reorganization, the number of vice premiers was to be reduced from 13 to 2 and the number of governmental organs (ministries, commissions, and agencies) was to be reduced from 98 to 52. Overall employment in the State Council, ministries, and commissions was to be cut from 49,000 to 32,000. Goverment revamping was to be carried out in stages with the first changes at the ministerial level. These included a new Ministry of Water Conservancy and Power (merger of the Ministry of Power Industry and the Ministry of Water Conservancy), a new Ministry of Commerce (merger of Ministries of Food and Commerce, and certain functions of the All-China Federation of Supply and Marketing Cooperatives), and a new Ministry of Foreign Trade and Economic Relations (merger of State Administrative Commission on Import and Export Affairs, Ministries of Foreign Trade and Economic Relations with Foreign Countries, and the State Foreign Investment Commission). The Ministries of Coal, Chemicals, and Textile Industries were to remain as separate entities but were to be reformed with a simplified internal structure.

PRODUCTION

In 1979, the Government announced a readjustment program for the Chinese economy, thereby reordering planning priorities, enunciating new capital construction policies, and generally slowing the pace for modernization. The 10-year plan for 1981-90 was scrapped, and the sixth 5-year plan (1981-86) was substituted in which heavy industry was to support growth and development in light industry and agriculture. Moreover, all phases of Government and industry were to be rejuvenated. While the iron and steel sector was to be deemphasized, the fuel sector (coal, oil, and electric power) continued to receive high priority. In addition, there was to be an expansion of the nonferrous sector. In essence, priority was to be given to projects that required less foreign exchange, provided a faster return on investment, and offered greater export earnings.

Generally, the targets or quota for commodity production in 1981 were lower than the output levels attained in 1980. For instance, while production in the iron and steel sector and in the fuels sector in 1981 was below the 1980 output levels, production in this sector exceeded the targets of 1981.

While China produces a wide variety of mineral and metal commodities, published official statistics are severely limited. For instance, Chinese pronouncements revealed that nonferrous metals production exceeded the 1-million-ton mark in 1979, that the 1980 level exceeded the 1979 output by 8%, and that the 1981 output was 3% greater than that of 1980. For other commodities, no official data were available. While China's gold production was believed to have increased, the country's monetary gold reserves have remained at 12.67 million troy ounces. In addition to being a traditional producer of such commodities as antimony, fluorspar, mercury, tin, and tungsten, China was becoming a significant producer of barite, beryllium, germanium, lithium, rare earths, tantalum, titanium, and vanadium.[5]

Table 1.—China: Estimated[1] production of mineral commodities[2]

(Metric tons unless otherwise specified)

Commodity[3]	1977	1978	1979	1980	1981[p]
METALS					
Aluminum:					
Bauxite, gross weight[4]	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Alumina, gross weight	750,000	750,000	750,000	750,000	750,000
Metal, refined, primary	350,000	360,000	360,000	360,000	360,000
Antimony, mine output, metal content	10,000	10,000	10,000	10,000	10,000
Bismuth, mine output, metal content	225	240	260	260	260
Cadmium metal, smelter	200	220	225	225	225
Copper:					
Mine output, metal content	195,000	200,000	200,000	200,000	200,000
Metal:					
Smelter, primary and secondary	195,000	200,000	200,000	200,000	200,000
Refined, primary and secondary	260,000	270,000	280,000	280,000	280,000
Gold, mine output, metal content—troy ounces	100,000	150,000	200,000	225,000	1,700,000
Iron and steel:					
Iron ore, gross weight[5] — thousand tons	r81,000	r70,000	r75,000	75,000	70,000
Pig iron[6] — do.	25,050	34,790	36,730	38,020	34,170
Ferroalloys — do.	450	600	650	660	650
Crude steel[6] — do.	23,740	31,780	34,430	37,120	35,600
Rolled steel — do.	16,330	e22,080	e24,970	e27,160	e26,700
Lead:					
Mine output, metal content	135,000	145,000	155,000	155,000	155,000
Metal, refined, primary and secondary	150,000	160,000	170,000	170,000	170,000
Magnesium metal, primary	5,000	6,000	6,000	7,000	7,000
Manganese ore, gross weight — thousand tons	1,150	1,300	1,500	1,600	1,600
Mercury, mine output, metal content 76-pound flasks	20,000	20,000	20,000	20,000	20,000
Molybdenum, mine output, metal content	1,500	2,000	2,000	2,000	2,000
Nickel:					
Mine	11,000	11,000	11,000	11,000	11,000
Smelter	10,000	10,000	10,000	10,000	10,000
Silver, mine output, metal content thousand troy ounces	1,000	1,500	2,000	2,500	2,500
Tin:					
Mine output, metal content	13,000	14,000	14,000	14,600	15,000
Metal, smelter	13,000	14,000	14,000	14,600	15,000
Tungsten, mine output, metal content	r9,000	r11,500	r13,100	15,000	13,500
Zinc:					
Mine output, metal content	155,000	160,000	160,000	160,000	160,000
Refined, primary and secondary	155,000	160,000	160,000	160,000	160,000
NONMETALS					
Asbestos	200,000	250,000	r140,000	131,700	135,000
Barite	350,000	400,000	500,000	680,000	775,000
Cement, hydraulic — thousand tons	e55,650	65,240	e73,900	e79,860	e84,000
Fluorspar	r430,000	r440,000	r460,000	470,000	480,000
Graphite	60,000	80,000	r182,000	160,000	160,000
Gypsum — thousand tons	1,000	1,500	r3,567	3,348	3,400
Kyanite	1,500	2,000	2,500	2,500	2,500
Lithium minerals, all types	10,000	10,000	10,000	10,000	10,000
Magnesite — thousand tons	1,500	1,800	2,000	2,000	2,000
Nitrogen: N content of ammonia[6] — do.	r6,360	r7,637	r8,821	9,990	9,860
Phosphate rock and apatite, P_2O_5 equivalent — do.	r860	e r1,033	e r1,817	e2,310	e2,510
Potash, marketable, K_2O equivalent — do.	18	21	16	12	20
Pyrite, gross weight — do.	2,800	3,600	3,700	3,800	3,800
Salt — do.	17,100	e19,530	e14,770	e17,280	e18,320
Sodium compounds: Sodium carbonate, natural and synthetic[6] — do.	1,077	1,329	1,486	1,613	1,652
Sulfur:					
Native	200,000	200,000	200,000	200,000	200,000
Content of pyrite	1,252,000	1,605,000	1,682,000	1,700,000	1,800,000
Byproduct, all sources	300,000	350,000	400,000	400,000	400,000
Total	1,752,000	2,155,000	2,282,000	2,300,000	2,400,000
Talc and related materials	150,000	150,000	150,000	915,000	900,000
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Anthracite — thousand tons	r55,000	r63,000	r65,000	60,000	60,000
Bituminous and lignite — do.	r495,000	r555,000	r570,000	560,000	560,000
Total — do.	550,000	618,000	e635,000	e620,000	e620,000
Coke, all types — do.	23,100	e32,375	e33,540	e34,050	e31,720
Gas, natural:					
Gross — billion cubic feet	465	535	565	555	495
Marketed — do.	425	e485	e512	e504	e450

See footnotes at end of table.

Table 1.—China: Estimated[1] production of mineral commodities[2] —Continued

(Metric tons unless otherwise specified)

Commodity[3]	1977	1978	1979	1980	1981[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude (including crude from oil shale) thousand 42-gallon barrels	684,000	[6]760,000	[6]775,000	[6]773,435	[6]738,906
Refinery products ---------- do	650,000	600,000	[r]470,000	470,000	450,000

[p]Preliminary. [r]Revised.

[1]Except those figures specifically footnoted as reported.

[2]Table includes data available through July 7, 1982.

[3]In addition to the commodities listed for which quantitative estimates of output have been made, China is known or believed to have produced the following commodities for which no estimates, even of order of magnitude, have been prepared, owing to a paucity of general information upon which to base an estimate: Arsenic, chromite, titanium minerals, uranium, boron minerals, various clays (including kaolin), feldspar, lime, mica, sand, various industrial and dimension stones, and carbon black. Other unlisted commodities also may be produced.

[4]Diasporic bauxite; includes an estimated 165,000 metric tons per year of production for refractory applications.

[5]In terms of 50% Fe ore.

[6]Reported figures.

TRADE

China has signed government-to-government trade agreements and protocols with 90 countries, and trade ties exist with 175 countries. The total value of China's foreign trade was estimated at $20.7 billion in 1978, $29.3 billion in 1979, and $36.7 billion in 1980. Total trade in 1981 was expected to exceed $42.0 billion. In 1981, China's major trading partners were Japan, Xianggang (Hong Kong), the United States, the European Economic Community, the socialist economy countries collectively, and the Association of Southeast Asian Nations, in that order. The major export commodities to Japan consisted of crude oil, coal, textiles, light industrial manufactures, and handicrafts. Chinese imports from Japan were predominantly iron and steel products (particularly shapes and semimanufactures), machinery and equipment, and chemical products. China's trade with Xianggang, a free trade zone, is largely for reexport. By far the largest export category to the United States was light manufactured articles—cotton fabric, textiles, floor coverings, and clothing. Other significant export categories included mineral fuels, crude materials, and chemicals.

During 1981, China was a fledgling purveyor of diverse minerals, metals, and fuel derivatives (refined and intermediary products and raw materials to the United States. In terms of U.S. customs value, these exports totaled $458 million and were as follows in thousand dollars:

Aluminum	21,165
Antimony	5,887
Arsenic	756
Barium	28,844
Beryllium	1,424
Cadmium	270
Calcium	60
Chromium	723
Clays	495
Cobalt	181
Ferroalloys	6,053
Fluorine	1,754
Gallium	403
Gasoline	258,744
Germanium	2,693
Gold and silver	304
Graphite	3,167
Indium	30
Lead	424
Lithium	524
Magnesium	148
Manganese	21
Mercury	308
Mica	4
Molybdenum	16,895
Naphtha	36,671
Nickel	163
Paraffin	13
Platinum-group	1,455
Pumice	5
Silicon	435
Talc, soapstone, etc	851
Tantalum	1,393
Tin	22,263
Titanium	12,833
Tungsten	28,947
Vanadium	621
Zinc	1,186
Total	458,113

During the decade, China was expected to realign its trade patterns along the lines followed in its restructuring of domestic industry.[6] For instance, exports of food and sideline products were to decrease in light of domestic demand by a large population. Concomitantly, imports of chemical fertilizers, grains, and other like commodities were not expected to be reduced. By the second half of 1980, export of light industrial products and machinery was to increase, parallel with an increase in imports of advanced technology and capital equipment. China continued to develop its technology to produce refined metallurgical products for export. Initially, refractory bauxite and tungsten were notable examples of products upgraded to meet foreign end use specifications. Other shipments included significant quantities of pig iron, manganese, rare earths, silicon, and tungsten. Moreover, the Government announced plans to develop China's nonferrous base for both internal use and external purchases, particularly by Japan, and perhaps by the United States.

The Government approved the establishment of five special economic zones—four in Guangdong Province (Shantou, Shekou, Shenzhen, and Zhuhai) and one in Fujian Province (Xiamen).[7] In these free export zones, foreign investors may establish 100% owned subsidiaries, heretofore impossible in China. Shenzhen, the largest trade zone, had attracted $1 billion in overseas investments. Furthermore, Guangdong officials stated that they would welcome foreign cooperation in the development of mineral resources on Hainan Island, which would be treated unofficially as a free trade zone.[8]

Table 2.—China: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	[r]210,181	451,667	116,812	Italy 122,510; West Germany 75,337; Japan 38,834.
Oxides and hydroxides	[r]14,142	32,968	21	Thailand 9,903; Finland 8,700; Singapore 5,666.
Metal including alloys:				
Scrap	--	11	--	All to Hong Kong.
Unwrought	2,721	5,930	--	Hong Kong 2,604; Thailand 1,927; Japan 1,299.
Semimanufactures	[r]3,107	5,411	5	Hong Kong 4,270; Indonesia 654; Saudi Arabia 97.
Antimony:				
Ore and concentrate	3,395	3,920	--	Yugoslavia 2,682; France 988; Belgium-Luxembourg 200.
Elemental	5,412	2,460	415	Japan 1,432; France 244; West Germany 195.
Arsenic:				
Natural sulfides	13	1	--	All to Hong Kong.
Trioxide, pentoxide, acids	214	3	--	Do.
Beryllium ore and concentrate	--	782	782	
Cadmium metal including alloys, all forms	--	226	16	West Germany 160; Belgium-Luxembourg 50.
Chromium:				
Chromite	--	2,057	--	Japan 2,041; Indonesia 11.
Oxides and hydroxides	76	692	--	France 262; Hong Kong 151; Belgium-Luxembourg 107.
Metal including alloys, all forms	--	137	137	
Cobalt:				
Oxides and hydroxides:				
Quantity, reported	4	32	--	Japan 18; Hong Kong 9.
Value only, reported, thousands	NA	$16	--	All to Italy.
Metal including alloys, all forms	3	5	--	All to West Germany.
Copper:				
Ore and concentrate	1	48	--	All to Pakistan.

See footnotes at end of table.

Table 2.—China: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Copper —Continued				
Sulfate	231	409	--	Japan 278; Finland 60; Hong Kong 36.
Metal including alloys:				
Scrap	820	2,888	--	Hong Kong 2,853; France 17.
Unwrought	35	58	--	Thailand 50; West Germany 5.
Semimanufactures	2,815	3,997	(2)	Hong Kong 2,863; Singapore 464; Indonesia 257.
Germanium metal including alloys, all forms	--	61	61	
Iron and steel:				
Ore and concentrate	196	254	30	Pakistan 223.
Metal:				
Scrap	440	10,161	--	Japan 7,075; Hong Kong 1,749; Singapore 1,005.
Pig iron, cast iron, powder, shot	31,153	260,575	--	Japan 224,173; Pakistan 17,851; Hong Kong 11,318.
Ferroalloys	r772	2,760	--	Pakistan 878; Japan 595; Thailand 405.
Steel, primary forms	r47,903	29,373	3	Thailand 14,838; Indonesia 6,941; Hong Kong 4,421.
Semimanufactures:				
Bars, rods, angles, shapes, sections	r178,238	202,632	3	Hong Kong 150,211; Singapore 13,360; Saudi Arabia 13,014.
Universals, plates, shapes	13,708	37,253	--	Hong Kong 16,502; Singapore 13,162; Indonesia 3,155.
Hoop and strip	r716	617	--	Thailand 188; Hong Kong 134; Singapore 125.
Rails and accessories:				
Quantity, reported	r5	865	--	Hong Kong 737; Indonesia 60; Singapore 56.
Value only, reported thousands	NA	$132	--	All to Japan.
Wire:				
Quantity, reported	r34,184	33,748	--	Hong Kong 13,432; Singapore 7,079; Saudi Arabia 4,823.
Value only, reported	NA	$44	--	All to Malta.
Tubes, pipes, fittings:				
Quantity, reported	r23,093	83,069	--	Japan 45,901; Hong Kong 18,218; Saudi Arabia 12,970.
Value only, reported thousands	NA	$255	--	Australia $227; Malta $28.
Castings and forgings, rough	r2,482	3,121	18	Saudi Arabia 1,930; Hong Kong 571; West Germany 323.
Lead:				
Ore and concentrate	1,100	NA	--	
Oxides and hydroxides	751	478	--	Japan 173; Hong Kong 155; Indonesia 75.
Metal including alloys:				
Unwrought	r398	731	--	Japan 662; Hong Kong 69.
Semimanufactures	r8	20	--	Hong Kong 18.
Manganese:				
Ore and concentrate	45,961	24,544	--	Japan 21,290; Finland 950; Italy 700.
Oxides and hydroxides	r1,526	3,529	87	Hong Kong 1,630; Singapore 1,047; Denmark 300.
Metal including alloys, all forms	39	437	--	Belgium-Luxembourg 150; West Germany 142; Canada 102.
Mercury 76-pound flasks	8,584	10,327	203	West Germany 3,248; Hong Kong 2,581; France 1,247.
Molybdenum:				
Ore and concentrate	494	330	--	France 215; Belgium-Luxembourg 79; Finland 15.
Metal including alloys, all forms:				
Quantity, reported	--	65	60	Sweden 3; Japan 1.
Value only, reported thousands	NA	$15	--	All to Hong Kong.
Nickel:				
Ore and concentrate	--	(2)	--	All to Indonesia.
Matte and speiss	--	2	--	Do.
Metal including alloys:				
Unwrought	19	NA	--	
Semimanufactures	4	9	--	Saudi Arabia 4; Pakistan 2; Hong Kong 1.

See footnotes at end of table.

Table 2.—China: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Niobium (columbium) ore and concentrate	29	14	--	All to Japan.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	--	$958	$165	France $793.
Silver:				
Ore and concentrate[3] do	$3	NA		
Waste and sweepings[3] do	$62	$211	$55	France $156.
Metal including alloys, unwrought and partly wrought do	--	$10,936	$78	United Kingdom $10,680; France $148.
Tin:				
Oxides and hydroxides	--	29	--	All to Egypt.
Metal including alloys:				
Scrap	--	3,000	--	All to Australia.
Unwrought	3,170	3,267	858	Yugoslavia 783; Hong Kong 552; Netherlands 471.
Semimanufactures	124	97	--	Hong Kong 82; Singapore 9.
Titanium:				
Oxides	r1,600	1,659	--	Japan 483; France 477; Hong Kong 354.
Metal including alloys, all forms	222	1,412	1,245	West Germany 130; France 37.
Tungsten:				
Ore and concentrate	6,674	6,207	1,602	West Germany 1,136; Sweden 1,010; Austria 707.
Metal including alloys, all forms:				
Quantity, reported	9	23	1	Sri Lanka 15; West Germany 3; Italy 2.
Value only, reported thousands	NA	$26	--	All to Hong Kong.
Zinc:				
Ore and concentrate	--	3	--	All to Singapore.
Oxides and hydroxides	935	908	3	Japan 339; Singapore 97; Denmark 90.
Metal including alloys:				
Scrap	--	30	--	All to Thailand.
Dust, blue powder	12	9	--	Japan 5; Hong Kong 4.
Unwrought	r8,594	9,264	1,220	Thailand 2,727; Japan 2,454; Singapore 1,262.
Semimanufactures	r417	221	--	Saudi Arabia 115; Singapore 100.
Other:				
Ores and concentrates	r42,028	5,290	195	Thailand 4,894; Hungary 100; New Zealand 59.
Ash and residue containing nonferrous metals	447	1,336	251	West Germany 698; Italy 328.
Oxides, hydroxides, peroxides	r6,646	13,211	2,205	Pakistan 8,367; Japan 669; West Germany 463.
Metalloids	84	1,832	--	Japan 1,772; Hong Kong 30.
Alkali, alkaline earth, rare-earth metals	10	31	--	Saudi Arabia 17; Italy 14.
Base metals including alloys, all forms:				
Quantity, reported	r1,626	1,597	92	Japan 507; Hong Kong 288; West Germany 148.
Value only, reported thousands	NA	$252	--	New Zealand $127; Australia $125.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	r331	988	--	Japan 565; Hong Kong 421.
Artificial: Corundum	--	3,157	--	Japan 3,134; Hong Kong 20.
Dust and powder of precious and semiprecious stones value, thousands	$4	$6	--	Thailand $5; Belgium-Luxembourg $1.
Grinding and polishing wheels and stones:				
Quantity, reported	r1,408	2,993	--	Hong Kong 1,333; Indonesia 915; Singapore 514.
Value only, reported thousands	NA	$24	$9	Uruguay $8; New Zealand $4.
Asbestos, crude	r10,430	7,397	(2)	Hong Kong 2,779; Indonesia 2,680; Thailand 1,350.
Barite and witherite	360,990	617,277	496,463	West Germany 53,628; Japan 35,585; Netherlands 23,386.
Boron materials:				
Crude, natural borates	4	3	--	All to Indonesia.
Oxide and acid	r232	1,320	132	Japan 877; Hong Kong 118; Netherlands 50.
Cement:				
Quantity, reported	r887,185	845,676	--	Hong Kong 843,211; Sri Lanka 2,216.
Value only, reported thousands	NA	$8	--	All to Australia.
Chalk	23	NA		

See footnotes at end of table.

Table 2.—China: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products:				
Crude	[r]168,424	203,549	--	Japan 119,188; Hong Kong 72,336.
Products:				
Nonrefractory:				
Quantity, reported	[r]85,096	37,511	4	Hong Kong 31,355; Singapore 3,749; Japan 1,033.
Value only, reported thousands	NA	$7,885	$1	Hong Kong $7,486; Singapore $216; Australia $180.
Refractory including nonclay brick:				
Quantity, reported	[r]5,642	8,597	--	Indonesia 3,792; Sweden 2,044; Italy 639.
Value only, reported thousands	NA	$1,852	--	Hong Kong $959; Singapore $880.
Cryolite and chiolite, natural	540	5,194	5,194	
Diamond:				
Gem, not set or strung value, thousands	$2,873	$5,829	$83	Hong Kong $1,633; Belgium-Luxembourg $1,261; United Kingdom $913.
Industrial do	$2,022	$65,175	$21	Belgium-Luxembourg $64,754; United Kingdom $320.
Diatomite and other infusorial earth	21	145	--	Singapore 130; Jordan 15.
Feldspar, fluorspar, leucite, nepheline	251,470	359,078	25,059	Japan 225,707; West Germany 51,579; Australia 17,941.
Fertilizer materials:				
Crude:				
Nitrogenous	60	NA		
Phosphatic	845	1,234	7	West Germany 973; Singapore 160; Denmark 50.
Manufactured:				
Nitrogenous	[r]31,345	479	--	Hong Kong 467.
Phosphatic	260	100	--	All to Japan.
Potassic	[r]235	225	1	Japan 218.
Other including mixed	2	NA		
Ammonia	[r]43	253	--	All to Hong Kong.
Graphite, natural:				
Quantity, reported	[r]26,090	37,824	2,222	Japan 21,215; West Germany 4,925; United Kingdom 2,340.
Value only, reported thousands	NA	$80	--	All to Canada.
Gypsum and plasters	[r]54,885	4,210	2	Hong Kong 2,420; Indonesia 1,038; Singapore 600.
Iodine	17	NA		
Lime	[r]44,973	27,510	--	Hong Kong 24,834; Singapore 2,569.
Magnesite	[r]96,440	211,176	--	Japan 68,678; West Germany 43,822; Yugoslavia 27,815.
Mica:				
Crude including splittings and waste	7,957	10,867	50	United Kingdom 6,575; Japan 2,380; West Germany 722.
Worked including agglomerated splittings:				
Quantity, reported	19	30	--	France 12; Spain 9; United Kingdom 6.
Value only, reported thousands	NA	$6	--	All to Hong Kong.
Pigments, mineral:				
Crude, earth colors	1,675	1,340	--	Hong Kong 466; Indonesia 455; Japan 200.
Iron oxides and hydroxides, processed	2,730	2,457	--	Indonesia 593; Singapore 578; Egypt 458.
Precious and semiprecious stones:				
Natural value, thousands	[r]$4,809	$3,473	$370	Hong Kong $1,526; Japan $1,069; West Germany $370.
Synthetic do	$103	$54	$3	Saudi Arabia $23; Netherlands $11; Canada $8.
Salt and brine	[r]186,202	868,053	--	Japan 711,782; U.S.S.R. 102,344; Hong Kong 52,500.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	[r]65	260	--	Hong Kong 182; United Kingdom 20; Indonesia 19.
Caustic soda	[r]8,829	7,272	--	Hong Kong 7,268.
Soda ash	[r]3,291	6,354	--	Hong Kong 3,221; Indonesia 2,762; Egypt 307.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	[r]47,483	67,437	--	Japan 62,593; Hong Kong 1,928; Australia 1,893.

See footnotes at end of table.

Table 2.—China: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Dimension stone —Continued				
Worked:				
Quantity, reported	r21,942	17,995	--	Japan 6,211; Hong Kong 4,524; Singapore 4,128.
Value only, reported thousands	NA	$1,256	$1,185	Australia $58; Canada $13.
Dolomite, chiefly refractory-grade	r550	NA		
Gravel and crushed rock	r95,491	12,921	--	Hong Kong 9,716; Japan 1,606; Singapore 772.
Limestone excluding dimension	25,644	130,485	--	All to Hong Kong.
Quartz and quartzite	r24,150	37,454	--	Japan 34,524; Hong Kong 2,350.
Sand excluding metal-bearing thousand tons	r1,351	1,208	--	Hong Kong 1,188; Japan 20.
Sulfur:				
Elemental:				
Other than colloidal	r1,109	90	--	Saudi Arabia 52; Pakistan 38.
Colloidal	10	NA		
Sulfuric acid, oleum	89	933	--	Hong Kong 932.
Talc, steatite, soapstone, pyrophyllite	356,677	381,875	148	Japan 341,882; United Kingdom 8,865; Indonesia 7,000.
Other:				
Crude	20,750	16,563	--	Hong Kong 7,611; Japan 1,829; Hungary 1,344.
Slag, dross, similar waste, not metal-bearing	r7,721	12,440	--	Japan 12,000; Hong Kong 407.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	260	2,113	18	Finland 1,835; Japan 146; Canada 89.
Halogens:				
Quantity, reported	r13	17	--	All to Ireland.
Value only, reported thousands	NA	$2	--	All to Singapore.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	5,369	--	Indonesia 5,301; Pakistan 48.
Carbon black	r272	2,973	--	Thailand 1,880; Indonesia 691; Hong Kong 205.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	1,814	2,795	--	Japan 2,071; Sri Lanka 235; West Germany 209.
Briquets of anthracite and bituminous coal	509	NA		
Lignite including briquets	649	1,351	--	All to Japan.
Coke and semicoke	12	31,543	--	Pakistan 30,022; Indonesia 1,313.
Hydrogen, helium, rare gases value, thousands	NA	$23	--	All to Hong Kong.
Petroleum:				
Crude thousand 42-gallon barrels	r79,463	72,374	764	Japan 57,530; Brazil 8,730; Thailand 4,085.
Refinery products:				
Gasoline do	r1,803	10,880	2,559	Japan 4,086; Netherlands 1,439; Colombia 1,001.
Kerosine and jet fuel do	2,914	2,830	24	Hong Kong 2,106; Japan 458; Singapore 240.
Distillate fuel oil do	11,069	10,495	11	Hong Kong 5,603; Thailand 2,118; Japan 1,945.
Residual fuel oil do	2,909	2,375	--	Hong Kong 1,928; Australia 203; Japan 129.
Lubricants:				
Quantity, reported do	r3,728	186	27	Hong Kong 98; Thailand 33; Singapore 10.
Value only, reported thousands	NA	$137	--	Australia $129; Japan $8.
Other:				
Liquefied petroleum gas thousand 42-gallon barrels	--	26	--	All to Japan.
Mineral jelly and wax do	r230	468	--	Pakistan 150; Hong Kong 93; Singapore 91.
Nonlubricating oils do	137	48	--	Indonesia 45.
Petroleum coke do	1,362	1,265	--	All to Japan.
Bitumen and other residues do	8	1	--	Mainly to Indonesia.
Bituminous mixtures do	r19	22	--	Hong Kong 22.

See footnotes at end of table.

Table 2.—China: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	[r]40,803	92,817	(4)	Japan 91,365; Hong Kong 1,285; Greece 100.

[p]Preliminary. [r]Revised. NA Not available.

[1]Owing to a lack of official trade data published by China, this table should not be taken as a complete presentation of this country's mineral exports. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2]Less than 1/2 unit.

[3]May include other precious metals.

[4]United States imported 856,061 barrels of naphtha.

Table 3.—China: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	196	95	3	France 52; West Germany 40.
Metal including alloys:				
Scrap	1,490	480	(2)	All from Hong Kong.
Unwrought	83,178	66,937	8,558	Canada 29,995; New Zealand 14,992; Norway 6,286.
Semimanufactures	4,447	12,675	95	Japan 11,903; West Germany 278; United Kingdom 98.
Chromium:				
Chromite	[r]34,405	NA		
Oxides and hydroxides	153	2,756	1,475	Japan 1,281.
Cobalt:				
Oxides and hydroxides, kilograms	50	1,000	--	All from Japan.
Metal including alloys, all forms, do	--	454	--	All from Canada.
Copper:				
Ore and concentrate, copper content	[3]22,254	54,782	3,012	Peru 35,457;[3] Canada 7,602; Papua New Guinea 5,884.[3]
Sulfate	2,205	7,539	--	Yugoslavia 6,039; Belgium-Luxembourg 1,500.
Metal including alloys:				
Scrap	81	188	--	All from Hong Kong.
Unwrought	93,678	92,213	--	Peru 35,457;[4] Chile 29,900;[3] Zambia 15,387.[3]
Semimanufactures	2,040	1,623	23	Japan 1,345; Hong Kong 230.
Iron and steel:				
Ore and concentrate, thousand tons	6,042	5,949	--	Australia 5,324; Brazil 625.
Metal:				
Scrap	4,950	1,932	--	Hong Kong 1,929.
Pig iron, cast iron, powder, shot	620,439	230,712	35	Australia 230,432.
Ferroalloys	69,496	1,022	--	Norway 1,000; West Germany 17.
Steel, primary forms	359,043	132,534	--	Japan 96,983; Australia 30,005.
Semimanufactures:				
Bars, rods, angles, shapes, sections:				
Quantity, reported, thousand tons	2,826	2,041	100	Japan 1,191; Canada 139; Australia 125.
Value only, reported, thousands	NA	$10,319	--	All from Japan.
Universals, plates, sheets:				
Quantity, reported, thousand tons	2,336	1,532	10	Japan 1,287; West Germany 125; France 42.
Value only, reported, thousands	NA	$28,364	--	Australia $28,339; Japan $25.
Hoop and strip:				
Quantity, reported	216,077	185,972	503	Japan 149,450; West Germany 16,613; Australia 10,989.
Value only, reported, thousands	NA	$6,074	--	All from Japan.
Rails and accessories	32,715	2,355	24	Japan 2,331.

See footnotes at end of table.

Table 3.—China: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures —Continued				
Wire:				
Quantity, reported	95,495	7,793	--	Japan 2,579; West Germany 2,036; Italy 363.
Value, reported thousands	NA	$8,699	--	Japan $8,695; Australia $4.
Tubes, pipes, fittings thousand tons	1,627	710	4	Japan 439; West Germany 60; Italy 59.
Castings and forgings, rough	2,453	97	--	United Kingdom 57; Spain 37.
Lead:				
Ore and concentrate, lead content	--	8	8	
Oxides and hydroxides	1,763	3,126	--	Australia 3,108.
Metal including alloys:				
Scrap	72	134	--	All from Hong Kong.
Unwrought	[4]34,987	26,648	--	Australia 14,011;[3] Mexico 5,485;[4] Canada 4,149.
Semimanufactures	3	4	--	Hong Kong 2; Japan 2.
Magnesium metal including alloys:				
Unwrought	4,643	4,648	4,647	Japan 1.
Semimanufactures	252	1	--	All from United Kingdom.
Manganese: Oxides and hydroxides	702	108	34	Japan 74.
Molybdenum metal including alloys, all forms kilograms	229	130	--	Switzerland 80; Japan 50.
Nickel metal including alloys:				
Scrap	--	2	--	Hong Kong 1; Japan 1.
Unwrought	1	NA		
Semimanufactures	64	105	--	France 100; Japan 3.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$9,731	$1,259	--	United Kingdom $1,018; West Germany $125; Japan $116.
Silver:				
Ore and concentrate do	$1,533	$197	--	All from Canada.
Metal including alloys, unwrought and partly wrought do	$21	$13	--	All from Hong Kong.
Tantalum metal including alloys, all forms kilograms	140	103	103	
Tin:				
Ore and concentrate	--	35	--	All from Singapore.
Metal including alloys:				
Scrap	--	356	--	All from Hong Kong.
Unwrought	6	1	--	All from Japan.
Semimanufactures	2	17	9	Japan 4; Hong Kong 3.
Titanium:				
Oxides	1,400	2,954	218	Japan 2,252; Italy 180; West Germany 178.
Metal including alloys, all forms	3	2	--	All from Japan.
Tungsten metal including alloys, all forms:				
Quantity, reported kilograms	[r]1,106	193	--	Do.
Value only, reported thousands	NA	$2	--	All from Hong Kong.
Zinc:				
Oxides and hydroxides	989	4	--	All from Japan.
Metal including alloys:				
Scrap	--	2	--	All from Hong Kong.
Unwrought	[4]2,098	[3]400	--	NA.
Semimanufactures	18	13	--	All from Japan.
Other:				
Ores and concentrates value, thousands	--	$331	--	All from Australia.
Ash and residues containing nonferrous metals	--	520	--	Hong Kong 493; Canada 27.
Oxides, hydroxides, peroxides	53	24	--	Japan 11; France 10.
Metalloids	5,769	254	--	France 253.
Alkali, alkaline-earth, rare-earth metals	4	4	--	All from United Kingdom.
Base metals including alloys, all forms	5	12	2	Sweden 4; Canada 3.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	1	1	--	All from Japan.

See footnotes at end of table.

Table 3.—China: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Abrasives —Continued				
Artificial: Corundum	4	2	--	All from Japan.
Dust and powder of precious and semiprecious stones value, thousands	--	$2	--	Belgium-Luxembourg $1; West Germany $1.
Grinding and polishing wheels and stones	25	113	(2)	Japan 85; West Germany 19.
Asbestos, crude	1,269	719	--	Canada 698; Japan 21.
Barite and witherite	50	NA		
Boron materials: Oxide and acid	268	452	262	Italy 190.
Cement	456,940	29,551	--	Japan 18,800; Hong Kong 5,135; Colombia 5,102.
Clays and clay products:				
Crude	350	964	2	Singapore 576; Japan 375.
Products:				
Nonrefractory:				
Quantity, reported	684	292	--	Italy 250; Hong Kong 22; Japan 18.
Value only, reported thousand	NA	$59	--	Australia $40; Japan $19.
Refractory including nonclay brick	2,163	47,576	17	Japan 45,999; West Germany 1,141.
Diamond:				
Gem, not set or strung value, thousands	$5,960	$7,312	--	United Kingdom $5,837; Belgium-Luxembourg $1,463.
Industrial do	$11,275	$13,834	$1	Belgium-Luxembourg $10,886; United Kingdom $2,947.
Diatomite and other infusorial earth	--	104	96	Japan 4; United Kingdom 4.
Feldspar, fluorspar, leucite, nepheline	--	2,121	--	All from Kenya.
Fertilizer materials:				
Crude:				
Nitrogenous	--	10,000	--	All from Saudi Arabia.
Phosphatic	448,835	351,532	--	Jordan 175,120; Morocco 164,412.
Manufactured:				
Nitrogenous thousand tons	2,323	2,142	210	Japan 1,186; Italy 238; Netherlands 197.
Phosphatic	r179,084	182,991	152,682	Singapore 20,300; Saudi Arabia 10,000.
Potassic	421,000	402,024	34	Canada 358,047; West Germany 43,943.
Other including mixed	82,718	257,327	15,186	Austria 59,065; Italy 52,686; Denmark 47,001; Spain 26,000.
Ammonia	21	10,132	--	Netherlands 10,125.
Gypsum and plasters	--	16	16	
Magnesite	70	127	--	All from Japan.
Mica:				
Crude including splittings and waste	3	27	--	Japan 20; Singapore 7.
Worked including agglomerated splittings kilograms	1,055	502	--	Hong Kong 500.
Pigments, mineral: Iron oxides and hydroxides, processed	16	1	--	United Kingdom 1.
Precious and semiprecious stones:				
Natural value, thousands	$2,285	$3,830	$2	Sri Lanka $2,399; West Germany $800; Japan $428.
Synthetic do	$13	$9	--	Japan $6; Switzerland $3.
Salt and brine	2	90	--	Singapore 80; Japan 10.
Sodium and potassium compounds:				
Caustic potash	--	1,588	1,500	Japan 85.
Caustic soda	r138,856	122,637	31,445	Netherlands 70,764; Italy 10,110; West Germany 8,316.
Soda ash	--	76,422	--	Belgium-Luxembourg 41,632; France 30,450.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	102	35	--	All from Norway.
Worked	97	25	--	Italy 16; Japan 5.
Gravel and crushed rock	26	99	--	West Germany 98.
Quartz and quartzite	20	205	--	All from Japan.
Sand excluding metal-bearing	--	6	--	Do.
Sulfur:				
Elemental, other than colloidal	250,538	347,195	--	Canada 343,195.
Sulfuric acid, oleum	1	111	108	Hong Kong 1; Japan 1.
Talc, steatite, soapstone, pyrophyllite	53	NA		

See footnotes at end of table.

Table 3.—China: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other:				
Crude	41	13,454	--	Kenya 13,445.
Slag, dross and similar waste, not metal-bearing	50	NA		
Oxides, hydroxides, peroxides of barium, magnesium, strontium	54	20	--	All from Japan.
Halogens	80	NA		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	4,866	NA		
Carbon black	19,317	5,239	3,160	Japan 1,534; West Germany 545.
Coal: Lignite including briquets	--	50	--	All from Singapore.
Hydrogen, helium, rare gases:				
Quantity, reported	4	1	--	All from Japan.
Value only, reported thousands	NA	$32	--	All from Singapore.
Peat including briquets and litter	--	1	--	All from Japan.
Petroleum refinery products:				
Gasoline 42-gallon barrels	11,807	5,925	--	All from West Germany.
Kerosine and jet fuel do	10,749	9,866	--	Yugoslavia 9,610; West Germany 233.
Distillate fuel oil do	[r]8,982	10,899	--	Yugoslavia 10,892.
Residual fuel oil do	15,072	319,520	--	Pakistan 199,800; Greece 119,460.
Lubricants:				
Quantity, reported do	18,060	37,337	14,146	West Germany 6,265; Japan 5,068; France 4,312.
Value only, reported thousands	NA	$1,698	--	All from Japan.
Other:				
Liquefied petroleum gas 42-gallon barrels	174	12	--	All from France.
Mineral jelly and wax do	268	283	--	Netherlands 165; Singapore 63.
Nonlubricating oils do	2,198	NA		
Petroleum coke do	539	1,634	--	All from Japan.
Bitumen and other residues do	--	1,073	--	Do.
Bituminous mixtures do	2,636	145	--	United Kingdom 109; Sweden 36.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	21,687	150	--	All from France.

[p]Preliminary. [r]Revised. NA Not available.

[1]Owing to a lack of official trade data published by China, this table should not be taken as a complete presentation of the country's mineral imports. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2]Less than 1/2 unit.

[3]World Metal Statistics, World Bureau of Metal Statistics, London, United Kingdom.

[4]Metallgesellschaft Aktiengeselschaft (Metal Statistics), Frankfurt am Main, West Germany.

COMMODITY REVIEW

METALS

Aluminum.—China has extensive resources of aluminous materials, and estimates range around 1 billion tons. Diasporic bauxite is the main aluminum ore mineral in China. Other high-alumina minerals such as cyanite, sillimanite, and andalusite occur throughout the country. Bauxite occurs in Guangxi, Guizhou, Hebei, Henan, Shanxi, and Sichuan. While reserves in Shanxi account for about one-fourth of the total reserves in China, Henan is reportedly the largest producer. A cyanite deposit with an estimated reserve of 1 million tons was discovered in Xingtai County in southwestern Hebei. An alumnite deposit with a verified reserve of 7 million tons was found in eastern Fujian.

Aside from isolated shipments in the early 1970's, China began exporting refractory-grade bauxite to the United

States in 1979. Shipments of metallurgical-grade bauxite were also being considered. Under a preliminary agreement, Minermet S.A. of Italy was to construct a calcining plant in Henan to produce 200,000 tons per year of bauxite using two rotary kilns. Under the agreement, Minermet was to export 50% of the output.

The new aluminum smelter at Guiyang, Guizhou, was commissioned in December 1981 with one operational potline (40,000 tons per year). The second potline of 40,000 tons was expected to be operational in 1982. The bauxite reserve in Guizhou was estimated at over 200 million tons.

China's primary aluminum plants were as follows, with capacity expressed in thousand tons per year:

Hefei, Anhui	25
Lanzhou, Gansu	30
Guiyang, Guizhou	40
Wuhan, Hubei	35
Changsa, Hunan	15
Changchun, Jilin	15
Fushun, Liaoning	100
Baotou, Nei Monggol	NA
Nanding, Shandong	NA
Qingdao, Shandong	15
Taiyuan, Shanxi	25
Kunming, Yunnan	15

NA Not available.

A large refinery proposed for Guangxi was deferred under China's economic retrenchment program.

Antimony.—China has large reserves of antimony and traditionally has been ranked as one of the top three world producers. The Xikuangshan Mine is a large, world-famous antimony mine. Xikuangshan means tin mine; hence, the name arose from misidentification. The mining district covers 14 square kilometers and is divided into two sections with independent mining, processing, and smelting sections. Sulfide ores occur in the southern part, while the northern division has complex ore comprised of mixed oxides and sulfides. Antimony was also mined in Guangdong. In addition to antimony finds in Qinghai, Shaanxi, Sichuan, Xizang, and Yunnan, a rich antimony occurrence was reported in Xihe, Gansu.

Chromium.—Chromite occurrences are widespread in northwest China. The deposits in the east are small, but larger occurrences have been discovered in Xizang. Platinum with associated chromite occurs in Dali, Yunnan. China's largest chromite find is in the Zhayier Mountains, northwest of Junggar Pendi, Xinjiang. Reserves are estimated at 1 million tons of 35% Cr_2O_3 ore. Chromium occurs associated in complex mineralization of iron ore in Panzhihua, Sichuan, and Baiunebo, Nei Monggol. A hard chromium mineral was discovered in the Liuzhuang area of Tongbai, Henan.

Cobalt.—Cobalt was recovered as a byproduct of nickel-copper and platinum refining at Jinchuan, Gansu. The Jinchuan nickel-copper sulfide deposit (0.035% cobalt) contains 100,000 tons of cobalt. The Zhuhou refinery in Hunan also recovers cobalt. Other cobalt association has been reported in ores at Panzhihua, Sichuan; Baiyunnebo, Nei Monggol; Hainan, Guangdong; Donghongshan, Yunnan; and Panshi Xian, Jilian.

Columbium and Tantalum.—China has abundant resources of columbium and tantalum. The quantity of tantalum pentoxide in slag from past tin operations may amount to several million pounds. In March 1981, a 3-year program was to begin to survey columbium, tantalum, and tin deposits in the Wangxiang area of Hunan. The Fujian Provincial Geological Bureau announced the finding of a promising columbium-tantalum deposit in Fujian. Tantalum was recovered as a coproduct from an apogranite-type tin deposit at Yichun, Jiangxi, which was estimated to be about 100 million tons containing 200 grams of tantalum pentoxide per ton of ore. Ore throughput capacity was 200,000 to 250,000 tons per year. Beneficiation produced a 28% tantalum pentoxide concentrate, and the recovery rate was around 60%. At Limu, Guangxi, tantalum was recovered as a byproduct from tin slag. Annual ore production was about 300,000 tons containing 150 grams of tantalum pentoxide per ton. Small amounts of tantalum concentrates were reportedly recovered from pegmatites in the Altai Mountains (north of Urunqi), Xinjiang, and in Guangdong Province.

Copper.—China's most significant copper deposits occur mainly in the valleys of the middle and lower reaches of the Changjiang River and in the southwestern region. There are also important deposits in the northwest and north. Total reserves were estimated to exceed 50.4 million tons of contained metal. The six major mining areas centered around Tongling, Anhui; Baiyanchang, Gansu; Daye, Hubei; Dexing, Jiangxi; Zhongtiaoshan, Shanxi; and Dongchuan, Yunnan. Recent finds of copper

mineralization include Zhangdu, Xizang (reserves of 6.4 million tons); Anjing, Anhui (20 million tons); Tongshankow, Hubei (50 million tons); Qamdo, Xizang (6.48 million tons); and Fengchang, Liaoning (260 million tons).

Current metal output level was only about 300,000 tons, and up to 200,000 tons was imported annually to meet demand. China's copper smelter-refining facilities are as follows in thousand tons:

Tongling, Anhui	
No. 1	30
No. 2	30
Baiyin, Gansu	30
Zhuzhou, Henan	10
Daye, Hubei	30
Zhenyang, Liaoning	50
Shanghai	50
Kunming, Yunnan	45

Small copper facilities are located in Beijing, Hainan, Lanzhon, Taiyuan, and Urunqi. Sumitomo Metal Mining Co. was to resume the construction of a 90,000-ton-per-year copper smelter at Guixi, Jiangxi. The project, along with a Fluor Corp. contract to develop an extensive porphyry deposit in Jiangxi, was suspended during the readjustment period. The $117 million Sumitomo project may later include a refinery and fabricating facilities. Status of the Fluor Corp. project at Dexing, Jiangxi, and the Japanese Government-assisted project at Anqing, Anhui, were not known.

Gold and Silver.—China has a long history of gold mining, and panning was carried out along its coasts in ancient times. Most of the gold mines are concentrated in the northeast, eastern China, and the Qinbeng and Yanshan regions. China's major gold-producing areas are Hebei, Heilongjiang, Liaoning, Nei Monggol, and Shandong. Shandong is probably the principal producer with five major underground mines and up to 30 small mines. Output level in Shandong was estimated at 320,000 to 480,000 troy ounces per year. There were numerous announcements of gold and silver finds—lode, placer, mixed ores—throughout China. Xinjiang was reported to be particularly abundant in alluvial gold. Lode silver was found in the Miyun area, northeast of Beijing. Gold output in 1981 was based on an estimate given by The Gold Institute, Washington, D.C.

Gold production has been variously estimated from 688,000 troy ounces per year to 1,900,000 troy ounces per year. In the spring of 1980, a conference was held on gold production in Urumgi, Xinjiang. Also, to promote increased production, China engaged Wright Engineering of Canada and Davy McKee of Great Britain to conduct feasibility studies on mines in Shandong. Furthermore, the People's Bank of China had lent 46 million yuan for the development of 36 gold mines to increase total production by 140,000 liang. Surveys for gold were underway in over 10 Provinces, including Hebei, Heilongjiang, Liaoning, and Nei Monggol, which have gold-producing areas. In early 1981, a large gold occurrence was reportedly discovered in Yunnan. The Ministry of Metallurgical Industry announced that the planned gold output was overfulfilled by 14.3% in 1979 and by 15.3% in 1980. China's gold transactions on the international market during the last two decades included purchase of 4,822,605 troy ounces in 1965, 1,028,822 troy ounces in 1966, and 2,572,056 troy ounces in 1968, and sale of 2,572,056 troy ounces in 1976. China used 120,000 troy ounces in 1979 for production of its 30th anniversary commemorative gold coin sets, but bought the same amount of gold in Xianggang to replace the metal used.

Iron Ore.—China's reserves of iron ore were estimated at 44 billion tons. The principal mines were Anshan and Benxi in Liaoning, Panzhihua in Sichuan, Maanshan in Anhui, Meishan in Nanjing, Daye in Hubei, Shichang in Hebei, Bayan Obo in Nei Monggul, Jingtieshan in Gansu, and Shilu in Hainan. The Anshan-type ore deposits (sedimentary metamorphic) are the main type in China and are distributed over an area from Anshan, Liaoning, to Jidong, Hebei. The Anshan ore is easily extracted but is not of high grade. There are large beds of titaniferous magnetite containing vanadium spread out in Panzhihua, Sichuan. The Daye-type deposits, formed by the interaction of gas and heat along contact edges, are found around Daye, Hubei, and east of this area. Iron and siderite mineral beds associated with volcanic action were expected to increase China's iron reserve-resource base.

Total mine output of iron ore approaches 120 million tons of mostly low-grade ore (around 30% grade), which is upgraded to 60% or better. Imports from Australia, Brazil, and North Korea (probably totaling less than 10 million tons) supplement domestic mine production.

Many iron ore mines began adopting a technique of ore segregation based on sieving followed by grinding. This technique was initially used with success by the Dagushan iron ore mine of Anshan Iron and Steel Co. Reportedly, ores with at least 30% iron were upgraded with this technique to 67% to 68%.

Iron and Steel.—China's annual capacity to produce steel was around 37 million tons. With the exception of Shanghai, all of the major iron and steel complexes are located near indigenous supplies of coal and iron ore. Shanghai is the only site with a coastal location. Eleven iron and steel complexes account for 86% of China's annual steel production: Anshan, Baotou, Beijing, Benqi, Maanshan, Panzhihua, Shanghai, Taiyuan, Tanggu, Tianjin, and Wuhan. Smaller iron and steelworks exist in every Province and Autonomous Region except Xizang. Collectively these units have an annual production capacity of 11 million tons of iron and 8 million tons of steel and steel products.

China's iron and steelworks were characterized by the Japanese as follows, in terms of annual crude steel output:

OVER 3 MILLION TONS	
Anshan	Wuhan
Baotou	
50,000 TO 3 MILLION TONS	
Anyang	Panzhihua
Beijing	Shanghai
Benqi	Shijingshan
Chengdu	Shoudu
Datai	Taiyuan
Fushan	Tanggu
Guangzhou	Tangshan
Guiyang	Tianjin
Hami	Urunqi
Handan	Xiangpiao
Jinan	Xinyu
Jiuchuan	Yonde
Linfun	Yongchen
Longyin	Yongxin
Maanshan	
UNDER 50,000 TONS	
Baoji	Nanning
Changzhi	Pinxiang
Dalian	Qingdao
Duyan	Sanmian
Fuzhou	Sanjiang
Hainan	Shaoguan
Heifei	Shaoxing
Hengyang	Shenyang
Hybei	Suzhow
Huzhou	Wuning
Jiaozuo	Xiamen
Kunming	Xian
Lianyuan	Xinxiang
Liubo	Xinyang
Liuzhou	Yanchuan
Macheng	Yangquan
Nanchang	Yantai
Nanjing	Zhejiang
	Banshan

The east coast of China contains by far the highest concentration of steelmaking plants.

During 1979, China reevaluated its modernization programs. The Baoshan iron and steel project was originally to be completed in two stages (3 million tons capacity in 1982 and the remaining 3 million tons by 1985). In November 1980, the Government announced the suspension of the second phase construction. Construction was to continue on the coal-fired powerplant at the site, and work was to continue on the Baoshan first stage at a slower pace. During 1981, Government announcements simply stated that construction of Baoshan continued.

The main thrusts in the iron and steel sector were to be modernization of existing installations by lowering energy and coke

consumption per ton of steel produced, lowering pig iron consumption by increasing scrap utilization, and improving steel-rolling output capacity and technology. Futhermore, steel product specifications were to meet the needs for producing machinery used in the agricultural and light industry sectors.

The installation of a 1,326-cubic-meter inner-volume blast furnace at Shoudu Iron and Steel Co. was completed in 1979, and startup of the furnace began in late December 1979. Operation of the furnace was deemed satisfactory, and productivity was increasing. The utilization coefficient of this blast furnace reportedly reached a monthly average of 1,729 tons per cubic meter per day during March 1980 and a coke consumption ratio of 525 kilograms per ton. In comparison, the No. 1 blast furnace at Shoudu has a monthly utilization coefficient of 3,114 tons per cubic meter per day and a coke ratio of 362 kilograms per ton. Shoudu has four blast furnaces (the smallest being 576 cubic meters) with a total capacity of 3,561 cubic meters. Shoudu reportedly has the highest average utilization coefficient of all Chinese iron and steelworks.

Installation of the No. 2 steel melting furnace, a continuous casting shop, a hot-rolling mill, a cold-rolling mill, and a silicon sheet steel shop at Shoudou was basically completed in December 1978; the entire construction time required 42 months. Commissioning of the 3-million-ton rolled and plate steel facility was in 1979.

In 1981, Beijing's Capitol Iron and Steel Corp. (CISC) was cited by the Government for its management techniques and increased productivity. CISC was reorganized, and independent entities within the corporation such as transport, power, water, supply, and labor were consolidated for easier control and coordination. Each unit in the new organization was given a daily production plan as well as an operational plan. Individual and a position or station responsibility systems were instituted. Bonuses for good performance were given to the work group, rather than the individual, and were to be equally distributed. Cost savings measures initiated during the year resulted in a profit of 312 million yuan (42 million yuan over the quota). Measures to reduce cost included recycling blast furnace ash (coke consumption per ton of iron produced was reduced from 443 kilograms to 412 kilograms), water and electricity conservation, sale of iron ore, sale of services to other enterprises, and shift of product output to consumer goods and building materials.

CISC has captive iron ore mines located 70 to 80 kilometers from Tangshan, Hebei, which produce 12 million tons of ore (24% to 28% iron content) per year. The ore is beneficiated to 68.5% iron before being shipped by rail to the mill. CISC has eight sintering mills for agglomerating the ore. About 5 million tons of coal per year is supplied from mines in Hebei and Shanxi. CISC's four coke ovens produce 1.2 million tons of coke annually. There are four blast furnaces with a combined daily output of 8,500 tons of iron. Half of the pig iron output is used internally for steel production, and the other half is sold. Annual output capacity of 1.4 million tons of steel is by five furnaces. Sixty percent of the steel output is sold as crude steel. Rolling capacity is about 500,000 tons; a 300-millimeter rolling mill produces 430,000 tons of steel beams for construction. There is also a 70,000-ton capacity for seam pipe and a cold-rolling capacity of 10,000 to 20,000 tons. New rolling capacity of 400,000 tons was being installed to produce nails and other items.

Between 1973 and 1979, China imported about 40,000 tons of stainless steel annually. Imports in 1979 were 47,000 tons: 17,000 tons of structural steel, 21,000 tons of steel plate, and 9,000 tons of pipe. Domestic production of stainless steel was 100,000 tons in 1979 and 86,300 tons in 1980. Nearly 80 types of stainless steel compositions were produced. The configuration of stainless steel output in China in 1980 was as follows in percent by product type:

Cold rolled:	
Sheet	35
Strip	3
Hot rolled (medium plate)	17
Hot-worked rods	23
Cold-worked rods	2
Wire	1
Pipe	10
Unspecified	9

The Shanghai Steelworks account for about 67% of the country's output of stainless steel sheet and about 89% of the medium-thickness plate.

Some of China's stainless steel production and finishing facilities included Changcheng Steel Mill (hot extrusion press and electron beam furnace); Taiyuan Steel-

works (medium plate annual capacity of 100,000 tons, cold-rolling plate capacity of 35,000 tons, and a 6-ton argon-oxygen decarburization furnace); Shanghai Steelworks (plate production and equipment for pipe); Dalian Steel Mill (10-ton vacuum-oxygen decarburization (VOD) furnace); and Fushun Steelworks (30-ton VOD furnace and 6-ton vacuum induction furnace).[9]

Lead-Zinc.—China has a long history of lead-zinc mining with deposits occurring widely throughout China. Occurrences being worked included the Shuikoushan Mine, Changsa, Hunan; Totaolin, Hunan; the Fankou deposit, Shaoguan, Guangdong; the Qinting mining district, Lanping, Yunnan; the Zhehai district, Yunnan; and Changpo, Guangxi. In addition, small operations in Guangxi, Xizang, and Yunnan collectively account for about 20,000 tons of ore per year for each Province. Recent reports of lead-zinc mineralization included occurrences in the Lian He Banner region, Nei Monggol; Huili County, Sichuan; Miyun County, Beijing; Cheng County, Gansu; and Xitilshan, Qinghai.

A lead-zinc mine, with confirmed reserves of 3.8 million tons of high-grade ore and inferred reserves of 10 million tons, was expected to open by the end of 1981 in Chengxian, Gansu. The mine will be operated by the Baiyin Nonferrous Metallurgical Corp. During the first 3 years, daily output of lead-zinc concentrates will be 600 tons, which will be expanded to 4,000 tons.

China's smelter facilities were as follows with capacity in thousand tons:

	Lead	Zinc
Liencheng, Fujian	NA	NA
Guangzhons, Guangdong	NA	--
Shaoguan, Guanddong	12	30
Changpo, Guangxi	5	20
Changchun, Heilongjiang	NA	--
Wuhan, Hubei	NA	--
Sungbei, Hunan	10	5
Zhushou, Hunan	50	100
Huludao, Liaoning	--	60
Shanghai	6	--
Shenyang, Liaoning	50	20
Kunming, Yunnan	NA	--

NA Not available.

As part of the current economic plan, China's nonferrous industry was to be modernized and expanded. During prior negotiations, Mitsubishi Metal Corp. of Japan was to assist in the development of the lead-zinc industry. Presumably, both mine and smelter operations were to be developed, expanded, and modernized.

Manganese.—China has large deposits of manganese. The best known mines are located in the south-central region, especially in east and southeast Guangxi. Other producing areas include Fancheng, Guandong; Shaoshanchang, Hunan; and Wafangzu, Liaoning. Also, large deposits were reported in Daxin, Guangxi, and southern Yunnan. The Hunan Geology Bureau surveyed three separate deposits of manganese, each containing about 25 million tons. A large manganese deposit in Daxin County, Guangxi, was reportedly being prepared for mining.

Mercury.—The well-known mercury belt of China is located in Hunan and Guizhou. In fact, Guizhou is known as the "Province of mercury." The five large mercury mines in Guizhou account for 90% of China's total output. Substantial mercury resources, estimated at 5,000 tons have been discovered in the Qinding mountain region.

Molybdenum.—China's large resources of molybdenum are in silicates and in porphyries, mainly distributed in the north. The important occurrences are in the Qingling and Funiushan Mountains. The copper deposits at Dexing, Jiangxi, contain 0.03% to 0.08% molybdenum, and tungsten deposits at Shinzhuyuan in the Waling Mountains, Hunan, contain 0.06% molybdenum. There were also appreciable molybdenum values in the porphyry copper at Jinduicheng, Shaanxi, and in tungsten deposits in Hunan, Jiangxi, and Yunnan. The Yangjiachangzu Mine in Jinxi, Liaoning, reportedly produces 1,000 tons of molybdenum concentrate annually; ore reserves were several million tons of 0.1% to 0.3% molybdenum.

A mineral occurrence reportedly containing 1.5 million tons of molybdenum was reported in Luanchuan County in Henan. Two occurrences of molybdenum were reported in Harquin Zhoyi, Liaoning. Under financial assistance from the China International Trust and Investment Corp., the Xiaosigu mine and milling operation in Hebei was expanded to export molybdenum concentrate.

Nickel.—China's largest nickel mine is at Jinchuan, Gansu, which the Chinese describe as the second largest nickel sulfide deposit in the world. Reserves at the mine have been estimated at 5 million tons of contained nickel, 3.5 million tons of copper, and 100,000 tons of cobalt. The mine, producing 10,000 tons of nickel per year, was

expanded, and output capacity in 1981 was 15,000 tons. The metallurgical complex at Jinchuan began producing electrolytic nickel in 1964 as well as byproduct cobalt, copper, gold, and silver. Nickel finds have been reported in Hebei, Hubei, Hunan, Jiangsu, and Shandong. A copper-nickel prospect in the Kalaton region in the Altai Mountain area of Xinjuang reportedly contains 4.9% copper and 4% nickel. A platinum-nickel occurrence was found in western Sichuan.

Platinum.—In the late 1960's, platinum occurrences were discovered associated with chromite and nickel. Later, platinum mineral beds were also found, as well as other minerals containing associated platinum. Platinum was reported in chromite in Xazang and in Dali, Yunnan, and was found in Guangdong. Nickel-copper sulfide ore at Jinchuan, Gansu, contains about 0.32 gram of platinum per ton of raw ore. A platinum nickel sulfide deposit was discovered in the western plateau of Sichuan. The mineralization also contained cobalt, copper, gold, and silver.

Rare-Earth Minerals.—China has vast reserves of rare-earth minerals estimated at over 36 million tons, 98% of which are in Nei Monggol. The remainder of the reserves were in Guangdong, Hunan, and Jiangxi. The Bayan Obo Mine in Nei Monggol is the country's major producer (reserves of 35 million tons), and its ore is high in europium and samarium. The rare-earth deposits in Jiangxi (reserves of 1.04 million tons) are high in yttrium values. China ranks second in world ouput of bastnasite after the United States. The three largest refinery operations were: No. 1 Smelting Plant, Gansu; Baotou Iron and Steel Co., Nei Monggol; and Yaolong Chemical Plant, Shanghai. The Gansu operation is China's largest refinery with an annual output capacity of 6,000 tons of mixed rare-earth chlorides. Chinese technical personnel have visited the U.S. rare earths industry as well as the world producers.

Tin.—The two main tin-producing centers are Gejiu in Yunnan, and Hechi in Guangxi. There are also tin mines in Guangdong, Hunan, and Jiangxi. Chinese tin is mainly cassiterite and has a high iron content compared to alluvial or placer tin in southeast Asia. On the whole, sulfide fuming has been adopted to separate the tin, leaving the iron in the slags. Electrolytic refining is used to purify the low-grade metal. Tin concentrates containing lead were used to produce solders, and those having arsenic were treated to recover arsenic oxide for insecticides. Byproducts recovered at the smelters were antimony, arsenic, columbium, lead, and tantalum.

China's tin smelter capacity in tons per year was as follows:

Guangzhou, Guangdong	1,000
Kanchou, Guangxi	100
Limo, Guangxi	400
Ping Gui, Guangxi	1,000
Liuchou, Guangxi	2,000
Hengyang, Hunan	100
Kokiu, Yunnan	10,000

All of the tin smelting and refining plants are in the tin belt area located in southeast China. A new smelter planned for Liepen, Guangxi, with an initial capacity of 6,000 tons per year (to be expanded to 12,000 tons) was expected to be opened by 1985.

Titanium.—Ilmenite was recovered from beach sand dredging operations along the Guangdong-Guangxi coast and in Hainan Dao. About 25,000 tons of ilmenite is produced annually in Guangdong, and about 10,000 tons per year in Guangxi. A large quantity of titanium slag is produced at Panzhihua iron and steel complex in Sichuan. Slag treatment facilities at Panzhihua were established to recover vanadium and produce 50,000 tons per year of titania. Titanium slag is also produced at the Chengde iron and steelworks in Hebei. Sponge output at Chengdu is only about 1,000 tons per year. Small electrolytic plants (500-ton-per-year capacity) were reportedly being operated at Fushun, Liaoning, and at Shanghai. China reportedly petitioned the United States to have Chinese exports classified under the General System of Preference. Currently, there is a 25% ad valorem tariff on Chinese titanium (sponge, ingot, and mill products) exported to the United States.

Tungsten.—China is well known for its tungsten, with large occurrences mainly in Jiangxi, Guangdong, and Hunan, south of the Nanling Mountains. Ten large tungsten mines are in operation in southern Jiangxi. The tungsten deposit in Xikuang, Hunan, is reportedly the world's largest; however, it is a low-grade ore, 0.22% tungsten. At the Xiangdong Mine, Hunan, daily throughput is 1,000 tons. The oldest tungsten mine, in Chna Xihuastan, is at Huashan, Jiangxi. Annual output is 2,500 tons of 65% tung-

sten concentrate. Tungsten mining operations in Guangdong were Dachishan, Tangjiang, and Yaoling. Aside from the tungsten in the Nanling Range, other mines in Guangxi included Dongxing, Lingma, and Nashan. The Changyingling ore-dressing plant in Guangxi went into operation in 1981 with a daily ore-treating capacity of 2,000 tons to produce about 4,000 tons per year of tungsten concentrates. The plant will also recover annually 800 tons of tin concentrate, 170 tons of copper concentrate, and 470 tons of zinc concentrate. Ore reserves at Zhizhuyuan (Chen County), Hunan, were reported to be 190 million tons, grading 0.33% tungsten. Other deposits in Hunan included Yaogangxian and Yangjiatan. A tungsten mine was being worked at Dajishan, Zhejiang. Tungsten was also recovered as a byproduct from the tin operation at Limi, Guangxi.

A 10-day tungsten symposium, jointly sponsored by the Chinese Ministry of Geology and the regional mineral resources development center of the United Nations Economic and Social Commission for Asia and the Pacific, was held at Nanchang, Jiangxi, in October 1981. In a joint venture between China Metals and Minerals Corp. and Li Tungsten Corp. of the United States, Chi Mei Metals Corp. (Glen Cove, N.Y.) was formed to market China's products directly to U.S. consumers.

Vanadium.—Vanadiferous slag was recovered from titaniferous magnetite (0.3% vanadium pentoxide) used in ironmaking at Panghihua, Sichuan; Chengde, Hebei; and Naashan, Anhui. While annual slag output capacity was theoretically 50,000 tons, current production was about 30,000 tons of 14% vanadium pentoxide slag at Panzhihua. Annual slag output at Chengde was about 8,000 tons of 13% pentoxide and at Maashan, 5,000 tons of 17.5% pentoxide. Vanadiferous slags were treated at Jinzhou, Liaoning, which produces about one-half of the country's total output of refined vanadium pentoxide. Slags are also treated in plants at Shanghai, Nanjing, and Emei.

NONMETALS

Cement.—The development of China's small cement plants (plants not part of the unified state distribution system) arose from farmland construction and rural housing. There were reportedly about 4,500 small cement plants, with about 3,000 using vertical kilns, in the country, which produced 54.27 million tons of cement in 1980 amounting to 68% of the total output in China. There were 7 million tons produced by plants run by collectives at the commune or production brigade level and 47 million tons by plants above the county level. Medium- and large-size cement plants located in all Provinces and Autonomous Regions except Ningxia and Xizang accounted for the remainder of the national output.

In late 1981, the new cement plants at Baimashan, Anhui, and Wushan, Gansu, each with an annual production capacity of 800,000 tons, began trial operations. The Pingdingshan cement plant in Henan was nearing completion, and cement construction and expansion projects at Changxing, Zhijiang (450,000 tons per year), Qujiang, Sichuan, and Xingiang were on schedule. Construction began on the Jidong cement plant, Hebei (1.5 million tons per year); all of the equipment was imported from Japan. Construction of the Hirachi cement plant near Xuzhon, Jiangsu (1 million tons per year), was also underway. Site preparation was completed for the Ningguo cement plant in Anhui (1.5 million tons per year). Smaller cement plants were being constructed at Yanbian, Jilin, Litang, Guangxi, and Kaiyuan, Yunnan.[10]

Fertilizers.—In 1981, China produced about 60 million tons of chemical fertilizers, making her a world-ranking producer. During the fourth 5-year plan, China purchased 14 large ammonia units, each with a daily capacity of 1,000 tons of ammonia and 1,620 tons of urea. By September 1979, installation was completed and the plants were placed into operation. The 14 units were located as follows: Sichuan Chemical Plant, Lughon Natural Gas Chemical Plant, Yunnan Natural Gas Chemical Plant, Guizhou Cheshui Natural Gas Chemical Fertilizer Plant, Daqing Chemical Fertilizer Plant, Liaoning Liaohe Chemical Fertilizer Plant, Hebei Cangzhon Chemical Fertilizer Plant, Shandong Shengli Petrochemical Complex, Shengli No. 2 Chemical Fertilizer Plant, Jiangsu Nanjing Xixiashan Chemical Fertilizer Plant, Anhui Anqing Petrochemical Complex, Hunan Tongding Nitrogen Fertilizer Plant, Hubei Provincial Chemical Fertilizer Plant, and Guangzhou Petrochemical Complex. China has about 1,500 small nitrogen fertilizer plants, of which 200 have an annual output of about 10,000 tons. In addition, there are 53 middle-sized nitrogen fertilizer plants located throughout the Provinces, municipalities, and Autonomous Regions except for Qinghai and Xizang.[11]

Graphite.—Natural flake graphite is mined in Hebei, Helongjiang, Nei Monggol, and Shandong. The largest production is from Shandong, the smallest from Hebei. Estimated reserves for flake graphite are in excess of 10 million tons. The occurrences appear to be lagoonal deposits containing graphite and marble. Both underground and open pit mining methods are employed. Raw ore with up to 34% fixed carbon is hand-sorted. The ore is crushed, beneficiated by flotation to a carbon content of 80% to 90%, sized, and bagged for shipping.

Magnesite.—The magnesite resource at Da Shih-Qiao, Liaoning, has proven reserves of 3 billion tons, with at least 50% containing 95% MgO on a calcined basis. Three open pit operations are worked at Da Shih-Qiao with each mine producing about 700,000 tons of dead-burned magnesite, 30,000 tons of dead-burned dolomite, and several thousand tons of light-burned magnesite. Mined material is sized and then moved by truck to calcining plants. There were 30 shaft kilns and 2 rotary kilns for calcining. The shaft kilns vary in size and produce 40 to 80 tons per day of dead-burned magnesite. Each of the rotary kilns produces about 200 tons per day. After calcining, the material is cobbed to assure uniform quality before storing in silos. Light-burned material is produced in a separate kiln. Electric arc furnaces, each with an annual output capacity of about 2,500 tons, produce fused magnesite.

Low-iron magnesite is believed to be mined in other Provinces. New magnesite deposits were reportedly discovered in Hebei, Shandong, and Sichuan.

MINERAL FUELS

China's primary energy output in 1981 was 620 million tons in terms of standard coal. China's principal energy source was coal, accounting for 71% of the total; the remainder of the energy was mainly from petroleum and natural gas, 21%; hydropower, 3%; and other, 5%. China has no nuclear powerplants. Under the current economic program, priority will be given to the development of coal and hydropower, as well as to energetic development of oil and natural gas. Nuclear power stations may be built to serve energy-poor areas; and in the vast rural areas, the use of biogas and firewood will continue. Research will be conducted to develop nonconventional energy sources such as solar, geothermal, wind, and marine resources.[12]

China's power industry has a total installed generating capacity of 60 million kilowatts. There are five large power grids—the north, northeast, east, central, and the Shaanxi-Gansu-Qinghai area. In addition, there are 27 provincial power supply networks. Construction of two large power grids in the south and southwest was underway, and work has also been started to integrate the power networks.

Sixty-one large thermal and hydroelectric power stations were under construction or being expanded. When completed, the country's total generating capacity will be increased by 20 million kilowatts. Proposed construction of seven new stations will add 2 million kilowatts. The largest thermal power station currently under construction is at Datong, Shanxi; it has a design capacity of 1.2 million kilowatts. Thermal plants being expanded include Douhe, Hebei (800,000 kilowatts), Matou (400,000 kilowatts), and Yaoming (1.2 million kilowatts).[13]

Large hydropower stations were being built on the Changjiang, Huanghe, Songhua, and Dadu Rivers. The largest of the hydropower stations was Gezhouba on the Changjiang in Hubei with a design capacity of 2,175,000 kilowatts. Two of its generating sets, each with a capacity of 170,000 kilowatts, went into operation in late 1981. Also under construction was the Longyang Gorge hydropower station (1.4 million kilowatts) on the Huanghe in Qinghai.

Coal.—Since 1949, China has opened 2,181 state-owned mines. In addition, 18,000 mines were developed by rural communes and production brigades. In 1980, output by state-controlled mines totaled 344 million tons; that by Province-, prefecture-, and county-owned mines, 162 million tons; and that by commune- and brigade-run mines, 113 million tons. State-controlled mines also produced 24 million tons of oil shale (torbanite). Classification of state-distributed coal was as follows: Anthracite, 40 million tons; bituminous (includes coking coal), 293 million tons; and lignite, 12 million tons. Quality characteristics of Chinese coals follow: Average ash content of marketable coal from state-controlled mines, 22%; average gangue content, 0.5%; dust from washed coal, 10%; and average water content, 12%. Construction of 73 out of 116 washing and sorting projects was completed in 1980, increasing coal-washing capacity by 8 million tons and screening capacity by 4 million tons.

China's principal coal mines were located in Datong, Shanxi; Fengfeng and Kailuan,

Hebei; Benxi and Fushun, Liaoning; Hegang, Heilongjiang; Weibei, Shaanxi; the northern slope of the Tianshan mountains, Xinjiang; Pingdingshan, Henan; and Huainan and Huaibei, Anhui. Guizhou and Yunnan also have important coal mines. Shanxi Province alone accounts for about one-sixth of China's total production.

During 1980, capital investment for construction in the coal sector totaled 3.61 billion yuan—1.352 billion yuan for new mines and 0.422 billion yuan for expanding old mines. Thirty-one mines were completed and commissioned with collectively a total annual output capacity of 8.29 million tons—24 new mines (5.93 million tons) and 7 expansions (2.36 million tons).

New mining sites with a designed annual capacity of 10 million tons or more included Gujiao Mine, Shanxi; Yangzhou Mine, Shandong; Huainan and Huaibei Mines of Anhui; and Hanxing Mine, Hebei. New mines being constructed with an annual capacity of 5 to 10 million tons included Tiefa and Shenbli, Liaoning; and Zaoteng and Yidatum, Shandong. Other large mines under construction included Yanzishan Mine in Datong, and Shanxi (3 million ton capacity) and Xichu Mine in Gujiao.

The China National Coal Development Corp. (CNCDC) and Island Creek Coal Co. (Occidental Petroleum Co.) discussed the feasibility of developing the Antaibao coal deposit in Shanxi. Preliminary design called for a 15-million-ton-per-year open pit mine in the Pingshuo area. Japanese loans were being used in seven coal mining projects with a planned total annual output of 21 million tons; some of the mines were expected to go into operation in 1984. A compensation trade agreement with Romania to operate a mine in Huozian, Shanxi, was in effect. A French export credit loan will be used to import key equipment in the construction of a 4-million-ton-output coal mine; location was not disclosed. Discussions on joint coal development were held with French, West German, Italian, Japanese, Spanish, and U.S. companies. CNCDC also wanted foreign cooperation to help China in coal gasification and liquefaction projects.[14]

Petroleum and Natural Gas.—In 1949, China had only three oilfields—Laojunmiao in Yumen, Gansu; Dushanzi, Xinjiang; and Yanchang, Shaanxi; two gasfields—Shengdengshan and Shiyougou, Sichuan; and two shale oil plants in Liaoning. During 1953-57, the Karamay Oilfield in Xinjiang and the Lenghu Oilfield in Qinghai were discovered and developed. Crude oil output reached 11 million barrels in 1957. During the economic plan for 1958-62, zone prospecting began in several large basins in the north, northeast, and southeast. In 1959, a commercially promising oil-bearing strata was discovered in the sedimentary continental facies in the Song-Liao Basin. In 1960, the development program for Daqing was organized, and national oil production reached 47 million barrels in 1963.

Beginning in 1964, the focus for prospecting shifted to Bohai Bay and to the discovery and development of the Shengli Oilfield in Shandong, Dagang in Tianjin, Liaohe in Liaoning, and Jizhong in Hebei. New oilfields were discovered in Henan, Hubei, Jiangsu, and the Shaanxi-Gansu-Ningxia border region. National oil output reached 77.5 million barrels in 1979, and China became one of the principal oil-producing countries. Oil and gas had been discovered in 19 Provinces, municipalities, and Autonomous Regions, and 122 oil and/or gasfields were in operation. There are 15 oil and natural gas production bases: Cangqing, Dagang, Daqing, Henan, Jianghan, Jiangsu, Jilin, Jizhou, Liaohe, Qinghai, Shengli, Sichuan, Xinjiang, Yangchang, and Yumên.

Daqing is China's largest producer with three oilfields averaging collectively 365 million barrels per year since 1976. The Shengli oil zone, located in the northern Shandong plain, flanks both banks of the Huanghe River near its mouth. There are 23 wells in operation at Shengli, producing a total of about 131 million barrels per year. The Jizhong oil zone is in the northern part of the Northern China Plain. There are 14 wells in operation, altogether producing about 117 million barrels per year. The Liaohe oil zone is in northeast Liaodong Bay. Nine oil wells have been developed with annual production of around 37 million barrels. The Dagang oil zone is south of Tianjin at the estuary of the Haihe. Annual output was around 15 million barrels by nine oil wells. There are three oil wells in the Karamay oil zone of Xinjiang with a total output of about 29 million barrels. The sedimentary basin housing the Sichuan oil-gas zone extends into the western part of Hubei. To date, 59 gas wells and 11 oil wells have been verified. There were 53 gas wells producing 6.3 billion cubic meters of gas. Annual crude oil output was around 73 million barrels.[15]

Two new onshore discoveries were announced in 1981. One was in the Dongpu depression near Zhengzhou, Henan. Seismic exploration was expected to shift to the western and southern parts of the area. The second find was in Dongtai County, Jiangsu, at a depth of 2,416 meters, yielding a flow of 1,600 barrels per day.

Offshore oil was found in 22 of the 95 exploratory wells that were drilled in the Bohai Sea area. Three platforms were built for offshore oil extraction. Seventeen exploratory wells with eight shows were drilled in Beibu Bay, Yinnge Sea, and off the mouth of the Jujiang River. Also, prospecting was being conducted in the Donghai Sea. Since the latter half of 1979, 48 oil companies from 13 countries have taken part in exploration programs in offshore China. In September 1981, the Ministry of Petroleum Industry announced that physical exploration and assessment of oil shows at the Zhujiang River estuary in the South China Sea, the Yingge Sea, Beibu Bay, and the southern part of the Yellow Sea had been basically completed. Public bidding for joint oil exploration by Chinese and foreign corporations would begin at the latest in early 1982. Inasmuch as bidding, document tending, and contract negotiations will consume much of 1982, drilling was not likely to begin until 1983.[16]

China's current annual output level of refinery products was around 60 million tons, compared with an installed capacity of 96 million tons.

Uranium.—No factual data are available on China's uranium resources. Although uranium discoveries have been widely reported throughout the country, it is mostly concentrated in the southeast (Guangdong) and the northwest (Xinjiang). Judging from Chinese literature, most of the development work is by specialized units of the People's Liberation Army. China's reserves of uranium were estimated by one western analyst at around 800,000 tons. Officials of the European Economic Community engaged in discussions with the Chinese assert that China could become a long-term supplier of reasonably priced uranium.

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[1]Physical scientist, Division of Foreign Data.

[2]Since 1976, the yearly average exchange rates have fluctuated as follows: 1976, 1.94 yuan=US$1.00; 1977, 1.86; 1978, 1.68; 1979, 1.56; and 1980, 1.50. In 1981 the exchange rate ranged from 1.59 to 1.80 and averaged 1.71.

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The Mineral Industry of Colombia

By Doris M. Hyde[1]

In 1981, Colombia's gross national product (GNP) at current prices was estimated at $40.4 billion,[2] which in terms of constant 1970 dollars amounted to about $12.5 billion. In real terms, the economy grew at a rate of 2.5%, a decrease from the 4% registered in 1980. The rate of inflation edged up slightly to about 27%.

Colombia's mineral sector has been traditionally centered on the precious metals, emerald, coal, and limestone. In 1981, the value of nonfuel mineral production fell 6% below that of 1980, despite production increases of the major individual contributors. Mining was expected to assume an accelerated role in the future economy, which has over the years maintained about a 1% participation in the GNP.

By the end of 1981, Colombia was completing facilities for the start of ferronickel production. The depressed world market price for this metal has, temporarily at least, somewhat dampened Colombia's economic expectations from the nickel project. For the long term, Colombia was counting on a dramatic increase in coal production and export to stimulate economic growth and lessen the impact of unstable prices for agricultural products, particularly coffee, on foreign exchange earnings. Other future mining ventures planned include several promising copper deposits, bauxite, phosphate rock, and uranium.

Crude oil discoveries in the eastern plains during 1981 and secondary recovery efforts in the Middle Magdalena Valley have increased the possibility that Colombia may regain petroleum self-sufficiency by the mid-1980's. Other energy gains from new hydroelectric projects, completion of the new national electric power grid, and increased industrial use of coal and natural gas have combined to improve Colombia's energy balance.

Government Policies and Programs.—The Ministry of Energy and Mines has initiated a complete inventory of Colombia's mineral resources. The Instituto Nacional de Investigaciones Geologico-Mineras (INGEOMINAS), Empresa Colombiana de Minas (ECOMINAS), Carbones de Colombia (CARBOCOL), Instituto de Asuntos Nucleares de Colombia, and the Empresa Colombiana de Uranio, were mentioned as cooperating in this important undertaking. The study will attempt to establish the location, quantity, and quality of mineral reserves. The program objectives included improving coordination among the participating entities, training mining engineers, and providing a basis for establishing clear rules and guidelines for foreign investment.

In 1981, new foreign investment in Colombia reportedly dropped to $166 million, compared with $1.3 billion in 1980. A large portion of this difference was attributed to the 1980 investment in the El Cerrejón coal project. Excluding this amount, there has been an apparent downtrend since 1979 when foreign investment amounted to about $236 million.

The Government was considering a series of steps to attract foreign investment to Colombia's mining and petroleum sectors. In 1981, the Government was reported as having raised the ceiling on profit remittances abroad by foreign companies acting as consultants in the domestic mining industry. The allowable annual remittance was increased from 20% to 40% of invested capital.

Additional steps were under consideration to clarify the guidelines for foreign participation in coal projects. These guidelines may approximate the policy incor-

porated into the Exxon Corp. contract for the El Cerrejón coal project. The guidelines were expected to stipulate a local participation of 50% in any venture, and allow the possibility for the foreign shareholder to repatriate up to 100% of its profits. If appropriate for the particular concession, the guidelines could include production controls, pricing policies, and provide for the payment of royalties to the state.

A cooperative study for a national mining development program through the year 2000 has been initiated by the United Nations Development Program Technical Mission, the Ministry of Mines and Energy, and various state mining entities.

Regional electrical energy shortages persisted during 1981 and added urgency to Colombia's plans for increasing installed electric capacity by over 2,000 megawatts by the end of 1986 to a total of about 6,500 megawatts.

Several hydroelectric power projects were initiated in 1981. A Colombian firm received a contract to design a 180-meter-high dam on the Río La Miel, about midway between Bogotá and Cali. The dam will be part of a $200 million hydroelectric plant with a design capacity of 324 megawatts.

Colombia obtained a World Bank loan of $85 million to help finance the $346 million Playas hydroelectric project, designed to expand the electric supply to Medellín, Antioquia Department. The Playas plant was to have an installed capacity of 200 megawatts and be situated on the Guatape River. The initial operating date was January 1986. A joint Italian-Colombian venture was awarded the contract to construct the $300 million Betania powerplant, near Neiva in southern Colombia. This plant has a design capacity of 510 megawatts. The projected operating date was April 1986.

The largest power scheme initiated in 1981 was the $1.3 billion Guavio hydroelectric powerplant of Empresa de Energía Electrica de Bogotá. The project was to have a generating capacity of 1,000 megawatts with a designed expansion capability of an additional 600 megawatts. Financing has been obtained from the Inter-American Development Bank, $100 million; the World Bank, $359 million; and commercial banks, $340 million. Also, $129 million in suppliers' credits were anticipated. The World Bank loan was the largest credit the agency has yet approved for a power project in South America. The dam and plant were to be about 50 miles east of Bogotá on the Guavio River, Guavio Province, Cundinamarca Department. Employment opportunities and construction of infrastructure were expected to increase the commercial activity in the area.

Development of geothermal energy also received attention during 1981. A geothermal project was about to be launched with five wells scheduled for drilling at Termales Botero, about 35 kilometers from Manizales, Caldas Department, in central Colombia. It was expected that the project would produce 5 megawatts of electricity.

PRODUCTION

Overall mineral production presented a mixed performance in 1981, with gold, platinum, emerald, coal, and some nonmetals showing gains. However, the total value of mineral production fell to an estimated $443 million, 6% below the 1980 level. This was primarily the result of falling market prices for gold. The value of emerald production also fell significantly. This estimate of decreased total mineral production value was based on current prices and did not take into account factors of inflation and peso devaluation, both of which would serve to accentuate the real difference in production values.

Following a traditional pattern, the production of gold, coal, emerald, and limestone accounted for about 90% of the total value of mineral production in 1981.

There are no significant changes in mineral production envisaged for 1982, except for the entry of ferronickel from the Cerro Matoso project. New petroleum discoveries in the eastern plains and secondary recovery projects in older fields have increased the possibility of Colombia's becoming energy self-sufficient by 1985.

Table 1.—Colombia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Chromite, gross weight	(3)	(3)	(3)	--	--
Copper, mine output, metal content	78	100	84	111	4113
Gold ---- troy ounces	r257,070	r246,446	269,369	510,439	4529,214
Iron and steel:					
Iron ore and concentrate ---- thousand tons	505	497	397	506	4419
Pig iron ---- do.	223	298	241	279	233
Ferroalloys: Ferrosilicon[e] ----	1,200	1,200	1,200	1,200	1,200
Crude steel ---- thousand tons	330	391	362	405	395
Semimanufactures, hot-rolled ---- do.	294	332	307	320	340
Lead, mine output, metal content ----	166	120	226	187	4154
Refined (secondary) ---- thousand tons	1,500	2,000	2,500	3,000	3,000
Manganese ore, gross weight ----	11,875	20,011	21,453	21,400	420,300
Platinum-group metals ---- troy ounces	17,315	r14,943	12,933	14,345	414,804
Silver ---- do.	r90,948	r76,773	99,331	151,542	4142,740
Zinc, mine output, metal content ----	--	--	--	--	4152
NONMETALS					
Asbestos ----	--	NA	NA	NA	1,000
Barite ----	3,450	3,500	3,500	3,200	43,380
Cement, hydraulic ---- thousand tons	3,298	4,153	4,257	4,351	4,459
Clays:					
Bentonite ----	(3)	(3)	(3)	--	--
Kaolin ----	790,000	783,000	819,150	786,384	4810,000
Diatomite ----	630	630	e630	630	630
Feldspar ----	26,508	26,455	29,200	27,150	427,500
Gypsum ---- thousand tons	210	255	257	262	4270
Lime, hydrated and quicklime[e] ---- do.	1,300	1,300	1,300	1,300	1,300
Magnesite ----	1,770	1,400	1,582	e1,600	1,600
Mica ----	(3)	--	--	--	--
Nitrogen: N content of ammonia ----	65,100	63,600	70,000	85,700	91,500
Phosphate rock ----	5,800	1,320	6,776	6,370	46,705
Precious and semiprecious stones: Emerald:					
Gem stones ---- carats	60,575	NA	NA	NA	NA
Moralla ---- do.	5423,937	NA	NA	NA	NA
Total[6] ---- do.	484,512	894,888	1,228,488	275,111	4299,006
Salt:					
Rock ---- thousand tons	r347	r377	383	347	4316
Other ---- do.	r594	r460	369	491	4399
Total[7] ---- do.	r941	r837	752	838	4715
Sodium compounds: Sodium carbonate ----	140,588	167,172	133,217	124,629	125,000
Stone and sand:					
Calcite ----	8,280	8,500	8,500	8,620	48,740
Dolomite ---- thousand tons	22	32	29	14	415
Limestone ---- do.	8,112	9,431	9,700	9,760	410,053
Marble ----	8,688	12,039	16,891	17,000	416,660
Sand excluding metal-bearing ----	428,854	440,000	480,000	492,000	4502,300
Sulfur:					
Native (from ore) ----	27,000	35,000	16,050	25,647	426,300
Byproduct, from petroleum ----	e2,000	3,239	2,262	1,959	2,200
Total ----	29,000	38,239	18,312	27,606	28,500
Talc, soapstone, pyrophyllite ----	3,380	4,320	6,085	5,900	46,050
MINERAL FUELS AND RELATED MATERIALS					
Carbon black ----	4,200	NA	NA	NA	NA
Coal, all grades ---- thousand tons	4,204	4,754	4,885	4,947	45,030
Coke, all types ---- do.	500	530	507	500	500
Gas, natural:					
Gross ---- million cubic feet	122,325	147,014	150,695	160,666	174,800
Marketed ---- do.	74,217	97,319	108,181	118,534	120,000
Natural gas liquids:					
Propane ---- thousand 42-gallon barrels	e2,645	2,614	2,491	2,712	2,800
Butane ---- do.	582	589	552	577	600
Natural gasoline ---- do.	700	723	816	790	800
Condensate ---- do.	(3)	(3)	--	--	--
Total ---- do.	3,927	3,926	3,859	4,079	4,200
Petroleum:					
Crude ---- do.	50,222	47,742	45,298	45,944	48,939
Refinery products:					
Gasoline:					
Aviation ---- do.	373	374	443	428	370
Motor[8] ---- do.	23,236	18,348	18,042	20,400	23,500

See footnotes at end of table.

Table 1.—Colombia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Jet fuel thousand 42-gallon barrels	2,895	3,150	3,517	3,521	3,500
Kerosine do.	3,156	3,069	3,209	2,730	3,000
Distillate fuel oil do.	7,505	7,961	7,768	8,584	9,500
Residual fuel oil do.	18,420	18,947	15,254	17,023	15,400
Lubricants do.	351	333	511	403	550
Other:					
Liquefied petroleum gas do.	1,992	1,819	1,729	1,975	2,050
Asphalt and bitumen do.	458	598	706	942	1,130
Refinery fuel and losses and unspecified products do.	1,978	2,853	8,067	7,239	7,000
Total do.	60,364	57,452	59,246	63,245	66,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through July 26, 1982.

[2]In addition to the commodities listed, coal briquets are also produced, but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.

[3]Revised to zero.

[4]Reported figure.

[5]U.S. imports, largely moralla and gangue, but also including some gem-quality emerald.

[6]Data represent total registered Colombian exports.

[7]Treated salt volumes, as reported by the Ministrio de Mines y Energia.

[8]Includes "industrial benzine" (white gasoline).

TRADE

Colombia's overall trade pattern indicated a trend toward greater market diversification. The United States share of Colombian imports has been declining as other countries increase their marketing in Colombia. Colombia has been seeking new sources of imported petroleum and a wider outlet for its exports.

The Government has set an export goal of 15 million tons of coal annually by 1985, increasing to 25 million tons by 1990, and 60 million tons by the year 2000. Coal sales agreements were being actively pursued to support this ambitious export program.

No significant changes were anticipated in the mineral trade sector until 1982 when ferronickel from the Cerro Matoso project should become available for export.

The trade balance of the mineral sector remained on the deficit side in 1981. Nonfuel mineral exports totaled $389 million, accounted for by gold ($263 million), emerald ($61 million), and others ($65 million). Petroleum exports were valued at $350 million.

Nonfuel mineral imports rose to $598 million, with imports of semiworked and worked metals and inorganic chemical products accounting for about three-fourths of this amount. The remainder of mineral-related imports consisted principally of scrap iron and nonferrous waste metals. In 1981, nonfuel mineral-related imports accounted for about 10% of total imports. Petroleum imports were valued at $700 million and represented 11% of total imports.

Table 2.—Colombia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	15	11	--	Ecuador 6; Venezuela 5.
Metal including alloys, unwrought	164	142	--	Ecuador 88; Chile 30.
Chromium oxides and hydroxides value, thousands	$1	$1	--	All to Ecuador.
Copper:				
Ore and concentrate	3,714	4,354	--	Japan 4,254.
Metal including alloys, all forms	61	59	--	Venezuela 32; Denmark 25.
Iron and steel:				
Ore and concentrate	54	--		
Metal:				
Pig iron, cast iron, powder, shot	336	500	--	All to Venezuela.
Steel, primary forms	--	6	--	Do.
Semimanufactures:				
Bars, rods, angles, shapes, sections	809	6	--	All to Peru.
Universals, plates, sheets	62	7	1	Ecuador 5.
Hoop and strip	32	(1)	--	All to Ecuador.
Rails and accessories	--	2	--	All to Venezuela.
Wire	88	92	--	Honduras 47; Dominican Republic 30.
Tubes, pipes, fittings	509	453	6	Venezuela 174; Peru 70; Nicaragua 60.
Castings and forgings, rough	240	269	19	Venezuela 225.
Lead:				
Ore and concentrate	312	361	--	All to Canada.
Metal including alloys, all forms	51	80	--	Venezuela 60; Panama 19.
Manganese ore and concentrate	176	--		
Nickel metal including alloys, all forms	--	10	--	All to Ecuador.
Silver:				
Ore and concentrate[2] value, thousands	$380	$135	--	All to Sweden.
Metal including alloys, unwrought and partly wrought value, thousands	--	$1,423	$440	Panama $908.
Zinc oxides and hydroxides	--	100	--	All to United Kingdom.
Other metals, n.e.s.:				
Ores and concentrates of niobium, tantalum, vanadium, etc	--	60	30	Sweden 30.
Base metals including alloys, all forms	--	1	--	All to Italy.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	2	4	--	All to Venezuela.
Grinding and polishing wheels and stones value, thousands	$11	$1	--	All to Chile.
Cement	717,119	830,677	40,899	Venezuela 382,226; Trinidad and Tobago 169,448; Mexico 113,162.
Chalk	150	180	--	All to Ecuador.
Clays and clay products:				
Crude	17	182	--	All to Venezuela.
Products:				
Nonrefractory	26,192	22,393	542	Venezuela 20,309; Honduras 639.
Refractory	1,565	3,899	--	Ecuador 3,685.
Diamond: Gem, not set or strung value, thousands	$1	--		
Fertilizer materials:				
Crude, phosphatic	--	250	22	Venezuela 228.
Ammonia	15,569	10,291	--	Mozambique 5,250; France 4,963.
Graphite, natural	7	--		
Gypsum and plasters	500	11,226	--	All to Venezuela.
Lime	3,957	2,168	--	Do.
Precious and semiprecious stones, natural value, thousands	$1,922	$61,036	$15,271	Japan $34,938; Switzerland $6,590.
Salt and brine	189,757	151,469	147,269	Venezuela 4,200.
Sodium and potassium compounds: Soda ash	22,140	3,500	--	Argentina 2,700; Peru 500.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	218	198	--	Ecuador 114; Venezuela 84.
Worked	25	124	46	Venezuela 78.
Gravel and crushed rock	23	175	--	Trinidad and Tobago 135; Guyana 39.
Sand excluding metal-bearing	35	127	10	Venezuela 50; Ecuador 47.
Sulfur, elemental	1,030	2,400	--	All to Ecuador.
Talc, steatite	75	57	--	Venezuela 37; Panama 20.
Other:				
Crude	142	630	--	Ecuador 580; Venezuela 50.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	3,325	7,942	--	Nicaragua 4,295; Ecuador 1,582; Suriname 993.

See footnotes at end of table.

Table 2.—Colombia: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	4,309	666	--	Ecuador 273; Peru 140; Jamaica 123.
Coal, anthracite and bituminous	135,695	95,429	--	Mexico 59,713; Venezuela 30,925.
Coke and semicoke	39,895	63,111	--	Brazil 23,501; Venezuela 21,494; Mexico 14,603.
Petroleum:				
Partly refined thousand 42-gallon barrels	--	17	--	All to Venezuela.
Refined products:				
Gasoline do	41	--		
Distillate fuel oil do	--	(3)	--	All to Bolivia.
Residual fuel oil do	9,337	5,053	1,901	Netherlands 1,927; Gibraltar 509.
Lubricants do	1	1	NA	NA.
Other:				
Mineral jelly and wax do	13	6	5	NA.
Unspecified do	3	17	--	Venezuela 11.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	475	2,274	--	Venezuela 1,615; Argentina 655.

NA Not available.
[1]Unreported quantity valued at $2,000.
[2]May include some platinum-group metals.
[3]Less than 1/2 unit.

Table 3.—Colombia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	(1)	3,841	--	All from Guyana.
Oxides and hydroxides	522	778	578	West Germany 114; United Kingdom 71.
Metal including alloys: Unwrought	16,364	13,444	134	Venezuela 8,037; Canada 2,498; Yugoslavia 2,094.
Semimanufactures	4,138	4,916	876	Venezuela 2,476; Yugoslavia 600; Japan 521.
Arsenic:				
Trioxide, pentoxide, acids	18	--		
Elemental value, thousands	--	$2	$2	
Chromium:				
Chromite	5	--		
Oxides and hydroxides	61	78	52	West Germany 19; U.S.S.R. 5.
Cobalt oxides and hydroxides	7	8	6	United Kingdom 1.
Copper:				
Matte	6	--		
Metal including alloys:				
Scrap	36	18	18	
Unwrought	3,613	2,768	14	Chile 1,550; Mexico 952; Peru 243.
Semimanufactures	8,941	11,975	373	Chile 6,890; Peru 2,067; Japan 722.
Iron and steel:				
Ore and concentrate	3,104	3,327	238	Venezuela 3,018.
Metal:				
Scrap	23,095	13,126	3,301	Netherlands Antilles 4,743; Ecuador 4,580.
Pig iron, cast iron, powder, shot	1,607	338	227	Brazil 43; Italy 40.
Ferroalloys	8,555	10,517	165	Brazil 4,997; Mexico 3,790.
Steel, primary forms	63,516	41,937	502	Japan 15,910; Canada 8,038; Spain 7,326.
Semimanufactures:				
Bars, rods, angles, shapes, sections	94,106	85,081	8,011	Brazil 17,275; Japan 14,566; Republic of South Africa 9,585.
Universals, plates, sheets	251,672	258,400	5,590	Japan 179,576; Venezuela 17,845.
Hoop and strip	6,438	5,140	590	Japan 1,776; United Kingdom 1,457; West Germany 976.
Rails and accessories	1,115	1,174	170	Italy 401; Belgium-Luxembourg 397.
Wire	9,402	5,982	359	Brazil 2,189; Venezuela 1,824; Japan 1,042.
Tubes, pipes, fittings	38,945	61,513	9,010	Japan 28,082; Italy 13,311; Brazil 5,862.

See footnotes at end of table.

Table 3.—Colombia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures —Continued				
Castings and forgings, rough	390	3,357	1,218	Belgium-Luxembourg 1,118; Spain 575.
Lead:				
Oxides and hydroxides	875	815	9	Mexico 430; Peru 375.
Metal including alloys:				
Scrap	--	2,435	7	Peru 2,292.
Unwrought	2,052	182	--	Peru 172.
Semimanufactures	62	25	9	Bolivia 10.
Magnesium metal including alloys, all forms	75	76	62	Japan 10.
Manganese:				
Ore and concentrate	1,962	4,603	--	All from Mexico.
Oxides and hydroxides	936	984	49	Brazil 470; Japan 319.
Mercury 76-pound flasks	609	638	58	Japan 290; Mexico 116.
Molybdenum metal including alloys, all forms	1	2	1	Netherlands 1.
Nickel:				
Matte and speiss value, thousands	$4	--		
Metal including alloys:				
Scrap	28	14	8	Canada 6.
Unwrought	105	121	27	Canada 87.
Semimanufactures	217	263	120	Canada 79; Japan 20.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$6	$11	$6	Japan $5.
Silver:				
Waste and sweepings do.	$3	--		
Metal including alloys, unwrought and partly wrought do.	$845	$252	$2	Peru $144; Spain $91.
Tantalum metal including alloys, all forms do.	--	$3	$3	
Tin metal including alloys, all forms	356	435	1	Bolivia 376.
Titanium oxides	653	602	242	West Germany 178; Spain 75; United Kingdom 70.
Tungsten metal including alloys, all forms	3	9	3	Spain 5.
Uranium metal including alloys, all forms value, thousands	$7	--		
Zinc:				
Ore and concentrate do.	$3	$1	$1	
Oxides and hydroxides	163	275	9	Peru 110; Venezuela 80; West Germany 59.
Scrap	81	--		
Dust, blue powder	95	77	14	Peru 50.
Unwrought	13,360	14,598	1	Peru 11,707; Mexico 1,789.
Semimanufactures	58	17	11	United Kingdom 3.
Other:				
Ores and concentrates of niobium, tantalum, vanadium, etc	511	395	--	Australia 149; Republic of South Africa 100; United Kingdom 70.
Oxides, hydroxides, peroxides	124	149	75	West Germany 49.
Metalloids	10	14	4	United Kingdom 5; Canada 2.
Alkali, alkaline-earth, rare-earth metals value, thousands	$3	$1	$1	
Base metals, including all forms	28	47	13	Republic of South Africa 10; Peru 9; Mexico 6.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	315	327	153	West Germany 171.
Artificial: Corundum	598	525	34	Brazil 386; West Germany 74.
Dust and powder of precious and semiprecious stones value, thousands	$4	$1	--	All from Spain.
Grinding and polishing wheels and stones	67	76	28	West Germany 15; Spain 12.
Asbestos, crude	20,920	27,057	262	Canada 21,720; Republic of South Africa 4,335.
Barite and witherite	8,793	8,010	--	Peru 2,983; Ireland 2,777; Chile 2,250.
Boron materials:				
Crude, natural borates	123	684	4	Peru 680.
Oxide and acid	527	571	562	West Germany 7.
Cement	21,958	10,211	264	Cuba 7,640; Peru 1,850.
Chalk	88	--		
Clays and clay products:				
Crude	3,399	8,056	7,339	Peru 422; United Kingdom 110.
Products:				
Nonrefractory	2,606	3,587	60	Italy 2,524; Spain 613.

See footnotes at end of table.

Table 3.—Colombia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products —Continued				
Products —Continued				
Refractory	7,738	13,099	4,490	Brazil 2,420; Mexico 1,102; Austria 768.
Diamond:				
Gem, not set or strung value, thousands	$27	$1	--	All from Switzerland.
Industrial do	$4	$4	$3	Netherlands $1.
Diatomite and other infusorial earth	796	488	290	Mexico 190.
Feldspar, fluorspar, etc	392	1	--	Mainly from France.
Fertilizer materials:				
Crude:				
Nitrogenous	415	598	3	Chile 595.
Phosphatic	48,842	40,758	40,758	
Potassic value, thousands	--	$1	--	All from West Germany.
Manufactured:				
Nitrogenous	147,366	224,768	22,074	Venezuela 56,502; U.S.S.R. 47,637; East Germany 35,976.
Phosphatic	16,202	116,837	8,487	Mexico 5,750; Spain 2,600.
Potassic	101,458	149,299	40,468	East Germany 84,981; Spain 23,850.
Other including mixed	41,262	36,409	35,994	Belgium-Luxembourg 267.
Ammonia	35,065	18,635	NA	Venezuela 18,624.
Graphite, natural	77	52	18	United Kingdom 15; West Germany 10.
Gypsum and plasters	28,772	68,730	334	Dominican Republic 60,212; Dominica 5,270.
Magnesite	769	730	220	France 180; West Germany 163.
Mica:				
Crude including splittings and waste	85	107	38	West Germany 69.
Worked including aggleomerated splittings	4	6	1	Spain 4.
Pigments mineral, iron oxides, processed	1,487	1,153	41	West Germany 919; Mexico 107.
Precious and semiprecious stones:				
Natural value, thousands	$23	$31	$16	Republic of South Africa $7; Belgium-Luxembourg $6.
Synthetic do	$10	2	--	Mainly from Switzerland.
Pyrites, unroasted	1	2	2	
Salt and brine	49	1,217	39	Ecuador 1,150.
Sodium and potassium compounds:				
Caustic potash	230	234	29	France 92; Italy 72.
Caustic soda	35,964	106,786	106,567	Poland 200.
Soda ash	22	16,232	15,634	West Germany 598.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	2,536	3,576	--	Peru 1,365; Italy 1,358.
Worked	35	245	10	Italy 218.
Dolomite, chiefly refractory-grade	5,720	9,025	1,676	Uruguay 4,128; Belgium-Luxembourg 2,900.
Gravel and crushed rock	1,167	1,192	91	Venezuela 604; Belgium-Luxembourg 230; United Kingdom 175.
Limestone excluding dimension	4	(2)		
Quartz and quartzite	38	2	--	All from Belgium-Luxembourg.
Sand excluding metal-bearing	31	88	28	Sweden 40; Peru 20.
Sulfur:				
Elemental:				
Other than colloidal	35,262	46,662	14,446	Venezuela 31,529.
Colloidal	39	83	82	NA.
Dioxide	67	--		
Sulfuric acid, oleum	16	35	14	Italy 13; West Germany 7.
Talc, steatite	2,559	2,377	1,957	Italy 345; Brazil 42.
Other nonmetals, n.e.s.:				
Crude	4,399	31,958	19	Guadaloupe 26,030; Morocco 2,650.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	440	26	--	France 16; West Germany 9.
Halogens	4	8	NA	Israel 2; Italy 2; Japan 2; West Germany 2.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	63	151	31	Venezuela 72; France 26.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	85	9	9	
Carbon black	718	1,093	824	West Germany 253.
Coal:				
Anthracite and bituminous	21	23	23	
Lignite including briquets	10	102	102	
Gas:				
Natural thousand cubic feet	264	845	--	Mainly from France.
Hydrogen, helium, rare gases	35	96	63	Venezuela 33.

See footnotes at end of table.

Table 3.—Colombia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	7,266	4,951	85	Venezuela 4,135; Nigeria 476.
Refinery products:				
Gasoline do	6,567	7,589	452	Netherlands Antilles 2,499; Peru 2,093; Romania 1,025.
Kerosine and jet fuel do	(3)	258	(3)	Venezuela 257.
Distillate fuel oil do	--	858	--	Netherlands Antilles 312; Bahamas 297; Venezuela 249.
Residual fuel oil do	274	1,137	--	Netherlands Antilles 888; Venezuela 249.
Lubricants do	203	254	99	Netherlands Antilles 73; Venezuela 70.
Other:				
Mineral jelly and wax do	32	26	10	West Germany 5; Japan 4; Brazil 4.
Nonlubricating oils do	10	18	16	NA.
Petroleum coke do	--	1	1	
Unspecified do	(3)	2	1	Venezuela 1.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	891	1,737	1,011	Belgium-Luxembourg 616; United Kingdom 104.

NA Not available.
[1]Unreported quantity valued at $726,000.
[2]Unreported quantity valued at $1,000.
[3]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Bauxite.—The Colombian state mining company, ECOMINAS, announced the discovery of an estimated 80 million tons of high-grade bauxite ore in southwestern Colombia. The deposit was found near the boundary between Valle del Cauca and Cauca Departments. It may represent a portion of the clayey bauxites of Morales-Cajibío, Cauca Department, and San Antonio in Valle del Cauca Department, which have been under investigation for several years.

Copper.—The Mocoa copper-molybdenum deposits in the region of Putumayo have been under study in cooperation with the United Nations since 1977. Examined drill cores have indicated ore grades averaging 0.06% molybdenum and 0.43% copper. Reserves were estimated at 160 million tons. Exploratory drilling was scheduled to continue until late 1982, followed by a prefeasibility study of reserves, options, and financial models.

By the end of 1981, INGEOMINAS had completed over 37,000 feet of exploration drilling in the Pegadorcito porphyry copper deposit in the Departments of Chocó and Antioquia. INGEOMINAS worked in cooperation with the United Nations and a Japanese group. As a result, Pegadorcito ore reserves were estimated at 200 million tons grading between 0.7% and 1.2% copper along with some molybdenum.

Iron Ore.—In 1981, iron ore production was valued at about $7 million and represented almost 2% of the total value of mineral production, excluding petroleum. The major portion of iron ore was mined and consumed by the integrated steel complex of Acerías Paz del Río S.A. (APR).

Studies continued on the iron ore deposits at Montelibano in Córdoba Department near the Cerro Matoso nickel project. A second deposit at Planeta Rica in the Porvenir Hills was estimated to contain about 7 million tons of reserves averaging 35%

to 55% iron. Total iron ore reserves in Córdoba Department have been reported as 94 million tons.

Iron and Steel.—Through the Instituto de Fomento Industrial (IFI), the Government and a group of four local nonintegrated steel companies announced they would construct a direct-reduction sponge iron plant on Colombia's Caribbean coast. The plant was projected to cost as much as $86 million for a capacity of 250,000 tons per year. IFI would contribute 30% toward financing; private companies, 35%; and the remainder was to come from overseas credit institutions. Construction bids were received from Italy, Brazil, and Japan. The plant was scheduled to open in 1984 or 1985.

Colombia's latest development plan for the steel industry projected a national demand for 1.5 million tons of steel per year by 1985. To encourage domestic steel producers to expand, the plan recommended a free market price for domestic steel and a 20% customs duty on imported steel. An investment of $1 billion would be required to expand the present national steelmaking capacity of 500,000 tons to the goal of 1.5 million tons.

APR launched a program to increase crude steel capacity from 250,000 tons per year to 380,000 tons per year. The expansion cost was estimated at $150 million but the resulting increase in finished steel could provide a foreign exchange savings of $30 million per year. A second APR expansion project to increase production to 1 million tons per year was under discussion. This second expansion would cost $800 million.

The six other Colombian steelmaking companies had plans to bring their combined capacity to about 500,000 tons per year by 1985.

Lead and Zinc.—Colombia registered production of zinc for the first time since 1976. Lead and zinc concentrates were byproducts of gold processing.

Nickel.—Construction of the Cerro Matoso ferronickel project was nearing completion by the end of 1981, and startup was expected in April 1982. Commercial production was scheduled to commence in early July. The $400 million project was to come onstream at an inauspicious time since in 1981 most world nickel producers were reducing production in response to weak demand and low prices.

Hanna Mining Co., with a 20% equity in Cerro Matoso S.A., has provided technical services. Bechtel Corp. was contracted to perform engineering, procurement, and construction management services. Billiton Metals and Ores International B.V., a 35% shareholder in the company through its subsidiary Billiton Overseas, Ltd., has agreed to purchase and market the entire ferronickel output through its overseas marketing companies.

By the end of 1981, about 2 million tons of material had been removed from the open pit mine. This included about 100,000 tons of ore for the plant. The lateritic ore contains finely dispersed nickel in saprolites and saprolitic peridotites (hydrated nickel magnesium silicates). Expected to average over 3% nickel, the 21 million tons of proven ore reserves occur as a blanket on an isolated oval-shaped hill about 200 meters high, 2,500 meters long, and 1,700 meters wide. This has provided relatively easy and economic mining conditions. At the present programed production capacity of 22,600 tons of nickel contained in ferronickel, the mine has an expected life of 25 years. In addition, 41 million tons of ore averaging 1% to 1.5% nickel has been identified, which could extend production an additional 40 years.

Nine 32-ton caterpiller dump trucks have been purchased to transport ore to the blending and preparation section of the plant. The processing description stated that ore from each mining level is to be stockpiled separately and then blended to obtain a uniform plant feed. Blended ore is then to be fed into a natural gas-fired rotary kiln where the moisture content should be reduced from over 20% to approximately 7%. After blending and agglomeration with locally mined bituminous coal, the pellets pass into a prereduction kiln.

The calcined material is to be smelted in a 51-megavolt-ampere 3-electrode circular electric furnace, having an inside diameter of 21 meters. Metal will be collected from the furnace in 40-ton ladles and refined with ladle refining equipment. After the slag has been removed, the metal will be cast into pigs weighing 22.5 kilograms each. The casting machine has a capacity of 60 tons per hour. Cerro Matoso was considering the installation of facilities to produce ferronickel granules.

To maximize the processing of Cerro Matoso ore to ferronickel, extensive research was done at a pilot plant installed at Hanna's nickel smelter in Riddle, Oreg. These

tests resulted in the plant design under construction. Analyses of the resultant ferronickel revealed the following composition:

	Typical percent	Maximum percent
Nickel[1]	37.50	40.00
Cobalt	.75	1.00
Chromium	.10	.20
Phosphorus	.02	.03
Carbon	.02	.03
Sulfur	.02	.03
Silicon	.50	.70
Copper	.10	.20
Iron	Balance	Balance

[1]Minimum nickel content: 35.00%.

The smelting process requires about 75% of the total energy input, supplied primarily from hydroelectric sources. Natural gas is to provide 20% of needed energy, piped 85 kilometers south from the Jobo Tablon Field. The gas will be used for drying the ore and heating the prereduction kiln. Coal and oil were expected to account for 5% of total energy demand, the coal being used as a reductant and the oil for driving mining equipment.

Peak employment during the construction phase has been about 2,000 workers, 98% of whom were Colombians. When operational, Cerro Matoso will employ about 750 workers, at least 96% Colombian.

Precious Metals.—Continuing a traditional pattern, the three metals, gold, silver, and platinum, accounted for 53% of the total value of mineral production, excluding petroleum. The rapid rise in the world market price of gold during recent years has permitted a reevaluation of reserves and the opening of marginal mines. In 1981, small producers accounted for almost 87% of gold production compared with about 30% in 1970. Gold alone in 1981 contributed almost 52% of the total value of nonpetroleum mineral production.

NONMETALS

At the beginning of the 1970's the industrial minerals represented 44% of the total value of mineral production, excluding petroleum. By 1981, their share of total mineral value had diminished to less than 16% because of the relatively low price increases in relation to other groups in the mineral sector. Volumetrically, the industrial minerals have shown dynamic growth, especially limestone, clay, and sand.

Asbestos.—There was a report in 1980 that Minera las Brisas S.A. had initiated production at the chrysotile mine and processing plant near Campamentos in Antioquia Department. Later information indicated that the startup date would be during the last half of 1981. The plant was expected to produce about 6,000 tons of fiber per year, with an eventual production of 16,000 to 20,000 tons per year. All production was to be sold in the domestic market. One of the investors in the project was Eternit Colombiana S.A., an asbestos cement products manufacturer.

Clays.—Clays, including kaolin, ranked third in importance among the industrial minerals, accounting for 10% of their total value and over 1% of the value of total Colombian mineral production. Approximately three-quarters of clay production was consumed by the cement industry. The remainder, based on partial estimates, was used to make bricks and tiles.

Emerald.—Because of the traditional hand digging and sorting mining method and a large contraband market, information on the actual volume and value of emerald production has been incomplete. For the most part it has been obtained indirectly through registered exports.

In 1981, emeralds represented 12% of the total value of all minerals, excluding petroleum, and was surpassed only by gold and coal.

ECOMINAS has recommended the formation of a Bolsa Nacional de Esmeraldas, similar to the Diamond Exchange of Europe, which would regulate the mining and marketing of this gem stone. It was hoped that such a mechanism would assist in curbing the contraband market and provide purchasers with stones of certified value and quality.

Gypsum.—The production of gypsum has shown a gradual 43% gain since 1970. Most production was by small operators who sell to the domestic cement industry. The cement manufacturers have had to also import gypsum owing to the quality of domestic output.

The more important mines were located in Guajira, Santander, Cundinamarca, and Boyacá Departments. The market value of gypsum has not increased significantly during the last decade, reflecting a limited increase in demand in spite of a high potential market.

Limestone.—Limestone production has doubled since 1970 and has consistently been Colombia's most valuable industrial mineral. In 1981, its production value repre-

sented 60% of that for all industrial minerals. Limestone accounted for 9% of the value of total mineral production, its value being surpassed only by gold, coal, and emerald. The total market value of limestone at current prices has hardly kept pace with the growth rate of production and inflation.

Approximately 76% of limestone production has been used by the domestic cement industry, 2% by the iron and steel industry, with most of the remainder used for the manufacture of lime and fertilizer.

Phosphate Rock.—Phosphate rock production has not been significant in Colombia. The peak output of 13,000 tons occurred in 1975. Following several years of sustained decline, production increased but has remained at a low, stable level for the past 3 years. Production was mainly from the Pesca deposits in Boyacá Department and the Sardinata deposits in Norte de Santander Department.

At yearend, ECOMINAS was soliciting bids for a management contract to develop these two phosphate areas. Work included planning and developing open pit and underground mines, the design and construction of phosphate fertilizer plants, and options for financing. The ambitious project would have a production of 800,000 tons per year from underground mines and 120,000 tons per year from open pit mines. Information given in a feasibility study indicated about 47 million tons of reserves in these two areas.

Salt.—Increased mining costs have been responsible for a 25% decrease in rock salt production since 1970. At Nemocón, Cundinamarca Department, and more recently at Upín, Meta Department, salt has been extracted hydraulically. About 84% of rock salt production has come from Zipaquirá, Cundinamarca Department, where traditional underground mining methods have been practiced. This has required both higher investment and more employees than the hydraulic process employed at Nemocón and Upín.

Because of low market prices and a shortage of labor, the production of marine salt has been declining since 1976. In 1981, the problems of low price and labor supply combined with poor weather conditions and technical difficulties and resulted in a cessation of marine salt production at Galerazamba, Bolívar Department, during the second half of the year.

In 1975, salt accounted for over 5% of the total value of mineral production and about 26% of the value of industrial mineral production. In 1981, it accounted for 3% of the value of total mineral production and 19% of the value of industrial mineral production.

Sulfur.—Sulfur deposits in the base material of the Puracé Volcano, in Cauca Department, were mined and refined by Industrias Puracé S.A. Proven reserves have been estimated at 3 million tons averaging 30% sulfur. Annual production since 1970 had occasionally been erratic but remained more or less stable throughout the period. The Puracé deposits revert to Government ownership in 1983, but negotiations have been undertaken to permit the present owners to continue mining.

At Cumbal, Nariño Department, reserves of about 2 million tons grading 22% sulfur have been identified. ECOMINAS planned to study this deposit to determine the prospects for increasing the reserve base and assess its mining feasibility.

MINERAL FUELS

Coal.—Since 1973, events in the international petroleum market have been reflected by an increase in coal demand and higher prices in the domestic market. Production volumes have doubled since 1970, but the 1981 price index, using 1970 as the base year, indicated a 1,400% growth. It was this sharp growth in demand that encouraged the development of many coal mines during the last decade. Coal exports have not exceeded 200,000 tons per year, limited mostly by high transportation costs to port facilities.

In 1970, coal accounted for almost 19% of the total value of mineral production, excluding petroleum, ranking third in value after gold and limestone. In 1981, coal's share of total mineral production value was 18%, ranking second in value after gold.

At the Exxon Corp. El Cerrejón Norte coal project, heavy rains caused delays in completing the road construction between the mine site and Bahia Portete Port. A construction camp at the port was nearing completion, but equipment still had not arrived. Both the Exxon operating subsidiary International Colombia Resources Corp. and its equal partner in the coal venture, State-owned CARBOCOL, have been actively seeking coal sales contracts.

In addition to the large El Cerrejón Norte coal mining project, a smaller project in the

central zone of El Cerrejón has been under study by CARBOCOL. CARBOCOL planned to initiate mining in 1982. An annual production of 300,000 tons of coal was envisaged with successive expansions to 3 million tons per year.

The Empresa Siderúrgica de Medellín S.A. held mineral rights to areas known as La Loma and La Jagua in César Department. Investigations began in 1979 and have cost $1 million thus far. CARBOCOL has a 2-year agreement with Minera Utah de Colombia, Ltd., a subsidiary of Utah International Inc., whereby Minera Utah can evaluate the work so far accomplished. Minera Utah expected to add to the data and prepare a preliminary technical and economic evaluation of the deposits. Plans included a large, mechanized opencast mine with a producing capacity of about 3 million tons per year.

A reassessment of Colombia's coal resources was made in 1981. From this study, it was concluded that by the year 2000 Colombia could expand its production capacity sufficiently to supply 10% of the world coal export market, or 50 to 60 million tons per year. The new evaluation of Colombian coal reserves is shown below, in million tons:

Type	Measured	Indicated	Inferred	Total
Coking	218	7	454	679
Caking	40	31	163	234
Thermal	3,474	292	6,855	10,621
Undefined	57	73	4,859	4,989
Total	3,789	403	12,331	16,523

The export of 50 million tons per year sustained over a 25-year period, plus local consumption projected at 20 million tons per year by the year 2000, would expend only 11% of reserves. At 1981 export market prices, exports of 50 million tons of coal would result in about $3 billion in annual foreign exchange earnings. The majority of these coal exports were expected to come from the El Cerrejón deposits in the Guajira Peninsula.

In the future, Colombia also has expectations of developing a synthetic fuel industry through the production of liquid fuels and chemicals from coal feedstock.

Natural Gas.—By 1985, as coal and hydroelectric energy sources are developed, natural gas is expected to comprise a gradually decreasing share in Colombia's overall energy balance. In 1979, gas provided 13% of total energy consumption, and in 1981 about 16%; but by 1990, this share was expected to be about 11%, and in the year 2000, about 7%.

Weeks Petroleum Co. increased its interest in the Tasajero contract area from 12.5% to 60% following the withdrawal of Amoco Colombia Oil Co. and Colombia-Cities Service Petroleum Co. Meridith Oil Co. was the remaining partner in this consortium of U.S. companies. Tasajero is in eastern Colombia near Cúcuta on the Venezuelan border. In 1981, the Cerrito No. 1 was the discovery well for a new gasfield in the Tasajero area. Eight other promising structures in this area were scheduled to be drilled. Empresa Colombiana de Petroleos (ECOPETROL) may take a 50% interest in the operation once commercial viability has been established.

During 1981, a new natural gas discovery was made along the Caribbean seaboard in the northwestern region of Córdoba Department. The discovery well was followed by a dry hole, but the operator, Petroleos Colombo Brasileros S.A., was proceeding with a third wildcat.

Exxon Corp. drilled a successful exploration well in the Sucre area of the Middle Magdalena Basin. The well tested at 5 million cubic feet of natural gas per day at a depth of 9,280 feet. On the western side of this basin, ECOPETROL completed a wildcat that tested at 4.5 million cubic feet of natural gas per day along with 150 barrels per day of 40° API gravity crude oil.

The percent distribution of natural gas production, by basin, is shown below:

Basin	1973	1978	1981
Guajira	--	19	37
Middle Magdalena	56	45	35
Lower Magdalena	28	21	15
Amazon	11	12	9
Catatumbo	5	2	3
Upper Magdalena	1	1	1
Total	[1]100	100	100

[1]Data do not add to total shown because of rounding.

Petroleum.—In 1980, Colombia published Resolution 058, which increased the base price for oil production from existing fields and established a mechanism for annual price increases. It also provided a formula to determine prices for future incremental output from older fields. The annual price

increase was to be a function of inflation and devaluation of the peso. In 1981, oil prices increased 13% over the 1980 levels. Resolution 058 and its promise of improved financial results from oil operations was viewed as the leading factor in the stepped-up efforts to increase production from existing fields. In 1980 and 1981, the older fields were responsible for most of the overall petroleum production gains.

The percent distribution of crude oil production, by basin, is shown below:

Basin	1973	1978	1981
Middle Magdalena	49	55	52
Upper Magdalena	2	11	23
Amazon	29	21	14
Catatumbo	19	12	8
Eastern Plains	--	1	3
Lower Magdalena	2	2	1
Total[1]	100	100	100

[1]Data may not add to totals shown because of rounding.

ECOPETROL association contracts with private companies or groups continued to increase during 1981. By the end of the year ECOPETROL had 40 association contracts with 29 companies acting either singly or as members of a group. These contracts covered about 28 million acres, of which 58% were in the Eastern Plains and 21% were in the Lower Magdalena Basin. The standard association contract required the foreign or associated company to assume all exploration costs. Once a discovery has been proven to be commercially viable, ECOMINAS reimburses one-half of the exploration costs and shares all subsequent development expenses as an equal partner in the venture.

Exploratory drilling increased in 1981, and a total of 61 wells were drilled. Of these, 16 were successful, 2 were suspended, 2 were abandoned, 3 were test wells, and 38 were dry holes. ECOPETROL drilled 12 of these exploration wells. Foreign oil companies drilled the remainder, 45 under association contracts and 4 under preexisting concession contracts.

International Petroleum (Colombia) Ltd. (INTERCOL), an Exxon Corp. subsidiary, drilled a confirmation well in its new Arauca Field located in the Eastern Plains of Colombia near the Venezuelan border in Arauca Department. The Arauca No. 2, located about 1 mile northeast of the 1980 discovery well, the Arauca No. 1, confirmed what was considered the most significant Colombian oil discovery in the past 18 years. From an upper zone at a depth of 18,100 feet, the well flowed 2,200 barrels per day of 40° API gravity oil. A lower zone at 19,200 feet flowed 1,900 barrels per day of 32° API gravity oil.

Reserves in the Arauca Field were estimated to be as much as 175 million barrels. It was thought that the field could produce up to 30,000 barrels of crude oil per day. INTERCOL was considering an investment of $1.2 billion during the next 5 years to drill as many as 50 wells. The depth of this field was expected to make development slow and costly. If the field continued to be promising, a $52 million pipeline would be built to the Barrancabermeja refinery.

Exxon added to its concessionary acreage in the Llanos, or Eastern Plains region, through its INTERCOL subsidiary Provincia Petroleum Co. Provincia took a tract to the west and north of Société Nationale Elf Aquitaine's concession where several successful fields were discovered in 1979, and in 1980 at Casanare. Pennzoil Co. has two contracts with ECOPETROL covering 1.5 million acres in the Eastern Plains region and planned to drill in 1982 following seismic work undertaken in 1981.

ECOPETROL was also successful in the Eastern Plains when it drilled the Apiay No. 1 about 100 kilometers east of Bogotá. This well tested at 4,500 barrels per day of metal- and sulfur-free crude oil with 25° API gravity. The producing zone was at a depth of about 10,500 feet. ECOPETROL was continuing its exploration drilling with a second well expected to be completed early in 1982.

Other new onshore areas under investigation included southwestern Colombia around Tumaco; a tract in the west-central coastal basin; an area south of Cartagena; and another east of Cartagena in the Lower Magdalena Valley.

The Inter-American Development Bank granted ECOPETROL a $10 million loan to assist in financing marine seismic studies off the Caribbean and Pacific coasts. The initial cost of this exploration program was estimated at $13 million.

In August, Texas Petroleum Co. (TEXPET), in association with ECOPETROL, initiated a steam injection project in the Cocorná and Nare areas north of Bogotá where reserves of heavy, 13° API gravity oil have received minimum attention. TEXPET expected to bring production up to

15,000 barrels per day in the next 3 years. A total of 144 development wells have been planned for the Cocorná and Nare areas as well as 17 wildcats. In 1981, TEXPET drilled 33 development wells in these two areas. Plans were also underway for exploration and development in the Natagaima area, about 40 miles southwest of Bogotá. Seismic work was planned for this area, after which an undetermined number of wells were expected to be drilled.

At the end of June 1981, Colombia's proved crude oil reserves totaled about 542 million barrels, not including new discoveries still under evaluation. The largest shares of these proved reserves were accounted for by the Middle Magdalena Basin, 52%; and the Upper Magdalena Basin, 21%. As of the end of June 1981, natural gas reserves were estimated at 4.3 trillion cubic feet, of which 75% was attributed to fields in the Guajira Peninsula.

Uranium.—Following preliminary surveys, the Colombian Nuclear Affairs Institute has estimated uranium reserves in the central and eastern areas of the country at 40,000 tons of yellow cake. In 1981, about $12 million was allotted for continuing exploration efforts.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Colombian pesos (Col$) to U.S. dollars at the average exchange rate of Col$54.49=US$1.00. As of Dec. 31, 1981, the rate was Col$59.07=US$1.00.

The Mineral Industry of Cyprus

By John R. Lewis[1]

The Republic of Cyprus, an island in the eastern Mediterranean Sea, is 224 kilometers long and its maximum width is about 96 kilometers. There are two mountain ranges which roughly trend east to west along the north and south coasts. Between them lies a broad basin, which also trends from east to west for most of the length of the island. About the size of the State of Connecticut, Cyprus has been geopolitically divided since 1974. A sector of 3,081 square kilometers, trending east to west and comprising about the northern one-third of the island, is controlled by the Federated Turkish Cypriots. The remainder, 6,170 square kilometers also trending east to west, comprises the south two-thirds of the island and is controlled by the Government of Cyprus. Very little, if any, mineral activity takes place in the Turkish area, and there are no available data. The information in this chapter, therefore, is primarily with respect to the southern sector.

In 1981, Cyprus, a small nation, had no energy resources of its own and only modest economically viable mineral resources. These two factors coupled with an inflation rate of about 14% per year created a balance-of-trade deficit of about $750 million in 1981, up slightly from that of 1980.[2] The value of imports, at about $1,325 million, was more than double the value of the country's exports, which were around $575 million.

Recovery of the Cyprus economy from the 1974 Turkish intervention continued but at a declining rate. Construction and light manufacturing remained strong and active. Construction required mineral raw materials, such as stone, sand and gravel, clay for bricks, etc., but the rate of consumption even of these materials showed less growth than in earlier years. The production of metal ores was off, owing to exhaustion of deposits, reduced world prices, and the location of some deposits in the Turkish sector where no activity was underway.

Inflation continued to inhibit the economic growth of Cyprus. Much of the problem stemmed from the upward spiraling of the cost of crude oil, of which Cyprus imported all of its requirements. The provisional gross national product (GNP) was around $2.2 billion, up considerably from that of 1980. In terms of 1973 constant dollars, however, the GNP only rose about 4.5% in 1981. Contributions to the GNP by mining and related activities declined in 1981, amounting only to 5%. Much of this probably can be attributed to the cessation of production of copper and zinc during 1979-80.

PRODUCTION AND TRADE

Although the production of copper and zinc had virtually ceased in Cyprus by 1981 and chromite production was down owing to depressed world steel markets, other mineral production was generally about equal to that of the previous 2 years. Production data are shown in table 1.

Substantial reserves of asbestos, chrome, gypsum, iron pyrites, marble, building materials, and other minerals occur in Cyprus and could sustain the mining industry there for many years to come. Havara, described as a soft, incoherent but compact-surfaced limestone, was produced in large quantities

in recent years. It was used as a foundation layer in the construction of roads throughout Cyprus. There were also thriving cement and raw mineral pigment industries on the island.

The European Economic Community (EEC) countries continued to be good customers for Cyprus minerals, but purchases by Middle Eastern countries continued to climb, and those countries were Cyprus' best customers, taking 61% of the country's mineral exports. Cyprus bought one-half of the minerals it imported from EEC sources. Monetary values for the country's mineral trade were not available at yearend 1981.

Table 1.—Cyprus: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
METALS					
Chromium ore and concentrate, marketable	14,231	15,339	15,742	16,280	10,381
Copper, mine output, metal content[3]	6,800	5,786	1,200	--	--
Zinc, mine output, metal content	179	--	--	--	--
NONMETALS					
Asbestos	36,684	34,342	35,472	34,535	24,440
Cement, hydraulic thousand tons	1,071	1,107	1,135	1,233	1,035
Clays, crude:					
Bentonite	13,200	8,500	6,669	8,852	[e]30,000
Other:					
For brick and tile manufacture thousand tons	132	[e]200	[e]200	683	550
For cement manufacture do.	444	272	274		
Gypsum:					
Crude	[r]95,028	[r]60,700	46,100	43,550	40,000
Calcined	10,544	18,100	15,300	17,850	23,000
Lime, hydrated	28,262	15,000	[e]18,000	13,984	11,320
Mineral pigments:					
Umber	27,400	29,695	26,000	27,280	20,000
Yellow ocher	273	305	293	200	250
Pyrites	145,161	122,837	46,159	51,533	15,866
Salt, marine	--	[r]3,319	[r]5,870	7,462	9,299
Stone, sand and gravel:					
Dimension stone: Marble	[r]42,000	38,400	52,700	66,200	56,000
Crushed and broken stone:					
Havara thousand tons	[r]795	1,000	1,980	5,101	4,350
Limestone:					
For cement production	865,458	976,443	993,000	[e]990,000	[e]990,000
Other	4,567	18,400	[e]20,000	[e]20,000	[e]15,000
Marl, for cement production	685,901	646,111	633,000	600,000	[e]575,000
Unspecified building stone	46,700	63,000	[r]87,100	105,000	100,000
Sand and aggregate thousand tons	3,353	3,972	4,000	4,209	3,857
Sulfur, S content of marketable pyrites	[r]69,018	63,000	[r]20,837	24,885	7,277
MINERAL FUELS AND RELATED MATERIALS					
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	763	793	850	857	813
Jet fuel and kerosine do.	319	296	296	434	434
Distillate fuel oil do.	830	910	986	1,141	1,036
Residual fuel oil do.	829	861	1,334	1,415	988
Other:					
Liquefied petroleum gas do.	202	204	256	239	215
Asphalt do.	93	97	110	100	148
Unspecified do.	--	45	32	3	4
Refinery fuel and losses do.	196	130	198	188	220
Total do.	3,232	3,336	4,062	4,377	3,858

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Aug. 23, 1982.

[2]In addition to the commodities listed, a variety of other crude construction materials are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Includes the nonduplicative sum of Cu content of all exportable products including copper concentrates, cuprous pyrites, cement copper, and copper precipitates.

Table 2.—Cyprus: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	183	221	--	Netherlands 127; Italy 49; Belgium-Luxembourg 33.
Semimanufactures	152	138	--	United Arab Emirates 60; Saudi Arabia 51; Libya 21.
Chromium: Ore and concentrate	10,699	7,500	--	Austria 3,999; United Kingdom 2,001; Poland 1,500.
Copper:				
Ore and concentrate	12,302	825	--	All to U.S.S.R.
Metal including alloys:				
Scrap	348	332	--	Belgium 120; Italy 58; United Kingdom 46.
Semimanufactures _ kilograms	112	--		
Iron and steel:				
Scrap	9,312	5,877	--	Greece 4,369; Lebanon 966; Italy 512.
Pig iron, cast iron, ferroalloys	NA	50	--	All to United Arab Emirates.
Semimanufactures:				
Bars, rods, angles, shapes, sections	24	106	--	Libya 64; Sudan 25; United Arab Emirates 13.
Universals, plates, sheets	18	54	--	Oman 44; Saudi Arabia 10.
Tubes, pipes, fittings	167	103	--	Libya 38; Qatar 16; United Arab Emirates 16.
Unspecified	68	51	NA	NA.
Lead metal including alloys:				
Scrap	290	17	--	All to Italy.
Unwrought	NA	1	--	All to Greece.
Nickel metal including alloys, scrap	--	19	--	Do.
Silver:				
Ore and concentrate[1] value, thousands	--	$228	--	All to West Germany.
Metal including alloys, unwrought and partly wrought do.	--	$17	--	United Kingdom $16; Lebanon $1.
Titanium: Oxides and hydroxides	NA	21	--	Saudi Arabia 15; Senegal 6.
Zinc metal including alloys, scrap	46	57	--	Netherlands 36; Spain 21.
NONMETALS				
Abrasives, n.e.s.: Natural: Pumice	12	--		
Asbestos, crude	39,107	30,446	--	United Kingdom 6,777; Greece 4,417; Thailand 3,659.
Cement	r619,780	656,458	--	Syria 549,976; Lebanon 93,733; Saudi Arabia 11,746.
Chalk	NA	21	--	All to Saudi Arabia.
Clays and clay products:				
Crude	6,487	23,273	--	Netherlands 9,179; Nigeria 5,400; Kuwait 2,814.
Products including refractory nonclay brick value	$24,900	$94,510	NA	NA.
Fertilizer materials: Manufactured	r2	2	--	All to Lebanon.
Gypsum and plaster	9,640	8,148	--	Malawi 2,540; Kuwait 1,500; Saudi Arabia 1,164.
Lime	80	--		
Mica: Crude including splittings and waste	NA	1	--	All to Greece.
Pigments, mineral:				
Natural, crude	10,383	6,206	3,692	United Kingdom 1,217; Denmark 268; Egypt 156.
Iron oxides, processed	NA	4	--	Syria 2; Bahrain 1; Saudi Arabia 1.
Pyrites (gross weight)	143,224	89,441	--	Greece 45,943; Egypt 34,733; Yugoslavia 8,750.
Salt	281	4	--	All to Saudi Arabia.
Sodium and potassium compounds, n.e.s.:				
Soda ash	NA	3	--	Do.
Stone, sand and gravel:				
Dimension stone, calcareous, crude, and partly worked	246	27	--	Bahrain 20; Saudi Arabia 7.
Gravel and crushed rock	75	265	--	All to Saudi Arabia.
Other: Building materials of asphalt, asbestos and fiber cement, unfired nonmetals value, thousands	$205	$835	--	Saudi Arabia $291; Bahrain $190; Netherlands $92.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Lubricants 42-gallon barrels	1,678	189	--	Syria 142; Yemen Arab Republic 45.
Unspecified value	$5,588	$213	--	All to Lebanon.

rRevised. NA Not available.

[1]May include ore and concentrate of platinum-group metals.

Table 3.—Cyprus: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	4,187	3,621	2	Greece 1,457; Hungary 589; Israel 580.
Chromium: Oxides and hydroxides	NA	1	--	All from West Germany.
Copper:				
Sulfate	5	15	NA	Belgium 8; United Kingdom 5.
Metal including alloys, all forms	460	602	20	Greece 181; United Kingdom 139; Italy 107.
Gold metal including alloys, unwrought and partly wrought, troy ounces	26,127	12,275	NA	United Kingdom 10,027; West Germany 923.
Iron and steel:				
Scrap	3	73	--	Mainly from Lebanon.
Pig iron, ferroalloys, similar materials	1,073	109	--	United Kingdom 43; France 35; West Germany 15; Sweden 10.
Steel, primary forms	56	4	--	Austria 2; United Kingdom 1.
Semimanufactures:				
Bars, rods, angles, shapes, sections	114,656	63,716	--	Greece 11,774; Italy 10,302; West Germany 7,965.
Universals, plates, sheets	15,016	15,610	--	Greece 5,119; Italy 2,533; Israel 2,404.
Hoop and strip	3,371	2,339	(1)	Greece 2,101; West Germany 67; Belgium 49.
Rails and accessories	--	38	--	West Germany 37; Spain 1.
Wire	4,349	2,919	1	United Kingdom 878; Belgium 473; U.S.S.R. 299.
Tubes, pipes, fittings	20,640	14,536	1	Greece 4,020; Hungary 2,248; United Kingdom 1,202.
Castings and forgings, rough	4	37	--	India 26; Spain 6; United Kingdom 4.
Lead:				
Oxides and hydroxides	105	108	--	United Kingdom 92; France 16.
Metal including alloys, all forms	713	1,053	--	Denmark 862; United Kingdom 133; United Arab Emirates 40.
Manganese: Oxides and hydroxides	2	11	--	United Kingdom 6; Belgium 5.
Nickel metal including alloys, all forms	9	29	(1)	Denmark 25; Canada 1; United Kingdom 1.
Platinum-group metals including alloys, unwrought and partly wrought, troy ounces	109	356	NA	NA.
Silver metal including alloys, unwrought and partly wrought, do.	299,378	52,658	NA	NA.
Tin metal including alloys, all forms	9	7	--	United Kingdom 5; Denmark 2.
Titanium: Oxides and hydroxides	368	326	--	United Kingdom 163; West Germany 106; Belgium-Luxembourg 22.
Uranium and thorium including alloys, all forms, kilograms	--	508	--	All from Israel.
Zinc:				
Oxides and hydroxides	9	24	--	United Kingdom 12; Netherlands 6.
Metal including alloys, all forms[2]	240	110	--	Belgium-Luxembourg 106; United Kingdom 3.
Other:				
Ores and concentrates:				
Of base metals	29	133	NA	Australia 128.
Of precious metals, except gold[3], value	$13,839	$4,965	$2,950	United Kingdom $1,916.
Base metals including alloys:				
Waste and scrap, do.	$1,566	$20,885	--	United Kingdom $13,299; Denmark $7,586.
Unwrought and semimanufactures	5	5	NA	NA.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	36	60	NA	Italy 51; United Kingdom 7.
Dust and powder of precious and semiprecious stones, value	--	$22,486	--	United Kingdom $19,730; Israel $2,400.
Grinding and polishing wheels and stones, do.	$216,998	$259,882	$1,000	Italy $91,447; West Germany $40,390; United Kingdom $40,336.
Asbestos, crude	545	790	--	Botswana 689; West Germany 101.
Barite and witherite	NA	6	--	All from West Germany.
Boron materials: Oxide and acid	NA	2	--	Italy 1; West Germany 1.
Cement	11,265	11,411	--	Italy 6,771; Greece 2,708; United Kingdom 1,904.
Chalk	923	762	--	United Kingdom 515; Greece 167; France 74.
Clays and clay products:				
Crude	2,054	1,276	100	Greece 945; Netherlands 106; United Kingdom 73.

See footnotes at end of table.

Table 3.—Cyprus: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products —Continued				
Products:				
Nonrefractory value, thousands	$6,709	$6,704	--	Italy $5,108; United Kingdom $455; Greece $416.
Refractory including nonclay brick ---do---	$927	$694	$2	West Germany $153; Brazil $141; Greece $109.
Diamond:				
Gem, not set or strung ---value---	$148,285	$317,363	--	United Kingdom $211,393; Belgium $88,270; Zaire $17,014.
Industrial ---do---	$1,219	$2,868	--	All from United Kingdom .
Diatomite and other infusorial earth	117	174	133	West Germany 41.
Fertilizer materials:				
Crude ---value---	$5,808	$26,238	--	Greece $13,166; Canada $12,945.
Manufactured:				
Nitrogenous	19,669	13,906	4	Romania 8,098; Austria 2,804; Yugoslavia 2,000.
Phosphatic	3,009	1,320	--	Tunisia 870; Portugal 450.
Potassic	1,038	408	--	Israel 306; Portugal 100.
Other including mixed	38,326	16,492	29	Greece 8,696; Spain 6,001; Belgium-Luxembourg 638.
Ammonia	15	25	--	Netherlands 15; United Kingdom 8; West Germany 2.
Gypsum and plaster	21	15	1	United Kingdom 12.
Lime	223	--		
Magnesite	--	130	--	Netherlands 106; West Germany 24.
Mica: Crude including splittings and waste	--	23	--	United Kingdom 12; India 10; Norway 1.
Pigments, mineral: Iron oxides, processed	32	37	--	West Germany 18; United Kingdom 13.
Precious and semiprecious stones, except diamond:				
Natural ---value---	$133,018	$247,487	--	United Kingdom $171,000; Ghana $22,000; Italy $17,000.
Manufactured ---do---	$19,923	$19,970	--	United Kingdom $10,000; West Germany $6,000.
Salt and brine	714	365	--	United Kingdom 162; Israel 129; Netherlands 64.
Sodium and potassium compounds, n.e.s.:				
Caustic potash including sodic and potassic peroxides	21	289	--	Romania 200; Spain 75; United Kingdom 14.
Caustic soda	446	600	--	West Germany 272; United Kingdom 147; Spain 55.
Soda ash	495	844	--	Bulgaria 325; United Kingdom 319; France 150.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	2,533	2,614	--	Italy 1,684; Greece 930.
Worked ---value---	$462,822	$791,072	--	Italy $607,354; Greece $85,074; Bulgaria $36,681.
Gravel and crushed rock	1,113	985	--	Italy 957; Greece 24.
Quartz, mica, feldspar, etc ---value---	$25,610	$15,235	NA	NA.
Sand excluding metal-bearing	328	596	7	West Germany 446; Belgium-Luxembourg 51.
Sulfur:				
Elemental:				
Other than colloidal	1,547	2,857	2	Poland 1,399; Lebanon 1,219; Greece 221.
Colloidal	--	40	--	Mainly from Poland.
Sulfuric acid	278	302	--	Greece 285; Netherlands 12; West Germany 3.
Talc, steatite, soapstone, pyrophyllite	518	208	--	Greece 115; Norway 60; India 17.
Other:				
Crude value, thousands	r$20	$37	--	Greece $27; Netherlands $4; United Kingdom $3.
Halogens and sulfur compounds of nonmetals kilograms	457	102	--	United Kingdom 51; West Germany 51.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals value, thousands	$1,025	$1,425	--	Greece $1,058; United Kingdom $176; Italy $123.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	73	--	Greece 40; United Kingdom 33.
Carbon black	4	4	2	West Germany 1; United Kingdom 1.

See footnotes at end of table.

Table 3.—Cyprus: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal:				
Anthracite, bituminous coal, lignite	55	35	--	West Germany 25; Belgium-Luxembourg 7.
Briquets	17	16	--	West Germany 15; Malta 1.
Coke and semicoke	125	201	--	All from Belgium.
Hydrogen, helium, rare gases	4	14	--	NA.
Peat including briquets and litter	575	1,311	--	West Germany 1,041; Ireland 261; Netherlands 9.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	3,546	4,305	--	Iraq 3,898; Saudi Arabia 407.
Refinery products:				
Gasoline including natural do	19	17	--	France 16.
Kerosine and jet fuel do	349	303	--	Italy 196; France 44; Greece 24.
Distillate fuel oil do	103	51	--	Italy 22; France 15; Greece 8; Spain 5.
Residual fuel oil do	1,685	2,043	--	U.S.S.R. 1,357; Sudan 381; Ethiopia 172; Italy 133.
Lubricants do	62	52	(1)	United Kingdom 20; Netherlands 9; Italy 7.
Mineral jelly and wax do	2	4	--	France 2.
Other:				
White spirit do	5	12	NA	France 6; Netherlands 3; Greece 2.
Liquefied petroleum gas do	111	171	--	Italy 101; Greece 57; Iran 8.
Bitumen and other residues and bituminous mixtures, n.e.s. do	7	5	(1)	United Kingdom 2; Italy 1; Syria 1.
Unspecified do	1	(1)	NA	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals value	$32,501	$27,936	--	United Kingdom $18,000; Netherlands $4,000.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]Excludes unreported quantities valued at $65,500 in 1979 and $31,400 in 1980.
[3]May include waste and sweepings.

COMMODITY REVIEW

METALS

Chromite.—Probably because of severe cutbacks in world steel demand, production of chromite was off significantly in 1981. Most of that produced from Cyprus' two active chromite operations, the Kokkinorotsos and Kannoures Mines in the Troodos Mountains in west-central Cyprus, was exported to European and United Kingdom customers.

NONMETALS

Asbestos.—There was one producer of asbestos in Cyprus in 1981, Cyprus Asbestos Mines, Ltd., at Amiandos. The Amiandos operation was open pit with onsite ore concentration. Capacity was reported to be 5,000 tons per day. About 12,500 tons of long-fiber asbestos plus 12,000 tons of the short-fiber variety were produced in 1981 and went mostly to the United Kingdom and Greece. Since the production of copper ceased, asbestos has been Cyprus' principal mineral export, but recognition that it was a possible hazard to health was probably responsible for a 35% drop in production.

Bentonite.—A prime ingredient in oil-well drilling mud, bentonite production rose dramatically during 1981. This was not surprising, however, when the close proximity of Cyprus to all of the Middle East's intensely active oil development was considered.

Cement.—Despite a leveling off of the country's economy, about the same amount of hydraulic cement, 1.2 million tons, was produced during 1981 as in 1980. Only about 7,500 tons was sent out of the country to nearby Middle Eastern customers. The remainder was used in Cyprus, mostly in construction.

Fertilizer Materials.—Hellenic Chemical

Industries, Ltd., a joint venture of the Hellenic Mining Co. (40%), Cyprus Cooperative Industries, Ltd. (35%), the Government of Cyprus (15%), and the Archbishopric (10%), was well along by the end of 1981 with construction of its fertilizer complex at Vassiliko. The complex was to use pyrites from Cyprus' own reserves to make sulfur. Phosphate rock for the phosphoric acid plant was to come from the Palmyra area of central Syria.

The sulfuric acid plant went onstream during 1981 and had a capacity of 180,000 tons per year. The complex also had the capability to produce 40,000 tons per year of phosphoric acid plus 150,000 tons per year of fertilizers, about 40,000 to 50,000 tons of which were to be used in Cyprus while the balance was to be exported.

The phosphoric acid plant and the fertilizer plant were being built by Lurgi Verwaltungs GmbH of the Federal Republic of Germany. Power for the complex was to come from generating equipment built by General Electric of the United Kingdom, and the ammonia-storage facility was to come from Polimex-Cekop of Poland.

Umber.—A naturally occurring brown earth containing ferric oxide together with silica, alumina, manganese oxides, and lime, umber was produced in large quantities in Cyprus. Raw umber, which was ground and then levigated, together with burnt umber, which was processed at low heat, was exported and also used locally as paint pigment. Umber producers were headquartered in Lanarca on the south coast.

MINERAL FUELS

Petroleum.—Except for very small amounts of imported coal, coke, and peat, Cyprus was fueled entirely on petroleum products. The country had no domestic crude petroleum resources or production in 1981 and relied mostly on Iraq and Saudi Arabia for its supplies of crude oil. Cyprus' sole refinery was at Lanarca on the south coast. Operating as the Cyprus Petroleum Refinery, Ltd., the plant was jointly owned by Shell Oil Co.; British Petroleum Co., Ltd.; Mobil Oil Corp.; and the Cyprus Government. Although listed as having a daily throughput capacity of 16,000 barrels of crude, only about 10,400 barrels of various petroleum products were produced daily, mainly regular- and high-octane motor fuels, jet fuel, and heating oils. Small volumes of these products were exported, mostly to Lebanon. Additional kerosine, jet fuel, and all of the country's residual fuel oil needs were imported, primarily from the Soviet Union.

Like many other nations, Cyprus was caught in 1981 between the worldwide recession and total dependency upon foreign oil with its extremely high cost. The petroleum pricing structure continued to play havoc with Cyprus' balance of trade; the value of the oil that Cyprus was required to import was roughly equal to one-half the value of everything that Cyprus exported.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Cyprus pounds (£C) to U.S. dollars at the rate of £C1 = US$2.38.

The Mineral Industry of Czechoslovakia

By Tatiana Karpinsky[1]

Czechoslovakia, with a highly industrialized economy, continued to experience slow growth in 1981. The key goals of the state plan for 1981 included improved efficiency of labor, further development of Czechoslovakia's economy, and improving the balance of payments. However, the goals of the state plan were not met in some sectors (table 1). A shortage of labor was one of the main problems.[2]

Table 1.—Czechoslovakia: Selected production increases for 1981, in percent

Item	Original plan	Fulfillment
National income	2.8	0.2
Industrial output	2.7	2.0
Productivity in industry	2.2	1.6
Coal (bituminous)	-.4	-2.4
Electric energy	2.0	1.0
Metallurgy	1.2	.9

In 1981, Czechoslovakia's national income (gross national product less material costs) reached 454 billion korunas (Kcs),[3] about 0.2% more than that of 1980, compared with a planned increase of 2.8%. Industry contributed 59% of the total. In 1981, capital investment declined 1.9% in comparison with the 1980 level, but considerable amounts were nevertheless spent on expansion of the fuel-energy sector. Mining and quarrying contributed about 4% of the total industrial production in Czechoslovakia. Of this, the share of coal was about 3%; crude oil, 0.1%; metallic ore, 0.5%; and other mining, 0.4%. Petroleum refining contributed about 9% of total industrial output. The nonferrous industry contributed 2.5%, and the nonmetallic mineral industry contributed 2.7%. Consumption of ferrous metals amounted to 5.6 million tons and that of nonferrous metals to 267,000 tons in 1980. The country's domestic iron ore and nonferrous metal production covered its needs only to the extent of 7% and 31%, respectively.

In 1981, the total number of workers and employees in Czechoslovakia was 2,008,000. The number of production workers and other employees in state mineral and energy enterprises by branch is shown in table 2 for 1980.

Table 2.—Czechoslovakia: Workers and employees in 1980

Branch	Number of workers	Number of employees	Number of enterprises
Fuel extraction and processing industry	176,000	137,000	55
Power and heat generation	57,000	38,000	27
Iron and steel production (including ore mining)	168,000	124,000	14
Nonferrous metal production (including ore mining)	43,000	31,000	20

Government Policies and Programs.—The basic tasks and targets of the 1982 state plan were approved by the Communist Party of Czechoslovakia in December 1981. The plan called for a 0.6% increase in national income and an 0.8% increase in gross industrial output. Primary production of fuel and energy was not to exceed the 1980 yield. Imports of oil, electric energy, and coal were expected to be lower than in 1981.

PRODUCTION

Czechoslovakia has reserves of coal, lignite, antimony, magnesite, mercury, uranium, graphite, kaolin and other clays, sand, limestone, and building materials, but the country remains deficient in oil, natural gas, iron ore, and nonferrous ores.

In 1981, the annual plan for coal production was not fulfilled because of bad weather in the fourth quarter and a labor shortage; the planned target for the removal of overburden was also unfulfilled. Nevertheless, no shortages of fuel developed. Electric energy production amounted to 73.5 billion kilowatt-hours, an increase of 1% over that of 1980. The one nuclear powerplant accounted for 83.6% of the total increase in electric energy production. The production increase in ferrous metallurgy amounted to 1.5%, while a 1.8% decrease was registered in ore output and dressing. Production of nonferrous metals slightly declined (0.9%). Crude oil processing declined 0.5%. Cement production was at the 1980 level. River transportation carried 11.1 million tons of goods, or 6.1% more than in 1980. Transportation of coal for the Chvaletice powerplant largely accounted for the increase.

Table 3.—Czechoslovakia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum:					
Alumina[e]	95,000	100,000	100,000	100,000	100,000
Aluminum ingot, primary only	36,544	36,823	36,889	38,304	32,684
Antimony:					
Mine output, metal content	[r]492	[r]510	[r]530	530	480
Metal[e]	700	700	NA	NA	NA
Copper:					
Mine output, metal content	5,400	4,700	6,180	6,639	5,218
Metal:					
Smelter, primary only	7,400	6,700	8,180	7,600	7,400
Refined including secondary	23,067	23,810	24,587	25,559	25,513
Iron and steel:					
Iron ore:					
Gross weight thousand tons	1,994	2,023	2,012	1,969	1,932
Metal content do	598	607	[r]523	512	502
Metal:					
Pig iron do	9,715	9,944	9,529	9,819	9,903
Ferroalloys: Electric furnace do	180	182	175	173	173
Crude steel do	15,064	15,294	14,817	15,225	[2]15,270
Semimanufactures:					
Rolled steel do	10,588	10,787	10,781	10,760	[2]10,795
Pipes and tubes	1,483	1,510	1,536	1,542	1,528
Lead:					
Mine output, metal content	4,300	3,981	4,026	3,349	2,700
Metal including secondary	19,015	19,042	19,020	20,014	20,015
Manganese ore, gross weight[3]	910	900	900	900	900
Mercury 76-pound flasks	5,309	5,686	4,960	4,612	4,438
Nickel metal, primary	[e]2,200	[e]2,200	2,202	2,241	2,200
Silver[e] thousand troy ounces	1,192	1,300	1,300	1,300	1,300
Tin:					
Mine output, metal content	180	180	180	180	180
Metal including secondary	120	120	120	125	125
Tungsten, mine output, metal content[e]	80	80	80	80	80
Zinc:					
Mine output, metal content	9,368	8,772	8,799	7,239	7,200
Metal including secondary	[e]11,500	[e]11,500	11,500	9,600	9,600
NONMETALS					
Barite	[e]65,000	[e]65,000	67,800	61,052	61,000
Cement, hydraulic thousand tons	9,749	10,204	10,258	10,546	[2]10,646
Clays: Kaolin do	580	499	513	518	515
Fluorspar[e]	96,000	96,000	96,000	96,000	96,000
Graphite[e] thousand tons	45	45	45	45	45
Gypsum and anhydrite, crude do	682	697	734	757	767
Lime, hydrated, and quicklime do	3,021	3,078	2,968	3,012	[2]3,234
Magnesite, crude do	661	658	654	666	660
Nitrogen: N content of ammonia do	[r]788	[r]809	[r]801	844	850
Perlite	[e]10,000	[e]20,000	[e]30,000	40,302	42,336
Pyrites, gross weight thousand tons	122	134	140	[e]140	140

See footnotes at end of table.

Table 3.—Czechoslovakia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Salt thousand tons	254	258	271	277	270
Sodium compounds:					
Caustic soda do	312	311	312	325	331
Sodium carbonate, manufactured do	118	121	119	123	132
Stone:					
Limestone and other calcareous stone do	22,761	23,174	[r]23,209	23,884	24,155
Quarry stone, not further described thousand cubic meters	32,990	34,368	[r]35,280	36,290	36,500
Sulfur:[e]					
Native thousand tons	5	5	5	5	5
From pyrites do	55	60	60	60	60
Byproduct, all sources do	9	10	10	10	10
Total do	69	75	75	75	75
Sulfuric acid do	1,276	[r]1,195	[r]1,253	1,284	1,317
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e]	30,000	30,000	30,000	30,000	30,000
Coal:					
Bituminous thousand tons	27,450	27,799	27,967	27,710	[2]27,513
Brown do	90,696	92,450	93,731	92,529	[2]93,096
Lignite do	3,354	3,269	3,201	3,197	[2]2,700
Total do	121,500	123,518	124,899	123,436	[2]123,309
Coke:					
Metallurgical do	8,816	8,809	8,569	8,445	8,445
Unspecified do	2,045	1,976	1,889	1,878	1,878
Total do	10,861	10,785	10,458	10,323	10,323
Fuel briquets from brown coal do	1,255	1,130	1,117	1,159	1,159
Gas:					
Manufactured, all types million cubic feet	279,094	282,136	275,983	274,323	274,000
Natural, marketed[4] do	35,355	26,129	[e]26,000	[e]26,000	26,000
Petroleum:					
Crude:					
As reported thousand tons	123	117	108	93	89
Converted thousand 42-gallon barrels	834	793	732	629	603
Refinery products:[5]					
Gasoline do	13,940	13,917	[r]14,790	12,903	12,200
Kerosine do	2,612	3,658	[r]3,759	4,084	4,000
Distillate fuel oil do	31,034	31,670	[r]33,167	30,922	28,200
Residual fuel oil do	57,289	58,484	[r]61,552	62,577	61,800
Lubricants do	1,960	[e]1,925	[e]1,936	[e]1,936	1,936
Other:					
Liquefied petroleum gas do	1,693	[e]1,720	[e]1,694	[e]1,694	11,800
Asphalt and bitumen do	7,836	[e]7,880	[e]7,986	[e]7,986	
Paraffin wax do	[e]120	[e]120	[e]121	[e]121	
Total do	116,484	119,374	125,005	122,223	119,936

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 13, 1982. In addition to the commodities listed, arsenic, gold, uranium, feldspar, graphite, and a variety of other petroleum products are produced, but information is inadequate to make reliable estimates of output levels.

[2]Reported figure.

[3]This material, although reported as manganese ore, is believed to be manganiferous iron ore with a manganese content of about 17% and as such is not equivalent to material ordinarily reported as manganese ore, which generally contains 25% or more manganese.

[4]Includes gas produced from coal mines. Gross output of natural gas is not reported, but it is believed to exceed reported marketed output by a relatively inconsequential amount.

[5]Data presented are for those products reported in official Czechoslovak sources and in United Nations publications; no estimates have been included for other products or for refinery fuel and losses.

TRADE

In 1981, exports rose faster than imports. Total trade increased 7.5%, and that with centrally planned economy countries 10.6%. Approximately two-thirds of the foreign trade turnover was under long-term agreements with centrally planned economy countries. The Soviet Union's share in Czechoslovakian foreign trade was about 36% in 1981. The Soviet Union supplied about 83% of Czechoslovakia's needs for iron ore and about three-fourths of the country's imports of most nonferrous metals, petroleum, and natural gas.

In 1980, fuels, minerals, raw materials, and metals contributed 17.2% to total export value and 31.7% to total import value. The main exports in this group were metallurgical products, in particular rolled stock, coal, and coke. Deliveries of raw materials and fuels under long-term agreements, primarily from the Soviet Union, were a stabilizing factor.

The Soviet Union supplied 18 million tons of crude oil, 17 million tons of iron ore and metals used in alloying steel, 100,000 tons of aluminum, 2.2 billion kilowatt-hours of electric energy, 32,000 tons of asbestos, 60,000 tons of ammonia, 165,000 tons of apatite concentrate, and more than 300,000 tons of mineral fertilizers.

During the year Czechoslovakia erected two urea plants in Cherkassy and Dneprodzerzhinsk, both in the U.S.S.R., and completed the deliveries for a similar plant in Angarsk, also in the U.S.S.R. Czechoslovakia also delivered equipment for several large Soviet ammonia plants and for phosphate grinding mills in Karatau. Other deliveries to the U.S.S.R. included equipment for catalytic reforming for a Moscow refinery, with an annual output of 1 million tons of high-octane gasoline, and more than 13,000 tons of equipment for the rolling mill plant in Zhdanov.

A trade protocol for 1982 between the U.S.S.R. and Czechoslovakia was signed on December 11, 1981, according to which trade turnover between the two countries will reach about 9 billion rubles, an increase of about 10% over that of 1981. As before, machinery and equipment will account for the largest share in Czechoslovak exports to the U.S.S.R. Deliveries by the U.S.S.R. of the main types of raw materials necessary for the further development of the Czechoslovak economy, including crude oil, natural gas, coal, electrical energy, iron ore, and metals, will be continued.

In 1982, imports of crude oil from the U.S.S.R. were planned to be reduced by 2.5 million tons and imports of gas were to be reduced by about 700 million cubic meters. By the end of the current 5-year plan period, trade turnover between Czechoslovakia and the U.S.S.R. is to be about 13 billion rubles.

Table 4.—Czechoslovakia: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxide and hydroxide	60	36	36	
Metal including alloys:				
Scrap	3,485	3,301	--	Austria 2,463; West Germany 507; Italy 210.
Unwrought	18,168	10,079	--	Japan 7,533; Hungary 1,881; Austria 220; Italy 220.
Semimanufactures	[r]5,518	[2]5,301	--	Poland 4,367; Hungary 765; Indonesia 149.
Antimony, elemental	105	12	--	All to Spain.
Chromium oxide and hydroxide	--	16	--	All to West Germany.
Copper:				
Ore and concentrate	506	520	--	All to United Kingdom.
Sulfate	2,159	1,889	--	West Germany 969; Italy 640; Switzerland 115.
Metal including alloys:				
Scrap	1,261	1,385	--	Austria 882; West Germany 503.
Unwrought	7,847	559	--	West Germany 539.
Semimanufactures	[r]961	443	--	Poland 378; West Germany 41; Finland 18.
Germanium metal including alloys, all forms kilograms	--	100	--	All to West Germany.

See footnotes at end of table.

Table 4.—Czechoslovakia: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Pyrites, roasted ____ kilograms	3,010	28,474	--	All to Hungary.
Metal:				
Scrap ____ do ____	124,174	99,490	--	Italy 75,037; West Germany 12,823; Austria 10,033.
Pig iron, cast iron, powder, shot ____ do ____	4,971	3,839	--	West Germany 1,519; Finland 612; United Kingdom 537.
Ferroalloys ____ do ____	30,784	36,839	--	West Germany 15,368; United Kingdom 5,211; Austria 4,852.
Steel, primary forms[3] ____ thousand tons	484	408	--	Yugoslavia 185; Italy 63; U.S.S.R. 40; Spain 36.
Semimanufactures:				
Bars, rods, angles, shapes, sections ____ do ____	[4]1,193	[4]1,234	2	West Germany 165; East Germany 77; Egypt 69; undetermined 653.
Universals, plates, sheets ____ do ____	[4]923	[4]902	--	Poland 166; Yugoslavia 106; West Germany 103.
Hoop and strip ____ do ____	[4]213	[4]223	--	Yugoslavia 28; West Germany 11; France 9; undetermined 142.
Rails and accessories ____ do ____	[4]16	[4]22	--	NA.
Wire ____ do ____	[4]117	[4]114	--	Hungary 17; West Germany 16; undetermined 72.
Tubes, pipes, fittings[3] ____ do ____	553	551	[5]7	U.S.S.R. 386; Poland 28; West Germany 26.
Castings and forgings, rough ____ do ____	[4]34	[4]27	--	Poland 16.
Unspecified[3] ____ do ____	1,320	1,296	--	Yugoslavia 367; Poland 197; East Germany 180.
Lead:				
Ore and concentrate ____	7,133	5,998	--	West Germany 4,680; Belgium-Luxembourg 1,315.
Metal including alloys: Scrap ____	89	55	--	West Germany 43; Austria 12.
Magnesium metal including alloys:				
Scrap ____	--	15	--	All to West Germany.
Semimanufactures ____ kilograms	327	296	--	All to Jordan.
Nickel metal including alloys:				
Scrap ____	634	250	--	All to West Germany.
Semimanufactures ____	--	4	--	France 3; West Germany 1.
Platinum-group metals including alloys, unwrought and wrought ____ value, thousands	[r]$702	$232	--	All to United Kingdom.
Silver:				
Waste and sweepings[6] ____ do ____	$14	$5	--	All to Saudi Arabia.
Metal, including alloys, unwrought and partly wrought ____ do ____	$1	$1,781	--	Italy $1,755.
Tin:				
Ore and concentrate ____	92	NA		
Metal including alloys:				
Unwrought ____ kilograms	18	NA		
Semimanufactures ____	--	1	--	All to Canada.
Titanium oxide ____	2,406	2,125	--	Italy 740; West Germany 460; United Kingdom 360.
Tungsten:				
Ore and concentrate ____	36	NA		
Metal including alloys, all forms ____ kilograms	--	46	--	All to Japan.
Zinc:				
Ore and concentrate ____	11,472	8,397	--	West Germany 4,571; Belgium-Luxembourg 2,005.
Oxide and hydroxides ____	701	725	--	Saudi Arabia 478; West Germany 133; Italy 60.
Metal including alloys:				
Scrap ____	617	226	--	All to West Germany.
Unwrought ____	41	150	--	Poland 109; West Germany 41.
Semimanufactures ____	[r]138	146	--	All to Saudi Arabia.
Zirconium metal including alloys, all forms ____ kilograms	2	NA		
Other metals, n.e.s.:				
Ores and concentrates ____	--	300	--	All to Saudi Arabia.
Ash and residue containing nonferrous metals ____	10,613	3,695	--	West Germany 3,211; Austria 255; Belgium-Luxembourg 212.
Oxides, hydroxides, peroxides ____	21	25	--	Austria 20; Pakistan 5.
Base metals including alloys, all forms	[r]45	[r]23	--	United Kingdom 21.

See footnotes at end of table.

Table 4.—Czechoslovakia: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	88	36	--	Egypt 35.
Artificial corundum	4,939	4,468	144	Italy 3,053; West Germany 638; Turkey 208.
Grinding and polishing wheels and stones:				
Quantity	548	892	--	West Germany 269; Italy 176; Thailand 74.
Value, only thousands	$88	$284	$196	Hungary $38; Uruguay $27; Canada $11.
Asbestos, crude	16	NA		
Barite and witherite	5,478	5,487	--	West Germany 4,425; Austria 852.
Cement[3] thousand tons	303	341	--	Yugoslavia 96; Poland 95; West Germany 80.
Clays and clay products:				
Crude:				
Andalusite, kyanite, sillimanite, etc	21,054	23,494	--	All to Austria.
Chamotte earth	121,838	77,967	--	West Germany 33,998; Italy 24,486; Austria 10,894.
Fire clay	35,949	36,097	--	All to Yugoslavia.
Kaolin[3]	382	367	--	West Germany 122; Poland 61; Austria 50.
Other, unspecified	163,968	166,454	--	West Germany 116,522; Hungary 47,384.
Products:				
Refractory	57,967	[5]49,629	--	West Germany 20,768; Poland 7,473; France 2,774.
Nonrefractory	25,353	24,631	3	Yugoslavia 7,701; West Germany 4,016; Austria 3,424.
Diamond:				
Gem, not set or strung value, thousands	$12	$14	--	All to Belgium-Luxembourg.
Industrial do	$108	$361	--	Do.
Diatomite and other infusorial earth	1,026	996	--	Austria 964; Netherlands 21.
Feldspar, fluorspar, etc	--	20	--	All to West Germany.
Fertilizer materials:				
Crude, nitrogenous	--	467	--	All to Turkey.
Manufactured:				
Nitrogenous	241,669	90,571	--	Yugoslavia 40,974; West Germany 20,788; Italy 10,097.
Phosphatic	40	3,460	--	All to Madagascar.
Potassic	--	5,420	--	All to United Kingdom.
Other including mixed	1,614	508	--	Yugoslavia 262; France 246.
Ammonia	1,198	16,489	--	Austria 12,987; West Germany 2,886.
Graphite, natural	768	951	--	Yugoslavia 854; Greece 82.
Gypsum and plasters	--	27	--	All to Austria.
Lime	15,261	8,349	--	All to Hungary.
Magnesite[3] thousand tons	377	385	--	Hungary 82; Poland 70; East Germany 61.
Mica, worked including agglomerated splittings	105	93	--	Yugoslavia 40; Italy 17; United Kingdom 15.
Pigments, mineral: Iron oxides and hydroxides, processed	1,424	1,340	--	Italy 1,280; Yugoslavia 60.
Precious and semiprecious stones:				
Natural value, thousands	$37	$23	--	Hong Kong $15; Canada $6.
Synthetic do	$271	$101	--	West Germany $38; Canada $36; Yugoslavia $13.
Salt and brine	744	2,029	--	Sweden 1,982; Hungary 47.
Sodium and potassium compounds:				
Caustic potash	[r]595	654	--	Yugoslavia 204; Netherlands 130; Italy 92.
Caustic soda	[9]18,100	[9]19,200	--	Yugoslavia 13,613;[3] West Germany 4,459.
Soda ash	[9]19,700	[9]8,200	--	West Germany 7,580; Italy 150.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	2,183	2,115	--	West Germany 1,850; Austria 108; Netherlands 92.
Worked	4,661	9,988	--	West Germany 9,352; Netherlands 336.
Gravel and crushed rock	74,214	2,706	--	West Germany 2,534; Hungary 122.
Limestone, except dimension	22,800	21,614	--	All to West Germany.
Sand excluding metal-bearing	398,071	277,260	--	Austria 187,220; Hungary 88,070.
Sulfur, elemental, other than colloidal	560	1,577	--	Portugal 1,552.
Talc, steatite	6,720	6,627	--	Poland 6,580; Yugoslavia 40.

See footnotes at end of table.

Table 4.—Czechoslovakia: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other, n.e.s.:				
Crude	25,489	24,130	--	Hungary 11,790; West Germany 6,987; Austria 4,472.
Slag, dross, similar waste, not metal-bearing	21,514	24,300	--	All to West Germany.
Halogens	205	NA		
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	18	10	--	All to Italy.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	3,366	3,728	--	Austria 837; East Germany 770; Yugoslavia 621.
Briquets of anthracite and bituminous coal do	[r]196	408	--	All to Greece.
Lignite and lignite briquets[3] do	1,647	2,160	--	West Germany 2,106.
Coke and semicoke[3] do	1,892	1,461	--	East Germany 632; Austria 420; Hungary 199.
Gas, natural million cubic feet	[2]2,341	[2]1,607	--	NA.
Peat including briquets	19	20	--	All to Greece.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	[2]178	[2]2,411	--	NA.
Refinery products:				
Gasoline do	[2]1,998	[2]2,440	--	West Germany 2,304.
Kerosine and jet fuel do	285	339	--	West Germany 262; Yugoslavia 55.
Distillate fuel oil do	[2]1,455	[2]3,999	--	Switzerland 955; West Germany 696; Austria 140.
Residual fuel oil do	124	2,458	--	West Germany 1,287; Austria 1,126.
Lubricants do	[2]50	[2]75	--	Yugoslavia 48; Austria 7.
Other:				
Liquefied petroleum gas do	936	926	--	West Germany 744; Italy 102; Netherlands 39.
Mineral jelly and wax 42-gallon barrels	[r]480	NA		
Bitumen and other residue do	6,799	15,435	--	Austria 15,023.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	34,107	47,874	--	West Germany 13,408; Italy 12,124; Switzerland 8,706.

[p]Preliminary. [r]Revised. NA Not available.

[1]Owing to a lack of official trade data published by Czechoslovakia, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from various sources which include United Nations information, data published by the partner trade countries, and partial official trade sources of Czechoslovakia.

[2]Excludes imports by Uruguay valued at $9,000.

[3]Official trade statistics of Czechoslovakia.

[4]Quarterly Bulletin of Steel Statistics for Europe, United Nations, New York.

[5]Official trade statistics of the United States.

[6]May include waste and sweepings of other precious metals.

[7]Excludes imports by Canada valued at $20,000.

[8]Excludes imports by Cyprus valued at $4,000.

[9]Statistical Yearbook of Member States of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

Table 5.—Czechoslovakia: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite[2] thousand tons	436	466	--	Hungary 330; Yugoslavia 135.
Oxide and hydroxide	29,036	29,520	--	Yugoslavia 20,195; Hungary 9,146.
Metal including alloys:				
Scrap	1	NA	--	
Unwrought[2] thousand tons	88	93	(3 4)	U.S.S.R. 63; Hungary 16; Yugoslavia 8.
Semimanufactures	r20,009	18,322	(4)	Yugoslavia 15,414; Hungary 1,887; Austria 363.
Antimony ore and concentrate	290	NA		
Beryllium, elemental kilograms	--	48	48	
Cadmium metal including alloys, all forms[2]	251	206	--	Japan 70; Finland 45; Yugoslavia 23.
Chromium:				
Chromite[2] thousand tons	168	182	--	U.S.S.R. 131; Austria 20; Switzerland 14.
Oxides and hydroxides	520	2	--	All from Switzerland.
Cobalt:				
Oxides and hydroxides	13	19	--	West Germany 14; United Kingdom 5.
Metal including alloys, all forms	--	29	--	All from Finland.
Copper:				
Ore and concentrate	5587	NA		
Sulfate	--	(4)	--	All from Switzerland.
Metal including alloys:				
Scrap	172	142	--	All from West Germany.
Unwrought[2] thousand tons	58	63	--	U.S.S.R. 39; Poland 12; United Kingdom 11.
Semimanufactures	r23,686	23,529	7	Poland 17,522; Yugoslavia 4,019; West Germany 925.
Iron and steel:				
Ore and concentrate[2] thousand tons	12,459	12,819	--	U.S.S.R. 10,290; Brazil 1,032; India 394.
Metal:				
Scrap do	43	228	--	U.S.S.R. 172; West Germany 56.
Pig iron, cast iron, powder, shot[2] do	732	809	--	U.S.S.R. 804.
Ferroalloys do	5	6	--	West Germany 3; Sweden 2.
Steel, primary forms[6] do	152	36	--	NA.
Semimanufactures:[6]				
Bars, rods, angles, shapes, sections do	97	120	--	NA.
Universals, plates, sheets do	125	136	--	West Germany 17; Bulgaria 10; Italy 6; undetermined 95.
Hoop and strip do	17	23	--	West Germany 3; Austria 2; Hungary 2; undetermined 15.
Rails and accessories do	(4)	4	--	NA.
Wire do	3	3	--	Italy 2; West Germany 1.
Tubes, pipes, fittings do	226	16	(4)	West Germany 7; Poland 2.
Castings and forgings, rough do	12	18	--	NA.
Lead:				
Oxides and hydroxides	3,992	4,007	--	Austria 2,064; France 1,941.
Metal including alloys:				
Scrap	2	NA		
Unwrought[2] thousand tons	40	40	--	U.S.S.R. 25; Yugoslavia 10.
Semimanufactures	6	4	--	Yugoslavia 3; Italy 1.
Magnesium:				
Scrap	1	NA		
Unwrought value, thousands	--	$54	--	All from Norway.
Semimanufactures	9	10	--	West Germany 9.
Manganese:				
Ore and concentrate[2] thousand tons	541	525	--	U.S.S.R. 356; Brazil 95; India 26.
Oxides and hydroxides	15	21	21	
Metal including alloys, all forms	--	49	49	
Mercury 76-pound flasks	--	1,363	--	Turkey 754; Norway 609.
Molybdenum:				
Ore and concentrate	431	533	--	Netherlands 369; Belgium-Luxembourg 119; West Germany 45.
Metal including alloys, all forms kilograms	132	8,286	1,926	United Kingdom 6,000.
Nickel metal including alloys:				
Unwrought[2]	5,580	7,919	--	U.S.S.R. 4,743; Cuba 1,963; United Kingdom 895.
Semimanufactures	69	51	--	West Germany 42; Switzerland 3; United Kingdom 3.
Niobium (columbium) metal including alloys, all forms kilograms	126	158	--	All from West Germany.

See footnotes at end of table.

Table 5.—Czechoslovakia: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$1,759	$8,920	$2	West Germany $6,212; United Kingdom $2,164.
Silver metal including alloys, unwrought and partly wrought ——do	$3,966	$26,411	--	Yugoslavia $14,152; Netherlands $7,727; West Germany $2,654.
Tin metal including alloys:				
Unwrought[2]	3,940	4,085	--	United Kingdom 1,574; Bolivia 1,067; Indonesia 800.
Semimanufactures ——kilograms	1,000	503	--	All from Yugoslavia.
Titanium:				
Ore and concentrate	219	400	--	West Germany 200; Netherlands 200.
Oxides	755	893	--	West Germany 738; United Kingdom 90.
Metal, all forms	4	1	--	All from West Germany.
Tungsten:				
Ore and concentrate	72	248	--	All from Netherlands.
Metal including alloys, all forms kilograms	2,404	1,233	--	All from Japan.
Zinc:				
Oxide and peroxide	260	324	--	United Kingdom 320.
Metal including alloys:				
Unwrought[2] —— thousand tons	67	67	--	U.S.S.R. 20; Yugoslavia 19; United Kingdom 13.
Semimanufactures	7,376	6,040	--	Yugoslavia 5,756; Poland 283.
Zirconium ore and concentrate	301	1,693	--	All from West Germany.
Other, n.e.s.:				
Ores and concentrates	98,833	200,107	--	Algeria 132,521; Norway 67,509.
Ash and residue containing nonferrous metals	1	NA		
Oxides, hydroxides, peroxides	291	1,805	--	Sweden 1,286; West Germany 223; United Kingdom 105.
Metalloids	6,439	7,184	--	France 4,706; Norway 2,473.
Alkali, alkaline-earth, rare-earth metals	--	22	--	United Kingdom 12; Austria 10.
Base metals including alloys, all forms	r66	20	--	Belgium-Luxembourg 10; Austria 9.
Nonferrous metals including alloys, rolled[2]	r2,829	5,136	--	NA.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	723	436	--	Italy 371; Belgium-Luxembourg 45.
Artificial corundum	2,182	1,923	--	Yugoslavia 1,891; West Germany 20.
Dust and powder of precious and semiprecious stones value, thousands	$474	$410	--	All from United Kingdom.
Grinding and polishing wheels and stones:				
Quantity	466	452	5	West Germany 233; Austria 152; Norway 31.
Value, only ——thousands	$183	$194	--	Hungary $190.
Asbestos, crude[2]	41,804	46,197	[3]200	U.S.S.R. 31,025; Botswana 5,553; Canada 4,951.
Barite and witherite	140	3,707	--	All from West Germany.
Boron materials:				
Crude, natural borates	8,590	13,656	--	Turkey 9,500; Netherlands 4,065.
Oxide and acid	3,666	2,153	--	France 2,088; West Germany 45.
Cement[2] —— thousand tons	r1,297	534	--	U.S.S.R. 384; Romania 104; East Germany 40.
Chalk	2,069	1,552	--	Belgium-Luxembourg 736; France 618; Austria 154.
Clays and clay products:				
Crude:				
Chamotte earth	--	453	--	All from Poland.
Kaolin	4,886	4,774	--	Hungary 4,748.
Other, unspecified	2,618	3,540	--	United Kingdom 2,835; West Germany 687.
Products:				
Refractory	r9,297	14,541	--	Austria 4,002; West Germany 3,749; Poland 2,287.
Nonrefractory	1,878	2,167	(7)	Italy 1,584; West Germany 447; Spain 106.
Diamond:				
Gem, not set or strung value, thousands	$90	$817	--	All from Belgium-Luxembourg.
Industrial ——do	$3,288	$3,405	--	Belgium-Luxembourg $2,564; United Kingdom $563.
Diatomite and other infusorial earth	246	804	--	Iceland 635; Austria 83; France 75.

See footnotes at end of table.

Table 5.—Czechoslovakia: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Feldspar, fluorspar, etc	[r]5,095	1,995	--	Yugoslavia 1,340; Finland 580.
Fertilizer materials:				
Crude:				
Nitrogenous	--	992	--	All from Bulgaria.
Phosphatic, P_2O_5 content[2] thousand tons	322	323	--	U.S.S.R. 168; Morocco 95; Tunisia 22.
Manufactured:				
Nitrogenous, N_2 content[2] do	47	100	--	All from U.S.S.R.
Phosphatic, P_2O_5 content do	[8]83	[8]153	--	Yugoslavia 31; Tunisia 9; undetermined 111.
Potassic, K_2O_5 content[2] do	624	578	--	East Germany 449; U.S.S.R. 129.
Other including mixed	19	2,206	--	Italy 2,188.
Ammonia	3,206	NA		
Graphite, natural	228	209	--	All from West Germany.
Gypsum and plasters[3] thousand tons	25	25	--	East Germany 24.
Iodine	24	9	--	All from France.
Lime	43	48	--	West Germany 42.
Magnesite	2,784	[9]2,203	--	Greece 1,290; Austria 379; France 374.
Mica:				
Crude including splittings and waste	180	270	--	France 262.
Worked including agglomerated splittings	1	34	--	Austria 33.
Pigments, mineral: Iron oxides and hydroxides, processed	1,302	2,294	27	West Germany 2,203; Italy 59.
Precious and semiprecious stones:				
Natural value, thousands	$216	$199	--	West Germany $178; France $21.
Synthetic do	$90	$51	$3	Switzerland $48.
Pyrites, unroasted	--	50	--	All from Italy.
Salt and brine	127,523	178,799	--	U.S.S.R. 166,733; Poland 10,287.
Sodium and potassium compounds:				
Caustic soda	[8]300	[8]100	1	West Germany 35; undetermined 64.
Soda ash[2] thousand tons	181	287	--	East Germany 81; Romania 51; Bulgaria 41.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	15,873	16,976	--	Yugoslavia 16,388.
Worked	316	[10]2,755	--	Yugoslavia 1,980; Italy 581; Netherlands 77.
Dolomite, chiefly refractory-grade	198	253	--	All from West Germany.
Gravel and crushed rock	5,532	3,747	--	Hungary 1,636; France 1,485; Yugoslavia 421.
Quartz and quartzite	6,269	5,061	--	All from West Germany.
Sand excluding metal-bearing	5,372	1,900	7	Hungary 1,587; West Germany 268.
Sulfur:				
Elemental:				
Other than colloidal[2] thousand tons	501	485	--	Poland 428; West Germany 52.
Colloidal	104	57	--	West Germany 48; France 9.
Dioxide	--	446	--	All from West Germany.
Sulfuric acid, oleum[2]	83,294	66,258	--	U.S.S.R. 50,850; East Germany 11,554; West Germany 3,853.
Talc, steatite	208	262	--	Norway 143; West Germany 119.
Other, n.e.s.:				
Crude	[r]11,895	9,757	--	Hungary 7,466; West Germany 1,524; United Kingdom 422.
Slag, dross, similar waste, not metal-bearing	--	80	--	All from Netherlands.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	21	16	--	West Germany 15.
Halogens	4	40	--	Japan 30; Netherlands 10.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	50	70	--	All from West Germany.
Carbon black[2]	33,974	36,406	--	U.S.S.R. 15,891; Austria 5,889; Romania 4,794.
Coal and briquets:[2]				
Anthracite and bituminous coal thousand tons	5,492	5,058	--	U.S.S.R. 3,174; Poland 1,884.
Lignite including briquets do	475	439	--	East Germany 363.
Coke and semicoke	--	360	--	All to Yugoslavia.
Gas, natural million cubic feet	259,385	294,099	--	U.S.S.R. 293,887.
Hydrogen, helium, rare gases	--	5	--	All from Yugoslavia.
Peat including briquets	--	49	--	All from United Kingdom.

See footnotes at end of table.

Table 5.—Czechoslovakia: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products:				
Crude[2] thousand 42-gallon barrels	138,430	141,690	--	U.S.S.R. 138,202.
Refinery products:				
Gasoline[3] do	2,312	3,417	--	NA.
Kerosine and jet fuel do	60	68	--	West Germany 54; Yugoslavia 10.
Distillate fuel oil[3] do	3,297	1,440	--	NA.
Residual fuel oil do	472	462	--	Hungary 457; Belgium-Luxembourg 5.
Lubricants do	[r]127	[r]139	--	Mainly from Austria.
Other:				
Liquefied petroleum gas 42-gallon barrels	183,118	56,863	--	Austria 40,855; West Germany 15,973.
Mineral jelly and wax do	11,813	11,191	--	West Germany 6,461; Hungary 2,739.
Nonlubricating oils do	14	7	7	
Petroleum coke do	66,473	20,383	--	All from West Germany.
Bitumen and other residues do	30	NA		
Bituminous mixtures do	927	885	--	Austria 782.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	1,653	3,664	--	West Germany 2,726; Netherlands 675; France 215.

[p]Preliminary. [r]Revised. NA Not available.

[1]Owing to the lack of official trade data published by Czechoslovakia, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from various sources, which include United Nations information, data published by the partner trade countries, and partial official trade sources of Czechoslovakia.

[2]Official trade statistics of Czechoslovakia.

[3]Official trade statistics of United States.

[4]Less than 1/2 unit.

[5]Metallgesellschaft Akteingesellschaft (Metallstatistik), Frankfurt am Main, West Germany.

[6]Quarterly Bulletin of Steel Statistics for Europe, United Nations, New York.

[7]U.S. reported exports valued at $4,000.

[8]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[9]Excludes exports from Canada valued at $17,000.

[10]Excludes exports from Pakistan valued at $200,000.

COMMODITY REVIEW

METALS

Aluminum.—The output of aluminum in 1981 was at the level of 1980. Domestic raw material shortages caused greater dependence on imports of bauxite and alumina. Aluminum was imported from the U.S.S.R., Hungary, and Yugoslavia.

Antimony.—In 1981, antimony ores were mined at Dubrava (Central Slovak Region) and at Pezinok near Bratislava (West Slovak Region). Deposits containing about 500,000 tons of antimony ore, with some gold and silver, were discovered in the Zlata Idka-Poproe-Betliar area in the Rosnava district. Exports of antimony were expected by 1990.

Copper.—Czechoslovakia's copper ores were mined at various locations. Deposits of copper ore were located in conjunction with iron ores at Rudnany (Slovakia) and near Roznova (Slovakia), copper-lead-zinc ores at Banska Stiavnica (Slovakia), and copper ores at Zlate Hory (Moravia). In 1981, output of copper ore was mainly from the Zlate Hory stratiform deposits and from Banska Stiavnica. In Zlate Hory, reserves of ore were estimated at 3.5 million tons with metal content more than 1%. In 1981, a new plant was under construction at Zlate Hory to process complex sulfide ores containing gold. In 1980, the Banksa Bystrica refinery in Slovakia produced 6.3 kilograms of gold, 621 kilograms of silver, and 355 tons of

copper. It was planned to produce 100,000 tons of copper ore in 1985 and extract 425 tons of copper.

In 1981, further prospecting and experimental mining in old copper mines at Spiska Nova Ves in Slovakia proved up medium-sized economic reserves, especially taking into account the uranium content of the ore. Plans for 1981-85 were to continue evaluation of ore in the main veins.

Imports of copper metal from Poland, the U.S.S.R., and the United Kingdom supplied the main requirements of Czechoslovak industry. Under a long-term trade agreement, Czechoslovakia was participating in the development of Polish copper mines.

Gallium.—Production of gallium was expected to increase from 1,650 kilograms per year to nearly 3,000 kilograms per year with the installation of new equipment at the Ziar nad Hronom aluminum plant in Central Slovakia. Gallium was a byproduct of treating bauxite.

Gold.—Extraction of gold-bearing ore continued in the Kremnice area (Slovakia). The 30,000-ton-per-year ore-dressing plant at Kremnice was being expanded to a capacity of 300,000 tons. At Sturec (Slovakia), 40 kilograms of gold was produced in a few months after modernization of the ore-processing equipment.

The Government created a commission under the Ministry of Metallurgy and Heavy Machine Building to mine gold.

In 1981, exploration for gold was concentrated in old gold mining areas in the Jeseniky Mountains in Northern Moravia, in the Slovak Ore Mountains in Central Slovakia, and in Central Bohemia.

Two grams of gold per ton of ore was considered the minimum economic grade in evaluating the deposits.

The Mineral Raw Materials Institute at Kutna Hora (Bohemia) developed equipment for dealing with so-called scattered deposits, mostly clays, sands, and gravels that contain metals such as gold, tin, and tungsten. This equipment was used in the Plzen region and in the Jeseniky Mountains for gold prospecting and mining.

Further prospecting was planned for the vicinity of the Psi Mountains (Central Bohemia), where ore with an average of 2.5 grams of gold per ton was located by drilling. The gold occurred in association with scheelite, molybdenite, and tellurides. Gold had been mined in Czechoslovakia in 1968 at Jilova near Prague, but has been continuously recovered only from refinery sludges since then. In 1981, the Telsa electrolytic plant in Iiglova thus recovered about 28 kilograms.

Iron and Steel.—Some iron ore is mined at Rudnany, Nina Slava, and other deposits in Slovakia, but the main steel production was based on imported ore from KrivoyRog, in the Soviet Union, where Czechoslovakia continued to invest in iron mining. Iron ore was also imported from Sweden and Brazil. Domestic coking coal production met a large part of the country's needs, but the difficulty of expanding hard coal mining was expected to bring about problems in the long term. In 1981, steel production remained approximately at the 1980 level.

The rate of growth of steel production in Czechoslovakia was to be cut back severely over the next 10 to 15 years. The main reason for the intended slowdown was reported to be expected fuel shortages. In the 1981-85 period, steel production was scheduled to rise by 2.3% per year and in 1986-90 by 1.3%.

In 1981, Czechoslovakia was a net exporter of steel. There was a 2% reduction in exports of steel products, while imports remained essentially at the 1980 level. There were some changes during 1981 in the range of Czechoslovak iron and steel products trade. Exports of semifinished products, strip, and wire rods declined, but those of steel pipe, heavy and light sections, and heavy and medium plate rose. The overwhelming majority of the steel pipe produced was, as in the past, for use in the Soviet oil and gas industry.

The share of oxygen converter steel output in the Czechoslovak total increased from 23.4% in 1979 to 27.0% in 1981, and the share of continuously cast steel increased from 0.95% to 1.49%.

In September, a 1-million-ton-per-year, computer-controlled coke-oven battery was put into operation at the Klement Gottwald steel plant. Construction took 5 years and cost Kcs850 million.

A new 1-million-ton-per-year bar mill at the Klement Gottwald plant was also to come into operation in 1984. A new 25-ton electric arc furnace, imported from the Soviet Union, was put into operation at the Skoda Plzen Enterprise. It was to increase production of steel particularly for the construction of nuclear power equipment.

The East Slovak iron plant at Kosice brought onstream a 66,000-ton-per-year continuous caster and a new coking plant. The caster cost almost Kcs800 million.

At the Trinec iron and steel plant, a new 2.8-million-ton-per-year steel shop with two 200-ton converters was under construction with a 1983 startup date. The country announced plans for a greater emphasis on expanding tube and pipe production. A new seamless-tube-making plant was planned for the Chomutov works.

In 1981, new discussions took place of the prospects for the development of ferroalloy production at plants in Istebne and Siroka.

Lead and Zinc.—Lead-zinc ore continued to be mined at Pribram and Kutna Hora (Central Bohemia), Horni Benesov (Moravia), and Banska Stiavnica (Central Slovakia). About 75% of the total lead-zinc ore came from Czech deposits, and about 25% from Slovak deposits. Production of lead and zinc was far below demand, and these metals continued to be imported, mainly from the U.S.S.R. and Yugoslavia. Intensive prospecting for lead-zinc might lead to increased production of this ore in the future.

NONMETALS

Graphite.—Czechoslovakia is one of the world's largest graphite producers. The major deposits occur in the vicinity of Cesky Budejavice and Cesky-Krumov in Southern Bohemia, and minor deposits occur in Northern Moravia. Graphite occurs in the form of strongly folded layers in gneisses, quartzites, or carbonates, with a carbon content between 15% and 50%. Recently new deposits of graphite were discovered northwest of Cesky Krumov. The raw graphite from the deposits in Southern Bohemia is enriched by multistage flotation at the Netolice dressing plant, located also in Southern Bohemia. The concentrates obtained at the plant contain 80% to 90% carbon in the form of graphite. All Southern Bohemia graphite concentrates are chemically refined at Tin nad Vltava, resulting in a final product containing up to 99.9% carbon. The plant also produces graphite lubricants and various special colloidal suspensions of graphite.

Fertilizer Materials.—Czechoslovak plants continued to concentrate on the production of liquid fertilizers. Capacity in excess of 165,000 tons per year of liquid fertilizers will be brought onstream by 1985. The country would need to import 1.5 million tons of ammonia in 1985 and 1.7 million tons in 1990 in order to satisfy domestic demand for nitrogenous fertilizers. Czechoslovakia decided not to attempt to attain self-sufficiency in manufactured fertilizers because of the high cost of imported raw materials. Increased demand for phosphate fertilizers will be met by importing from developing countries. In 1981, the U.S.S.R. supplied 800,000 tons of assorted fertilizers to Czechoslovakia, together with 430,000 tons of apatite for fertilizer production.

Preliminary tests proved the suitability of Syrian phosphate rock for superphosphate production, and the first 25,000 tons will be imported in 1982. In 1981, a major contract was signed between the Soviet Union's Techmashimport and Chemoproject of Czechoslovakia for the supply by the latter of four new urea plants with capacity of 1,000 tons per day to the U.S.S.R.

Magnesite.—Czechoslovakia was the world's fifth largest producer of magnesite. Approximately 3.9 million tons of magnesite ore was produced from six deposits in Slovakia in 1981. Total exports of magnesite in 1981 were estimated at 385,000 tons. Magnesite was exported mainly to the Council for Mutual Economic Assistance (CMEA) countries[4] and to the Federal Republic of Germany.

MINERAL FUELS

Total energy production from fossil fuels and from hydroelectric and nuclear power generation was estimated at 85.2 million tons of standard coal equivalent (SCE) in 1981, about 2 million tons below that of 1980, with coal, including lignite, supplying about 98%.

Total consumption of primary energy was 123 million tons of SCE with coal providing 67%, oil 22.4%, gas 9.4%, and hydroelectric power and nuclear power 0.5% each. Imported electrical energy was about 0.2% of total consumption.

Table 6.—Czechoslovakia: Total primary energy balance

(Million tons of standard coal equivalent)[1]

	Total primary energy	Coal (bituminous, brown, lignite) and coke	Crude oil and petroleum products	Natural gas	Hydroelectric power	Nuclear power	Turnover of electric energy
1981:							
Production	85.2	83.4	0.1	0.5	0.6	0.6	--
Imports	46.2	5.3	29.5	11.0	--	--	0.4
Exports	8.4	6.2	2.0	--	--	--	.2
Apparent consumption	123.0	82.5	27.6	11.5	.6	.6	.2
1980:							
Production	87.1	85.1	.1	.7	.6	.6	--
Imports	46.7	5.4	29.8	11.1	--	--	.4
Exports	8.6	6.3	2.1	--	--	--	.2
Apparent consumption	125.2	84.2	27.8	11.8	.6	.6	.2

[1]One ton of standard coal equivalent (SCE)=7 million kilocalories. Conversion factors used are as follows: Hard coal, 1.0; brown coal and lignite, 0.6; crude oil, 1.47; natural gas (per 1,000 cubic meters), 1.33; and hydroelectric and nuclear power (per 1,000 kilowatt-hours), 0.125.

Sources: Statistical Yearbook of Czechoslovakia, Prague, 1981; Statisticke Prehledy (Statistic Summary), Prague, No. 4, 1982, p. 106.

Coal.—Coal mines in Czechoslovakia were managed by the Ministry of Power and Fuel. Bituminous coal mining was centered on the Ostrava-Karvina Basin (Northern Moravia) and brown coal mining on the Northern Bohemian and the Socolov Basins. A steady deterioration in mining conditions had led to a fall in the average daily extraction in underground bituminous mines. The plan for bituminous coal production was not fulfilled, and the plan for total brown coal and lignite production was fulfilled only through exceptionally long overtime. Bituminous coal production declined slightly compared with that of 1980. In 1981, difficulties were encountered in the stripping of overburden in opencast brown coal mines owing to outmoded and wornout equipment.

Annual bituminous coal production was expected to remain at about 28 million tons during the 1982-85 period. In 1981, 2.6 million tons of bituminous coal was exported. Austria and the German Democratic Republic were the largest importers of bituminous coal from Czechoslovakia with a total of 0.6 million tons each. In 1981, bituminous coal imports amounted to about 4.4 million tons, of which about 3.2 million tons was imported from the U.S.S.R. and about 1.2 million tons from Poland.

In 1981, about 87% of bituminous coal came from the Ostrava-Karvina Basin, 8% from Kladno, 2% from Plzen, and 3% from Trutow and Rosice. Most of the output of the Ostrava-Karvina Coalfield was suitable for coking. In 1981, some 16 mines were operating in this basin. The average depth in Ostrava-Karvina was about 600 meters with seam thickness from 0.5 to 4.0 meters; however, a considerable part of the reserves at the Ostrava-Karvina Coalfields was found in seams 0.5 to 0.7 meter thick. In 1981, opening of new mines was more costly. The cost of obtaining 1 ton of hard coal was 60% higher in the 1976-80 period than in the preceding 5 years.

In 1981, the Darkov Mine with a projected annual capacity of 5 million tons was under development in the Ostrava-Karvina coal basin; in 1990, this mine was to replace the production from the May 9 and May 1 Mines located in the same district. Preparatory work for the development of new mines in the Probor and Frenstat mining areas, also located in Northern Moravia Region, continued in 1981. Czechoslovakia's bituminous coal deposits were estimated to be sufficient for the next 50 to 60 years. Survey drilling to a depth of 6,000 meters at Jablunka in the Beskydy Mountains of Northern Moravia discovered a deposit of coal which was a continuation of the Ostrava Coalfield. Prospecting was continuing. Geologists also discovered new bituminous coal deposits near Plzen, close to the village of Choticov. Construction of the main mine shaft was expected to be during the seventh 5-year plan period (1981-85), and coal production was expected to start in 1990. Another prospective area was the Slany Basin of Central Bohemia, where large reserves of coal were found. A new mine was under development in that area to produce 2.5 million tons of bituminous coal in 1985.

Brown coal and lignite production was planned to reach 97 million tons in 1982 and 107 million tons in 1990.

In 1981, about 69% of brown coal output came from the Northern Bohemian Basin

and about 22% from the Socolov Basin; the remainder was from the Handlova and Modry Kamen Basins. The calorific value of brown coal in the Northern Bohemian Basin was reported at 3,000 to 4,500 kilocalories per kilogram.

In 1981, development was continued on the large 7-million-ton-annual-capacity annual capacity Vrsany opencast lignite mine near Most. The Vrsany Mine was scheduled to come into operation in 1982 and was to supply coal to the Pocedrany electric powerplant. Operation of the new lignite mine at Dubnany in the Hodonin district, with an annual capacity of 600,000 tons of lignite, started in the first half of 1981.

In September 1981, 65 coal miners were killed in the Pluto Mine, near Zaluzi, in the country's worst mining accident in 20 years.

The Institute for Research and Utilization of Fuels studied the underground gasification of brown coal that could not be conventionally extracted. The result of research work and pilot plant experiments indicated the possibility of economic lignite gasification under favorable conditions.

Natural Gas.—The production of natural gas from domestic deposits was relatively insignificant. In 1981, natural gas imports from the U.S.S.R., about 300 billion cubic feet, was the most important source of gas. The natural gas deliveries were in payment of Czechoslovakia's participation in the building of the gas pipeline and for the transit of the gas for Western Europe across Czechoslovak territory.

At the end of 1980, construction of the third branch of a gas pipeline system to Czechoslovakia, Austria, Italy, Yugoslavia, the Federal Republic of Germany, France, and the German Democratic Republic was completed. This branch runs from the frontier of the Soviet Union through Czechoslovakia, reaching the Federal Republic of Germany at Rozvadov, and measures 909 kilometers. Up to 330 billion cubic feet of the gas will be delivered to Czechoslovakia annually in payment for the use of its territory. When the compressor stations are completed and enlarged in 1984, the system is to carry 1,870 billion cubic feet per year. In the 1981-85 period, it will carry a total of 8,100 billion cubic feet, almost twice as much as in 1976-80.

In the early 1970's, domestic and imported natural gas made up 3% to 4% of all Czechoslovak primary energy resources, but the supplies carried by the new gas pipeline made it possible to increase the use of natural gas to about 9% of energy consumption in 1981.

Petroleum.—Production of crude oil in Czechoslovakia was insignificant, and the country had poor prospects for maintaining crude oil output by increased drilling. However, intensive geological exploration was to continue, with emphasis on finding deeper sources of oil. The Bratislava Petroleum and Gas Industry, a Government corporation, was solely responsible for geological research for petroleum areas. In 1981, domestic crude oil production was mainly between Hodonin and Gbely, both on the Moravia River. New crude oil deposits were discovered near Zdanice, Korycany, and Urice in the Zdanicky Les, about 4,000 meters below the surface.

The price of oil imported from the the Organization of Petroleum Exporting Countries (OPEC) in 1981 reached a level unprofitable for the Czechoslovak economy, and this source of primary energy, which had been counted in preliminary plans for the 1981-85 period, will not be considered either for that period or beyond.

The total capacity of Czechoslovakia's seven refineries, at Bratislava, Kolin, Krolupi, Pardubice, Strazke, Zaluzi, and Zyolen, was approximately 20 million tons. In addition, a crude oil distillation plant, the center of a new refinery division of the chemical combine at Litvinov in Northern Bohemia, was put into trial operation on July 13, 1981. The new refinery was to produce materials for the newly built petrochemical combine. Air Products Co. of the United States also commissioned a new benzene unit for Chemopetrol at Zaluzi in Czechoslovakia, with a capacity of 300,000 tons per year of high-quality benzene.

Uranium.—In 1981, the main mining areas included Hamar-na-Jezere in Northern Bohemia and the Pribram area in Central Bohemia. The deposits of uranium ore at Hamar-na-Jezere were considered relatively large and were expected to last through several decades of exploitation. A new uranium ore chemical processing plant was recently opened at Strazpod Raleskem, in the Ceska Lipa district in Northern Bohemia. This plant will produce uranium oxide to be exported to the U.S.S.R. The Soviet Union controlled the exploration and production of uranium in Czechoslovakia.

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[1]Foreign mineral specialist, Division of Foreign Data.
[2]Rude Pravo (Prague). Feb. 3, 1982, pp. 1-3.
[3]Official exchange rate for Czechoslovakia korunas (Kcs) to U.S. dollars was Kcs7.27. = US$1.00 in 1981.
[4]Includes the following countries: Bulgaria, Cuba, Czechoslovakia, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, the U.S.S.R., and Vietnam.

The Mineral Industry of Denmark and Greenland

By Joseph B. Huvos[1]

DENMARK

In 1981, Denmark had few known mineral resources of its own and continued to import most fuels and minerals. Production included some oil and gas in the North Sea and some industrial minerals.

In 1981, the recession in Denmark was deeper than in most of Europe and production fell for the second consecutive year. It was aggravated by restraints on domestic demand introduced to slow down a growing payments deficit.

In 1981, the gross national product (GNP) was again down by 1% in real terms and amounted to about $65 billion at current prices.[2] The consumer price index was up 11.7%, and unemployment averaged 8.8% during the year.

The contribution of the principal sectors of the mineral industry to the GNP, in million dollars and average employment, are shown in the following tabulation:

Sector	Contribution to GNP (millions)		Average 1980 employment
	1979	1980	
Iron, steel, metals	r$453	$479	7,496
Nonmetallic minerals	74	73	1,260
Nonmetallic mineral products	1,111	1,091	21,887
Oil refining	1,257	1,653	621
Fertilizers	r142	180	1,367
Total	r3,037	3,476	32,631

Source: Danmarks Statistik (Copenhagen). Industrial Statistics 1980. April 1982, pp. 18, 22-23.

Important events in the mineral industry of Denmark in 1981 included continued construction of the Tyra offshore gasfield and construction of a related gas landing and distribution system. The Government readied new legislation on taxation of hydrocarbons and obtained a bill to salvage the Danish Steel Co.

PRODUCTION

Denmark's production of selected minerals and mineral products for the last 5 years, including 1981, are shown in table 1.

Table 1.—Denmark: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
Cement, hydraulic[2] thousand tons	2,309	2,627	2,412	1,917	1,602
Chalk[2]	124,133	110,939	123,654	[e]120,000	112,028
Clays: Kaolin, crude and washed	[e]23,000	[e]23,000	[e]20,000	[e]20,000	20,390
Coke, gashouse	[e]70,000	NA	NA	5,700	[e]60,000
Diatomaceous materials:[e]					
Diatomite	25,000	25,000	25,000	25,000	25,000
Moler	[r]160,000	[r]160,000	[r]125,000	125,000	125,000
Iron and steel:					
Iron ore (less than 42% Fe), gross weight thousand tons	5	5	[r]8	8	[e]8
Crude steel[3] do	686	863	804	734	612
Semimanufactures do	[4]560	[4]646	[4]683	[4]655	552
Lead metal including alloys, secondary	24,200	26,200	29,800	24,500	26,500
Lime, agricultural and quicklime[2] thousand tons	173	162	177	170	195
Nitrogen: N content of ammonia	32,900	32,900	32,900	31,200	31,200
Peat, agricultural[2] thousand tons	40	47	45	31	33
Petroleum:					
Crude thousand 42-gallon barrels	3,285	3,305	3,313	2,272	5,815
Refinery products:					
Gasoline do	11,943	12,045	12,410	9,367	NA
Jet fuel do	72	32		80	NA
Kerosine do	775	698	730	202	NA
Distillate fuel oil do	25,588	24,648	27,740	20,821	NA
Residual fuel oil do	14,992	16,497	18,980	14,099	NA
Lubricants do	--	--	--	--	NA
Other do	3,839	3,839	4,380	6,517	NA
Refinery fuel and losses do	4,465	4,465	4,400		NA
Total do	61,674	62,224	68,640	51,086	NA
Salt[2] thousand tons	314	325	380	[e]380	398
Sodium compounds: Sodium carbonate[2]	[r]572	[r]2,038	2,754	134	149
Stone, sand and gravel:[2]					
Dimension stone[5] thousand cubic meters	39	48	NA	NA	60
Crushed and broken stone:[6]					
Limestone:					
Agricultural do	1,687	1,782	2,119	[e]2,100	1,611
Other do	284	226	213	[e]200	195
Other do	10	11	NA	NA	NA
Sand:					
Industrial do	1,161	1,694	NA	NA	1,875
Other do	626	421	881	NA	1,250
Sulfur, byproduct	11,000	14,000	8,000	8,000	6,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Oct. 7, 1982.

[2]Data represent sales.

[3]Includes shipyard's production of steel castings.

[4]Excludes steel forgings.

[5]Granite and gneiss only; excludes an unreported quantity of other dimension stone with a sales value of $302,938 in 1977 (not available for 1978-81).

[6]Partial figures; exclude an unreported quantity of quartz and quartzite with a sales value of $356,143 in 1977 (not available for 1978-81).

TRADE

The balance of trade was again negative in 1981, by over $1 billion. Main imports of U.S.-origin products were more than 4 million tons of coal, some machinery, and other industrial products; they were valued at about $1.8 billion. Total mineral trade in 1979 and 1980 is shown in tables 2-3.

Table 2.—Denmark: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980[1]	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	51,989	46,483	--	West Germany 25,444; United Kingdom 10,054; Sweden 4,127.
Oxides and hydroxides	270	184	80	West Germany 17; India 15; Norway 15.
Metal including alloys:				
Scrap	11,560	11,855	--	West Germany 10,832; Netherlands 842; Italy 64.
Unwrought	9,968	6,984	--	Belgium-Luxembourg 2,685; West Germany 1,284; Sweden 1,270.
Semimanufactures	15,448	17,938	92	Sweden 5,129; Netherlands 3,428; West Germany 2,406.
Antimony metal including alloys, all forms	3	NA		
Chromium:				
Ore and concentrate	30	--		
Oxides and hydroxides	--	4	--	Sweden 3.
Cobalt:				
Oxides and hydroxides value, thousands	--	$1	--	All to Sweden.
Metal including alloys, all forms kilograms	8	NA		
Copper:				
Matte	--	25	--	All to France.
Metal including alloys:				
Scrap	12,735	15,118	--	West Germany 14,318; Sweden 189; Netherlands 152.
Unwrought	1,235	1,110	--	Sweden 733; Norway 212; West Germany 158.
Semimanufactures	10,943	8,629	1	United Kingdom 1,909; Italy 1,701; Sweden 1,542.
Iron and steel:				
Ore and concentrate	6,751	8,638	218	West Germany 4,516; Netherlands 1,993; United Kingdom 1,760.
Pyrites, roasted	23	--		
Metal:				
Scrap	91,176	100,298	--	West Germany 76,996; Sweden 6,721; Norway 5,601.
Pig iron, cast iron, powder, shot	444	223	--	West Germany 123; Sweden 95.
Ferroalloys	95	6	--	Yemen Arab Republic 2; France 1; Sweden 1.
Steel, primary forms	26,747	4,804	--	Sweden 2,735; West Germany 1,354; United Kingdom 680.
Semimanufactures:				
Bars, rods, angles, shapes, sections	138,278	123,793	5	West Germany 56,852; Sweden 21,907; United Kingdom 19,984.
Universals, plates, sheets	426,991	417,527	6,241	West Germany 135,833; Sweden 77,436; United Kingdom 68,759.
Hoop and strip	21,371	26,672	--	Sweden 23,531; United Kingdom 1,755; Switzerland 411.
Rails and accessories	3,615	1,147	--	West Germany 1,033; Greenland 40; Sri Lanka 27.
Wire	5,561	6,201	--	Sweden 2,335; Finland 1,119; West Germany 764.
Tubes, pipes, fittings	52,864	63,858	8	Sweden 35,559; West Germany 7,267; Netherlands 4,402.
Castings and forgings, rough	18,435	24,525	--	Sweden 9,742; West Germany 9,067; Norway 2,941.
Lead:				
Ore and concentrate	515	--		
Oxides	55	23	--	United Kingdom 12; Hong Kong 7; Singapore 2.
Metal including alloys:				
Scrap	1,322	1,702	--	West Germany 1,642; Italy 24; East Germany 23.
Unwrought	15,045	14,736	1,043	Norway 3,969; Austria 3,623; Thailand 1,033.
Semimanufactures	271	139	(2)	West Germany 58; Finland 57; Norway 11.
Magnesium metal including alloys:				
Scrap	147	205	31	West Germany 171; Sweden 3.
Unwrought	1	--		
Semimanufactures	19	7	--	Sweden 5; Norway 1.
Manganese oxides	270	399	--	Sweden 301; West Germany 80; Finland 15.
Mercury 76-pound flasks	78	116	--	United Kingdom 87; West Germany 29.

See footnotes at end of table.

Table 2.—Denmark: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[1]	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Molybdenum metal including alloys, all forms	1	4	--	All to West Germany.
Nickel metal including alloys:				
Scrap	231	95	--	West Germany 89; United Kingdom 6.
Semimanufactures	4	15	--	United Kingdom 10; Israel 3.
Platinum group metals including alloys, unwrought and partly wrought value, thousands	$778	$1,540	--	Sweden $1,410; West Germany $46; Switzerland $42.
Silver:				
Waste and sweepings[3] do	$5,633	$19,135	--	West Germany $11,267; Switzerland $2,947; United Kingdom $2,186.
Metal including alloys, unwrought and partly wrought do	$6,409	$23,050	--	France $5,983; United Kingdom $4,745; Sweden $3,123.
Tin:				
Ore and concentrate	--	24	--	All to West Germany.
Metal including alloys:				
Scrap	545	244	--	United Kingdom 242.
Unwrought	768	484	17	Netherlands 165; Norway 135; Italy 82.
Semimanufactures	103	23	(2)	Norway 18; Iceland 2.
Titanium oxides	484	746	--	United Kingdom 417; West Germany 101; Belgium-Luxembourg 100.
Tungsten metal including alloys, all forms	7	6	--	West Germany 4; Sweden 1.
Zinc:				
Ore and concentrate	--	301	--	All to West Germany.
Oxides	16	7	--	Malta 2; Iceland 1; Sweden 1.
Metal including alloys:				
Scrap	3,317	3,387	--	West Germany 2,364; East Germany 395; Netherlands 261.
Unwrought	288	926	--	Singapore 306; West Germany 190; Belgium-Luxembourg 174.
Semimanufactures	170	289	--	West Germany 175; Norway 34; Tunisia 30.
Other:				
Ores and concentrates	81	442	--	Norway 331; Sweden 47; West Germany 42.
Ash and residues	8,635	5,607	--	West Germany 2,153; Norway 1,786; Sweden 777.
Oxides and hydroxides	51	62	--	Norway 20; United Kingdom 16; Finland 12.
Metalloids	--	2	1	Colombia 1.
Base metals including alloys, all forms	r95	82	1	West Germany 57; Sweden 21.
NONMETALS				
Abrasives:				
Natural: Corundum, emery, pumice, etc	15	10	--	Saudi Arabia 1; Sweden 1.
Grinding and polishing wheels and stones	847	1,310	(2)	Ethiopia 635; Iran 169; Yemen Arab Republic 120.
Asbestos, crude	80	48	--	Switzerland 18; Finland 10; Iceland 7.
Barite and witherite	43	15	--	Iceland 9; Ecuador 6.
Boron materials:				
Crude, natural borates	--	5	--	All to Iceland.
Oxide and acid	35	42	--	Sweden 37; Norway 4.
Cement	280,464	279,055	22,046	Venezuela 89,445; Sweden 36,820; Israel 30,328.
Chalk	14,729	15,300	--	Sweden 8,213; Norway 4,511; Finland 1,754.
Clays and clay products:				
Crude	2,928	1,845	6	Sweden 766; Norway 299; Belgium-Luxembourg 261.
Products:				
Nonrefractory	79,172	88,591	300	West Germany 70,126; Sweden 9,098; Norway 5,100.
Refractory including nonclay brick	36,951	35,500	198	West Germany 5,299; Norway 3,470; Sweden 2,506.
Cryolite and chiolite, natural	27,537	22,678	NA	NA.
Diamond:				
Gem not set or strung value, thousands	$174	$69	--	Belgium-Luxembourg $36; Switzerland $15; West Germany $9.
Industrial do	--	$9	--	Norway $6; Belgium-Luxembourg $3.

See footnotes at end of table.

Table 2.—Denmark: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[1]	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Diatomite and other infusorial earth	58,110	56,270	--	West Germany 21,736; Netherlands 11,833; Switzerland 7,421.
Feldspar, fluorspar, related materials	--	2	--	Sweden 1.
Fertilizer materials:				
Crude:				
Phosphatic	124	--		
Other including mixed	337	324	--	Sweden 223; West Germany 67; Norway 22.
Manufactured:				
Nitrogenous	400	641	--	West Germany 588; Greenland 20; Iceland 19.
Phosphatic	37,978	105,117	--	Nigeria 58,713; Brazil 15,090; Bangladesh 14,828.
Potassic	30	7	--	Norway 6.
Other including mixed	46,884	136,673	--	China 47,001; United Kingdom 18,255; Pakistan 15,752.
Ammonia	527	464	--	Sweden 360; Saudi Arabia 36; Greenland 15.
Graphite, natural	48	7	(2)	Sweden 3; United Kingdom 3.
Gypsum and plasters	123	168	--	Sweden 82; West Germany 43; Malaysia 20.
Lime	15,602	8,426	--	Norway 4,414; West Germany 3,217; Greenland 576.
Magnesite	41	78	--	West Germany 30; Norway 25; Netherlands 13.
Mica:				
Crude including splittings and waste	65	29	--	West Germany 12; Switzerland 5; Yugoslavia 3.
Worked including agglomerated splittings	(2)	1	--	Mainly to Belgium-Luxembourg.
Pigments, mineral: Iron oxides and hydroxides, processed	108	125	--	West Germany 40; Finland 22; Iceland 20.
Precious and semiprecious stones:				
Natural value, thousands	--	$89	--	West Germany $49; Norway $19; Greenland $7.
Synthetic do.		$5	--	West Germany $2; Iceland $1; Norway $1.
Salt and brine	38,211	45,904	155	Sweden 16,648; Finland 11,910; Norway 10,004.
Sodium and potassium compounds:				
Caustic potash	4	8	--	Norway 5; Iceland 2.
Caustic soda	242	2,417	--	Sweden 2,375; Iceland 22; Saudi Arabia 20.
Soda ash	207	171	--	Sweden 63; Peru 28; Iceland 27.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	45,534	67,959	--	West Germany 67,843; Netherlands 91.
Worked	8,806	7,641	(2)	West Germany 7,118; Norway 143; Sweden 129.
Dolomite, chiefly refractory-grade	97	262	--	West Germany 240; Iceland 10.
Gravel and crushed rock thousand tons	1,372	1,184	--	West Germany 1,157; Sweden 20.
Limestone excluding dimension	70,246	73,925	--	Sweden 42,504; West Germany 21,077; Norway 9,503.
Quartz and quartzite	689	226	--	Greenland 92; Sweden 45; Montserrat 40.
Sand excluding metal-bearing	408,085	162,780	--	Sweden 117,835; West Germany 24,292; Finland 11,610.
Sulfur:				
Elemental, all forms	25	51	--	Iceland 50.
Sulfuric acid	50,462	16,245	--	Finland 15,183; Sweden 512; Norway 238.
Talc, steatite, soapstone, pyrophyllite	506	68	--	Ecuador 15; Iceland 14; Oman 10.
Other nonmetals:				
Crude	1,322	1,236	(2)	West Germany 796; Switzerland 207; Finland 76.
Slag and dross, not metal-bearing	19,526	31,831	--	France 23,958; West Germany 4,344; Sweden 1,616.
Oxides and hydroxides of barium, magnesium, strontium	47	3	--	Iceland 1; Norway 1.
Halogens	--	3	--	Ghana 2.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	12,492	8,804	4	Finland 1,772; Sweden 1,743; Norway 1,707.

See footnotes at end of table.

Table 2.—Denmark: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[1]	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	284	1,073	--	West Germany 1,016; Sweden 51.
Carbon black	34	33	--	Sweden 23; Yugoslavia 3.
Coal and briquets:				
Anthracite and bituminous coal	2,792	4,103	--	Sweden 2,165; Greenland 1,926.
Briquets of anthracite and bituminous coal	--	1	--	NA.
Lignite including briquets	--	27	--	West Germany 26.
Coke and semicoke	r55,704	56,980	--	Norway 26,604; Sweden 23,957; West Germany 6,141.
Peat including briquets	2,081	2,654	--	Sweden 575; United Kingdom 524; West Germany 468.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	5,140	3,520	--	Sweden 3,169; France 163; West Germany 62.
Kerosine and jet fuel do.	161	14	--	Sweden 7; Greenland 6.
Distillate fuel oil do.	10,727	6,645	2	Sweden 3,247; United Kingdom 2,019; France 395.
Residual fuel oil do.	2,462	1,194	33	Sweden 487; Netherlands 381; United Kingdom 153.
Lubricants do.	194	208	(2)	Norway 96; Belgium-Luxembourg 61; Sweden 13.
Other:				
Liquefied petroleum gas 42-gallon barrels	95,816	141,474	--	Sweden 85,144; Netherlands 33,220; West Germany 18,073.
Mineral jelly and wax do.	5,281	5,241	--	Sweden 2,998; Norway 519; Finland 268.
Petroluem coke do.	--	2,728	--	All to Iceland.
Bitumen and other residues do.	r660,340	443,537	--	Sweden 180,067; Norway 135,344; Finland 63,557.
Bituminous mixtures do.	15,665	13,653	--	Sweden 4,400; Greenland 2,969; Norway 2,133.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	14,532	22,306	--	Norway 11,897; West Germany 4,624; Sweden 2,792.

rRevised. NA Not available.
[1]Exports for 1980 include Faroe Islands.
[2]Quantity less than 1/2 unit.
[3]May include waste and sweepings of other precious metals.

Table 3.—Denmark: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980[1]	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	89,385	90,554	26	Suriname 71,579; Malaysia 14,022; Greece 4,927.
Oxides and hydroxides	3,164	4,018	586	United Kingdom 2,246; West Germany 929; Sweden 60.
Metal including alloys:				
Scrap	1,377	2,269	25	West Germany 1,036; Norway 655; Sweden 500.
Unwrought	21,110	21,935	224	Norway 13,655; United Kingdom 4,079; Netherlands 1,567.
Semimanufactures	62,823	59,030	3,364	West Germany 12,243; Norway 8,655; Sweden 7,846.
Antimony metal including alloys, all forms	24	NA		
Beryllium metal including alloys, all forms	--	1	(2)	All from West Germany.
Cadmium metal including alloys, all forms	8	NA		
Chromium:				
Ore and concentrate	175	200	--	All from Finland.
Oxides and hydroxides	381	370	1	West Germany 316; Italy 52.

See footnotes at end of table.

Table 3.—Denmark: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[1]	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Cobalt:				
Oxides and hydroxides	10	5	--	United Kingdom 4.
Metal including alloys, all forms	26	NA		
Copper metal including alloys:				
Scrap	2,909	3,124	144	United Kingdom 901; West Germany 618; France 599.
Unwrought	4,093	3,686	4	Belgium-Luxembourg 2,788; Sweden 340; West Germany 328.
Semimanufactures	38,833	35,211	96	West Germany 9,371; Belgium-Luxembourg 9,077; Sweden 8,228.
Iron and steel:				
Ore and concentrate	1,379	3,345	--	Sweden 3,299; West Germany 25; United Kingdom 12.
Pyrites, roasted	25,581	16,288	--	Norway 16,215; West Germany 73.
Metal:				
Scrap	284,249	216,796	388	United Kingdom 137,637; U.S.S.R. 38,174; West Germany 26,526.
Pig iron, cast iron, powder, shot	24,469	43,607	6	Sweden 18,357; West Germany 9,442; East Germany 3,791.
Ferroalloys	21,049	17,560	1	Norway 13,310; United Kingdom 1,974; Sweden 1,241.
Steel, primary forms	34,231	114,113	(2)	West Germany 41,822; Norway 29,303; Sweden 18,248.
Semimanufactures:				
Bars, rods, angles, shapes, sections	373,218	306,414	60	West Germany 98,223; Sweden 50,019; Belgium-Luxembourg 35,125.
Universals, plates, sheets	707,216	716,756	423	West Germany 282,643; Sweden 71,733; France 66,280.
Hoop and strip	63,208	56,868	8	West Germany 33,540; Sweden 8,251; Belgium-Luxembourg 4,111.
Rails and accessories	12,263	12,952	--	France 5,404; West Germany 4,519; Sweden 320.
Wire	30,136	30,792	76	Belgium-Luxembourg 12,928; West Germany 9,139; Sweden 5,740.
Tubes, pipes, fittings	217,343	183,664	228	West Germany 70,959; Austria 17,302; France 16,342.
Castings and forgings, rough	3,807	6,459	--	West Germany 1,835; United Kingdom 1,677; Norway 1,454.
Lead:				
Oxides	526	547	11	West Germany 286; France 145; East Germany 40.
Metal including alloys:				
Scrap	19,012	16,546	1,087	United Kingdom 4,735; Norway 3,926; West Germany 2,768.
Unwrought	8,884	6,523	952	Sweden 2,167; West Germany 1,109; United Kingdom 618.
Semimanufactures	2,413	3,956	--	West Germany 3,784; United Kingdom 43; Netherlands 21.
Magnesium metal including alloys:				
Unwrought	99	113	20	Norway 93.
Semimanufactures	74	87	47	Switzerland 13; Canada 10; West Germany 8.
Manganese:				
Ore and concentrate	980	819	--	Netherlands 530; West Germany 214; Gabon 75.
Oxides	2,056	2,086	40	Belgium-Luxembourg 1,145; China 300; Greece 260.
Mercury 76-pound flasks	406	290	NA	Netherlands 116; U.S.S.R. 58; United Kingdom 29.
Molybdenum metal including alloys, all forms	6	6	(2)	West Germany 3; Austria 2.
Nickel:				
Matte and speiss	30	21	1	United Kingdom 11; Canada 9.
Metal including alloys:				
Scrap	1	4	--	United Kingdom 3.
Unwrought	206	179	6	Finland 74; United Kingdom 31; West Germany 21.
Semimanufactures	241	213	8	West Germany 72; Finland 66; Norway 26.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$6,162	$6,833	$221	Netherlands $2,747; Switzerland $2,083; West Germany $1,181.

See footnotes at end of table.

Table 3.—Denmark: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[1]	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Silver:				
Waste and sweepings[3] value thousands	$954	$1,521	--	Sweden $927; Finland $513; Norway $57.
Metal including alloys, unwrought and partly wrought ---do---	$22,364	$35,744	$29	West Germany $13,562; United Kingdom $5,909; Switzerland $5,887.
Tantalum metal including alloys, all forms ---do---	--	$18	--	Austria $11; Switzerland $5.
Tin metal including alloys:				
Scrap	285	249	--	West Germany 120; Switzerland 46; Singapore 40.
Unwrought	323	246	--	United Kingdom 73; Italy 69; Thailand 40.
Semimanufactures	72	74	(2)	Switzerland 39; West Germany 16; United Kingdom 11.
Titanium oxides	6,796	5,821	18	United Kingdom 2,267; Norway 2,151; West Germany 622.
Tungsten metal including alloys, all forms	14	15	(2)	Sweden 8; West Germany 3; Netherlands 2.
Uranium and thorium:				
Ore and concentrate value, thousands	--	$85	--	All from Greenland.
Metal including alloys, all forms do	$72	$12	--	West Germany $7; France $3; United Kingdom $2.
Zinc:				
Oxides	3,057	2,802	--	West Germany 1,422; Norway 348; France 320.
Metal including alloys:				
Scrap	1,389	101	--	All from Sweden.
Unwrought	17,835	17,024	1	Finland 6,925; Norway 6,503; Netherlands 1,851.
Semimanufactures	4,106	4,949	5	France 2,134; West Germany 1,208; Norway 960.
Zirconium ore and concentrate	49	NA		
Other:				
Ores and concentrates	199	147	--	Finland 125; Norway 10; Sweden 10.
Ash and residue	7,614	7,471	2,218	United Kingdom 1,707; West Germany 1,315; Norway 558.
Oxides and hydroxides	740	691	(2)	West Germany 305; Belgium-Luxembourg 154; United Kingdom 74.
Metalloids	786	853	--	France 438; Norway 351; Sweden 38.
Alkali, alkaline-earth, rare-earth metals	274	263	(2)	West Germany 259; France 3.
Pyrophoric alloys	2	--		
Base metals including alloys, all forms	108	69	6	Sweden 25; Belgium-Luxembourg 14; Bolivia 5.
NONMETALS				
Abrasives:				
Natural: Corundum, emery, pumice, etc	25,039	40,061	24	Iceland 38,348; West Germany 1,108; Netherlands 434.
Artificial: Corundum	742	477	--	West Germany 452; Netherlands 23.
Dust and powder of precious and semiprecious stones value, thousands	$225	$238	$36	Switzerland $176; United Kingdom $10; France $7.
Grinding and polishing wheels and stones	1,198	1,124	9	West Germany 376; Austria 280; Sweden 194.
Asbestos, crude	26,865	13,713	30	Canada 9,930; South Africa 1,314; West Germany 1,028.
Barite and witherite	3,950	12,461	--	Iceland 9,372; Netherlands 2,214; United Kingdom 252.
Boron materials:				
Crude natural borates	4,255	5,414	3,494	West Germany 878; Belgium-Luxembourg 587; Netherlands 380.
Oxide and acid	379	350	145	France 142; Italy 40; West Germany 23.
Cement	95,342	6,812	38	West Germany 4,076; Poland 1,142; France 906.
Chalk	10,869	9,967	(2)	West Germany 6,600; France 1,833; Sweden 1,100.

See footnotes at end of table.

Table 3.—Denmark: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[1]	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products:				
Crude	52,358	50,796	1,202	United Kingdom 33,278; West Germany 11,523; Czechoslovakia 1,649.
Products:				
Nonrefractory	93,513	61,668	--	West Germany 27,899; Italy 19,646; Netherlands 3,486.
Refractory including nonclay brick	34,659	29,718	79	West Germany 15,799; Sweden 3,996; Austria 3,983.
Cryolite and chiolite	44,025	48,535	--	Greenland 48,530.
Diamond:				
Gem, not set or strung value, thousands	$3,057	$4,392	$1	Belgium-Luxembourg $1,712; Israel $892; Switzerland $888.
Industrial do	$55	$203	--	Switzerland $159; Belgium-Luxembourg $33; India $7.
Diatomite and other infusorial earth	5,447	7,205	3,261	Iceland 997; Norway 800; Spain 701.
Feldspar, fluorspar, and related materials	11,786	16,899	--	Norway 11,136; Mexico 3,395; France 836.
Fertilizer materials:				
Crude:				
Nitrogenous	5,501	1,501	--	Chile 1,500.
Phosphatic	264,651	312,163	103,956	Morocco 184,496; Israel 10,429; Iceland 10,073.
Potassic	825	849	--	West Germany 824; United Kingdom 25.
Other including mixed	8	21	--	Sweden 12; Finland 6.
Manufactured:				
Nitrogenous	131,673	93,592	6,589	Norway 71,042; West Germany 11,049; Poland 3,560.
Phosphatic	10,734	5,226	--	France 2,285; Israel 1,812; West Germany 756.
Potassic	240,418	235,417	75,304	East Germany 61,760; West Germany 51,690; Canada 23,426.
Other including mixed	641,292	537,032	34	Norway 399,842; West Germany 63,440; Belgium-Luxembourg 51,302.
Ammonia	326,679	309,076	--	West Germany 179,699; U.S.S.R. 35,999; Venezuela 30,190.
Graphite, natural	653	990	18	West Germany 879; United Kingdom 72; Canada 11.
Gypsum and plasters	316,363	307,994	23	Spain 263,976; France 36,881; West Germany 4,226.
Lime	5,086	5,630	--	West Germany 2,816; Poland 1,654; Sweden 968.
Magnesite	16,639	13,872	129	Austria 6,882; Spain 3,795; China 2,084.
Mica:				
Crude including splittings and waste	274	175	--	United Kingdom 106; Norway 59; China 10.
Worked including agglomerated splittings	71	65	--	Belgium-Luxembourg 42; France 10; Spain 7.
Pigments, mineral: Iron oxides and hydroxides, processed	5,553	4,038	23	West Germany 2,935; Spain 541; France 257.
Precious and semiprecious stones other than diamonds:				
Natural value, thousands	$1,074	$2,065	$2	Switzerland $1,426; West Germany $374; Thailand $72.
Synthetic do	$84	$130	$15	United Kingdom $61; Switzerland $28; France $13.
Pyrites, unroasted	1	19	--	All from Sweden.
Salt and brine	366,120	282,965	53	West Germany 131,734; U.S.S.R. 51,424; Italy 39,165.
Sodium and potassium compounds:				
Caustic potash	2,682	3,494	--	France 1,254; Sweden 675; West Germany 524.
Caustic soda	71,287	84,416	--	Norway 37,586; West Germany 34,868; Netherlands 7,817.
Soda ash	64,497	67,951	--	East Germany 19,272; Netherlands 18,506; United Kingdom 14,023.

See footnotes at end of table.

Table 3.—Denmark: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[1]	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Calcareous	7,059	4,363	--	Norway 2,305; Sweden 1,778; Italy 263.
Slate	11,657	11,853	--	West Germany 5,046; Sweden 4,050; Norway 1,906.
Other (granite, sandstone, etc.)	94,633	167,056	--	Sweden 138,789; Norway 28,079.
Worked	48,185	41,690	--	Portugal 15,586; Sweden 10,475; West Germany 8,673.
Dolomite, chiefly refractory-grade	32,906	30,933	--	Norway 23,047; West Germany 4,788; Sweden 2,463.
Gravel and crushed rock	870,401	812,508	26	Sweden 734,361; Norway 70,005; United Kingdom 2,912.
Limestone excluding dimension	203,761	189,769	--	Sweden 109,688; United Kingdom 50,391; Norway 22,167.
Quartz and quartzite	14,280	12,967	18	Sweden 11,508; Norway 1,083; West Germany 154.
Sand excluding metal-bearing	120,565	141,042	131	Belgium-Luxembourg 118,634; West Germany 9,559; France 5,081.
Sulfur:				
Elemental:				
Crude	74,184	79,706	--	West Germany 78,966; Poland 360; Norway 319.
Refined	114	114	--	West Germany 113.
Sulfuric acid	4,701	7,634	--	Sweden 4,010; West Germany 3,597.
Talc, steatite, soapstone, pyrophyllite	8,775	8,001	418	Norway 3,908; Finland 1,891; Austria 621.
Other:				
Crude	47,477	43,975	339	East Germany 24,466; West Germany 7,325; Sweden 4,013.
Slag and dross, not metal-bearing	4,460	3,018	--	United Kingdom 2,399; West Germany 439; Belgium-Luxembourg 79.
Oxides and hydroxides of barium, magnesium, strontium	615	1,024	39	Sweden 569; Greece 180; Italy 106.
Halogens	92	101	(2)	Israel 63; United Kingdom 31; Netherlands 5.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	16,229	8,011	30	West Germany 3,290; Finland 1,413; Belgium-Luxembourg 705.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	952	6,327	222	Netherlands 3,160; Sweden 1,641; Norway 989.
Carbon black	3,994	4,444	238	West Germany 1,502; United Kingdom 1,354; Sweden 646.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	7,552	10,005	2	Poland 38; Unspecified 9,877.
Briquets of anthracite and bituminous coal	147	75,228	40,757	Poland 33,734; West Germany 546.
Lignite including briquets	22,411	40,001	25	West Germany 20,062; East Germany 19,837.
Coke and semicoke	130,970	114,011	--	France 56,462; West Germany 25,738; Belgium-Luxembourg 16,185.
Peat including briquets and litter	22,978	23,277	10	Sweden 16,061; Netherlands 2,330; Finland 2,204.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	60,840	42,069	--	United Kingdom 17,531; Saudi Arabia 6,659; U.S.S.R. 5,682.
Refinery products:				
Gasoline do	8,959	6,926	(2)	Sweden 2,635; Netherlands 2,101; Belgium-Luxembourg 555.
Kerosine and jet fuel do	5,328	6,205	(2)	Netherlands 3,889; United Kingdom 1,149; Belgium-Luxembourg 760.
Distillate fuel oil do	31,377	26,869	(2)	Netherlands 6,662; United Kingdom 5,609; Sweden 4,588.
Residual fuel oil do	20,852	17,099	--	Sweden 5,570; Netherlands 3,194; Netherlands Antilles 2,437.
Lubricants do	3,783	5,033	15	East Germany 1,897; U.S.S.R. 1,146; Sweden 805.

See footnotes at end of table.

Table 3.—Denmark: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[1]	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products —Continued				
Refinery products —Continued				
Other:				
Liquefied petroleum gas thousand 42-gallon barrels	1,222	1,666	(2)	United Kingdom 1,054; West Germany 297; Poland 86.
Mineral jelly and wax do	121	106	4	West Germany 66; Hungary 13; United Kingdom 8.
Petroleum coke do	6	370	339	Netherlands Antilles 29.
Bitumen and other residues do	1,123	1,267	--	Netherlands 689; West Germany 324; Sweden 218.
Bituminous mixtures do	13	13	1	West Germany 7; Sweden 3.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	29,162	53,715	205	Sweden 25,861; Norway 12,314; West Germany 7,752.

NA Not available.
[1]Imports for 1980 include Faroe Islands.
[2]Quantity less than 1/2 unit.
[3]May include waste and sweepings of other precious metals.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Danish Steel Works Ltd. (DDS) was in a very serious financial situation in 1981, and the Danish Parliament passed a bill for the financial reconstruction of the company. The reconstruction plan provided new capital in the form of share capital and subordinated loan capital totaling $50 million, $43 million of which was paid in cash and the rest in the form of converted debt. In addition, an interest reduction of $28 million was granted for the 1981-85 period, and debts totaling $42 million were written off. Finally, the existing share capital and subordinated loan capital was written down by $45 million and an extraordinary depreciation of $36 million was carried out on plant and equipment. Major creditors of the company included foreign and domestic interests plus the Danish Government, whose share in DDS rose to 30% following the granting of new state aid.

In previous years DDS has undergone a complete restructuring, making it an all electric ministeelmaker at its Frederiksvaerk plant, located 60 kilometers north of Copenhagen. In 1981, production showed a 17% decrease compared with 1980 because of the closing down of the old Siemens-Martin plant. The new electric steel plant had a capacity of about 650,000 tons per year.

Nonmetals.—*Cement.*—A/S Aalborg Portland-Cement- Fabrik, a member of the F. L. Smidth Group, remained Denmark's sole cement producer with 2.4 million tons capacity. Cement production in 1981 was centralized at the Rördal works near Aalborg in northern Jutland. The company's former cement plant at Dania near Mariager had been converted to the production of calcined bauxite for refractory use, with a capacity of up to 100,000 tons per year.

Moler.—Moler, one of the most important minerals produced in Denmark, was a natural diatomaceous earth containing 20% to 25% plastic clay. The clay acts as a natural binder during brick formation. A large export oriented industry has developed since 1912, exploiting the deposits located on Fur and Moors Islands. It is used in insulating boards, as absorbent for oil, as an anticaking agent for fertilizers and foodstuffs, as a carrier for insecticides, in explosives, and for refining acids. It is also an additive to cement for enhancing resistance to seawater, as in oil drilling in the North Sea. In 1981, most moler was produced on Fur Island. The larger of the two moler producers was Skarrehage Molervaerk A/S, which was acquiring the operations of Molisol Products, and the smaller was Dansk Moler

Industri A/S, which cooperated with Molervaerk Ludolph Struve & Co.

Denmark no longer produced pure diatomite, since Andreas Jennow A/S at Ego-Vaerkene had closed its operations.

Salt.—Dansk Salt I/S continued as the sole producer of salt in Scandinavia, producing salt by solution mining from a salt dome at Hvornum near Hobro. The salt brine was transported 25 kilometers by pipeline to the Mariager plant where the conventional vacuum salt process was used.

Mineral Fuels.—*Petroleum and Natural Gas.*—Crude oil production on the Danish continental shelf continued at a very modest pace by the Dansk Undergrunds Corsortium (DUC), consisting of Dansk Boreselskab (AP Möller) the operator (30%), Shell Oil Co. (40%), Chevron Oil Co. (15%), and Texaco Oil Co. (15%). Discovered in 1971, the Dan Field, located 200 kilometers west of Ejsberg in 41 meters of water, had been in production since 1972, and had in 1981 estimated reserves of 100 million barrels. Production was transferred by way of a 27-kilometer pipeline to the Gorm Field's loading facilities. Gorm, operational since May 1981 and located in 38 meters of water, was also operated by DUC. It had reserves estimated in 1981 at 125 million barrels; its crude oil production was to reach 26,000 barrels per day in 1983 and was to be tank loaded until 1984, when a pipeline was to enter service for landing the oil on the Danish Continent. Production was to include small amounts of oil from the nearby Skjöld Oilfield.

DUC was continuing construction of the new Tyra Gasfield. One 1,300-ton platform, Tyra B, was installed, with three further platforms to follow, costing about $20 million. Production, due to start in mid-1982, was to be landed by separate gas and condensate pipelines, together with the production from the Dan and Gorm Fields. Ultimately the Tyra Field was to have nine platforms. The project linking the producing fields with onshore points was progressing on schedule. The Government-owned Danish Oil and Natural Gas Co. (DONG) was giving out the contracts for the construction of the pipeline and was to operate the system after its completion. When completed, the pipeline was to run from the gas system of the Federal Republic of Germany near Froslew in the south to Egtved in central Jutland, then further north to Lille Thorup, where it was to terminate in gas storage caverns to be built in salt domes. A branch was to lead from the drilling platforms of the continental shelf to the Danish Continent near Ejsberg, then to join the north-south leg at Egtved, to cross the Little Belt and Big Belt Straits and was to be landed at Kongsmark near Korsör, then extended to the Copenhagen area.

In 1981, Denmark's oil refining (distillation) capacity remained unchanged at 214,000 barrels per calendar day. A/S Dansk Shell operated a 59,000-barrel-per-day facility at Fredericia on Jutland, Dansk Esso A/S operated a 70,000-barrel-per-day facility at Kalundborg on Zealand Island, and Gulf Oil Refining A/S operated an 85,000-barrel-per-day facility at Skaelskor, also on Zealand Island.

The Danish Parliament passed new legislation for the taxation of income in connection with the production of hydrocarbons called the Hydrocarbons Tax Act. Starting with 1982, the Government's terms for a maximum tax take, including an 8.5% royalty, was 83.5% of the value of net production. The average take excluding royalty was to amount to 70% of the net production value, with each field taxed individually so that profits and losses could not be transferred from one field to the other. DUC has strongly criticized the Government's new tax laws, which will lead the consortium to incur a tax liability.

Exploration of the Danish North Sea was formerly under the exclusive license of AP Möller. Starting with 1982, other companies may apply for exploration licenses.

Fulfilling its commitment to the Government to boost exploration and development work, Möller was planning to operate five offshore drilling rigs. Two of the three are to drill wildcat wells.

There was also a rising interest in acquiring drilling permits in areas around the Faroe Islands. The Faroese Government received 25 inquiries from both Danish and foreign firms wishing drilling permits.

The Energy Ministry of Denmark licensed the Western Geophysical Co. of America and Norwegian Geophysical Consultants A/S to undertake seismic exploration in the Danish North Sea sector for the period through 1982. The Ministry is to have full access to seismic data and interpretations. About a dozen companies were lined up with the Danish Government for similar projects.

The Government-owned DONG concluded a cooperation agreement with the British National Oil Corp. (BNOC) on joint explora-

tion and exploitation of hydrocarbons in the Danish continental shelf. BNOC will supply the technical expertise. A similar agreement has also been concluded between DONG and the Norwegian Statoil, covering certain other offshore areas in Denmark.

GREENLAND

Greenland, the world's largest island, with apparently substantial mineral resources, had only a modest mineral production of lead and zinc concentrates. Some crude cryolite ore was also shipped from stocks.

Home rule for Greenland was voted in 1979, and in 1981 a plebiscite revealed that a narrow majority of the about 50,000 inhabitants was opposed to continued membership in the European Economic Communities (EEC) because of EEC policies on fishing quotas and rights. Fishing was the major industry in Greenland. Greenland's council can unilaterally revoke EEC membership as soon as January 1, 1984. As a result it would be possible that exploration for mineral deposits in Greenland would decline further, as several large projects were partly funded by EEC.

PRODUCTION AND TRADE

Greenland's mineral production in 1977 through 1981 is shown in table 4. Greenland's foreign trade in 1979 and 1980 are detailed in tables 5-6.

Table 4.—Greenland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
Lead, mine output, metal content:					
Of ore hoisted	33,733	36,018	35,255	34,344	30,080
Of concentrates	28,800	30,600	31,900	30,100	27,400
Silver, mine output, metal content:					
Of ore hoisted thousand troy ounces	587	699	763	771	720
Of concentrates do	521	559	[r]543	547	NA
Zinc, mine output, metal content:					
Of ore hoisted	83,500	90,050	92,950	86,832	83,400
Of concentrates	76,600	82,400	87,300	52,100	78,500

[r]Revised. [p]Preliminary. NA Not available.

[1]Table includes data available through Oct. 6, 1982.

[2]In addition to the commodities listed a variety of crude construction materials (common clays, sand and gravel, and stone) are undoubtedly produced but output is not reported and available information is inadequate to make reliable estimates of output levels. Also, chromite apparently was produced in 1979 for metallurgical purposes.

Table 5.—Greenland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, scrap	--	2	--	All to Denmark.
Chromium ore and concentrate	4,800	--	--	
Copper metal including alloys, scrap	23	49	--	All to Denmark.
Iron and steel:				
Scrap	51	736	--	Do.
Semimanufactures				
value, thousands	--	$3	--	Do.
Lead ore and concentrate	45,558	37,729	--	France 17,563; Brazil 11,832; West Germany 8,333.
Zinc ore and concentrate	115,511	156,325	--	Finland 86,731; France 38,038; West Germany 23,755.
NONMETALS				
Cryolite and chiolite, natural	44,048	48,530	--	All to Denmark.
Stone, dimension:				
Crude and partly worked	--	25	--	All to West Germany.
Worked	2	4	--	All to Denmark.

Table 6.—Greenland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Unwrought ___ value, thousands__	--	$1	--	All from Denmark.
Semimanufactures_____	82	85	1	Denmark 83.
Copper metal including alloys, semi-manufactures _____	62	123	--	All from Denmark.
Iron and steel:				
Pig iron, cast iron powder, shot ____	25	--		
Steel, primary forms_____	3	2	--	All from Denmark.
Semimanufactures:				
Bars, rods, angles, shapes, sections	2,618	2,398	1	Denmark 2,326; Belgium-Luxembourg 25; Ireland 24.
Universals, plates, sheets _____	544	467	--	Denmark 377; Norway 46; Sweden 41.
Hoop and strip_____	8	36	--	All from Denmark.
Rails and accessories _____	5	46	--	Denmark 40; Canada 6.
Wire_____	14	19	--	All from Denmark.
Tubes, pipes, fittings _____	1,009	1,073	3	Denmark 1,038; Sweden 30.
Castings and forgings, rough ___	576	566	--	Bulgaria 525; Norway 28; Denmark 13.
Lead metal including alloys:				
Scrap_____	6	4	--	All from Denmark.
Unwrought _____	3	1	--	Do.
Semimanufactures_____	7	5	--	Do.
Platinum-group metals including alloys, unwrought and partly wrought value thousands__	$1	--		
Silver metal including alloys, unwrought and partly wrought _____do____	$10	$81	--	All from Denmark.
Tin metal including alloys:				
Unwrought _____ value, thousands	$1	$1	--	Do.
Semimanufactures_____do____	$2	$2	--	Do.
Zinc metal including alloys:				
Unwrought _____do____	--	$1	--	All from Norway.
Semimanufactures_____	22	17	--	All from Denmark.
Other, base metals including alloys, all forms _____	6	4	--	Norway 3.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc _____ value, thousands__	$8	$1	--	All from Denmark.
Grinding and polishing wheels and stones _____	2	2	--	Do.
Cement_____	9,949	8,794	10	Denmark 8,711.
Clays and clay products:				
Crude_____	10	23	--	All from Denmark.
Products:				
Nonrefractory_____	464	474	--	Do.
Refractory including nonclay brick _____	3	7	--	Do.
Diatomite and other infusorial earth ___	4	2	--	Do.
Fertilizer materials:				
Manufactured:				
Nitrogenous _____	727	711	--	Canada 691; Denmark 20.
Other including mixed_____	102	145	--	All from Denmark.
Ammonia _____	15	15	--	Do.
Lime _____	23	576	--	Do.
Mica worked including agglomerated splittings _____ value, thousands__	$1	--		
Pigments, mineral: Iron oxides and hydroxides, processed_____	2	--		
Precious and semiprecious stones, natural value, thousands__	$3	$5	--	All from Denmark.
Salt and brine_____	8,513	8,061	--	Spain 4,621; Denmark 3,005; Norway 435.
Sodium and potassium compounds:				
Caustic potash _____	1	(1)	--	All from Denmark.
Caustic soda_____	2	5	--	Do.
Soda ash_____	3	16	--	Do.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked _____	(1)	13	--	Do.
Worked_____	12	47	--	Denmark 33; Sweden 14.
Gravel and crushed rock _____	4	246	--	Denmark 232; Italy 14.
Quartz and quartzite_____	5	92	--	All from Denmark.
Sand excluding metal-bearing _____	65	43	--	Do.
Sulfuric acid_____	8	23	--	Do.
Other:				
Crude_____	--	67	--	Do.
Slag and dross, not metal-bearing___	25	25	--	Do.
Building materials of asphalt, asbestos and fiber cements, unfired non-metals_____	1,409	1,277	--	Do.

See footnotes at end of table.

Table 6.—Greenland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	6	393	--	All from Sweden.
Coal and briquets:				
Anthracite and bituminous coal	2,791	1,926	--	All from Denmark.
Lignite including briquets	--	1	--	Do.
Hydrogen, helium, rare gases	57	NA		
Peat including briquets	6	12	--	All from Denmark.
Petroleum refinery products:				
Gasoline--42-gallon barrels	68,619	67,286	--	Denmark 32,269; Belgium-Luxembourg 17,170; United Kingdom 16,847.
Kerosine and jet fuel--do	100,014	31,612	--	United Kingdom 24,475; Denmark 6,177.
Distillate fuel oil thousand 42-gallon barrels	1,205	1,251	--	Denmark 507; Netherlands 315; United Kingdom 274.
Lubricants--42-gallon barrels	11,452	11,760	7	Denmark 11,753.
Other:				
Liquefied petroleum gas do	2,401	4,478	--	All from Denmark.
Mineral jelly and wax--do	--	8	--	Do.
Bitumen and other residues do	4,381	764	--	Do.
Bituminous mixtures--do	1,824	2,969	--	Do.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	5	7	--	All from Denmark.

NA Not available.
[1]Quantity less than 1/2 unit.

COMMODITY REVIEW

Metals.—*Lead and Zinc.*—Greenex A/S, a subsidiary of Cominco Ltd. of Canada, continued to operate, the Black Angel Mine at Marmorilik, Greenland's only active mine, and produced silver-bearing lead and zinc concentrates. Concentrate production was exported to Europe. Exploration in 1981 was very extensive and cost $2 million. Proven ore reserves were 3.1 million tons of ore assaying 31 grams per ton of silver, 4.2% lead, and 13.5% zinc. Slightly lower production resulted in 1981 from lower metal content of the ore.

Tungsten.—Encouraging results were reported by the Nordisk Mineselskab A/S in East Greenland between the 70th and 74th parallels north in a survey performed under an EEC contract.

Mineral Fuels.—*Coal.*—Although large reserves of high volatile bituminous coal in workable seams have been found in late Cretaceous sedimentary basins on Nugssua Peninsula at 70° North in West Greenland, no further exploration work was commissioned for the near future.

Petroleum.—There was a mounting interest for oil exploration in East Greenland. The Nordisk Mineselskab A/S, partly owned by the Arco Oil Co. of the United States, decided to perform seismic tests in the south of Jameson Land during the summer of 1982. It was not believed that exploration drilling could start earlier than 10 to 15 years. The Canadian Government's Petro Canada Oil Co. planned to transport liquefied natural gas from the Canadian Arctic Pilot Project, for transporting natural gas from the Melville Islands and the Arctic Archipelago from 1986 on, on an experimental basis through the Northwest Passage between Canada and Greenland. The Government of Greenland expressed opposition to the project for environmental reasons.

Uranium.—The Geological Survey of Greenland gained renewed funding for a remote sensing study in South Greenland for the exploration of uranium.

[1]Physical scientist, Division of Foreign Data.
[2]Where necessary, values have been converted from Danish kroner (DKr) to U.S. dollars at the rate of DKr6.25=US$1 for 1981.

The Mineral Industry of Egypt

By Peter J. Clarke[1]

Egypt's economic growth continued in 1981 at a somewhat slower pace than the 8% to 9% rate of growth of the gross domestic product (GDP) reported for 1980. The GDP for fiscal year 1980-81 was $26 billion[2] and was expected to rise to $30 billion in fiscal year 1981-82.

Economic expansion has been led by revenues generated from the substantial petroleum production increases of 1980 and 1981. The country's petroleum surplus (exports minus imports) in 1980 was $2.65 billion. This increased to approximately $2.76 billion in 1981, despite lower than expected prices for crude and refined oil.[3]

Revenues from oil exports, Suez Canal receipts, tourism, and remittances from Egyptians working abroad provided the bulk of foreign exchange earnings for the country and held down the current account deficit to about $800 million. Egypt's persistent deficit in the balance of trade, estimated at about $4 billion in 1981, remained a problem. Increased levels of capital inflows ($1.5 billion), as well as a substantial amount of aid from the United States ($1.3 billion) and other Western nations, provided the country with a substantial surplus in the overall balance of payments.

The mining and industrial sectors in Egypt contributed about 14% to the GDP in 1981. Petroleum provided about 25%. The country's major mineral commodities besides petroleum were aluminum, iron and steel, nitrogenous fertilizer, phosphate rock, salt, clays, and construction materials. Major strides were made in the past 2 years in nitrogenous fertilizer production, making the country nearly self-sufficient in 1981. Phosphate rock production also increased as Egypt planned to exploit its vast resources and become a world-scale producer.

The Government continued to emphasize development of the country's underground resources in the 1980-84 5-year plan, to lead the way in overall economic development. Nearly all mining operations in the country were carried out by public mining companies. The Egyptian Geological Survey and Mining Authority (EGSMA), in addition to its own geological surveying work, was preparing to offer some private sector-joint venture arrangements to develop the mineral industry. The country has suffered from a general lack of information on its mineral potential and from old and inefficient equipment used by the public mining companies. In 1981, Egypt received a World Bank loan and a U.S. Agency for International Development (AID) grant to conduct detailed studies of its petroleum and mineral resources. EGSMA prepared a list of several areas and minerals that may be open to private development, which include phosphates, coal, iron ore, and gold.

The Government also planned to reopen several old mines on the Sinai Peninsula. The western two-thirds of the Sinai was restored to Egyptian control in 1981, with the final portion scheduled to be returned to Egyptian sovereignty in April 1982. Mineral development plans centered around the coal deposit at Maghara in central Sinai, manganese at Abu Zeneima, and gypsum at Ras Malaab. All of these mineral deposits had been exploited prior to the Israeli occupation in 1967.

Egypt was also embarking on a major nuclear energy development program. In 1981, Egypt signed cooperative agreements with the United States, France, and the Federal Republic of Germany for nuclear

research and the development of nuclear energy. The agreements formed part of Egypt's overall plan to purchase or build eight nuclear power reactors of approximately 1,000 megawatts each by the year 2000. The agreement with the United States called for the establishment of a framework for peaceful nuclear cooperation, under which the United States may supply nuclear power reactors and low-enriched uranium fuel, to provide a maximum generating capacity of 2,000 megawatts. The agreement with the Federal Republic of Germany also opened the possibility of that country selling up to four nuclear reactors to Egypt before the year 2000.

The French appeared to be the furthest ahead in their cooperative agreement with Egypt. The French were prepared to sell to Egypt two 900-megawatt pressurized water reactors to be built by Framatome (France), utilizing Westinghouse (United States) technology. The power stations were worth about $2 billion each. Egypt was also planning to sign a nuclear cooperation agreement with Canada.

Egypt's switch to nuclear power to satisfy its growing requirement for electricity was expected to make available over $3 billion per year in revenue from petroleum that otherwise would have been consumed for domestic production of electricity.

PRODUCTION AND TRADE

Production of most of Egypt's important mineral commodities increased in 1981 with significant gains in the production of crude petroleum, nitrogenous fertilizers, aluminum, and phosphates. Petroleum production averaged 642,000 barrels per day in 1981, a 3% increase from the 1980 level. Exports of petroleum provided the Government of Egypt with revenues of $2.89 billion for fiscal year 1981-82. Several new discoveries during the year, as well as an increased rate of exploration, brought closer the possibility of the country reaching its goals of producing 1 million barrels per day of crude oil by 1983.

Fiscal year 1981-82 industrial production increased an average of 6.5% from the 1980 level, with public sector production increasing 7% to $5.45 billion, and private sector production increasing 6% to 2.8 billion. Production of nitrogenous fertilizers increased substantially during the year, as the Talkha II ammonia-urea complex came fully onstream. For the first time since fertilizer production began in Egypt, the country approached self-sufficiency in both nitrogen and phosphate fertilizer. Production of phosphate rock also increased during the year, with further increases scheduled within the decade as development of the Abu Tartur deposit in the Western Desert progresses.

Egypt's production of iron and steel posted a slight increase in 1981 but was scheduled to nearly double in 1984, when a new direct-reduction steelworks will come onstream. Iron ore production from the Bahariya Oasis deposits in the Western Desert was to increase substantially to meet the new demand.

Production of cement, gypsum, clays, and sand and gravel also increased in 1981. Output of construction materials was expected to increase rapidly throughout the 1980's to respond to an expanding construction industry in the country. New construction projects were to increase 20% per year for most of the decade. Mineral production in Egypt is shown in table 1.

After showing a significant improvement in the balance of payments in 1980, Egypt's current account balance deteriorated slightly in 1981, mainly owing to lower than expected earnings from the petroleum sector. In 1980, Egypt's merchandise trade deficit shrunk from over $4 billion the previous year to $3.7 billion. Service receipts from tourism ($780 million), the Suez Canal ($660 million), worker remittances ($2.7 billion), and investment income and transfer payments left Egypt with a current account deficit of $680 million in 1980, the smallest since the 1973 war. The growth of the current account deficit in 1981 was partly a result of the rapid growth of imports, 35% of which were for food and other consumable items. Exports of industrial products also declined, despite the Government's programs to encourage them.

Egypt's principal mineral exports were petroleum and petroleum products, aluminum, gypsum, cement, and salt. Petroleum was exported to Italy (40%), Israel (25%), Greece (7%), the United States (6%), the Netherlands (6.4%), and others (15.6%).

The United States remained Egypt's single largest trading partner in 1981, supplying about one-fifth of its imports, worth over $2 billion, and receiving one-ninth of its exports. Of the $2 billion worth of goods Egypt imported from the U.S., about half were financed by AID. The United States also contributed $275 million in agricultural assistance, bringing the total U.S. eco-

nomic assistance to Egypt to about $1.3 billion. Egypt's trade statistics are shown in tables 2 and 3.

Table 1.—Egypt: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum metal	89,182	100,698	77,204	120,000	[2]133,812
Chromite	500	873	22	--	--
Iron and steel:					
Iron ore and concentrate thousand tons	1,409	1,456	1,435	1,776	[2]1,943
Pig iron do	[r]550	[r]600	[r]600	[e]650	650
Ferroalloys: Ferrosilicon do	5	[e]5	--	--	--
Crude steel do	263	[e]600	[e]635	760	800
Semimanufactures do	621	1,000	[e]1,000	847	850
Manganese ore and concentrate	3,833	173	--	--	--
NONMETALS					
Asbestos	478	349	238	316	325
Barite	746	989	2,272	4,532	[2]2,108
Cement: Hydraulic thousand tons	3,257	3,000	2,957	3,028	[2]3,499
Clays:					
Bentonite	3,811	3,448	3,500	5,200	5,200
Fire clay	143,648	383,389	250,000	942,000	[2]995,000
Kaolin	49,000	55,577	46,544	41,227	[2]32,113
Diatomite	373	99	33	--	--
Feldspar, crude	2,633	3,337	3,271	3,309	[2]3,480
Fluorspar	1,404	2,235	682	1,752	[2]535
Gypsum and anhydrite, crude	508,635	798,000	796,000	940,000	950,000
Lime	100,000	100,000	88,000	87,907	[2]91,294
Mica	86	[e]86	--	--	--
Nitrogen: N content of ammonia thousand tons	210	250	263	400	[2]518
Phosphate:					
Phosphate rock do	472	639	623	658	[2]698
Thomas slag do	NA	NA	9	10	10
Pigments, mineral, natural: Iron oxide	32	245	140	126	130
Pumice[e]	250	NA	NA	NA	NA
Salt, marine thousand tons	597	755	616	636	[2]837
Sodium compounds:					
Sodium carbonate	NA	4,000	[e]5,000	4,675	4,700
Sodium sulfate	5,000	2,902	2,902	2,942	3,000
Stone, sand and gravel:					
Basalt thousand cubic meters	213	281	85	96	[2]103
Dolomite thousand tons	92	130	504	500	500
Granite, dimension cubic meters	NA	NA	2,666	6,408	6,400
Gravel thousand cubic meters	1,900	2,090	[e]3,300	3,400	3,400
Limestone and other calcareous n.e.s do	5,500	5,667	5,845	5,196	[2]5,535
Marble blocks (including alabaster) cubic meters	11,000	25,718	26,000	32,000	[2]46,930
Quartz	9,332	11,348	[e]10,000	10,000	10,000
Sand including glass sand thousand cubic meters	2,973	2,996	6,147	6,000	6,200
Sandstone do	120	111	787	32	32
Sulfur:					
Elemental, byproduct	[e]5,000	3,106	3,206	3,300	[2]2,408
Sulfuric acid	NA	NA	3,200	32,000	[2]44,111
Talc, steatite, soapstone, pyrophyllite	6,993	5,905	4,406	4,007	[2]5,723
MINERAL FUELS AND RELATED MATERIALS					
Coke:					
Oven and beehive thousand tons	694	700	853	915	920
Gashouse and other low temperature do	[e]30	[e]40	[e]50	NA	NA
Total do	724	740	903	915	920
Gas, natural:					
Gross production million cubic feet	[e]93,000	[e]105,800	[e]140,000	84,624	120,000
Marketed do	18,670	30,835	120,000	60,000	72,000
Petroleum:					
Crude thousand 42-gallon barrels	150,925	175,925	180,000	227,395	234,330
Refinery products:					
Gasoline and naphtha do	6,936	8,109	8,840	15,068	16,000
Kerosine and jet fuel do	11,671	12,849	12,710	13,361	13,800
Distillate fuel oil do	14,629	16,412	17,205	18,791	19,000
Residual fuel oil do	32,265	36,210	52,281	47,841	50,000
Lubricants do	336	434	461	539	600
Liquefied petroleum gas do	846	NA	1,150	1,612	1,800
Asphalt do	--	6,115	1,127	1,654	1,800
Unspecified do	6,542	NA	--	292	400
Refinery fuel and losses do	3,976	2,631	4,242	4,500	4,600
Total do	77,201	NA	98,016	103,658	108,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through June 23, 1982.
[2]Reported figure.

Table 2.—Egypt: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	41,240	33,170	1,500	Netherlands 29,288; Yugoslavia 1,487; Italy 499.
Unwrought	--	139	--	All to Saudi Arabia.
Semimanufactures	31,741	12,425	--	Netherlands 8,676; Saudi Arabia 2,279; Japan 1,000.
Copper: Matte and speiss	1	--		
Iron and steel metal, semimanufactures:				
Bars, rods, angles, shapes, sections	10	134	--	All to Saudi Arabia.
Universals, plates, sheets	40,294	50,792	--	Austria 16,100; Italy 12,112; West Germany 10,839.
Tubes, pipes, fittings	502	411	--	Sudan 394; Saudi Arabia 17.
Lead metal including alloys, semimanufactures	--	3	--	All to Saudi Arabia.
Nickel metal including alloys, semimanufactures	1	--		
Tin metal including alloys, semimanufactures	2	--		
Zinc oxides and hydroxides	4	3	--	All to Saudi Arabia.
Other: Metals including alloys, nonferrous scrap	215	--		
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones value	$2,000	--		
Cement	1,700	750	--	All to Sudan.
Clays and clay products:				
Crude	9,100	1,500	--	All to Kuwait.
Products:				
Nonrefractory	--	50	--	Sudan 45; Saudi Arabia 5.
Refractory including nonclay brick	183	47	--	All to Saudi Arabia.
Feldspar and fluorspar	--	10	--	All to Lebanon.
Fertilizer materials:				
Crude, phosphatic	--	25,945	--	China 12,000; Lebanon 5,607; Romania 5,607.
Manufactured:				
Nitrogenous	--	11,105	--	France 5,790; Belgium-Luxembourg 4,600; West Germany 715.
Phosphatic	19,100	10,200	--	Italy 5,200; West Germany 5,000.
Lime	80	--		
Pigments, mineral: Crude natural	505	--		
Precious and semiprecious stones except diamond value, thousands	$11	--		
Salt and brine	84,960	49,407	--	North Korea 21,000; Lebanon 10,357; United Kingdom 9,050.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	2,584	769	--	Italy 724; Saudi Arabia 45.
Worked	1	--		
Gravel and crushed rock	401	--		
Talc, steatite, soapstone, pyrophyllite	1,018	580	--	All to East Germany.
Other: Building materials of asphalt, asbestos and fiber cements, and unfired nonmetals	372	1,227	--	Saudi Arabia 1,209; Sudan 18.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	4,178	1,580	--	Italy 1,130; Switzerland 300; France 150.
Carbon black and gas carbon	--	8,773	--	Romania 7,700; Lebanon 1,073.
Coke and semicoke	23,404	9,145	--	All to Romania.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	37,980	57,961	6,044	Italy 25,692; People's Democratic Republic of Yemen 7,239; Israel 5,393; Switzerland 3,513.
Refinery products:				
Nonlubricating oils[1] do	11,507	6,722	--	Italy 2,995; Netherlands 1,925; France 636.
Petroleum coke do	--	2	--	All to Switzerland.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	3,185	3,738	--	Switzerland 3,586; Italy 150; United Kingdom 2.

[1]Totals include bunker loadings of 4,476,969 barrels in 1979 and 915,460 barrels in 1980.

Table 3.—Egypt: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	1,099	492	--	West Germany 215; United Kingdom 86; Italy 79.
Metal including alloys:				
Scrap	1,856	1,587	--	Canada 799; Switzerland 618; Greece 87.
Unwrought	1	3	--	All for ships' bunkers.
Semimanufactures	1,108	2,786	437	Spain 1,244; West Germany 403; Italy 282.
Arsenic: Oxides and acid	10	29	--	West Germany 17; France 12.
Chromium: Oxides and hydroxides	25	110	2	U.S.S.R. 53; Poland 43; West Germany 7.
Cobalt: Oxides and hydroxides	155	(1)	--	All from United Kingdom.
Copper:				
Matte and speiss	893	90	--	Do.
Metal including alloys:				
Scrap	271	1,391	138	Nigeria 1,194; Lebanon 2.
Unwrought	10	--	--	
Semimanufactures	1,026	3,270	429	Greece 811; West Germany 565; United Kingdom 371; Yugoslavia 327.
Iron and steel:				
Pyrites, roasted	3	5,000	--	All from Cyprus.
Metal:				
Scrap	15,829	37,095	14,834	Republic of Korea 6,909; Sudan 3,820; France 3,485.
Pig iron, cast iron, powder, shot	11,688	6,214	--	Turkey 4,670; Switzerland 500; West Germany 491.
Ferroalloys	1,665	310	--	All from Switzerland.
Steel, primary forms	43,561	63,245	13,389	Australia 16,476; Spain 15,080; West Germany 8,333.
Semimanufactures:				
Bars, rods, angles, shapes, sections	514,014	747,031	49,528	West Germany 91,067; Republic of Korea 82,939; Bulgaria 79,049.
Universals, plates, sheets	90,146	84,424	22,378	West Germany 15,385; Bulgaria 8,467; Japan 6,006.
Hoop and strip	2,567	1,057	2	Lebanon 500; West Germany 379; India 172.
Rails and accessories	8,830	8,820	931	Poland 5,999; Japan 999; India 795.
Wire	6,157	7,312	5	West Germany 5,020; Belgium-Luxembourg 581; Romania 379.
Tubes, pipes, fittings	89,660	75,855	614	Japan 24,347; France 20,867; West Germany 14,218.
Lead:				
Oxides and hydroxides	1,196	1,252	--	Bulgaria 548; France 292; United Kingdom 214.
Metal including alloys:				
Scrap	483	--	--	
Unwrought	4,320	9,106	--	United Kingdom 8,179; North Korea 397; West Germany 200.
Semimanufactures	(1)	128	128	
Magnesium: Metal including alloys, all forms	24	19	(1)	Norway 16; Italy 2.
Manganese: Oxides and hydroxides	631	791	--	Belgium-Luxembourg 391; Japan 186; Switzerland 148.
Mercury 76-pound flasks	174	580	--	United Kingdom 377; West Germany 203.
Nickel:				
Matte and speiss	1	3	--	All from United Kingdom.
Metal including alloys: Semimanufactures	7,818	27	--	United Kingdom 17; West Germany 6; Italy 2.
Platinum-group: Metals including alloys, unwrought and partly wrought value, thousands	$310	--		
Silver: Metal including alloys, unwrought and partly wrought do.	$102	$403	--	All from Switzerland.
Tin:				
Oxides and hydroxides	--	55	--	China 29; West Germany 17; Netherlands 5.
Metal including alloys:				
Unwrought	241	35	--	Mainly from Hong Kong.
Semimanufactures	5	(1)	--	All from Netherlands.
Titanium: Oxides and hydroxides	1,218	1,905	--	West Germany 1,258; United Kingdom 269; France 218.
Tungsten: Metal including alloys, unwrought value, thousands	$645	$190	--	All from Netherlands.
Uranium and thorium: Metals including alloys, all forms do.	--	$54	--	All from Gabon.
Zinc:				
Oxides and hydroxides	249	436	--	France 203; United Kingdom 154; Netherlands 61.

See footnotes at end of table.

Table 3.—Egypt: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc —Continued				
Metal including alloys:				
Scrap	--	2	--	All from Italy.
Unwrought	2,865	2,729	--	North Korea 1,481; Switzerland 1,159; Zambia 63.
Blue powder				
value, thousands	$9	$5	--	All from France.
Semimanufactures	27	634	11	United Kingdom 339; Netherlands 133; West Germany 25.
Other:				
Ores and concentrates	368	704	--	Yugoslavia 500; West Germany 204.
Pyrophoric alloys	72	19	(1)	Italy 13; Austria 4.
Alkali, alkaline-earth, rare-earth metals	1	2	--	France 1; United Kingdom 1.
Metals including alloys, all forms	4	4	--	West Germany 3.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	46	51	--	Czechoslovakia 35; Italy 15.
Corundum, artificial	165	53	--	Czechoslovakia 35; Netherlands 16; United Kingdom 2.
Grinding and polishing wheels and stones	1,179	506	--	Italy 338; West Germany 52; Poland 38.
Asbestos, crude	476	4,387	(1)	Switzerland 1,857; U.S.S.R. 1,783; Canada 547.
Barite and witherite	20	254	--	West Germany 153; Turkey 101.
Boron materials: Oxide and acid	161	152	--	France 150; United Kingdom 2.
Cement, thousand tons	2,569	2,849	--	Romania 993; Greece 842; Spain 717.
Chalk	7	14	--	All from United Kingdom.
Clay and clay products:				
Crude	17,497	9,606	436	United Kingdom 6,179; Czechoslovakia 700; India 666.
Products:				
Nonrefractory	39,155	31,862	(1)	Spain 17,075; Italy 8,302; West Germany 1,450.
Refractory including nonclay brick	10,473	13,701	52	Spain 3,958; West Germany 1,764; Italy 1,759.
Cryolite and chiolite	31	--		
Diamond: Gem, not set or strung				
value	$12,000	--		
Diatomite and other infusorial earth	14	118	103	Italy 15.
Feldspar and fluorspar	5,336	6,992	--	China 5,622; Norway 1,226; Italy 144.
Fertilizer materials:				
Crude	1	3	--	All from Netherlands.
Manufactured:				
Nitrogenous	247,036	256,724	--	Romania 96,373; U.S.S.R. 76,084; Bulgaria 52,256.
Phosphatic	15,909	41,180	--	Lebanon 25,125; Tunisia 10,050; Bulgaria 6,005.
Potassic	4,731	5,025	--	All from Italy.
Other including mixed	1,046	11,877	28	Romania 8,396; West Germany 1,801; Italy 571.
Ammonia	67	3	--	Mainly from United Kingdom.
Graphite, natural	529	101	--	All from China.
Lime	--	1	--	All from United Kingdom.
Magnesite	1,198	106	--	Switzerland 92; West Germany 10; Netherlands 3.
Mica:				
Crude including splittings and waste	5	83	--	India 81; Austria 1.
Worked including agglomerated splittings	4	5	--	Mainly from India.
Pigments, mineral:				
Crude, natural	183	331	--	United Kingdom 217; Cyprus 76; Italy 22.
Iron oxides, processed	1,382	2,038	5	Japan 912; China 458; France 370.
Precious and semiprecious stone except diamond, value, thousands	$6	$35	--	All from Italy.
Salt and brine	2	71	5	United Kingdom 33; Netherlands 26; Italy 5.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	471	106	--	Italy 57; West Germany 37; Switzerland 7.
Caustic soda	29,245	64,552	2,369	Romania 19,964; France 12,814; West Germany 10,767.
Soda ash	4,495	4,730	30	East Germany 1,475; West Germany 750; Poland 504.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	13,111	14,991	--	Italy 12,837; Greece 1,445; Spain 706.
Worked	3,955	2,360	--	Italy 2,206; Greece 86; West Germany 36.

See footnotes at end of table.

Table 3.—Egypt: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Dolomite, chiefly refractory-grade	5	--		
Gravel and crushed rock	78	614	--	Sweden 306; Finland 204; United Kingdom 50.
Quartz and quartzite	--	44	--	Netherlands 37; Switzerland 7.
Sand excluding metal-bearing	1,491	2,602	--	Belgium-Luxembourg 2,248; West Germany 348.
Sulfur:				
Elemental:				
Other than colloidal	46,177	70,595	60,357	Greece 10,099; West Germany 139.
Colloidal	15	--		
Dioxide	12	--		
Sulfuric acid, oleum	106	15	--	United Kingdom 7; France 4; East Germany 2.
Talc, steatite, soapstone, pyrophyllite	628	140	--	Finland 102; United Kingdom 25; Italy 12.
Other:				
Crude:				
Meerschaum, amber, jet	--	74	--	All from Italy.
Unspecified	--	188	--	All from United Kingdom.
Halogens	41	--		
Oxides, hydroxides, peroxides of barium, magnesium, strontium	3	49	--	West Germany 30; Netherlands 14; Japan 5.
Building materials of asphalt, asbestos, and fiber cements, and unfired nonmetals	4,824	2,350	157	Canada 638; Japan 480; France 291.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	11	11	11	
Carbon black and gas carbon	598	3,323	2,375	France 406; Italy 200; United Kingdom 151.
Coal, all grades including briquets	356,990	802,050	360,519	U.S.S.R. 292,656; Australia 72,536; Netherlands 38,397.
Coke and semicoke	5,700	--		
Hydrogen, helium, rare gases	26	61	--	Netherlands 46; United Kingdom 11; West Germany 3.
Peat including briquets and litter	4,195	3,900	--	West Germany 2,434; Ireland 838; Canada 544.
Petroleum and refinery products:				
Crude and partly refined 42-gallon barrels	--	146	--	All from West Germany.
Refinery products:				
Kerosine and jet fuel ---do---	23,157	3,472	--	Mainly from Italy.
Lubricants ---do---	293,419	378,084	70,581	Greece 125,531; Italy 68,173; Netherlands 53,473.
Mineral jelly and wax ---do---	14,276	16,134	--	West Germany 13,993; Hungary 1,000.
Nonlubricating oils ---do---	57,792	24,801	1,841	Italy 8,470; Netherlands 4,704; China 3,591.
Petroleum coke ---do---	28,963	19,492	--	Albania 16,076; Spain 3,322; West Germany 94.
Bituminous mixtures ---do---	442	51,062	79	West Germany 50,740; Italy 127.
Liquefied petroleum gas thousand 42-gallon barrels	1,281	1,448	--	Italy 629; Greece 320; Venezuela 127; France 124.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	1,107	9,047	297	West Germany 2,174; Italy 1,807; Switzerland 1,303.

[1]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Aluminum production from the state-owned Aluminum Co. of Egypt increased 12% from the 1980 level as two new potlines came onstream early in 1981. Capacity of the aluminum smelter, located at Nag Hammadi, 550 kilometers south of Cairo on the Nile River, increased from 133,000 to 166,000 tons per year as potlines 9 and 10 were activated, completing the smelter's final stage of expansion. Alumina for the plant was imported from Australia through the Red Sea Port of Safaga, and then trucked 220 kilometers to Nag Hammadi. Approximately 70% of the plant's output was exported, mainly to Japan, China, and Western Europe. The remainder of the output was used by the Arab Aluminum Co. manufacturing facility at Is-

mailia. The plant produced aluminum doors and window frames for export and domestic sale.

In December of 1981, Metallgesellschaft A.G. (Federal Republic of Germany) announced it had sold an aluminum rolling plant to Egypt. The plant was worth about $18 million and was to be used in conjunction with the smelter at Nag Hammadi.

Gold.—In 1981, EGSMA opened an investigation of the Baramya gold mine, which closed when gold was selling at $35 per ounce. EGSMA indicated that the mine may contain as much as 30 million tons of gold-bearing ore in a deposit that averaged nearly 1 ounce of gold per ton of rock. There were no immediate plans to activate the deposit, but EGSMA considered the area one of the best prospects for mineral development in the coming years.

Iron and Steel.—Iron ore production in Egypt continued to increase in 1981 to about 1.94 million tons, most of which was supplied from the Bahariya Oasis deposit, about 350 kilometers west of Helwan. Iron ore at Bahariya Oasis occurs at four locations: Nasser, Gebel Ghorabi, El-Harra, and El-Gedida. The deposits occur in an irregular succession of lenticular beds of Middle Eocene age. Mining is currently limited to El-Gedida, where reserves were estimated at 129 million tons containing 52% to 54% iron. Mining was by open pit methods. Reserves of the deposits at Bahariya Oasis were estimated at over 250 million tons with an average grade of 54% iron and 3% silica. Output from the deposit was expected to increase to 2.5 million tons per year when the Helwan steel plant reaches capacity, and a new steelworks at El-Dekheila is completed, sometime in 1984.

Iron ore was also mined at Aswan, which was the original source of iron ore for the steel plant, but because of its low-grade (44% iron), high-silica content (14% SiO_2), and distance from the main steelworks works at Helwan, the mine was being phased out as output from Bahariya increases.

The Egyptian Geological Survey was investigating iron ore deposits at Wedan El-Faras, about 65 kilometers north of Lake Qarun. These iron ore deposits were reportedly 12 meters thick and less than 1 meter from the surface. No reserve or grade figures were available by the end of the year.

Iron ore from El-Gedida was transported by rail to the state-owned Egyptian Iron and Steel Co.'s steelworks at Helwan, located 33 kilometers south of Cairo on the Nile River. Production of crude and semimanufactured steel remained stable in 1980 and well below the plant's rated capacity of 1.5 million tons per year. The facility was modernized in 1979, with the conversion of three blast furnaces to handle feed from Bahariya, conversion of two blast furnaces to natural gas fuel, and the starting of a fourth blast furnace. Problems with the quality of the ore feed, however, have kept the output below capacity. For this reason, the company planned to start a beneficiation research program aimed at improving the productivity of the ovens and reducing the consumption of coke. Coke for the plant was supplied from a blend of coals imported from Poland, the U.S.S.R., and the United States.

Following 2 1/2 years of neogtiations, an agreement was signed late in 1980 to establish a joint venture company to build Egypt's first direct-reduction steel mill, at El-Dekheila. Equity shares in the National Iron and Steel Co. belong 87% to the Egyptian Government, through state-owned banks, insurance companies, and steelmakers; 5% to Nippon Kokan (NKK) (Japan); 3% to Kobe Steel (Japan); 2% to Toyo Menka Kaisha (Japan); and 2% to the International Finance Corp. (IFC). Most of the engineering work for the plant had been completed by the end of the year, and commissioning was scheduled for early 1985. Formal contracts covering construction of the electric arc furnaces and continuous casters had not been signed by year-end, owing to the assassination of President Sadat, who was also president of the National Iron and Steel Co. NKK was expected to provide the furnaces, and Kobe, the billet casters, as part of their equity participation.

The direct-reduction plant was to have a capacity of 716,000 tons per year, feeding an 816,000-ton-per-year melt shop and a 775,000-ton-per-year continuous casting plant. The mill was expected to produce 720,000 tons per year of rebars and wire rod for the domestic construction industry. Financing for the project, which was expected to cost $835 million, was to be provided by the Japanese Government ($168 million in 30-year loans), the Japanese Export-Import bank ($210 million in similar credits), the IFC ($150 million loan), and the remainder from commercial banks.

Manganese.—The Egyptian Government continued to investigate the possibility of

reopening the manganese mines at Abu Zeneima, on the Sinai Peninsula. In the early 1960's, Egypt had planned to produce ferromanganese from a manganese mine located at Um Bogma in southwestern Sinai. The Israeli occupation of the Sinai cut short plans to commission the smelter, and during the occupation, the entire operation was disassembled or destroyed. Egypt planned to spend over $40 million to build a new processing plant and reactivate the mine. The mine was to produce 60,000 to 70,000 tons per year of ore, which in turn would be processed to produce 19,000 tons per year of ferromanganese alloy. Most of this would be used in the domestic steel industry. Once the El-Dekheila steelworks becomes operational, demand for ferromanganese is expected to rise to 20,000 tons per year. Kaiser Engineers of California (United States) completed a feasibility study of the operation late in 1980, but no date was available for either groundbreaking or commissioning of the new plant. Reserves at Abu Zeneima were estimated at 2 million tons of ore containing between 22% and 38% manganese and from 15% to 36% iron.

Uranium.—Uranium production from Egypt's first uranium mine remained at about 20 to 30 tons per year (U_3O_8) level. The mine opened in January of 1980 and has produced a total of less than 100 tons of reportedly good-quality uranium (U_3O_8). The deposit is located in the Eastern Desert, between Qena and Safaga. Reserves were estimated at 5,000 tons of U_3O_8. The mine and two other small mines scheduled to open in the same region were part of a 5-year research project being conducted by the Nuclear Materials Authority. Annual production was to increase to about 50 tons in 1982 and 100 tons by 1984. Egyptian officials were hoping the ore could be enriched and used for fuel for the 8 nuclear powerplants that Egypt planned to build before the year 2000. Most of the early production was to be exported.

Phosphate deposits near Wadi Qena and at Abu Tartur were also known to contain uranium as an impurity. Large-scale development of Egypt's phosphate may lead to the extraction of uranium as a byproduct. The uranium content of Egypt's phosphate deposits was estimated at 100,000 tons of U_3O_8.

NONMETALS

Cement.—Cement production in Egypt increased significantly in 1981, but remained well below the 8-million-ton-per-year consumption requirement. Three of the five cement producers in Egypt were either undergoing or planning an expansion during the year. Projects already under construction were to double the country's cement capacity of 4 million tons per year by 1983. Fuller Co. (United States) received a $66 million contract from the Suez Cement Co., for a 1.4-million-ton-per-year dry process facility at Qattanya, 55 kilometers from Suez City near the Red Sea. The plant was scheduled to start production early in 1982. Suez Cement Co. was the only privately owned cement company formed in Egypt since nationalization of the industry in 1960.

After completing a 1.4-million-ton-per-year production line in 1978, the Brown Bouveri and F.L. Smith consortium received a repeat order from the Helwan Cement Co., to increase capacity to 3 million tons per year. Also, a consortium of KHD Industrienlager A.G., operating with Deutz France S.A., and CGEE Alsthon S.A., was awarded a contract by National Cement Co. for construction of a 1.5-million-ton-per-year rotary kiln at Assiut, 50 kilometers south of Cairo. Egypt's current and planned cement facilities are listed in the following table.

Location	Company	Startup date	Current capacity (thousand tons)	Planned capacity (thousand tons)
Torah	Torah Portland Cement Co	1929	1,400	1,400
Alexandria	Alexandria Portland Cement Co.	1948	500	1,000
Assiut	National Cement Co	1960	700	1,500
Helwan	Helwan Portland Cement Co.	1978	1,400	3,000
Qattaniya	Suez Cement Co	1982	--	1,400
Nag Hammadi	National Cement Co	1983	--	1,000

Clays.—EGSMA continued to examine the possibility of extracting alumina from the Kalabsha kaolin deposit, 105 kilometers southwest of Aswan. The region currently produces a small amount of kaolin for the domestic ceramic industry. Reserves at Kalabsha were estimated at 16 million tons of kaolin with a 38% alumina content. The obstacles to utilizing the alumina from kaolin were in separating the alumina from its combined silica, and in transporting large quantities of clay from the remote Kalabsha deposit.

The Sinai Peninsula also contains several deposits of white clay and kaolin that were mined and marketed prior to Israeli occupation of the Sinai. The deposits occur about 15 kilometers from Abu Zeneima, near the manganese mines at Um Bogma. EGSMA was considering reopening these mines along with the manganese mines, in order to reindustrialize the Sinai.

Fertilizer Materials.—The Egyptian fertilizer industry was undergoing large-scale expansion in 1981. The most significant achievement during the year was the commissioning of the Talkha II ammonia-urea complex in September 1981. The new plant raised Egypt's nitrogen production capacity to approximately 1 million tons per year. The plant represented the second major addition to the country's nitrogenous fertilizer industry in 2 years, the first being the Abu Qir ammonia-urea complex that began operating in July 1979.

Egypt had similar plans for the development of the phosphate fertilizer industry. Construction was continuing on the Abu Zaabal triple-superphosphate and phosphoric acid plants during the year. When these plants commence operating in 1982, total phosphatic fertilizer capacity is expected to reach 685,000 tons per year.

Egypt's consumption of chemical fertilizer continued to increase nearly as rapidly as its output. Since the completion of the Aswan High Dam and the elimination of the annual floods that provided natural fertilization for the rich Nile River soils, Egyptian agriculture has become increasingly dependent on chemical fertilizer. Consumption in 1980 averaged 554,000 tons of nitrogen in ammonia and urea, and 102,000 tons of P_2O_5 in phosphatic fertilizers. Since 1976, Egypt has imported an average of 250,000 tons per year of nitrogenous fertilizer, or about one-half of its annual consumption. The fertilizer plants now in operation and under construction in Egypt could make it self-sufficient in chemical fertilizer by 1984. Egypt's operating and planned fertilizer plants are listed in the following table.

Location	Company	Primary product	Startup date	Capacity (thousand tons per year)
Suez	Société el Nasr d'Engrais et d'Industries Chimiques.	Calcium nitrate	1951	275
Talkha I	do	Calcium ammonium nitrate	1975	365
Talkha II	do	Ammonia/urea	1981	1,000
Abu Qir	do	do	1979	900
Do	do	Ammonium nitrate	1984	150
Helwan	El Nasr Co. for Manufacturing Coke and Chemicals.	Calcium ammonium nitrate	1964	140
Kafr-el-Zaiyat	Société Financiere et Industrielle d'Egypte S.A.	Single superphosphate	1937	200
Assiut	do	do	1969	200
Kosseir	Kosseir Phosphate Co.	do	1958	50
Abu Zaabal	Abu Zaabal Fertilizer and Chemical Co.	do	1948	200
Do	do	Triple superphosphate	1982	175
Do	do	Phosphoric acid	1982	200

Nitrogen.—The new Talkha II fertilizer complex was composed of a 326,000-ton-per-year contained nitrogen ammonia plant, and a 262,000-ton-per-year nitrogen urea plant. The new complex was located adjacent to Talkha I, which consisted of a 231,000-ton-per-year nitric acid unit, a 118,000-ton-per-year nitrogen calcium ammonium nitrate plant, and a 98,000-ton-per-year ammonia unit. Talkha I came onstream in 1975. Both units received natural gas feedstock piped from the Abu Madi Gasfield in the Nile Delta. The consumption rate of about 30 million cubic feet per day of natural gas was to be increased to 105 million cubic feet per day as the Talkha

unit production expanded. Both Talkha I and Talkha II were built by Foster Wheeler Italiana.

The Abu Qir ammonia-urea plant began operating in 1979. Production capacity of this complex was 350,000 tons per year ammonia and 550,000 tons per year of urea. Feedstock was supplied by the Abu Qir Gasfield. Plans were underway in 1981 to further expand Abu Qir through the addition of a 150,000-ton-per-year ammonium nitrate plant to absorb excess ammonia, and a 135,000-ton-per-year nitric acid facility.

Phosphatic Fertilizer.—Construction was continuing on Egypt's largest phosphatic fertilizer complex at Abu Zaabal, 20 kilometers north of Cairo. Single superphosphate, on which the country's phosphate fertilizer industry had been based, was to be supplemented in 1982 by the first production of triple superphosphate. The Abu Zaabal complex consisted of two single-superphosphate plants and two sulfuric acid plants in addition to the new units. The new plant was to produce 175,000 tons per year of triple superphosphate and 200,000 tons per year of phosphoric acid. Krebs of France was awarded a contract in 1980 to add a third unit that was to produce 215,000 tons per year of sulfuric acid and 100,000 tons per year of 65% oleum. Also under construction were phosphoric acid and triple-superphosphate handling facilities.

Egypt was considering building another fertilizer complex, to be based in the Red Sea area. Late in 1981, the Ministry of Industry invited several companies to prepare studies for a new joint venture fertilizer project. Carbonnage de France Chimie (France) and Technipetrol (Italy) joined to present the Egyptians with a plan for a combined nitrate-phosphate fertilizer complex. The project would produce 1,000 tons per day of ammonia and 1,700 tons per day of urea from gas provided by the Gulf of Suez gasfields. Also included in the plan was a plant to produce 300,000 tons per year of diammonium phosphate, utilizing phosphate rock from the Abu Tartur deposit, which was still in the planning stage. Estimated cost of the project was $400 million. The earliest possible commissioning would be 1984-85.

Gypsum.—Production of gypsum increased in 1981 in response to the expanded capacity in the cement industry. The Egyptian Gypsum, Marble, and Quarries Co. was planning to further expand its output with the construction of a 300,000-ton-per-year gypsum plant in Alexandria. About 50,000 tons per year of the output from the plant was to be used in the manufacture of gypsum blocks, with the remainder going to the domestic cement industry.

Many commercial deposits of gypsum have been located in Egypt, the most important being the 20 million ton reserve that occurs at El-Hamman, southwest of Alexandria, and the deposit at Ras Malaab, on the Sinai Peninsula. The deposit at Ras Malaab had been worked in the late 1950's and early 1960's by the Ras Malaab Mining Co., which produced gypsum for wallboard and cement. The operation was closed after the Israeli occupation but was being considered for revitalization to strengthen Egypt's industrial base in the Sinai. Egypt was considering building a 300,000-ton-per-year processing plant at the site, at a cost of about $20 million. Reserves at Ras Malaab were estimated at 250 million tons.

Phosphate Rock.—Production of phosphate rock continued to increase in 1981, but remained substantially below the targeted output. Production from the Red Sea mines at Kossier and Safaga declined to about 180,000 tons per year, while output from the Hamrawein deposit, in the Eastern Desert increased substantially. The calcining plant at Hamrawein continued to experience some problems and was operating at about 75% of capacity. The mine and plant were expected to become fully operational by 1983 with an annual capacity of 600,000 tons of phosphate concentrate averaging 33% P_2O_5. The Hamrawein deposit was being operated by the Misr Phosphate Co. of Egypt.

The Red Sea Phosphate Co. was considering developing another mine, close to Hamrawein, at Abu Sheigela. The new mine was to replace the Kosseir and Safaga Mines, also operated by the Red Sea Phosphate Co. These older deposits would be nearly depleted by 1985, when Abu Sheigela was to become fully operational.

Expansion was also planned at the West Sabaya Mine, 31 kilometers north of Idfu on the Nile River. Output was to be expanded from the current level of 120,000 tons per year of concentrate to 500,000 tons per year. The increased production was to be used in the Abu Zaabal triple-superphosphate and phosphoric acid fertilizer plant. The deposit and the fertilizer plant were operated by

the Abu Zaabal Fertilizer and Chemical Co.

Progress was also made during the year on development of Egypt's largest phosphate deposit at Abu Tartur in the Western Desert. Reserves of Abu Tartur were estimated at 1 billion tons, containing an average of 25% P_2O_5. Production from the pilot plant began in 1980 and reached about 100,000 tons of concentrate in 1981. The small mine and beneficiation plant was built in 1978 by Sofremines (France) and Alusuisse (Switzerland). The mine provided bulk samples for testing and also some input for the manufacture of single superphosphate at Assuit. The Government planned to increase output to around 3.5 million tons per year by 1983, possibly increasing output to 6 million tons by 1986.

EGSMA examined a phosphate deposit near Wadi Qena in the Eastern Desert where EGSMA had reported a large deposit but had not specified its tonnage or grade. Initial tests indicated a high concentration of uranium in the ore.

Salt.—Salt production in Egypt was scheduled to undergo a large-scale expansion within the next several years. The El Nasr Saline Co., located at Port Said, was increasing its production of sodium chloride through addition of new salt pans. The company was also seeking financial support for a proposed $100 million chemical complex, to be located at Lake Qarun, 83 kilometers southwest of Cairo. The company planned to produce 200,000 tons per year of high-grade salt (99.98% NaCl), 21,000 tons per year of magnesia, and 7,500 tons per year of sodium sulfate. Feasibility studies for the project were carried out by DSS Engineers (United States) and White Consultants (United Kingdom). The earliest possible production date, should financing become available, was 1984.

MINERAL FUELS

Coal.—Negotiations were underway in 1981 to reopen the Maghara coal mine, located in north-central Sinai. The mine was worked between 1959 and 1967 but has been closed since that time. The deposit contained 27.5 million tons of probable reserves. In 1980, the Government allocated $21 million to reopen the mine and repair the rail lines. Once the mine is opened, the Government expects an annual production of about 300,000 tons for the first few years. About half of the annual production was to be used in making coke, with the remainder going to a planned thermal power station to be built near the deposit. Plans for the power station, however, remained tentative during the year.

Natural Gas.—Egypt's production of both associated and nonassociated gas increased significantly from 1980 to 1981. The rise reflected both the increasing production of crude oil and the greater utilization of natural gas reserves for industrial uses and for export as natural gas liquids.

The country produced approximately 200 million cubic feet per day of associated gas from the Gulf of Suez oilfields. Facilities to gather and process a large portion of this gas were under construction in 1981. In 1979, the World Bank's International Bank for Reconstruction and Development granted the Egyptian General Petroleum Authority (EGPA) a $75 million loan to partly finance a project to gather, process, and transport associated gas from the Gulf of Suez oilfields. Late in 1981, Daelim Engineering Co., Ltd., (Republic of Korea) won a $17 million contract to construct a 40-million-cubic-foot-per-day gas gathering station at Ras Bakr, on the west side of the Gulf of Suez. This station was to be linked by a 16-inch pipeline to the main gas processing and compressing station at Ras Skukair. The processing plant was to utilize 120 million cubic feet per day of associated gas to produce 260 tons per day of liquefied petroleum gas (LPG) and 600 tons per day of naphtha. Daelim was also constructing the processing facility. The plant was due onstream in June of 1982.

In 1981, Egypt produced nonassociated gas from three fields: Abu Madi (50 million cubic feet per day) in the northern Nile Delta, Abu Qir (100 million cubic feet per day) offshore in Abu Qir Bay, and Abu Gharadig (70 million cubic feet per day) in the Western Desert.

At the Abu Madi Field, reserves of nonassociated gas were estimated at about 1 trillion cubic feet. Natural gas from Abu Madi was being utilized as feedstock for the Talkha I and Talkha II fertilizer plants and at other industrial ventures in the area. The Belayim Petroleum Co. (Petrobel), a subsidiary of Italy's Ente Nationale Idrocarburi (ENI) group, also operated a gas processing plant at Abu Madi, which processed about 35 million cubic feet per day of gas, to produce about 800 barrels per day of natural gasoline. Total gas capacity of the plant was 120 million cubic feet per day.[4] Production from the field was to increase signifi-

cantly by the middle of the decade to fuel both the fertilizer plants and the gas processing facility.

The offshore Abu Qir Gasfield began production in 1979 at 100 million cubic feet per day and was scheduled to reach 200 million cubic feet per day by the middle of the 1980's. Gas produced at Abu Qir was used in the Abu Qir fertilizer plant and nearby power-generating facilities and industrial plants. The Egyptian General Petroleum Corp. (EGPC) also utilized Abu Qir gas at a 65-million-cubic-foot-per-day gas processing plant, which produced approximately 1,400 barrels per day of natural gasoline. Total gas throughput capacity at the plant was 150 million cubic feet per day.

In October 1981, EGPA invited prequalification bids for the construction of a 200-ton-per-day LPG recovery plant for the Abu Qir Gasfield. EGPA was seeking loans from the World Bank and the European Investment Bank to assist in financing the project.

The Abu Gharadig Field in the Western Desert produced about 70 million cubic feet per day of natural gas in 1981. Reserves at Abu Gharadig were estimated at about 3 trillion cubic feet. Gas production was used at the cement plants at Helwan and Turah, as well as the Helwan iron and steel complex. Amoco International (United States) was operating two processing plants for Abu Gharadig gas; one which produced approximately 1 million barrels per year of condensate, and the other at Dashour, which produced about 1,400 barrels per day of liquefied petroleum gas. The combined throughput capacity of both gas processing facilities was 207 million cubic feet per day of natural gas.

Two significant gas discoveries were made in 1981. The first was by Mobil Oil Corp. (United States) at its Temsah No. 2 well off the Damietta branch of the Nile Delta in the offshore Mediterranean. The well was 28 miles offshore in 228 feet of water. The well tested at 25 million cubic feet per day of gas and 1,440 barrels per day of 48° API condensate. The well was one-half mile northeast of Mobil's Temsah No. 1 well, which produced over 5 million cubic feet per day of gas when discovered in 1977. The General Petroleum Co. (GPC), a subsidiary of EGPC, discovered gas at the GPC-1 well in the Western Desert. Test results from the well were unavailable by yearend.

Petroleum.—Egypt's production of crude oil continued to rise in 1981, registering a 3% increase over the 1980 level. The production level for the year averaged 642,000 barrels per day, which brought the country closer to its target of 1 million barrels per day by 1985. Egypt's total investment in the oil sector for fiscal year 1980-81 was $231 million, of which $105 million was derived from foreign sources. Of the total resources invested, 39% were directed toward exploration and production, 28% to refining and processing, and 33% to transportation and distribution. Seventy exploration wells were drilled during the year, which yielded 13 discoveries—12 offshore in the Gulf of Suez and one onshore in the Western Desert.

The value of Egypt's oil and gas output for fiscal year 1980-81, calculated on world market prices, was $9.1 billion, of which the foreign partners' share came to $1.9 billion. Of the remainder, $4.3 billion was earmarked for local consumption, with the other $2.9 billion for export. The planned investment in the oil sector for fiscal year 1981-82 was $1.275 billion. At the end of 1981, Egypt's petroleum reserves were estimated at 3.2 billion barrels.

Production from the Gulf of Suez oilfields continued to increase in 1981, and many new discoveries were made in the area. The majority of Egypt's oil was produced in the Gulf of Suez by joint venture companies of Amoco Egypt Co. (United States) and EGPA; these companies were the Gulf of Suez Petroleum Co., the Nile Valley Petroleum Co., and the Fayum Petroleum Co.

Several other companies were producing oil in conjunction with EGPA. These include Italy's ENI subsidiary Azienda Generale Italiana Petroleos (AGIP) through Petrobel, the Phillips Petroleum Co. (United States) through ownership in the Western Desert Petroleum Co., and Total-Proche Orient (Total-France). GPC was EGPC's wholly owned subsidiary for production and marketing of Egypt's share of crude oil output. Egypt's major oilfields, their owners and/or operators, estimated production level, and locations are listed in the following table.

Field name	Owner and/or operator	Production level (barrels per day)	Location
El-Morgan	Amoco-EGPA/GUPCO	120,000	Gulf of Suez.
Ramadan	do	140,000	Do.
July	do	60,000	Do.
GS-195	Amoco-EPGA	30,000	Do.
Shiab Ali (Alma)	do	15,000	Western Sinai-Gulf of Suez.
Abu Rudeis	do	100,000	Sinai Peninsula-Offshore.
Belayim	AGIP-EPGA/Petrobel	40,000	Sinai Peninsula.
Balayim Marine	do	70,000	Offshore-Sinai Gulf of Suez.
Alamein/Yidma	Phillips-EGPA/WEPCO	20,000	Western Desert.

Source: International Petroleum Encyclopedia.

New discoveries.—Several significant discoveries of crude oil were made in 1981. A group composed of Deminex (Federal Republic of Germany), Royal Dutch Shell (Netherlands), and British Petroleum (United Kingdom) discovered oil in its third well in the Ghubba-al-Zeit offshore concession at the mouth of the Gulf of Suez. The well tested at 6,000 barrels per day from two formations. The well was the first commercial discovery in a previously untapped part of the Gulf.

Shell Winning N.V. (Netherlands) drilled a highly promising 11,000-foot foot well on its 5,800-square-kilometer production sharing concession at Badr-al Din in the Qattara Depression in Egypt's Western Desert. The well produced 6,000 barrels per day of high-quality 38° to 39° API crude, 400 barrels per day of condensate, and 5 million cubic feet per day of natural gas. This discovery was significant for two reasons: its location was in an area that had produced only a few minor discoveries, and the oil quality was exceptionally good compared with other finds in the area.

Finally, AGIP announced that its subsidiary, International Egyptian Oil Co., made an important crude oil discovery in the Al-Tina Gulf, 50 kilometers east of Port Said off the Sinai Coast. This was the first discovery of commercial quality ever made in Egypt's Mediterranean offshore, in an area that was previously thought to contain only natural gas reserves.

Exploration.—With the number of discoveries continuing to rise in Egypt, international attention has been focused on the areas yet to be claimed for exploration. All exploration agreements signed during the year were production sharing concessions with EGPA, with multiyear exploration obligations, significant signature bonuses, and an output split averaging 80% in favor of EGPA. Exploration agreements were signed in 1981 with the following companies: Total (France), Conoco (United States), Keith Collins Petroleum Corp. (United States), Murphy Oil Co. (United States), Agip (Italy), Petrofina (Belgium), Gulfstream Resources (Canada), and Lochiel Exploration Ltd. (Canada).

In addition to these agreements, two Japanese firms, Mitsui Oil Exploration Corp. and Fuyo Petroleum Development Corp., acquired a 20% interest in Southeastern Drilling Co.'s (Sedco) (United States) 6,000-square-kilometer Tiba tract. Tiba was located 120 kilometers west of Cairo, and 80 kilometers south of the Mediterranean coast. Sedco acquired the tract in 1979. Also Louisiana Land and Exploration Suez Inc., a U.S. firm, planned to drill two wildcats in its 690-kilometer concession in the Eastern Desert adjoining the Gulf of Suez. Drilling began in October 1981.

Pipelines.—The Arab Petroleum Pipelines Co. was considering raising the capacity of the Suez—Mediterranean pipeline, commonly known as SUMED, from the current 590 million barrels per year to the system's design capacity of 850 million barrels per year. With output from the Gulf of Suez fields increasing, international oil companies were anxious to transport oil through the overland pipeline route to the Mediterranean Sea terminal rather than going through the Suez Canal.

Refining.—Egypt's six operating refineries, with a combined crude oil input capacity of over 100 million barrels per year, handled about 40% to 45% of Egypt's domestic crude oil production. In 1981, Egypt's consumption of crude oil averaged 310,000 barrels per day, just slightly above its refinery capacity. A small amount of petroleum products were imported during the year, mainly from Western Europe. Egypt's refinery capacities are listed in the following table.

Company	Location	Capacity (thousand barrels per day)
Suez Oil Processing Co	Suez	10,000
	Mustu-rud,	25,000
	Tanta	10,000
El Nasr Petroleum Co	Suez	18,000
	Am-eriyah,	22,000
Alexandria Petroleum Co	Alexand-ria,	23,000

Source: International Petroleum Encyclopedia.

The Alexandria Petroleum Co. refinery in Alexandria planned to add several new units to the refinery, including a 20,000-barrel-per-day vacuum distillation unit, a 3,000-barrel-per-day lubrication oil plant, and a 260-barrel-per-day wax plant. All the plants were to be built by Chiyoda Chemical Engineering and Construction Co. (Japan). Also under construction were several new units at the Suez Oil Processing Co. plant at Suez, including a new lubrication oil desulfurization complex, a hydrotreater, and a catalytic reforming unit.

Work was also progressing on Egypt's first petrochemical complex, to be located at Ameriyah, adjacent to the El-Nasr Petroleum Co. refinery. The plant was to produce 80,000 tons per year of polyvinyl chloride, 90,000 tons of low-density polyethylene, and 50,000 tons of high-density polyethylene. The ethylene feedstock was to be imported from Montedison of Italy, which was a 25% partner in the operation with EGPA. The plant was scheduled to go onstream in 1982, at a cost of $550 million.

The El-Nasr Petroleum Co. awarded a contract to Snamprogetti of Italy for construction of a 40,000-ton-per-year linear alkylbenzene plant in 1981. The unit, to be constructed at Ameriyah adjacent to the refinery, was to be completed late in 1983, at a cost of $70 million.

[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Egyptian pounds (LE) to U.S. dollars at the rate of LE0.7 = US$1.00.

[3]Middle East Economic Survey. V. 25, No. 22, Mar. 15, 1982, p. 8.

[4]International Petroleum Encyclopedia. 1981 ed., p. 297.

The Mineral Industry of Finland

By Joseph B. Huvos[1]

In 1981, after 2 years of economic growth, Finland finally felt the effects of the international recession, which in Finland itself was aggravated by the adverse weather conditions, which lowered agricultural production. The rate of growth of the gross national product (GNP) fell from 5% in 1980 to only 1% in 1981. The GNP was approximately $50 billion[2] at current prices, unemployment rose to over 5%, and inflation was 12%. The contribution of mining and quarrying to the GNP was about 0.5%, but together with manufacturing this sector amounted to 27.4% of the GNP.

Important events in Finland's mineral industry in 1981 included commissioning of new plants and equipment, such as Outokumpu Oy's new copper converter at Harjavalta, Ovako Oy's new rod mill at Dalsbruk, and Kemira Oy's nitric acid plant at Uusikaupunki, a sulfuric acid plant at Pori, and a sodium sulfate plant at Kokkola. Several large projects at existing facilities were started, including enlargement of Kemira Oy's Siilinjärvi phosphate project; construction of Rautaruukki Oy's Laurinoja Mine; expansion of Outokumpu Oy's nickel smelter, Pori electrolytic copper refinery, and Tornio stainless steel plant; and construction of Outokumpu Oy's Enonkoski nickel mine.

PRODUCTION

Production of mineral commodities in 1977-81 is shown in table 1.

Volume indexes (1975=100) of the country's mineral industry and its industry as a whole for 1980-81 are shown in the following tabulation; all mineral-related indexes declined:

Sector	1980	1981[p]
Mining and quarrying	140	119
Nonmetallic minerals processing	114	103
Iron and steel	173	168
Nonferrous metals	140	137
Petroleum refining	148	132
Industrial chemicals	117	112
All industry	127	129

[p]Preliminary.

Source: Central Statistical Office of Finland (Helsinki). Bulletin of Statistics, No. 4, pp. 8-9.

Table 1.—Finland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS					
Aluminum metal, secondary	7,400	7,000	8,000	8,000	9,000
Cadmium metal, refined	527	611	590	581	621
Chromium: Chromite:					
Gross weight:					
Lump ore	233,129	328,542	257,107	175,770	209,912
Concentrate	145,131	160,865	152,297	165,000	181,000
Foundry sand	23,740	17,559	25,289	21,400	21,400
Cr_2O_3 content:					
Lump ore	62,479	86,078	69,419	NA	53,318
Concentrate	59,939	66,116	66,880	NA	72,207
Foundry sand	11,087	8,200	11,100	NA	10,073
Cobalt:					
Mine output, metal content	1,227	r1,212	r1,065	1,035	1,034
Metal, refined	985	922	1,162	1,151	1,229
Copper:					
Mine output, metal content	46,728	46,865	41,063	36,918	38,539
Metal:					
Smelter:					
Primary	61,542	53,737	55,300	49,200	54,747
Secondary	10,563	9,990	9,900	10,000	12,950
Total	72,105	63,727	65,200	59,200	67,697
Refined:					
Primary[e]	32,755	32,719	33,027	30,542	23,796
Secondary[e]	10,000	10,000	10,000	10,000	10,000
Total	42,755	42,719	43,027	40,542	33,796
Gold metal troy ounces	27,392	29,096	28,325	41,828	31,893
Iron and steel:					
Iron ore, marketable, all types:					
Gross weight thousand tons	1,141	1,088	1,144	1,172	1,230
Fe content do	753	712	738	755	789
Metal:					
Pig iron do	1,763	1,916	2,038	2,019	1,978
Ferroalloys: Ferrochromium do	34	45	49	53	51
Steel, crude:					
Ingots do	2,171	2,304	2,469	2,472	2,393
Castings do	25	29	30	37	35
Semimanufactures, rolled do	1,518	1,804	1,900	2,509	1,848
Lead, mine output, metal content	628	790	1,000	1,134	1,942
Mercury 76-pound flasks	630	1,145	r1,348	2,170	1,949
Molybdenum metal	--	--	104	114	165
Nickel:					
Mine output, metal content	5,837	r4,170	5,800	6,531	6,864
Nickel sulfate, metal content	223	173	NA	NA	NA
Metal, electrolytic	9,447	7,501	11,460	12,807	13,310
Platinum-group metals:					
Palladium troy ounces	NA	NA	932	675	1,993
Platinum do	640	640	711	225	1,608
Selenium metal kilograms	11,654	16,830	17,541	17,250	19,122
Silver metal troy ounces	812,898	1,068,850	1,027,729	1,429,581	1,215,457
Titanium concentrate: Ilmenite:					
Gross weight	124,700	131,900	119,700	159,000	161,500
Ti content	56,240	59,750	54,223	72,026	e70,000
Vanadium (V_2O_5):					
Gross weight	3,328	5,007	4,941	5,076	5,557
V content	1,864	2,805	2,768	2,844	3,112
Zinc:					
Mine output, metal content	62,856	52,923	51,623	58,433	53,480
Metal	137,980	132,935	147,064	146,719	139,835
NONMETALS					
Asbestos	70,467	68,239	103,639	140,900	140,500
Cement, hydraulic thousand tons	1,712	1,704	1,749	1,793	1,787
Feldspar	71,890	71,330	67,928	74,089	63,066
Lime	235,000	194,101	e439,105	392,227	382,903
Nitrogen: N content of ammonia	131,400	149,900	114,200	70,100	68,800
Phosphates, natural: Apatite	2,550	4,218	2,688	137,950	200,927
Pyrites, gross weight	295,015	215,765	341,967	321,797	403,352
Sodium compounds: Sodium sulfate[e]	45,000	50,000	45,000	45,000	45,000
Stone:					
Limestone and dolomite:					
For cement manufacture thousand tons	2,535	2,287	2,339	2,534	2,416
For lime manufacture do	430	387	439	392	383
For sulfite and metallurgical use do	98	81	80	82	75
Other do	901	1,055	1,241	1,428	631
Quartz do	119	145	217	237	255
Sulfur:					
S content of pyrites do	130	87	151	144	184

See footnotes at end of table.

Table 1.—Finland: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Sulfur —Continued					
Byproduct:					
Of metallurgy ____ thousand tons	280	232	263	247	234
Of petroleum ____ do ____	25	30	30	30	[e]30
Total ____ do ____	435	349	444	421	448
Talc ____	156,584	195,159	267,180	317,901	307,915
Wollastonite ____	8,904	7,688	10,576	8,782	13,690
MINERAL FUELS AND RELATED MATERIALS					
Peat:					
For fuel use ____ thousand tons	600	1,870	1,551	1,841	[e]2,000
For agriculture and other uses ____ do ____	231	203	773	578	[e]500
Petroleum refinery products:					
Gasoline ____ thousand 42-gallon barrels	15,630	16,737	17,508	NA	NA
Jet fuel ____ do ____	1,582	1,765	1,806	NA	NA
Kerosine ____ do ____	34	29	40	NA	NA
Distillate fuel oil ____ do ____	29,060	26,993	28,000	NA	NA
Residual fuel oil ____ do ____	27,330	24,707	24,997	NA	NA
Liquefied petroleum gas ____ do ____	1,163	8,468	1,188	NA	NA
Other ____ do ____	8,539		8,477	NA	NA
Refinery fuel and losses ____ do ____	5,269	4,629	5,035	NA	NA
Total ____ do ____	88,607	83,328	87,051	NA	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through Aug. 18, 1982.

TRADE

The brisk rate of export growth during the past 2 years leveled off by the end of 1981, but Finland's trade balance improved substantially.

The United States continued to maintain a positive balance-of-trade with Finland in 1981, largely on the strength of exports of coal, aircraft, office machinery, and chemicals.

Finland's mineral commodity trade in 1979 and 1980 is shown in tables 2 and 3.

Table 2.—Finland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides ____	--	8	--	West Germany 7; Austria 1.
Metal including alloys:				
Scrap ____	NA	102	--	All to West Germany.
Unwrought ____	1,337	3,887	34	Japan 1,449; Sweden 1,238; West Germany 434.
Semimanufactures ____	23,277	28,796	4	West Germany 6,138; United Kingdom 4,441; Sweden 4,415.
Cadmium metal including alloys, all forms ____	NA	565	60	Sweden 160; United Kingdom 119; Belgium-Luxembourg 102.
Chromium: Chromite ____	308,847	206,547	31,208	Sweden 149,107; France 16,328; Poland 3,008.
Cobalt:				
Oxides and hydroxides ____ value	--	$521	--	All to U.S.S.R.
Metal including alloys, all forms ____	NA	1,201	408	United Kingdom 259; East Germany 188; West Germany 84.

See footnotes at end of table.

Table 2.—Finland: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Copper:				
Ore and concentrate	--	15	--	All to Denmark.
Oxides and hydroxides	NA	387	--	United Kingdom 278; France 23.
Matte	--	81	--	All to Sweden.
Metal, including alloys:				
Scrap	521	234	--	Denmark 224; West Germany 10.
Unwrought	16,893	5,945	--	East Germany 3,949; Switzerland 1,001; Belgium-Luxembourg 995.
Semimanufactures	29,158	28,411	976	Sweden 3,967; France 3,507; Denmark 3,178; West Germany 28.
Iron and steel:				
Ore and concentrate	10	14,628	14,628	
Metal:				
Scrap	3,661	194	--	Sweden 127; West Germany 67.
Pig iron	32,513	17,520	--	Italy 10,853; Sweden 2,912; Norway 2,599.
Ferroalloys	31,735	16,982	--	Sweden 8,464; Netherlands 7,216; United Kingdom 1,001.
Steel, primary forms	163,350	129,465	--	Sweden 85,703; United Kingdom 30,317; West Germany 11,215.
Semimanufactures:				
Bars, rods, angles, shapes, sections	222,447	174,515	2,620	West Germany 41,002; U.S.S.R. 35,261; France 15,065; Sweden 13,734.
Plates and sheets	667,929	532,532	38,648	West Germany 90,458; Sweden 75,061; Norway 59,557; U.S.S.R. 34,431.
Hoop and strip	33,422	25,466	180	U.S.S.R. 9,088; Norway 4,160; Sweden 3,702; West Germany 3,253.
Rails and accessories	308	127	--	Iraq 92; West Germany 14; Sweden 11.
Wire	4,657	2,685	--	Sweden 2,231; United Kingdom 101; Ireland 80.
Tubes, pipes, fittings	68,278	68,653	35	Sweden 29,658; U.S.S.R. 10,319; West Germany 8,076.
Castings and forgings, rough	3,292	3,255	64	Sweden 1,945; West Germany 378; Norway 213; France 210.
Lead:				
Ore and concentrate	2,035	2,047	--	All to Sweden.
Oxides and hydroxides	--	1	--	All to U.S.S.R.
Metal including alloys:				
Scrap	102	20	--	All to Denmark.
Unwrought	991	869	--	Denmark 367; United Kingdom 362; Sweden 79.
Semimanufactures	59	45	--	Australia 29; Belgium-Luxembourg 14.
Magnesium metal including alloys: Scrap	NA	31	31	
Mercury 76-pound flasks	NA	1,595	--	Belgium-Luxembourg 1,189; Romania 203; Netherlands 174.
Molybdenum:				
Ore and concentrate	NA	1	--	All to East Germany.
Metal including alloys, all forms	NA	1	--	All to Sweden.
Nickel:				
Ore and concentrate	686	1,657	--	All to Norway.
Metal including alloys:				
Scrap	146	--		
Unwrought	9,578	11,104	4,132	United Kingdom 1,521; West Germany 1,466; Italy 689.
Semimanufactures	5	268	(1)	Norway 201; Belgium-Luxembourg 49; Sweden 9.
Platinum-group metals including alloys, unwrought and wrought value, thousands	$389	$237	--	United Kingdom $236.
Silver:				
Ore and concentrate[2] do	NA	$156	--	All to United Kingdom.
Waste and sweepings[2] do	(3)	$7,509	--	United Kingdom $2,943; West Germany $2,415; Sweden $1,785.
Metal including alloys, unwrought and partly wrought do	$4,932	$33,151	--	United Kingdom $16,051; West Germany $13,829; Sweden $1,797.
Tantalum metal including alloys, all forms do	NA	$7	--	All to East Germany.
Tin metal including alloys:				
Scrap	14	47	--	United Kingdom 23; West Germany 15; Sweden 9.
Unwrought	7	5	--	All to Sweden.
Semimanufactures	--	2	--	All to United Kingdom.

See footnotes at end of table.

Table 2.—Finland: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Titanium oxides	NA	2,634	309	Hungary 740; Sweden 558; East Germany 519.
Tungsten metal including alloys, all forms	NA	15	--	West Germany 7; United Kingdom 7.
Zinc:				
Oxides	NA	3	--	Niger 2.
Metal including alloys:				
Scrap	501	1,596	--	Belgium-Luxembourg 449; West Germany 439; France 410.
Unwrought	129,565	120,613	18,127	United Kingdom 27,311; Netherlands 14,968; Yugoslavia 13,101.
Semimanufactures	56	18	--	U.S.S.R. 9; Sweden 4; Libya 3.
Other:				
Ash and residue containing nonferrous metals	[4]4,037	3,252	--	France 1,186; West Germany 873; Belgium-Luxembourg 711.
Oxides, hydroxides, peroxides	NA	5,398	873	West Germany 1,457; United Kingdom 1,138; Sweden 463.
Metals:				
Metalloids	NA	56	--	Switzerland 47; United Kingdom 3; Italy 2.
Alkali, alkaline earth, rare-earth metals	NA	2	--	Japan 2.
Base metals including alloys, all forms	[5]1,876	36	1	Denmark 25; Sweden 10.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc. value, thousands	--	$3	--	All to Zambia.
Grinding and polishing wheels and stones	58	83	(1)	U.S.S.R. 63; Sweden 6; West Germany 3.
Asbestos, crude	--	20	--	All to Norway.
Barite and witherite	--	18	--	All to Japan.
Boron materials: Crude natural borates	--	12	--	All to Sweden.
Cement	217,547	66,129	--	U.S.S.R. 33,710; Sweden 23,890; Nigeria 6,401.
Chalk	NA	75	--	Nigeria 58; Niger 17.
Clays and clay products:				
Crude:				
Fire clay	NA	130	--	Sweden 82; United Kingdom 38.
Other	NA	268	--	Sweden 231; France 35.
Products:				
Refractory including nonclay brick	732	4,018	--	Sweden 2,273; U.S.S.R. 762; Saudi Arabia 297.
Nonrefractory	2,405	1,963	90	U.S.S.R. 764; Sweden 710; Iraq 161.
Diamond gem, not set or strung value, thousands	$499	$959	--	Belgium-Luxembourg $386; Sweden $257; United Kingdom $148.
Diatomite and other infusorial earth	NA	42	--	United Kingdom 39.
Feldspar and fluorspar	NA	47,310	--	United Kingdom 20,642; West Germany 10,577; Sweden 8,005.
Fertilizer materials:				
Crude, phosphatic	--	1,677	--	West Germany 1,381; Sweden 296.
Manufactured:				
Nitrogenous	62,416	8,644	--	India 6,647; Belgium-Luxembourg 1,110; Ireland 610.
Phosphatic	6	11,425	--	All to U.S.S.R.
Potassic	8,796	15,065	--	Cuba 9,211; Japan 5,854.
Other including mixed	205,668	34,513	--	China 11,822; Venezuela 10,549; Sweden 5,052.
Ammonia	--	12	--	All to Libya.
Graphite, natural	--	1	--	All to Mexico.
Lime	116	1,046	--	U.S.S.R. 846; Sweden 194.
Magnesite value, thousands	--	$2	--	Tanzania $1; United Kingdom $1.
Mica:				
Crude including splittings and waste	--	1	--	All to United Kingdom.
Worked including agglomerated splittings value, thousands	--	$2	--	All to France.
Pigment, mineral: Iron oxides, processed	--	3	--	Niger 1; Nigeria 1.
Precious and semiprecious stones, excluding diamond:				
Natural value, thousands	$43	$56	--	Sweden $26; Australia $14; West Germany $5.
Synthetic do.	$569	$998	$914	Sweden $74; Australia $8.
Salt and brine	148	199	--	Sweden 118; Denmark 50; Hong Kong 17.

See footnotes at end of table.

Table 2.—Finland: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Sodium and potassium compounds, n.e.s.:				
Caustic soda	NA	6,038	--	U.S.S.R. 525; Kuwait 505.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	148,040	281,584	124	Italy 105,280; Netherlands 98,099; France 38,447.
Worked	1,609	1,705	--	Sweden 963; West Germany 242; Japan 192.
Dolomite, chiefly refractory-grade	NA	40	--	All to West Germany.
Gravel and crushed rock	52,490	193,848	2	Sweden 189,758; U.S.S.R. 3,143; Egypt 800.
Limestone	9,590	14,062	--	Sweden 10,407; Denmark 2,045; United Kingdom 1,560.
Quartz and quartzite	NA	10,131	--	Norway 5,784; U.S.S.R. 1,164; Sweden 836.
Sand excluding metal-bearing	17,502	11,413	--	Sweden 10,729; U.S.S.R. 228; Saudi Arabia 227.
Sulfur:				
Elemental, other than colloidal	4	6	--	Nigeria 5; Iraq 1.
Sulfuric acid	NA	34	--	Sweden 22; Libya 11.
Talc, steatite, soapstone, pyrophyllite	NA	54,044	--	Sweden 23,141; West Germany 8,279; Poland 4,593.
Other:				
Crude	[6]122,354	10,326	--	West Germany 4,084; Italy 1,925; Spain 1,332; Sweden 1,134.
Slag, dross, similar waste	NA	6,507	--	Sweden 6,455; Denmark 25.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	NA	1,474	--	U.S.S.R. 1,001; Norway 234; Libya 80.
Carbon black	NA	6,729	--	Ireland 6,521; Hungary 170; Sweden 22.
Coal and briquets, anthracite and bituminous	--	21	--	All to Sweden.
Coke and semicoke	2,080	5,473	--	Norway 2,830; Iceland 2,361.
Hydrogen, helium, rare gases	NA	370	--	Sweden 321; Norway 44.
Peat including briquets and litter	30,028	42,660	--	Netherlands 12,329; Sweden 8,321; United Kingdom 8,177.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	[r]6,240	7,263	--	Sweden 3,956; Netherlands 1,485; United Kingdom 745.
Kerosine do.	[r]101	122	--	Mainly to Sweden.
Distillate fuel oil do.	1,150	3,645	--	Sweden 3,279; West Germany 201; Netherlands 140.
Residual fuel oil do.	2,818	4,967	--	Sweden 2,749; Denmark 927; Portugal 427; France 422.
Lubricants do.	113	89	([1])	U.S.S.R. 65; Nigeria 15; Sweden 6.
Other:				
Liquefied petroleum gas 42-gallon barrels	20,000	220	--	Sweden 128; U.S.S.R. 81.
Mineral jelly and wax do.	165	102	--	Netherlands 47; Nigeria 24.
Bitumen and other residues do.	([7])	17,313	--	U.S.S.R. 14,023; Sweden 2,606.
Bituminous mixtures do.	([7])	21,646	--	U.S.S.R. 15,550; Norway 5,727.
Mineral tar and coal-, petroleum-, and gas-derived crude chemicals	31	3	--	All to Sweden.

[r]Revised. NA Not available.
[1]Less than 1/2 unit.
[2]May include other precious metals.
[3]1979 export was 7,031 kilograms.
[4]Includes aluminum scrap, if any.
[5]Includes metals of cadmium, cobalt, magnesium, molybdenum, and tungsten, if any.
[6]Includes chalk, clay, feldspar or fluorspar, dolomite, quartz or quartzite, talc, etc., if any.
[7]1979 export of bitumen, residues, and bituminous mixtures was 24,961 barrels.

Table 3.—Finland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	4,495	4,131	--	West Germany 2,390; Australia 696; Italy 437.
Oxides and hydroxides	NA	29,259	176	Hungary 13,822; China 8,700; West Germany 5,084.
Metal including alloys:				
Scrap	3,849	2,475	321	Norway 901; U.S.S.R. 482; West Germany 229; Sweden 204.
Unwrought	24,891	26,737	1,385	U.S.S.R. 10,230; Hungary 3,409; United Kingdom 3,277.
Semimanufactures	32,243	35,008	1,024	Norway 7,649; Sweden 6,391; West Germany 4,525.
Antimony metal including alloys, all forms	NA	15	--	Denmark 5; West Germany 5; Yugoslavia 2.
Beryllium metal including alloys, all forms, value, thousands	NA	$2	--	All from United Kingdom.
Cadmium metal including alloys, all forms, do	NA	$3	--	NA.
Chromium, oxides and hydroxides	NA	868	(1)	West Germany 382; U.S.S.R. 153; China 98.
Cobalt:				
Oxides and hydroxides	NA	246	65	Sweden 147; United Kingdom 34.
Metal including alloys, all forms	NA	7	3	Belgium-Luxembourg 2; Sweden 1.
Copper:				
Ore and concentrate	24,706	9,934	--	Yugoslavia 5,109; Canada 2,969; Morocco 1,856.
Matte	NA	1	--	All from West Germany.
Sulfate	NA	1,620	--	U.S.S.R. 1,340; France 142; China 60.
Metal including alloys:				
Scrap	1,002	1,768	1,415	Sweden 199; United Kingdom 47; India 31.
Unwrought	12,392	23,933	2	West Germany 7,064; United Kingdom 5,661; U.S.S.R. 4,885.
Semimanufactures	9,874	13,717	292	Sweden 5,003; West Germany 3,164; United Kingdom 2,220.
Iron and steel:				
Ore and concentrate, thousand tons	1,791	1,737	--	Sweden 1,220; U.S.S.R. 315; Norway 193.
Metal:				
Scrap	88,213	104,581	251	U.S.S.R. 101,278; United Kingdom 2,824.
Pig iron	19,752	45,698	(1)	Sweden 30,868; West Germany 5,605; Canada 3,246.
Ferroalloys	47,437	48,315	--	Norway 23,423; U.S.S.R. 7,336; French Polynesia 5,545.
Steel, primary forms	1,813	9,589	(1)	Spain 5,000; Netherlands 506; West Germany 84.
Semimanufactures:				
Bars, rods, angles, shapes, sections	214,240	225,280	31	Sweden 70,174; West Germany 38,168; Poland 22,551.
Plates and sheets	127,422	176,014	897	West Germany 48,796; Sweden 28,073; Poland 22,653.
Hoop and strip	25,852	30,371	21	Sweden 11,786; West Germany 8,846; United Kingdom 2,800.
Rails and accessories	2,488	3,405	(1)	West Germany 1,287; Belgium-Luxembourg 1,059; Sweden 812.
Wire	18,486	19,978	161	Sweden 6,484; Belgium-Luxembourg 3,888; West Germany 2,519.
Tubes, pipes, fittings	103,314	123,913	326	West Germany 40,561; United Kingdom 12,501; Sweden 12,030.
Castings and forgings, rough	1,906	2,200	3	West Germany 617; Sweden 538; Switzerland 413.
Lead:				
Oxides and hydroxides	NA	212	--	East Germany 126; Sweden 53; West Germany 28.
Metal including alloys:				
Scrap	NA	597	89	Norway 488; West Germany 16.
Unwrought	16,306	20,498	443	Sweden 11,017; U.S.S.R. 7,058; United Kingdom 1,053.
Semimanufactures	526	832	2	West Germany 413; Sweden 169; Belgium-Luxembourg 156.
Magnesium metal including alloys:				
Unwrought	NA	180	132	Norway 47.
Semimanufactures	NA	16	--	West Germany 14.
Manganese:				
Ore and concentrate	18,916	10,736	--	Netherlands 9,780; China 950.
Oxides and hydroxides	NA	767	(1)	Netherlands 249; United Kingdom 239; China 111.
Mercury, 76-pound flasks	NA	116	--	Spain 87.

See footnotes at end of table.

Table 3.—Finland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Molybdenum:				
Ore and concentrate	NA	675	443	Sweden 83; Netherlands 63; Belgium-Luxembourg 36.
Metal including alloys, all forms	NA	5	2	Austria 3.
Nickel:				
Ore and concentrate	21,968	14,676	--	All from Norway.
Matte and speiss	NA	7,523	--	Canada 7,393; Australia 130.
Metal including alloys:				
Scrap	1,176	1,944	900	Netherlands 364; United Kingdom 343; West Germany 297.
Unwrought	2,846	4,299	1,270	U.S.S.R. 1,897; Canada 646; Austria 148.
Semimanufactures	66	97	20	West Germany 35; United Kingdom 15; Netherlands 10.
Platinum-group metals including alloys, unwrought and wrought value, thousands	$697	$4,010	$2	United Kingdom $2,060; U.S.S.R. $1,629; Sweden $264.
Silver:				
Ore and concentrate[2] do.	NA	$23	--	All from Sweden.
Waste and sweepings[2] do.	NA	$2,379	$2,376	Denmark $1; United Kingdom $1.
Metal including alloys, unwrought and partly wrought do.	$6,785	$14,000	$29	United Kingdom $6,557; West Germany $3,178; Sweden $2,038.
Tantalum metal including alloys, all forms do.	NA	$9	--	Austria $5; United Kingdom $2.
Tin metal including alloys:				
Unwrought	302	267	(1)	West Germany 96; Denmark 45; United Kingdom 44.
Semimanufactures	105	112	(1)	United Kingdom 71; West Germany 25; Norway 10.
Titanium:				
Ore and concentrate	NA	37,602	--	Norway 35,093; India 1,989.
Oxides	NA	348	36	West Germany 173; Norway 119; Sweden 20.
Tungsten metal including alloys, all forms	NA	83	16	Belgium-Luxembourg 60; United Kingdom 5.
Zinc:				
Ore and concentrate	146,816	189,500	--	Denmark 100,530; Sweden 70,198; Peru 9,062.
Oxides and peroxides	NA	382	18	Sweden 160; United Kingdom 77; Canada 72.
Metal including alloys:				
Unwrought	1,310	1,085	52	Sweden 684; West Germany 196; United Kingdom 61.
Semimanufactures	1,000	839	--	Norway 550; West Germany 120; Sweden 74.
Zirconium ore and concentrate	NA	23	--	United Kingdom 21.
Other:				
Ores and concentrates	NA	25	--	United Kingdom 21; Austria 2.
Ash and residue containing nonferrous metals	3,150	2,946	2,183	United Kingdom 403; West Germany 191; Sweden 82.
Oxides, hydroxides, peroxides	NA	649	8	West Germany 220; Belgium-Luxembourg 138; Australia 108.
Metals:				
Cermet	NA	23	(1)	West Germany 22.
Metalloids	NA	493	1	Sweden 407; Norway 62; West Germany 12.
Alkali, alkaline earth, rare-earth metals	NA	10	(1)	Japan 7; West Germany 2.
Base metals including alloys, all forms	[3]693	178	17	Netherlands 38; Republic of South Africa 34; United Kingdom 25.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	77	87	1	Italy 42; Norway 23; Netherlands 5.
Artificial: Corundum	NA	839	1	Austria 629; West Germany 152; United Kingdom 45.
Dust and powder of precious and semi-precious stones, including diamond value, thousands	NA	$24	--	U.S.S.R. $12; West Germany $4; United Kingdom $4.
Grinding and polishing wheels and stones	2,082	2,460	417	Austria 511; West Germany 375; Sweden 306.
Asbestos, crude	3,019	5,040	--	Republic of South Africa 2,577; Canada 1,507; U.S.S.R. 665.

See footnotes at end of table.

Table 3.—Finland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Barite and witherite	NA	1,168	--	West Germany 968; China 150; France 30.
Boron materials:				
Crude, natural borates	NA	17,809	7,370	Turkey 9,068; Netherlands 1,020; West Germany 249.
Oxide and acid	NA	192	22	France 104; United Kingdom 35; Switzerland 20.
Cement	4,569	8,575	1	Denmark 5,039; United Kingdom 1,628; Sweden 1,303.
Chalk	NA	12,454	1	West Germany 6,272; Sweden 2,012; United Kingdom 1,853.
Clays and clay products:				
Crude:				
Fire clay	NA	15,345	20	United Kingdom 11,808; West Germany 3,428.
Kaolin	NA	390,021	473	United Kingdom 362,969; Brazil 18,355; Netherlands 3,656.
Other	NA	10,958	5,185	United Kingdom 2,824; Cyprus 2,010; Czechoslovakia 322.
Clay products:				
Refractory including nonclay brick	59,575	63,783	117	Sweden 15,113; United Kingdom 14,948; West Germany 10,386.
Nonrefractory	18,771	38,808	1	U.S.S.R. 20,610; Italy 3,763; Sweden 2,519; France 2,324.
Cryolite and chiolite	NA	77	--	All from Denmark.
Diamond:				
Gem, not set or strung value, thousands	$6,069	$10,201	$188	Belgium-Luxembourg $4,307; Israel $2,228; United Kingdom $2,185.
Industrial do	$175	$105	--	Belgium-Luxembourg $59; Republic of South Africa $25; Switzerland $11.
Diatomite and other infusorial earth	NA	2,053	902	Iceland 362; United Kingdom 312; Switzerland 210.
Feldspar and fluorspar	NA	5,130	--	Canada 2,139; Mexico 1,133; Sweden 711.
Fertilizer materials:				
Crude, phosphatic	672,527	613,628	118,434	Senegal 205,809; Algeria 124,529; U.S.S.R. 77,179.
Manufactured:				
Nitrogenous	27,403	35,113	1	U.S.S.R. 14,078; Norway 13,568; Sweden 5,085.
Phosphatic	256	12,681	--	Netherlands 12,316; Belgium-Luxembourg 290.
Potassic	300,015	333,528	--	U.S.S.R. 130,167; East Germany 103,773; United Kingdom 38,737.
Other including mixed	1,279	32,652	31,192	Belgium-Luxembourg 908; Sweden 287; United Kingdom 232.
Ammonia	NA	265,419	97,048	U.S.S.R. 161,543; Netherlands 6,824.
Graphite, natural	NA	172	--	West Germany 47; United Kingdom 47; Norway 43.
Gypsum and plaster	NA	151,201	85	Spain 126,871; U.S.S.R. 20,422; West Germany 2,796.
Lime	8	424	--	United Kingdom 419; Denmark 3.
Magnesite	NA	15,865	72	U.S.S.R. 8,756; Spain 2,868; China 2,531.
Mica:				
Crude including splittings and waste	NA	253	--	United Kingdom 225; Norway 22.
Worked including agglomerated splittings	NA	29	1	Austria 12; Switzerland 6; West Germany 3.
Pigments, mineral: Processed iron oxides	NA	4,275	57	West Germany 4,004; China 76; United Kingdom 42.
Precious and semiprecious stones:				
Natural value, thousands	$351	$463	$2	Switzerland $137; Austria $111; West Germany $111.
Synthetic do	$449	$494	$277	Switzerland $87; Austria $51; West Germany $34.
Pyrites	22	556	--	Portugal 550.
Salt and brine	659,560	726,593	--	Netherlands 456,227; Poland 73,761; East Germany 61,510.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	NA	70,772	4	West Germany 26,542; East Germany 25,084; Netherlands 11,216.
Caustic potash	NA	774	(1)	East Germany 307; Sweden 143; West Germany 130.
Soda ash	NA	88,285	--	East Germany 18,681; United Kingdom 17,079; Poland 13,338.

See footnotes at end of table.

Table 3.—Finland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,367	1,415	36	Sweden 798; Norway 348; Italy 175.
Worked	892	379	--	Italy 195; Sweden 130; Portugal 42.
Dolomite, chiefly refractory-grade	NA	17,511	--	Belgium-Luxembourg 12,143; West Germany 2,654; Norway 2,533.
Gravel and crushed rock	4,006	6,005	--	Sweden 3,777; Denmark 903; Norway 490.
Limestone excluding dimension	NA	735,157	--	Sweden 727,492; United Kingdom 5,878.
Quartz and quartzite	NA	185	18	Portugal 80; West Germany 38; Sweden 18.
Sand excluding metal-bearing	71,250	71,562	1	Belgium-Luxembourg 44,189; Denmark 12,678; Norway 10,662.
Sulfur:				
Elemental:				
Other than colloidal	42,132	58,357	2	Poland 33,134; France 15,593; Sweden 9,202.
Colloidal	NA	16	--	Belgium-Luxembourg 8; West Germany 8.
Sulfuric acid	NA	91,522	--	West Germany 32,374; Norway 23,572; Denmark 15,172.
Talc, steatite, soapstone, pyrophyllite	NA	805	--	Belgium-Luxembourg 390; West Germany 196; Sweden 70.
Other:				
Crude	[4]588,618	59,321	366	Norway 56,839; Sweden 1,009; Republic of South Africa 643.
Slag, dross, similar waste	28,464	75,608	--	Sweden 37,999; East Germany 33,451; Norway 3,300.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	NA	2,821	68	China 1,835; East Germany 715.
Halogens	NA	4	--	Chile 3; West Germany 1.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	NA	405	183	Trinidad and Tobago 185; Italy 30.
Carbon black	NA	10,134	113	Netherlands 5,984; Sweden 2,171; United Kingdom 1,229.
Coal, all grades including briquets:				
Anthracite	124,205	127,242	21,863	U.S.S.R. 105,322; Sweden 53.
Bituminous coal including dust thousand tons	4,647	4,542	512	Poland 3,535; U.S.S.R. 484.
Coke and semicoke do	1,263	1,229	--	U.S.S.R. 776; West Germany 211; Sweden 124; Poland 60.
Gas, natural million cubic feet	30,721	31,944	--	All from U.S.S.R.
Hydrogen, helium, rare gases	NA	2,777	15	U.S.S.R. 2,118; Sweden 218; West Germany 190.
Peat including peat briquets and litter	52	1,967	--	U.S.S.R. 1,931; United Kingdom 36.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	93,580	109,368	--	U.S.S.R. 51,264; Saudi Arabia 40,248; Iraq 8,260.
Refinery products:				
Gasoline do	150	136	([1])	Netherlands 99; West Germany 11; Belgium-Luxembourg 8.
Kerosine do	20	47	([1])	France 31; U.S.S.R. 12.
Distillate fuel oil do	10,123	10,375	--	U.S.S.R. 10,366; Sweden 8.
Residual fuel oil do	10,170	8,876	--	U.S.S.R. 8,744; United Kingdom 132.
Lubricants do	764	969	30	United Kingdom 316; Netherlands 173; U.S.S.R. 108; France 106.
Other:				
Liquefied petroleum gas do	133	102	--	U.S.S.R. 101.
Mineral jelly and wax do	121	151	1	West Germany 47; U.S.S.R. 38; China 31.
Petroleum coke do	NA	16	15	West Germany 1.
Bitumen and other residues do	388	405	([1])	Netherlands 190; West Germany 84; Sweden 71.
Bituminous mixtures do	NA	24	1	Sweden 18; United Kingdom 1.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	NA	23,797	54	Poland 13,309; U.S.S.R. 5,709; United Kingdom 2,732.

NA Not available.
[1]Less than 1/2 unit.
[2]May include ores and concentrates and wastes and sweepings of other precious and semiprecious metals.
[3]Includes metals of antimony, beryllium, cadmium, cermet, cobalt, magnesium, molybdenum, tantalum, and tungsten, if any.
[4]Includes barite and witherite, natural borates, chalk, clay, cryolite and chiolite, diatomite, feldspar and fluorspar, graphite, gypsum and plaster, magnesite, mica, dolomite, limestone, quartz and quartzite, talc, etc., if any.

COMMODITY REVIEW

METALS

Chromium.—In 1981, Government-owned Outokumpu Oy, the country's only chromite, ferrochrome, and stainless steel producer, continued to exploit chrome ore reserves at its Kemi Mine, at the foot of the Gulf of Bothnia, which was said to be large enough to supply the country well into the next century. In 1981, Finnish chromite production was about 2% of the world's total output.

The first stage of the extension to the Tornio stainless steel plant near Kemi was started. Completion in 1983 was to increase production capacity by 20% to 90,000 tons per year. The ferrochrome capacity of the plant had already been increased.

Cobalt and Molybdenum.—In 1981, Outokumpu Oy reportedly set a new company record for the production of cobalt and molybdenum, facilitated by a previously completed augmentation of the plant capacity for both metals at Kokkola, on the Gulf of Bothnia. Raw materials for 65% of the cobalt produced at Kokkola originated in the company's own mines. In 1982, the company was to start construction of a cobalt salt plant in Kokkola.

Copper.—In 1981, expansion of Outokumpu Oy's Pori electrolytic copper refinery on the west coast from 45,000 tons per year to 55,000 tons per year was completed. A new converter in the company's Harjavalta smelter helped to increase copper production in 1981. The expanded smelting capacity of 60,000 to 80,000 tons could not be used fully since restricted demand by Kemira Oy for sulfur dioxide limited production. Concentrates from the company's own mines accounted for 70% of copper concentrates used in producing copper; the rest were imported from the Lökken Mine in Norway under a new contract. An important contract was also concluded with the two Swedish companies, Luossavaara Kiirunavaara AB (LKAB) and Boliden AB, according to which Outokumpu Oy was to buy 60% of the copper concentrate produced at LKAB's Viscaria Mine in Kiruna, due to go onstream in 1983.

Iron Ore.—In 1981, iron ore production continued at Government-owned Rautaruukki Oy's three iron ore mines, of which the Otanmäki and Mustavaara Mines were located in central Finland and Rautavaara in the north in Finnish Lappland. Otanmäki and Mustavaara also produced some vanadium pentoxide, and Otanmäki produced, in addition, some ilmenite concentrates.

At the Rautavaara Mine, a decision was made in 1981 to start an opencast operation at the nearby Laurinoja copper-bearing iron ore deposit. Stripping at the mine and construction of a flotation plant next to the existing concentrator started immediately. Ore mining was scheduled to begin in 1982.

In 1981, the Mustavaara operation had reached an extremely low level of profitability, but it was decided to continue operation at least until it became necessary to shut down the sintering furnace for repairs.

Finnstroi Oy, a Helsinki construction company, signed an additional $450 million building contract for the enlargement of the U.S.S.R. iron mining town of Kostamus, located close to Finland's eastern border. The first phase of the project, worth almost $700 million, was nearing completion. Work included construction of a city for 9,000 workers, removal of 9 million cubic meters of soil, 40 kilometers of road construction, and erection of 4.3 million cubic meters of industrial and residential buildings.

The new plans for Kostamus call for tripling mine and pelletizing capacity to 9 million tons per year of pellets and for increasing housing capacity to accommodate 20,000 employees.

Iron and Steel.—Ovako Oy's Dalsbruk works, located on Finland's southwest coast, inaugurated a new Ashlow rod mill. There were plans to modernize an older mill at the same location, and also to start production of reinforcing bars for prestressed concrete. The modernizations will boost Finnish steel rod capacity by only 10%, as outdated units are to be shut down.

Rautaruukki Oy and Outokumpu Oy signed an agreement combining their prospecting operation in Lappland and the northeast territory into one organization called Lapin Malmi, effective January 1, 1982.

Finland's largest steelmaker remained Government-owned Rautaruukki Oy with a basic iron and steel plant at Raahe on the west coast. The next largest steelmaker was Ovako Oy, with a basic steel plant and three electric arc furnaces at Imatra, in the south near the Soviet border, and a 500,000-ton-

per-year blast furnace and two Linz-Donawitz (basic oxygen) converters at Koverhar, also in the south.

The smallest major steelmaker in Finland was Outokumpu Oy's Tornio works at the foot of the Gulf of Bothnia. In 1981, steel slabs, rolled stainless steel products, and cast refractories were produced there. Decision was made to proceed with the first phase of an extension of the stainless steel works, including a second pickling and annealing line. Construction on a cold-rolling mill began in the summer of 1981. The first extension phase was to be completed in 1983 when capacity was to reach 90,000 tons per year. Construction of a metal technology laboratory was also started at Tornio.

Lead and Zinc.—At Outokumpu Oy's Kokkola works sole zinc smelter in Finland, plans to produce 140,000 tons of zinc in 1981 were fulfilled in spite of industrial disputes. In 1981, only 35% of the zinc in the concentrates used for metal production originated from Outokumpu Oy's domestic mines, the rest being imported.

Lead concentrates produced at the company's Vihanti Mine continued to be exported, mainly to the Federal Republic of Germany.

Nickel.—Expansion of Outokumpu Oy's nickel plant started at Harjavalta, on the west coast, and was to be completed in 1982, raising output from 13,000 to 16,500 tons per year. Even so, nickel production in 1981 reached an alltime high. Forty-five percent of the nickel concentrates used by the company to produce nickel metal originated from the company's own mines. In November, Outokumpu Oy started work on a 3-kilometer tunnel for a new nickel project near Savonlinna at Enonkoski, southeast Finland, and it was expected that mining operations could start in the mid-1980's.

NONMETALS

Industrial Minerals.—In tonnage terms, limestone was the main mineral produced, but in terms of world trade, talc, feldspar, and wollastonite were of major significance. Efforts were also being made to produce more talc and calcium carbonate fillers for the country's paper industry to replace other mineral fillers. However, production of ilmenite, quartz, and silica was also significant in 1981. Finland's industrial minerals industry was described in detail in the technical literature.[3]

Mica.—Kemira Oy studied the feasibility of exploiting mica contained in its Siilinjärvi phosphate ore. The mica would be processed chemically on a large scale to yield a potassium raw material for fertilizers.

Nitrogen.—Kemira Oy commissioned a new nitric acid plant at Uusikaupunki, on the southwest coast of Finland. Capacity of the plant was not given.

Phosphate.—The year 1981 was the first year of operation at Government-owned Kemira Oy's Siilinjärvi Mine and concentrator in central Finland. The mine yielded over 200,000 tons of apatite concentrate, corresponding to its rated capacity. The planning and procurement phase of a new major project was already underway, consisting of enlargement of much of the Sillinjärvi facility including the construction of a roasting plant and a sulfuric acid plant, and expansion of the mine, the phosphoric acid plant, and the power station. The project was to be completed by the end of 1982.

The company continued research on a process to recover the phosphoric acid by liquid extraction from the ore without producing byproduct gypsum.

Sodium Sulfate.—A sodium sulfate plant enlargement was commissioned at Kemira Oy's Kokkola plant, but no capacity was given.

Sulfur.—A new 250,000-ton-per-year sulfuric acid plant was commissioned by Kemira Oy at its Vuorichemia Div. in Pori on the west coast.

In 1981, Finland's consumption of sulfuric acid for the manufacture of fertilizers was 533,000 tons.

MINERAL FUELS

In 1981, hydroelectric power, domestic peat, fuelwood, and industrial waste supplied about 25% of Finland's energy requirements; the rest was supplied by imports of crude oil, amounting to about 50% of energy supply, some natural gas, nuclear fuel, and coal.

Nuclear and Hydroelectric Power.—In 1981, Finland produced a surplus of electric power. A rainy summer even permitted water to be bypassed over dams. Finland was also importing 250 megawatts of electric power in the daytime and 120 megawatts at night from the U.S.S.R. Normally power was exported to Sweden, but in 1981 this was not possible, as Sweden also had a surplus of hydroelectric and nuclear power.

Finland's power surplus was increased when Loviisa 2, the 440-megawatt nuclear powerplant on Finland's west coast, was put into operation after a shutdown, and all

four of Finland's nuclear powerplants were in operation, with a total nominal generating capacity of about 2,260 megawatts.

Plans were considered to expand Finland's nuclear-power-generating capacity further with a 1,000-megawatt nuclear powerplant. The Government-owned electric power company, the Imatran Voima Oy, contracted for preliminary studies, both with Sofratome of France and with Atomenergoexport of the U.S.S.R.

Petroleum and Natural Gas.—In 1981, Government-owned Neste Oy reexported about 3.7 million barrels of surplus U.S.S.R. crude oil to the West. Simultaneously, Finland imported some crude oil from Saudi Arabia for its bitumen content.

Most oil and gas imports to Finland came by pipeline from the U.S.S.R. In 1981, 79 million barrels of oil was imported from the U.S.S.R., but in 1982, these imports were to decrease by 7 million barrels.

Neste Oy operated the country's only two oil refineries, one at Porvoo and the other at Naantali, both in southern Finland, with a capacity totaling 110 million barrels per year.

Finland entered talks with the U.S.S.R. to supply equipment and expertise to exploit oil in the Barents Sea. Differences of opinion between Norway and the U.S.S.R. on the control of the Barents Sea delayed the commencement of the drillings.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Finnish markka (Fmk) to U.S. dollars at the rate of Fmk4.315=US$1.00 in 1981.

[3]Industrial Minerals (London). February 1982, pp. 23-33.

The Mineral Industry of France

By Roman V. Sondermayer[1]

During 1981, the Government of France acquired control of the largest part of the French mineral industry through direct nationalization of mineral- and metal-producing companies or through nationalization of banks that were large shareholders in companies producing and processing minerals.

France remained a large processor of crude minerals and petroleum, but its domestic production was modest when compared to the country's demand. In some regions of the country, the mineral industry was a significant economic factor, and consequently, many mines and other mineral-related facilities in France remained in operation for social reasons during 1981.

The most prominent minerals and metals produced in France during 1981 were, with production expressed as an approximate percentage of world totals, arsenic, 18%; diatomite, 15%; gypsum, 8%; and fluorspar, 5%.

The Bureau de Recherches Géologiques et Minières (BRGM) remained the principal Government-owned minerals organization in France. BRGM had two major branches—Direction des Recherches et du Developpement Minière (Research and Mining Development) and the Service Geologique National. Both branches operated in France and in foreign countries. The largest BRGM project in France was the Inventaire des Ressources Minerales de la France Metropolitaine (Inventory of Mineral Resources of Metropolitan France), and work abroad was performed in Saudi Arabia, former French colonies in Africa, Peru, and Mexico. Another important BRGM activity was the introduction of new technology for exploration and data processing. During 1981, BRGM also acquired instrumentation for interpretation of satellite images to be used in conjunction with its geological work.

Principal events in the mineral industry during 1981 included the nationalization of the principal mining companies, preparation for closure of the Largentiére Mine, the decision not to start production at deposits of mixed sulfides at Bodennec and Port-aux-Moins, and resumption of tin mining.

PRODUCTION

After nationalization in early 1981, most of the large mineral-producing companies were Government-controlled operations. BRGM remained an important instrument of the French Government in securing raw mineral materials for the French industry. Table 1 shows the latest trends in French minerals production.

Table 1.—France: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS					
Aluminum:					
Bauxite, gross weight ____ thousand tons	2,059	1,978	1,970	1,921	1,827
Alumina:					
Crude ____ do	1,242	1,221	1,238	1,339	1,234
Calcined ____ do	1,081	1,056	1,069	1,173	1,095
Metal:					
Primary ____ do	399	391	395	432	436
Secondary ____ do	143	155	161	170	170
Antimony metal, smelter	4,562	r5,205	r4,000	3,885	3,800
Arsenic, white	6,043	e5,950	e5,550	e5,300	e5,200
Bismuth:[2]					
Ore and concentrate, metal content kilograms	73,000	90,000	e45,000	e48,000	NA
Metal ____ do	52,000	(3)	(3)	--	--
Cadmium metal	790	694	689	789	e660
Cobalt metal including powder	852	905	771	676	e700
Copper:					
Mine output, metal content	128	600	400	500	e400
Metal:					
Blister, secondary	5,300	3,200	5,000	7,300	e7,200
Refined:					
Primary	22,337	20,672	22,000	23,000	NA
Secondary	22,708	20,628	23,350	23,500	NA
Total	45,045	41,300	45,350	46,500	46,350
Gold, mine output, metal content troy ounces	50,444	59,640	54,109	37,391	e38,000
Iron and steel:					
Iron ore and concentrate:					
Gross weight ____ thousand tons	36,630	33,454	31,627	28,980	21,576
Metal content ____ do	11,050	10,310	9,800	9,100	6,800
Metal:					
Pig iron ____ do	r18,257	r18,497	r19,415	19,159	17,268
Ferroalloys:					
Blast furnace: Spiegeleisen and ferromanganese ____ do	373	397	449	480	312
Electric-furnace:					
Ferromanganese ____ do	21	19	13	20	12
Ferrosilicon ____ do	241	199	272	257	172
Silicon metal ____ do	43	42	55	60	55
Ferrochrome ____ do	101	93	95	87	27
Other ____ do	127	130	143	123	66
Total[4] ____ do	906	880	1,027	1,027	644
Steel ingots and castings ____ do	22,094	22,841	23,360	23,176	21,624
Semimanufactures ____ do	22,097	22,841	23,360	20,998	18,780
Lead:					
Mine output, metal content	31,481	32,500	r29,270	28,360	17,200
Metal, refined:					
Primary	126,150	125,890	129,050	126,822	128,555
Secondary	18,320	25,450	30,800	35,700	38,892
Antimonial lead (Pb content)	56,930	79,200	84,200	78,600	72,780
Total	201,400	230,540	244,050	241,122	240,227
Magnesium metal including secondary	8,682	8,500	9,040	9,328	e9,300
Nickel metal, Ni content of metallurgical products (pure nickel, ferronickel, nickel oxide)	10,279	7,750	3,320	10,847	e11,000
Silver:					
Mine output, metal content thousand troy ounces	3,004	2,755	2,408	2,427	e2,400
Metal, Ag content of final smelter products do	7,060	6,665	7,428	10,847	e11,000
Tin, smelter output of solder and other alloys, secondary	9,500	9,000	r9,410	8,900	e9,000
Tungsten concentrate, metal content	653	608	590	577	e600
Uranium:					
Mine output, metal content	2,472	2,574	2,771	3,172	e3,200
Chemical concentrate, U_3O_8 equivalent	3,225	2,921	r3,332	2,845	e3,000
Zinc:					
Mine output, metal content	41,828	r39,860	r37,000	35,810	37,429
Metal including secondary:					
Slab	238,273	231,212	r248,620	252,800	257,441
Dust	9,790	r8,210	r8,790	8,390	e8,400
NONMETALS					
Barite	211,090	225,000	170,000	236,560	240,000
Bromine, elemental	15,570	16,200	19,000	16,480	e16,500
Cement, hydraulic ____ thousand tons	28,830	28,025	28,825	29,104	28,289

See footnotes at end of table.

Table 1.—France: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Clays:					
Bentonite[5]	8,063	e8,000	e9,000	e10,000	e10,000
Brick and tile clay thousand tons	9,579	e10,000	NA	NA	NA
Ceramic and potter's clay do	681	e700	NA	NA	NA
Clay and marl for cement manufacture do	14,065	e13,000	NA	NA	NA
Kaolin and kaolinitic clay (marketable) do	294	265	315	338	e340
Refractory clay, unspecified	958,936	e900,000	NA	NA	NA
Diatomite thousand tons	206	e200	e200	220	210
Feldspar, crude do	r192	r211	r195	210	220
Fluorspar:					
Crude do	631	r535	r506	529	e530
Marketable, all grades[e] do	286	r274	r259	r262	260
Gypsum and anhydrite, crude do	6,700	6,071	r6,127	6,528	6,204
Kyanite, andalusite, related materials	26,834	e30,000	e30,000	e30,000	e30,000
Lime: Quicklime, hydrated lime, dead-burned dolomite thousand tons	4,468	e4,600	3,870	4,000	4,000
Mica[e]	7,000	7,300	7,000	7,000	7,000
Nitrogen: N content of ammonia thousand tons	2,034	2,020	2,150	2,085	e2,000
Pigments, mineral, natural: Iron oxides	15,902	e16,000	e16,500	e16,000	e16,000
Phosphates:					
Phosphate rock (phosphatic chalk)	19,340	24,580	12,420	14,460	e14,000
Thomas slag thousand tons	1,990	2,042	2,072	1,865	1,800
Potash:					
Gross weight (run-of-mine) do	10,593	11,666	12,514	12,117	11,344
K_2O equivalent (run-of-mine) do	1,719	1,928	2,075	2,039	2,000
K_2O equivalent (marketable) do	1,580	1,795	r1,920	1,894	1,900
Pozzolan and lapilli do	896	r653	r559	465	450
Quartz[6]	934,032	NA	NA	NA	NA
Salt:					
Rock salt thousand tons	287	458	572	301	298
Brine salt (refined) do	1,016	1,102	1,188	1,113	1,092
Marine salt do	986	864	1,802	1,275	e1,300
Salt in solution do	3,487	3,859	4,495	4,415	3,870
Total do	5,776	6,283	8,057	7,104	6,560
Sodium compounds:					
Sodium sulfate do	119	125	152	e150	e150
Sodium carbonate do	1,365	1,353	1,550	e1,600	e1,600
Stone, sand and gravel:[7]					
Building stone:					
Granite and similar stone do	757	NA	NA	NA	NA
Limestone do	1,041	NA	NA	NA	NA
Marble do	166	NA	NA	NA	NA
Crushed limestone and granite do	11	NA	NA	NA	NA
Dolomite:					
For agriculture	553,150	NA	NA	NA	NA
Crude, for calcining	365,528	NA	NA	NA	NA
Other	322,179	NA	NA	NA	NA
Total	1,240,857	NA	NA	NA	NA
Limestone:					
For agriculture thousand tons	824	NA	NA	NA	NA
For iron and steel manufacture do	3,089	NA	NA	NA	NA
For lime and cement manufacture do	26,957	NA	NA	NA	NA
For sugar mills do	1,216	NA	NA	NA	NA
Total do	32,086	NA	NA	NA	NA
Roadbuilding, foundation, and ballast material excluding alluvial sand and gravel:					
Ballast and road surfacing do	119,663	NA	NA	NA	NA
Foundation material do	9,259	NA	NA	NA	NA
Ground rock for road filler do	10	NA	NA	NA	NA
Paving block and curbing do	111	NA	NA	NA	NA
Slate:					
Roof do	r88	86	86	90	e85
Other do	38	NA	NA	NA	NA
Other stone:					
Beach pebble do	228	NA	NA	NA	NA
Marl for agriculture do	394	NA	NA	NA	NA
Mine fill do	23,212	NA	NA	NA	NA
Sand and gravel:					
Industrial sands:					
Foundry do	1,546	NA	NA	NA	NA

See footnotes at end of table.

Table 1.—France: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Stone, sand and gravel[7] —Continued					
Sand and gravel —Continued					
Industrial sands —Continued					
Glass sand ____ thousand tons	3,369	NA	NA	NA	NA
Miscellaneous ____ do	1,109	NA	NA	NA	NA
Other sand and gravel:					
Alluvial ____ do	238,270	206,200	200,000	NA	NA
Product of grinding and crushing ____ do	7,115	NA	NA	NA	NA
Sulfur, byproduct:					
Of natural gas ____ do	1,872	1,856	[r]1,900	1,838	1,701
Of petroleum ____ do	146	161	184	226	[e]200
Of unspecified sources ____ do	[e]160	[e]160	[e]160	[e]150	[e]120
Total ____ do	2,178	2,177	[r]2,244	2,214	2,021
Talc:					
Crude	299,500	270,820	268,350	320,790	[e]325,000
Powder	286,500	292,700	302,470	301,580	300,276
MINERAL FUELS AND RELATED MATERIALS					
Asphaltic material[8]	82,270	68,990	51,420	50,460	NA
Carbon black[e]	170,000	170,000	180,000	170,000	170,000
Coal including briquets:					
Anthracite ____ thousand tons	4,188	3,871	3,020	[9]18,136	[9]18,588
Bituminous coal ____ do	17,106	15,819	15,597		
Lignite ____ do	3,080	2,732	[r]2,454	2,558	2,940
Total ____ do	24,374	22,422	[r]21,071	20,694	21,528
Briquets ____ do	2,222	2,175	2,134	1,757	[e]1,700
Coke, metallurgical ____ do	10,770	10,682	11,615	11,118	[e]9,700
Gas, natural:					
Gross ____ million cubic feet	393,368	398,517	392,499	382,820	358,936
Marketed ____ do	271,745	277,741	273,687	265,922	249,900
Natural gas liquids:					
Natural gasoline and condensate thousand 42-gallon barrels	4,215	4,194	3,981	NA	NA
Propane ____ do	1,717	1,751	1,669	NA	NA
Butane ____ do	2,008	1,804	1,790	NA	NA
Total ____ do	7,940	7,749	7,440	7,394	NA
Peat ____ thousand tons	185	[e]140	[e]140	[e]140	NA
Petroleum:					
Crude ____ thousand 42-gallon barrels	7,557	8,140	8,715	10,304	[2]10,383
Refinery products:					
Gasoline:					
Aviation ____ do	258	436	348	264	NA
Motor ____ do	149,728	153,842	161,670	157,485	NA
Jet fuel ____ do	28,591	32,832	35,192	36,667	NA
Kerosine ____ do	770	705	884	1,054	NA
Distillate fuel oil ____ do	303,920	302,436	326,710	267,655	NA
Residual fuel oil ____ do	240,783	239,820	246,540	215,723	NA
Lubricants ____ do	9,364	10,276	10,427	10,860	NA
Liquefied petroleum gas ____ do	34,785	33,860	33,489	36,048	NA
Bitumen ____ do	20,268	19,956	20,150	19,453	NA
Unspecified ____ do	32,348	82,755	[e]87,950	[e]79,250	NA
Refinery fuel and losses ____ do	52,689	50,771	54,691	56,832	NA
Total ____ do	873,504	927,689	978,051	881,291	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Sept. 30, 1982.

[2]Although output reported is at the smelter stage of production rather than at the mine stage and thus could include metal contained in ores mined in other countries, it is believed that any such production derived from ores from other countries is not duplicative to any significant extent of mine production reported for other countries.

[3]Revised to zero.

[4]Series revised to include blast furnace ferroalloys and silicon metal, both hitherto counted separately.

[5]Includes smectic clay.

[6]Includes material for both the glass and ceramics industries.

[7]Series discontinued in original source and will be revised according to new data when available.

[8]Excludes bituminous material produced by oil refineries.

[9]Includes anthracite.

TRADE

Tables 2 and 3 show latest trends in mineral trade in France.

Table 2.—France: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	12,471	10,768	--	Switzerland 3,969; Sweden 3,407; Spain 1,507.
Oxides and hydroxides	326,901	346,714	5,111	Netherlands 95,816; Italy 88,664; Spain 82,682.
Ash and residue containing Al	11,569	12,147	--	Italy 6,620; West Germany 3,780; Belgium-Luxembourg 916.
Metal including alloys:				
Scrap	39,790	47,219	36	Italy 21,935; West Germany 15,869; Belgium-Luxembourg 6,088.
Unwrought	157,598	177,378	1,083	Italy 51,103; West Germany 37,669; Belgium-Luxembourg 31,068.
Semimanufactures	260,798	237,203	3,874	West Germany 74,543; Italy 25,565; United Kingdom 19,549.
Antimony:				
Ore and concentrate	770	104	--	All to Spain.
Metal including alloys, all forms	126	124	NA	Spain 37; Belgium-Luxembourg 32; West Germany 22.
Arsenic metal, all forms	41	104	NA	Belgium-Luxembourg 22.
Beryllium metal including alloys, all forms, value, thousands	$22	$102	$4	Turkey $87; Morocco $10.
Bismuth metal including alloys, all forms	49	11	NA	NA.
Cadmium metal including alloys, all forms	478	265	50	Belgium-Luxembourg 97; West Germany 36.
Chromium:				
Chromite	1,379	1,616	--	Italy 945; Spain 378; West Germany 196.
Oxides and hydroxides	280	533	--	Italy 280; West Germany 157; Switzerland 20.
Metal including alloys, all forms	720	699	347	West Germany 85; Belgium-Luxembourg 71; United Kingdom 57.
Cobalt:				
Ore and concentrate	--	4	NA	NA.
Oxides and hydroxides	118	179	--	Italy 61; West Germany 47; Belgium-Luxembourg 32.
Metal including alloys, all forms	797	831	225	West Germany 224; United Kingdom 80; Italy 71.
Columbium metal including alloys, all forms, value, thousands	$21	$18	NA	NA.
Copper:				
Ore and concentrate	564	1,618	--	All to West Germany.
Matte	1,181	2,344	NA	Spain 2,148; Belgium-Luxembourg 143.
Sulfate	12,549	12,088	NA	West Germany 4,261; Spain 1,347; Netherlands 1,248.
Ash and residue containing Cu	14,691	16,194	--	Belgium-Luxembourg 9,698; Spain 2,609; Sweden 2,254.
Metal including alloys:				
Scrap	104,933	108,369	145	West Germany 39,277; Italy 28,110; Belgium-Luxembourg 26,629.
Unwrought:				
Blister and other unrefined, unalloyed	5,790	3,335	--	All to Belgium-Luxembourg.
Refined, unalloyed	21,756	15,354	108	Italy 6,618; West Germany 2,657; Portugal 2,189.
Master alloys	257	365	--	Italy 128; West Germany 110; Belgium-Luxembourg 53.
Semimanufactures	161,090	215,693	4,049	West Germany 60,553; Italy 52,294; Netherlands 13,843.
Germanium metal including alloys value, thousands	$281	$261	NA	NA.
Gold:				
Waste and sweepings, do.	$41,490	$22,415	--	Spain $21,595; West Germany $336; Switzerland $333.
Metal including alloys, unwrought and partly wrought:				
Of domestic origin, thousand troy ounces	1,081	406	5	United Kingdom 86; West Germany 81; Netherlands 45.
Reexports, do.	172	513	1	Switzerland 336; Netherlands 130; United Kingdom 34.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Ore and concentrate thousand tons	10,220	8,653	--	Belgium-Luxembourg 6,806; West Germany 1,843.
Metal:				
Scrap do	3,526	3,312	--	Italy 2,596; Spain 392; West Germany 159.
Pig iron, cast iron, spiegeleisen	361,567	285,759	13,394	Italy 149,982; Belgium-Luxembourg 54,220; West Germany 22,323.
Sponge iron, powder, shot	39,520	43,210	86	West Germany 17,484; Italy 12,063; Spain 2,636.
Ferroalloys	602,382	513,798	189,128	West Germany 107,530; Italy 87,559; Belgium-Luxembourg 34,571.
Steel, primary forms thousand tons	r2,528	2,671	379	Italy 728; Belgium-Luxembourg 266; Spain 262.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	r2,931	2,844	194	Germany 615; Belgium-Luxembourg 339; Italy 321.
Universals, plates, sheets do	r3,394	3,528	191	West Germany 665; Italy 531; United Kingdom 221.
Hoop and strip	r530,743	549,471	4,625	West Germany 196,179; Belgium-Luxembourg 68,449; Italy 66,233.
Rails and accessories	253,856	268,348	14,480	Italy 41,611; Tunisia 40,561; Netherlands 17,080.
Wire	r205,742	185,955	38,962	West Germany 39,266; Belgium-Luxembourg 15,783; Italy 10,991.
Tubes, pipes, fittings thousand tons	1,512	1,521	16	U.S.S.R. 285; West Germany 131; Italy 85; Netherlands 79.
Castings and forgings, rough	69,707	64,409	1,023	West Germany 24,894; Belgium-Luxembourg 17,786; Italy 3,442.
Lead:				
Ore and concentrate	34	69	--	Saudi Arabia 33; United Kingdom 20; Brazil 10.
Oxides and hydroxides	14,270	16,368	(1)	Romania 3,552; U.S.S.R. 2,844; Czechoslovakia 1,941.
Ash and residue containing Pb	13,062	13,782	NA	Belgium-Luxembourg 8,639; West Germany 4,858.
Metal including alloys:				
Scrap	30,191	7,851	--	Italy 5,986; Belgium-Luxembourg 546; Netherlands 234.
Unwrought	58,527	57,625	1	Belgium-Luxembourg 16,883; West Germany 12,783; Italy 7,316.
Semimanufactures	3,700	3,513	(1)	Netherlands 954; West Germany 793; Italy 754.
Magnesium metal including alloys:				
Scrap	516	588	37	Italy 418; Netherlands 76; West Germany 53.
Unwrought	4,607	4,195	--	West Germany 2,027; Japan 634; Belgium-Luxembourg 450.
Semimanufactures	146	184	(1)	West Germany 53; Belgium-Luxembourg 44; Spain 37.
Manganese:				
Ore and concentrate	7,092	6,390	--	Italy 3,297; Netherlands 679; Yugoslavia 670.
Oxides and hydroxides	855	991	--	Algeria 450; United Kingdom 143; Upper Volta 140.
Metal including alloys, all forms	2,325	2,276	NA	Italy 1,214; Sweden 421; West Germany 242.
Mercury 76-pound flasks	3,829	1,102	--	Netherlands 870; United Kingdom 116.
Molybdenum:				
Ore and concentrate	395	1,180	--	West Germany 654; Netherlands 299; Italy 109.
Oxides and hydroxides	22	21	--	All to Netherlands.
Metal including alloys, all forms	166	133	16	West Germany 52; United Kingdom 26; Netherlands 14.
Nickel:				
Ore and concentrate	79	(2)	--	All to New Caledonia.
Matte and speiss	2,754	272	NA	Norway 228; East Germany 20.
Oxides and hydroxides	1,033	547	121	West Germany 90; East Germany 65; Yugoslavia 40.
Ash and residue containing Ni	3,723	4,634	NA	Canada 3,586; United Kingdom 371; Italy 221.
Metal including alloys:				
Scrap	2,708	2,179	298	West Germany 774; United Kingdom 598; Japan 146.
Unwrought	5,178	6,757	920	West Germany 2,467; Mexico 755; India 460.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Nickel —Continued				
Metal including alloys —Continued				
Semimanufactures	5,691	6,301	860	West Germany 3,467; Italy 248; Belgium-Luxembourg 231.
Platinum-group metals:				
Waste and sweepings of platinum value, thousands	r$4,259	$4,822	--	Spain $3,903; Belgium-Luxembourg $513; Switzerland $270.
Waste and sweepings of other precious metals do.	$326	$2,285	--	Spain $1,190; United Kingdom $607; West Germany $366.
Metals including alloys, unwrought and partly wrought:				
Platinum troy ounces	r74,270	80,072	224	Switzerland 33,590; Netherlands 23,529; West Germany 7,223.
Others do.	42,565	28,452	(1)	United Kingdom 7,641; Netherlands 5,427; West Germany 5,353.
Selenium, elemental	21	(1)	NA	NA.
Silver:				
Waste and sweepings value, thousands	r$20,192	$56,199	--	Spain $45,568; Sweden $8,342; West Germany $2,124.
Metal including alloys, unwrought and partly wrought thousand troy ounces	13,759	30,581	1,747	United Kingdom 13,443; Switzerland 7,541; Netherlands 3,960.
Tantalum metal including alloys, all forms	22	20	4	West Germany 9; Belgium-Luxembourg 6.
Tellurium, elemental	12	(1)	NA	NA.
Tin:				
Ore and concentrate	7	8	--	All to Spain.
Oxides and hydroxides	29	27	NA	West Germany 21; Belgium-Luxembourg 5.
Metal including alloys:				
Scrap	881	915	--	Netherlands 579; United Kingdom 199; West Germany 134.
Unwrought	666	643	--	Italy 372; Netherlands 165; Switzerland 24.
Semimanufactures	350	356	(1)	Algeria 79; Italy 65; Switzerland 47.
Titanium:				
Ore and concentrate	715	2,160	NA	Yugoslavia 2,041.
Oxides and hydroxides	2,262	2,502	(1)	Netherlands 451; Italy 347; United Kingdom 339.
Metal including alloys, all forms	604	734	176	Italy 175; West Germany 136; United Kingdom 101.
Tungsten:				
Ore and concentrate	1,082	846	91	West Germany 282; Austria 224; United Kingdom 126.
Oxides and hydroxides	8	40	NA	Switzerland 15; Sweden 12; West Germany 9.
Metal including alloys, all forms	363	267	20	West Germany 76; Belgium-Luxembourg 60; Switzerland 29.
Uranium:				
Ore and concentrate	21	11	NA	NA.
Metal including alloys, all forms	r4	3	--	Netherlands 2; Belgium-Luxembourg 1.
Zinc:				
Ore and concentrate	46,530	43,979	--	Belgium-Luxembourg 22,477; Italy 6,656; U.S.S.R. 4,004.
Matte	1,484	5,201	NA	Italy 4,284; Belgium-Luxembourg 428; West Germany 290.
Oxides and peroxides	17,575	19,470	--	Romania 5,037; West Germany 3,708; Belgium-Luxembourg 2,233.
Ash and residue containing Zn	30,521	21,012	NA	Belgium-Luxembourg 13,870; Sweden 3,150; West Germany 2,905.
Metal including alloys:				
Scrap	4,280	3,209	--	Belgium-Luxembourg 1,769; West Germany 665; Italy 591.
Blue powder	1,748	1,846	NA	West Germany 366; Austria 333; Republic of South Africa 321.
Unwrought	47,486	35,504	3,515	West Germany 10,488; U.S.S.R. 3,525; Portugal 3,410.
Semimanufactures	41,041	42,047	14	Belgium-Luxembourg 20,379; West Germany 14,719; Denmark 2,616.
Zirconium:				
Ore and concentrate	326	260	NA	West Germany 84.
Metal including alloys, all forms	940	888	533	West Germany 120; Sweden 93; Japan 59; Canada 43.
Other:				
Ores and concentrates:				
Precious metals	--	2,500	--	All to Sweden.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Other —Continued				
Ores and concentrates —Continued				
Unspecified	55	21	NA	NA.
Ash and residues containing nonferrous metals, unspecified	19,417	22,957	NA	Belgium-Luxembourg 9,569; Sweden 7,023; West Germany 3,986.
Oxides, hydroxides, peroxides	5,741	7,100	2,178	West Germany 1,677; United Kingdom 365; East Germany 318.
Metals:				
Metalloids	1	24	NA	NA.
Alkali, alkaline earth, rare-earth metals	640	447	6	West Germany 156; Belgium-Luxembourg 106; Yugoslavia 101.
Pyrophoric alloys	10	13	NA	NA.
Base metal including alloys, all forms	r6	5	--	West Germany 2; Netherlands 2.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	17,908	1,120	(1)	West Germany 540; Tunisia 146; Spain 107.
Artificial: Corundum	24,791	24,610	734	Italy 6,458; Austria 3,373; West Germany 2,848.
Dust and powder of precious and semiprecious stones excluding diamond carats	r7,600	--		
Grinding and polishing wheels and stones	4,218	3,949	45	West Germany 846; Belgium-Luxembourg 434; Italy 320.
Asbestos, crude	1,348	1,574	--	Tunisia 1,140; Italy 192; United Kingdom 124.
Barite and witherite	121,722	98,255	NA	West Germany 63,977; Netherlands 11,487; Cameroon 7,660.
Boron materials:				
Crude natural borates	10,030	4,583	--	Italy 2,255; Spain 1,958; Belgium-Luxembourg 306.
Oxide and acid	34,479	40,536	3,510	West Germany 11,931; East Germany 4,648; Belgium-Luxembourg 3,886.
Cement thousand tons	3,525	2,614	279	Ivory Coast 473; Cameroon 319; West Germany 280.
Chalk	516,187	530,633	2,764	West Germany 220,772; Belgium-Luxembourg 98,710; Netherlands 42,120.
Clays and clay products:				
Crude:				
Bentonite	5,887	6,880	--	Belgium-Luxembourg 1,047; Congo 938; West Germany 772.
Dinas earth	39	53	NA	NA.
Fuller's earth and chamotte	206,445	211,174	NA	Italy 73,993; West Germany 52,135; Poland 20,430.
Kaolin (china clay)	154,671	181,593	--	West Germany 80,083; Italy 52,276; Belgium-Luxembourg 14,617.
Andalusite, kyanite, sillimanite	173	437	--	NA.
Other	r293,362	389,543	--	Italy 216,233; West Germany 92,581; Spain 18,362.
Products:				
Nonrefractory	435,635	422,619	1,682	West Germany 227,339; Belgium-Luxembourg 96,076; Switzerland 28,340.
Refractory including nonclay brick	219,448	216,046	3,688	West Germany 54,253; Belgium-Luxembourg 28,082; Italy 28,020.
Cryolite and chiolite	105	12	--	All to Italy.
Diamond:				
Gem, not set or strung carats	37,166	54,949	2,898	Switzerland 17,246; Belgium-Luxembourg 13,799; Lebanon 9,640.
Industrial do	191,048	177,213	18,822	Belgium-Luxembourg 86,851; Ireland 58,000.
Dust and powder do	124,130	199,770	NA	Switzerland 146,065.
Diatomite and other infusorial earth	28,876	25,852	1	West Germany 7,847; Belgium-Luxembourg 4,128; United Kingdom 2,773.
Feldspar	51,726	56,949	--	Belgium-Luxembourg 27,258; Spain 15,265; Italy 4,935.
Fertilizer materials:				
Crude:				
Nitrogenous	25	11	--	Italy 5; Congo 3; Iraq 3.
Phosphatic	26,017	15,498	--	United Kingdom 9,047; Italy 214; Switzerland 186.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials —Continued				
Crude —Continued				
Potassic	18,453	13,293	--	Belgium-Luxembourg 9,689; Netherlands 2,181; Switzerland 1,404.
Other including mixed	24,820	28,694	NA	Switzerland 15,429; Belgium-Luxembourg 3,696; Saudi Arabia 2,956.
Manufactured:				
Nitrogenous	623,471	586,482	--	Belgium-Luxembourg 92,603; West Germany 83,141; China 66,443.
Phosphatic	213,261	254,550	--	Switzerland 86,061; West Germany 56,718; Austria 42,872.
Potassic	446,757	335,407	--	West Germany 84,020; Italy 77,539; Switzerland 59,234.
Other including mixed	629,828	513,781	3	West Germany 122,720; Pakistan 117,713; Belgium-Luxembourg 62,273.
Ammonia	156,072	159,466	--	West Germany 119,157; Spain 19,635; Belgium-Luxembourg 7,199.
Fluorspar	98,742	107,392	--	West Germany 58,212; Italy 29,481; Sweden 5,567.
Graphite, natural	1,518	889	--	Spain 357; West Germany 224; United Kingdom 103.
Gypsum and plasters _ thousand tons	1,139	1,142	(1)	West Germany 433; Belgium-Luxembourg 321; Netherlands 153.
Iodine	131	138	--	United Kingdom 51; West Germany 45; Switzerland 18.
Lime	279,654	240,029	82	West Germany 110,979; Belgium-Luxembourg 87,896; Ivory Coast 9,472.
Magnesite	5,923	9,511	--	West Germany 1,521; Spain 1,378; Netherlands 1,007.
Mica:				
Crude including splittings and waste	3,284	3,816	2	United Kingdom 1,603; West Germany 638; Belgium-Luxembourg 480.
Worked including agglomerated splittings	940	840	1	Switzerland 368; West Germany 224; United Kingdom 71.
Pigments, mineral: Iron oxides, processed	7,537	88,410	--	Italy 2,301; West Germany 1,277; United Kingdom 962.
Precious and semiprecious stones excluding diamond:				
Natural _____ value, thousands	$26,963	$57,638	$984	Switzerland $47,616; United Kingdom $2,884; Hong Kong $1,377.
Synthetic _____ do	$13,094	$13,538	$1,314	Switzerland $8,208; U.S.S.R. $1,642; Japan $1,004.
Pyrites, unroasted	36	121	--	Republic of South Africa 68; Belgium-Luxembourg 38; West Germany 15.
Salt and brines	230,393	129,735	240	West Germany 80,576; Belgium-Luxembourg 24,084; United Kingdom 14,453.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	15,121	14,542	388	Netherlands 4,598; Switzerland 1,894; Brazil 1,399.
Caustic soda	82,202	96,624	144	Indonesia 20,772; Egypt 13,394; Tunisia 6,495.
Soda ash	397,816	388,778	--	Brazil 50,250; Italy 41,728; Sweden 29,470; West Germany 29,292.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	142,729	160,026	83	Belgium-Luxembourg 60,074; Netherlands 33,519; West Germany 33,411.
Worked	51,397	54,036	228	Belgium-Luxembourg 24,908; West Germany 13,677; Saudi Arabia 6,657.
Dolomite, chiefly refractory-grade	51,512	45,570	--	Belgium-Luxembourg 14,533; Switzerland 5,942; West Germany 5,940.
Gravel and crushed rock thousand tons	10,912	11,247	4	West Germany 7,249; Switzerland 1,485; Belgium-Luxembourg 1,179.
Limestone excluding dimension	208,036	165,463	--	United Kingdom 144,582; Belgium-Luxembourg 19,670.
Quartz and quartzite	1,536	4,445	300	Belgium-Luxembourg 2,800; United Kingdom 690; West Germany 243.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Sand excluding metal-bearing thousand tons	4,596	4,232	--	West Germany 2,303; Italy 865; Switzerland 829.
Sulfur:				
Elemental:				
Other than colloidal ---do---	1,246	1,100	--	United Kingdom 312; Tunisia 175; Netherlands 129.
Colloidal	3,000	2,334	--	West Germany 569; Belgium-Luxembourg 379; United Kingdom 258.
Sulfuric acid	213,517	199,150	--	Belgium-Luxembourg 137,332; Spain 28,670; West Germany 14,803.
Talc, steatite, soapstone, pyrophyllite	75,159	81,332	4,025	West Germany 27,701; Spain 12,633; United Kingdom 8,512.
Other:				
Crude thousand tons	1,206	1,180	(1)	Belgium-Luxembourg 978; Switzerland 187.
Slag, dross, similar waste ---do---	2,717	2,279	(1)	West Germany 1,167; Belgium-Luxembourg 881; Netherlands 164.
Oxides, hydroxides, peroxides of barium, magnesium, strontium ---	9,426	9,363	2,353	U.S.S.R. 4,966; West Germany 885; United Kingdom 172.
Fluorine	25	67	NA	NA.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	139,173	149,526	348	West Germany 28,909; United Kingdom 16,223; Italy 15,997.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	7,248	5,879	--	United Kingdom 2,380; Belgium-Luxembourg 1,445; Ivory Coast 1,109.
Carbon black	r72,665	68,789	14	West Germany 20,392; Italy 10,562; Belgium-Luxembourg 10,440.
Coal and briquets:				
Anthracite and bituminous coal	569,554	459,329	--	West Germany 302,291; Belgium-Luxembourg 59,540; Norway 36,574.
Briquets of anthracite and bituminous coal	41,312	50,249	--	United Kingdom 45,674; Belgium-Luxembourg 2,541; Switzerland 1,701.
Lignite including briquets	6,908	6,617	--	Spain 6,355; West Germany 262.
Coke and semicoke --- thousand tons	1,570	871	199	West Germany 233; Norway 100; Belgium-Luxembourg 57.
Gas, natural ----- million cubic feet	5,854	8,441	--	Belgium-Luxembourg 4,217; Switzerland 4,104.
Hydrogen, helium, rare gases	6,205	6,040	--	Italy 4,122; Belgium-Luxembourg 686; Netherlands 303.
Peat including briquets and litter	2,145	1,680	--	Switzerland 469; West Germany 445; Belgium-Luxembourg 270.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	540	555	--	Austria 489; United Kingdom 22.
Refinery products:				
Gasoline ---------- do	25,736	23,144	2	Switzerland 4,784; West Germany 3,486; United Kingdom 2,915.
Kerosine and jet fuel ---do---	9,509	10,962	--	Switzerland 2,465; Greece 1,630; West Germany 1,022.
Distillate fuel oil -----do---	35,683	29,067	(1)	Switzerland 7,782; West Germany 7,389; Greece 3,566.
Residual fuel oil ------do---	42,243	39,335	1,744	Italy 11,837; West Germany 4,546; Ireland 3,354.
Lubricants ---------- do	5,235	5,383	4	Belgium-Luxembourg 902; United Kingdom 692; West Germany 675.
Other:				
Liquefied petroleum gas do	8,745	8,183	1	Spain 3,727; West Germany 1,047; Portugal 569; Italy 568.
Mineral jelly and wax do	585	346	1	West Germany 123; Netherlands 60; Italy 52.
Petroleum coke ---do---	2	49	--	Switzerland 19; Netherlands 16; West Germany 14.
Bitumen and other residues do	1,960	1,797	--	West Germany 776; Switzerland 726; Belgium-Luxembourg 179.
Bituminous mixtures do	337	329	(1)	Algeria 149; Belgium-Luxembourg 65; West Germany 22.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Mineral tar and other coal-, petroleum- and gas-derived crude chemicals	375,952	274,096	NA	West Germany 136,917; Belgium-Luxembourg 21,341; Netherlands 21,341.

[r]Revised. NA Not available.
[1]Less than 1/2 unit.
[2]Unreported quantity valued at $8,282.

Table 3.—France: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite thousand tons	1,720	1,358	(1)	Guinea 980; Greece 209; Guyana 49.
Oxides and hydroxides	38,187	44,644	4,044	West Germany 25,416; Netherlands 9,735; Australia 1,965.
Ash and residue containing Al	12,745	10,719	NA	West Germany 3,734; Italy 3,222; Netherlands 1,909.
Metal including alloys:				
Scrap	52,228	56,671	4,447	Belgium-Luxembourg 16,408; West Germany 13,077; Netherlands 12,585.
Unwrought	315,102	332,451	44,241	Netherlands 72,033; West Germany 58,539; Norway 32,445.
Semimanufactures	197,999	219,986	13,912	West Germany 70,250; Belgium-Luxembourg 54,712; Netherlands 15,051.
Antimony:				
Ore and concentrate	10,794	8,823	NA	Thailand 2,945; Australia 1,406; Bolivia 1,365.
Metal including alloys, all forms	886	348	NA	China 224; Spain 50; Belgium-Luxembourg 34.
Arsenic, all forms	113	211	12	Sweden 52; Netherlands 36.
Beryllium metal including alloys, all forms	9	9	6	U.S.S.R. 2; West Germany 1.
Bismuth metal including alloys, all forms	322	362	57	Belgium-Luxembourg 166; United Kingdom 54; Japan 35.
Cadmium metal including alloys, all forms	735	659	NA	Belgium-Luxembourg 173; Australia 130; Netherlands 116.
Chromium:				
Chromite	261,701	278,773	(1)	Republic of South Africa 87,161; Madagascar 63,696; Turkey 46,018.
Oxides and hydroxides	5,821	6,970	2	West Germany 3,587; Italy 1,695; United Kingdom 679.
Metal including alloys, all forms	246	394	97	Japan 137; Belgium-Luxembourg 112; United Kingdom 45.
Cobalt:				
Intermediate metallurgical product	7,684	5,696	--	All from Morocco.
Oxides and hydroxides	267	201	21	Belgium-Luxembourg 145; United Kingdom 25.
Metal including alloys, all forms	897	1,140	217	Belgium-Luxembourg 231; Japan 168; United Kingdom 91.
Columbium metal including alloys, all forms	5	3	1	West Germany 2.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Copper:				
Ore and concentrate	4	(2)	NA	NA.
Matte	45	1,054	--	Peru 1,003; United Kingdom 49.
Sulfate	2,758	2,935	NA	Italy 1,272; U.S.S.R. 1,082; Hungary 160; Belgium-Luxembourg 154.
Ash and residue containing Cu	1,377	3,511	373	Finland 2,120; Netherlands 317; Belgium-Luxembourg 316.
Metal including alloys:				
Scrap	24,870	36,740	492	West Germany 11,836; United Kingdom 7,157; Belgium-Luxembourg 5,578.
Unwrought:				
Blister and other unrefined, unalloyed	21,258	17,896	NA	Zaire 11,313; Chile 2,501; Portugal 1,857.
Refined, unalloyed	347,731	416,255	7,408	Belgium-Luxembourg 122,085; Zambia 99,846; Chile 72,701.
Master alloys	305	316	95	Belgium-Luxembourg 172; West Germany 35.
Semimanufactures	206,220	206,790	5,067	Belgium-Luxembourg 101,640; West Germany 39,602; Italy 25,998.
Germanium metal including alloys, all forms, value, thousands	$755	$767	NA	Belgium-Luxembourg $509; United Kingdom $255.
Gold:				
Waste and sweepings, do.	r$7,043	$13,318	$760	Switzerland $6,805; United Kingdom $2,850; Netherlands $731.
Metal including alloys, unwrought and partly wrought:				
For domestic use, thousand troy ounces	2,804	1,343	18	West Germany 1,085; Netherlands 94; United Kingdom 77.
Temporary imports, do.	591	1,191	283	Switzerland 559; Netherlands 184; Republic of South Africa 87.
Iron and steel:				
Ore and concentrate, thousand tons	17,345	18,643	--	Brazil 4,640; Sweden 3,175; Mauritania 2,934; Liberia 2,298.
Pyrites, roasted	87,452	73,924	--	Italy 37,193; Spain 19,803; West Germany 13,044.
Metal:				
Scrap	422,289	455,082	55,740	Belgium-Luxembourg 162,774; West Germany 117,289; United Kingdom 82,683.
Pig iron, cast iron, spiegeleisen	446,457	451,628	--	West Germany 417,885; Canada 19,028.
Sponge iron, powder, shot	29,342	53,821	50	Venezuela 29,563; Sweden 12,516; West Germany 4,707.
Ferroalloys	318,117	337,276	1,292	New Caledonia 104,021; Norway 36,557; Belgium-Luxembourg 34,699.
Steel, primary forms, thousand tons	r2,916	2,321	1	Belgium-Luxembourg 1,291; West Germany 696; Italy 120.
Semimanufactures:				
Bars, rods, angles, shapes, sections, do.	r2,386	2,451	1	West Germany 766; Belgium-Luxembourg 690; Italy 567.
Plates and sheets, do.	r2,980	2,830	3	Belgium-Luxembourg 1,313; West Germany 755; Italy 296.
Hoop and strip	r440,431	411,483	384	Belgium-Luxembourg 179,851; West Germany 171,594; Italy 18,394.
Rails and accessories	36,288	62,451	15,381	Belgium-Luxembourg 23,278; United Kingdom 18,712; West Germany 2,361.
Wire	133,050	204,601	675	Belgium-Luxembourg 77,889; West Germany 58,036; Italy 24,827.
Tubes, pipes, fittings	r200,801	559,420	3,224	West Germany 175,355; Italy 152,419; Belgium-Luxembourg 56,312.
Castings and forgings, rough	49,006	52,648	54	West Germany 24,248; Italy 10,234; Switzerland 4,379.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	134,824	139,029	--	Ireland 34,165; Morocco 26,710; Greenland 16,857; Republic of South Africa 16,522.
Oxides and hydroxides	1,568	1,322	20	West Germany 681; Belgium-Luxembourg 476; Bulgaria 67.
Ash and residue containing Pb	8,768	13,225	NA	Italy 10,542; Belgium-Luxembourg 1,901.
Metal including alloys:				
Scrap	26,411	31,187	181	Belgium-Luxembourg 13,705; Netherlands 10,091; United Kingdom 2,137.
Unwrought	51,817	55,088	4,405	West Germany 13,030; Belgium-Luxembourg 12,878; United Kingdom 10,421.
Semimanufactures	1,652	2,270	82	Spain 875; West Germany 704; Belgium-Luxembourg 561.
Magnesium metal including alloys:				
Scrap	450	225	NA	Italy 152.
Unwrought	3,851	3,953	903	Norway 2,407; United Kingdom 290; Canada 111.
Semimanufactures	282	311	4	Italy 147; Norway 70; West Germany 44.
Manganese:				
Ore and concentrate thousand tons	1,275	1,226	(1)	Gabon 498; Republic of South Africa 485; Brazil 153.
Oxides and hydroxides	6,679	6,930	106	Belgium-Luxembourg 2,845; West Germany 1,607; Spain 1,391.
Metal including alloys, all forms	3,471	1,497	NA	Republic of South Africa 822; Belgium-Luxembourg 400; Netherlands 180.
Mercury 76-pound flasks	4,003	4,060	58	Spain 2,175; China 1,247.
Molybdenum:				
Ore and concentrate	7,413	7,094	2,606	Canada 1,765; Chile 1,348; Netherlands 582.
Oxides and hydroxides	119	227	25	Japan 80; Netherlands 74; Chile 24.
Metal including alloys, all forms	206	263	52	West Germany 79; Austria 69; United Kingdom 35.
Nickel:				
Ore and concentrate	--	24	--	All from Australia.
Matte and speiss	10,500	15,050	--	New Caledonia 12,660; Canada 650; Cuba 644.
Oxides and hydroxides	141	244	--	Canada 133; Cuba 63; Netherlands 33.
Ash and residue containing Ni	109	41	NA	NA.
Metal including alloys:				
Scrap	1,444	763	6	United Kingdom 185; Netherlands 179; Belgium-Luxembourg 145.
Unwrought	19,838	22,554	2,461	U.S.S.R. 4,529; West Germany 3,499; Canada 2,489; Australia 2,005.
Semimanufactures	5,026	4,725	858	United Kingdom 1,748; West Germany 1,170; Sweden 408.
Platinum-group metals:				
Waste and sweepings:				
Platinum value, thousands	$22,733	$19,766	$254	Netherlands $4,895; Switzerland $3,463; West Germany $2,366.
Other do.	$384	$13,396	$597	Republic of South Africa $6,413; Yugoslavia $2,258; West Germany $2,065.
Metals including alloys, unwrought and partly wrought troy ounces	r241,943	320,124	43,304	Republic of South Africa 101,013; West Germany 42,540; U.S.S.R. 34,608.
Selenium, elemental	62	60	NA	Japan 26; United Kingdom 22; Canada 6.
Silver:				
Waste and sweepings value, thousands	r$17,039	$68,006	$14,703	Switzerland $27,195; United Kingdom $8,274; Lebanon $5,705.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Silver —Continued				
Metal including alloys, unwrought and partly wrought thousand troy ounces	30,322	27,263	957	Switzerland 8,885; Greece 2,056; Belgium-Luxembourg 1,850.
Tantalum metal including alloys, all forms	52	36	20	West Germany 11; Spain 2.
Tellurium, elemental	11	6	NA	Belgium-Luxembourg 2; United Kingdom 2.
Thorium: Ore and concentrate	8,990	4,996	222	Australia 4,751.
Tin:				
Ore and concentrate	941	--		
Oxides and hydroxides	128	178	NA	Italy 75; West Germany 64; United Kingdom 19.
Metal including alloys:				
Scrap	99	194	--	Italy 132; Switzerland 26; Belgium-Luxembourg 21.
Unwrought	10,565	10,524	--	Malaysia 3,514; Thailand 3,293; Indonesia 1,635.
Semimanufactures	134	209	1	West Germany 119; Netherlands 52; United Kingdom 23.
Titanium:				
Ore and concentrate	129,408	111,330	NA	Australia 70,594; Republic of South Africa 20,386.
Oxides and hydroxides	18,734	13,696	2,945	West Germany 4,397; Netherlands 3,176; Belgium-Luxembourg 2,156.
Metal including alloys, all forms	1,786	2,809	753	Japan 1,018; United Kingdom 414; West Germany 367.
Tungsten:				
Ore and concentrate	1,586	1,438	20	China 404; Canada 190; North Korea 166.
Oxides and hydroxides	17	8	--	West Germany 4.
Metal including alloys, all forms	307	241	5	West Germany 141; Netherlands 23; Austria 17; United Kingdom 15.
Uranium:				
Ore and concentrate	2,942	7	(1)	Mainly from Australia.
Metal including alloys, all forms	136	--		
Vanadium metal including alloys, all forms	19	19	--	West Germany 10; Japan 9.
Zinc:				
Ore and concentrate	494,334	469,945	15,767	Peru 121,016; Canada 88,107; Ireland 69,081; Sweden 56,016.
Matte	3,952	4,011	NA	Belgium-Luxembourg 1,830; West Germany 999; Finland 404.
Oxides and peroxides	8,280	6,184	7	Netherlands 1,861; West Germany 1,646; Belgium-Luxembourg 1,133.
Ash and residue containing Zn	30,234	39,241	1,781	Belgium-Luxembourg 16,833; West Germany 9,033; Peru 4,811.
Metal including alloys:				
Scrap	4,600	4,981	18	Belgium-Luxembourg 2,450; Netherlands 1,208; West Germany 822.
Blue powder	3,412	2,317	NA	Belgium-Luxembourg 1,304; Netherlands 789; West Germany 157.
Unwrought	101,253	124,119	--	Belgium-Luxembourg 52,403; Netherlands 24,676; West Germany 17,595.
Semimanufactures	6,521	7,009	11	West Germany 4,881; Belgium-Luxembourg 1,108; Italy 519.
Zirconium:				
Ore and concentrate	41,904	39,618	NA	Australia 33,135; Republic of South Africa 6,055.
Metal including alloys, all forms	985	687	649	Canada 9.
Other:				
Ores and concentrates	r41,904	20,107	70	Greece 9,966; Italy 5,418; Turkey 2,383; Australia 1,880.
Ash and residue containing nonferrous metals, unspecified	38,604	58,914	60	Republic of South Africa 43,526; Italy 13,538.
Oxides, hydroxides, peroxides	r3,554	4,748	359	West Germany 1,895; Belgium-Luxembourg 432; Republic of South Africa 399.
Metals:				
Metalloids	4,751	5,956	3	Norway 2,214; Spain 1,648; West Germany 1,240.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Other —Continued				
Metals —Continued				
Alkali, alkaline earth, rare-earth metals	120	87	3	West Germany 43; United Kingdom 18; Austria 6.
Cermets	12	16	1	Belgium-Luxembourg 10; West Germany 3.
Pyrophoric alloys	119	129	NA	Brazil 80; Japan 31; Austria 14.
Base metals including alloys, all forms	6	257	NA	Belgium-Luxembourg 250.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	27,636	29,616	797	Turkey 17,738; West Germany 7,671; Italy 2,743.
Artificial: Corundum	6,415	7,237	464	West Germany 5,180; Austria 624; Italy 470.
Dust and powder of precious and semi-precious stones excluding diamond kilograms	50	90	NA	Belgium-Luxembourg 5.
Grinding and polishing wheels and stones	8,425	8,859	158	Italy 2,003; West Germany 1,924; Belgium-Luxembourg 1,524.
Asbestos, crude	126,476	127,123	238	Canada 67,104; U.S.S.R. 21,552; Republic of South Africa 17,172.
Barite and witherite	14,427	14,610	--	West Germany 10,590; Morocco 2,716; Romania 770.
Boron materials:				
Crude natural borates	192,823	221,176	76,503	Turkey 143,138; Netherlands 1,023.
Oxide and hydroxide	1,379	1,594	284	Italy 712; United Kingdom 288; Turkey 202.
Cement	332,248	407,267	25	Belgium-Luxembourg 358,177; West Germany 23,886; Italy 21,259.
Chalk	29,057	42,183	27	West Germany 36,660; Belgium-Luxembourg 5,181.
Clays and clay products:				
Crude:				
Bentonite	92,464	76,063	4,632	Italy 27,468; Greece 19,593; West Germany 13,385.
Dinas earth	483	688	--	All from West Germany.
Fuller's earth and chamotte	12,392	10,672	NA	West Germany 9,087.
Kaolin (china clay)	332,710	338,662	62,315	United Kingdom 232,575; West Germany 20,887.
Andalusite, kyanite, sillimanite	5,126	11,653	822	Republic of South Africa 7,889; Brazil 1,066; United Kingdom 771.
Other	196,175	210,683	11,268	West Germany 163,357; United Kingdom 26,654.
Products:				
Nonrefractory thousand tons	974	1,501	(1)	Italy 520; West Germany 248; Spain 134.
Refractory including nonclay brick	233,641	226,299	3,627	West Germany 100,482; Belgium-Luxembourg 46,156; Austria 33,526.
Cryolite and chiolite	766	668	18	Denmark 645; West Germany 5.
Diamond:				
Gem, not set or strung carats	456,186	726,946	116,277	Belgium-Luxembourg 330,380; Israel 105,389; India 60,727.
Industrial do	496,826	689,793	38,925	Ireland 295,267; Belgium-Luxembourg 200,970; Republic of South Africa 56,356.
Dust and powder thousand carats	3,977	4,470	2,748	Republic of South Africa 1,086; Switzerland 449.
Diatomite and other infusorial earth	11,327	9,164	4,850	West Germany 3,251; Algeria 506; Spain 264.
Feldspar	17,839	17,947	NA	West Germany 12,172; Portugal 3,987; Italy 925.
Fertilizer materials:				
Crude:				
Nitrogenous	9,693	9,111	--	Chile 9,062; Belgium-Luxembourg 49.
Phosphatic thousand tons	5,386	5,450	1,025	Morocco 2,419; Togo 647; Israel 470; Tunisia 447.
Potassic	--	3	--	All from Spain.
Other including mixed	25,480	22,678	NA	Netherlands 12,592; Belgium-Luxembourg 4,214; Italy 2,685.
Manufactured:				
Nitrogenous thousand tons	1,308	1,822	494	Belgium-Luxembourg 536; Netherlands 436; West Germany 119.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials —Continued				
Manufactured —Continued				
Phosphatic thousand tons	1,262	904	133	Belgium-Luxembourg 458; Netherlands 120; Tunisia 90.
Potassic do	364	455	(1)	Belgium-Luxembourg 157; Israel 152; U.S.S.R. 75.
Other including mixed	1,847	1,852	282	Belgium-Luxembourg 849; Netherlands 410; West Germany 185.
Ammonia	354,218	413,069	12,101	Belgium-Luxembourg 58,457; Venezuela 52,233; U.S.S.R. 50,087.
Fluorspar	1,228	27,766	NA	Republic of South Africa 26,105; Italy 708.
Graphite, natural	7,744	9,058	24	China 3,530; Italy 2,529; Madagascar 1,288.
Gypsum and plasters	13,297	21,386	60	Spain 9,566; West Germany 5,833; Switzerland 3,698.
Iodine	1,156	1,100	18	Japan 684; Chile 367.
Lime	131,629	192,416	--	Belgium-Luxembourg 120,456; West Germany 70,243.
Magnesite	98,358	116,562	4,160	Greece 33,085; Spain 19,159; Italy 13,354; Austria 10,862.
Mica:				
Crude including splittings and waste	3,418	6,956	572	India 5,147; Morocco 485; Brazil 204.
Worked including agglomerated splittings	138	232	5	Belgium-Luxembourg 69; West Germany 64; Switzerland 28.
Pigments, mineral: Iron oxides, processed	32,369	37,203	209	West Germany 24,982; Belgium-Luxembourg 9,122; Netherlands 1,833.
Precious and semiprecious stones excluding diamonds:				
Natural value, thousands	$149,987	$154,601	$3,137	Switzerland $68,687; India $21,587; Thailand $20,831.
Synthetic do	$3,920	$2,812	$598	Switzerland $989; West Germany $299; Japan $220.
Pyrites, unroasted	672	732	24	Italy 514; West Germany 156; Spain 21.
Salt and brines	187,546	139,160	57	Belgium-Luxembourg 65,191; Netherlands 31,887; West Germany 23,230.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	2,121	1,655	--	Spain 722; Yugoslavia 270; West Germany 256.
Caustic soda	217,454	226,968	--	West Germany 121,668; Belgium-Luxembourg 70,592; Netherlands 19,450.
Soda ash	21,801	28,756	31	East Germany 12,515; West Germany 7,319; Poland 5,346.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	286,110	292,822	70	Republic of South Africa 71,163; West Germany 66,858; Italy 50,854.
Worked	289,526	273,916	18	Spain 136,680; Italy 103,633; West Germany 21,170.
Dolomite, chiefly refractory-grade	389,856	411,094	4,159	Belgium-Luxembourg 238,242; West Germany 138,475; Italy 26,621.
Gravel and crushed rock thousand tons	4,376	4,541	1	Belgium-Luxembourg 3,960; United Kingdom 312; Norway 158.
Limestone excluding dimension	176,612	172,792	--	Belgium-Luxembourg 172,620; West Germany 171.
Quartz and quartzite	23,681	82,692	856	Spain 65,116; Italy 12,414; West Germany 3,045.
Sand excluding metal-bearing thousand tons	1,560	1,926	(1)	Belgium-Luxembourg 1,108; United Kingdom 662; Netherlands 104.
Sulfur:				
Elemental:				
Other than colloidal	716,377	632,977	64,477	Poland 360,568; Canada 124,728; Belgium-Luxembourg 30,051.
Colloidal	412	586	5	West Germany 559; Spain 21.
Sulfuric acid	205,249	190,757	1	Belgium-Luxembourg 96,684; West Germany 93,711.
Talc, steatite, soapstone, pyrophyllite	18,028	20,514	414	Italy 12,102; Belgium-Luxembourg 3,536; Spain 1,339.
Other:				
Crude thousand tons	1,122	1,075	4	Switzerland 564; Spain 174; West Germany 134.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other —Continued				
Slag, dross, similar waste thousand tons	731	1,281	(1)	Belgium-Luxembourg 914; West Germany 198; Canada 103.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	1,436	1,132	202	West Germany 513; Japan 168; Italy 82.
Fluorine	3	40	--	All from Netherlands.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	174,372	172,065	650	Italy 57,690; Belgium-Luxembourg 48,996; West Germany 26,052.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3,614	18,154	1,482	Belgium-Luxembourg 16,386; Italy 254.
Carbon black	80,405	84,784	5,686	Netherlands 37,957; West Germany 24,901; Italy 6,838.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	26,708	29,813	7,561	Republic of South Africa 9,260; West Germany 5,294; Poland 3,561.
Briquets of anthracite and bituminous coal	253,264	148,948	--	West Germany 122,661; Belgium-Luxembourg 21,248; Italy 4,710.
Lignite including briquets	191,056	168,340	26	West Germany 167,988; Belgium-Luxembourg 293.
Coke and semicoke thousand tons	2,272	3,011	156	West Germany 2,331; Netherlands 293; Belgium-Luxembourg 166.
Gas, natural million cubic feet	r671,018	712,333	--	Netherlands 389,338; U.S.S.R. 120,006; Norway 85,046.
Hydrogen, helium, rare gases	31,889	38,714	260	Belgium-Luxembourg 30,676; West Germany 3,897; Netherlands 3,641.
Peat including briquets and litter	131,356	147,536	86	West Germany 82,511; U.S.S.R. 27,999; Netherlands 18,674.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	932,727	733,770	(1)	Saudi Arabia 285,808; Iraq 177,553; United Arab Emirates 55,116.
Refinery products:				
Gasoline do	25,966	33,803	377	Italy 3,828; West Germany 3,610; U.S.S.R. 3,330; Libya 2,225.
Kerosine and jet fuel do	391	2,861	45	Indonesia 2,175; Nigeria 242; Libya 131.
Distillate fuel oil do	17,064	25,799	14	U.S.S.R. 8,535; United Kingdom 3,244; Netherlands 2,102.
Residual fuel oil do	36,836	53,418	(1)	Iran 9,567; Belgium-Luxembourg 4,805; United Kingdom 4,499.
Lubricants do	1,328	1,409	147	United Kingdom 289; Italy 239; Iran 223; Netherlands 186.
Other:				
Liquefied petroleum gas do	5,098	6,481	(1)	Saudi Arabia 2,081; U.S.S.R. 979; United Kingdom 827.
Mineral jelly and wax do	156	164	21	Netherlands 55; West Germany 50; Republic of South Africa 12.
Petroleum coke do	9,808	9,460	8,723	United Kingdom 364; West Germany 297.
Bitumen and other residues do	52	181	(1)	Belgium-Luxembourg 27; Netherlands 9.
Bituminous mixtures do	94	79	4	Belgium-Luxembourg 36; West Germany 27; Netherlands 3.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r639,862	834,283	371,614	West Germany 111,288; Belgium-Luxembourg 90,942; Italy 76,382.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]Unreported quantity valued at $1,656.

COMMODITY REVIEW

METALS

Aluminum.—With the nationalization of Pechiney Ugine Kuhlman S.A. (PUK) and its subsidiary, Aluminium Pechiney S.A., the Government of France became the largest producer of bauxite, alumina, and aluminum in the country. During 1981, bauxite was produced in mines located in the Departments of Var, Herault, Bouches-du-Rhone, and Ariege. Aluminium Pechiney (by far the largest producer), Union des Bauxites, Société Anonyme des Bauxites et Alumines de Provence, and Société Alusuisse de France were the major companies involved in bauxite production in France. Having been mined since the end of the last century, reserves in French bauxite deposits were becoming exhausted; reportedly, reserves in the Midi were adequate to support mining for only an additional 11 years at the present rate of production. Bauxite deposits occurred in an irregular karst structure. Water influx was a serious problem, and large pumping stations were necessary. At the Maraugues Mine, Var, the pumping station had a capacity of 3,000 cubic meters per hour, and at the Montplesir Mine, Herault, the pumping capacity was 3,200 cubic meters per hour. Because of their location in attractive tourist areas, all mines operated under environmental restrictions. Mining was underground and mechanization was low. Roof support was obtained by bolting with protective mesh. Underground mining equipment was specially designed by French industry for bauxite mines in France. Domestic output covered about one-third of the country's demand in 1981. Employment in bauxite mines averaged 800 persons during 1981.

Alumina was produced in three plants with an aggregate annual capacity of 1,390,000 tons. All three belonged to Government-owned PUK, and the largest, with a capacity of 745,000 tons of alumina per year, was located at Gardanne, Bouches-du-Rhone. PUK also produced all aluminum metal. The largest aluminum smelter in the country, at Noguéres, Pyrenees-Atlantiques, accounted for about one-third of the aluminum output in France. In addition, nine plants situated in the Alps and Pyrenees produced aluminum metal. About 7,000 persons worked in aluminum smelters during 1981.

Antimony.—Coframines, the wholly owned subsidiary of BRGM, started antimony production from a deposit at Chani-Quimper (Finistére) on August 1, 1981. At yearend, production reached 320 tons per day of concentrates, but the startup period was difficult. Complex mineralogy of the ore and difficult mining conditions resulting from complicated geometry of the ore body extended the startup time. Investments in the mine and mill totaled about $1 million.[2]

Copper.—After several years of exploration at Chessy, significant reserves with substantial metal content were blocked out. The deposits also contained zinc.

At Bodennec (Finistére) and Port-aux-Moins (Cotes-du-Nord), after long study, a decision was made not to start production. The complex geometry of the ore bodies and difficult problems in concentration led to the negative decision, in spite of significant reserves and the relatively high content of metals.

Germanium.—Capacity for production of electronic-grade germanium oxide was expanded at Penarroya's Imperial smelter at Noyelles-Godault (Pas-de-Calais). However, the size of the new expanded capacities at Noyelles-Godault were not made public during the year.

Gold.—La Combe du Saut Mine (Aude), north of Carcassone, was operated by Mines et Produits Chimiques de Salsigne (in which Coframines, a wholly owned subsidiary of BRGM, held 47.4% of the capital) and had a difficult year. The gold content of the mine ore dropped, and the mine was flooded during January as a result of heavy snow that cut powerlines. Consequently, only 900 kilograms of gold was produced during 1981. Work on a new shaft named Castan continued. Reportedly, the Castan shaft should replace the old Bru shaft sometime in 1982 or early 1983.

Iron and Steel.—After nationalization, which for the French steel industry was nothing more than legalization of a situation existing since 1979, the steel industry continued to have economic difficulties and suffered losses.

During 1981, the consolidation of steel operations continued, and the following installations operated by the Union Siderurgi-

que du Nord et de l'Est de la France were closed: at Rehon, one 35-ton converter and one 23-ton electric furnace; at Neuves-Maison, a small section mill; at Longwy, a steelmaking furnace 2 by 60 tons. At Creusot Loire S.A., at Creusot, a blooming mill, a billet stand, and a bar mill were closed; at Ordain, one 15-ton, 4-megavolt-ampere electric arc furnace was shut down; and at Pamiers, one 12-ton, 3.5-megavolt-ampere electric arc furnace was also shut down. Acieries et Laminoirs de Lorrain-SACILOR closed a basic bessemer converter and a blooming mill at Hagondange.

Lead and Zinc.—During 1981, the Largentiére Mine, operated by Penarroya, was preparing to close. Results of exploration near the mine were negative, and reserves onhand should be exhausted by the end of 1982 or early 1983.

During 1981, Penarroya purchased buildings of a closed factory located several kilometers from their Imperial smelting furnace at Noyelles-Godault (Pas-de-Calais). After substantial investment, this new installation was to start processing about 200,000 tons of residues with a low content of zinc in 1983. In favorable economic circumstances, this raw material should be a significant source of zinc for the installations at Noyelles-Godault.

Tin.—In 1981, France again started mining tin. For several years, the Massif Armoricain, in the central-western part of France, was a site of intensive exploration for tin in an area that had a long history of tin mining dating back to the Romans. In 1981, production started at Montbelleux in a granitic stock containing numerous veins of cassiterite and wolframite. The size of the mine and daily output were not known at yearend. In addition, exploration continued at the Beaulieu deposit, where reserves were estimated at 9,000 tons of tin.

Tungsten.—Société Minière d'Anglade, the largest producer of tungsten in France, started production from a new deposit at Veronique. High metal content in the ore resulted in a successful year for the operator. Coframines, a BRGM subsidiary, held a 7% participation in the Société Minière d'Anglade.

NONMETALS

Bentonite.—Large deposits of bentonite may exist in the Basin of Paris, according to preliminary reports[3] on exploration for bentonite in France published during 1981. The news was important because France imports about 90% of its yearly bentonite demand. The small domestic production consisted of low-grade bentonite with an active clay (smectite) content of less than 50%. Pits producing bentonite were located in Dordogne and in Vaucluse.

Preliminary bentonite inventories prepared by the BRGM showed 12 areas in Sparnacian Beds located in the western and northwestern areas of the Paris Basin, where the grade of the clay (85% smectite) appeared good. Several tests confirmed suitability of the clays for use in foundries. Although reserves were not determined, preliminary reports indicated several thousand tons of clay may be present and economically recoverable.

Lime.—During 1981, burnt lime was produced in about 34 locations spread throughout France. Only three plants have more than a 200,000-ton-per-year capacity. Four companies produced most of the lime; the major ones were the two French subsidiaries of the Lhoist Group of Belgium: S.A. des Chaux et Dolomies du Boulonnais with a 750,000-ton-per-year capacity of quicklime, located at Rety and Boran, in northeastern France, and S.A. des Carrieres et Fours a Chaux de Dugny, which operated a 700,000-ton-per-year installation at Dugny. In addition, Chaux Balthazard et Cotte operated four plants located at la Buisse, Polienas, Sassenage, and Lathuille in eastern France, with an aggregate capacity of 30,000 tons per year. Through its subsidiaries, Chaux de Provence and Chaux de la Tour, Balthazard had a capacity of about 390,000 tons per year of lime in southeast France at Chateauneuf-les-Martigues, in Bouches-du-Rhone, and at Robion in Vaucluse. In addition, the company operated two plants with an aggregate capacity of 100,000 tons per year located at Sauveterre-la-Lemance in Cot-et-Garonne and Terrasson in the Dordogne. Another subsidiary of Balthazard, Fours a Chaux de l'Aisne, operated a 130,000-ton-per-year plant located at Vendeuil.

La Dolomie Francaise operated a 400,000-ton-per-year plant, the largest lime plant in France, at Neau, Mayenne; its production, however, was wholly dolomitic lime and dead-burnt dolomite.

Salt.—France produced salt from mines, brines, and the sea during 1981. Rock salt was produced by the Compagnie des Salins du Midi et des Salines de l'Est (CSMSE)

with facilities at Saint-Nicolas de-Port (Meurthe-et-Moselle). Salt from brine was produced at Varangeville (Meurthe-et-Moselle) and at nearby Dax; the operator was CSMSE. Solvay also produced salt at Tavaux (Jura) and at Bayonne. Salt from the sea was produced at Salins-de-Giraud (Bouches-du-Rhone) and at Aigues-Mortes (Gard) by CSMSE. Table 1 shows the latest trends in salt production of France.

Talc.—As in the past, Talcside Luzenac operated its opencast mine at Trumouns (Ariege) from May until October during 1981. The high altitude of the minesite and abundant snowfall made production during winter impossible. To move overburden, a new larger power shovel was commissioned at the mine. New equipment increased productivity at the mine and led to lower consumption of explosives. At the nearby plant at Luzenac, new installations for production of 30-micrometer fines, for use in the paper industry, were completed during 1981. In addition, a new storage facility was commissioned at the plantsite.

MINERAL FUELS

Coal.—During 1981, for the first time since 1964, French coal production increased over that of the previous year. About 10 coalfields, varying in size, geological conditions, and mining methods, were in production. These were grouped in three coal basins, namely Nord-Pas-de-Calais, Lorraine, and Centre-Midi. The largest producers of coal were mines in the Lorraine Basin located in northeastern France near the border with the Federal Republic of Germany, which accounted for about 50% of the country's total coal production.

The coal industry had an uneventful year, and the production increase resulted from better utilization of existing facilities. The coking plants at mines as well as those at steel plants suffered from low level activities in the iron and steel sector of the mineral industry.

In the coalfield of Aquitaine, plans called for development of two opencast mines based on 15 million tons of reserves not recoverable by present underground mining. The first one would exploit reserves of 5 million tons at the Sainte Marie Mine, and the second one would produce coal from 10 million tons of reserves at the Troniqui-Lavoir Mine. Work at the Sainte Marie Mine could start during 1983 and at the Troniqui-Lavoir Mine during 1990.

During 1981, the center for study and research for the French coal mining industry, Centre d'Etudes et Recherches des Charbonnages de France (CERCHAR), celebrated its 130th anniversary. The laboratories of CERCHAR were located at Verneuil-en-Halatte, north of Paris. Employment at CERCHAR totaled 700 engineers, scientists, and technicians.

During many years of research, CERCHAR worked on problems related to mining at great depths, remote control of mining equipment, designing of equipment including use of high voltages underground, and research into spontaneous oxidation of coal at low temperatures and into the gases emitted during such oxidation. In addition, CERCHAR studied effects of atmospheric pollution in mines on miners' health, and CERCHAR was appointed by the French Government to issue certificates in conformity with mandatory standards for health and safety in mines.

Petroleum.—Although consumption of crude oil was lower by about 11% than that during 1980, France remained heavily dependent on imported crude oil. Domestic production was low and accounted only for slightly less than 2% of the country's consumption during 1981.

Significant increases of expenditures by the oil companies for exploration and development signaled a revival of the search for oil and gas. In 1981, expenditures for exploration and development totaled about $347 million. In 1978, the same expenditures had amounted to only $111 million.

During 1981, 43 wells totaling 88,945 meters onshore and 5 wells totaling 12,699 meters offshore were drilled for exploration. In the Aquitaine Basin, 18 wells totaling 52,107 meters and in the Parisian Basin, 12 wells totaling 27,168 meters comprised the bulk of exploratory drilling in France. Offshore, three wells totaling 7,648 meters were drilled in the Golfe de Gascogne, and two wells totaling 5,051 meters were drilled in Manche-Iroise. From onshore drilling, the only indication of oil and gas was in the Orlon and Marne Basins, Aquitaine. Offshore, all five wells were dry.

During 1981, 89 wells totaling 153,765 meters were drilled for development. The Parisian Basin was the most active area, where 36 wells totaling 43,490 meters were drilled. In addition, 21 wells were drilled in Landes, Aquitaine. In addition to the small production in France, French oil companies

operated in 40 foreign countries and controlled production of about 350 million barrels per year abroad.

During 1981, 24 petroleum refineries with a capacity of 1,155 million barrels per year were operated in France, which was 5.7 million barrels less than in 1980. The largest refinery was at Petite Couronne, operated by Shell Francais. However, in spite of the reduction of operational capacities in French petroleum refineries, utilization of the installed capacity was only 62%, and for the first time since 1970, petroleum refineries processed less than 730 million barrels.

During 1981, three analytic cracking units were under construction in refineries at Donges (Atlantque), Flandres (Mardyck), and Reichstet (Strasbourg). The new additions will increase cracking capacity in France from 81 million barrels per year in 1981 to 101 million barrels per year in 1982. At the Bordeaux refinery operated by ESSO, S.A.F., a new 4.7-million-barrel-per-year desulfurization unit was completed, and at the Mede refinery (Mediterranee-Rhone) operated by Compagnie Francaise de Raffinage, a new 715,000-barrel-per-year alkalinization unit was completed. An experimental platforming unit for treatment of residues was completed at the Feyzin refinery (Mediterranee-Rhone).

Uranium.—France continued to mine and process domestic and foreign uranium ore during 1981.

The mining division of Compagnie Generale des Matieres Nucleaires (COGEMA) at Crouzilles was the largest producer of uranium ore. The uranium content of its output was over 1,000 tons of U_3O_8.

After the startup in the early part of 1980, the mining division at Herault had problems in reaching the designed capacity during 1981.

Exploration for uranium continued at a fast pace. At the beginning of the year, COGEMA had 38 exploration permits covering 3,352 square kilometers. Reserves of the new uranium deposit at Coutras, Province of Nord Aquitaine, reportedly totaled 20,000 tons. Production from the Coutras deposit was planned for the beginning of the next decade.

The capacity of the COGEMA plant at Bessines for the production of yellow cake was increased to 1.1 million tons of ore per year.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from French francs (F) to U.S. dollars at the average rate for 1980 of F5.00 = US$1.00.

[3]Le Berre, P., and B. Rozes. Vers l'Existance de Gisements de Bentonite en France? Prospection des Argiles du Sparnacien dans l'Ouest du Bassin de Paris (Are There New Bentonite Deposits in France? Exploration of Sparnacian Clay Deposits in the West of the Basin of Paris). Chronique de la Recherche Minière, No. 460, 1981, pp. 53-65.

Rozes, B. Sodium-Exchanged Bentonite in France. Ind. Miner. (London), November 1981, pp. 59-63.

The Mineral Industry of Gabon

By Ben A. Kornhauser[1]

The appreciation of the U.S. dollar, with respect to the African Financial Community franc (CFAF), impacted favorably in 1981 on Government oil revenues, which increased 32% over initial estimates.[2] However, the rise in the value of the dollar substantially increased Gabon's foreign debt, which was almost 50% payable in dollars. In addition, the high interest rates in the United States of about 19% and in France of 20%, compared with Gabon rates of between 10% and 15%, attracted Gabon's cash holdings. The devaluation of the French franc also increased the cost of imports outside the franc area since importers had to pay more for foreign exchange in dollars, marks, or yen. Gabon's inflation was projected at 15% for 1981.

The economic growth of Gabon was related directly to the development of its rich natural resources, with petroleum the predominant factor. Higher prices in 1981 offset declining petroleum production, increased Government oil revenues by $492,000, and enabled the gross domestic product (GDP) to grow by almost 12% from $3.32 billion in 1980 to $3.71 billion in 1981. Outstanding public debt was still heavy, although reduced from its 1980 level, and accounted for 36.3% of Government spending in 1981 compared with 38.3% in 1980. Public finance showed continuing substantial improvement through the holding of Government spending to budget limits and increased GDP.

In addition to petroleum, Gabon's wealth was derived from its manganese, uranium, and timber. Major iron ore deposits remained undeveloped. The Trans-Gabon Railroad was being constructed to provide the transport infrastructure to make these resources more accessible, exploitable, and marketable, and to enable Gabon to control their delivery from Gabon's ports. The plan was for prospecting to take place for 100 kilometers on either side of the railroad by the national geological office, France's Bureau de Recherches Géologiques et Minières (BRGM) and by aerial survey by a U.S. company.

In late 1981, France granted Gabon a loan of $24.9 million at 8.5% interest to finance the second leg of the railroad. This section was to extend for 140 kilometers from Ndjole to Booue, the most difficult part of the line that followed along the Ogooue River Valley. This leg was scheduled to open by the end of 1982. The first section of the railroad—182 kilometers between Owendo, the Port of Libreville, and Ndjole on the Ogooue River—became operational in 1979. In 1981, traffic was expected to exceed 80,000 passengers, an estimated 20% increase over that of 1980, with freight remaining at about 300,000 tons.

Gabon planned to raise its participation in three primarily French-controlled companies, from 25% to a 35% to 41% portion in petroleum and from 10% up to 30% in nonfuel minerals. The target companies were Essence et Lubrificants de France (ELF)-Gabon Oil Co., a subsidiary of the ELF-Aquitaine Group involved in petroleum production; the Compagnie Minière de l'Ogooue SA (COMILOG), owned jointly by the United States Steel Corp. (40.76%), France's BRGM (18.3%), Imetal SA (15.8%), the Gabonese Government (15.02%), and Banque des Paris et de Pays-Bas and Japan's Mitsui Mining & Smelting Co. Ltd. (10.12%), involved in the mining of manganese; and the Compagnie des Mines

d'Uranium de Franceville (COMUF), controlled by the French Commissariat à l'Energie Atomique (CEA) and involved in the production of uranium.

The production and distribution of electricity and water in Gabon were controlled by the Société d'Energie et d'Eau du Gabon (SEEG). SEEG was owned by the Gabonese Government (64%) and other private and quasipublic entities. However, the electrical network consisted of unconnected regional centers. Fortunately, Gabon had developed hydroelectric power and could increase that capacity greatly. Also, its oil and natural gas supplies provided thermal power generation. In mid-1980, SEEG's installed capacity was 265,200 kilovolt-amperes (kva), of which 152,000 kva were from hydroelectric facilities and 113,000 kva were from 24 thermal stations. The hydroelectric plants were at the Kinguele Dam (72,000 kva), Tchimbele Dam (57,000 kva), and Petit Poubara Dam (23,200 kva). Capacity was being added at the last two sites. Port Gentil had two gas-oil and natural gas generators producing 78,750 kva. Libreville had a backup thermal generator listed at 18,500 kva. In 1981, 23 towns, including Libreville and Port Gentil, were electrified, and powerlines to Fougamou and Lastoursville were under construction. Several projects that were to increase electrical supply were under study. These possibilities included expanding capacity at Kinguele and Petit Poubara Dams, constructing a 240,000-kva capacity at Grand Poubara Dam, and developing the Ngounie River's Empress Falls, which had a power potential of 3 billion kva. New ministations were planned for several towns; auxiliary power was to be supplied for any major industrial project.

PRODUCTION

The slump in the international markets for manganese, uranium, and wood decreased their value and potential volume in 1981. Although the worldwide economic malaise also reduced petroleum production, increased oil prices and a strengthened U.S. dollar raised the value of the oil produced. Uranium production increased about 11% over that of 1980 and had a value of $63.3 million. France's long-term contract to purchase 1,000 tons of uranium (metal content) undoubtedly was a major stimulus to its mining. Manganese production decreased by about 31% from 1980 at a value of approximately $95 million. Cement production, on the other hand, increased about 37% over that of 1980 and had a value of about $16.1 million.

Table 1.—Gabon: Production of mineral commodities[1]

Commodity[2] and unit of measure	1977	1978	1979	1980[p]	1981[e]
Cement, hydraulic—metric tons	190,000	e190,000	96,205	109,430	149,913
Diamond, gem and industrial—carats	NA	NA	NA	557	550
Gas, natural:					
Gross—million cubic feet	61,694	64,449	e64,000	e58,000	66,073
Marketed—do	6,250	5,827	6,549	2,538	2,500
Gold, mine output, metal content—troy ounces	2,572	965	964	553	NA
Manganese:					
Ore, gross weight (50% to 53% Mn) metric tons	r1,772,685	r1,616,516	2,188,445	2,044,049	1,359,954
Pellets, battery and chemical grade, gross weight(82% to 85% MnO_2)—do	r77,944	r93,905	111,649	102,703	127,584
Total—do	r1,850,629	r1,710,421	2,300,094	2,146,752	1,487,538
Petroleum:					
Crude—thousand 42-gallon barrels	79,032	76,176	70,991	64,444	55,386
Refinery products:					
Gasoline—do	1,058	1,142	850	886	648
Jet fuel and kerosine—do	730	2,308	740	1,391	728
Distillate fuel oil—do	5,073	3,275	2,286	2,545	4,117
Residual fuel oil—do	3,650	5,662	4,150	4,140	2,182
Other—do	1,971	2,496	684	142	752
Refinery fuel and losses—do	--	534	274	14	20
Total—do	12,482	15,417	8,984	9,118	8,447
Uranium oxide (U_3O_8), content of concentrate metric tons	1,068	1,205	1,297	1,218	1,360

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 20, 1982.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) is also produced, as well as diamond from artisan works, but output is not reported and available information is inadequate to make reliable estimates of output levels.

TRADE

Because Gabon interacted with other countries, its trade was affected greatly by external factors, such as the state of the world economy, interest rates elsewhere, and the strength or weakness of other country currencies, particularly the U.S. dollar and French franc. Preliminary 1981 data indicated that Gabon's foreign trade balance declined from $910 million in 1980 to $740 million in 1981. This decline was attributed primarily to increased spending for imported goods and contracted services. Gabon's foreign assets were expected to increase slightly in 1981 over those in 1980, while balance-of-trade payments were expected to be the same as in 1980.

COMMODITY REVIEW

METALS

Gold.—Data for gold production were unavailable. Previously, gold was produced mainly in the Eteke region with some gold mining in the Lastoursville, Makokou, and Ndjole regions. Gold output was sold on the official market by Société Gabonese de Recherche et d'Exploitation Minière (SOGAREM).

Gold was sought in primitive rock formations in the Eteke (Ngounie) region by the Or Eteke syndicate (Gabon 45%, COMUF 35%, and BRGM 20%). BRGM also intended to prospect actively for gold in 1982. These explorations were aimed first at locating the mother lode of the Eteke gold, from which 15 tons were mined in dispersed locations from 1937 to 1954, and then using open pit and/or underground mining to exploit the source if it proved to be economically feasible.

Iron Ore.—The Board of Directors of the Société des Mines de Fer de Mekambo (SOMIFER) met to restructure its capital and to outline a study for developing its Belinga iron ore deposit near Mekambo, in northeast Gabon near the Congo border. SOMIFER was owned by the Gabon Government (41%), Bethlehem Steel Corp. (United States) (20%), Bergbau AG Niederrhein Exploration (Federal Republic of Germany) (10%), Industralexport (Romania) (5%), Finsider International (Italy) (3.5%), BRGM (France) (3%), Ste' Lorraine et Mèridionale de Laminage Continu (SOLMER) (2.4%), Banque de Paris et des Pays-Bas (1%), Estel Hoogovens BV (Netherlands) (0.5%), and a Japanese group (13.6%). The ore reserves of the deposit were estimated at 910 million tons, with about 65% iron content, of which about 200 million tons contained less than 0.1% phosphorus. Open pit mining was to be used to produce between 7.5 and 10 million tons annually. The development of the deposit was predicated upon construction of the Trans-Gabon Railroad and a northern extension. The railroad would carry the ore to Libreville for export to world markets.

Manganese.—Manganese production in 1981 operated at two-thirds of plant capacity owing to depressed world steel production, in which manganese was essential as a desulfurizer and as an inexpensive hardening element. Gabon was the world's largest producer of manganese from a single mine and was one of the world's four principal producers of manganese ore.

At the Ogooue Mine at Moanda, manganese ore was extracted by the open pit method by COMILOG. With manganese, also, mining expansion and expected ferromanganese alloy production was predicated upon construction of the Trans-Gabon Railroad. Once the railroad would reach Moanda, transportation no longer would be a limiting factor to production. New production was limited by the capacity of the chain-conveyor system that carried the ore from Moanda to M'Binda in the Congo for transport by two railroads to Point Noire, Congo, for export.

France agreed to participate with the Gabonese Government in building a ferromanganese alloy plant at Haut-Ogooue, the proposed site of the hydroelectric plant. France was to conduct studies before bids were invited for the plant. Production capacity was planned at 85,000 tons of ferromanganese and 50,000 tons of silicomanganese per year. The conversion of the manganese ore concentrate to ferroalloys was to boost Gabon's GDP through sale of a higher priced product and increased employment.

NONMETALS

Barite.—Promising indications of 1.2 billion tons of barite deposits were reported

primarily at Dourakiki in the Nyanga region, 110 kilometers north of Mayumba in the southern coastal region. The Dourakiki deposit was reported to have a barite content of 47%. Barite was discovered first in Gabon in the 1960's by BRGM. The feasibility study of the Dourakiki deposit was conducted by the Koussou syndicate, consisting of the Gabonese Government, COMILOG, and BRGM. The deposit was to be exploited jointly by a company composed of the above three plus ELF-Gabon. Beneficiation by gravitation was expected to convert about 80% of the run-of-mine output into a salable product.

The dominant use of crushed and ground barite was in drilling fluids for oil and gas wells, of particular interest in Africa with the increased drilling for petroleum.

Cement.—Cement production was considerably below the clinker-grinding capacity available. The older clinker-grinding plant located at Owendo was operated by the Société des Ciments d'Owendo and had an annual capacity of 270,000 tons. The principal shareholders of the firm were the Gabon Government (20%) and Ciments Lafarge S.A. (France) (71.3%).

Two new plants were constructed and operated by Société des Ciments de Gabon, which is owned by the Gabonese Government (51%), ELF-Gabon (19%), Ciments Lafarge (15%), and Société des Ciments d'Owendo (15%). One plant, located near Ntoum about 40 kilometers from Libreville, was to produce 350,000 tons of clinker from local limestone deposits, thereby reducing dependence on imports. The second plant, a clinker-grinding plant with an annual production capacity of 100,000 tons, was constructed at Franceville.[3]

Talc.—An estimated 100-million-ton deposit of talc was located in the N'dendi Tchibanga region of the Nyanga Province. The Gabonese Government and BRGM continued to consider the feasibility of exploiting the deposit.

MINERAL FUELS

Natural Gas.—Natural gas production, which was associated mostly with petroleum production, declined slightly in step with the drop in crude oil output. About 5% of the gas production was used for power generation and the remainder was flared. Natural gas reserves remained stable at about 70 billion cubic meters.

Petroleum.—*Production.*—Gabon's petroleum production declined again in 1981, owing largely to a decrease in world demand for oil that caused crude oil prices to drop and the Organization for Petroleum Exporting Countries to mandate production controls. Gabon also lost Cameroon as a market for some refined products. Oil production declined to a little under 150,000 barrels per day, about two-thirds of the peak production of 224,000 barrels per day in 1976.

Oil production was mostly from offshore fields with development still centered in offshore areas. ELF-Gabon, which was 25% owned by the Gabonese Government and 75% by Essence et Lubrificants de France-Enterprise de Recherches et d'Activités Pètrolièrs, still dominated oil production in the country. ELF-Gabon operated the Mandji Field, among several others, by itself and in conjunction with other companies. Recent discoveries doubled Gabon's known oil reserves, but 1980 world economic conditions failed to motivate the Government to determine future production levels.

In June 1979, the Gabon Government established the Société Nationale des Pètroles Gabonais (PETROGAB), and all petroleum-producing companies were required to deliver 25% of their annual output to the national company. PETROGAB became independent in 1980 under the Minister of Economy and Finance. PETROGAB was organized into five sections. One section oversaw all exploration and production activities. A second section was responsible for all financial matters. A third division handled legal matters. A fourth section was responsible for refining and petrochemicals, and a fifth section was concerned with storage and transport. By 1981, the first three divisions were operational. The first division proved to be most important because Gabon entered into leases under production-sharing agreements and oversaw the production of the operating companies. Until mid-1981, PETROGAB had no problems in marketing its 25% share of oil produced through long-term or yearly leases. Approximately 70% of PETROGAB's contracts were directly with governments as purchasers and not through intermediaries. When PETROGAB's work force and expertise could be increased, the company planned to become more active in the areas of refining, petrochemicals, storage, and transport. In 1981, Gabon announced its intention of increasing its share of capi-

tal interest in foreign oil companies from 25% to a 35% to 41% portion.[4] New exploration leases were to be on a production-sharing basis, with PETROGAB receiving much larger shares of annual production.

Exploitation of the AYOL I site by the joint partnership of the Wed Gabon Oil Co. (70%) and ELF-Gabon (30%) began in the fall of 1981. The initial discovery was made in 1979 in the North Concession where petroleum was found in the Batenga Stone at a depth of 2,259 meters, with an initial flow of 1,082 barrels per day. Annual production was estimated at 400,000 barrels. The Wed Gabon Oil Co., a Japanese firm, was composed of Japan National Oil Co. (50%), World Energy Development (28.6%), and C. Itoh Energy Development (21.4%).[5]

Exploration.—The pursuit of oil by foreign companies continued actively in 1981. The Wed Gabon Oil and ELF-Gabon partnership drilled in the Assouka Concession without success in 1981. A 50-50 partnership of the Mitsubishi Petroleum Development Co. and ELF-Gabon was exploring the Baliste Concession north of the Wed Gabon site.[6]

The Amoco Gabon Exploration Co. made two significant oil discoveries in the Inguessi Marine block, covering a tract of 1,391 square kilometers lying 86 kilometers southeast of Port Gentil. The wells flowed at daily rates from 1,166 to 2,114 barrels of oil. Amoco Gabon took over this concession after successive abandonment by ELF-Gabon and Exxon Corp. Amoco Gabon Exploration Co. consisted of five companies—Amoco Oil (an affiliate of Standard Oil Co. (Indiana) (50%), Wintershall AG (18.5%), Bristish Petroleum Co. Ltd. (15%), Lingen Exploration Inc. (8.25%), and Preussag AG (8.25%).[7] In addition, Amoco drilled its second exploratory well on its wholly owned Gombi Marine block. At the end of 1981, Amoco had interests in three tracts of about 1,800 square kilometers in offshore Gabon. Amoco had explored four concessions in Gabon under four different names: Gombe Marine, Omboue Sud Marine, Iguela, and Inguessi Marine, in association with other oil companies such as Gulf Gabon, Hispanoil, and Gulf Canada.

ELF-Gabon found oil in two promising wells in wholly owned concessions. The Moubenga Marine exploratory well was in the Paka Marine Concession located 70 kilometers south of Mayoumba and passed through oil-permeated sandstone en route to depths of about 3 kilometers in the Dentale formation. The well flowed at about 2,750 barrels per day. The second, the Kenzi Marine No. 3 test well, went through 30 meters of oil-bearing sandstone between 1080 and 1140 meters. The well was located in the Pongara Marine Concession about 65 kilometers from the Lopez cap. This well was drilled under an exploration and shared production contract between the Gabon Government on the one hand and ELF-Aquitaine (70%) and ELF-Gabon (30%) on the other. In August, the 50-50 partnership of Elf-Gabon and Mitsubishi Petroleum found oil in the Baudroie Marine No. 2 Concession located offshore Gabon. The well passed through the oil-bearing Anguille and Bananga reservoirs.

Refining.—Gabon's two refineries had a combined annual capacity of approximately 22 million barrels of crude oil. The Société Gabonaise de Raffinage (SOGARA) refinery at Port Gentil had an annual production capacity of 12 million barrels. It was owned by the Gabon Government (51%), Elf-Gabon (18.75%), Compagnie Française des Pètroles (18.75%), and a group of petroleum marketing companies (11.5%). SOGARA was supplied with crude oil from the Mandji Isle fields via an 18-kilometer pipeline. Its production was sold on the domestic market and exported to the Central African Republic, to the Congo, and to Cameroon at a lower price to compete with Cameroon's new refinery. The second refinery, which came onstream in Port Gentil in 1977, had an annual capacity of 10 million barrels of crude oil and was operated by the Compagnie Gabonaise-ELF de Raffinage (COGER). COGER was owned by the Government (30%) and ELF-Gabon (70%). Total 1981 production from the COGER refinery was approximately 8.36 million barrels of gasoline, jet fuel, kerosine, distillate fuel oil, and fuel oil. COGER refinery exports were intended for Western European countries.

Uranium.—Major uranium deposits were centered in the Mounana region near the Moanda manganese deposits. However, of the three deposits delineated at Oklo, Boyindzi, and Okelobondo, only the Oklo Mine was being worked, using open pit and underground methods. The mine was operated by COMUF, which was owned jointly by the Gabonese Government (25%), Cie. de Mokta (28%), France's CEA (15%), Minatome S.A. (France) (13.2%), Compagnie Française des Minerais d'Uranium (7.5%), Cie. des Mines d'Huaron (3.75%), and Compagnie de Geston d'Investissements Internationaux (7.5%). Concentrates were sold to the CEA under contract.

The European Investment Bank loaned $17 million to Gabon to modernize its uranium processing plant and to expand the mine from a production capacity of 1,000 to 1,500 tons per year of uranium metal. The loan was granted for 15 years at 8% interest. The run-of-mine ore averaged 5% of U_3O_8 content. The first processing enriched the ore to between 35% and 55% U_3O_8 and the yellowcake plant produced a 70% to 75% uranium concentrate.

The Taiwan company TAIPOWER accepted Gabon's offer to participate in the exploitation of its uranium. Exploration for uranium was concentrated in the recent past in the Booue-Lastoursville-Mounana regions.

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[1]Metallurgist, Division of Foreign Data.
[2]Where necessary, values have been converted from African Financial Community francs (CFAF) to U.S. dollars at the rate of CFAF300 = US$1.00.
[3]European Societe of Cement Producers. World Cement Directory. 1981.
[4]Paris Marches Tropicaux et Mediterraneans. No. 1885, Dec. 25, 1981, p. 3438.
[5]The Libreville L'Union (Gabon). June 18, 1981, p. 4.
[6]———. June 22, 1981, p. 4.
[7]Standard Oil Co. (Indiana). Annual Report 1981.

The Mineral Industry of the German Democratic Republic

By Walter Steblez[1]

In 1981, the German Democratic Republic (GDR) showed significant economic growth in contrast to several other centrally planned Eastern bloc economies. The GDR national income registered the planned 5% increase over that of 1980, and gross industrial production for the entire economy rose by 5.1%, versus a planned 5.0%; in industrial sectors directly controlled by ministries, the increase amounted to 5.9% versus a planned 5.8%. The relative shares of ferrous and nonferrous metallurgy and mining in total industrial production were approximately 6.4% and 2.4%, respectively, and in the production of fuel and power, about 11.1%.

The total industrial labor force in the GDR economy was in excess of 3.2 million with over 22% employed in key energy and raw and other material sectors of the economy. Reportedly, in 1981, there were more than 125,000 personnel employed in ferrous metallurgy and mining, of which 83,000 were production workers. The nonferrous mining and metallurgical sector employed about 50,000 personnel including approximately 32,000 production workers. The fuel and power and chemical sectors had, respectively, about 271,000 and 274,000 total personnel, of which 175,000 and 170,000, respectively, were production workers. Industrial labor productivity in 1981 rose 5% and was responsible for 90% of the overall industrial production increase.

While the Ministries of Coal and Energy and Mining, Metallurgy, and Potash were increasing production by 1.7% and 1.0%, respectively, in 1981, the GDR continued to pursue and implement policies for the efficient consumption of raw materials and energy and for materials and energy savings. The reported 1981 raw materials and energy savings were achieved by a 5% consumption decrease in industry.

The planned 16% growth of foreign trade turnover for 1981 fell short of the goal and attained a 10% increase over that of 1980. Official sources, however, pointed to a favorable trade balance in 1981 and a trade surplus with "developing and industrialized capitalist countries."[2]

In the GDR, mineral economic policy, to a large extent, determined the content and direction of overall economic development. Despite a leading role in the world production of lignite and potash, the country, with a highly developed industrial base, possessed scant mineral reserves. To meet its industrial material requirements, the GDR relied heavily upon imports of ferrous and nonferrous ores and metallurgical products, as well as upon significant amounts of energy resources.

Government Policies and Programs.—The GDR objectives of maintaining economic growth in the 1980's with concurrent reduction of imports for essential raw material and energy resources included the following trends: (1) Industrial enterprise reorganization; (2) increased technology transfer and reliance upon scientific work in key industries; (3) expanded reliance on secondary raw materials, increased use of special steels, and refining in the ferrous and nonferrous metallurgical sectors; and (4) enhanced marketability of exported commodities.

During the 1976-80 5-year plan, the GDR embarked upon a reorganization of industrial enterprises under respective ministries into large centrally organized firms (Kombinats) with the aim of improving the division of labor and production efficiency. Closely related enterprises were consolidated into vertically organized state monopolies. By

the end of 1981, over 150 Kombinats had been organized, and it was planned to increase their number during the 1981-85 period. Reportedly, the Kombinats were to subordinate foreign trade organizations and have an advisory status in the drafting of national economic plans. To reduce costs and consumption of raw materials, 30 performance quality indices were designated to check Kombinat efficiency, of which 7 were concerned with improving the foreign trade balance. By 1981, these functions had not been officially codified, and it was believed that this was due to the fact that the reorganized industry was undergoing a period of testing and evaluation.[3]

Together with the structural reorganization of industry, the GDR has emphasized industrial modernization through increased use of high technology and automation; much of the country's industry was labor intensive with obsolescent plant and equipment. Capital repair was reputed to run 20 billion marks per year[4] and absorb 9% of the total industrial work force. The productivity of the repair sector was estimated at 40% to 45% below that of the manufacturing sector level. In 1981, some 70% of the GDR total research and development outlays were to be spent on applied sciences with specific emphasis on robotics and microelectronics. In 1981, the GDR reported the installation of 13,000 robots in industry. However, it should be noted that the definition of robotics in the GDR included simple process equipment programmable in less than a three-directional mode. It was reported that in the lignite industry, the first robot was installed at the VEB Schwarze Pumpe Kombinat in 1981 to perform tough repair work on overburden excavators. In ore mining, metallurgy, and potash industries, 2,000 industrial robots were planned for 1985, of which 67% were to be simple, specific-process type.

High material costs and a substantial labor pool in the sectors of the GDR economy producing energy and raw and other materials have prompted the country's planning authorities to upgrade the collection and reutilization of secondary raw materials by 28% to 30%, especially ferrous and nonferrous industrial scrap and used oil and refractories during the 1981-85 plan period. Concurrently, the GDR metalworking sector was to decrease consumption and increase end-use product refinement by means of improved metallurgical processes and input weight reductions of raw materials and energy. By 1985, the planned special steel output was to comprise 80% to 90% of the total rolled-steel output; in the nonferrous sector, 90% of the total output was to be refined. These measures were forecasted to increase material supplies between 0.5% and 0.8% for rolled steel and about 1.0% for nonferrous metals.

The GDR 1981-85 5-year plan set a specific goal for the reduction in the annual consumption rate of important energy and raw-material sources at 5.0% to 5.5%. Primary energy consumption was to be reduced by 4.0% to 5.0% per year. By 1985, planned reductions in energy consumption compared with those of 1980, were to be equivalent to 70 million tons of raw lignite. Measures taken for reduced consumption and improved efficiency in industry were to result in the following savings for the 5-year period: (1) Rolled steel—2.2 million tons, (2) aluminum—more than 50,000 tons, (3) copper—about 15,000 tons, and (4) cement—1.9 million tons.[5]

The GDR national economic plan for 1981-85, published originally in April, and with adjustments in December of 1981, fixed a 28% increase in national income in 1985 in comparison with that of 1980. Likewise, industrial output for the entire economy was to increase by 28%, and, in enterprises under the industrial ministries, a 31% increase was planned. Labor productivity was planned to grow by 29%, and freight transportation, by 11% to 12%.

Total investment for the 1981-85 planning period was set at 256 billion marks, with the construction share of investment maintained at about a 25% level. New production capacities in the lignite industry amounting to 70 million tons were planned for 1985; the share of nuclear-generated electric power was planned to reach 12% to 14% of the produced total.

Increased and more efficient steel production was expected at the Ost Eisenhutten Kombinat with the addition of an oxygen converter and continuous casting technology by 1985. Increased ore output was planned in the copper mining industry, and self-sufficiency in tin production was set for the end of the 1981-85 period. The planned 1985 production targets for key energy and material resources are presented in table 1.

Table 1.—German Democratic Republic: 1980 production and 1985 production goals for key resources

Commodity	1980 production	1985 goals
Electric energy billion kilowatts	99	112
Lignite, mine output million tons	258	290
Nitrogen fertilizers, N content thousand tons	943	1,200
Potash fertilizers:		
Crude, K_2O content do	3,422	3,450
Granulated and globular, K_2O content do	--	2,245
Steel:		
Total rolled do	5,128	9,282
Total rolled (alloyed) special steel do	4,330	7,393

In comparison with that of 1981, the GDR national income was planned to increase 4.8% in 1982. Total manufacturing output and enterprise production under the industrial ministries were set to grow 4.5% and 5.1%, respectively. At the same time, specific consumption of energy was to decrease by 4.0% in 1982. Consumption of rolled steel in the metal-working industry was to decrease by 6.5%, and in the building industry, by 3.9%. Consumption of cement by the building industry was to be reduced by 5.5% in 1982.

In 1982, the GDR planned to increase coal and energy output by 3.7% over that of the preceding year. Electric power generation was expected to reach 103.4 billion kilowatts. Raw lignite output was set at 271.9 million tons, and lignite briquets at over 50 million tons. The ore mining, metallurgical, and potash industries were to increase their output by 3.3% and raise the production of potassic fertilizer (in K_2O content) to 3.45 million tons. Also, labor productivity in industry was to grow by 4.5%, and foreign trade, by 15%; capital investment in industry, however, was reduced by 3.1%.

PRODUCTION

In 1981, every industrial sector in the GDR reportedly met and exceeded production plan targets. Enterprises under the jurisdiction of the coal and energy ministry overfulfilled the plan by 101.7%. The plan for refined coal products was exceeded by 353,000 tons for brown coal briquets and by 22,000 tons for high-temperature brown coal coke. Lignite open pit mines surpassed production quotas and insured adequate supplies for domestic consumption. Also, the GDR put into operation 1,000 megawatts of new electric-power-generating capacity and, overall, increased electric power output during the year.

The production plan goals of enterprises under the Ministry of Ore Mining, Metallurgy, and Potash were met and in some cases exceeded for most essential raw materials. Domestic mineral raw materials and ground water resources were expanded in 1981 by workers of the Ministry of Geology, which exceeded its plan by 105%. Actual production of most mineral commodities did not vary from or significantly exceed output levels of 1980. Rather than emphasize production in gross output, the GDR attempted to give greater impetus to quality and efficiency in commodity output by using the net output indices and reducing material cost per 100 marks of production.

Table 2.—German Democratic Republic: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum:					
Alumina:					
For metallurgical use	38,953	37,585	40,965	43,025	43,000
For other use[e]	19,000	19,000	19,000	20,000	20,000
Metal:					
Primary[3]	r65,000	r65,000	r60,000	60,000	60,000
Secondary	53,000	53,500	53,000	52,500	52,000
Total	118,000	118,500	113,000	112,500	112,000
Cadmium metal, primary[e]	18	18	15	15	16
Copper:[e]					
Mine output, metal content	17,000	16,000	15,000	15,000	16,000
Metal:					
Smelter, primary	18,000	17,000	19,000	r18,000	18,000
Refined:					
Primary	32,000	31,000	32,000	32,000	32,000
Secondary	19,000	18,000	19,000	19,000	19,000
Total	51,000	49,000	51,000	51,000	51,000
Iron and steel:					
Iron ore, gross weight marketable, 42% Fe[4] thousand tons	66	80	70	70	70
Metal:					
Pig iron do	2,628	2,560	2,386	2,458	2,400
Ferroalloys[5] do	154	164	155	150	150
Crude steel do	6,850	6,976	7,023	7,308	7,400
Semimanufactures (hot-rolled only) do	4,802	5,002	5,100	5,128	5,200
Lead:[e]					
Smelter, primary	20,000	20,500	22,000	22,000	22,000
Refined:					
Primary	20,000	20,500	22,000	22,000	22,000
Secondary	17,000	17,500	18,000	18,000	18,000
Total	37,000	38,000	40,000	40,000	40,000
Nickel:[e]					
Mine output, metal content, recoverable	2,500	2,700	2,500	r2,700	2,700
Metal, refined	2,800	3,000	3,000	3,000	3,000
Silver, mine output, metal content, recoverable[e] thousand troy ounces	1,600	1,600	1,550	1,510	1,600
Tin:[e]					
Mine output, metal content, recoverable	1,400	1,600	1,600	r1,800	1,900
Metal, smelter output including secondary	r1,750	r1,750	r2,000	r2,200	2,300
Zinc metal including secondary[e]	15,500	16,000	17,000	17,500	17,500
NONMETALS					
Barite[e]	31,000	35,000	35,000	35,000	35,000
Boron materials: Processed borax, $Na_2B_4O_7 \cdot 10H_2O$ content	3,700	4,100	4,200	3,400	3,500
Cement, hydraulic thousand tons	12,102	12,521	12,273	12,444	12,500
Chalk[e] do	50	50	50	50	50
Clay, kaolin:[e]					
Crude do	350	370	380	400	400
Marketable do	170	180	190	200	200
Fluorspar[e] do	100	100	100	100	100
Gypsum and anhydrite:					
Crude[e] do	340	350	360	r360	360
Calcined do	304	309	319	313	315
Lime and dead-burned dolomite do	3,367	3,443	3,470	3,401	3,400
Nitrogen, N content of ammonia do	1,130	1,137	1,078	1,182	1,190
Potash, marketable, K_2O equivalent do	3,229	3,323	3,395	3,422	3,490
Pyrite, gross weight[e] do	25	25	25	25	25
Salt:					
Marine do	53	53	55	52	53
Rock do	2,590	2,688	2,997	3,076	3,100
Total do	2,643	2,741	3,052	3,128	3,153
Sodium compounds, n.e.s.:					
Caustic soda	423,486	414,988	548,303	626,081	650,000
Sodium carbonate	839,561	852,260	860,483	866,254	870,000
Sodium sulfate	137,579	130,799	127,000	127,000	126,000
Stone, sand and gravel:					
Crushed stone thousand tons	14,561	14,566	15,000	15,000	15,500
Sand and gravel do	8,359	8,477	9,829	10,353	11,000

See footnotes at end of table.

Table 2.—German Democratic Republic: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Sulfur:					
Byproduct:					
Elemental[e] thousand tons	80	80	80	80	80
Other forms do	260	270	270	270	270
From pyrite[e] do	10	10	10	10	10
Sulfuric acid do	927	971	952	958	960
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous do	349	115			
Lignite do	253,705	253,264	256,063	258,350	267,000
Total do	254,054	253,379	256,063	258,350	267,000
Coke:					
From anthracite and bituminous coal[e] do	1,600	1,500	1,500	1,500	1,500
From brown coal:					
High-temperature do	2,240	2,297	2,373	2,608	2,700
Low-temperature do	3,020	2,857	2,769	2,727	2,600
Total do	5,260	5,154	5,142	5,335	5,300
Fuel briquets (from lignite) do	48,749	48,468	48,698	49,693	49,790
Gas:					
Manufactured million cubic feet	203,517	218,138	228,380	219,057	220,000
Natural, marketed production do	300,343	302,426	302,450	302,450	302,500
Petroleum:					
Crude thousand 42-gallon barrels	392	392	392	392	392
Refinery products:					
Gasoline do	26,205	27,515	27,832	28,333	29,000
Kerosine, jet fuel, distillate fuel oil do	41,048	42,583	45,329	46,533	48,000
Residual fuel oil do	56,850	r58,941	59,000	59,500	60,000
Lubricants do	2,738	2,817	2,910	2,894	2,900
Asphalt do	7,268	6,781	6,969	7,000	7,200
Total[6] do	134,109	r138,637	142,040	144,260	147,100

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through July 12, 1982.

[2]In addition to the commodities listed, magnesium, peat, and a variety of crude construction materials are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Reported in Metal Statistics, 1970-80, Metallgesellschaft Aktiengesellschaft, 68th ed., Frankfurt am Main, 1981, p. 15.

[4]Source indicates that data include "roasted ore," presumably roasted pyrite.

[5]Figures represent the sum of estimates for silicon metal production (3,000 tons in 1977; 4,000 tons in 1978, 1979, and 1980) and reported figures for production of all other ferroalloys (1981 estimated).

[6]Total of listed products only; no estimates have been made for unreported products or refinery fuels and losses.

TRADE

The key objectives of the GDR foreign trade policy for the 1981-85 plan period were to reduce reliance on imported energy sources and raw materials and to upgrade the marketability of domestic production to increase exports. The rise in world market prices beginning in 1973 for fuel, raw materials, and durable goods, resulted in annual foreign trade deficits. By the end of 1980, the estimated convertible currency debt to industrialized Western countries reached an alarming $11 billion with interest payments absorbing approximtely one-third of the value of exports to the West. The estimated incurred debt to the U.S.S.R. for the period between 1974 to the end of 1980 was valued at roughly $3 billion, corresponding closely with the petroleum price increase in the Council for Mutual Economic Assistance (CMEA) bloc.[6]

According to the 1981-85 plan directives, the GDR was to slowly redirect some of its more profitable exports from CMEA countries to Western markets. By the end of 1980, a slight overall trade shift occurred; the trade share with Western industrial and developing countries rose to 31%; with CMEA countries, the trade share fell from

68% to 65% for the same period, and it decreased from 72% to 69% with other centrally planned economy countries. This was primarily due to a decrease in trade turnover with Poland and Czechoslovakia.

The GDR, as a rule, does not fully publish its annual trade statistics; however, available official sources indicated a successful turning of the trade balance with Western countries and a reduction of the trade deficit with the U.S.S.R. through increased exports in 1981.

Among CMEA bloc countries, the GDR trade with the Soviet Union was the largest in value. The GDR import requirements for domestically processed raw materials were about 60% of the total, with Soviet exports accounting for 100% of the natural gas, 90% of the petroleum, 60% to 70% of the coal, 70% to 80% of the iron ore and rolled ferrous metals and 60% to 70% of the nonferrous metals. Approximately three-quarters of the GDR total cast-iron output was produced from Soviet supplied ore, and about every third ton of steel consumed by the engineering, building, and other industries was manufactured in the U.S.S.R.

The 5-year commercial agreement for the 1981-85 period with the U.S.S.R. provided for annual deliveries to the GDR of about 130,000 tons of aluminum, 3.2 million tons of rolled stock, 4.2 million tons of bituminous coal, 6.5 billion cubic meters of natural gas, and 19 million tons of petroleum. In 1981, however, the petroleum exports were reduced to between 16.5 and 17 million tons; otherwise, Soviet raw material exports to the GDR remained at approximately the 1980 level.

Furthermore, the 1981-85 commercial agreement called for Soviet exports of machine tools, heavy lorries, tractors, and excavators as well as mining and engineering equipment. Soviet equipment deliveries were to be completed for the Jaenschwalde lignite-fired, thermal power station, and with Soviet assistance, work was to continue on the 3,200-cubic-meter blast furnace and hot-rolling mill at the Ost Eisenhutten Kombinat. The U.S.S.R. was also to supply heavy press equipment at the Hettstedt copper billet plant as well as furnace equipment and a cold-rolling mill at the Riesa metallurgical plant.

In turn, the GDR agreed to supply the Soviet Union with presses and forging assemblies (about 5,500 units), milling and toolmaking machines valued at $1.4 billion, metallurgical and strip mining equipment, earthmoving equipment, ships, and plants and individual equipment for the chemical and petroleum industries of the U.S.S.R.

Reportedly, one of the largest industrial-scale agreements in the nonferrous metals field signed in recent years was concluded in 1980 between Licensintorg of the U.S.S.R. and Technocommerz of the GDR. It called for a transfer of technology to the Soviet Union for producing copper electrolytic foil as well as for the delivery of 10 production lines.

The GDR national economic plan was also coordinated with those of other CMEA countries over the 1981-85 period. Inter-CMEA agreements included economic and scienific-technical development as well as trade for the 5-year period.

The GDR was to participate in a CMEA-wide agreement on comprehensive specialization and cooperation on 24 types of nonferrous semimanufacture production from copper, aluminum, nickel, zinc, and their alloys and would specialize in the production of copper wire, aluminum strip for the canning industry, and other aluminum semimanufactures. In general, the exchange of raw materials and mineral commodities with CMEA countries for the 5-year period will include exports of bituminous coal and coke from Czechoslovakia and Poland, alumina and aluminum from Hungary, petcoke and petrochemicals from Romania, aluminum, lead, zinc, and ammonium dioxide from Yugoslavia and nickel-cobalt sinter and concentrate from Cuba. The GDR was to continue to supply these countries with potassium fertilizer, brown coal briquets, cement, and various chemical products.

The GDR trade with Poland was especially important owing to their common border and large-scale commercial agreements. A long-term commercial agreement had established the supply of copper metal and semimanufactures to the GDR in exchange for equivalent values of aluminum and aluminum semimanufactures.

The 1981 commercial agreement between the two countries specified Polish deliveries of bituminous coal and coke, sulfur, nonferrous metals, and manufactured goods to the GDR in exchange for potash, farm machinery, and manufactures, but owing to the continued labor crisis in Poland, significant delivery shortfalls to the GDR occurred for the second straight year. The GDR was particularly hard hit by hard-coal delivery shortfalls in 1981. The amount shipped to

the GDR was about one-third less than in 1980, which necessitated purchases of hard coal from the Federal Republic of Germany (FRG).

The GDR 1981 commercial agreement with Hungary included, among other items, imports of bauxite, alumina, and aluminum. In turn, the GDR supplied Hungary with potash, lignite briquets, and chemical raw materials.

Yugoslavia has played an important role in the GDR mineral trade, and for a number of years, the two countries have been cooperating on the basis of long-term credit arrangements in fields such as nonferrous metallurgy. These agreements were planned to continue for the 1981-85 period. Key Yugoslav mineral exports to the GDR during 1980 and 1981 were bauxite, aluminum in bars and semimanufactured products, rolled aluminum, aluminum castings, electrolytic copper and copper semimanufactures, rolled copper, rolled and slab zinc, forgings and castings of ferrous metallurgy, nickel-cadmium and lead storage batteries, bentonite, and titanium dioxide. The GDR mineral exports to Yugoslavia for this period included potassium salts, kaolin, fluorite, ammonia, rolled ferrous metallurgical products, and open pit mining equipment.

Furthermore, bilateral commercial agreements with Vietnam and Cuba, respectively, formed the basis of supplies of chrome ore and nickel-cobalt sinter and concentrate to the GDR. In 1981, the GDR continued playing an active role in the multilateral CMEA nickel-cobalt mine development plan in Cuba.

In the GDR trade with developed Western countries, the FRG share was over 50%. During the first half of 1981, trade between the FRG and GDR increased by 4% over that during the same period in 1980. The biggest increase in FRG exports to the GDR was in the mining sector, with a 49% increase over that of the previous year. This was due primarily to the rise in hard-coal deliveries to the GDR, owing to Polish delivery shortfalls during the same year. Also, the GDR was reported to have increased purchases of silver from the FRG in 1981 over that of the previous year.

In 1981, the GDR firm Industrieanlagenimport placed an order for a 500,000-ton-per-year magnesium chloride plant to be built near Sonderhausen in Thuringia with Mannesmann Anlagenbau AG, head of the FRG consortium that included Klöckner Industrienlagen GmbH, Standard Messo Dursburg, and others. The magnesium chloride, produced as a byproduct of potash mining, would be used as a raw material for magnesium metal and magnesia production.

Commercial agreements with Austria for 1981 included two orders for Vöest-Alpine of Austria. One was for supply of a 2.55-million-ton-per-year LD shop with continuous bloom and slab casting facilities to the Ost Eisenhutten Kombinat, and the other was for modernization of the 520,000-ton-per-year steel plate mill at Ilsenburg, which was scheduled to undergo trial runs in February 1982.

A number of important commercial arrangements were concluded with Japan in 1981. Industrieanlagenimport contracted Hitachi Ltd., Nippon Steel Corp., and Mitsui and Co. to construct a 400,000-ton-per-year, cold-rolling sheet steel mill at the Ost Eisenhutten Kombinat. The project, valued at $65.5 million, had scheduled equipment deliveries in 1983 and startup by March 1985. A consortium of the Marubeni Corp. and Kubota Ltd. of Japan and Dyckehoff and Widmann AG of the FRG were contracted to build a $182 million, 53,000-ton-per-year foundry near Leipzig for the production of castings for trucks and agricultural machinery. The project was scheduled to come onstream in 1985; the Japanese companies agreed to provide materials and equipment, and the FRG was to provide engineering services. Industrieanlagenimport of the GDR had also contracted Toyo Engineering Corp. and Mitsui and Co. of Japan to provide a $186 million, 240,000-ton-per-year crude oil cracking plant for the Schwedt Petrochemical Kombinat. The plant, designed to produce fuel oil and gasoline, was scheduled for startup in 1984.

Trade with the United States during the first 6 months of 1981 declined by 25% in comparison with that of the same period during the previous year. The United States reported a $217 million trade surplus for this period. In the minerals-related sector, U.S. exports to the GDR consisted of spare parts for mining, drilling, and excavating machinery, and imports from the GDR included potash and machine tools.

GDR commercial relations outside of the CMEA and the Organization for Economic Cooperation and Development (OECD) areas included a tripartite arrangement between India's Mineral and Metals Trading Corp. and the GDR, Hungary, and

Yugoslavia for the shipment of 1.5 million tons of iron ore to the latter countries in 1981. An agreement was reached between Nigeria and the GDR Ernst Thaelmann heavy engineering Kombinat of Magdeburg for the supply of one wire rolling mill train and four steel rolling mill trains for a metallurgical enterprise that was under construction in Nigeria with U.S.S.R. aid. Also, an agreement was reported with Mozambique providing for GDR assistance in the development of the country's cement industry.

Table 3.—German Democratic Republic: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	r9,563	4,001	--	West Germany 2,960; Austria 559; France 448.
Unwrought	r27,234	22,962	--	West Germany 19,677; Japan 1,479; United Kingdom 693.
Semimanufactures	r12,659	14,582	14	West Germany 7,516; Hungary 3,724; Poland 2,586.
Arsenic: Trioxides, pentoxides, acids	3	--		
Bismuth metal including alloys, all forms	2	--		
Cadmium metal including alloys, all forms	--	53	--	All to West Germany.
Chromium: Oxide and hydroxide	26	25	--	All to Greece.
Cobalt metal including alloys, all forms	--	20	--	All to Netherlands.
Copper:				
Sulfate	48	(2)	--	All to Yugoslavia.
Metal including alloys:				
Scrap	r2,432	2,760	--	West Germany 2,481; Netherlands 202; France 47.
Unwrought	r16,427	9,166	--	West Germany 6,973; Belgium-Luxembourg 1,480.
Semimanufactures	r15,612	19,849	49	West Germany 19,671; Austria 101.
Iron and steel:				
Scrap	r51,716	3,48,941	--	West Germany 46,283; Denmark 1,125.
Pig iron	r84,646	29,932	--	Austria 9,168; West Germany 7,800; Sweden 6,717.
Ferroalloys	4,7,000	6,432	--	West Germany 5,880; United Kingdom 477.
Steel, primary forms thousand tons	4,296	4,344	--	West Germany 189; Italy 152.
Semimanufactures:[4]				
Bars, rods, angles, shapes, sections do	688	869	(2)	West Germany 63; Bulgaria 21; Egypt 19.
Universals, plates, sheets do	350	368	(2)	West Germany 106; France 56; Poland 51.
Hoop and strip do	242	359	--	NA.
Rails and accessories do	17	6	--	NA.
Wire do	63	57	--	West Germany 36;[5] Hungary 1.
Tubes, pipes, fittings do	118	138	--	Poland 29; West Germany 20; France 18.
Castings and forgings, rough do	62	83	--	West Germany 51; Poland 10.
Lead:				
Oxides	r1,434	1,833	--	West Germany 720; Yugoslavia 640; Sweden 186.
Metal including alloys:				
Scrap	r1,995	999	--	All to West Germany.
Unwrought	1,246	577	52	Austria 400; Netherlands 125.
Semimanufactures	--	37	--	All to West Germany.
Magnesium metal including alloys, scrap	66	29	--	Do.
Manganese:				
Ore and concentrates	--	2	--	All to Norway.
Oxides	r12	18	--	Sweden 14; Denmark 4.
Molybdenum metal including alloys, all forms kilograms	100	200	--	All to West Germany.
Nickel metal including alloys:				
Unwrought	90	106	--	Netherlands 66; Greece 22; Japan 18.
Semimanufactures	33	1	(2)	Yugoslavia 1.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$84	$1,748	--	West Germany $1,398; United Kingdom $350.

See footnotes at end of table.

Table 3.—German Democratic Republic: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Silver:				
Waste and sweepings[6] value, thousands	r$358	$41	--	All to West Germany.
Metal including alloys, unwrought and partly wrought do	r$74,204	$25,678	--	United Kingdom $25,577; West Germany $101.
Tin metal including alloys, unwrought	27	4	--	Greece 2; Italy 2.
Zinc:				
Ore and concentrate	363	NA		
Oxides and peroxides	r157	425	--	West Germany 325; Yugoslavia 100.
Metal including alloys:				
Scrap	240	159	--	All to West Germany.
Unwrought	--	72	--	Sweden 50; Greece 22.
Semimanufactures	5	61	--	All to Austria.
Other:				
Ash and residue containing nonferrous metals	r22,363	27,236	--	Austria 16,993; West Germany 10,137.
Oxides, hydroxides, peroxides	r705	974	21	West Germany 950.
Metalloids	3	4	--	All to Finland.
Base metals including alloys, all forms	r117	2,200	--	West Germany 1,218; Poland 977.
NONMETALS				
Abrasives, n.e.s.:				
Artificial: Corundum	22	3	--	All to Hungary.
Dust and powder of precious and semiprecious stones value, thousands	$5	$1	--	All to Belgium-Luxembourg.
Grinding and polishing wheels and stones	r482	r593	--	West Germany 340; Italy 96; Pakistan 65.
Asbestos, crude	--	486	--	All to Italy.
Barite and witherite	r15,122	9,705	--	West Germany 9,625.
Boron materials:				
Crude, natural borates	41	NA		
Oxides and acids	--	23	--	Netherlands 13; Greece 10.
Cement thousand tons	[8]1,183	[8]1,226	--	West Germany 326; Hungary 248; Yugoslavia 84.
Chalk	[5]28,054	[5]43,055	--	West Germany 12,098.
Clays and clay products:				
Crude:				
Andalusite	--	717	--	All to Austria.
Fire clay	3,149	1,600	--	Poland 1,580.
Fuller's earth, chamotte	--	494	--	All to Hungary.
Kaolin	[5]106,356	[5]133,984	--	West Germany 56,709; Yugoslavia 15,590; Poland 12,156.
Other	6,314	6,281	--	Hungary 5,671; Belgium-Luxembourg 300; Italy 218.
Products:				
Nonrefractory	r43,443	[9]46,753	--	West Germany 37,894; Sweden 1,559; Finland 1,469.
Refractory including nonclay brick	r9,397	8,174	--	Hungary 3,819; West Germany 1,215; Sweden 1,083.
Diamond:				
Gem, not set or strung value, thousands	--	$202	--	All to Belgium-Luxembourg.
Industrial do	$2,390	$22	--	All to Netherlands.
Feldspar and fluorspar	r51,892	48,939	--	Poland 13,370; Norway 10,900; Austria 10,004.
Fertilizer materials:				
Crude:				
Nitrogenous	60	20	--	All to Sweden.
Phosphatic	968	NA		
Potassic	r150,260	139,810	--	West Germany 125,360; United Kingdom 13,062.
Manufactured:				
Nitrogenous	r280,007	[10]446,617	1	West Germany 326,380; Brazil 52,034; Colombia 35,976.
Phosphatic	r34,291	36,064	--	West Germany 18,720; Bulgaria 13,000; Netherlands 3,644.
Potassic, K_2O content[5] thousand tons	2,745	2,817	([11])	Czechoslovakia 459; Poland 287; Brazil 271; Hungary 228.
Other including mixed	r1,200	1,809	--	West Germany 855; Sweden 425; Saudi Arabia 256.
Ammonia	r12,098	53,626	--	West Germany 29,258; Spain 11,417; Italy 7,994.

See footnotes at end of table.

Table 3.—German Democratic Republic: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Graphite, natural	240	50	--	All to Yugoslavia.
Gypsum and plasters	[5]80,353	[5]78,604	--	Hungary 51,707.
Lime	[r]10,418	39,248	--	West Germany 37,212; Hungary 2,036.
Magnesite	--	530	--	Netherlands 430; Denmark 76.
Mica, worked including agglomerated splittings	2	4	--	Italy 3; Belgium-Luxembourg 1.
Precious and semiprecious stones:				
Natural value, thousands	$14	$10	$9	France $1.
Synthetic do.	$15	$1	$1	
Pyrite, unroasted	--	12,725	--	Greece 12,705.
Salt[5] thousand tons	1,232	1,210	--	Sweden 74; Finland 63.
Sodium and potassium compounds:				
Caustic potash	[r]1,976	2,405	--	Hungary 1,487; Finland 307; West Germany 289.
Caustic soda	[8]77,600	[8]137,000	--	Netherlands 65,085; Sweden 57,163.
Soda ash	[5]295,500	[5]311,500	--	Sweden 26,180; Hungary 21,137; Finland 19,054.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	[r]19,191	17,268	--	West Germany 16,615; Norway 428; Yugoslavia 200.
Worked	[r]28,157	27,013	--	West Germany 26,594; Netherlands 151; Norway 120.
Gravel and crushed rock	[5]296,918	[5]385,296	--	West Germany 327,291.
Limestone, except dimension	127,516	80,154	--	All to West Germany.
Sand excluding metal-bearing	[r]66,918	55,176	--	Austria 19,257; Yugoslavia 18,778; Hungary 15,578.
Sand and gravel[5] thousand tons	2,472	2,561	--	All to West Germany.
Sulfur:				
Elemental, other than colloidal	--	1	--	All to Sweden.
Sulfuric acid, oleum	[r 8]4,000	[8]20,500	--	Austria 5,163.
Talc	24	21	--	All to Yugoslavia.
Other:				
Crude	13,011	38,783	--	Denmark 24,446; United Kingdom 7,321; Hungary 5,549.
Slag, dross, and similar waste, not metal-bearing	[r]2,407	35,073	--	Finland 33,451; West Germany 862; Netherlands 600.
Oxides and hydroxides of strontium, barium, magnesium	1,049	1,475	--	Finland 715; Sweden 444; Italy 80.
Halogens	[r]546	792	--	Hungary 381; Switzerland 236; Italy 130.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	3	--	All to Finland.
Carbon black	[r]7,950	9,540	11	West Germany 5,642; United Kingdom 1,277; Bulgaria 895.
Coal and briquets:				
Anthracite and bituminous	285,000	300,366	--	Poland 300,000.
Briquets of anthracite and bituminous coal	462,037	537,493	--	Hungary 503,747; Denmark 33,734.
Lignite including briquets[5] thousand tons	1,806	2,212	--	West Germany 906; Czechoslovakia 369; Austria 195.
Coke and semicoke	[r]110,774	209,067	--	West Germany 149,494; Spain 35,651; Austria 17,113.
Gas, manufactured[5] million cubic feet	343	381	--	NA.
Hydrogen, helium, rare gases	16	20	--	West Germany 16; Finland 4.
Peat including briquets	[r]189	124	--	France 62; West Germany 51.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	[5]3,340	[5]3,610	--	West Germany 2,337.
Kerosine do.	57	77	--	All to Hungary.
Distillate fuel oil do.	[5]6,932	[5]8,958	--	Mainly to West Germany.
Residual fuel oil do.	[r 5]5,562	[5]7,932	--	West Germany 4,608; Sweden 2,644.
Lubricants do.	[8]31	[8]60	--	Mainly to Austria and West Germany.

See footnotes at end of table.

Table 3.—German Democratic Republic: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products —Continued				
Other:				
Mineral jelly and wax thousand 42-gallon barrels	87	119	20	West Germany 36;[5] Netherlands 15; Austria 14.
Petroleum coke do	--	17	--	All to Italy.
Bitumen and other residues do	r400	554	--	West Germany 553.
Unspecified do	255	211	--	All to Poland.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r55,473	93,452	--	West Germany 90,850; Switzerland 1,032.

rRevised. NA Not available.

[1]Owing to a lack of official trade data published by the German Democratic Republic (GDR), this table should not be taken as a complete presentation of this country's mineral exports. These data have been compiled from various sources, which include United Nations information, data published by the trading partner countries, and partial official trade statistics of the GDR. Unless otherwise specified, data are compiled from the official trade statistics of the individual trading partners.

[2]Less than 1/2 unit.

[3]Excludes imports of Sri Lanka valued at $45,000.

[4]Source for total exports only, not destinations: Quarterly Bulletin of Steel Statistics for Europe, New York.

[5]Source: Official trade statistics of the GDR.

[6]May include waste and sweepings of other precious metals.

[7]Excludes imports of Uruguay and Brazil valued at $30,000 and $1,000, respectively.

[8]Source: Statistical Yearbook of the Member States of the Council for Mutual Economic Assistance, Moscow.

[9]Excludes imports of Malta valued at $15,000.

[10]Excludes imports of Uruguay valued at $1,078,000.

[11]Imports of 49 metric tons, gross weight, reported by the United States.

Table 4.—German Democratic Republic: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite[2]	133,800	120,600	--	Hungary 69,300; Yugoslavia 22,800.
Oxides and hydroxides	r95,025	101,007	--	West Germany 77,063; Hungary 22,294.
Metal including alloys:				
Scrap	r249	231	--	All from West Germany.
Unwrought	38,382	49,422	--	Yugoslavia 36,739; Hungary 12,472.
Semimanufactures	r24,065	30,039	--	West Germany 13,887; Hungary 8,111; Yugoslavia 7,382.
Bismuth metal including alloys, all forms	8	NA		
Cadmium metal including alloys, all forms	10	NA		
Chromium:				
Chromite, Cr_2O_3 content	[2]44,600	[2]40,100	--	U.S.S.R. 15,500.
Oxides and hydroxides	--	1	--	All from Switzerland.
Cobalt:				
Oxides and hydroxides	5	NA		
Metal including alloys, all forms	--	189	--	Finland 188.
Copper:				
Ore and concentrate	10,297	19,522	5,700	Ireland 5,811; Sweden 4,032; Yugoslavia 3,979.
Metal including alloys:				
Scrap	r22,187	22,560	75	West Germany 19,978; Belgium-Luxembourg 704; Netherlands 494.
Unwrought	r29,917	21,515	--	Chile 5,000;[3] Finland 4,469; Yugoslavia 4,468.
Semimanufactures	r2,882	5,344	1	West Germany 3,790; Poland 456; Finland 308.
Iron and steel:				
Ore and concentrate, Fe content[2] thousand tons	2,033	2,088	--	U.S.S.R. 1,679; India 316; Sweden 50.
Pyrite, roasted do	26	--		

See footnotes at end of table.

Table 4.—German Democratic Republic: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal:[4]				
Scrap ---------- thousand tons	708	908	--	U.S.S.R. 444; West Germany 93; Belgium-Luxembourg 81.
Pig iron ---------- do	669	695	--	West Germany 31.
Ferroalloys ---------- do	44	66	--	NA.
Steel, primary forms ---------- do	2,057	2,142	--	West Germany 147; Belgium-Luxembourg 12.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	719	646	--	U.S.S.R. 554;[2] Czechoslovakia 78.[2]
Universals, plates, sheets do	636	731	--	U.S.S.R. 517;[2] West Germany 87; Bulgaria 30.
Hoop and strip ---------- do	204	138	--	West Germany 86; Sweden 2.
Rails and accessories ---------- do	218	233	--	NA.
Wire ---------- do	36	28	--	West Germany 7;[2] Belgium-Luxembourg 3; Sweden 1.
Tubes, pipes, fittings ---------- do	350	321	2	Poland 34; West Germany 20; Yugoslavia 19.
Castings and forgings, rough do	12	10	--	West Germany 6.
Lead:				
Oxides ----------	25	21	--	West Germany 12; Netherlands 8.
Metal including alloys:				
Scrap ----------	r1,550	3,162	1,811	West Germany 1,009; United Kingdom 159; Netherlands 70.
Unwrought ----------	3,512	613	--	Sweden 431; Yugoslavia 137.
Semimanufactures ----------	5	4	--	All from France.
Magnesium metal including alloys:				
Unwrought ----------	18	[5]60	--	Do.
Semimanufactures ----------	--	1	--	All from United Kingdom.
Manganese ore and concentrate, Mn content[2]	73,800	46,600	--	Mainly from U.S.S.R.
Mercury ---------- 76-pound flasks	5,045	87	--	All from Netherlands.
Molybdenum:				
Ore and concentrate ----------	33	351	--	Netherlands 350.
Metal including alloys, all forms kilograms	--	100	--	All from West Germany.
Nickel:				
Matte and speiss ----------	141	20	--	All from France.
Metal including alloys:				
Scrap ----------	42	NA		
Unwrought ----------	--	308	--	Finland 241; France 66.
Semimanufactures ----------	27	77	--	West Germany 72.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$830	$2,588	$1	West Germany $1,312; United Kingdom $1,179.
Silver:				
Waste and sweepings[6] ---------- do	$33	$40,933	--	All from United Kingdom.
Metal including alloys, unwrought and partly wrought thousand troy ounces	10,818	[7]5,106	--	West Germany 3,852; United Kingdom 932; Poland 322.
Tantalum metal including alloys, all forms kilograms	--	[8]33	--	All from Japan.
Tin metal including alloys:				
Scrap ----------	--	49	--	All from Switzerland.
Unwrought ----------	r171	102	--	All from West Germany.
Semimanufactures ----------	17	NA		
Titanium:				
Ore and concentrate ----------	--	560	--	All from Netherlands.
Oxides ----------	21,502	22,994	--	Yugoslavia 11,323; West Germany 6,777; Finland 4,499[2].
Metal including alloys, all forms ----------	2	1	--	All from West Germany.
Tungsten:				
Ore and concentrate ----------	[9]22	NA		
Metal including alloys, all forms kilograms	4	5,000	--	All from Sweden.
Zinc:				
Ore and concentrate ----------	15,957	54,277	--	West Germany 45,996; Sweden 5,398; Canada 2,883.
Oxides and peroxides ----------	r212	212	--	France 111; West Germany 101.
Metal including alloys:				
Scrap ----------	--	595	--	Denmark 395; West Germany 200.
Unwrought ----------	[3]11,300	11,950	--	Norway 9,247; West Germany 1,519; Finland 1,000.
Semimanufactures ----------	205	1,154	--	Norway 416; West Germany 368; Italy 360.
Zirconium, ore and concentrate ----------	--	1,737	--	All from Netherlands.

See footnotes at end of table.

Table 4.—German Democratic Republic: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates	18,019	3,928	--	Norway 3,916.
Ash and residues containing nonferrous metals	r28,068	21,330	--	West Germany 12,963; Spain 6,427.
Oxides, hydroxides, peroxides	2,201	16,572	--	Sweden 14,068; West Germany 2,049.
Metalloids	232	2,276	--	Netherlands 1,240; Spain 940.
Alkali, alkaline-earth, rare-earth metals	167	418	--	West Germany 415.
Base metals including alloys, all forms	r16,535	39,002	--	Yugoslavia 38,403; Japan 326; West Germany 201.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	--	43	--	All from Italy.
Artificial: Corundum	2,627	3,484	--	All from West Germany.
Dust and powder of precious stones and semiprecious, value, thousands	$142	$344	--	All from Netherlands.
Grinding and polishing wheels and stones	119	10236	--	Austria 107; West Germany 66; Sweden 36.
Asbestos, crude[2]	62,000	74,400	--	NA.
Barite and witherite	r3,541	1,340	--	All from West Germany.
Boron materials:				
Crude, natural borates	6,885	45	--	All from Netherlands.
Oxides and acids	4,674	4,680	--	France 4,648.
Cement[11]	12,800	5,400	--	NA.
Chalk	94	169	--	All from France.
Clays and clay products:				
Crude:				
Bentonite	10,536	11,004	--	All from Hungary.
Fuller's earth, chamotte	430	832	--	All from Poland.
Kaolin[2]	15,000	15,200	--	United Kingdom 2,339.
Other	r275	318	--	West Germany 275; France 29.
Products:				
Nonrefractory	r1,176	2,805	--	West Germany 2,285; Sweden 194; Italy 109.
Refractory including nonclay brick	r10,953	17,582	--	West Germany 8,614; Austria 1,785; France 1,765.
Diamond:				
Gem, not set or strung, value, thousands	$17	$218	--	All from Belgium-Luxembourg.
Industrial, do.	$5,179	$1,877	--	Belgium-Luxembourg $1,734; West Germany $143.
Diatomite and other infusorial earth	r1,138	951	--	West Germany 697; France 254.
Feldspar and fluorspar	24,740	21,101	--	Norway 10,075; Sweden 9,476.
Fertilizer materials:				
Crude, phosphatic, P_2O_5 content[2], thousand tons	545	534	--	U.S.S.R. 460.
Manufactured:				
Nitrogenous, N_2 content[11]	12,700	24,900	--	NA.
Phosphatic, P_2O_5 content[2]	22,300	25,400	--	West Germany 25,009.
Unspecified	NA	84,277	--	Austria 72,003; Sweden 12,274.
Ammonia	22,064	2,722	--	All from Hungary.
Graphite, natural	26,884	25,632	--	West Germany 843; Austria 741.
Gypsum and plasters	r229	409	--	West Germany 346; Belgium-Luxembourg 47.
Iodine	1	1	--	All from West Germany.
Lime	102	27	--	All from Denmark.
Magnesite	36,717	43,426	--	Czechoslovakia 34,449; Greece 5,780; Austria 3,098.
Mica, all forms[2]	1,234	1,424	--	India 709.
Pigment, mineral: Iron oxides, processed	230	76	--	Italy 53; Belgium-Luxembourg 23.
Precious and semiprecious stones:				
Natural, value, thousands	$83	$395	$5	West Germany $390.
Synthetic, do.	r$11	$37	$3	West Germany $17; Australia $9; Switzerland $6.
Pyrite, unroasted, S content	38,200	(12)	--	All from Yugoslavia.
Salt	--	6	--	Austria 2; Sweden 2.
Sodium and potassium compounds:				
Caustic potash	499	540	--	All from West Germany.
Caustic soda	r78	18	1	West Germany 17.
Soda ash	r71	81	--	Do.

See footnotes at end of table.

Table 4.—German Democratic Republic: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	r11,141	9,643	--	West Germany 6,685; Yugoslavia 2,565.
Worked	r359	921	--	Yugoslavia 466; Italy 356.
Gravel and crushed rock	r14,236	4,709	--	Hungary 3,511; Austria 852; Yugoslavia 140.
Limestone, except dimension	r5,142	1,219	--	All from West Germany.
Quartz and quartzite	r614	696	--	Brazil 300; Yugoslavia 211; West Germany 120.
Sand excluding metal-bearing	2,138	234	--	Yugoslavia 112; Denmark 75.
Sand and gravel	152,466	15,177	--	All from West Germany.
Sulfur:				
Elemental, other than colloidal[2]	178,238	179,400	--	All from Poland.
Sulfuric acid, oleum[11]	41,300	7,600	--	NA.
Talc	2,612	2,250	--	Austria 975; Egypt 580; West Germany 513.
Other:				
Crude	28,758	28,444	--	Hungary 28,318; Austria 61.
Slag, dross, and similar waste, not metal-bearing	5,749	168	--	Italy 90; France 76.
Halogens	32,643	NA		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	91	178	--	France 88; Yugoslavia 76.
Carbon black	r42,402	39,526	--	U.S.S.R. 22,178; West Germany 17,109.
Coal and briquets:				
Anthracite and bituminous coal[2] thousand tons	8,657	6,828	[13]8	U.S.S.R. 3,376; Poland 1,831; Czechoslovakia 876.
Lignite including briquets do.	3,015	1,562	--	All from Poland.
Coke and semicoke[2] do.	2,961	3,136	--	U.S.S.R. 1,156; Czechoslovakia 659; Poland 413.
Gas, natural[2] million cubic feet	152,919	227,097	--	NA.
Hydrogen, helium, rare gases	1,716	1,387	--	All from West Germany.
Peat including briquets	--	228	--	Do.
Petroleum and refinery products:				
Crude[2] thousand 42-gallon barrels	152,065	160,938	--	U.S.S.R. 139,731; Iraq 10,658; Algeria 1,548.
Refinery products:				
Gasoline do.	r20	43	--	Belgium-Luxembourg 35; Netherlands 6.
Kerosine do.	51	57	--	Hungary 48; Yugoslavia 4; Italy 3.
Distillate fuel oil do.	r167	382	--	Italy 376; West Germany 4.
Residual fuel oil[11] do.	182	219	--	NA.
Lubricants do.	[11]188	[11]204	--	West Germany 39; Netherlands 11.
Other:				
Liquefied petroleum gas 42-gallon barrels	5,058	[14]12	--	All from West Germany.
Mineral jelly and wax do.	r118	205	--	United Kingdom 134; West Germany 71.
Nonlubricating oils do.	1,071	NA		
Petroleum coke do.	r143,628	131,962	--	West Germany 127,309; Netherlands 4,653.
Bitumen and other residues do.	r2,327	1,218	--	West Germany 654; Sweden 273; France 194.
Bituminous mixtures do.	1,079	406	--	France 267; Yugoslavia 67.
Unspecified[11] thousand 42-gallon barrels	r663	2,050	--	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	39,429	36,843	--	U.S.S.R. 28,190; West Germany 7,657.

rRevised. NA Not available.

[1]Owing to a lack of official trade data published by the German Democratic Republic (GDR), this table should not be taken as a complete presentation of this country's mineral imports. These data have been compiled from various sources, which include United Nations information, data published by trading partner countries, and partial official trade sources of the GDR. Unless otherwise specified, data are compiled from the official trade statistics of individual trading partners.

[2]Source: Official Trade Statistics of the GDR.

[3]Source: World Metal Trade Statistics, World Bureau of Metal Statistics, London.

[4]Source for total imports only, not sources: Quarterly Bulletin of Steel Statistics for Europe, New York.

[5]Excludes exports from Norway valued at $1,101,000.

[6]May include waste and sweepings of other precious metals.

[7]Excludes exports from Sweden and Switzerland valued at $2,000 and $3,000, respectively.

[8]Excludes exports from Finland valued at $6,000.

[9]Excludes exports from Australia valued at $95,000.

[10]Excludes exports from Hungary valued at $550,000.

[11]Source: Statistical Yearbook of Member States of the Council for Mutual Economic Assistance, Moscow.

[12]Import for 1980 was 54 metric tons gross weight.

[13]Source: Official Trade Statistics of the United States.

[14]Excludes exports from Sweden valued at $2,000.

COMMODITY REVIEW

METALS

In 1981, secondary recovery of industrial scrap and increased metallurgical refining remained the main development trends in the GDR ferrous and nonferrous industries. Approximately 30% of the available scrap in the GDR was used for about 10% of the country's overall raw material requirements. For key metals, the proportions of raw materials covered by scrap in 1981 were as follows: (1) Steel—70% to 75%, (2) copper—37%, (3) lead—46%, (4) zinc—20%, and (5) aluminum—18%.

The GDR Government has planned to increase these proportions to reduce the net import reliance for all metallic raw materials. Most of the country's economic reserves have been depleted, with domestic ore mining only partially covering the country's requirement for iron ore, copper, nickel, and tin. In the nonferrous scrap sector, however, the difficulty was that from 1976 to 1980 there was a decreasing trend for domestically collected scrap. Data collected for this period indicated that in 1980, when compared with that of the 1976 base year, collected lead scrap decreased by 2.9%, aluminum by 1.6%, copper by 4.9%, and zinc by 11.6%. The GDR was reported to have become a net importer of such material. Despite a set growth rate for nonferrous metal consumption, the collection and preparation of scrap and waste material was becoming increasingly difficult, and measures taken to improve the situation were both regulatory and technological.

In 1981, a law was passed requiring scrap-metal recovery quotas to be made part of the annual plans of the industrial Kombinats. The Kombinats would be obliged to contract scrap-metal deliveries to VEB Metallaufbereitung, a national organization responsible for scrap-metal allocation within the GDR and its export and import.

Some of the scrap processing technologies that were applied in 1981 were electromagnetic cable separation, cable processing after preliminary cryogenic separation, belt conveyors for manual sorting, installations for stocking and processing batteries, and copper extraction from saline-bath installations. For example, in 1981, the Liebewalde enterprise under VEB Metallaufbereitung, which handled cable scrap, reported the introduction of electrostatic separation, allowing the firm to reclaim 1,700 tons of copper and 420 tons of aluminum annually, and the use of cryogenic treatment reportedly allowed a 99% metal reclamation from cable.

In the GDR, most nonferrous metallurgical production was controlled by the Wilhelm Pieck Kombinat at Mansfield with copper and aluminum and their alloys constituting the main production elements. The Kombinat's responsibility covered the entire range of activity from mining to importing ores and concentrates, smelting, refining, and production of end-use products.

Aluminum.—Aluminum production changed little in respect to the previous year. The alumina production reported in GDR statistics was used for metallurgical purposes, and alumina used for abrasives, etc., constituted an estimated additional 20,000 tons per year. The bauxite raw material base came primarily from Hungary and Yugoslavia. The Wilhelm Pieck Kombinat in 1981 reported further progress on aluminum refining by means of continuous pouring of aluminum foil up to 1,600 millimeters in width—a process jointly developed with the U.S.S.R. Reportedly, a strip rolling technique that combined casting with hot rolling was claimed to have saved several production steps and decreased material consumption by 5.7% and electrical energy by 550 kilowatt-hours per ton of cold-rolled aluminum.

Copper.—Approximately 50% of the GDR copper requirement was supplied from domestic mining and secondary recovery of scrap. The rest of the demand was met by imports of copper cathode from the U.S.S.R. and concentrate from Western Europe; 70% of the copper production was earmarked for the electronics industry.

Copper mining at the Wilhelm Pieck Kombinat was reported to be an almost fully mechanized operation; between 8 and 10 kilograms of copper was extracted from each ton of ore produced at the Sangerhousen and Allstedt Mines. Mine economy has been decreasing owing to difficult mining conditions, but in 1981, losses were apparently limited to about 2% by the introduction of a slanted caving system.

In 1981, the use of continuous casting and rolling technology resulted in the production increase of 271,000 kilometers of fine copper wire in comparison with that of 1980. The increase was achieved without added material inputs. In 1982, the production of copper wire and thin-walled brass tubes was planned to increase by 88% and 47%, respectively.

Iron and Steel.—The GDR continued to mine small amounts of iron ore in 1981, but decreasing reserves were insufficient to meet national requirements. With scrap satisfying a large share of the domestic demand, about 25% of the demand was met by imports of iron ore and steel, mainly from the Soviet Union. The estimated production of raw steel showed a slight increase in 1981 over that of the previous year, and its production by process was about 9.3% by oxygen; 26.4%, electric; 62.9%, open hearth; and 1.4%, other.

In 1981, the GDR added several new projects and capacities to the steel industry. The Delitzsch enterprise near Leipzig began production of a highly refined trapezoid spring steel. This was the first time this type of special steel was to be manufactured in the GDR or in any of the CMEA countries. The enterprise planned to produce 1,000 tons of steel, which will help reduce its future import requirements.

At the Brandenburg Steel and Rolling Mill, a new 240-meter automated rolling train had been commissioned 7 months ahead of schedule and was the first of its kind in the GDR. Steel ingots were to be rolled into rod of 5 to 9 millimeters in diameter with an output speed of 70 meters per second. Owing to early startup, it was expected to produce 220,000 tons of structural steel in excess of the 1981 production target.

In 1981, the Eisenhutten Kombinat Ost tandem cold-rolling mill was less successful in achieving planned output targets and reportedly registered a shortfall in its production plan.

Lead and Zinc.—The GDR domestic lead ore reserves have been depleted, and mining has been discontinued. In 1981, the country had to meet a little over 50% of its demand for lead through imports, chiefly from the Soviet Union; some lead was also imported from Yugoslavia in the form of concentrate. Domestic production from secondary resources was mainly from battery scrap and about 5% to 10% from industrial scrap. Battery scrap together with slags and other lead-containing products were treated in a shaft furnace at the lead plant in the Freiberg Mining and Metallurgical Enterprise. Some byproduct lead was also recovered from the domestic copper ore.

All of the GDR primary zinc demand was met through imported concentrates, and the country's cadmium supply varied in proportion to the cadmium content in the imported zinc concentrates.

In 1981, the GDR reported the recovery of 200 tons of zinc from zinc sludge produced at the Siegfried Raedel synthetic silk factory in Pirna. Plans were announced to produce zinc from sludge derived from latex manufacture at the Fuerstenwalde lithopone plant. A reported 150,000 tons of sludge have been accumulated at the plant dump, and a potential recovery of 650 tons per year of zinc was estimated.

Nickel.—In 1981, nickel output from the country's mining operations and three smelters remained at approximately the 1980 level. Domestic production was modest and nickel had to be imported for industrial requirements. Reportedly, the GDR imported nickel-cobalt from Cuba and was active in that country's mining development.

In 1981, the Wilhelm Pieck Kombinat at Mansfeld installed equipment to process iron-bearing slag from copper smelting, and constituent cobalt and nickel were to be extracted from the slag.

Silver.—Silver was produced as a byproduct of the GDR nonferrous mining and metallurgical operations and was recovered, for example, from the country's mined copper ore together with lead, nickel, and other components. In 1981, approximately 1 ton of silver was recovered by reprocessing fixing-bath solutions and other industrial chemicals containing silver.

Tin.—The domestic mining and processing industry supplied 80% of the tin required by GDR. Technological advances in tin ore dressing and roasting as well as new extraction procedures in mining and gallery driving were credited with this development. Reportedly, completely new ore concentration equipment was put into operation for processing Altenberg ore in cooperation with the Novosibirsk tin complex of the U.S.S.R. Imported Soviet machinery was claimed to have significantly improved the efficiency of the concentrator, but no technical details were provided. It was further reported that by mid-1981, 1 million tons of 0.3% grade ore had been extracted and processed at the new Altenberg Mine and processing plant since their startup 3 years ago.

NONMETALS

The GDR nonmetallic mining enterprises provided the country with a variety of nonmetallic mineral in sufficient amounts to meet domestic as well as export needs. These commodities included fluorspar, barite, limestone, sand and gravel, chalk, salt, kaolin, and potash. Kaolin and potash were the most important of these minerals, both in terms of the scale of their mining output as well as for export. Nonmetals that the GDR had to import in large quantities were phosphatic fertilizer raw materials, asbestos, pyrite, and some clays such as bentonite.

Cement.—In 1981, the GDR reported construction work continuing on the second stage of its largest and most efficient foamed concrete plant, located at Hennersdorf in the Cottbus district. Continuous production trial runs of the first stage were begun in April. This facility was reported as largely mechanized and automated, and among other tasks, was to provide materials for the reconstruction of electric powerplants built 20 to 30 years ago.

Clays.—Although a number of clays in the GDR were near depletion and had to be imported, the GDR produced enough kaolin in 1981 to claim status as a major world producer. The VEB Silikatrohstoff Kombinat at Kemmlitz managed the silicate mining industry and controlled 5 enterprises that mined about 400,000 tons of raw kaolin per year from 16 opencast mines nearby. Despite this sizable output, the quality of the raw kaolin varied significantly owing to wide varieties and high concentrations of impurities in the mined product. In 1981, it was reported that often as much as 5 tons of raw kaolin was required to produce 1 ton of refined material. The geological conditions in the kaolin mining industry were reported to be growing more complex, and mining was becoming more difficult with overburden removal reaching 4 to 5 million cubic meters per year. Occasionally, 30-meter-thick rock covers had to be removed to expose the deposits. It was also reported that raw kaolin found beneath coal seams was extracted and processed.

Production of kaolin rose by 48% between 1970 and 1980, largely owing to mining facility modernization and expansion at Caminau in 1977. Processed kaolin was used for the production of porcelain and industrial ceramics.

Potash.—In 1981, the GDR remained a leading world producer of potash. The potash mining and processing industry, administered by the VEB Kombinat Kali, produced an average of 20,000 tons per day of potash product from 200,000 tons of crude salt. Apart from sylvinite, associated carnallite and kieserite were extracted from the salt and used in the construction and chemical industries. Moreover, it was planned to use byproduct magnesium chloride as a raw material for the production of magnesium metal and magnesia. In 1981, the potassium chloride content in the mined rock was about 20% and was expected to decline in the future. Consequently, improved extraction and processing of potash byproducts from the mine materials as well as from overburden has been planned. The Rossleben potash works was already reported processing kieserite and bromine in 1981.

In 1981, there were no new planned mining operations reported for the long or short term, and the most important development in the industry during the year was the commissioning in January of the 110-ton-per-hour granulation unit at Zielitz. The plant utilizing Komarek Greaves technology was constructed by Klöckner Werke AG of the FRG.

The GDR exported over two-thirds of its potash. In Western Europe, the United Kingdom was the principal importer; in Eastern Europe, Czechoslovakia; in the Western Hemisphere, Brazil; and in Asia and Africa, India was the chief importer of GDR potash.

MINERAL FUELS

Lignite was the principal domestic energy resource of the GDR. In 1981, the proportion of domestic and imported coal in the country's total energy balance amounted to about 65%, and was planned to increase to 67% by 1985. The country produced minimal amounts of natural gas and petroleum and had to import over 90% of its requirements for these two fuels.

About 80% of GDR energy import requirements were covered by Soviet exports. Imports of Soviet oil alone were equal to roughly one-third of the proceeds from GDR exports to the Soviet Union and formed the chief basis for the GDR incurred debt to that country. To reduce this reliance on imported oil, the GDR short-term energy policy was to minimize energy imports where possible, to increase conservation and efficient use of fuels in industry, and to maximize reliance on domestic lignite re-

sources. To achieve some of these goals, the GDR transportation plan for 1981-85 stipulated more efficient and greater use of railroad and river transportation and less reliance on more energy-intensive truck-based transportation. Also, the amount of petroleum exports from the U.S.S.R. decreased by about 2 million tons from the planned import volume.

The GDR long-term energy objective has been to gradually convert the country's lignite and hydrocarbon fuel base to a nuclear one. By the end of 1980, nuclear energy accounted for 12% of the total electric power generated that year, a 1.9% increase over that of 1979. Coal-generated electric power (including lignite briquets and hard coal) was 79.2% of the total, down 1.7% from that of the previous year. Other sources of power generated in 1980 amounted to about 8.8%.

Table 5.—German Democratic Republic: Primary energy balance for 1980 and 1981

(Million tons of standard coal equivalent)[1]

Year	Total primary energy	Coal (lignite, brown, bituminous)	Crude oil and petroleum products	Natural and associated gas	Hydroelectric power	Nuclear power
1980:						
Production[2]	98.1	85.3	.1	11.4	.2	1.1
Exports	.8	.7	--	--	.1	--
Imports	49.8	9.7	31.2	8.7	.2	--
Apparent consumption	147.1	94.3	31.3	20.1	.3	1.1
1981:						
Production[2]	101.2	88.1	.1	11.4	.2	1.4
Exports	.9	.8	--	--	.1	--
Imports	49.8	9.6	31.3	8.7	.2	--
Apparent consumption	150.1	96.9	31.4	20.1	.3	1.4

[1]One ton standard coal equivalent (SCE)=7,000,000 kilocalories. Conversion factors used follow: Hard coal, 1.0; lignite and brown coal, 0.33; crude oil, 1.47; natural gas, 1.33 (per 1,000 cubic meters); and hydroelectric and nuclear power, 0.123 (per 1,000 kilowatt-hours).

[2]Production is taken from production table.

Coal.—The GDR lignite mining industry was administered by the Ministry of Coal and Energy and organized into seven Kombinats (mining complexes): Senftenberg, "Geiseltal" Grosskayna, "Glueckauf" Knappenrode, Regis, "Erich Weinert" Deuben, Bitterfeld, and Borna. Lignite mining was centered in two major fields, the Eastern-Elbe Field near the Cottbus district and the Western-Elbe Field near Leipzig. Over 50% of the total lignite mined in the GDR orignated from the 13 open pit mines of the Senftenberg Kombinat in the Eastern-Elbe Field.

In 1981, lignite production exceeded the planned output quota for the year. The lignite was strip mined, and to insure greater output, the industry increased its reliance on large-capacity excavators produced by the TAKRAF Kombinat. Swinging rotary bucket SRS 1300 excavators were used, with an 80,000-cubic-meter-per-day overburden output. The strip mine in the Groitzscher Triangle area was reported to be using a 1,600-ton rotary bucket excavator with program control for automatic operation, and at the Griefenhan Mine, a SRS 6300 was in operation with a 14,000-cubic-meter-per-hour overburden handling capacity. Each year the amount of overburden that had to be removed increased, and in 1980-81, the average amount that was to be removed was 4.7 cubic meters per ton of recovered coal. By 1990, this amount was forecast to reach about 6.0 cubic meters per ton of mined coal.

To effectively handle the increasing volume of overburden and coal, the GDR planned an increase in the share of belt conveyers to 90% at new mines commissioned by 1990. In 1981, overburden conveyer bridges constituted 53% of the haulage; belt conveyers, 20%; and locomotive haulage, 27%.

In 1981, GDR reported the startup of two lignite mines; the Zwenkau Mine south of Leipzig in July and the Cottbus North Mine in April. The Zwenkau Mine was reported to have seams up to 15 meters thick and a good overburden-to-coal ratio of 2.5 cubic meters per ton. The Cottbus North Mine produced about 1 million tons of lignite in 1981 and was scheduled to supply the Jaenschwalde coal-fired electric power sta-

tion with fuel. Also, work was reported to have begun at the Graebendorf Mine near Cottbus.

Increasingly unfavorable ground water conditions were reported to be affecting lignite mining. In 1981, over 10,000 vertical filter wells were collecting water, which was then removed by submersible motor pumps, and in 1980, a reported average of 6 cubic meters of water per ton of coal had to be pumped out. During the 1980's, this amount had been estimated to reach 8 to 10 cubic meters per ton with an ensuing rise in production costs.

To achieve production targets, the GDR had planned the reduction of mine development and startup time from 6 to 8 years to 3 to 4 years. It was planned, furthermore, to use robots for repair work; a highly labor-intensive facet of the lignite industry occupying about 30% of the industry's personnel.

Natural Gas and Petroleum.—The GDR produced very little domestic petroleum and natural gas and had to import over 90% of its requirements for this fuel. Offshore petroleum development at Usedom Island and along the northern coast was reported to have made modest gains in the 1970's, but the last estimated production figure for these fields for 1977 was about 7,000 barrels per day.

The GDR had a substantial petrochemical industry, and the most important project during 1981 was the extensive reconstruction of the Schwedt refinery. This included the overhaul of the No. 3 crude distillation plant and the replacement of 30 kilometers of pipeline and 1,800 fittings. New capacities were also added at the Schwedt refinery, such as the 611,000-metric-ton-per-year gasoline unit as well as alkylate and benzene units. The construction was contracted to Creusot-Loir and SC Grande Paroisse, and completion scheduled for 1982.

Nuclear Power.—Nuclear energy development in the GDR, based on a number of bilateral agreements with the U.S.S.R., provided the GDR with enriched nuclear fuel, reactor equipment, expert Soviet assistance in plant assembly, etc.

The GDR first nuclear reactor built with Soviet assistance was constructed and put into operation near Rheinsberg in 1966; its power output was rated at 75 megawatts. The construction of the second and much larger Bruno Leuschner atomic powerplant began in 1967 in Lubin near Greifswald. It was supplied with four 440-megawatt Novo Voronezh type reactor blocks (VVEhR-440). The first block was installed in 1973, the second in 1974, the third in 1978, and the fourth in 1981. In addition, four more reactor blocks had been planned for the Leuschner plant for a total capacity of 3,520 megawatts. A third nuclear powerplant, supplied with 1,000-megawatt reactor blocks, had been reported under construction at Stendal; however, its completion date was not published. A fourth nuclear powerplant was planned but no details were provided. The GDR Government's stated plan was to make nuclear energy the mainstay of the country's energy base by the end of the century.

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[1]Foreign mineral specialist, Division of Foreign Data.

[2]Neues Deutschland (East Berlin). Jan. 16-17, 1982, pp. 3-5.

[3]DIW Wochenbeicht (The Weekly Report) (West Berlin). Sept. 3, 1981, pp. 405-408.

[4]The GDR mark (M) is a nonconvertible currency officially fixed at 1:1 with the West German Deutsche mark (DM). Western banks, however, exchange the currencies at the rate of 4M-5M=1DM. The GDR mark's relation to the U.S. dollar is based upon the fluctuation of the dollar-DM ratio. Foreign trade figures are denoted in an accounting unit known as the valuta mark (VM). The rate of dollars to valuta marks is US$1.00=3.11VM.

[5]Neues Deutschland (East Berlin). Dec. 5-6, 1981, pp. 3-4.

[6]The Council for Mutual Economic Assistance (CMEA) was founded in 1949. The current member states are Bulgaria, Cuba, Czechoslovakia, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, the U.S.S.R., and Vietnam. Yugoslavia was accorded permanent observer status in 1965.

The Mineral Industry of the Federal Republic of Germany

By Joseph B. Huvos[1]

In 1981, for the first time in 6 years, the gross national product (GNP) of the Federal Republic of Germany (FRG) decreased 0.3% in real terms (an increase of 3.8% at current prices) to $691 billion;[2] but there was a foreign trade surplus of almost $12 billion, a favorable sign for 1982 economic performance, and the rate of unemployment was only 5.5% in 1981.

The FRG remained one of the world's major processors and consumers of minerals, most of which were imported. Only coal, potash, and salt were available domestically in sufficient quantities. National efforts remained focused, as previously, on securing and expanding raw material supply by encouraging development of domestic resources, concluding trade agreements, and encouraging exploration, development, and production of raw materials abroad. The contributions of the individual sectors of the mining and minerals processing industries to the GNP and employment in 1980 and 1981 are shown in the following tabulation:

	Contribution to gross national product (million dollars)[1]		Employment at end of 1981 (thousand persons)
	1980	1981[p]	
Coal mining	12,709	9,712	211
Stones and earths	15,808	10,841	184
Iron and steel	25,093	17,896	273
Nonferrous metals	13,399	8,587	78
Chemicals including petroleum	66,911	51,445	565
Total	133,920	[2]98,481	1,311

[p]Preliminary.
[1]Does not include value added tax.
[2]1.4% of the GNP.

Source: Adapted from Statistisches Bundesamt, Wiesbaden. Wirtschaft und Statistik, No. 2, 1982, p. 83.
NOTE: Apparent decrease in output was due to a substantial change in the exchange rate of the Deutsche mark.

Important events in 1981 in the minerals industry of the FRG were few because of the slow performance of the economy. To be noted were negotiations to form a new steel giant, Ruhrstahl AG, transfer of Kali Chemie AG's potash mine to Kali und Salz AG, authorization by the FRG Government to build three new nuclear powerplants, and signature by Ruhrgas AG of a preliminary agreement to import 10.5 billion cubic meters of natural gas from the Soviet Union.

PRODUCTION

In 1981, mining production increased 0.8%, while processing and raw materials production decreased 3.3%. Production of minerals for 1977 through 1981 is shown in table 1.

Table 1.—Federal Republic of Germany: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum:					
Bauxite, gross weight	28	280	349	--	--
Alumina thousand tons	1,454	[r]1,556	[r]1,539	1,608	[2]1,419
Metal:					
Primary do	742	740	741	731	[2]729
Secondary:					
Alloyed do	347	368	381	368	[2]352
Unalloyed do	45	47	45	40	[2]41
Bismuth:					
Ore and concentrate[e]	11	9	10	10	10
Metal, smelter[e]	700	600	661	--	--
Cadmium metal, smelter	1,336	1,182	1,266	1,194	[2]1,192
Cobalt metal, smelter	400	350	385	400	400
Copper:					
Mine output, metal content	1,210	821	861	1,274	1,274
Metal:					
Blister and anodes:					
Primary	189,600	165,800	158,200	153,900	153,900
Secondary	58,407	55,700	92,500	103,900	103,900
Total	248,007	221,500	250,700	257,800	257,800
Refined, including secondary:					
Electrolytic	340,709	318,551	303,122	302,516	[2]304,036
Fired refined	99,451	84,881	79,396	71,261	[2]83,303
Total	440,160	403,432	382,518	373,777	[2]387,339
Gold:					
Mine output, metal content troy ounces	2,392	2,119	2,357	2,964	2,900
Metal including secondary do	319,803	336,264	293,857	298,873	298,873
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	2,470	1,597	1,649	1,948	[2]1,575
Iron content do	816	510	526	597	[2]477
Metal:					
Pig iron do	28,697	29,861	34,855	33,873	[2]31,876
Blast furnace ferromanganese and spiegeleisen do	175	209	233	200	200
Blast furnace ferrosilicon do	87	78	79	64	64
Electric furnace ferroalloys do	210	139	195	182	182
Steel ingots and castings do	38,985	41,253	46,040	43,838	[2]41,610
Semimanufactures do	28,758	30,198	32,813	31,661	[2]30,850
Lead:					
Mine output, metal content	30,468	23,181	25,227	23,063	[2]21,605
Metal:					
Primary	182,900	189,900	194,800	191,109	[2]190,857
Secondary	190,600	179,100	178,500	159,200	[2]168,000
Total	373,500	369,000	373,300	350,309	[2]358,857
Magnesium metal including alloys:					
Unwrought (secondary only)[e]	600	600	600	600	600
Castings	16,360	16,359	15,999	15,102	15,102
Mercury (secondary only) 76-pound flasks	[e]3,200	2,437	2,639	1,624	1,600
Nickel metal, including secondary[3]	91	901	1,223	1,235	1,200
Platinum troy ounces	[e]4,820	2,572	2,400	2,411	2,411
Silver:					
Mine output, metal content thousand troy ounces	1,061	799	1,039	1,038	1,038
Metal, including secondary do	18,004	18,085	16,291	24,371	24,371
Tin metal, including secondary	3,940	4,767	4,096	2,257	[2]1,816
Tungsten metal	[e]1,400	[e]1,500	NA	NA	NA
Zinc:					
Mine output, metal content, recoverable	111,384	97,405	96,853	99,720	[2]91,779

See footnotes at end of table.

Table 1.—Federal Republic of Germany: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS —Continued					
Zinc —Continued					
Metal, unwrought, unalloyed:					
Primary	335,127	288,679	333,665	342,797	[2]331,199
Secondary	19,653	18,157	21,858	27,849	[2]35,357
Total	354,780	306,836	355,523	370,646	[2]366,556
NONMETALS					
Abrasives: Artificial corundum	93,646	96,737	102,212	102,222	102,000
Barite	265,593	168,586	161,661	175,380	175,000
Bromine	3,736	3,893	4,020	[e]4,000	4,000
Cement and clinker:					
Cement (excluding clinker) thousand tons	32,163	33,959	35,287	34,258	[2]31,669
Clinker do	1,245	1,344	1,377	1,360	1,360
Clays:					
Fire clay (exclusive of klebsand) do	5,276	5,224	5,635	5,791	5,791
Kaolin, marketable do	500	521	556	502	500
Bleaching do	642	621	639	638	638
Other (schieferton) do	129	128	124	152	152
Diatomite and similar earth, marketable	49,457	47,600	43,271	47,891	52,000
Feldspar, marketable	393,793	385,590	372,754	380,880	380,000
Fluorspar, marketable:					
Acid-grade[e]	75,375	68,150	56,855	70,337	70,000
Metallurgical-grade[e]	8,375	7,572	6,317	7,815	8,000
Total	83,750	75,722	63,172	78,152	78,000
Graphite:					
Crude	16,653	12,763	7,342	11,375	11,400
Marketable[e]	8,326	6,381	3,671	5,688	5,700
Gypsum and anhydrite, marketable thousand tons	2,218	2,238	2,251	2,250	2,250
Lime (hydrated), quicklime, dead-burned dolomite do	8,770	8,990	9,230	9,000	9,000
Nitrogen, N content of ammonia do	1,989	1,955	2,161	2,044	[2]1,962
Phosphates:					
Phosphate rock (including apatite), gross weight do	80	--	--	--	--
Thomas slag-based fertilizer, P_2O_5 content do	134	150	145	161	160
Pigments, mineral, natural	26,421	21,475	28,561	[e]28,000	25,000
Potash, K_2O equivalent:					
Crude, marketable thousand tons	76	72	74	76	[2]72
Chemically processed do	2,265	2,398	2.542	2,661	[2]2,519
Total do	2,341	2,470	2,616	2,737	[2]2,591
Pumice:					
Crude and washed do	3,137	3,552	2,640	2,102	2,100
Marketable do	1,749	2,087	1,432	807	800
Pyrites, marketable concentrate, gross weight do	531	502	460	502	500
Quartz, quartzite, glass sand:					
Quartzite do	425	411	426	426	426
Quartz sand, ground do	407	421	454	453	453
Quartz sand, unground and glass sand do	6,737	7,026	7,417	7,475	7,475
Salt, marketable:					
Rock do	7,131	6,846	8,960	6,759	6,759
Marine and other do	5,192	5,812	6,130	[e]6,100	5,500
Sodium compounds, n.e.s.:					
Sodium carbonate	1,350,543	1,229,722	1,400,922	1,411,110	1,400,000
Sodium sulfate	242,247	211,000	200,664	189,519	100,000
Stone, sand and gravel, n.e.s.:					
Dimension stone thousand cubic meters	215	307	311	264	264
Limestone, industrial thousand tons	48,953	50,995	54,521	53,477	[2]48,675
Crushed and broken stone do	110,718	118,096	126,463	117,610	118,000
Slate do	2	3	4	4	4
Basalt lava and lava sand do	6,623	7,047	8,056	8,152	8,152
Calcite do	9	12	8	5	5
Grinding stone cubic meters	63	238	71	43	[2]42
Tuff thousand tons	2	3	3	4	4
Sand and gravel do	170,425	184,786	198,637	187,037	[2]164,807
Sulfur:					
S content of pyrites do	235	221	203	[e]198	200

See footnotes at end of table.

Table 1.—Federal Republic of Germany: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Sulfur —Continued					
Byproduct:					
Of metallurgy thousand tons	385	380	450	450	400
Of natural gas do	631	650	903	814	834
Of petroleum do	186	190		220	191
Unspecified do	165	160	93	[e]93	[2]30
Total do	1,602	1,601	1,649	1,775	1,655
Talc including talc schist do	16	15	15	[e]15	15
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	301,678	297,509	340,629	353,568	353,019
Coal:					
Anthracite thousand tons	6,067	6,942	7,018	87,146	[2]88,422
Bituminous coal do	78,773	76,994	79,301		
Lignite do	122,920	123,559	130,579	129,833	[2]130,619
Total do	207,760	207,495	216,898	216,979	[2]219,041
Coke:					
Metallurgical do	27,499	25,455	26,501	28,494	[2]27,914
Gashouse do	809	782	937	[e]900	--
Total do	28,308	26,237	27,438	29,394	[2]27,914
Fuel briquets:					
Of anthracite and bituminous coal do	1,305	1,453	1,673	1,455	[2]1,332
Of lignite do	4,104	3,889	4,752	4,446	[2]4,169
Gas:					
Manufactured (excluding that from petroleum refineries):					
Blast furnace million cubic feet	174,312	179,857	212,629	199,456	200,000
Coke oven do	223,294	205,848	214,324	226,336	226,336
Other do	70,735	72,818	52,760	[e]53,000	53,000
Total do	468,341	458,523	479,713	478,792	479,336
Natural:					
Gross do	678,565	738,002	743,900	671,223	[2]672,669
Marketable do	637,578	707,156	[e]725,000	[e]665,000	[2]665,942
Peat:					
Agricultural use thousand tons	1,911	2,047	1,849	2,130	2,100
Fuel use do	221	228	230	279	280
Petroleum:					
Crude thousand 42-gallon barrels	39,021	36,541	34,482	33,450	31,213
Refinery products:					
Gasoline, motor do	123,479	127,069	182,800	182,296	NA
Jet fuel (including aviation gasoline) do	10,099	10,620	10,345	10,506	NA
Kerosine do	456	334	523	315	NA
Distillate fuel oil do	293,903	292,020	345,621	311,192	NA
Residual fuel oil do	143,004	160,047	146,333	128,509	NA
Lubricants do	6,763	6,653	9,660	9,080	NA
Other:					
Liquefied petroleum gas do	38,741	37,932	36,669	30,938	NA
Bitumen do	22,421	22,866	23,756	20,406	NA
Unspecified do	86,999	[e]76,555	97,846	89,758	NA
Refinery fuel and losses do	46,253	54,362	99,807	91,557	NA
Total do	772,118	788,458	953,360	874,557	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through July 7, 1982.

[2]Reported figure.

[3]Primary nickel and nickel contained in ferronickel, Monel metal, and nickel oxide directly used by the steel industry.

TRADE

The country's trade surplus increased sharply during 1981, contributing substantially to the GNP. Members of the European Communities remained the FRG's principal trading partners, and members of the Organization of Petroleum Exporting Countries were also important. The FRG's mineral commodity trade in 1979-80 is shown in tables 2 and 3.

Table 2.—Federal Republic of Germany: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	21,985	22,645	--	France 7,022; Belgium-Luxembourg 5,759; Finland 2,789.
Alumina	298,443	333,433	2,597	East Germany 73,948; U.S.S.R. 57,338; Austria 49,079; Poland 36,458.
Hydroxides	156,986	145,504	7,094	Switzerland 44,607; France 19,750; Netherlands 19,213.
Metal including alloys:				
Scrap	52,223	69,144	--	Italy 28,678; Netherlands 17,926; France 12,833.
Unwrought	247,866	223,680	3,707	Italy 71,617; France 57,500; Netherlands 31,764.
Semimanufactures	364,791	385,544	3,361	France 74,244; United Kingdom 41,477; Italy 40,797.
Antimony:				
Oxides and hydroxides	372	261	--	Switzerland 30; Taiwan 29; Netherlands 28.
Metal including alloys, all forms	16	47	--	Italy 26.
Arsenic: Trioxide, pentoxide, acid	166	1,010	--	United Kingdom 673; Netherlands 105.
Beryllium metal including alloys, all forms kilograms	17	58	--	United Kingdom 22; Netherlands 13.
Bismuth metal including alloys, all forms	407	316	53	Yugoslavia 86; United Kingdom 58; Italy 30.
Cadmium:				
Oxides and hydroxides	22	28	--	Yugoslavia 15.
Metal including alloys, all forms	494	300	NA	NA.
Chromium:				
Chromite	8,807	5,412	--	Netherlands 1,357; France 956; Romania 890.
Oxides and hydroxides	55,688	49,744	NA	NA.
Metal including alloys, all forms	224	275	46	Italy 66; Netherlands 44; Belgium-Luxembourg 36.
Cobalt:				
Oxides and hydroxides	45	88	--	Italy 43; Czechoslovakia 14.
Metal including alloys, all forms	847	821	NA	NA.
Columbium and tantalum metals including alloys, all forms:				
Columbium	42	90	NA	NA.
Tantalum	81	97	NA	NA.
Copper:				
Ore and concentrate	--	8	NA	NA.
Ash and residue containing Cu	28,150	26,508	--	East Germany 12,682; Austria 9,128.
Matte	96	617	--	Belgium-Luxembourg 369; Switzerland 210.
Oxides and hydroxides	2,814	2,174	209	Netherlands 249; France 204; Denmark 168.
Sulfate	1,452	943	NA	East Germany 6.
Metal including alloys:				
Scrap	72,986	86,810	39	Italy 25,089; East Germany 19,978; France 11,725.
Unwrought:				
Smelter	22,384	24,976	--	United Kingdom 24,694.
Refined:				
Alloyed	11,152	12,534	--	Italy 5,589; France 2,080; Turkey 1,535.
Unalloyed	99,599	76,270	--	Belgium-Luxembourg 17,935; France 9,466; United Kingdom 7,548.
Masteralloys	1,068	1,534	--	East Germany 563; Belgium-Luxembourg 508; France 279.
Semimanufactures	358,345	353,785	23,165	Netherlands 46,038; France 41,009; Switzerland 35,258.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Gallium metal including alloys, all forms kilograms	5,400	4,200	500	Japan 1,100; Switzerland 1,000; United Kingdom 900.
Germanium metal including alloys, all forms do	1,300	700	--	United Kingdom 400; North Korea 300.
Gold:				
Ash and waste value	$1,637	$53,914	--	Netherlands $50,613.
Scrap and sweepings value, thousands	$701	$2,760	--	Switzerland $2,028.
Metal including alloys:				
Unwrought thousand troy ounces	739	786	6	United Kingdom 243; Switzerland 211; Belgium-Luxembourg 93.
Partly wrought do	138	96	1	United Kingdom 23; Italy 10; France 9.
Iron and steel:				
Ore and concentrate	3,996	4,467	--	Belgium-Luxembourg 1,426; East Germany 655; Greece 614.
Roasted pyrites	236,795	156,829	--	Belgium-Luxembourg 115,392; Austria 22,873.
Metal:				
Scrap thousand tons	3,073	3,174	(2)	Italy 2,315; Belgium-Luxembourg 298; East Germany 97.
Pig iron including cast iron do	959	1,033	--	France 416; Italy 188; Poland 90; East Germany 31.
Sponge iron, powder, shot do	38	39	1	France 8; Italy 6; Switzerland 6.
Spiegeleisen	1,752	4,763	--	Italy 2,235; France 1,197; Switzerland 650.
Ferroalloys:				
Ferrochrome	27,726	33,524	4,716	France 12,514; Belgium-Luxembourg 7,789.
Ferromanganese	95,818	36,762	--	Italy 9,015; France 6,394; Belgium-Luxembourg 6,228.
Ferronickel	422	86	--	Belgium-Luxembourg 39.
Ferrosilicon	31,553	55,714	206	Belgium-Luxembourg 13,892; France 9,938; Austria 2,723.
Ferrosilicochrome	3,583	1,417	--	Belgium-Luxembourg 544; Italy 498; France 237.
Ferrosilicomanganese	3,590	5,598	--	Italy 2,040; France 2,007.
Others	16,339	13,802	1,414	France 3,828; Austria 1,684; Romania 1,523.
Steel, primary forms thousand tons	3,695	3,722	293	France 646; Italy 428; United Kingdom 286; East Germany 141.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	3,874	3,788	169	France 757; Netherlands 498; Switzerland 242.
Universals, plates, sheets do	6,686	6,750	481	U.S.S.R. 1,349; France 708; United Kingdom 463.
Hoop and strip do	1,335	1,529	32	U.S.S.R. 274; France 188; Netherlands 138.
Rails and accessories do	239	219	45	Italy 42; Netherlands 30; India 20.
Wire do	355	334	13	France 61; Netherlands 48; Belgium-Luxembourg 28.
Tubes, pipes, fittings do	3,558	3,191	124	U.S.S.R. 861; Netherlands 374; France 159.
Castings and forgings, rough do	117	121	6	Netherlands 16; France 15; Belgium-Luxembourg 13.
Lead:				
Ore and concentrate	2,577	2,000	--	All to Bulgaria.
Oxides and hydroxides	10,648	11,810	42	Netherlands 3,506; U.S.S.R. 2,100; Sweden 1,562.
Metal including alloys:				
Scrap	19,964	20,041	--	Italy 7,036; Netherlands 5,259; Denmark 2,785.
Unwrought	107,431	98,780	938	Italy 39,674; Austria 19,199; France 14,220.
Semimanufactures	4,974	18,254	32	Belgium-Luxembourg 4,832; Denmark 3,794; Switzerland 1,439.
Lithium:				
Oxides and hydroxides	717	859	--	France 276; Italy 221; Belgium-Luxembourg 175.
Metal including alloys, all forms	12	23	--	Switzerland 16; France 6.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Magnesium:				
Oxides, hydroxides, peroxides	445	419	--	Colombia 155; Denmark 50.
Metal including alloys:				
Scrap	1,964	2,123	459	Italy 1,026; Netherlands 539.
Unwrought	200	149	--	Switzerland 35; Italy 33; Austria 30.
Semimanufactures	482	494	--	Austria 91; Switzerland 50; Republic of South Africa 48.
Manganese:				
Ore and concentrate	1,946	1,405	--	France 790.
Oxides and hydroxides	5,171	4,318	--	NA.
Metal including alloys, all forms	59	123	--	Yugoslavia 53.
Mercury 76-pound flasks	2,344	6,370	--	Netherlands 4,299; Switzerland 545.
Molybdenum:				
Ore and concentrate	6,668	6,984	446	Belgium-Luxembourg 2,580; Netherlands 1,376.
Oxides and hydroxides	2,748	2,502	NA	NA.
Metal including alloys, all forms	391	487	(2)	NA.
Nickel:				
Matte, speiss, similar material	1,332	302	--	Finland 112; Austria 88; Spain 50.
Oxides and hydroxides	147	135	--	Netherlands 40; Italy 25; Sweden 18.
Metal including alloys:				
Scrap	8,380	5,317	276	Switzerland 3,364; Austria 343; Finland 312.
Unwrought	11,337	6,436	333	France 3,459; Netherlands 1,658.
Semimanufactures	10,183	11,728	3,782	United Kingdom 1,552; France 952; Belgium-Luxembourg 695.
Platinum-group metals:				
Ash and waste: Platinum value	$54,558	$84,172	--	Belgium-Luxembourg $77,571.
Scrap and sweepings: Platinum value, thousands	$659	$2,150	--	Spain $1,123; Netherlands $919.
Metal including alloys, unwrought and partly wrought:				
Platinum troy ounces	289,818	279,037	16,820	Switzerland 91,522; Netherlands 31,289; France 26,564.
Paladium do	134,272	105,045	31,415	Switzerland 27,406; Italy 9,561; Japan 9,364.
Unspecified do	120,488	84,334	4,025	Japan 15,539; Hong Kong 8,285; Republic of South Africa 7,452.
Silicon, elemental	1,496	4,094	384	France 1,360; Netherlands 1,182; Poland 302.
Silver:				
Ash and waste value, thousands	$3,213	$2,729	--	France $1,502; Belgium-Luxembourg $535.
Scrap and sweepings do	$1,071	$3,960	--	Belgium-Luxembourg $1,687; Spain $1,364.
Metal including alloys, unwrought and partly wrought thousand troy ounces	43,581	64,706	2,117	United Kingdom 15,749; Netherlands 9,532; Switzerland 9,088.
Tin:				
Ore and concentrate kilograms	100	--		
Metal including alloys:				
Scrap	52	107	--	Netherlands 65; Denmark 32.
Unwrought	5,887	3,241	--	Netherlands 1,556; France 770.
Semimanufactures	781	788	--	Austria 111; Switzerland 82.
Titanium:				
Ore and concentrate	5,602	9,262	--	Netherlands 4,936; Bulgaria 1,121; France 842.
Oxides and hydroxides	54,612	50,635	7,337	East Germany 6,777; Italy 4,245; Netherlands 2,993.
Metal including alloys, all forms	1,866	2,234	322	United Kingdom 503; Sweden 421; France 384.
Tungsten:				
Ore and concentrate	174	139	--	Netherlands 119.
Metal including alloys, all forms	608	2,087	(2)	Sweden 327; Italy 310; Brazil 207.
Uranium and thorium:				
Oxides including rare-earth oxides	1,923	1,974	1,525	Japan 168.
Metals including alloys, all forms kilograms	9,900	800	NA	NA.
Vanadium metal including alloys, all forms	108	124	(2)	United Kingdom 80; Japan 26.
Zinc:				
Ore and concentrate	94,792	111,130	--	Netherlands 49,288; East Germany 22,989; Belgium-Luxembourg 18,876; France 11,442.
Matte	5,609	5,270	--	Italy 2,383; Belgium-Luxembourg 1,302; France 962.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc —Continued				
Oxides and hydroxides	15,244	15,767	NA	NA.
Metal including alloys:				
Scrap	8,824	10,595	--	Netherlands 6,855; Italy 1,948.
Blue powder	4,588	5,275	34	Romania 1,496; Netherlands 1,241; Hungary 480.
Unwrought	101,627	112,723	11,590	Italy 19,581; France 17,433; Netherlands 16,864.
Semimanufactures	15,086	16,572	NA	NA.
Zirconium:				
Ore and concentrate	8,205	11,487	--	Bulgaria 1,829; France 1,815; Czechoslovakia 1,693.
Metal including alloys, all forms	127	50	(2)	Argentina 23; France 7.
Other:				
Ores and concentrates:				
Of columbium, tantalum, vanadium	1,276	2,210	1,822	Belgium-Luxembourg 192.
Unspecified	2	14	NA	NA.
Ash and residue containing nonferrous metals	174,064	147,657	4,910	Belgium-Luxembourg 49,277; Netherlands 48,401.
Matte, speiss, similar materials	4	26	--	All to East Germany.
Oxides, hydroxides, peroxides	8,108	7,349	NA	NA.
Metals:				
Metalloids:				
Arsenic and tellurium	10	4	NA	France 1.
Selenium and phosphorus[3]	12,838	12,073	NA	East Germany 709.
Alkali, alkaline-earth, rare-earth metals	167	185	NA	NA.
Radioactive isotopes value, thousands	$100	$181	--	All to East Germany.
Pyrophoric alloys	39	75	--	United Kingdom 35; Thailand 10; Nigeria 6.
Base metals including alloys all forms	1,280	1,014	191	France 183; East Germany 177; Canada 133; Sweden 110.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	426,761	491,496	--	Netherlands 445,714; Belgium-Luxembourg 35,323.
Artificial:				
Corundum	55,046	59,294	1,549	Italy 10,927; Austria 6,657; France 4,785; East Germany 3,484.
Silicon carbide	28,480	26,445	NA	NA.
Dust and powder of precious and semiprecious stones, kilograms	414	564	70	Brazil 180; Greece 139; Austria 95.
Grinding and polishing wheels and stones	11,853	13,202	546	France 1,191; Switzerland 931; Austria 778.
Asbestos, crude	65,366	27,334	NA	NA.
Barite and witherite	42,261	45,746	--	France 9,380; Nigeria 7,130; Czechoslovakia 3,707.
Boron materials:				
Crude natural borates	11,589	11,045	--	Switzerland 3,235; Belgium-Luxembourg 2,581; Norway 1,450.
Oxides, acid, borates, perborates	41,489	42,382	--	Switzerland 18,720.
Bromine, elemental	13	11	NA	NA.
Cement, thousand tons	2,397	2,216	(2)	Netherlands 1,599.
Chalk	22,538	27,734	--	Switzerland 9,585; Denmark 6,702; Finland 6,418.
Clays and clay products:				
Crude:				
Andalusite and kyanite	9,512	9,490	--	Austria 3,695; Italy 2,998.
Bentonite	26,250	29,755	--	France 13,374; Belgium-Luxembourg 5,291; Netherlands 5,160.
Ceramic clay	776,003	843,902	--	Italy 310,103; Netherlands 215,887; Belgium-Luxembourg 135,517.
Chamotte	45,618	54,202	--	Netherlands 26,198; Italy 8,132; Switzerland 5,200.
Dinas earth	60,770	65,110	--	France 26,255; Italy 10,143; Switzerland 7,756.
Fire clay	283,985	302,716	--	Italy 100,140; Netherlands 75,390; Belgium-Luxembourg 52,332.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products —Continued				
Crude —Continued				
Fuller's earth	3,411	5,220	--	Netherlands 2,558; France 1,262; East Germany 275.
Kaolin	114,578	102,004	--	Italy 30,422; Austria 19,115; Belgium-Luxembourg 13,302.
Other	235,133	389,858	21,665	Czechoslovakia 55,112; Netherlands 26,699; France 23,817.
Products:				
Nonrefractory	846,738	829,754	11,150	France 250,195; Belgium-Luxembourg 141,228; Netherlands 102,977.
Refractory including nonclay brick	647,200	669,801	12,220	France 88,327; Netherlands 40,528; Italy 38,784.
Cryolite and chiolite, natural	58	38	NA	NA.
Diamond:				
Gem, not set or strung thousand carats	113	113	6	Belgium-Luxembourg 38; Switzerland 27; United Kingdom 9.
Industrial do	296	228	10	Ireland 82; Belgium-Luxembourg 52; Switzerland 18.
Diatomite and other infusorial earth	5,137	3,210	--	Netherlands 970; East Germany 697; United Kingdom 556.
Feldspar, leucite, nepheline, nepheline syenite	17,802	18,923	--	France 6,787; Italy 3,802; Belgium-Luxembourg 2,070.
Fertilizer materials:				
Crude:				
Phosphatic	952	1,555	--	Switzerland 1,009; Netherlands 233.
Potassic	49,296	38,585	--	Belgium-Luxembourg 19,038; United Kingdom 12,082.
Manufactured:				
Nitrogenous thousand tons	1,619	1,344	21	Belgium-Luxembourg 527; France 116; India 112.
Phosphatic do	54	58	--	France 22; Austria 11.
Potassic do	2,475	2,554	32	Belgium-Luxembourg 773; India 274; Netherlands 130.
Other including mixed do	892	756	(2)	France 150; Austria 135; Belgium-Luxembourg 124.
Ammonia do	242	238	--	Denmark 158; France 38; United Kingdom 27.
Fluorspar	16,609	14,098	--	Austria 5,834; Netherlands 2,966; Yugoslavia 1,783.
Graphite, natural	7,352	8,039	745	Italy 1,826; East Germany 843; France 673; Turkey 558.
Gypsum and plasters	356,984	390,963	--	Netherlands 232,262; Switzerland 48,517; Belgium-Luxembourg 45,873.
Iodine, elemental	46	76	--	Italy 32; France 20.
Lime	573,377	473,949	--	Netherlands 371,958; France 59,615.
Magnesite	20,445	18,547	107	France 4,543; Canada 2,008; Italy 1,894.
Mica:				
Crude including splittings and waste	642	661	--	Austria 212; Yugoslavia 64.
Worked including agglomerated splittings	332	254	--	United Kingdom 65; Australia 22; Yugoslavia 21.
Pigments, mineral:				
Natural, crude	29	85	NA	NA.
Iron oxides, processed	170,421	157,656	19,538	France 23,917; Italy 12,546; United Kingdom 11,964.
Precious and semiprecious stones other than diamond:[4]				
Natural kilograms	169,068	259,099	9,381	China 62,026; Italy 25,420; Austria 24,678.
Synthetic do	26,380	21,995	1,926	Japan 9,518; Netherlands 2,583; Italy 2,434.
Pyrites, gross weight	1,238	968	NA	NA.
Salt and brine thousand tons	2,499	1,841	(2)	Belgium-Luxembourg 1,177; Sweden 263.
Sodium and potassium compounds, n.e.s.:				
Caustic potash including sodic and potassic peroxides do	14	15	NA	NA.
Caustic soda do	1,379	826	24	Netherlands 192; Austria 97; Sweden 63.
Soda ash	218,582	215,524	--	Brazil 21,018; Saudi Arabia 20,816; Italy 15,942.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Calcareous	5,230	8,813	--	Italy 5,044; Austria 1,188.
Slate	12,556	10,458	--	Denmark 4,134; Netherlands 3,076.
Other	628,865	854,521	--	Netherlands 743,464; Switzerland 83,657.
Worked:				
Slate	1,139	978	--	Netherlands 350; Belgium-Luxembourg 166.
Paving and flagstone	14,917	11,177	--	Denmark 6,051; Belgium-Luxembourg 2,193.
Other	21,884	24,620	43	Belgium-Luxembourg 5,692; Netherlands 3,959; Switzerland 3,675.
Dolomite, chiefly refractory-grade	279,055	302,654	--	France 151,163; Netherlands 108,311; Belgium-Luxembourg 29,831.
Gravel and crushed rock thousand tons	9,264	8,923	--	Netherlands 6,975; Belgium-Luxembourg 732.
Limestone except dimension	80,157	72,917	--	Netherlands 54,287; Belgium-Luxembourg 15,327.
Quartz and quartzite	121,887	122,878	104	Belgium-Luxembourg 57,147; Netherlands 15,259; Austria 12,807.
Sand excluding metal-bearing thousand tons	8,112	7,744	2	Netherlands 6,277; Belgium-Luxembourg 855.
Sulfur:				
Sulfates, natural: Magnesium sulfate (kieserite)	512,916	497,536	20,922	Norway 87,722; Singapore 86,572; France 68,814.
Elemental:				
Other than colloidal	356,669	394,400	--	Netherlands 109,590; Denmark 78,783; Switzerland 47,235.
Colloidal	1,238	952	--	Italy 507; Czechoslovakia 48.
Dioxide	25,687	35,567	--	East Germany 22,842; Netherlands 3,395; Belgium-Luxembourg 2,958; Sweden 2,071.
Sulfuric acid, oleum	841,669	624,343	--	Netherlands 203,859; Belgium-Luxembourg 137,143; France 73,595.
Talc, steatite, pyrophyllite	6,332	6,137	--	Yugoslavia 1,638; Belgium-Luxembourg 526; East Germany 513; United Kingdom 422.
Other:				
Crude:				
Pottery, broken	38,504	33,523	--	Netherlands 14,591; Switzerland 6,885; Austria 4,883.
Vermiculite, perlite, chlorite	4,403	5,183	--	Belgium-Luxembourg 3,868; Austria 402.
Unspecified thousand tons	1,296	1,635	--	Netherlands 1,383.
Slag, dross, similar waste, not metal-bearing:				
From iron and steel manufacture do	2,658	2,630	--	Netherlands 2,480.
Unspecified do	702	718	--	Netherlands 565; France 92.
Oxides and hydroxides of barium and strontium	3,633	2,968	1,131	France 525; Belgium-Luxembourg 446.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	201,190	168,505	NA	NA.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	6,552	4,104	--	Austria 1,015; Belgium-Luxembourg 499; Sweden 277.
Carbon black	126,545	138,360	686	France 23,671; East Germany 16,491; Poland 14,452; Austria 14,198.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	15,607	12,369	--	France 5,254; Italy 2,545; Belgium-Luxembourg 2,241.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal and briquets —Continued				
Briquets of anthracite and bituminous coal thousand tons	391	357	--	France 105; United Kingdom 95; Belgium-Luxembourg 87.
Lignite including briquets do	718	877	--	France 193; Belgium-Luxembourg 192; Netherlands 167.
Coke and semicoke do	11,656	8,163	--	Belgium-Luxembourg 2,916; France 2,342; East Germany 898; Netherlands 561.
Gas, hydrocarbon:				
Natural million cubic feet	217,289	345,325	NA	NA.
Manufactured do	39	32	--	All to Switzerland.
Hydrogen, helium, rare gases	23,097	24,807	(2)	Italy 9,726; France 3,648; Austria 3,113; East Germany 1,387.
Peat including briquets and litter	497,431	507,005	--	Netherlands 321,778; France 55,071; Switzerland 52,649.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	7,797	9,080	--	East Germany 8,573; Netherlands 254; Mozambique 252.
Refinery products:				
Gasoline:				
Aviation[5] do	35	80	--	Turkey 63.
Motor do	6,254	8,711	219	Austria 2,371; Switzerland 1,963; Sweden 1,597.
Kerosine do	168	21	--	Austria 6; Australia 3; Sweden 3.
Jet fuel[6] do	10,022	11,508	--	France 1,130; Norway 589.
Distillate fuel oil[7] do	7,043	10,813	--	Switzerland 2,598; Netherlands 1,928; Austria 1,448.
Residual fuel oil[8] do	19,391	20,803	--	France 2,374; Netherlands 2,182; Austria 2,083.
Lubricants do	274	233	(2)	Denmark 111.
Other:				
Liquefied petroleum gas do	4,308	4,988	--	Netherlands 1,177; Italy 977; Belgium-Luxembourg 835.
Mineral jelly and wax do	1,103	1,038	19	Italy 94; Netherlands 90; Austria 75.
Nonlubricating oils do	8,335	5,188	70	France 2,189; Netherlands 932; Belgium-Luxembourg 650.
Petroleum coke do	2,281	1,994	--	Netherlands 571; France 327; Switzerland 263; East Germany 127.
Bitumen and other residues do	2,127	2,063	--	Austria 775; Denmark 345; Switzerland 318.
Bituminous mixtures do	457	268	--	Netherlands 173; Austria 28.
Unspecified do	799	717	(2)	Netherlands 160; Belgium-Luxembourg 147; France 57.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	350,158	337,091	NA	Netherlands 223,106; Italy 14,072.

[r]Revised. NA Not available.

[1]The revised figures for 1979 reflect the inclusion in this table of the Federal Republic of Germany's shipments of the reported commodities to the German Democratic Republic. These data had not been included in previous editions of the Minerals Yearbook.

[2]Less than 1/2 unit.

[3]Includes elemental sodium and potassium.

[4]May include some diamond shipped to the German Democratic Republic.

[5]Includes 16,296 barrels of bunker loadings in 1979.

[6]Includes 8,744,192 barrels of bunker loadings in 1979 and 9,024,480 barrels in 1980.

[7]Includes 1,434,931 barrels of bunker loadings in 1979 and 1,614,680 barrels in 1980.

[8]Includes 40,786 barrels of bunker loadings in 1979 and 8,787,237 barrels in 1980.

Table 3.—Federal Republic of Germany: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite thousand tons	3,694	4,177	--	Australia 1,761; Guinea 1,463; Sierra Leone 534.
Alumina	458,120	440,704	4,839	Italy 139,062; Australia 134,611; Suriname 130,529.
Hydroxides	1,712	1,437	835	France 329.
Metal including alloys:				
Scrap	164,415	174,772	35,012	Netherlands 48,163; France 15,713; Australia 10,822.
Unwrought	511,461	608,752	28,111	Norway 204,584; United Kingdom 86,239; Netherlands 62,355.
Semimanufactures	264,252	288,045	6,011	France 78,338; Netherlands 46,304; Belgium-Luxembourg 40,428.
Antimony:				
Ore and concentrate	3,126	3,002	--	Thailand 574; Bolivia 465; Republic of South Africa 458.
Oxides and hydroxides	3,896	3,351	45	France 1,385; Belgium-Luxembourg 1,066; United Kingdom 447.
Metal including alloys, all forms	567	538	--	Belgium-Luxembourg 159; Spain 70; United Kingdom 40.
Arsenic: Trioxide, pentoxide, acid	825	638	--	Belgium-Luxembourg 353; France 136; Sweden 61.
Beryllium metal including alloys, all forms kilograms	1,233	1,460	712	NA.
Bismuth metal including alloys, all forms	211	268	--	United Kingdom 132.
Cadmium:				
Oxides and hydroxides	539	550	--	Belgium-Luxembourg 400; United Kingdom 96.
Metal including alloys, all forms	1,126	1,198	--	Belgium-Luxembourg 374; China 160; Netherlands 111.
Chromium:				
Chromite	546,786	328,847	--	Republic of South Africa 223,968; Turkey 29,557.
Oxides and hydroxides	1,407	969	72	U.S.S.R. 343; United Kingdom 157; France 102.
Metal including alloys, all forms	883	862	82	Belgium-Luxembourg 214; Japan 157; United Kingdom 153.
Cobalt:				
Oxides and hydroxides	483	319	2	Belgium-Luxembourg 177; France 52; United Kingdom 36.
Metal including alloys, all forms	1,848	1,703	80	Zaire 325; Japan 287; Finland 206.
Columbium and tantalum metals including alloys, all forms:				
Columbium	22	23	21	Brazil 1.
Tantalum	252	255	155	France 28; Belgium-Luxembourg 11.
Copper:				
Ore and concentrate	483,740	537,883	5,784	Papua New Guinea 200,157; Republic of South Africa 78,323; Norway 67,664.
Matte and speiss	12,249	11,026	1,215	Australia 3,000; Brazil 1,842; United Kingdom 1,490.
Oxides and hydroxides	216	263	--	Belgium-Luxembourg 177; Italy 36.
Sulfate	12,477	10,759	--	France 4,253; Belgium-Luxembourg 2,267; U.S.S.R. 1,834.
Metal including alloys:				
Scrap	170,002	180,971	26,757	United Kingdom 36,089; France 35,283; Netherlands 22,442.
Unwrought:				
Smelter	62,785	51,680	--	Republic of South Africa 22,098; Chile 13,592.
Refined:				
Alloyed	53,358	49,046	626	United Kingdom 15,177; Belgium-Luxembourg 4,895; Yugoslavia 3,385.
Unalloyed	457,426	451,682	5,218	Chile 124,562; Poland 88,723; Belgium-Luxembourg 67,743.
Master alloys	1,752	1,970	69	Belgium-Luxembourg 928; United Kingdom 860.
Semimanufactures	209,975	244,465	9,717	Belgium-Luxembourg 78,127; France 59,803; East Germany 19,634; Italy 15,551.
Gallium metal including alloys, all forms kilograms	3,500	5,800	200	France 1,800; Netherlands 700; Switzerland 700.
Germanium metal including alloys, all forms do	900	1,800	100	Belgium-Luxembourg 900; France 500.
Gold:				
Ash and waste value, thousands	$6,099	$10,566	$3,143	Netherlands $2,442; United Kingdom $1,802.
Scrap and sweepings do	$9,765	$97,881	$41,452	Switzerland $14,729; Denmark $13,986.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Gold —Continued				
Metal including alloys:				
Unwrought thousand troy ounces	3,377	4,002	85	Switzerland 1,670; Spain 396; Netherlands 393.
Partly wrought do	68	68	10	Republic of South Africa 21; Switzerland 13.
Hafnium metal including alloys, all forms kilograms	100	300	NA	NA.
Iron and steel:				
Ore and concentrate thousand tons	51,703	47,917	2	Brazil 13,284; Canada 7,932; Liberia 6,818.
Roasted pyrites do	626	561	--	Spain 377; Belgium-Luxembourg 138.
Metal:				
Scrap do	1,632	1,535	25	Netherlands 542; Belgium-Luxembourg 292; United Kingdom 290.
Pig iron including cast iron do	266	258	--	Brazil 83; Canada 66.
Sponge iron, powder, shot do	69	67	(2)	Venezuela 20; Sweden 17; France 16.
Spiegeleisen	17	99	NA	NA.
Ferroalloys:				
Ferrochrome thousand tons	230	301	1	Republic of South Africa 173; Zimbabwe 51; Sweden 32.
Ferromanganese do	154	137	5	Norway 55; France 33; Spain 12.
Ferronickel do	71	72	--	New Caledonia 34; Greece 32.
Ferrosilicon do	191	222	(2)	Norway 117; France 38; Spain 25.
Ferrosilicochrome do	11	13	(2)	Zimbabwe 6; Republic of South Africa 2.
Ferrosilicomanganese do	121	130	(2)	Norway 65; Republic of South Africa 21; Spain 15.
Other do	18	16	(2)	France 4; Belgium-Luxembourg 3; United Kingdom 3.
Steel, primary forms do	2,633	2,136	(2)	Netherlands 524; Belgium-Luxembourg 448; Austria 256.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	4,024	4,159	1	Belgium-Luxembourg 1,011; Italy 731; France 630.
Universals, plates, sheets do	4,252	3,778	5	Belgium-Luxembourg 1,212; France 737; Netherlands 228.
Hoop and strip do	777	729	2	Belgium-Luxembourg 280; France 210; East Germany 60.
Rails and accessories do	42	27	(2)	Netherlands 11; Belgium-Luxembourg 5; Denmark 4.
Wire do	283	272	1	Belgium-Luxembourg 93; France 38; East Germany 22.
Tubes, pipes, fittings do	927	802	2	France 129; Italy 129; Netherlands 117.
Castings and forgings, rough do	51	60	(2)	East Germany 10; France 9; Poland 7.
Lead:				
Ore and concentrate	191,179	181,679	--	Canada 36,765; Sweden 33,663; Morocco 20,323.
Oxides and hydroxides	6,746	7,186	56	Belgium-Luxembourg 2,080; France 1,190; East Germany 720.
Metal including alloys:				
Scrap	64,538	44,308	5,994	Netherlands 11,518; Canada 8,896; United Kingdom 7,705.
Unwrought	129,034	160,650	7,248	United Kingdom 44,752; Sweden 19,457; Canada 17,474.
Semimanufactures	4,054	4,367	--	Belgium-Luxembourg 2,748; France 790.
Lithium:				
Oxide and hydroxides	464	568	472	U.S.S.R. 60.
Metal including alloys, all forms	9	8	7	NA.
Magnesium:				
Oxides, hydroxides, peroxides	459	266	80	Ireland 52; France 44; Italy 43.
Metal including alloys:				
Scrap	1,098	1,250	78	Netherlands 430; Sweden 207; Denmark 141.
Unwrought	32,340	31,131	8,029	Norway 15,131; Italy 3,694; France 1,784.
Semimanufactures	500	347	83	Austria 168; Norway 43.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Manganese:				
Ore and concentrate thousand tons	717	490	(2)	Republic of South Africa 326; Australia 81.
Oxides and hydroxides	5,462	5,059	109	Belgium-Luxembourg 2,507; Greece 920; Ireland 740.
Metal including alloys, all forms	5,848	5,731	1,395	Republic of South Africa 2,651; Netherlands 863.
Mercury 76-pound flasks	13,373	12,659	577	China 3,142; Spain 2,854; U.S.S.R. 2,396.
Molybdenum:				
Ore and concentrate	22,065	18,087	8,700	Canada 2,340; Peru 1,428; Chile 1,331.
Oxides and hydroxides	515	453	48	Netherlands 264; Belgium-Luxembourg 65.
Metal including alloys, all forms	797	1,101	189	Austria 667.
Nickel:				
Ore and concentrate	34	39	--	U.S.S.R. 29.
Matte, speiss, similar material	15,746	14,116	15	Austria 8,705; Cuba 2,753; Canada 2,643.
Oxides and hydroxides	612	391	26	Canada 256; Netherlands 50; France 25.
Metal including alloys:				
Scrap	6,505	7,551	2,134	France 1,672; Netherlands 813; United Kingdom 594.
Unwrought	47,708	39,329	2,588	Canada 6,957; U.S.S.R. 6,411; United Kingdom 4,046.
Semimanufactures	6,325	6,723	676	France 3,227; United Kingdom 1,025.
Platinum-group metals:				
Ash and waste: Platinum value, thousands	$2,580	$2,482	$463	Canada $412; Switzerland $349; Austria $338.
Waste and sweepings: Platinum do	$30,034	$71,058	$17,618	Netherlands $13,852; Belgium-Luxembourg $6,624; Hungary $6,058.
Metals including alloys, unwrought and partly wrought:				
Platinum troy ounces	509,667	416,969	94,904	United Kingdom 113,946; Switzerland 78,908; U.S.S.R. 51,591.
Paladium do	382,027	367,909	52,862	U.S.S.R. 175,273; United Kingdom 58,890; Switzerland 45,446.
Others do	113,898	120,025	48,548	Republic of South Africa 42,785; United Kingdom 13,228.
Rare-earth metals:				
Oxides and other compounds	1,196	904	319	France 274; United Kingdom 171; Austria 126.
Metals, all forms	107	60	NA	NA.
Silicon, elemental	59,236	55,132	(2)	Norway 14,222; France 13,642; Switzerland 6,066.
Silver:				
Ash and waste value, thousands	$20,752	$41,125	$20,816	Switzerland $6,036; United Kingdom $3,984.
Waste and sweepings do	$20,602	$78,265	$13,907	Switzerland $14,123; United Kingdom $12,209; Hong Kong $8,113.
Metal including alloys, unwrought and partly wrought thousand troy ounces	42,542	35,661	5,135	Sweden 5,965; North Korea 2,250; Mexico 1,974.
Tin:				
Ore and concentrate	7,158	3,343	--	United Kingdom 2,360; Bolivia 819.
Oxides and hydroxides	30	36	--	Italy 16; France 11.
Metal including alloys:				
Scrap	340	324	28	Netherlands 86; Switzerland 83; Yugoslavia 32.
Unwrought	17,098	18,304	50	Indonesia 6,182; Thailand 5,222; Malaysia 2,872.
Semimanufactures	1,684	1,541	--	Netherlands 1,446.
Titanium:				
Ore and concentrate	574,005	484,902	--	Norway 334,575; Canada 97,364; Australia 30,533.
Oxides and hydroxides	21,916	18,329	809	Belgium-Luxembourg 9,196; France 2,713; United Kingdom 2,354.
Metal including alloys, all forms	3,836	4,878	613	Japan 2,519; U.S.S.R. 808.
Tungsten:				
Ore and concentrate	4,097	2,931	45	China 1,136; Canada 459; Australia 414.
Oxides and hydroxides	294	127	--	Austria 110.
Metal including alloys, all forms	831	970	96	Austria 422; United Kingdom 127.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Uranium and thorium:				
Oxides	416	910	1	U.S.S.R. 877.
Metal including alloys, all forms	2	16	--	United Kingdom 15.
Vanadium:				
Oxides and hydroxides	710	1,382	--	China 425; United Kingdom 20.
Metal including alloys, all forms	42	(2)	NA	NA.
Zinc:				
Ore and concentrate	502,951	618,984	10,245	Canada 221,561; Sweden 74,652; Greenland 62,907.
Matte	4,231	3,339	--	Netherlands 1,768; Belgium-Luxembourg 300; Austria 258.
Oxides and hydroxides	6,993	7,089	--	France 2,906; Netherlands 1,453; Italy 1,392.
Metal including alloys:				
Scrap	12,609	11,128	734	Denmark 2,300; Netherlands 2,200; Italy 1,932.
Blue powder	12,705	14,475	--	Belgium-Luxembourg 11,069; Netherlands 1,160.
Unwrought	156,138	161,781	75	Belgium-Luxembourg 68,481; Netherlands 41,488; Norway 14,175.
Semimanufactures	24,014	25,673	--	NA.
Zirconium:				
Ore and concentrate	50,185	56,086	1,355	Australia 29,016; Republic of South Africa 18,511.
Metal including aloys, all forms	218	279	128	France 124.
Other:				
Ores and concentrates:				
Of columbium, tantalum, vanadium	1,458	1,341	205	Brazil 731.
Unspecified	5,319	7,301	273	Chile 4,536; Australia 1,957.
Ash and residue containing nonferrous metals	410,884	483,176	12,559	Canada 140,022; Belgium-Luxembourg 30,065; Italy 28,085; United Kingdom 24,089.
Oxides, hydroxides, peroxides	627	487	57	United Kingdom 255; France 89; U.S.S.R. 65.
Matte, speiss, similar material	40	56	--	All from East Germany.
Metals:				
Metalloids:				
Arsenic and tellurium	54	49	9	U.S.S.R. 14; Belgium-Luxembourg 7.
Selenium and phosphorus	28,873	32,432	NA	NA.
Alkali, alkaline-earth; rare-earth metals	336	246	4	France 164; Canada 25.
Pyrophoric alloys	37	14	--	Austria 13.
Radioactive isotopes value, thousands	$528	$459	--	All from East Germany.
Metals including alloys, all forms	748	1,078	385	Sweden 272; Belgium-Luxembourg 106.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	66,202	249,522	1,038	Greece 219,903; Italy 16,341.
Artificial:				
Corundum	40,011	41,497	2,415	Netherlands 16,710; Hungary 6,473; Austria 6,060.
Silicon carbide	66,711	72,364	260	Norway 10,344; Italy 4,688; U.S.S.R. 2,281.
Dust and powder of precious and semiprecious stones, kilograms	2,205	397,430	396,390	Ireland 806.
Grinding and polishing wheels and stones	7,410	8,897	336	Austria 1,853; Spain 989; France 719; East Germany 341.
Asbestos, crude	386,383	392,978	886	Canada 307,756; U.S.S.R. 28,714; Republic of South Africa 27,611.
Barite and witherite	212,735	211,315	--	France 82,203; China 53,628; Spain 37,094; East Germany 9,685.
Boron materials:				
Crude natural borates	143,862	124,693	80,947	Turkey 33,378; Belgium-Luxembourg 9,078.
Oxide, acid, borates, perborates	90,114	87,072	13,334	Belgium-Luxembourg 36,667; France 15,782.
Bromine, elemental	3,008	2,982	--	Israel 2,074; Netherlands 437; East Germany 108.
Cement, thousand tons	1,591	1,686	3	Belgium-Luxembourg 574; France 417; East Germany 326.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Chalk	119,133	121,736	--	France 91,394; Belgium-Luxembourg 14,113; East Germany 12,098.
Clays and clay products:				
Crude:				
Andalusite and kyanite	65,312	101,824	45,544	Republic of South Africa 49,484.
Bentonite	66,841	78,043	44,392	Greece 23,106; Belgium-Luxembourg 3,647.
Ceramic clay	108,865	133,303	--	France 60,435; Netherlands 28,245; East Germany 14,923.
Chamotte	90,398	79,704	547	Czechoslovakia 33,998; France 31,406.
Dinas earth	6,550	3,949	--	Belgium-Luxembourg 3,853.
Fire clay	134,053	158,659	23,044	France 52,520; Czechoslovakia 43,250; Republic of South Africa 16,888.
Fuller's earth	5,282	5,676	3,835	Spain 1,000; Netherlands 549.
Kaolin	842,983	859,571	112,742	United Kingdom 465,574; Czechoslovakia 123,736; France 57,292; East Germany 56,709.
Other	163,718	139,188	21,665	Czechoslovakia 55,112; Netherlands 26,699; France 23,817.
Products:				
Nonrefractory thousand tons	1,832	1,871	--	Italy 648; Netherlands 608; France 217.
Refractory including nonclay brick do.	268	266	2	Austria 49; France 30; United Kingdom 23.
Cryolite and chiolite, natural	2,724	2,066	--	Greenland 2,043.
Diamond:				
Gem, worked and unworked, not set or strung thousand carats	520	561	5	Belgium-Luxembourg 259; Israel 119.
Industrial do.	1,057	1,105	71	Republic of South Africa 399; Belgium-Luxembourg 363; Ireland 115.
Diatomite and other infusorial earth	40,190	37,506	7,534	Denmark 21,819; France 6,913.
Feldspar, leucite, nepheline, nepheline syenite	120,150	119,288	--	Norway 73,453; Italy 15,934; Finland 10,568.
Fertilizer materials:				
Crude:				
Nitrogenous	2,631	3,136	--	Chile 3,000.
Phosphatic thousand tons	2,584	2,560	1,443	U.S.S.R. 357; Morocco 339.
Potassic do.	120	125	--	All from East Germany.
Manufactured:				
Nitrogenous do.	1,548	1,586	31	Belgium-Luxembourg 397; Netherlands 341; Austria 211.
Phosphatic do.	774	1,005	(2)	Belgium-Luxembourg 804; France 93; East Germany 30.
Potassic do.	91	94	--	France 87; East Germany 2.
Other including mixed do.	1,038	971	83	Austria 221; France 147; Netherlands 103.
Ammonia do.	203	283	30	France 112; Netherlands 53; East Germany 29.
Fluorspar	255,868	279,058	--	China 51,579; Republic of South Africa 43,122; Spain 25,624.
Graphite, natural	26,062	25,123	262	China 4,925; Austria 4,656; Norway 3,299.
Gypsum and plasters	595,650	689,483	106	France 411,794; Austria 200,440; East Germany 31,424.
Iodine	871	1,140	6	Japan 655; Chile 438.
Lime	153,766	188,096	--	France 116,762; East Germany 37,212; Belgium-Luxembourg 16,090.
Magnesite	386,152	420,054	46,492	Greece 118,791; China 43,822; Austria 42,871.
Mica:				
Crude including splittings and waste	8,631	10,330	548	India 3,334; Brazil 2,312; Argentina 1,033.
Worked including agglomerated splittings	611	702	20	France 283; Belgium-Luxembourg 224; Spain 85.
Pigments, mineral:				
Natural, crude	2,174	2,041	--	Austria 1,932.
Iron oxides, processed	6,152	6,550	422	Netherlands 2,375; France 1,210; Belgium-Luxembourg 914.
Precious and semiprecious stones except diamond:				
Natural	1,636	1,724	419	Brazil 906.
Synthetic kilograms	25,587	21,437	3,070	Switzerland 11,385; Japan 3,680.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Pyrites, gross weight	98,943	132,716	--	U.S.S.R. 100,011; Norway 13,732; Yugoslavia 13,178.
Salt and brine	937,522	628,219	--	Netherlands 453,286; France 87,492; Italy 56,054.
Sodium and potassium compounds, n.e.s.:				
Caustic potash including sodic and potassic peroxides	3,537	4,100	--	Belgium-Luxembourg 1,932; East Germany 289; Spain 286.
Caustic soda	168,556	120,434	--	Belgium-Luxembourg 25,571; Switzerland 9,342; Netherlands 8,740.
Soda ash	220,273	215,886	4,289	Poland 49,530; France 30,080; Netherlands 29,504; East Germany 25,194.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Calcareous	124,036	151,073	--	Austria 80,452; Italy 30,021; Portugal 11,853.
Slate	33,756	40,249	--	France 21,184; United Kingdom 8,276; Portugal 4,970.
Other	441,289	424,702	170	Denmark 83,292; Sweden 54,477; Italy 50,514.
Worked:				
Slate	17,779	24,576	--	Spain 16,785; Italy 1,586; France 1,302.
Paving and flagstone	212,321	274,007	--	Portugal 134,393; Italy 63,856; Romania 17,082.
Other	540,343	534,035	--	Italy 436,583; East Germany 26,523; Switzerland 13,112.
Dolomite, chiefly refractory-grade	680,951	772,456	--	Belgium-Luxembourg 652,777; United Kingdom 36,561.
Gravel and crushed rock thousand tons	12,605	12,968	--	France 7,715; Denmark 1,939; Norway 885.
Limestone excluding dimension do.	1,501	1,272	--	Austria 691; Belgium-Luxembourg 260; France 144.
Quartz and quartzite	121,860	110,934	622	Belgium-Luxembourg 52,591; Netherlands 25,382; Yugoslavia 11,951.
Sand excluding metal-bearing thousand tons	6,393	6,223	3	France 2,561; East Germany 2,283; Netherlands 935.
Sulfur:				
Elemental:				
Other than colloidal	385,973	360,317	83,517	Poland 168,080; Canada 91,324.
Colloidal	732	661	--	France 636.
Dioxide	8,534	5,731	--	Sweden 3,136; Switzerland 2,290.
Sulfuric acid, oleum	48,309	33,774	--	Switzerland 15,796; France 9,704; East Germany 3,024.
Talc, steatite, soapstone, pyrophyllite	125,688	130,765	389	Austria 52,665; France 27,460; Italy 11,122.
Other:				
Crude:				
Pottery, broken	95,168	104,720	--	France 33,548; Netherlands 18,366; Belgium-Luxembourg 16,425.
Vermiculite, perlite, chlorite	136,938	140,811	3,207	Greece 107,129; Hungary 11,838; Republic of South Africa 16,425.
Unspecified	802,263	990,953	13,471	Norway 358,167; United Kingdom 173,941; Austria 164,567.
Slag, dross, similar waste, not metal-bearing:				
From iron and steel manufacture thousand tons	1,943	1,662	1	France 861; Belgium-Luxembourg 504.
Unspecified do.	429	362	2	France 154; Belgium-Luxembourg 93; Netherlands 38.
Oxides and hydroxides of barium and strontium	791	655	--	France 317; Netherlands 280.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	165,746	176,282	NA	East Germany 10,319.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	21,170	18,185	7,488	Trinidad and Tobago 9,363.
Carbon black	58,321	55,713	3,781	France 19,911; Netherlands 16,685.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal and briquets:				
Anthracite and bituminous coal thousand tons	7,773	9,123	1,751	Poland 1,918; Republic of South Africa 1,492; United Kingdom 1,402.
Briquets of anthracite and bituminous coal	56	365	--	France 310.
Lignite including briquets thousand tons	2,387	3,223	--	Czechoslovakia 2,113; East Germany 1,081.
Coke and semicoke do	1,201	1,225	239	France 234; Netherlands 170; East Germany 150.
Gas, natural million cubic feet	1,645,762	1,765,080	NA	NA.
Hydrogen, helium, rare gases	27,073	32,008	2,571	Netherlands 15,694; Belgium-Luxembourg 13,685.
Peat including briquets and litter	70,297	83,069	--	U.S.S.R. 71,658; Poland 6,673.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	770,942	697,460	--	Saudi Arabia 180,361; Libya 114,094; United Kingdom 104,686.
Refinery products:				
Gasoline:				
Aviation do	270	289	--	Netherlands 127; United Kingdom 118.
Motor do	24,821	29,442	5	Netherlands 14,508; Belgium-Luxembourg 4,191; France 2,648.
Kerosine do	933	359	13	Belgium-Luxembourg 150; Netherlands 124.
Jet fuel do	14,523	14,414	--	Netherlands 9,596; Belgium-Luxembourg 3,722.
Distillate fuel oil do	139,905	117,544	--	Netherlands 49,562; Belgium-Luxembourg 12,080; East Germany 11,552; U.S.S.R. 10,942.
Residual fuel oil do	34,524	41,679	1	Netherlands 12,986; Belgium-Luxembourg 4,847; East Germany 4,608; U.S.S.R. 3,040.
Lubricants do	1,222	1,654	102	United Kingdom 558; France 523; Italy 226.
Other:				
Liquefied petroleum gas do	5,037	7,219	--	Netherlands 1,645; Republic of South Africa 943; Czechoslovakia 744.
Mineral jelly and wax do	1,477	1,497	10	Netherlands 184; France 121; United Kingdom 59.
Nonlubricating oils do	42,566	36,949	147	Netherlands 13,292; U.S.S.R. 6,458; Algeria 3,299.
Petroleum coke do	8,274	6,213	5,461	United Kingdom 287; Netherlands 231.
Bitumen and other residues do	2,077	2,515	--	Netherlands 915; France 749; East Germany 553.
Bituminous mixtures do	144	130	4	Netherlands 85.
Unspecified do	19,919	10,355	177	U.S.S.R. 3,030; Libya 2,578; Romania 1,175.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals thousand tons	2,134	2,130	73	Netherlands 1,032; France 231; Belgium-Luxmebourg 96; East Germany 72.

[r]Revised. NA Not available.

[1]The revised figures for 1979 reflect the inclusion in this table of the Federal Republic of Germany's receipts of the reported commodities from the German Democratic Republic. These data had not been included in previous editions of the Minerals Yearbook.

[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Vereinigte Aluminum Werke AG was to cut aluminum capacity at its Lippe plant near Lünen, in the Ruhr area, by 5,000 tons to 33,000 tons per year by the end of 1981. This followed the shutdown of 10,000 tons of capacity early in the year at the same plant.

In 1981, it was reported that the alumina segment of the Giulini Chemie GmbH production plant in Ludwigshafen on the Rhine

was to be sold to the Aluminum Co. of America. Involved were an alumina plant and an aluminum chemicals plant.

In 1981, the FRG's aluminum production declined slightly for the second straight year. Six companies in the FRG operated 10 aluminum plants with a total primary capacity of about 729,000 tons.

Iron and Steel.—Peine Salzitter was to close its Haverlahwiese iron ore mine in Lower Saxony in 1982, causing a drop of almost 0.5 million tons in the FRG's iron ore output. However, another FRG steelmaker, Klöckner-Werke AG's Maxhütte subsidiary, is to expand production from its Leonie iron ore mine near Auerbach in Bavaria to 850,000 tons per year, supplying the company's blast furnaces at Sulzbach Rosenberg.

Metallhüttenwerke Lübeck GmbH, a pig iron producer, filed bankruptcy suits. Causes of the collapse were high fuel costs and loss of the company's Polish business, which had provided the majority of the company's orders. The Government of Schleswig-Holstein was planning efforts in cooperation with Lübeck city authorities to save the 1,000 jobs affected. The company had a capacity of 500,000 tons per year of pig iron and 500,000 tons per year of coke.

Norddeutsche Ferrowerke AG (Nordferro) of Emden, a Midrex-reduced iron producer, was struggling to survive in face of high gas costs and inadequate prices for direct-reduced iron ore. Nordferro was owned by AS Sydvaranger (74.9%) and Korf Stahl AG (25.1%). Sydvaranger was making efforts, together with the Government of Lower Saxony, to interest Thyssen AG or Peine Salzgitter AG in the plant in exchange for supplying Thyssen with an order for six Norwegian submarines.

Krupp Stahl AG and Hoesch-Estel reviewed the approval of their supervisory boards for the formation of a new company, Ruhrstahl AG, to include their steelmaking, coating, and surface finishing activities. The announcement, predicting organization of the new company during 1982, ended 2 years of negotiations. As a result of the merger, cost reductions were to be sought by better utilization of raw steel capacity and by elimination of product line overlap and the duplication of investments. It seemed possible that Government-owned Peine Salzgitter AG (P&S) is to join in on the merger. The steel giant formed thus would have a capacity of about 15 million tons of crude steel, larger than steel industry leader Thyssen AG (12 million tons). In 1980, Krupp and Hoesch had a capacity of little more than 5 million tons each, while P&S produced about 4.5 million tons. Krupp was the FRG's biggest high-grade steel producer, Hoesch was the leader in surface refined sheet metal, and P&S was the only ferromanganese producer in the FRG. Of about 65,000 jobs of the three companies, only about 45,000 would have remained in 1985. While the merging companies sought to receive $2 to $3 billion in help, the Government planned to keep the amount as low as possible.

The FRG has been for a long time the strongest opponent of state aid for the steel industry. In 1980, the European Economic Community agreed to phase out by 1985 all subsidies to the steel industries of its member states. By 1981, it became clear, however, that not all FRG steel concerns could survive without state funds to pull them through. Maxhütte, a subsidiary of Klöckner Werke, was the first company to obtain a restructuring grant by 1980, in this instance, from Bavaria's regional Government. Steel industries in the Saar were the next to obtain joint subsidies, in that they contributed to complete rationalization of production involving substantial cutbacks funded partly by the parent company. The next to seek help from Bonn was to be the Ruhr Industries.

In 1981, the FRG's raw steel and pig iron production declined further for the third consecutive year, although it remained still the largest among West European countries. Top crude steel producers in 1981 and approximate crude steel capacities in million tons, remained virtually unchanged as follows: Thyssen Group (12.2), Hoesch-Estel Group (11.5), Krupp Group (5.1), Peine-Salzgitter Group (4.4), and Mannesmann Group (4.3).

About 48 companies continued to produce stainless and alloy steels in 1981. The most important producers, with about 60% of total production, in order of decreasing output, were the Edelstahlwerke Buderus AG at Wetzlar; Klöckner Werke AG in Osnabrück; Friedrich Krupp Hüttenwerke AG in Bochum; Stahlwerke Röchling-Burbach GmbH of Völklingen in the Saar; Stahlwerke Südwestfalen AG in Siegen; and Thyssen Edelstahlwerke in Krefeld.

Lead, Zinc, and Copper.—Preussag AG decided to cut production of its Harlingerode vertical retort zinc smelter near Goslar in the Harz Mountains from 70,000 to 50,000 tons for 1982 by shutting down a roasting furnace and a sulfuric acid plant.

The nonferrous metal mine in Meggen, the barite mine in Dreislar, and the barite-

fluorite mine in Wolfach were described in the technical literature.[3]

Nonferrous metal mining in the FRG continued at Preussag AG's Rammelsberg (Goslar) and Bad Grund, and Metallgesellschaft AG's subsidiary Sachtleben AG in Meggen.

Mercury.—By yearend, Preussag AG closed its mercury refining operation at Harlingerode, near Goslar in the Harz Mountains. The plant had a capacity of about 200 tons per year of mercury. About 50% of the supply of the plant was from local zinc ores, 45% from contracts with other companies, and about 5% of the feed came from Scandinavia.

Tin.—Exploratory drilling for lead-tin ores in the Sauerland region of North Rhine Westfalia produced promising indications of Mississippi Valley type mineralization. Lead-tin bearing limestone was found in several places at depths from 100 to 500 meters. The German subsidiary of Rio Tinto Zinc worked out an investigation program for the ores.

In 1981, Metallgesellschaft AG of Frankfort operated a tin smelter in Duisburg, based on imported concentrates, with a capacity of 5,000 tons per year of tin and 8,000 tons per year of soft solders (secondary metal). Three brands were marketed, all registered on the London Metal Exchange: M Standard (99.75% Sn), M Special (99.85% Sn), and Rose (99.90% Sn).

Titanium.—In 1981, four companies in the FRG produced pure titanium ingots: Boschgotthardshütte O. Breyer GmbH at Siegen, Contimet-Thyssen Edelstahlwerke AG in Krefeld, WC Heraeus GmbH in Hanau, and Krupp Stahl AG in Essen. These companies produced some or all of the following: Forgings, alloy sheets, plates, bars, rods, wire, disks, and other semimanufactured products in various shapes. Another three companies also produced various commercial shapes: Otto Fuchs Metallwerke in Meinerzhagen, E&S Lohaus KG in Mayen, and Vereinigte Deutsche Metallwerke AG in Duisburg. Finally one company, the Gesellschaft für Elektrometallurgie mbH produced 40% ferrotitanium.

Vanadium.—Several FRG companies processed imported vanadium raw material into ferrovanadium and/or vanadium pentoxide. The Gesellschaft für Electrometallurgie mbH of Düsseldorf produced 3,000 tons per year of vanadium pentoxide from vanadium slag, which was converted to vanadium metal and ferrovanadium. Hermann C. Starck of Berlin produced vanadium metal and ferrovanadium at Laufenburg on the Swiss border and vanadium metal at Goslar in the Harz. Metallhütte Mark KG of Hamburg, a subsidiary of Klöckner & Co. of Duisburg, produced 200 tons per year of ferrovanadium. The company concluded a contract with Agnew Glough Ltd.'s Wundowie Mine in Western Australia to buy a total of 16,000 tons of fused flake vanadium pentoxide during the next 7 years. The Otavi Minen und Eisenbahn Gesellschaft of Frankfort also produced some ferrovanadium.

NONMETALS

Cement.—Cement production declined slightly in 1981. At yearend, 70 cement plants were operated in the FRG by 41 individual companies. Total cement capacity (including clinker) of the plants was 35 million tons per year.

Potash and Salt.—In 1981, Kali and Salz AG (K&S) became the FRG'S only potash producer when it took over the mine at Friedrichshall, previously owned by Kali Chemie AG. K&S was not going to operate the Friedrichshall Mine separately, but would mine its reserves from the nearby Bergmanssegen-Hugo Mine in 1982. Friedrichshall has been in continuous operation since 1930. K&S, with eight active potash mines and seven salt mines in operation, exploited some areas of the potash reserves in the Zechstein Basin, which stretches from Poland to the northeast of England.

Weak demand in world markets resulted in sales reduced to 2.34 million tons of K_2O in 1981; some shutdowns were therefore necessary towards the end of the year. Only salt and some magnesium compound sales increased. Employment in 1981 increased to 8,899. K&S invested about $130 million in the 1970-80 period on expanding and modernizing its industry.

Sulfur.—Sulfur production in 1981 was substantially unchanged and exports declined about 7%. The bulk of the FRG'S sulfur production was recovered by four sour gas processing complexes located at Rütenbrock, Dötlingen near Grossenkneten, Barnstadt near Düste, and Neag near Sulingen, all in Lower Saxony. Output from these sources was 834,000 tons, while production from coking plants and power stations accounted for an additional 30,000 tons. In 1981, supplies of sulfur from oil refining activities fell 10% to 191,000 tons, reflecting a fall in consumption of oil products in the FRG.

Exports by rail to the FRG's major markets such as the Netherlands, Denmark, Belgium, and Switzerland were supplemented by exports of solid slated sulfur by way of the new terminal of Brake, on the Weser south of Bremerhaven, with shipments to the United Kingdom and Senegal. Despite the opening of this new facility, the FRG is unlikely to become a significant exporter on the global scale, as production in the Grossenkneten Gasfield is to decline somewhat in the near future.

MINERAL FUELS

Energy consumption in 1981 was almost 5% below 1980 levels as shown in the following tabulation, in million tons of standard coal equivalent:

	1980	Percent	1981	Percent
Oil	185.7	47.6	165.0	44.5
Bituminous coal	77.1	19.8	78.5	21.2
Lignite	39.2	10.0	40.0	15.9
Natural gas	63.6	16.3	59.0	10.8
Nuclear power	14.3	3.7	17.2	4.6
Hydroelectric power	7.6	1.9	8.4	2.2
Other	2.7	.7	2.9	.8
Total	390.2	100.0	371.0	100.0

Source: Arbeitsgemeinschaft Energie-Bilanzen. American Embassy, Bonn, State Department Telegram No. 3501, Jan. 5, 1982.

Prime reasons for the decline in the energy consumption shown above between 1980 and 1981 were unfavorable economic conditions and a more rational use of energy. Coal and nuclear power expanded their positions, while petroleum and natural gas suffered additional losses. The FRG's energy balance in 1979 and 1980 is shown in table 4.

Table 4.—Federal Republic of Germany: Energy balance in 1979 and 1980

(Million tons of standard coal equivalent)[1]

	Bituminous coal	Lignite	Crude oil	Natural gas	Hydropower	Nuclear power[2]	Fuelwood, peat	Other[3]	Total
1979:									
Production[1]	87,528	37,197	6,943	23,492	5,572	--	412	1,456	162,600
Imports	9,625	1,439	219,672	44,032	5,130	13,892	--	--	293,790
Exports	27,190	570	13,656	415	4,924	--	89	--	46,844
Consumption	75,840	38,076	206,842	66,008	5,778	13,892	323	1,456	408,215
1980:									
Production[1]	88,235	37,862	6,735	20,943	5,686	--	636	1,388	161,485
Imports	10,732	1,903	199,584	46,662	6,301	14,338	--	--	279,520
Exports	20,845	614	14,498	2,863	4,413	--	101	--	43,334
Consumption	77,081	39,182	185,705	64,282	7,573	14,338	535	1,388	390,084

[1]Includes only primary energy.
[2]Produced domestically from imported fuel.
[3]Includes solid wastes, refuse, waste heat, and waste steam.

Source: Statistik der Kohlenwirtschaft E.V.: Zahlen zur Kohlenwirtschaft, No. 121. Essen and Köln, January 1982.

Coal, Coke, and Lignite.— In 1981, the FRG's bituminous coal production increased slightly for the third consecutive year, exceeding 88 million tons. FRG's stocks of coal and coke at yearend remained constant, representing a supply of approximately 4 months.

The FRG's lignite production in 1981 was almost unchanged at over 130 million tons, but production of briquets made from lignite decreased again and overburden moved was about 450 million cubic meters, or 3.46 cubic meters per ton of lignite produced.

Ruhrkohle AG opened the FRG's first new bituminous coal mine in 17 years at Bergkamen near Dortmund in the Ruhr region. The $300 million facility supplied a mine-mouth powerplant, Verbundkraftwerk Bergkamen, at a design rate of 3.2 million tons per year and employed 3,000

people. The Vereinigte Elektrizitätswerke AG (VEW) and Steag AG decided to build a second 750-megawatt, coal-fired unit at Bergkamen. Construction was to start in 1982, and commissioning of the new unit was to take place in 1987. The plant was to use a total of 3 million tons of bituminous coal per year.

The Neckarwerke Elektrizitäts Versorgungs AG obtained Government approval for the construction of a fifth coal-fired unit of 420 megawatts in Altbach, near Stuttgart.

The Federal Ministry of the Economy lowered the coal price subsidies, paid both by the country's coal producers and consumers, from a country wide average of 4.5% to 4.2%, the latter being sufficient to accumulate about $1 billion in the coal price equalization fund in 1982. Regional contributions to the fund were to vary from state to state between 3.2% in Berlin and 4.8% in North Rhine-Westphalia. Besides these contributions, the Federal Government and North Rhine-Westphalia also contributed substantial amounts to the subsidy.

Ruhrkohle AG and Veba AG put on-stream in the Ruhr city of Bottrop, Europe's biggest coal liquefication plant. The $200 million plant was designed to convert about 75,000 tons of bituminous coal per year into automotive and chemical gasoline, diesel fuel, heating oil, and gas. A crew of 220 was needed to operate the plant.

A 55,000-ton-per-day prototype coal gasification plant was tested in the Ruhr region at Oberhausen by Ruhr-Chemie AG and Ruhrkohle AG. Coal used was from Moundsville, W. Va., United States. The Rheinische Braunkohlenwerke AG started construction of a 1.8-million-ton-per-year lignite gasification plant at the site of the Ville-Berrenrath briquet plant, near Hürth. The plant was to be built in two stages at a total cost of $300 million, and is to generate by 1988 up to 0.9 billion cubic meters of lignite gas per year. No Government subsidy was to be involved for the construction of the plant.

In 1981, the FRG had 38 coal and 20 lignite mines, 18 coking plants, 5 briquet plants, and 20 mine-mouth powerplants. The bituminous coal industry was controlled mainly by seven companies: Three in the Ruhr area, two in the Aachen area, and one each in the Saar and Lower Saxony. The largest industrial group was the Ruhrkohle AG, controlling almost three-quarters of the country's bituminous coal output. Total employment in the bituminous coal industry was 184,000.

The FRG lignite industry was dominated by the Rheinische Braunkohlenwerke AG, which accounted for nine-tenths of total output; remaining production came from three medium-size companies in Bavaria, Helmstedt, and Hesse, and three smaller companies. The lignite industry employed 22,000. The FRG's bituminous coal reserves were estimated at 24 billion tons and lignite reserves were estimated at 35 billion tons. Resources were 230 billion tons of bituminous coal and 55 billion tons of lignite.

Nuclear Power.—For the first time in more than 4 years the construction of new nuclear powerplants was authorized by the Federal Government. The plants to be built were those in Oho, Bavaria; Biblis, Hesse, and Lingen, Lower Saxony.

Construction work on the Gorleben Nuclear Waste Disposal Facility, the first permanent facility to be built in the FRG, was to continue according to a ruling by the Lüneburg (Lower Saxony) Court; work had been halted previously by a lower court in Stade. The FRG's atomic wastes are to be buried underground in salt mines there. Plans for an adjacent fuel reprocessing plant remained blocked by the courts.

A permit was issued for the construction of the first phase of a uranium enrichment plant at Gronau by the Government of North Rhine Westphalia. The plant was to be built by the Uranit-Uran-Isotoptrennungs Gesellschaft mbH and funded by the Federal Ministry for Research and Technology, together with the United Kingdom and the Netherlands. The plant's first stage is to have a capacity of 1,000 tons of separative work units.

In 1981, the FRG had 15 nuclear powerplants in operation with a total nominal gross capacity of 10,358 megawatts (electrical). Another 10 nuclear powerplants were under construction, with a total nominal gross capacity of 11,329 megawatts (electrical), and another 10 nuclear powerplants were in various planning stages with a total nominal gross capacity of 13,898 megawatts (electrical). In 1981, the plants in operation generated 53.4 billion kilowatt-hours, about 21.7% more than in 1980. Nuclear power contributed 17.4% to the generation of the public electricity supply system, which itself supplied 83% of the total electricity supply in the FRG.

Petroleum and Natural Gas.—Production trends continued, with a decrease of crude

oil and an increase of natural gas production in 1981. Drilling activity increased 11% above that of the previous year. Of 89 development holes, 60 resulted in oil or gas finds. Of 27 exploration holes, 7 struck oil or gas. The planned oil drilling by the German North Sea Group (10 companies) in the German sector of the North Sea did not start as planned owing to a delay in the completion of the chartered drilling platform "Dyvi."

In 1981, Saudi Arabia was the country's leading supplier of crude oil, followed by North Sea oil, (Norway, United Kingdom, and Denmark), and in third place, Libya.

Starting with January 18, 1982, royalty rates for oil and gas production were to be raised in the FRG from 22% to 32% in most of the German Länder, notably in Lower Saxony, where 90% of the oil production occurs.

In 1981, the FRG had 25 companies operating 37 oil refineries with a total capacity of 141 million tons per year (throughput). Six of the refineries were being rebuilt or expanded during 1981. In 1981, the FRG's refinery capacity utilization was 57.1%.

Crude oil reserves at the beginning of the year were estimated at 47 million tons. Total resources were estimated at 70 million tons.

A group of gas companies led by Ruhrgas AG signed a preliminary agreement to import 10.5 billion cubic meters of natural gas per year from the Soviet Union starting with 1984. Previously, contracts had been signed for supplying the pipe and compressor stations for the $15 billion, 5,000-kilometer Yamal pipeline.

Important natural gas deposits were found near Sohlingen, south of Hamburg, by the Brigitta & Elverath Management Co., owned by a consortium consisting of the Mobil Oil Co., Texaco, and Wintershall AG. Reserves were estimated at 40 to 60 billion cubic meters out of total FRG reserves estimated at 289 billion cubic meters; total resources were 316 billion cubic meters.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted to U.S. dollars from Deutsche marks (DM) at the rate of DM2.2392 = US$1.00 for 1981.

[3]Bergbau. October 1981, pp. 649-658.

The Mineral Industry of Ghana

By Ben A. Kornhauser[1]

The mineral industry of Ghana in 1981 deteriorated even more than in previous years, owing to the growing unmanageability of the general economy. Ghana was faced with many interlocking, synergistically debilitating problems. These problems included a low rate of capital formation; triple-digit inflation; increasing budget expenditures and deficits; an overvalued currency; shortages of commodities, industrial raw materials, and spare parts; declining export earnings from cocoa and diamonds; a shortage of foreign exchange; and rising oil import costs.

In 1981, the estimated gross domestic product (GDP) was $21,255 million,[2] a 55% increase over the GDP in 1980.[3] However, if the GDP was considered in constant 1975 dollars, the estimated GDP in 1981 was $1,862 million, and there was no increase in GDP over that of 1980. The value of the minerals produced was reported at $517 million, of which gold and diamonds contributed about $158 million of the mineral wealth produced. Cocoa sales, although decreasing, still were the backbone of the economy, accounting for about 10% of GDP and 60% of export earnings.

For the 1981 fiscal year ending June 30, 1981, Government expenditures reached $3.3 billion compared with revenues of $1.6 billion. Prime contributors to this large deficit were a 300% increase in the minimum daily wage in the fall of 1980 and a shortfall in cocoa export earnings of about $400 million.[4] The increase in the fiscal year 1981 wages from $1.44 to $4.32 for about 300,000 civil servants represented about 40% of total Government expenditures. Ghana's inflation kept soaring. Its 1980 average consumer price index (CPI) was about 50% higher than that of 1979. In 1981, the CPI was 116% higher than that of 1980.

Except for the continued petroleum operation of the Agri-Petco Co., very little U.S. or other foreign investments were made in recent years. The new 1981 Investment Code, Act 437, was approved by Parliament in July 1981 to attract greater private foreign investment into priority investment areas, which included mining and oil and/or gas exploration. The emphasis of the code was on developing Ghana's production sectors, using its existing raw materials and enterprises, strengthening its balance of payments, increasing employment, locating enterprises in rural areas, and providing new technology and skills to its work force. Main incentives for new investment were exemption from company tax until the initial risk capital was recovered, exemption from import duties on machine and spare parts for the first 5 years, and guarantees of management control. However, at 1981 official exchange rates, high cedi costs influenced decisions to invest in projects.

Ghana's relatively good transport system of the 1950's and 1960's deteriorated owing to years of neglect and insufficient funding for maintenance and equipment. The highway system consisted of approximately 7,700 miles of trunk roads, 8,500 miles of feeder roads, and 450 miles of village roads, each under a separate authority. The worsening condition of the roads, coupled with a lack of adequate vehicles and spare parts, seriously affected the transport of agricultural and mineral products, and contributed to the increasing inflation of food and material prices.

The Ghana Railway Corp. underwent a major reorganization. In July 1981, the World Bank signed a $29 million International Development Agency loan to rehabil-

itate and to provide technical assistance in improving its management. The African Development Bank supplied an additional $13 million, but the project is under Canadian and Indian technical supervision. A new rail line from Tema to the Akosombo dam port on the Volta Lake was under consideration to increase lake transport.

The condition of Ghana's two seaports, Tema and Takordi, also declined in recent years owing to old, inefficient cargo handling techniques that delay offloading and onloading.

PRODUCTION AND TRADE

Although the GDP in 1981 was an estimated $21,255 million, it was stagnant. The overall value of the reported mineral production in 1981 was essentially the same as that in 1980. The decline in the values of diamond and gold of about 50% and 30%, respectively, were compensated by the increased values of aluminum and cement of approximately 20% and 55%, respectively. In 1981, export earnings were about $766 million or 34% lower than that of 1980. The lower export value was a major factor in the continued deterioration of Ghana's balance of payments and caused a negative balance of trade of about $100 million. The lack of foreign exchange compounded the problems of industrial and mining companies by drastically reducing their imports of commodities, parts, equipment, and services necessary for the operation of their plants and mills.

The black market exchange rate of the Ghanaian new cedi (Nc), Nc40=US$1.00, was about 15 times the official rate. This unrealistic exchange rate, among other factors, distorted the trade balance and the economy by reducing profit margins on some products and by causing the price of some goods to exceed world prices. Net uncommitted foreign reserves thus practically disappeared, reducing Ghana's ability to pay its short-term external trade and service bills, blocked remittances, and equity payments. Strict controls in import licenses were imposed to improve the situation.[5]

At the end of 1981, Ghana's external debt reached $1.6 billion, of which $485 million were short-term external arrears consisting of trade and service bills, overdue remittance, and unpaid equity purchases. These short-term arrears could exceed $600 million by mid-1982.

Ghana's oil imports still consumed from 30% to 40% of its external earnings. Rationing of domestic refinery products plus illegal activities in the distribution of these products created shortages in various sections of the country.

Ghana's largest trading partner was the United States. United States-Ghana trade in 1981 reached almost $400 million, about 20% higher than in 1980. U.S. exports to Ghana in 1981 amounted to $153 million or $26 million more than in 1980. About 60% of Ghana's exports to the United States in 1981 consisted of aluminum from the Volta Aluminum Co. (VALCO), the U.S.-owned aluminum smelter that was the largest U.S. investment in Ghana. Other countries with which Ghana traded included the Federal Republic of Germany, the German Democratic Republic, Japan, Nigeria, Norway, Romania, and the United Kingdom.

Ghana's critical foreign exchange situation affected the payment of overdue loans to aid donors. In many cases, the amount of foreign assistance declined or stopped because the conditions under which the aid was granted were not being met. Other countries, such as China, Libya, and Cuba, provided or intended to provide assistance also. Western countries, particularly the United States, the Federal Republic of Germany, Canada, and the European Communities, focused their financial assistance on agriculture, which still was the most important sector of the Ghanaian economy.

The Kuwait Fund for Arab Economic Development loaned $14.5 million to Ghana to build an electrical powerplant. The loan, which was Kuwait's second to Ghana, was repayable over 15 years at 4% interest.[6]

Table 1.—Ghana: Production of mineral commodities[1]

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
Aluminum:					
Bauxite, gross weight ____ metric tons	[r]279,200	[r]327,900	[r]235,300	225,100	181,257
Metal, smelter, primary ____ do	153,468	111,364	168,727	187,667	190,496
Cement, hydraulic ____ thousand metric tons	[r]565	[r]489	[r]248	294	401
Diamond:					
Gem ____ thousand carats	230	[e]142	[e]125	[e]126	NA
Industrial[e] ____ do	1,717	1,281	[r]1,101	1,023	NA
Total ____ do	1,947	1,423	[r]1,226	1,149	836
Gold ____ thousand troy ounces	481	402	[r]357	353	341
Iron and steel: Crude steel ____ metric tons	15,000	10,000	5,000	[e]5,000	NA
Manganese ore and concentrate, gross weight do	[r]292,400	[r]316,700	[r]253,800	249,900	233,146
Petroleum:					
Crude ____ thousand 42-gallon barrels	--	285	556	650	NA
Refinery products:					
Gasoline ____ do	1,928	2,231	[e]2,200	[e]1,830	
Jet fuel ____ do	392	309	[e]300	[e]260	
Kerosine ____ do	747	1,046	[e]1,000	926	
Distillate fuel oil ____ do	2,531	2,455	[e]2,400	2,115	NA
Residual fuel oil ____ do	2,589	2,080	[e]2,000	NA	
Other ____ do	92	137	[e]130	NA	
Refinery fuel and losses ____ do	384	393	[e]390	NA	
Total ____ do	8,663	8,651	[e]8,420	[e]8,500	NA
Salt[e] ____ metric tons	50,000	50,000	50,000	50,000	50,000
Silver, mine output, metal content thousand troy ounces	NA	19	20	[e]20	20

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through Sept. 2, 1982.
[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) are produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

COMMODITY REVIEW

METALS

Aluminum.—Ghana granted an international consortium $4.5 million for the first phase of a program for the development of the Kibi bauxite alumina project. Brown and Root, Inc., of Houston, Tex., was the general manager of the project; project members included Granges International Mining, A.B., of Sweden and Bankers Trust International of the United Kingdom. Granges International was to be responsible for the mine development of the Kibi project; Bankers Trust was to be the financial adviser; and Brown and Root's subcontractor, Swiss Aluminum Ltd. of Switzerland, was to provide ore testing and process technology. The 16-month study was to determine the feasibility of producing alumina from a bauxite deposit at Kibi, 150 kilometers north of Accra, for domestic use and export. The consortium was to review conclusions of two previous feasibility studies that placed measured deposit reserves at 190 million tons of medium-grade ore averaging 45% Al_2O_3.

The project comprised a four-phase program for the development of an open pit bauxite mine, the design and construction of a plant to extract 800,000 tons per year of alumina from the bauxitic ore, the design and construction of its supporting infrastructure, and the financial implementation of the program. Phase one was the project development plan and report. It included the establishment of ore reserves and mining method, selection of process and design criteria, site investigation, personnel skill survey, training programs, preliminary engineering, estimates of capital and operating costs, an economic analysis and financing plan, and a plan describing the development of the subsequent project phases.

Phase two involved the commercial and financial implementation of the development plan. It consisted of the activities required to determine and implement the financial plans that were then to become firm commitments to finance the construction of the facilities and marketing plans that were to become sales contracts for a substantial portion of the alumina production.

Phase three was the technical implementation of the development plan. It included all the project management, engineering, procurement, construction of the mine, alumina plant, and infrastructure facilities,

plus personnel training required to operate these three areas. Operation of all the facilities was to commence during this phase.

Phase four involved plant operations and personnel training. It was to include accelerating to full design capacities for bauxite mining and alumina production. Training of management, operating and maintenance personnel also was to be accelerated so that Ghanaian personnel replaced expatriate personnel gradually.[7] The alumina refinery was to be about 7 kilometers from the mine with startup projected for the third quarter of 1985.

A state-run firm, Kibi Bauxite Development Co., was to manage and operate the plant once production begins. The owners of the firm, with equal shares, were Ghana's Aluminum Industries Commission, Granges Aluminum, and Brown and Root.

Gold.—An international seminar on Ghana's gold resources, held in Accra on January 6-8, 1981, attracted some 50 participants from foreign countries. Attention was drawn again to Ghana's large gold deposits, the abundance of which centuries ago caused the country to be called the Gold Coast. France, through its Caisse Centrale de Cooperation Economique, agreed to loan Ghana $6.7 million to rehabilitate the Tarkwa gold mine, which now produces under 2 tons per year of gold metal. Reportedly, in the 1950's, the mine produced around 24 tons per year of gold metal. With modernization, in 10 years, production of 60 tons per year of gold metal is thought to be possible.[8]

Ghana was optimistic about establishing a number of large-scale gold mines to exploit its gold resources, the potential of which was in their relative richness, purity, accessibility, and ease of recovery. The two main gold sources were alluvial and eluvial placers and banket reef gold in the rock types of the Birrimian and Tarkwian systems. Gold also probably was reclaimable from existing tailings dumps. To increase gold production, foreign investment and assistance were needed to augment domestic efforts. Ghana had allegedly lost considerable export and tax revenue through illegal gold mining and smuggling.

Of the approximately 335,000 troy ounces of gold produced in 1981, the State Gold Mining Corp. (SGMC), wholly owned by the Government, produced about 75,000 troy ounces and the Ashanti Goldfields Corp. (AGC), owned by SGMC (55%) and Lonhro Ltd. of the United Kingdom (45%), its manager, produced about 259,764 troy ounces. Production in 1981 decreased about 5% from the 353,038 troy ounces produced in 1980 and continued the declining trend from Ghana's gold-output peak of 915,000 troy ounces in 1960. In 1981, gold export earnings were estimated at $160 million or approximately 23% of the total exports that year. The SGMC had become very inefficient and a losing proposition because of labor problems, smuggling, depletion of some reserves, and insufficient importation of capital equipment, materials, and spare parts. In 1981, the Limann Government established a Gold Action Committee to promote development and investment in the gold sector. Among the recommendations of the committee were reduction of taxes, joint ventures, legalization of small-scale mining to reduce smuggling, enclave operation including free port status and external accounts for the two present companies, and the establishment of 14 new mines over the next 15 years.[9] U.S. companies had expressed interest in exploring for gold in Ghana.

Manganese.—The manganese roasting and nodulizing plant to process manganese carbonate ore at Nsuta was scheduled to be online at yearend. The plant, constructed by the Fuller Co. of the United States, was designed to process 1,000 to 1,100 tons per day of carbonate ore. The carbonate ore was mined and processed to supplement the declining manganese oxide ores that were nearing depletion. Reserves of manganese carbonate ore, based on limited drilling, were estimated at 20 million tons of 30% manganese. The Nsuta Mine, operated by the Ghana National Manganese Corp., was a mechanized, relatively modern, open pit operation with a 3,000-ton-per-day capacity. The mine was located in the Tarkwa district in southern Ghana, about 60 kilometers by connecting railroad to the seaport of Takoradi.[10]

NONMETALS

Diamond.—The Government of Ghana underwrote another loan for about $3.5 million to Ghana Consolidated Diamonds Ltd. (GCD) to assure the continued operation of the Akwatia diamond mine, currently Ghana's only diamond producing mine. GCD was owned by the Government (55%) and Consolidated African Selection Trust of the United Kingdom (45%), which managed the company. The mine has been in operation since 1924 with its reserves of

primarily industrial-grade bort expected to be depleted within the next 2 years. The hopes of profitability were dimmed by many factors such as low diamond prices, increasing operating costs owing to old equipment and lack of spare parts, loss of managerial and skilled personnel, diminishing grade of reserves, and the rate of exchange. The future of the mine depended on large investments to upgrade the equipment and to locate better grades of diamond reserves.

India concluded a bilateral trade agreement with Ghana to purchase rough diamonds valued from about $3 to $6 million.

MINERAL FUELS

Petroleum.—The Tema refinery, which had been in operation for 18 years, closed in March for more than a month for maintenance work.[11] In mid-1981, Agri-Petco, which produced petroleum at offshore Saltpond, reported production at the rate of only 1,800 barrels per day because of technical problems. In 1981, Agri-Petco produced 40,500 barrels of petroleum products, of which one-fourth was consumed domestically. The Phillips Petroleum Co. prospected for oil in the Western Region, hoping to find small pockets in which the total output would be worthwhile.[12] Several other U.S. companies had expressed interest in exploring for oil in Ghana.

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[1]Metallurgist, Division of Foreign Data.

[2]Where necessary, values have been converted from Ghanaian new cedi (Nc) to U.S. dollars at the rate of Nc1 = US$0.36. Since the official exchange rate does not reflect the true value of the Ghanaian currency, the converted values must be viewed cautiously.

[3]U.S. Embassy, Accra, Ghana. Economic Trends Report, July 1982.

———. State Department Airgram A13, June 2, 1982.

[4]First work cited in footnote 3.

U.S. Embassy, Accra, Ghana. State Department Airgram A20, Aug. 3, 1981.

[5]Second work cited in footnote 4.

The Financial Times (London). Section 3, May 13, 1981, p. 3.

[6]Paris AFP 1052 GMT. May 17, 1981.

[7]Mining Magazine. September 1981, pp. 153, 155.

[8]Metal Bulletin Monthly. No. 30, October 1981, p. 143.

[9]Paris Marches Tropicaux et Mediterraneens. May 1, 1981, p. 1251.

[10]National Materials Advisory Board. Rept. NMAB374, 1981, pp. 180, 182.

[11]Work cited in footnote 9.

[12]Accra Ghanaian Times. June 5, 1981, p. 1.

The Mineral Industry of Greece

By Walter G. Steblez[1]

The Greek economy in 1981 continued to exhibit a declining trend under the impact of inflationary and recessionary pressures as well as an increased oil import bill. The Greek gross national production (GNP) was forecast to grow by only 1% in 1981, down from roughly a 6.4% increase in 1978. The recession, which began at the end of 1979, continued well into 1981, and the inflation rate, twice that of the European Economic Community (EEC) average, was about 25%, in contrast with the 13% annual average rate during 1975-78.

The Greek capital market showed a corresponding decline during the year; the Athens Stock Exchange price averages declined during January-September by 15% compared with the corresponding 9 months in 1980. There was reportedly, on the other hand, a substantial increase in transactions in the mining and metallurgical sectors of the economy, as well as in chemicals and construction materials, except for cement transactions, which declined slightly compared with the same period in 1980. Mining and metallurgy's share of the GNP remained at about 7% in 1981. A noteworthy development in 1981 was Greece's entry into the EEC as a full member, which followed an 18-year association with this body, and a gradual adjustment of policies with those of the EEC.

Government Policies and Programs.—Policies and programs of the Greek Government included domestic legislation to aid the development of the country's industrial base, including mining and metallurgy.

In compliance with EEC regulatory policies, the Greek Government introduced export controls on January 1, 1981, on nonferrous scrap such as copper, zinc, and tin sold outside the EEC. Export quotas for these commodities, as well as for aluminum and lead, were not set; however, their non-EEC export became subject to prior approval by the Bank of Greece.

In 1981, new legislation, Law 1116-81, was adopted to stimulate foreign and domestic investment incentives in less developed areas of Greece by means of Government interest rate subsidies, loans, increased depreciation rates on fixed capital, etc. Law 1116-81 divided Greece into three development areas. The first, the least favored and most highly industrialized area, included the Attica district and the Thessaloniki Province. The second area, with moderate industrial development, included territory from the northern Peloponnesos stretching north of Attica to the eastern part of the mainland and the island of Euboea. The third, the least developed and most favored area, covered the rest of Greece. Mining enterprises were favored under this law by being allowed the highest depreciation rates for both the second and third developmental areas. The legislation also allowed grants of up to 50% of the investment costs to help stimulate investment capital flow into the economy. The grants were aligned with EEC's regional development fund and provided, between March and July 1981, $100 million in grant assistance for 123 investment projects valued at about $300 million.[2] Nonmetallic mining, metallurgy, and the tourist sectors received investment grant shares under the provisions of this law.

Despite these measures, the Greek Association of Mining Enterprises felt that Law 1116-81 insufficiently addressed the problem of markets for Greek mine output caused by worldwide economic recession. The association called for more comprehensive long-term Government policies in mining and mineral processing and research.

In 1981, as in 1980, the Greek Government continued to promote the integration of domestic mining, processing, and fabrication as well as exploration by state-controlled agencies for lead-zinc ore, gold, chromite, bauxite, phosphate, lignite, and other industrial mineral deposits.

In the energy field, the Greek Government pursued policies of decreased consumption of imported petroleum and increased reliance upon domestically produced lignite. Development of alternate energy sources such as geothermal, wind, and solar power was planned as well.

PRODUCTION

The Greek Government, since 1974, had been assuming a more active role in the development of the country's material resource base. Fossil fuels were produced by Government-owned public corporations, and state involvement in the exploration and production of other mineral resources increased steadily. In 1981, the mining and processing industries of Greece were operated by both private and public sectors of the economy. During the same year, there were reported 150 state-owned producing mines and 1,100 privately owned mines. Of the privately held mines, 110 were fully operational and 550 were reported to be under development. Unfavorable world market conditions in 1981 adversely affected most branches of the Greek mining industry with few exceptions, such as bauxite mining.

A number of problems pertinent to the production and end use of ore were identified by Greek business sources.[3] They were: (1) Low secondary technical education standards that have resulted in a lack of midlevel technical personnel qualified in the use of advanced machinery and equipment; (2) less than adequate survey, exploration, and analysis of domestic ore deposits, and (3) the generally slow pace of vertical integration of the Greek mining industry with the industrial sector producing finished products; notable exceptions to this point were the aluminum and magnesite industries which achieved the highest level of integration in the mineral industry. Table 2 indicates the relative level of vertical integration of the Greek mineral industry. The vertical integration of the country's mineral economy continued to be promoted in 1981 with the intention of increasing the value added of the Greek marketable mine production.

Table 1.—Greece: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum:					
Bauxite, gross weight ----- thousand tons	r2,885	r2,663	r2,812	3,286	3,300
Alumina, gross weight ----------do----	474	r477	495	494	500
Metal:					
Primary ----------	129,700	143,800	140,830	146,500	147,000
Secondary ----------	6,000	5,800	6,500	7,116	7,000
Chromium:					
Chromite:					
Run-of-mine ore ----------	r72,275	r71,000	r86,843	77,855	80,000
Marketable products:					
Direct-shipping ore[e] ----------	8,000	7,000	10,000	8,000	8,000
Concentrate ----------	33,450	r30,300	r34,767	34,568	34,600
Copper, mine output, metal content ----------	3,500	1,500	--	--	--
Iron and steel:					
Iron ore and concentrate, nickeliferous:[3]					
Gross weight ------- thousand tons	2,050	1,685	1,832	1,451	1,400
Iron content ----------do----	881	725	788	624	600
Metal:					
Pig iron ----------do----	440	600	328	e350	350
Ferronickel ----------	35,593	55,137	54,192	51,407	51,000
Crude steel ------- thousand tons	759	936	1,000	e1,000	1,000
Semimanufactures[4] ----------do----	e650	e650	1,450	NA	NA
Lead:					
Mine output, metal content ----------	16,400	20,300	21,700	20,504	21,000
Metal, refined:[5]					
Primary ----------	r14,502	r15,600	r15,640	21,067	21,000
Secondary ----------	e4,200	e5,600	6,000	4,000	4,000
Manganese, gross weight:					
Ore, crude ----------	r71,496	r81,068	r77,360	60,050	60,000
Concentrate ----------	r9,592	7,010	r5,700	5,555	5,500
Nickel:					
Ni content of nickeliferous iron ore[6] -------	22,550	18,535	20,152	15,237	15,600

See footnotes at end of table.

Table 1.—Greece: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS —Continued					
Nickel —Continued					
Ni content of alloys	9,600	14,192	[e]18,900	13,880	14,000
Silver:					
Mine output, metal content thousand troy ounces	1,070	1,360	1,752	1,672	1,600
Metal content of alloys[e] do	500	500	500	NA	NA
Tin metal, secondary[e]	30	30	30	45	45
Zinc:					
Mine output, metal content	18,000	25,600	[r]23,200	27,100	27,000
Metal, including secondary	[e]10	[r]12	--	300	NA
NONMETALS					
Abrasives, natural: Emery	6,500	8,000	9,300	9,300	9,300
Asbestos[e]	35	40	NA	NA	20,000
Barite:					
Crude ore	[r]91,556	[r]110,838	109,344	98,529	100,000
Concentrate	[r]86,954	44,691	48,007	48,200	48,000
Cement, hydraulic thousand tons	10,584	11,280	12,098	[e]13,150	13,500
Clays:					
Bentonite:					
Crude	[r]537,072	[r]408,729	[r]495,176	501,878	502,000
Processed	[r]353,874	[r]279,788	[r]373,304	362,013	360,000
Kaolin:					
Crude	[r]60,484	[r]47,648	[r]32,803	42,546	42,500
Processed	[r]11,726	[r]12,777	9,485	11,489	11,000
Fluorspar, grade unspecified	500	610	360	400	[7]292
Gypsum and anhydrite	[r]621,643	[r]544,837	[r]604,299	[e]460,000	500,000
Magnesite:					
Crude thousand tons	[r]1,083	[r]975	[r]1,219	1,167	1,200
Dead-burned	[r]364,750	[r]284,509	[r]392,489	397,962	400,000
Caustic-calcined	[r]78,958	[r]94,330	[r]112,172	114,000	115,000
Nitrogen: N content of ammonia	225,000	229,000	287,000	226,000	225,000
Perlite:					
Crude	[r]237,110	[r]221,277	[r]279,660	278,912	280,000
Screened	[r]142,331	[r]150,392	[r]171,014	147,654	150,000
Pozzolan (Santorin earth) thousand tons	1,256	1,420	1,120	[e]1,500	1,500
Pumice	568,292	750,152	628,032	[e]630,000	625,000
Pyrites, gross weight	128,556	146,870	150,951	147,298	147,000
Salt, all types thousand tons	190	133	135	121	120
Silica (probably silica sand)	25,448	26,162	27,000	[e]28,000	28,000
Sodium compounds:					
Sodium sulfate	6,322	6,280	7,610	10,870	11,000
Sodium carbonate[e]	1,000	1,000	1,000	1,000	1,000
Stone: Marble cubic meters	NA	250,000	NA	NA	250,000
Sulfur:					
S content of pyrites thousand tons	54	61	63	61	60
Byproduct of petroleum do	3	3	3	4	7
Talc and steatite	--	1,078	--	1,460	1,400
MINERAL FUELS AND RELATED MATERIALS					
Coal including briquets:					
Lignite thousand tons	23,572	21,779	23,617	23,207	[7]27,107
Lignite briquets do	90	73	70	97	110
Coke:					
Coke oven do	300	300	[e]310	[e]300	310
Gashouse do	15	12	15	15	15
Gas:					
Manufactured, gasworks million cubic feet	270	270	10	12	12
Natural do	NA	NA	NA	NA	[7]1,351
Petroleum:					
Crude thousand 42-gallon barrels	--	--	--	--	1,538
Refinery products:					
Gasoline do	8,458	10,668	10,812	9,690	[7]13,277
Jet fuel do	4,504	5,408	10,064	10,632	[7]12,976
Kerosine do	326	310	348	333	[7]357
Distillate fuel oil do	20,642	21,559	26,363	27,505	[7]29,407
Residual fuel oil do	33,087	35,418	46,679	41,772	[7]45,841
Lubricants do	467	731	756	535	[7]618
Other do	7,361	6,658	11,759	10,240	[7]3,400
Refinery fuel and losses do	3,668	4,789	5,852	4,060	[7]3,465
Total do	78,513	85,541	112,633	104,767	[7]109,341

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Sept. 7, 1982.

[2]In addition to the commodities listed, a variety of other crude construction materials (clays, sand and gravel, and stone) is produced, but output is not reported and available information is inadequate to make reliable estimates of output levels. Cobalt is also produced and is included with nickel.

[3]Ni content is also reported under Nickel.

[4]Black sheet, galvanized sheet, reinforcing bars, and wire only.

[5]Includes antimonial lead and hard lead.

[6]Also includes Co content.

[7]Reported figure.

Table 2.—Greece: Current status of vertical integration of the mineral industry

Ore	Sufficient deposits	Extensive exploration needed	Technical research underway	Vertical integration in stages[1]	Possibilities for further development
Alunite	X	-	-	-	Chemical industry.
Antimonite	-	X	-	-	Metal production.
Asbestos	X	-	-	1,2	
Barite	X	-	-	1	Expansion, increased exports.
Bauxite	X	-	X	1,2,3	Second alumina and aluminum plant.
Bentonite	X	-	X	1	Increased exports.
Chromite	X	-	X	1,2	Production of stainless steel and ferrochrome.
Copper ores	-	X	X	1	Increased exploration.
Dolomite	X	-	-	1	Production of MgO with seawater.
Emery	-	X	X	-	Increased exports, standardization.
Fluorite	-	X	-	-	
Gold	-	X	-	-	Gold production.
Gypsum	X	-	X	1,2,3	Production of building materials.
Heavy metals	-	X	-	-	Discovery of new deposits.
Iron ores	-	X	X	2	Import substitution.
Kaolin	X	-	-	1	Import substitutions and standardization.
Lignite	X	X	X	1	Production of fertilizers and energy.
Magnesite	X	X	X	1,2,3	Expansion.
Manganese ores	-	X	-	1	Import substitution.
Marble	X	-	-	1,2	Increased exports, standardization.
Mixed sulfide	X	-	X	1,2	Zinc and lead industry.
Nickeliferous ores	X	-	X	1,2	Expansion, new plant for nickel and stainless steel.
Perlite	X	-	X	1,2	Increased exports, standardization.
Phosphorites	-	X	-	-	Intensive exploration and exploitation.
Pozzolana	X	-	-	-	Expansion.
Pumice stone	X	-	-	1	Increased exports.
Pyrite	-	X	-	2	New sulfuric acid plant.
Rare earths	-	X	X	-	Discovery of new deposits.
Uranium	-	X	X	-	Production of uranium.

[1]Stage 1: Extraction, and in some cases, beneficiation; Stage 2: Metallurgy; Stage 3: Production of finished goods.

Source: Business and Finance, Athens. No. 165, Oct. 24, 1981, pp. 1-10.

TRADE

In 1981, the volume of trade declined by approximately 10%, while exports were down a sharp 17.2%, with respect to that of 1980. In particular, Greece suffered a steep 34% export decline to centrally planned economies, owing chiefly to the termination of certain commercial transaction conditions after Greece's entry into the EEC. Whereas overall exports to the EEC dropped 24.8% in 1981, Greek exports of ore to this market continued to rise in 1981 with respect to that of 1980 as a percentage of total exports. Ore exports to the EEC in 1979 constituted 5.26% of total exports to that market; in 1980, this share increased to 5.94%; and in 1981, it rose to 7.72%. Reportedly, in recent years the share of Greek mineral and metallurgical products constituted 15% of the country's total export volume.

The major mineral raw materials that Greece had to import in 1981 were petroleum, coal, phosphate, lead, and iron ore. Also, most of the mining machinery and equipment had to be imported.

Table 3.—Greece: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite thousand tons	r1,831	2,340	--	Romania 974; U.S.S.R. 586; France 214.
Oxides and hydroxides	266,882	203,175	--	All to Netherlands.
Metal including alloys:				
Scrap	r286	1,013	--	France 724; Italy 188; Netherlands 73.
Unwrought	r73,805	60,245	--	Italy 26,046; France 22,107; Lebanon 10,873.
Semimanufactures	r30,291	32,786	127	Saudi Arabia 8,559; West Germany 7,509; Italy 3,022.
Chromium: Chromite	29,140	32,319	--	West Germany 17,769; Italy 4,260; Netherlands 4,000.
Cobalt, oxides and hydroxides	18	--		
Copper:				
Matte and speiss	20	--		
Metal including alloys:				
Scrap	161	851	--	Spain 306; West Germany 233; Belgium-Luxembourg 227.
Unwrought	r61	129	--	Belgium-Luxembourg 115; Netherlands 6; Saudi Arabia 6.
Semimanufactures	r4,728	10,142	344	West Germany 2,984; Italy 1,591; Lebanon 1,001.
Iron and steel:				
Ore and concentrate excluding roasted pyrite	r231	--		
Roasted pyrite	50	22,603	--	All to Kenya.
Metal:				
Scrap	511	859	--	Italy 581; Netherlands 268.
Pig iron, sponge iron, powder, shot	20	16	--	All to Italy.
Ferroalloys: Ferronickel	65,526	49,468	--	West Germany 35,348; Finland 4,180; Canada 3,794.
Steel, primary forms	237,078	69,072	--	Italy 54,081; Iran 14,991.
Semimanufactures:				
Bars, rods, angles, shapes, sections	r96,915	167,712	--	Egypt 82,369; Syria 32,021; Algeria 15,410.
Universals, plates, sheets	47,338	173,120	--	Yugoslavia 66,764; Albania 18,776; United Kingdom 17,083.
Hoop and strip	4,619	10,788	--	Syria 3,590; West Germany 3,525; Cyprus 1,180.
Rails and accessories	17	75	--	Morocco 71; Libya 4.
Wire	1,369	4,382	--	Libya 3,248; Albania 496; Bulgaria 275.
Tubes, pipes, fittings	94,660	96,164	42,165	Libya 21,292; Albania 8,083; Iran 6,000.
Castings and forgings, rough	r80	11	4	Saudi Arabia 6; Tunisia 1.
Lead:				
Ore and concentrate	r32,840	39,124	--	Italy 15,705; Belgium-Luxembourg 10,000; Bulgaria 7,000.
Metal including alloys:				
Scrap	100	235	--	All to Italy.
Unwrought	121	550	--	Italy 500; Lebanon 50.
Semimanufactures	16	5	--	All to Saudi Arabia.
Magnesium metal including alloys, all forms	64	--		
Manganese:				
Ore and concentrate	200	750	--	All to Spain.
Oxides and hydroxides	15,118	13,126	2,298	Belgium-Luxembourg 2,558; U.S.S.R. 1,260; United Kingdom 1,238.
Nickel metal including alloys:				
Scrap	--	90	--	Netherlands 70; Belgium-Luxembourg 20.
Semimanufactures	r1,005	981	--	Egypt 683; Netherlands 297.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$3	--		
Silver:				
Waste and sweepings do	--	$199	--	Belgium-Luxembourg $132; Switzerland $67.
Metal including alloys, unwrought and partly wrought do	$1,254	$2,102	--	France $2,100; Saudi Arabia $2.
Tin:				
Ore and concentrate	5,365	30,325	--	Romania 24,900; France 5,425.
Metal including alloys:				
Scrap	47	--		
Semimanufactures	--	8	(1)	United Kingdom 7.

See footnotes at end of table.

Table 3.—Greece: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Uranium and thorium:				
Ore and concentrate value, thousands	--	$205	--	All to France.
Zinc:				
Ore and concentrate	r47,489	44,741	--	Italy 11,495; Bulgaria 9,048; Belgium-Luxembourg 8,000.
Oxides and hydroxides	--	7	--	All to Saudi Arabia.
Metal including alloys:				
Scrap	753	629	--	Italy 596; United Arab Emirates 33.
Unwrought and semimanufactures	86	42	--	Mainly to United Kingdom.
Other:				
Ores and concentrates	8,832	942	--	Yugoslavia 920; Spain 22.
Ash and residue containing nonferrous metals	25,516	88,208	--	Mexico 26,743; Saudi Arabia 21,683; Italy 15,379.
Base metals including alloys, all forms	--	106	--	All to Netherlands.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc.	r246,432	412,923	140,557	West Germany 150,044; United Kingdom 65,309; Netherlands 53,973.
Dust and powder of precious and semiprecious stones value, thousands	$172	$79	$62	West Germany $17.
Grinding and polishing wheels and stones	r76	55	--	Switzerland 18; France 13; Lebanon 11.
Barite and witherite	38,537	55,259	28,800	Nigeria 12,100; Saudi Arabia 6,750; Kuwait 6,749.
Cement thousand tons	4,271	5,222	--	Saudi Arabia 2,376; Egypt 724; Yemen Arab Republic 437.
Chalk	157	619	--	Saudi Arabia 342; Cyprus 203.
Clays and clay products:				
Crude	r464,051	485,449	--	Canada 149,452; Italy 60,173; Sweden 41,683.
Products:				
Nonrefractory	14,382	18,154	1	Saudi Arabia 10,145; Libya 2,926; Jordan 1,001.
Refractory including nonclay brick	41,261	43,340	--	Romania 12,645; West Germany 4,456; France 4,169.
Feldspar, fluorspar, leucite, nepheline	73	--		
Fertilizer materials:				
Crude	159	943	--	Jordan 500; Saudi Arabia 443.
Manufactured:				
Nitrogenous	2	--		
Potassic	200	500	--	All to Cyprus.
Other including mixed	r15,350	71,944	--	Algeria 29,850; China 20,530; Italy 7,830.
Gypsum and plasters	r5	19	--	All to Cyprus.
Lime	3,160	130	--	All to Cameroon.
Magnesite	r473,521	423,809	15,122	West Germany 107,001; Italy 74,179; Yugoslavia 40,640.
Pigments, mineral: Iron oxides, processed	1	--		
Precious and semiprecious stones other than diamond: Synthetic value, thousands	$2	$75	--	All to Albania.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	r39,851	51,452	471	Italy 11,635; Lebanon 9,112; West Germany 6,834.
Worked	r19,932	53,328	1	Saudi Arabia 31,409; Libya 8,007; West Germany 5,097.
Gravel and crushed rock	13,719	15,804	--	Libya 15,435; Lebanon 308.
Quartz and quartzite	18,420	27,013	--	Sweden 18,943; Norway 8,050; Lebanon 20.
Sand other than metal-bearing	--	12	--	All to Austria.
Sulfur:				
Elemental: Other than colloidal	10,756	2,046	--	Bulgaria 2,010; United Kingdom 36.
Sulfuric acid	26,637	162,927	--	Turkey 156,609; Albania 3,624; Syria 1,262.
Talc, steatite, soapstone, pyrophyllite	1,405	--		

See footnotes at end of table.

Table 3.—Greece: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other:				
Crude	r217,844	285,748	17	West Germany 107,007; France 48,892; United Kingdom 32,035.
Slag, dross, and similar waste, not metal-bearing	18,367	9,007	--	Norway 5,000; Netherlands 976; Italy 937.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	r3,835	6,126	--	France 5,661; Hungary 464.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	r34,152	33,572	--	Saudi Arabia 12,117; Libya 9,584; Cyprus 4,316.
MINERAL FUELS AND RELATED MATERIALS				
Coal: Lignite including briquets	21	45	--	All to Saudi Arabia.
Coke and semicoke	38,123	22,000	--	All to Spain.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	2,322	1,222	75	Italy 399; United Kingdom 314; Denmark 269.
Kerosine and jet fuel do	1,297	5,113	2,328	Netherlands 389; Portugal 256; France 233.
Distillate fuel oil do	3,211	2,904	1,044	France 405; Saudi Arabia 392; West Germany 341.
Residual fuel oil do	9,699	10,528	38	Italy 3,447; France 2,699; Netherlands 1,532.
Lubricants do	473	400	73	Egypt 134; Italy 52; Syria 47.
Other:				
Liquefied petroleum gas do	326	51	--	Cyprus 17; France 15; Egypt 13.
Mineral jelly and wax do	82	130	--	West Germany 93; Morocco 36.
Bitumen and other residues do	r304	1	--	Mainly to Cyprus.

rRevised.
[1]Less than 1/2 unit.

Table 4.—Greece: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	r5,877	6,502	--	Italy 6,007; Republic of Korea 495.
Oxides and hydroxides	r632	220	61	France 52; United Kingdom 42; West Germany 31.
Metal including alloys:				
Scrap	62	61	58	NA.
Unwrought	367	154	--	France 91; West Germany 53; United Kingdom 8.
Semimanufactures	r3,432	4,000	363	West Germany 1,258; France 780; Italy 774.
Chromium:				
Chromite	r2,449	6,932	--	All from Republic of South Africa.
Oxides and hydroxides	r127	133	2	West Germany 63; United Kingdom 39; East Germany 25.
Cobalt:				
Oxides and hydroxides	(1)	2	--	All from West Germany.
Metal including alloys, all forms	4	NA		
Copper:				
Matte and speiss	--	(1)	--	All from Italy.
Sulfate	1,296	NA		
Metal including alloys:				
Scrap	255	355	87	Libya 139; Lebanon 75; United Kingdom 18.
Unwrought	r24,731	24,958	(1)	Zambia 8,009; Chile 5,736; Belgium-Luxembourg 3,337.
Semimanufactures	r1,050	799	46	West Germany 288; United Kingdom 135; France 86.

See footnotes at end of table.

Table 4.—Greece: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Ore and concentrate	r390,590	288,463	--	Republic of South Africa 239,685; Venezuela 48,758.
Metal:				
Scrap	231,286	239,004	217,284	Bulgaria 15,071; Cyprus 2,183.
Pig iron including cast iron	15,014	9,512	--	U.S.S.R. 6,465; West Germany 1,094; Spain 997.
Sponge iron, powder, shot	r493	771	(1)	France 218; Italy 177; United Kingdom 175.
Ferroalloys	r15,146	13,931	11	Portugal 10,007; France 1,988.
Steel, primary forms	385,438	630,584	--	France 146,634; Brazil 104,292; Japan 81,890; Italy 76,050.
Semimanufactures:				
Bars, rods, angles, shapes, sections	217,111	207,360	9	France 51,401; Czechoslovakia 34,570; West Germany 26,843; Italy 24,656.
Universals, plates, sheets	180,859	208,611	950	Japan 48,288; West Germany 37,599; France 28,586; Czechoslovakia 22,387.
Hoop and strip	97,046	121,632	1,268	West Germany 39,252; France 33,338; Bulgaria 15,512; Czechoslovakia 11,033.
Rails and accessories	24,735	1,118	--	West Germany 396; Belgium-Luxembourg 303; Italy 213.
Wire	7,408	8,405	1	West Germany 3,212; Italy 1,371; Belgium-Luxembourg 1,146.
Tubes, pipes, fittings	31,524	31,318	127	West Germany 15,746; France 3,622; Italy 3,006.
Castings and forgings, rough	1,222	2,083	57	Belgium-Luxembourg 737; France 511; West Germany 435.
Lead:				
Ore and concentrate	3,468	7,022	--	Ireland 2,834; Greenland 2,686; Italy 1,502.
Oxides and hydroxides	r70	251	--	France 215; Bulgaria 15; United Kingdom 14.
Metal including alloys:				
Unwrought	r4,806	7,807	(1)	Tunisia 2,975; Bulgaria 2,423; Morocco 978.
Semimanufactures	r156	13	(1)	Netherlands 6; West Germany 5.
Magnesium metal including alloys, all forms	r518	503	73	France 317; Norway 87; Yugoslavia 24.
Manganese:				
Ore and concentrate	r4,721	29,278	--	Brazil 16,898; Republic of South Africa 12,380.
Oxides and hydroxides	54	108	--	Mainly from Belgium-Luxembourg.
Metal including alloys, all forms	140	NA		
Mercury 76-pound flasks	87	87	--	Turkey 58.
Molybdenum metal including alloys, all forms	1	1	(1)	Mainly from Austria and West Germany.
Nickel metal including alloys:				
Scrap	2	1	--	All from Netherlands.
Unwrought	r175	182	(1)	Canada 117; East Germany 22.
Semimanufactures	r43	58	(1)	United Kingdom 19; West Germany 18; Hungary 9; Italy 8.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$2,535	$1,595	$461	West Germany $556; Switzerland $416.
Silver metal including alloys, unwrought and partly wrought do.	$17,713	$6,443	$609	Switzerland $2,007; West Germany $1,973; United Kingdom $997.
Tin metal including alloys:				
Unwrought	799	468	--	Malaysia 206; Bolivia 198; West Germany 46.
Semimanufactures	15	19	--	West Germany 10; United Kingdom 7.
Titanium: Oxides and hydroxides	837	680	--	West Germany 378; France 137; Belgium-Luxembourg 121.
Tungsten metal including alloys, all forms	1	5	(1)	Austria 2; Sweden 2.
Uranium and thorium:				
Ore and concentrate value, thousands	--	$22	--	United Kingdom $17; Italy $5.

See footnotes at end of table.

Table 4.—Greece: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Oxides and hydroxides	446	606	(1)	France 219; Netherlands 215; West Germany 146.
Metal including alloys:				
Scrap	43	23	--	Bulgaria 18; Italy 5.
Unwrought	r20,941	18,812	--	Netherlands 5,834; Belgium-Luxembourg 2,614; Zaire 2,562.
Semimanufactures	189	154	--	Norway 59; Belgium-Luxembourg 43; West Germany 38.
Other:				
Ores and concentrates	r1,600	7,498	--	Republic of South Africa 3,982; Italy 1,176; Australia 1,094.
Ash and residue containing nonferrous metals	284	95	--	All from Kuwait.
Metals:				
Metalloids	r535	632	5	France 604; West Germany 21.
Alkali, alkaline-earth, rare-earth metals	1,609	2,080	--	Mainly from West Germany.
Base metals including alloys, all forms	r168	193	5	France 163; Belgium-Luxembourg 11.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	8	39	7	Italy 32.
Artificial: Corundum	r605	512	--	West Germany 214; France 157; Poland 60.
Dust and powder of precious and semiprecious stones value, thousands	$2,410	$3,215	$1,069	Belgium-Luxembourg $1,215; West Germany $537.
Grinding and polishing wheels and stones	346	277	6	Italy 91; West Germany 44; Austria 39; East Germany 39.
Asbestos, crude	15,214	14,181	5	Republic of South Africa 6,128; Cyprus 4,591; Canada 1,875.
Barite and witherite	110	137	--	Turkey 60; West Germany 57; United Kingdom 20.
Boron materials:				
Crude natural borates	501	600	600	
Oxide and acid	443	214	--	France 88; Italy 66; Netherlands 47.
Cement	127	770	--	Italy 620; Denmark 64; United Kingdom 33.
Chalk	971	580	--	Austria 311; France 140; United Kingdom 64.
Clays and clay products:				
Crude	r72,615	113,902	276	United Kingdom 67,453; Czechoslovakia 11,509; Italy 10,722.
Products:				
Nonrefractory	45,860	32,454	(1)	Italy 31,408; West Germany 561.
Refractory including nonclay brick	32,783	29,433	117	West Germany 8,434; Italy 4,830; France 4,255.
Cryolite and chiolite, natural	5	NA		
Diatomite and other infusorial earth	677	521	333	West Germany 165; Italy 16.
Feldspar and fluorspar	20,643	16,044	--	Norway 9,557; Italy 2,935; Kenya 2,000.
Fertilizer materials:				
Crude:				
Phosphatic	82,864	244,261	--	Morocco 150,482; Tunisia 83,432; Israel 10,336.
Other including mixed	--	1	--	All from Austria.
Manufactured:				
Nitrogenous	r120,820	73,547	--	Romania 26,802; Bulgaria 25,346; Italy 9,242.
Potassic	r9,116	50,475	--	West Germany 19,090; Spain 17,494; Belgium-Luxembourg 8,401.
Other including mixed	r211	3,538	--	West Germany 2,870; Belgium-Luxembourg 498.
Ammonia	r82,188	68,490	--	Libya 27,626; U.S.S.R. 17,937; Romania 9,920.
Graphite, natural	154	194	--	Czechoslovakia 82; Austria 50; Switzerland 40.
Gypsum and plasters	1,289	1,175	--	Italy 662; West Germany 386; France 80.

See footnotes at end of table.

Table 4.—Greece: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Magnesite	457	881	2	Austria 665; Yugoslavia 59; France 49.
Mica:				
Crude including splittings and waste	173	272	20	Austria 165; India 45; France 13.
Worked including agglomerated splittings	26	10	(1)	Japan 3; United Kingdom 3; Belgium-Luxembourg 2.
Pigments, mineral: Iron oxides, processed	r2,119	2,103	(1)	West Germany 1,521; United Kingdom 222; Italy 142.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$564	$191	--	Belgium-Luxembourg $117; Switzerland $24; Brazil $16.
Synthetic do.	$82	$14	--	West Germany $7; Austria $3.
Pyrites, unroasted	r14,413	69,977	--	Cyprus 31,622; U.S.S.R. 14,163; East Germany 12,705.
Salt and brine	r7,288	39,241	--	Romania 21,602; Italy 14,202; Tunisia 3,023.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	256	295	(1)	Italy 174; France 75; West Germany 29.
Caustic soda	r50,956	60,418	7	France 36,682; Bulgaria 17,623; Italy 6,022.
Soda ash	r33,871	31,025	299	Bulgaria 18,687; Belgium-Luxembourg 7,406; France 2,101.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	r10,709	2,843	(1)	Italy 1,074; Pakistan 914; Bulgaria 435.
Worked	r593	336	--	Italy 281; Mexico 33.
Dolomite, chiefly refractory-grade	r1,372	2,372	--	Italy 2,250; Austria 32; West Germany 31.
Gravel and crushed rock	665	791	--	France 341; Belgium-Luxembourg 297; West Germany 61.
Limestone other than dimension	--	30	--	West Germany 22; United Kingdom 8.
Quartz and quartzite	449	36	--	West Germany 25; United Kingdom 9.
Sand other than metal-bearing	111,930	126,993	59	Belgium-Luxembourg 108,921; Bulgaria 10,411.
Sulfur:				
Elemental:				
Other than colloidal	r58,503	41,187	--	Poland 24,712; Canada 16,182; Kuwait 189.
Colloidal	r339	49	--	West Germany 18; France 16; Italy 15.
Sulfuric acid	r15,712	58	--	Netherlands 28; West Germany 21; Italy 9.
Talc, steatite, soapstone, pyrophyllite	r1,776	2,267	4	France 882; Belgium-Luxembourg 473; Italy 197.
Other:				
Crude	r502	1,496	31	Gabon 66; Finland 173; Australia 149.
Slag, dross, and similar waste, not metal-bearing	r2,865	121,174	--	Italy 116,544; Turkey 2,640; United Kingdom 1,181.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	r155	57	12	Italy 21; West Germany 11; France 6.
Halogens excluding chlorine	3	2	--	West Germany 1; United Kingdom 1.
Building materials of asphalt, asbestos and fiber cements, unfired non-metals	r2,874	2,528	10	France 938; Italy 925; Romania 407.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	20	22	5	France 17.
Carbon black	1,437	798	12	West Germany 481; France 108; Italy 91.
Coal and briquets:				
Anthracite and bituminous coal	r454,440	480,684	47,874	Canada 311,952; Poland 99,071; U.S.S.R. 20,137.
Briquets of anthracite and bituminous coal	180	408	--	All from Czechoslovakia.
Coke and semicoke	r72,313	31,732	--	Italy 21,515; Czechoslovakia 5,505; Yugoslavia 2,844.
Hydrogen, helium, rare gases	r504	NA		
Peat including briquets and litter	r3,502	3,337	--	U.S.S.R. 1,942; Netherlands 1,083.

See footnotes at end of table.

Table 4.—Greece: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	114,078	75,370	--	Saudi Arabia 24,774; Egypt 21,659; Tunisia 13,379; Libya 9,208; U.S.S.R. 2,077.
Refinery products:				
Gasoline ---do---	165	46	--	United Kingdom 40; Netherlands 4.
Kerosine and jet fuel ---do---	1,082	154	(1)	France 121; Italy 23.
Distillate fuel oil ---do---	r1,005	732	--	Venezuela 268; Bulgaria 195; Italy 98.
Residual fuel oil ---do---	3,438	434	(1)	U.S.S.R. 171; Bulgaria 162; Romania 59.
Lubricants ---do---	489	501	7	Netherlands 256; Italy 74; United Kingdom 67.
Other:				
Liquefied petroleum gas ---do---	7	(1)	(1)	
Mineral jelly and wax ---do---	r6	11	(1)	West Germany 7; Hungary 1.
Petroleum coke ---do---	318	439	439	
Bitumen and other residues ---do---	r245	120	--	Mainly from Albania.
Bituminous mixtures ---do---	2	2	(1)	United Kingdom 1.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r18,721	7,379	4	Egypt 3,984; United Kingdom 1,097; Netherlands 729.

rRevised. NA Not available.
1Less than 1/2 unit.

COMMODITY REVIEW

METALS

Metallic and nonmetallic mining and metallurgy, in no small way, helped shape the life and development of Greece for over 3,000 years; the earliest European treatise on minerals and metallurgy "Peri Lithon" (On Stones) had been attributed to Theophrastos, a pupil of Aristotle.

In 1981, out of occurrences of approximately 50 known mineral ores, about 20 were mined and underwent varying degrees of processing. The country produced both metallic and nonmetallic ores and mineral fuels, that for the first time included petroleum and natural gas. Private and Government-controlled producers of ores, fuels, and metallurgical products remained, for the most part, the same in 1981 as they were in 1980. The two notable exceptions were the virtual nationalization of Larco S.A. (Bodossakis Foundation), the country's chief nickel producer, and the proposed sale to the Greek Government of the Laurium mining operations (Companie Française des Mines du Laurium S.A.F.) by the controlling French firm, Penarroya.

Aluminum.—Greece remained the world's eighth largest producer of bauxite. The mineral was mined primarily in the mountainous regions of the central part of the country. According to the latest published sources, the proved and possible reserve base was about 650 million tons of ore, although other estimates have indicated a reserve base of up to 1 billion tons. The ore was of good quality, and was graded at an average of 56% Al_2O_3 and 4% SiO_2.

The Bauxite Parnasse Mining Co. S.A. of the Eliopolos Kyriacopoulos Group, the largest bauxite producer in Greece, came close to its planned 2-million-ton output for 1981 with a reported actual production of 1.8 million tons. The company's underground mine expansion program continued in 1981 with the objective of underground mining output reaching 50% of the total by 1982. Elsewhere, the second largest bauxite producer, Eleusis Bauxite Mines of the Scalistiris Group, was reported to have begun the development of a new mine at Lamia. Elikon Bauxite (G. Barlos S.A.) and the three mining subsidiaries of Aluminium de Grece S.A. (AG) remained the other leading producers, with a combined annual

capacity of over 900,000 tons, and were reported to have continued with their facility upgrading programs in 1981.

Despite a depressed world metals market and reduced domestic aluminum sales in 1981, demand for Greek bauxite increased owing reportedly to a rise in its use in steel production, as well as to reported Soviet stockpiling. Prices per ton of bauxite were expected to rise 25% in 1981 over those of 1980. As in previous years, most of the Greek bauxite was shipped to the Soviet Union and Romania; a substantially smaller amount was exported to the EEC. The remaining bauxite was used domestically by Aluminium de Grece S.A. (AG) to produce alumina and aluminum.

In April 1981, an agreement was concluded between the Soviet firm Tsvetmetexport and the Hellenic Industrial Development Bank (ETVA) for a Soviet feasibility study for the construction of a new 600,000-ton-per-year alumina plant in Greece. The Soviet plan to build this plant called for payment in alumina over a period of years. The issue of market guarantees for the plant's alumina production after the investment was repaid had reportedly caused some concern to the Greek authorities. A counter proposal from the Government of Iraq called for the construction of an integrated alumina-aluminum facility, which would be powered by Iraqi oil. Payment would be in primary metal. Iraq would also have a share of the sales to third parties in the event it could not domestically absorb the aluminum. No decision or firm commitment was reported on these proposals during the year.

The Greek primary aluminum industry, established in 1965 at Aspra Spitia, was wholly owned and operated by Aluminium de Grece S.A. (AG), a subsidiary of the nationalized Pechiney Group of France. The industry, adversely affected by a depressed world aluminum market in 1981 and by a 20,000-ton decrease in domestic sales with respect to that of 1980, was nevertheless able to increase output by 1,000 tons and exports as a percent of sales by 13%. This was largely owing to increased sales to the Middle East and to the EEC. Reportedly, Syria, Saudi Arabia, Jordan, and the United Arab Emirates contracted for about 50% of the exported aluminum.

Chromite.—Greek chromite ranges from 18% to 20% Cr_2O_3 at Xeralivado to 35% Cr_2O_3 in scattered podiform deposits. In 1981, work sponsored by the Greek Government, through ETVA and the Hellenic Industrial and Mining Co. (HIMIC), included groundbreaking in March for the 30,000-ton-per-year Tsigeli ferrochromium plant, near Volos.

The Tsigeli plant was planned to undergo scheduled trial runs by the end of 1982, and full startup of operations would begin in early 1983. Technology would be provided by Outokumpu Oy of Finland at a cost of $23 million to $28 million. The Hellenic Ferro-Alloy S.A., a HIMIC subsidiary in charge of Greek ferrochromium development, in parallel with the Tsigeli ferrochrome plant project, planned to begin construction of a chromium concentrator at Skoumtsa in late 1981 to produce concentrate with a 50% Cr_2O_3 content. The project was planned for completion at the beginning of the trial runs of the Tsigeli plant in 1982. United States and Swedish companies were reported as the main bidders for supplying equipment for this plant.

Iron and Steel.—Salient developments in the industry concerned the Metallurghiki Halyps Co. Facility expansion and improvement was begun that would eventually raise the company's plant capacity to 600,000 tons. This company also concluded an agreement through the Swiss firm Sytco to sell 100,000 tons of construction steel and 100,000 tons per year of pipe to the U.S.S.R. in 1981-85; the value of this sale was in excess of $300 million.

Lead and Zinc.—The Aegean Metallurgical Industries S.A., the former Hellenic Metals S.A. and a subsidiary of ETVA, did not proceed with its investment plans for the development of the lead-zinc sector in 1981 owing to the depressed world prices for lead, zinc, and silver. The firm was to produce a smelting facility in northern Greece for the production of lead and zinc as well as associated gold, silver, and other metals. Although the project was not abandoned, the Greek Government would require fuller study prior to its implementation.

The Kassandra lead and zinc mines on the Chalkidiki Peninsula reported on overall production increase for the year. Also, new but unspecified lead-zinc deposits were reported to have been discovered by the Kassandra mining operations, which are owned by Hellenic Chemical Products and Fertilizers Co.

At the end of 1981, Greece's oldest lead-zinc-silver mining operation, Companie

Française des Mines du Laurium S.A.F., a subsidiary of Penarroya of France, suspended its lead-silver operations, and offered to sell its assets to the Greek Government. Negotiations were reportedly conducted for Government acquisition of this firm. The company asked about $10 million in foreign exchange of which about $2.7 million would be used to settle outstanding debts.

Nickel.—Owing to very adverse international nickel market conditions, Larco S.A. of the Bodossakis Group, the country's largest nickel producer, suffered a 20% production cutback and inccurred a debt of over 800 million drachmas for the year. Late in 1981, Government banks foreclosed on the company and took about 80% of the company's equity to settle the debts, including a sum of $30.4 million that was borrowed at the beginning of the year at a 4% annual interest rate. Negotiations between the Government and Larco S.A. were reported to have begun in 1981 to create a new industrial concern with predominant Government financial control.

NONMETALS

Asbestos.—The ETVA-sponsored 5-million-ton-per-year open pit mine and 100,000-ton-per-year processing plant at Zidani in northern Greece were put into operation. The cost of the project exceeded $60 million. The asbestos reserves were estimated at 95 million tons with a 2.6% chrysotile fiber content. The export of the Greek asbestos fibers will be conducted through a Greek company working jointly with the PETROW Co., a firm specializing in world asbestos trade.

Magnesite.—The magnesite industry, as most other domestic mining industries, was hurt by adverse market conditions. The downward business trend began in the second half of 1980, and continued through the end of 1981. The depressed steel market as well as competition from North Korean and Chinese lower quality and lower priced products were some of the causes of this condition. In 1980, Larco S.A. of the Bodossakis Group closed its magnesite processing and sintering facilities at Troupi in northern Euboea. The industry's plan to lower production in 1981 was largely carried out. Furthermore, this trend was forecast to continue at least through 1982.

MINERAL FUELS

Lignite.—Greek authorities announced plans to increase the production of domestic lignite, as well as oil and gas, to reduce the country's reliance on imported sources of primary energy.

By yearend the Public Power Corp. had increased Greek lignite output by nearly 4 million tons per year. Exploration for new deposits continued at Ptolemais, Pyrgos, Aliveri, Megalopolis, and in Crete (Kandanos Area).

Petroleum and Natural Gas.—The Prinos offshore oilfields and gasfields began Greece's first production during the year. Production was expected to reach 30,000 barrels per day of crude oil and 18 million cubic feet of gas.

During the year the Greek Government awarded a license to the Italian firm AGIP S.p.A. that would allow this firm to conduct exploratory drilling in the Paxi area. Petroleum exploration during the year had mainly negative results.

Uranium.—Reportedly, a new uranium deposit was discovered at Arkoudorema. The deposit is apparently larger than the Paranestion deposit, also in the same area. The exploration of uranium in the Maramena lignite deposits was moderately successful with reserves there estimated at 4,000 tons.

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[1]Foreign mineral specialist, Division of Foreign Data.
[2]Where necessary, values have been converted from Greek drachmas (Dr) to U.S. dollars at the rate of Dr 56=US$1.00.
[3]Business and Finance, Athens. No. 165, October 24, 1981, pp. 1-10.

Table 5.—Greece: Primary energy balance for 1981

(Million tons of standard coal equivalent)[1]

	Total primary energy	Coal (lignite, anthracite, bituminous), coke, and briquets	Crude oil and petroleum products	Natural and associated gas	Hydroelectric and other power
Production	70.08	13.6	5.3	50.8	38.0
Exports	18.1	--	e18.1	--	--
Imports	14.6	1.0	13.6	--	--
Apparent consumption	66.58	14.6	.8	50.8	38.0

e Estimated.
[1]One ton of standard coal equivalent (SCE)=7,000,000 kilocalories. Conversion factors used are hard coal, 1.0; lignite and brown coal, 0.5; briquets 0.67; coke, 0.9; crude oil, 1.47; refinery products, 1.53; natural gas, 1.33 (per thousand cubic meters); manufactured gas, 0.6; and hydroelectric power, 0.125 (per thousand kilowatt-hours).

The Mineral Industry of Hungary

By Walter G. Steblez[1]

In 1981, Hungary's centrally planned economy showed signs of overall improvement compared with that of 1980. Although the planned 1981 targets for all major economic indicators were not met, actual performance shortfalls, in most cases, varied by narrow margins from their respective plans.

National income (gross national product less services) increased 1.8% versus the planned 2.5%, and industry's share of generated national income amounted to 49%. Industrial production rose 2.3% in 1981 versus the planned 3.0% to 3.5%. The mining sector's share of gross industrial production was 6.0% and that of metallurgy was 9.9%. The mining industry's labor force declined by about 8% in 1981 to approximately 113,000 workers, of which 17% were nonmanual and technical personnel; the country's labor productivity in the mining sector was reported to have dropped by about 2.4%; however, the wage scale remained the highest in industry and amounted to an average monthly earning of 6,642 forints.[2] The metallurgical sector's wage scale was the second highest in industry at 5,054 forints per month.

Government Policies and Programs.—The general aim of the Hungarian state planning bodies in recent years has been to increase the production of marketable industrial goods in accordance with Western quality standards. The often-stated ultimate aim of this program was the creation of some degree of currency convertibility of the forint with other Western convertible currencies. This would require the upgrading of Hungarian technology and industrial efficiency to Western European standards. Two of the problems that Hungarian industry had to face during the year were the need for increased energy conservation and alignment of its output with the depressed market conditions for a number of products, including metallurgical production. During the year, prices for petroleum increased 12%. The price of natural gas rose 15%, and that of coal and coke increased by 10% and 5%, respectively. The price of electricity went up 9%, and that of thermal energy increased by 11%.

Wage-incentive plans for 1982 included a stricter linkage of wage with measurable increases in productivity; wage increases would apparently be smaller than in the past but would also be less arbitrary. The existing wage rates, however, would still apply to coal and ore mining, ferrous metallurgy, and a number of other industrial areas.

The Hungarian national economic plan for 1982 called for a 1.0% to 1.5% increase of the national income compared with that of 1981. Industrial production was to grow by 2.0% to 2.5% over the same period. Per capita income and consumption would remain at approximately the same level as in 1981. It was also expected that the industrial labor force would decrease in 1982, but that production increases would stem from increases in productivity.

Major investments in the mining and metallurgical fields would continue in 1982 with ongoing new mine development and facility expansion in the bauxite mining industry. Industrial development was planned in both light and heavy metal production, in coking coal production, and in the nuclear energy field.

PRODUCTION

Owing to limited markets, production dropped in the mining, smelting, and construction-materials industries. The output of the Hungarian steel industry declined by 4% in the first half of 1981 compared with output during the corresponding period in 1980. Some production bottlenecks were allegedly caused by inadequate transportation, which caused inventories to rise excessively.

Also, shortfalls by the country's machine industry was reportedly one of the reasons only a moderate increase in industrial production was achieved during the year. Transportation manufacturing facilities were reportedly allowed to stagnate, while the branches producing communication equipment developed at a faster pace.

In 1981, Hungary's mineral industry continued to produce substantial quantities of bauxite and manganese ore, as well as some lead-zinc ores and uranium.

Table 1.—Hungary: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum:					
Bauxite, gross weight ----- thousand tons	2,949	2,899	2,976	2,950	[3]2,914
Alumina, gross weight ----------do----	783	782	788	805	[3]799
Metal, primary ----------	71,335	71,359	71,879	73,498	[3]74,253
Copper:					
Mine output, metal content[e] ----------	1,000	500	[r]100	--	--
Metal:					
Smelter, secondary[e] ----------	800	300	100	100	100
Refined including secondary[e] ----------	12,100	13,100	12,000	12,000	12,000
Gold, mine output, metal content[e] thousand troy ounces	115	60	60	• 60	[3]60
Iron and steel:					
Iron ore:					
Gross weight -------- thousand tons	525	534	532	426	[3]422
Iron content ----------do----	116	120	121	90	[3]88
Metal:					
Pig iron:					
For steel industry ---------do----	2,175	2,252	2,262	2,094	[3]2,065
For foundry use ---------do----	111	78	107	120	[3]128
Total ----------do----	2,286	2,330	2,369	2,214	[3]2,193
Ferroalloys:					
Ferrosilicon ----------	[e]6,800	[e]7,600	[r]7,726	10,390	10,500
Other[e] ----------	2,900	2,300	4,300	2,400	2,500
Total ----------	9,700	9,900	[r]12,026	12,790	13,000
Crude steel --------- thousand tons	3,723	3,877	3,908	3,764	[3]3,645
Semimanufactures, rolled only --do----	3,077	3,188	3,240	3,043	3,100
Lead:					
Mine output, metal content[e] ----------	1,200	1,100	1,000	1,100	1,000
Metal, refined, secondary[e] ----------	200	100	100	100	100
Manganese ore:					
Run of mine[4] ----------	160,637	156,181	130,871	134,472	135,000
Concentrate ----------	120,000	114,000	83,000	83,000	[3]83,000
Silver, mine output, metal content thousand troy ounces[e]	39	32	32	[r]33	33
Zinc:					
Mine output, metal content[e] ----------	3,000	2,800	2,600	2,800	2,000
Metal, smelter, secondary[e] ----------	600	600	600	600	600
NONMETALS					
Cement, hydraulic --------- thousand tons	4,620	4,764	4,857	4,660	[3]4,635
Clays:					
Bentonite:					
Raw ----------	80,003	82,211	72,488	77,685	77,600
Processed ----------	51,636	56,076	48,140	51,061	50,000
Kaolin:					
Raw ----------	71,455	68,199	63,457	51,839	50,000
Processed ----------	6,000	6,859	7,300	7,067	7,000
Lime, calcined ---------- thousand tons	743	740	74	698	700
Nitrogen: N content of ammonia ------do----	729	746	803	795	[3]818
Perlite ----------	103,270	92,630	97,895	99,270	99,500
Pyrites, gross weight[e] ----------	7,000	7,000	7,000	7,000	7,000

See footnotes at end of table.

Table 1.—Hungary: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Refractory materials, n.e.s.:					
Chamotte products ____ thousand tons	171	163	164	164	164
Chrome magnesite products ____ do	44	42	46	41	40
Sand and gravel:					
Gravel ____ thousand cubic meters	12,890	13,821	13,254	11,634	11,500
Sand:					
Common ____ do	288	279	415	406	400
Foundry ____ thousand tons	732	787	818	496	500
Stone:					
Dimension, all types ____ do	3	2	2	1	1
Other:					
Dolomite ____ do	1,173	1,171	1,304	1,200	1,200
Limestone ____ do	8,263	8,598	8,563	8,415	8,500
Quartzite ____ do	34	31	31	43	45
Sulfur:					
From pyrite[e] ____	3,000	3,000	3,000	3,000	3,000
Byproduct, elemental, all sources ____	8,004	8,633	9,412	9,293	9,200
Total ____	11,004	11,633	12,412	12,293	12,200
Sulfuric acid ____	632,632	643,795	587,948	589,834	[3]573,240
Talc[e] ____	16,000	17,500	17,500	17,500	17,500
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e] ____	5,000	5,000	5,000	5,000	5,000
Coal:					
Bituminous ____ thousand tons	2,925	2,954	3,002	3,065	[3]3,066
Brown ____ do	14,433	14,302	14,182	14,157	[3]14,463
Lignite ____ do	8,096	8,414	8,475	8,479	[3]8,413
Total ____ do	25,454	25,670	25,659	25,701	[3]25,942
Coke:					
Coke oven:					
Metallurgical ____ do	586	604	651	673	[3]645
Other[e] ____ do	170	170	170	170	170
Total ____ do	756	774	821	843	[3]815
Gashouse[e] ____ do	190	185	180	180	180
Total coke ____ do	946	959	1,001	1,023	[3]995
Fuel briquets ____ do	1,105	1,169	1,251	1,250	1,250
Gas:					
Manufactured ____ million cubic feet	20,376	19,811	18,152	19,317	18,000
Natural, marketed ____ do	253,464	259,420	230,286	216,902	[3]211,782
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	1,420	2,380	3,834	3,791	3,700
Liquefied petroleum gas ____ do	2,366	2,912	3,480	[e]3,600	3,500
Peat, agricultural use[e] ____ thousand tons	70	70	70	70	70
Petroleum:					
Crude:					
As reported ____ do	2,191	2,198	2,200	2,031	[3]2,024
Converted thousand 42-gallon barrels	16,717	16,771	16,405	15,497	[3]15,443
Refinery products:[5]					
Gasoline including naphtha ____ do	9,928	11,475	13,005	12,240	12,000
Kerosine and other light distillates[6] do	6,107	6,285	5,968	6,960	7,000
Distillate fuel oil ____ do	25,685	26,968	29,571	27,207	27,000
Residual fuel oil ____ do	23,543	24,549	26,440	21,758	21,000
Lubricants ____ do	1,229	1,121	1,134	1,090	1,000
Other:					
Liquefied petroleum gas ____ do	1,102	1,218	1,160	[e]1,100	1,000
Asphalt and bitumen ____ do	4,006	4,145	3,951	3,927	3,900
Paraffin and petrolatum ____ do	198	208	220	251	250
Total ____ do	71,798	75,969	81,449	74,533	73,150

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Sept. 2, 1982.

[2]In addition to the commodities listed, diatomite, gypsum, and a variety of other crude construction materials such as common clays are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]18% to 20% Mn.

[5]Excludes refinery fuel and losses.

[6]Data derived by subtracting reported motor gasoline and white spirit data from reported light refinery products total.

TRADE

The Hungarian foreign trade position showed overall improvement in 1981 compared with that of 1980, although the plan was not fulfilled. Total exports for the year rose by 6.4% compared with those of 1980, and imports increased by 4.7%. The country's incurred foreign trade deficit was reduced to 15 billion forints in 1981 from 19 billion forints in 1980. Trade with the Council for Mutual Economic Assistance (CMEA) bloc[3] increased by about 7.4%, and, reportedly, trade with the Soviet Union achieved the first surplus since 1974. On the other hand, exports to market economy countries dropped 3.0% compared with those of 1980, and imports were reduced by 0.9%; the percentage of total trade that was conducted with market economy countries in convertible currency declined by 2% to 45%.

In the CMEA bloc, the Soviet Union remained Hungary's largest trading partner; the second most important trading partner was the German Democratic Republic. In convertible currency trade, the Federal Republic of Germany remained Hungary's largest trading partner, followed by Austria.

In mineral commodity trade, depressed world prices in 1981 allowed Hungary to purchase metallurgical products, with the exception of zinc, at substantially lower prices than in 1980 but the same market conditions also reduced the export price of Hungarian rolled steel by 12% and foundry aluminum by 21% on the world market in 1981. However, in CMEA soft-currency trade, the export values for Hungarian-produced bauxite, alumina, and foundry aluminum as well as finished aluminum products and rolled steel increased from 19% to 27%, which, in part, reflected the import price increases for petroleum and gas as well as coal briquets. On the whole, Hungary's raw and other material import bill was about 12% higher in 1981 than in 1980.

Table 2.—Hungary: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:[2]				
Bauxite	595,687	541,943	--	Czechoslovakia 330,167; East Germany 141,306; Poland 70,205.
Oxides and hydroxides	701,444	693,838	--	U.S.S.R. 387,315; Austria 136,134; Poland 128,441.
Metal including alloys:				
Scrap	10,970	9,372	--	Italy 5,013; Austria 3,102; West Germany 1,223.
Unwrought	81,915	85,886	--	Poland 18,955; Czechoslovakia 17,807; East Germany 12,427.
Semimanufactures	27,241	28,861	--	East Germany 8,111; Sweden 3,708; France 2,061.
Cadmium metal including alloys, all forms	10	NA	--	NA.
Chromium:				
Ore and concentrate	2,918	NA	--	NA.
Oxides and hydroxides	[r]337	105	--	Italy 63; Finland 25; Yugoslavia 15.
Cobalt oxides and hydroxides	3	NA	--	NA.
Copper:				
Sulfate	560	414	--	West Germany 194; France 160; Austria 50.
Metal including alloys:				
Scrap	6,616	5,195	--	Austria 3,459; West Germany 1,611.
Unwrought	6,935	3,857	--	All to West Germany.
Semimanufactures	[r]2,421	3,566	144	West Germany 1,866; Austria 887; Italy 293.

See footnotes at end of table.

Table 2.—Hungary: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Ore and concentrate	1,616	NA	--	NA.
Metal:				
Scrap	[3]37,000	[3]31,000	--	Italy 18,554; West Germany 8,911; Austria 3,285.
Pig iron, cast iron, powder, shot[2]	15,477	2,149	--	All to Yugoslavia.
Ferroalloys[3]	2,000	2,000	--	NA.
Steel, primary forms[2]	9,239	13,119	--	Turkey 5,585; West Germany 4,486; Switzerland 2,002.
Semimanufactures:				
Bars, rods, angles, shapes, sections[2]	[r]839,827	714,070	41	Iran 146,701; West Germany 116,049; U.S.S.R. 88,783.
Universals, plates, sheets[2]	384,234	311,345	--	Italy 53,236; Iran 39,585; India 30,655.
Hoop and strip[2]	18,750	15,608	--	Romania 6,489; Iran 1,539; Czechoslovakia 1,512.
Rails and accessories	--	327	--	West Germany 169; Austria 107; Yugoslavia 46.
Wire[2]	20,707	19,204	--	Iran 5,514; West Germany 3,990; Austria 2,209.
Tubes, pipes, fittings[2]	72,287	67,622	--	U.S.S.R. 12,922; West Germany 5,679; Finland 4,994.
Castings and forgings, rough[2]	25,378	20,088	--	India 4,121; West Germany 3,708; Italy 2,695.
Unspecified[2]	43,365	36,787	--	West Germany 19,898; Iraq 3,190; Sweden 2,882.
Lead:				
Oxides	3	NA	--	NA.
Metal including alloys:				
Scrap	1,226	7,974	--	Italy 5,689; West Germany 1,258; Austria 1,027.
Unwrought	286	NA	--	NA.
Semimanufactures	2	75	--	Saudi Arabia 74.
Manganese ore and concentrate[3]	56,795	37,745	--	Poland 28,841; Czechoslovakia 8,904.
Molybdenum metal including alloys, all forms kilograms	--	715	--	Yugoslavia 707.
Nickel:				
Matte and speiss	185	21	--	All to Austria.
Metal including alloys:				
Scrap	220	474	--	West Germany 461; Austria 10.
Unwrought	476	261	48	Austria 150; West Germany 51.
Semimanufactures	134	158	--	Yugoslavia 89; West Germany 21; Italy 15.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$95	$2,063	--	West Germany $1,817; Italy $246.
Silver:				
Waste and sweepings[4] do	$5,315	$6,365	--	West Germany $6,146; United Kingdom $198.
Metal including alloys, wrought or partly wrought do	$1,304	$1,578	$207	West Germany $503; Austria $360; United Kingdom $243.
Tantalum metal including alloys, all forms	1	NA	--	NA.
Tin metal including alloys, scrap	62	18	--	All to United Kingdom.
Tungsten metal including alloys, all forms	2	1	--	Mainly to Yugoslavia.
Zinc metal including alloys:				
Scrap	599	738	--	West Germany 421; Austria 317.
Semimanufactures	5	NA	--	NA.
Zirconium metal including alloys, all forms kilograms	400	NA	--	NA.
Other metals:				
Ores and concentrates	55	NA	--	NA.
Ash and residues	19,766	22,671	--	Austria 18,543; West Germany 3,141.
Oxides and hydroxides	134	17	11	Switzerland 5.
Metalloids	--	3	--	Belgium-Luxembourg 2; Indonesia 1.
Alkali, alkaline-earth, rare-earth metals	10	NA	--	NA.
Base metals including alloys, all forms	58	196	(5)	West Germany 127; Austria 68.
NONMETALS				
Abrasives:[2]				
Artificial: Corundum	8,512	9,173	--	West Germany 6,600; Romania 1,040; Italy 601.
Grinding and polishing wheels and stones value, thousands	$2,118	$2,110	$60	Romania $1,084; East Germany $550; Poland $41.

See footnotes at end of table.

Table 2.—Hungary: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Asbestos, crude	5,078	5,285	--	All to Belgium-Luxembourg.
Boron materials: Oxides and acids	39	NA	--	NA.
Cement[2]	299,231	186,400	--	Yugoslavia 136,713; Poland 25,001; U.S.S.R. 15,237.
Clays and clay products:				
Crude:				
Andalusite, kyanite, sillimanite, etc	--	177	--	All to Austria.
Bentonite[2]	14,797	15,604	--	East Germany 11,004; Poland 4,499.
Chamotte earth	--	485	--	All to Austria.
Kaolin[2]	6,791	6,496	--	Czechoslovakia 4,748; West Germany 1,748.
Unspecified	2,459	158	--	Italy 120; Netherlands 25; Greece 13.
Products:				
Nonrefractory	r901	4,461	--	Austria 1,901; West Germany 1,401; Italy 371.
Refractory[2]	32,265	24,757	--	Romania 8,432; Italy 3,665; West Germany 2,953.
Diamond:				
Gem, not set or strung value, thousands	$58	$76	--	Belgium-Luxembourg $52; Switzerland $22.
Industrial do	$1,726	$1,018	--	Belgium-Luxembourg $1,011.
Diatomite and other infusorial earth	2,663	3,832	--	Austria 3,663; Switzerland 147.
Feldspar, fluorspar, etc	--	2,491	--	All to Switzerland.
Fertilizer materials:				
Crude, nitrogenous	137	NA	--	NA.
Manufactured:				
Nitrogenous	r 2748,015	2960,839	--	Yugoslavia 138,090; West Germany 97,274; undetermined 622,653.
Potassic	431	NA	--	NA.
Other including mixed	39,705	97,998	--	West Germany 53,131; Yugoslavia 28,324; Turkey 7,689.
Ammonia[2]	104,052	86,500	--	Yugoslavia 69,737; Poland 11,077; Austria 2,279.
Lime	--	20	--	All to Switzerland.
Magnesite	24	NA	--	NA.
Mica, worked including agglomerated splittings value, thousands	--	$5	--	All to Italy.
Pigments, mineral: Iron oxides and hydroxides, processed	911	65	--	Yugoslavia 40; Greece 15.
Precious and semiprecious stones:				
Natural value, thousands	$82	$2	--	All to Switzerland.
Synthetic do	--	$6	--	All to West Germany.
Sodium and potassium compounds:				
Caustic potash	72	NA	--	NA.
Caustic soda	27,817	3,000	--	All to Yugoslavia.
Soda ash	--	6	--	All to Egypt.
Stone, sand and gravel:				
Dimension stone, worked	204	1,227	--	Switzerland 889; Austria 187; West Germany 118.
Dolomite, chiefly refractory-grade	r333	348	--	West Germany 248; Finland 100.
Gravel and crushed rock[2]	213,274	96,260	--	Yugoslavia 72,900; U.S.S.R. 15,905.
Limestone excluding dimension	74,017	22,660	--	All to Yugoslavia.
Quartz and quartzite	4,660	9,386	--	Austria 9,325.
Sand:[2]				
Industrial	35,801	37,752	--	Yugoslavia 19,616; Austria 16,549.
Construction cubic meters	329,314	299,078	--	Czechoslovakia 267,544; Austria 26,728.
Sulfur:				
Elemental, crude	4,850	1,449	--	All to Austria.
Sulfuric acid[2]	79,323	68,411	--	Yugoslavia 58,041; Austria 5,444; Poland 4,902.
Talc, steatite, soapstone, pyrophyllite	r220	NA	--	NA.
Other nonmetals:				
Crude[3]	104,714	104,487	(5)	East Germany 28,318; Austria 27,329; Poland 12,540.
Slag and dross, not metal-bearing	1,168	46,980	--	Yugoslavia 45,452; West Germany 1,062.
Halogens	2,548	NA	--	NA.
Halides[2]	3,067	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	842	198	--	All to Tunisia.
Carbon black	40	NA	--	NA.

See footnotes at end of table.

Table 2.—Hungary: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal and briquets:				
Anthracite and bituminous coal[6]	43,500	267,000	--	NA.
Briquets of anthracite and bituminous coal	--	40	--	All to Austria.
Lignite including briquets[2]	20,983	44,547	--	Austria 24,221; U.S.S.R. 20,326.
Coke and semicoke	[2]23	596	--	All to Austria.
Gas, natural—million cubic feet	271	311	--	All to U.S.S.R.
Peat including briquets[2]	4,547	6,340	--	Austria 2,215; West Germany 1,847; Yugoslavia 1,579.
Petroleum and refinery products:				
Crude[6] thousand 42-gallon barrels	8,304	6,752	--	NA.
Refinery products:				
Gasoline do	[2]1,172	341	--	Mainly to West Germany.
Kerosine and jet fuel[2] do	374	408	--	U.S.S.R. 237; East Germany 48; West Germany 18.
Distillate fuel oil[2] do	971	702	--	Austria 268; Poland 224; U.S.S.R. 166.
Residual fuel oil[2] do	550	2,738	--	Austria 1,419; West Germany 543; Czechoslovakia 457.
Lubricants[2] do	261	305	--	Austria 129; Yugoslavia 87; Vietnam 26.
Other:				
Liquefied petroleum gas[2] do	1,327	840	--	Yugoslavia 340; West Germany 171; Italy 105.
Mineral jelly and wax[2] do	196	240	--	West Germany 88; Italy 46; Austria 38.
Bitumen and other residues[2] do	485	604	--	Austria 196; Lebanon 105; West Germany 61.
Bituminous mixtures do	6	2	--	Mainly to Yugoslavia.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals[2]	78,500	150,728	--	Italy 61,383; Romania 34,284; West Germany 31,453.

[p]Preliminary. [r]Revised. NA Not available.

[1]Owing to the lack of official trade data published by Hungary, this table should not be taken as a complete presentation of this country's mineral trade. These data are compiled from various sources, which include United Nations information, data published by the partner trade countries, and partial official trade sources of Hungary.

[2]Official Trade Statistics of Hungary.

[3]Quarterly Bulletin of Steel Statistics for Europe, United Nations, New York.

[4]May include other precious metals.

[5]Less than 1/2 unit.

[6]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

Table 3.—Hungary: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	245	156	--	All from West Germany.
Oxides and hydroxides	350	123	(5)	West Germany 102; France 19.
Metal including alloys:				
Scrap	103	NA	--	NA.
Unwrought[3]	180,187	187,865	--	U.S.S.R. 166,749; Poland 15,900; Romania 2,300.
Semimanufactures[3]	10,310	7,923	--	East Germany 3,724; Romania 1,626; U.S.S.R. 930.
Beryllium metal including alloys, all forms	1	NA	--	NA.

See footnotes at end of table.

Table 3.—Hungary: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Cadmium metal including alloys, all forms	72	12	--	All from Belgium-Luxembourg.
Chromium ore and concentrate	[r]65,708	19,242	--	U.S.S.R. 15,000; Greece 3,000; Turkey 1,000.
Cobalt:				
Oxides and hydroxides	2	5	--	All from France.
Metal including alloys, all forms	6	NA	--	NA.
Copper:				
Sulfate[3]	4,050	4,216	--	U.S.S.R. 4,080; Netherlands 100; West Germany 36.
Metal including alloys:				
Scrap	3,740	3,090	--	Switzerland 1,351; Belgium-Luxembourg 964; West Germany 573.
Unwrought	[3]25,995	[3]28,962	--	West Germany 4,020; Austria 1,536; Poland 997; undetermined 22,409.
Semimanufactures	[3]11,945	[3]8,393	5	West Germany 1,000; Italy 233; Austria 178; undetermined 6,618.
Iron and steel:				
Ore and concentrate[3] thousand tons	4,045	3,286	--	U.S.S.R. 3,049; India 150; Yugoslavia 53.
Pyrite, roasted[3]	209,509	320,799	--	Romania 137,850; U.S.S.R. 93,323; Austria 29,623.
Metal:				
Scrap	[4]6,000	[4]4,000	--	NA.
Pig iron, cast iron, powder, shot[3]	223,978	255,823	--	U.S.S.R. 254,408; Canada 1,000.
Ferroalloys[3]	75,474	87,456	--	U.S.S.R. 47,917; Norway 15,760; Czechoslovakia 6,873.
Steel, primary forms	541,345	443,633	--	U.S.S.R. 395,888; Bulgaria 19,962; Yugoslavia 10,044.
Semimanufactures:				
Bars, rods, angles, shapes sections[3]	261,302	173,187	1	U.S.S.R. 138,613; Czechoslovakia 11,617; Austria 4,755.
Universals, plates, sheets[3]	326,245	340,562	--	U.S.S.R. 238,445; Czechoslovakia 28,665; West Germany 17,040.
Hoop and strip[3]	11,532	9,442	2	West Germany 3,060; France 2,225; Austria 1,418.
Rails and accessories[4]	2,000	3,000	--	NA.
Wire[3]	40,849	37,427	1	Czechoslovakia 17,439; U.S.S.R. 5,772; West Germany 3,777.
Tubes, pipes, fittings[3]	69,972	69,131	--	West Germany 21,254; Romania 12,653; East Germany 11,506.
Castings and forgings, rough[3]	12,100	13,338	--	Yugoslavia 9,090; Italy 2,524; East Germany 757.
Unspecified[3]	1,983	1,773	--	France 1,347; Poland 403; Austria 22.
Lead:				
Oxides	3,599	2,911	--	France 1,630; Austria 1,280.
Metal including alloys:				
Unwrought	[3]13,177	[3]12,868	--	West Germany 2,269; Canada 100; undetermined 10,387.
Semimanufactures	63	23	(2)	Belgium-Luxembourg 10; West Germany 8.
Magnesium metal including alloys:				
Unwrought	225	[5]41	--	All from Yugoslavia.
Semimanufactures	13	20	--	West Germany 19.
Manganese:				
Ore and concentrate[3]	15,569	15,537	--	U.S.S.R. 15,457.
Oxides	90	80	80	
Mercury 76-pound flasks	406	NA	--	NA.
Molybdenum:				
Ore and concentrate	69	79	--	All from Netherlands.
Metal including alloys	18	22	--	All from Japan.
Nickel metal including alloys:				
Unwrought	28	4	--	All from West Germany.
Semimanufactures	88	124	(2)	Canada 73; United Kingdom 19; Sweden 9.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$4,264	$8,084	--	West Germany $7,024; Italy $380; Austria $75.
Silver metal including alloys, worked or partly worked do.	$8,762	$5,120	--	West Germany $2,752; Switzerland $1,425; France $741.

See footnotes at end of table.

Table 3.—Hungary: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Tantalum metal including alloys, all forms	(2)	36	--	All from West Germany.
Tin metal including alloys:				
Unwrought	r 3 1,699	3 1,621	--	Belgium-Luxembourg 140; West Germany 30; undetermined 1,450.
Semimanufactures	r25	11	--	Netherlands 9.
Titanium:				
Ore and concentrate	456	1,687	--	Netherlands 1,583; West Germany 104.
Oxides	r4,392	3,238	--	United Kingdom 1,844; Finland,740; West Germany 559.
Metal including alloys, all forms	2	NA	--	NA.
Tungsten:				
Ore and concentrate	--	6	--	All from United Kingdom.
Metal including alloys, all forms	3	16	--	Japan 12; United Kingdom 2.
Zinc:				
Oxides	2,799	3,087	--	Belgium-Luxembourg 1,171; Italy 1,022; Austria 592.
Metal including alloys:				
Blue powder	210	NA	--	NA.
Unwrought	3 22,471	3 24,319	--	Poland 8,924; Yugoslavia 3,192; West Germany 2,737; undetermined 8,637.
Semimanufactures	3 7,067	3 7,215	--	France 500; West Germany 480; Yugoslavia 203; undetermined 5,939.
Other metals:				
Ores and concentrates[3]	r7,491	5,925	345	U.S.S.R. 1,292; Canada 762; Portugal 556.
Ash and residues	67	10	--	All from Yugoslavia.
Oxides and hydroxides	280	1,078	16	Sweden 637; Japan 78; United Kingdom 48.
Metalloids	8,764	9,358	--	France 8,596; Norway 300; Italy 190.
Alkali, alkaline-earth, rare-earth metals	--	283	--	Israel 267; United Kingdom 15.
Base metals including alloys, all forms	r86	88	--	France 40; Austria 36; West Germany 10.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	--	24	--	Italy 22; West Germany 2.
Artificial: Corundum[3]	4,446	4,343	--	West Germany 2,251; Italy 1,213; Switzerland 375.
Dust and powder of precious and semiprecious stones excluding diamond value, thousands	$139	$190	$27	Belgium-Luxembourg $79; United Kingdom $42; West Germany $33.
Grinding and polishing wheels and stones	657	1,165	23	Austria 437; West Germany 318; Yugoslavia 129.
Asbestos, crude[3]	37,540	48,402	--	U.S.S.R. 41,639; Botswana 5,301; Canada 1,254.
Barite and witherite	8,182	19,879	--	Yugoslavia 18,929; West Germany 950.
Boron materials:				
Crude natural borates	1,216	11,920	--	Turkey 10,000; Netherlands 1,890.
Oxides and acids	3,545	3,634	--	France 2,410; U.S.S.R. 1,064; West Germany 159.
Cement[3] thousand tons	764,795	861,198	350	U.S.S.R. 511,892; East Germany 247,615; Romania 70,697.
Chalk	3,553	3,221	--	Austria 1,831; France 1,390.
Clays and clay products:				
Crude:[3]				
Chamotte earth including products	r69,679	66,149	--	Czechoslovakia 60,568; Israel 1,548; Italy 1,207.
Kaolin	41,685	34,903	--	Austria 13,280; East Germany 10,843; Czechoslovakia 8,538.
Unspecified	82,596	78,220	--	Czechoslovakia 47,384; Poland 14,966; West Germany 7,150.

See footnotes at end of table.

Table 3.—Hungary: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products —Continued				
Products:				
Nonrefractory	2,109	3,904	--	Yugoslavia 1,515; Italy 1,272; Austria 503.
Refractory[3]	44,474	48,925	--	Austria 27,079; West Germany 10,015; East Germany 3,819.
Diamond:				
Gem, not set or strung value, thousands	$7	$469	$113	Switzerland $332; Sweden $14.
Industrial do	$2,631	$2,127	--	Belgium-Luxembourg $1,706; West Germany $385.
Diatomite and other infusorial earth	424	828	--	France 448; Iceland 369.
Feldspar, fluorspar, related materials	r10,944	14,042	--	Yugoslavia 9,480; Norway 1,965; Finland 1,050.
Fertilizer materials:[3]				
Crude:				
Phosphatic	595,111	671,784	--	U.S.S.R. 478,863; Morocco 101,609; Algeria 82,760.
Potassic	1,897	2,312	--	U.S.S.R. 1,077; East Germany 1,029.
Manufactured:				
Nitrogenous, N_2 content	140,820	96,490	--	U.S.S.R. 65,015; Austria 23,378; Belgium-Luxembourg 6,464.
Phosphatic, P_2O_5 content	115,570	129,337	50,125	Yugoslavia 43,622; U.S.S.R. 22,129; Romania 7,675.
Potassic, K_2O content	444,018	528,894	--	U.S.S.R. 281,066; East Germany 231,058.
Other including mixed	116,589	96,972	--	Yugoslavia 51,613; U.S.S.R. 45,335.
Ammonia	--	5	5	
Graphite, natural	91	80	--	All from West Germany.
Gypsum, calcined[3]	85,931	86,584	--	East Germany 51,707; Romania 28,502; Austria 5,775.
Iodine, elemental[3]	40	34	--	U.S.S.R. 33.
Lime, calcined[3]	85,904	103,219	--	Yugoslavia 69,785; Poland 10,061; Romania 7,692.
Magnesite, calcined[3]	120,346	118,258	--	Czechoslovakia 77,559; Austria 11,850; North Korea 8,929.
Mica:				
Crude including splittings and waste	103	330	--	United Kingdom 321; West Germany 6.
Worked including agglomerated splittings	22	33	--	Switzerland 20; Austria 8; France 5.
Pigments, mineral: Iron oxides and hydroxides, processed	3,147	2,887	--	West Germany 2,433; France 332; United Kingdom 112.
Precious and semiprecious stones:				
Natural value, thousands	$276	$59	--	Switzerland $56.
Synthetic do	$270	$219	$2	Switzerland $119; France $66; Austria $17.
Pyrite, unroasted[3]	83,518	89,676	--	All from U.S.S.R.
Salt and brine[3]	683,251	820,520	--	Romania 538,369; U.S.S.R. 184,655; Poland 72,785.
Sodium and potassium compounds:[3]				
Caustic potash	1,642	1,754	--	East Germany 1,487; France 139; West Germany 128.
Caustic soda	35,270	74,702	(2)	Romania 47,535; Italy 8,912; West Germany 1,246.
Soda ash	172,504	205,823	--	Bulgaria 97,796; Romania 41,230; East Germany 21,137.
Stone, sand and gravel:				
Dimension stone, worked	1,545	e276	--	Italy 251; Austria 22.
Dolomite, chiefly refractory-grade	75	NA	--	NA.
Gravel and crushed rock[3]	209,971	17,106	--	Yugoslavia 4,923; Romania 4,457; Bulgaria 2,936.
Quartz and quartzite	2,009	1,830	--	West Germany 1,694; Netherlands 113.
Sand excluding metal-bearing[3]	120,458	112,737	--	Czechoslovakia 88,070; East Germany 15,578; Australia 4,069.
Sulfur:				
Elemental:				
Crude[3]	167,344	250,960	61,061	Poland 151,257; U.S.S.R. 37,075.
Refined	57	35	--	West Germany 20; Italy 15.
Sulfuric acid[3]	19,896	8,733	--	All from Poland.
Talc, steatite, soapstone, pyrophyllite	r2,987	2,069	--	Austria 931; Finland 526; Italy 489.
Other nonmetals:				
Crude[3]	57,198	63,257	--	Czechoslovakia 11,790; Bulgaria 9,782; Yugoslavia 9,639.
Slag and dross, not metal-bearing	--	17	--	Italy 12; West Germany 5.

See footnotes at end of table.

Table 3.—Hungary: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[P]	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other nonmetals —Continued				
Oxides and hydroxides of barium, magnesium, strontium	568	505	--	Greece 464; France 38.
Halogens: bromine[3]	1,036	618	--	East Germany 318; Israel 200; U.S.S.R. 100.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	71	32	--	West Germany 26; Austria 6.
Carbon black[3]	19,050	20,039	--	U.S.S.R. 19,184; West Germany 400; East Germany 160.
Coal and briquets:[3]				
Anthracite and bituminous coal thousand tons	1,515	1,623	--	U.S.S.R. 649; Czechoslovakia 607; Poland 364.
Coal briquets	462,037	503,747	--	All from East Germany.
Coke and semicoke[3] thousand tons	1,270	1,492	--	U.S.S.R. 665; Czechoslovakia 200; Yugoslavia 106.
Gas, natural[3] million cubic feet	96,161	142,847	--	U.S.S.R. 135,855; Romania 6,992.
Hydrogen, helium, rare gases	--	1	--	All from Yugoslavia.
Petroleum and refinery products:				
Crude[3] thousand 42-gallon barrels	70,940	61,323	--	U.S.S.R. 55,125; Iraq 3,124; Iran 3,074.
Refinery products:				
Gasoline[3] do	4,482	5,214	--	U.S.S.R. 4,984; Austria 190.
Kerosine and jet fuel[3] do	2,049	2,228	--	U.S.S.R. 1,939; East Germany 77; Greece 23.
Distillate fuel oil[3] do	5,937	6,777	--	U.S.S.R. 6,250; Austria 375; United Kingdom 87.
Residual fuel oil[3] do	2,558	613	--	U.S.S.R. 478; United Kingdom 135.
Lubricants[3] do	137	143	3	U.S.S.R. 66; Romania 40; Netherlands 13.
Other:				
Liquefied petroleum gas[3] 42-gallon barrels	150,394	318,973	--	All from U.S.S.R.
Mineral jelly and wax do	2,015	3,006	--	West Germany 1,354; United Kingdom 1,204; Netherlands 401.
Nonlubricating oils do	(7)	24	24	
Petroleum coke do	6,622	84,623	--	Norway 82,808; Italy 1,595.
Bitumen and other residues do	30	236	--	Austria 94; West Germany 42.
Bituminous mixtures do	2,448	1,588	--	Sweden 679; Austria 594; West Germany 164.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals[3]	35,530	44,883	--	U.S.S.R. 18,361; West Germany 8,035; Netherlands 5,819.

[P]Preliminary. [r]Revised. NA Not available.

[1]Owing to a lack of official trade data published by Hungary, this table should not be taken as a complete presentation of this country's mineral trade. These data have been compiled from various sources, which include United Nations information, data published by the partner trade countries, and partial official sources of Hungary.

[2]Less than 1/2 unit.

[3]Official Trade Statistics of Hungary.

[4]Quarterly Bulletin of Steel Statistics for Europe, United Nations, New York.

[5]Excludes exports from Norway valued at $148,000.

[6]Excludes exports from Pakistan valued at $16,000.

[7]Revised to none.

COMMODITY REVIEW

METALS

Hungary remained a net importer of most industrial ores and raw materials. In 1981, the country was still a ranking world producer of bauxite and continued to exploit its reserves of iron, manganese, and lead-zinc ores.

Aluminum and Bauxite.—In 1981, Hungary produced about 2% of the world's aluminum and was the world's seventh largest bauxite producer. Hungarian bauxite reserves, reportedly, were estimated to be sufficiently large to last 30 years at

current or even increased consumption levels. Bauxite was mined at five underground and two open pit mines and had an average Al_2O_3 content of over 50% and an SiO_2 content of 7%.

Hungarian bauxite deposits were typically pocket-shaped lenticular bodies with an average thickness of about 20 meters and were associated with Mesozoic carbonate rock formations. The underground mining of Hungarian bauxite has, over the years, presented a number of technical problems. The first problem was that both the footwalls and hanging walls were unstable, requiring the use of closely spaced props and caps for mine support. Rockbolting, used elsewhere in Europe, was found impractical. The second and more serious problem was ground water. Approximately 80% to 90% of Hungary's proved reserves under exploitation were situated at a depth of 100 to 500 meters below the water table. Reportedly, in the Transdanubian area, near Budapest, 10% to 20% of the total production costs were related to water control.

Mine dewatering, in some instances, was reported to have dried up surrounding agricultural wells and aquifers, requiring compensation by the mining authorities and the provision of alternate sources of water to the farmers.

The bauxite industry drilled about 100,000 meters of dewatering wells in 1981. The wells were primarily in the Bakony mining area, where contained water was about 3% of the volume of the dolomite. The drilling and pumping equipment used in this region were manufactured in the Federal Republic of Germany. The submersible pumps ranged in capacity from 9.1 to 10.1 tons of water per minute, and the water, directly pumped from the aquifer, was often sold as drinking water to outlying populated areas. Reportedly, in 1979, 200 million metric tons of water was pumped out in this manner. Despite this well planned dewatering effort, Hungarian bauxite was mined with about an 18% moisture content.

In 1981, two new bauxite mines were put into operation, the Bito II and the Halimba III. Reportedly, the Halimba III Mine would eventually add about one-third more to the country's bauxite output. The ore had a significant content of gallium and vanadium. In recent years, Hungary reported the extraction of gallium from bauxite ore and sales of up to 1.5 tons per year. Hungary also announced the start of the Fenyofo bauxite mine development program in the Bakony area. When completed in 1988, the mine would reportedly have a 650,000-ton-per-year capacity, of which 450,000 tons would be produced from underground workings. In 1981, bauxite output remained at about the level of 1980.

Hungary's production of alumina declined slightly in 1981 compared with that of 1980. Alumina was produced at three plants: the Ajka plant, with about a 400,000-ton-per-year capacity; the Almasfuzito plant, with an annual capacity of 330,000 tons; and the Masonmagyarovar plant, with a capacity of 70,000 tons. Approximately 75% of Hungary's alumina was exported, with the Soviet Union as the main importer. Other new capacities that were added in 1981 were a 2,700-ton-per-year aluminum castings foundry at the Ajka alumina plant and a 5,600-ton-per-year aluminum rolling facility at the Kobanya light metal works. The Szekesfehervar light metal works was reported to have stepped up the production of aluminum semimanufactures to 143,000 tons and was successful in both domestic and foreign markets.

In late 1981, it was announced that a new smelter was under construction at the Inota primary aluminum works. The capacity of the smelter would be 100,000 tons per year, and production startup would be in 1985. In 1981, the Inota plant produced about 50% of Hungary's total primary aluminum output. Also the Aluker aluminum works ordered five 360° hydraulically controlled rotating furnace chargers from Manns Mechanical Equipment Ltd. of Dunstable, United Kingdom.

Hungary exported alumina mostly to other CMEA countries. The Soviet Union was the largest importer of Hungarian alumina. According to a long-standing agreement, the Soviet Union would import Hungarian alumina in exchange for primary aluminum metal. In 1980, Hungary shipped 330,000 tons of alumina to the Soviet Union and received, in turn, 165,000 tons of primary metal; the price differential was to be compensated by finished Hungarian products. Similar transactions were made with other CMEA countries. According to an agreement reached in 1980 with Poland, Hungary would annually supply Poland with 80,000 tons of alumina in exchange for 18,000 tons of primary metal. The agreement with the German Democratic Republic called for supplies of bauxite to the German Democratic Republic Laute alumina plant for anodes used in Hungarian aluminum plants, and the agreement with

Czechoslovakia provided for Czechoslovakian shipments of machines and equipment for Hungarian mines and aluminum plants in exchange for medium-grade bauxite that would be used at the Zhar-nad-Gronom alumina plant.

Copper.—Copper production was reported to have ended owing to the depletion of the Lahocahegy Mine at Recsk. The recently discovered larger copper ore deposits at Recsk were not yet exploited in 1981. Studies continued of suitable mining methods and ventilation requirements to extract the deep-lying sulfide ore bodies.

Gold.—Some gold may have been produced as a byproduct of lead-zinc ore mining; however, it appeared that with the termination of copper mining operations at Recsk most of the gold produced in Hungary came from secondary sources as well as from small-scale prospecting of alluvial deposits in areas such as the Komarom branch of the Danube.

Iron and Steel.—In 1981, the Rudabanya Mine continued to produce sideritic ore. Mine output decreased slightly compared with that of 1980, and amounted to just over 400,000 tons. The country also continued to process large quantities of Soviet ore and concentrate. The capacity of the steel industry was increased during the year. At the Danube ironworks the new No. 1 500,000-ton-per-year oxygen-converter shop was commissioned at midyear. Furthermore, the combined steelworks at Dyosgyor, under construction in 1981, could be completed in 1982. The new facility was expected to add 350,000 tons of capacity to the existing facilities.

At the other end of the spectrum, the decline in the world market negatively affected the three major Hungarian steel producers. The situation was especially serious for the Lenin metallurgical works and the Ozd metallurgical plant. Both plants reportedly operated at a loss during the year. At the Csepel steel and tube works, a rod mill in service for 7 years was decommissioned when its losses reached 2,000 forints per ton.

In 1981, a 5-year agreement was reported between the United States Steel Corp. and the Ozd metallurgical plants that provided for the training of Hungarian specialists in state-of-the-art techniques of high-alloy steel production, as well as forging and rolling.

Lead and Zinc.—In 1981, lead-zinc ore deposits that were worked at the Gyongyosoroszi Mine in the Matra Mountains were reported nearing depletion. The mine output during the year amounted to just over 100,000 tons of ore, which was used to produce about 1 ton of lead and 2.5 tons of zinc concentrate. Hungary had to rely heavily upon imports to meet its industrial requirements for these metals and continued to sell battery scrap in exchange for part of the recovered lead.

Manganese.—Hungary's manganese reserves, after the Soviet Union, were estimated to be the largest in Europe. Carbonate reserves were estimated at 100 million tons with an 11% to 20% manganese content, while the oxide reserve base was estimated at 25 to 30 million tons with 37% to 40% manganese content. In 1981, the Urkut Mines, the chief producer, produced around 120,000 tons of oxide ore. A small amount of carbonate ore was reportedly also produced.

The industry lacked domestic capacity for the production of ferromanganese. Hungary had to import its entire ferromanganese requirements, both in 1981 and in prior years. For this reason, tentative plans were announced to develop the country's ferromanganese capacity to satisfy a projected annual consumption rate of 50,000 tons.

NONMETALS

Most of Hungary's industrial nonmetallic minerals were produced in the Tokaj Mountains. Twelve operating mines, located in this region, have been producing about 300,000 tons per year of various nonmetallic industrial mineral commodities, including perlite, zeolite, kaolin, diatomite, and bentonite. Production of most of these commodities remained at the level of 1980, and no new capacity was added during the year. In some instances, the production of several commodities, such as perlite, declined compared with that of 1980. Apart from these commodities, the country continued to produce sand, gravel, and limestone in sufficient amounts to satisfy domestic as well as export requirements.

Cement.—In 1981, the overall volume of construction declined by 3.5% compared with that of 1980. Correspondingly, the 1981 output of cement dropped during the year, and no new capacity was added during the period.

Fertilizer Materials.—Hungarian fertilizer output was centered around the Pat nitrogen works in Petfurdo and the Borsod and Tisza chemical complexes located near Miscolc. The country continued to produce

both compound as well as nitrogenous fertilizer material. In 1981, no major investments in this field were undertaken.

MINERAL FUELS

Hungary was able to increase domestic supplies of energy and to reduce consumption requirements by 0.7%, which resulted in a 3.5% decrease in energy imports. Domestic production of energy as a share of consumption was 48.5% in 1981 and was expected to increase to 50% in 1982. Energy conservation measures were claimed to be sufficiently successful to warrant a reduction of petroleum imports in 1982 by 2 million tons.

Coal.—The major events in the industry were the discovery of new reserves and the production startup of two new mines.

New coal reserves were discovered at the Dorog colliery near Esztergom. The discovery could extend the operations at this mine for another 10 years. A new face was prepared at the mine to allow access to about 1 million tons of coal. An additional 100 tons per day would be produced at the mining complex.

Two coal mines were put onstream during the year. The first was the Markushegy Mine of the Orszlany mining complex. Trial runs were started, and the mine was scheduled to produce 300,000 tons of coal in 1981 and 800,000 tons in 1982. The mine's reserves were reported to be 50 million tons, and operating at maximum capacity, it would produce 8,000 tons of coal per day. The second mine was at Nagyegyhaza in the Tata Coalfield. The 55-million-ton deposit was said to be situated on top of a 10-million-ton deposit of bauxite, which would also be mined after 1985. The maximum coal-producing capacity of this mine would eventually reach 2 million tons per year.

Petroleum and Natural Gas.—The most significant event during the year was the discovery of a new gasfield in the Drava Valley near the Yugoslav border. Full exploration was to be conducted during the year.

Uranium and Nuclear Energy.—Uranium deposits were discovered after World War II in the Mecsk Mountains. In the early 1960's, detailed surveys were conducted and mine development was begun with Soviet assistance. The uranium deposits were found to be connected with weathered Paleozoic granites and sandstones. Shaft sinking, drifting, and equipping the mines were carried out with Soviet help.

In 1981, uranium mine output was shipped to the U.S.S.R. for enrichment and was used to fuel the Paks nuclear reactor power station, which became operational for the first time with the installation of the first Novo-Voronezh 440-megawatt reactor blocks.

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[1]Foreign mineral specialist, Division of Foreign Data.

[2]The relation of the Hungarian forint (Ft), a nonconvertible currency, to the U.S. dollar is based upon the fluctuation of the dollar-forint ratio. The rate of dollars to forints was US$1.00=Ft34.05 (official rate, June 1981). The conversion of Hungarian national income and foreign exchange accounts into U.S. dollars was not done owing to different criteria used in determining value in centrally planned economies as opposed to those used in market economies.

[3]Council for Mutual Economic Assistance (CMEA). Its membership includes Bulgaria, Cuba, Czechoslovakia, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, the U.S.S.R., and Vietnam. Yugoslavia obtained permanent observer status in 1965.

Table 4.—Hungary: Primary energy balance for 1980 and 1981

(Million tons of standard coal equivalent[1])

Year	Total primary energy	Coal (lignite, anthracite, bituminous), coke, and briquets	Crude oil and petroleum products	Natural and associated gas	Fuelwood	Hydroelectric power
1980:						
Production	26.4	14.5	3.0	8.2	0.7	--
Exports	3.1	.05	3.0	.01	--	--
Imports	23.8	2.9	14.5	5.4	--	1.0
Apparent consumption	47.1	17.3	14.5	13.6	.7	1.0
1981:						
Production	27.9	14.6	3.0	8.6	.7	1.0
Exports	2.6	.05	2.5	.01	--	--
Imports	22.3	2.6	14.0	5.0	--	.7
Apparent consumption	47.6	17.1	14.5	13.6	.7	1.7

[1]One ton of standard coal equivalent (SCE)=7,000,000 kilocalories. Conversion factors used are hard coal, 1.0; lignite and brown coal, 0.5; briquets, 0.67; coke, 0.9; crude oil, 1.47; refinery products, 1.53; natural gas, 1.33 (per thousand cubic meters); manufactured gas, 0.6; and hydroelectric power, 0.125 (per thousand kilowatt-hours).

The Mineral Industry of Iceland

By Joseph B. Huvos[1]

Although Iceland's mineral resources remained insignificant in 1981, there was an abundance of inexpensive hydroelectric power, allowing the establishment of energy-intensive industries for the processing of imported raw materials. Manufacturing and processing industries again suffered from low demand in export markets and from temporary power shortages caused by a lack of rainfall during the year.

Iceland's economy continued its trend of high inflation at 50.6%, a slow rate of real-term growth at 1%, and a policy of full employment, with unemployment at 0.4%. In 1981, Iceland's gross national product (GNP) was 2.8 billion dollars.[2] Contribution of the mineral and related industries to the national economy continued to be mainly hydroelectric and geothermal power, aluminum, and ferroalloys, the latter two contributing about 5% of the total.

The balance of foreign trade was slightly negative. The krona was devalued twice, first by 3.8% and later by 6.5%.

Important events in Iceland's mineral industry in 1981 included commissioning of two new hydroelectric powerplants on the Hrauneyjafoss River, and continued construction of the State Fertilizer Co.'s nitric acid plant at Gufunes and a southwest Iceland geothermal heating utility.

PRODUCTION

In 1981, there was no significant change in the production pattern of minerals and metals in Iceland, which consisted largely of aluminum, ferroalloys, cement, and pumice. Mineral production for 1977-81 is shown in table 1.

Table 1.—Iceland: Production of mineral commodities[1]

Commodity	1977	1978	1979	1980	1981[p]
Aluminum metal, primary metric tons	74,245	73,800	72,145	73,111	74,577
Cement, hydraulic thousand metric tons	139	134	127	122	115
Diatomite metric tons	20,985	20,020	21,288	18,150	19,840
Iron and steel ferroalloys: Ferrosilicon do.	--	--	15,000	25,309	33,612
Nitrogen: N content of ammonia[e] do.	6,000	7,000	7,000	7,000	7,000
Pumice do.	7,586	8,497	24,462	36,000	33,945
Salt do.	--	--	--	53	50
Sand and gravel:					
Calcareous thousand cubic meters	111	107	180	109	114
Basaltic cubic meters	NA	10,800	6,200	4,900	5,000
Other thousand metric tons	430	410	NA	NA	NA
Stone:					
Crushed and broken do.	30	28	25	24	21
Scoria do.	100	85	110	[e]95	98
Silica dust metric tons	NA	NA	4,400	4,400	4,900

[e]Estimated. [p]Preliminary. NA Not available.
[1]Table includes data available through July 7, 1982.

TRADE

There was no significant change in Iceland's modest foreign trade in minerals in 1979 and 1980, as shown in tables 2 and 3. Minerals amounted to only 4% of the country's total export trade, which was dominated by fish and fish products.

Table 2.—Iceland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, unwrought	76,225	67,318	--	United Kingdom 20,660; Switzerland 17,292; West Germany 14,325.
Iron and steel:				
Scrap	3,343	2,906	--	All to Norway.
Ferrosilicon	12,539	25,309	3,777	West Germany 7,622; Poland 4,055; United Kingdom 3,506.
Silver metal including alloys, unwrought troy ounces	--	3,215	--	All to Belgium.
Other: Base metals including alloys scrap	365	336	--	Netherlands 202; Denmark 110; Norway 13.
NONMETALS				
Abrasives, natural, n.e.s.: Pumice	24,462	48,198	--	Denmark 43,758; Sweden 2,035; West Germany 1,922.
Diatomite	21,288	18,149	--	West Germany 4,758; Italy 1,951; France 17,01.
Salt	5	--		

Table 3.—Iceland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Alumina	r142,469	145,906	NA	Australia 145,900.
Metal including alloys:				
Unwrought	133	110	--	All from United Kingdom.
Semimanufactures	1,039	1,153	10	Norway 328; West Germany 236; Switzerland 169.
Chromium oxides and hydroxides	5	2	NA	Mainly from West Germany.
Copper metal including alloys, semimanufactures	160	184	17	West Germany 60; Sweden 34; United Kingdom 23.
Gold metal including alloys, unwrought and partly wrought value	$158,456	$141,407	$246	Switzerland $81,822; West Germany $28,515; United Kingdom $17,605.
Iron and steel:				
Ore and concentrate	8,700	5,600	--	All from Norway.
Metal:				
Pig iron, speigeleisen, powder, shot	53	279	10	France 175; Sweden 54; Norway 25.
Scrap kilograms	--	400	--	All from Norway.
Steel, primary forms	542	206	NA	Denmark 185; West Germany 14.
Semimanufactures:				
Bars, rods, angles, shapes, sections	21,031	24,156	5	Norway 13,787; Netherlands 2,004; West Germany 1,721.
Universals, plates, sheets	13,348	17,657	(1)	West Germany 3,307; Belgium-Luxembourg 2,809; Norway 2,808; Sweden 2,104.
Hoop and strip	337	463	NA	West Germany 153; Belgium-Luxembourg 82; Denmark 78; Netherlands 75.
Rails and accessories	r58	22	--	Netherlands 15; Sweden 6; Norway 1.
Wire	196	240	(1)	Belgium-Luxembourg 174; Denmark 18; United Kingdom 17.
Tubes, pipes, fittings	8,260	9,390	10	West Germany 3,751; Netherlands 1,426; United Kingdom 965.
Castings and forgings, rough	85	172	--	United Kingdom 111; Denmark 50.

See footnotes at end of table.

Table 3.—Iceland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	22	29	--	United Kingdom 11; West Germany 10; Norway 5.
Metal including alloys:				
Unwrought	163	286	--	Denmark 280; Norway 5.
Semimanufactures	r59	13	(1)	West Germany 11.
Manganese metal including alloys:				
Unwrought	3	5	--	All from Norway.
Semimanufactures—value	$411	$25	--	All from West Germany.
Mercury—76-pound flasks	3	3	NA	Mainly from West Germany.
Nickel metal including alloys, semimanufactures	r6	1	(1)	Do.
Platinum-group metals including alloys, unwrought and partly wrought—value	$162,066	$302,254	$66,488	Switzerland $204,022; West Germany $28,865.
Silver metal including alloys, unwrought and partly wrought—do	$262,721	$301,125	$2,000	United Kingdom $113,735; West Germany $106,168; Sweden $41,905.
Tin metal including alloys, all forms	9	11	NA	Denmark 7; United Kingdom 3.
Titanium oxides and hydroxides	896	1,044	11	United Kingdom 602; West Germany 345; Norway 85.
Tungsten metal including alloys, all forms—value	$510	$2,464	--	Norway $2,420; Sweden $44.
Zinc:				
Oxides and peroxides	13	17	--	West Germany 14; Norway 1.
Metal including alloys:				
Unwrought	r72	87	--	Norway 72; Belgium-Luxembourg 15.
Blue powder	r4	3	1	United Kingdom 2.
Semimanufactures	r7	16	NA	West Germany 8; Norway 7; Belgium-Luxembourg 1.
Other:				
Ores and concentrates	2	--		
Oxides, hydroxides, peroxides	r3	6	NA	United Kingdom 4; Norway 1; West Germany 1.
Metalloids	45	21	NA	Mainly from Norway.
Base metals including alloys, all forms	10	10	NA	Mainly from Republic of South Africa.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Emery, pumice, corundum, etc	1	7	NA	West Germany 5.
Grinding and polishing wheels and stones	17	29	2	Sweden 6; West Germany 5; Spain 3; United Kingdom 3.
Asbestos, crude	7	5	NA	China 4.
Barite and witherite	42	36	--	West Germany 24; Denmark 12.
Boron materials	11	6	NA	Denmark 5.
Cement	19,876	9,516	--	Denmark 8,990; United Kingdom 302.
Chalk	299	378	--	Norway 152; France 120; United Kingdom 71.
Clays and clay products:				
Crude clays	328	476	24	United Kingdom 240; West Germany 76; Netherlands 68.
Products:				
Refractory including nonclay brick	r1,648	3,262	4	United Kingdom 1,217; France 1,163; Sweden 490.
Nonrefractory	931	972	(1)	Italy 326; West Germany 199; Sweden 195; Denmark 159.
Cryolite and chiolite	500	2,000	--	Denmark 1,600; Greenland 400.
Diamonds:				
Gem, not set or strung—value	r$13,697	$17,874	--	Belgium-Luxembourg $9,367; Netherlands $5,030; West Germany $3,470.
Industrial—do	r$34,358	$20,071	--	Belgium-Luxembourg $17,140; Switzerland $1,543.
Diatomite and other infusorial earth	44	3	(1)	NA.
Feldspar, fluorspar, nepheline—kilograms	700	100	--	NA.
Fertilizer materials:				
Crude	r4	6	--	Mainly from West Germany.
Manufactured:				
Nitrogenous	86	87	--	Norway 57; West Germany 15; Denmark 15.
Phosphatic	1,894	2,045	--	All from Sweden.
Potassic	5,673	7,199	NA	East Germany 6,998; Belgium-Luxembourg 200.
Other including mixed	35,410	32,010	NA	Norway 18,997; Netherlands 7,039; Belgium-Luxembourg 4,957.

See footnotes at end of table.

Table 3.—Iceland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials —Continued				
Ammonia	4,834	4,096	NA	Norway 4,090.
Graphite, natural kilograms	1,100	500	--	All from United Kingdom.
Gypsum and plasters	3,522	9,501	(1)	East Germany 9,471; Belgium-Luxembourg 12.
Lime	890	741	5	United Kingdom 445; West Germany 266.
Mica, all forms	10	6	NA	United Kingdom 5.
Pigments, mineral, including processed iron oxides	32	48	--	West Germany 23; Denmark 13; Spain 6; United Kingdom 6.
Precious and semiprecious stones, except diamond, natural and synthetic value	r$17,621	$14,108	NA	West Germany $5,647; Netherlands $2,614.
Salt and brine	49,242	105,556	1	Spain 86,885; Tunisia 16,214; Denmark 892.
Sodium and potassium compounds, n.e.s:				
Caustic potash	11	26	NA	West Germany 20.
Caustic soda	586	653	--	Belgium-Luxembourg 499; France 60; United Kingdom 45.
Soda ash	1,443	1,481	250	East Germany 850; West Germany 141; United Kingdom 129.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	56	74	--	Italy 49; Netherlands 12; Sweden 7.
Worked	69	42	(1)	Italy 35; Sweden 2.
Dolomite, chiefly refractory grade	63	120	--	Mainly from Norway.
Gravel and crushed rock	266	322	--	Sweden 279; United Kingdom 22.
Limestone, except dimension	55	16	--	All from Denmark.
Quartz and quartzite	25,416	41,335	12	Norway 41,289; Denmark 20.
Sand excluding metal-bearing	284	267	43	United Kingdom 76; Denmark 73; Norway 27.
Sulfur:				
Dioxide	2	1	NA	Mainly from United Kingdom.
Elemental:				
Colloidal	2	5	NA	West Germany 3.
Other than colloidal	20	50	--	Mainly from Denmark.
Sulfuric acid, oleum	435	388	--	Norway 320; Denmark 34; Netherlands 32.
Talc, steatite, soapstone, pyrophyllite	106	106	--	Norway 94; China 8; Denmark 4.
Other:				
Crude	r4	24	(1)	Sweden 17; United Kingdom 4.
Oxides, hydroxides, peroxides of strontium, magnesium, barium	2	1	NA	Mainly from Denmark.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	1,074	3,969	6	Spain 2,810; West Germany 409; Austria 361.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	50	797	(1)	United Kingdom 772; Norway 15.
Carbon black and gas carbon kilograms	400	600	NA	Mainly from West Germany.
Coal and briquets:				
Anthracite	9,833	12,243	--	Poland 12,156; United Kingdom 85; West Germany 2.
Bituminous	15	36	--	United Kingdom 35; Denmark 1.
Briquets	1	--		
Lignite including briquets kilograms	200	--		
Coke and semicoke	11,904	16,403	--	Norway 11,625; United Kingdom 4,748; Denmark 29.
Hydrogen, helium, rare gases	1	6	NA	Mainly from Sweden.
Peat including briquets and litter	22	33	--	Denmark 32; Sweden 1.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	834	766	--	U.S.S.R. 585; Portugal 93; Netherlands 88.
Kerosine and jet fuel do	r514	452	--	Netherlands 356; United Kingdom 96.
Distillate fuel oil do	2,306	1,723	--	U.S.S.R. 972; Netherlands 454; Portugal 147.
Residual fuel oil do	1,075	1,197	--	U.S.S.R. 1,060; Netherlands 130; United Kingdom 7.
Lubricants do	r60,412	49,200	256	United Kingdom 36,092; Netherlands 4,218; Belgium-Luxembourg 3,772.
Other:				
Liquefied petroleum gas do	10,550	9,669	--	Netherlands 7,013; Denmark 2,139.

See footnotes at end of table.

Table 3.—Iceland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products —Continued				
Other —Continued				
Mineral jelly and wax thousand 42-gallon barrels	4,573	3,690	--	United Kingdom 2,167; West Germany 1,423.
Nonlubricating oils ----do----	323	382	NA	Netherlands 127; United Kingdom 118; Denmark 98.
Bitumen, petroleum coke, other residues ----------do----	61,507	58,775	606	United Kingdom 53,643; West Germany 3,919.
Bituminous mixtures ----do----	7,672	12,029	1,364	United Kingdom 9,495; Denmark 595.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals -----	548	298	5	Netherlands 141; Denmark 109.

[r]Revised. NA Not available.
[1]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—In 1981, aluminum production increased slightly in spite of a shortage of electric power, caused by a lack of precipitation.

Disagreement continued between the Icelandic Government and Swiss Aluminum Ltd. (Alusuisse) over the latter's Icelandic Aluminum Co. Ltd. subsidiary. The Government had accused Alusuisse of avoiding Icelandic taxes by buying alumina from its Australian subsidiary, Swiss Aluminum of Australia Ltd., at a price at least $35.5 million higher than the average market price during a period from 1975 to 1980. Alusuisse denied the charges. Talks to settle the difference were delayed repeatedly during the year. In the meantime, the Government was reviewing its energy deal with Alusuisse, on the basis of which it had supplied the electric power needed by the company, and as an alternative, it was also considering the possibility of taking over the company's operations.

The Icelandic Government had been preparing a feasibility study, aided by the Norwegian company, Aardal og Sunndal Verk AS, to create further aluminum capacity in Iceland, depending on the state of the world aluminum market. It had planned to hold at least 51% of this and any major industrial venture in the future.

Ferroalloys.—Icelandic Alloys Ltd. continued to produce ferrosilicon north of Reykjavik at Grundartangi. Equipment continued to be two 30-megawatt semiopen rotary Elkem furnaces. As in 1980, repeated shortages of electric power and ferroalloy markets determined production, which was well below the 1981 targeted 44,000 tons of 75% ferrosilicon, and a net loss was recorded by the company.

NONMETALS

Cement.—The Sementsverksmidja Rikisins (state-owned cement works) operated at Akranes, north of Reykjavik, a single-kiln, oil-fired cement plant. Capacity of the plant was 100,000 tons per year of cement or 95,000 tons of clinker.

Nitrogen.—Aburdarverksmidja Rikisins (state-owned fertilizer company) was building a new 35,000-ton-per-year nitric acid plant at Gufunes, near Reykjavik, to replace the existing unit built in 1952. The Société Chimique de la Grande Paroisse was awarded a $4 million contract to supply the equipment and startup services, financed 85% by an export loan from France. The Gufunes fertilizer complex produced 45,000 tons of compound fertilizers of a dozen different grades, including 7,000 tons of ammonium nitrate. The new nitric acid plant was to expand the compound fertilizer plant's capacity to 70,000 tons per year. At the same location, there was also an electrolytic plant to produce 8,000 tons per year of ammonia. An additional 8,000 tons of ammonia was to be imported each year in the future. Iceland also imported monoammonium phosphates and potash.

MINERAL FUELS

Coal.—A draft resolution introduced in

the Althing (Parliament) has focused attention on the possibility of exploiting lignite deposits found at several locations in the fjords of northwest Iceland. The bill called for preliminary studies by the National Energy Authority and the power utilities.

The lignite at Stalfjall Mountain, West-Barda-Strada, Sysla County, was estimated previously at 180 million tons, sufficient to supply a 680-megawatt powerplant for 60 years. Lignite was mined in Iceland during World War I, but mining was abandoned, as strata were thin and poor in quality.

Geothermal Energy.—The Geothermal Energy Department of the Energy Institute sponsored a study of geothermal energy in Iceland. It was revealed that only about one thousandth of all of the geothermal energy resources of Iceland have been developed. In 1981, total thermal energy used for home heating amounted to 1,200 megawatts, which was the maximum output of existing installations. Other uses, including generation of electric power, amounted to about 500 megawatts.

In 1981, there were 19 proven high-temperature geothermal areas in Iceland and 9 possible new ones. The largest of all areas was that around the Torfa Glacier in central Iceland, estimated to cover 140 square kilometers. Next came the Helgill area, followed by the Krafla and Krisovik areas. All geothermal areas were located within the eruption and disintegration belt, an extension of the mid-Atlantic Rift, that crosses Iceland from the southwest to the northeast.

Work continued on completing a new southwestern Iceland geothermal heating utility to pump hot water from what is said to be the world's biggest natural hot spring, in Bogarfjordur County near Deildartunga. A pipeline system was built to distribute the hot water at a temperature of 97° C.

Hydroelectric Power.—In October, the first turbine of a new hydroelectric powerplant of the National Power Co. (Landvirksjun) went onstream at Hrauneyjafoss in southern Iceland, and a second unit went onstream by yearend. The plant was not far from existing plants at Burfell and Sigalda. All three facilities harness the glacial rivers in the Thjorsa drainage basin. They should contribute to avoiding power shortages such as those experienced in early 1981. During the winter of 1981, there was a power shortage when the country's total electrical output had to be cut back by 110 megawatts for an extended period.

The State Electric Power Works signed an agreement with five rural communities in Hunavatnssysla County to cut the planned size of the Blanda River reservoir in the northwest of the country to 220 gigaliters, from the original 400 gigaliters. This will limit the capacity of the planned Blanda River powerplant to 177 megawatts. The generating capacity of the Burfell plant was to be increased from 210 to 350 megawatts.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from new Icelandic krona (IKr) to U.S. dollars at the rate of IKr7.26=US$1.00.

The Mineral Industry of India

By Gordon L. Kinney[1] and Francis E. Shafer[2]

India's gross national product (GNP) increased an estimated 4.7% in real terms during fiscal year (FY) 1981-82[3] compared with a 7.5% increase in FY 1980-81 and a 4.5% decline in FY 1979-80. Foodgrain production, the key factor in the highly agricultural Indian economy, reached a record level of 133 million tons, but fell short of the FY 1981-82 target of 138.5 million tons. GNP at current prices was estimated at $156 billion[4] in FY 1981-82, compared with $140 billion (revised) in FY 1980-81. Current per capita income was about $226, one of the lowest in the world. Complicating the planning and executing of economic development was the formidable population problem—approaching 700 million—which added over 6 million persons to the labor force in 1980 and again in 1981.[5]

Industrial production in FY 1981-82 increased 8.5%, more than doubling the previous year's growth. This was largely because of improvement in the performance of infrastructural industries, particularly coal, electric power, and railroad. Significant growth was recorded in coal, crude steel, cement, aluminum, and nitrogenous fertilizers. During 1981, the Government of India introduced a series of measures to promote industrial production including liberalization of capital goods and raw materials imports for export-oriented industries, simplification of industrial licensing procedures, and provision of institutional financing for modernization extended to all industries.

Power generation, the major limiting factor in recent industrial performance, increased more than 10% over the FY 1980-81 level and exceeded its target by a modest 0.7%. A total of 123 billion kilowatt-hours was produced but even with the increase, this fell considerably short of the 137 billion kilowatt-hours required. Thermal capacity utilization increased from 45% in FY 1980-81 to 47% in FY 1981-82. An achievable goal for the Indian system would be about 58% capacity utilization, still much lower than most electrical systems.

Several industries in the Bihar-West Bengal steel producing belt continued to be hampered by power shortages despite a 40% increase in power output by the local electric company. Acute power shortages were also experienced in the States of Rajasthan, Madhya Pradesh, Tamil Nadu, and Orissa. The addition of 2,300 megawatts to generating capacity during FY 1981-82 fell considerably short of the 3,212-megawatt target because of shortages of steel and cement as well as delays in delivery of equipment.

The target for FY 1982-83 was to add 3,500 megawatts of capacity and to generate a total of 132 billion kilowatt-hours of electrical power. Power transmission losses for the overall system were estimated at 15% to 20%, which contributed significantly to the power shortages. Considering the record of slippage between targets and achievement, the sixth 5-year plan (FY 1980-81 through FY 1984-85) target of 20,000 megawatts in added generating capacity appears unlikely to be realized. This suggests that Indian industry is likely to continue facing power shortages for the foreseeable future.

In order to circumvent additional shortages, the Government had decided to approve construction of captive powerplants for major public sector corporations such as steel, fertilizers, and aluminum. Other industrial users may also construct captive powerplants provided they set up a consortium.

The Government's public sector FY 1982-

83 annual plan called for an expenditure of $23.5 billion, a 21% increase over that of the previous year.

The energy sector development was assigned highest priority in the plan and was to receive 32% of total expenditures. This was mainly intended to increase domestic petroleum production from about 40% of the requirements in FY 1981-82 to roughly 70% in FY 1984-85. Other major expenditures included $960 million for expansion of existing steel plants and construction of a 3.4-million-ton-per-year integrated plant at Visakhapatnam, $560 million for the fertilizer and chemicals sector, and $1.26 billion for the railroads.

The Indian railroad system increased freight traffic during 1981, thereby helping to sustain the higher level of industrial production. Inadequacies in railroad freight movement have been strong contributors to coal and electric power shortages in recent years. The amount of freight moved in 1981 reached a record high of over 220 million tons, up nearly 13% over that of 1980, and exceeded the annual target by 5 million tons. The freight target for 1982 was 230 million tons. The FY 1982-83 budget allocated $1.26 billion for capital expenditures on the railroad system. That figure was unchanged from the previous year and was claimed to be seriously inadequate to meet the growing need to modernize the system. Given the modest funding and the past problems, it was anticipated that the traffic bottlenecks would reemerge in 1982.

Research and development activities under the science and technology program were given major emphasis under the public sector organizations controlled by the Department of Mines; i.e., the Geological Survey of India (GSI), the India Bureau of Mines (IBM), the Mineral Exploration Corp., Ltd. (MEC), and the Government-owned nonferrous metals companies. Geology, exploration, mining, beneficiation, and nonferrous metals research were being given priority.

The planned outlay for science and technology during the sixth 5-year plan (FY 1980-81 through FY 1984-85) has been increased to $18 million from $3.8 million during the previous 5-year plan, GSI and IBM research funding are not included. The major programs being implemented included research on rock bursts, scheelite recovery from gold ore, ore dressing, recovery of cobalt from copper-converter slag, recovery of tellurium from electrolytic copper refinery slime, recovery of copper by dump-leaching, and long-hole raising in mines.

GSI has acquired a vessel to be remodeled into a research ship for geoscientific cruises. The research facilities were to be ready for offshore surveys in 1982. Two small launches will be purchased for survey work in coastal waters. These ships will strengthen considerably the marine geology section of GSI. GSI was also strengthening its aerial survey and deep exploration-drilling capability.

IBM has received a new charter enlarging its scope of activities, particularly in the fields of mineral conservation and environmental protection. Facilities for beneficiation of minerals in IBM were being expanded, and as part of this program, an ore dressing laboratory was completed at Ajmer in October 1981. The existing laboratory and pilot plant facilities at Nagpur were also being strengthened and another new ore dressing laboratory was being built at Bangalore.

PRODUCTION

According to preliminary data, overall value of Indian mineral production in 1981 rose 63% over that of the previous year to $3.78 billion. Most of the increase was attributed to a sharp rise in production and price increases of the mineral fuels. The value of coal production rose 33% to $1.93 billion. In the case of crude oil, the 1981 wellhead value rose 226% to $1.33 billion based on a more than 50% increase in production, coupled with increased domestic crude oil prices at the wellhead.

In contrast, the value of nonfuel minerals totaled only $456 million in 1981 compared with $417 million in 1980. With few exceptions, production levels remained nearly unchanged from those of 1980. Even in value terms, most of the increases were marginal, stemming primarily from upward price revisions.[6]

Among key minerals, production of iron ore, a major export commodity, rose marginally but the pithead value rose 11% to $144 million. Production of manganese ore declined but the value increased slightly to $26.6 million. The values of some other

important metallic ores were copper, $39.9 million; gold, $29.4 million; chromite, $15.9 million; and zinc, $14.2 million. Limestone was by far the major nonmetallic mineral and was valued at $83.2 million. The next most valuable nonmetallic minerals were apatite and phosphorite with combined values less than one-third that of limestone.

Despite the performance of the nonfuel mineral sector, India remained the world's principal source of sheet mica. Among the market economy countries, it was second in garnet and kyanite production, third in rare-earth minerals, tied for third in ammonia for nitrogen fertilizer, fourth in zircon, and fifth in world barite production. In addition, India was among the top nine producers of iron ore, chromite, manganese, magnesite, and cement.

Table 1.—India: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
METALS					
Aluminum:					
Bauxite, gross weight ----- thousand tons	1,519	1,663	r1,952	1,740	1,912
Alumina, gross weight ----------do----	387	480	493	e500	e500
Metal, primary ----------	179,000	213,729	r211,428	184,838	212,844
Antimony metal, regulus ----------	186	--	--	--	--
Cadmium metal ----------	44	113	166	89	113
Chromium: Chromite, gross weight ----------	352,500	266,293	r309,841	319,538	334,681
Copper:					
Mine output, metal content ----------	31,200	26,040	r26,313	e22,000	e27,000
Metal:					
Smelter ----------	23,489	19,481	21,455	28,489	25,743
Refined ----------	21,059	17,682	14,707	17,021	e24,000
Gold metal, smelter ----------troy ounces	96,902	89,186	r84,781	78,834	79,875
Iron and steel:					
Iron ore and concentrate:					
Gross weight ------- thousand tons	42,598	38,838	r39,859	40,670	41,120
Iron content ----------do----	26,666	24,313	r24,952	25,459	25,741
Metal:					
Pig iron ----------do----	9,796	9,432	r8,748	8,459	9,474
Ferroalloys:					
Ferrochrome ----------	18,068	21,545	r22,249	16,012	31,066
Ferromanganese ----------	193,908	219,993	r186,803	162,650	208,836
Ferrosilicon ----------	44,675	52,275	r53,087	42,606	60,253
Ferrosilicochrome ----------	4,155	3,892	r3,851	4,037	4,408
Other ----------	10,833	3,634	2,844	535	9,074
Crude steel:					
Steel ingots ----- thousand tons	9,852	9,917	r9,936	9,356	10,700
Steel castings ----------do----	66	e70	65	e65	e80
Total ----------do----	9,918	e9,987	r10,001	e9,421	e10,780
Semimanufactures:[3]					
Angles, shapes, sections ----do----	1,012	1,040	e1,000	e1,000	NA
Bars and rods ----------do----	2,312	2,300	e2,200	e2,200	NA
Plates and sheets:					
Uncoated ----------do----	1,019	1,062	e1,100	e1,000	NA
Galvanized ----------do----	192	194	e200	e200	NA
Tinplate ----------do----	110	90	e100	e100	NA
Hoop, strip, strapping, skelp --do----	1,166	1,153	e1,100	e1,100	NA
Rails and accessories ------do----	497	452	400	e350	NA
Wire ----------do----	326	351	234	e240	NA
Special steels, not further specified ----do----	352	422	518	e550	NA
Total ----------do----	6,986	7,064	6,852	e6,740	NA
Lead:					
Mine output, metal content ----------	12,720	12,840	15,960	12,720	15,320
Metal, refined:					
Primary ----------	7,588	10,059	9,820	14,846	14,325
Secondary ----------	12,400	10,900	10,800	10,732	11,081
Total ----------	19,988	20,959	20,620	25,578	25,406
Magnesium ----------	107	23	28	13	15

See footnotes at end of table.

Table 1.—India: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
METALS —Continued					
Manganese ore and concentrate, gross weight thousand tons	1,865	1,619	r1,771	1,645	1,500
Rare-earth metals: Monazite concentrate, gross weight[e]	2,734	3,272	r3,254	4,210	4,300
Selenium kilograms	4,078	5,151	4,596	e3,800	e3,700
Silver, mine and smelter output thousand troy ounces	425	388	370	366	555
Titanium concentrates, gross weight:					
Ilmenite	3137,350	3161,536	3146,843	3167,900	188,828
Rutile	35,491	35,660	34,940	35,360	8,752
Tungsten, mine output, metal content	22	21	r18	22	e38
Zinc:					
Mine output, concentrate:					
Gross weight	46,113	66,019	71,774	48,104	57,434
Metal content	r25,362	r36,310	r39,476	26,457	31,589
Metal:					
Primary	35,997	59,354	63,326	43,627	58,516
Secondary	NA	NA	NA	234	200
Total	35,997	59,354	63,326	43,861	58,716
Zirconium concentrate: Zircon, gross weight	10,677	11,167	r12,180	14,820	12,400
NONMETALS					
Abrasives, natural, n.e.s.:					
Corundum, natural	1,306	1,082	r909	1,454	1,500
Garnet	1,825	2,467	r6,820	3,742	3,176
Jasper	1,450	2,631	r3,301	4,117	3,356
Asbestos	22,177	24,623	r32,094	31,253	24,515
Barite	330,989	388,582	r490,699	434,015	353,362
Bromine, elemental	510	460	300	334	350
Cement, hydraulic thousand tons	19,060	19,560	18,264	17,700	20,760
Chalk	61,414	74,813	r79,786	87,142	85,309
Clays:					
Ball clay	48,369	96,552	r128,090	125,457	118,635
Diaspore	7,900	4,909	r6,437	5,504	e5,000
Fire clay	726,000	725,000	789,291	656,279	791,105
Kaolin:					
Direct salable, crude thousand tons	349	304	r379	349	406
Processed do.	96	114	r116	97	100
Total do.	445	418	r495	446	506
Other do.	129	71	r81	80	80
Diamond:					
Gem[e] thousand carats	15	14	r14	12	14
Industrial[e] do.	3	2	2	2	2
Total do.	18	16	r16	14	16
Feldspar	54,710	51,675	50,157	58,610	59,395
Fluorspar:					
Concentrates:					
Acid-grade	9,069	9,678	r10,991	12,349	e13,000
Metallurgical-grade	6,140	4,349	r6,369	4,809	e5,720
Total	15,209	14,027	r17,360	17,158	18,720
Other fluorspar materials (graded)	3,586	3,519	4,081	4,049	4,185
Gem stones excluding diamond:					
Agate (including chalcedony pebble)	1,768	2,268	r2,164	1,379	1,476
Emerald, crude carats	550	35,085	3,760	6,600	1,000
Garnet kilograms	5,529	4,912	r5,035	3,726	1,539
Graphite	48,455	63,784	r52,821	48,795	56,249
Gypsum thousand tons	778	884	r877	856	943
Kyanite and related materials:					
Andalusite	387	225			
Kyanite	42,123	30,897	40,709	46,522	38,283
Sillimanite	15,023	13,471	16,105	12,987	10,254
Lime[e]	182,000	200,000	408,000	400,000	400,000
Magnesite	402,007	414,166	384,665	385,104	453,410
Mica:[4]					
Exports:					
Block	1,099	r1,329	r e1,000	e1,180	e1,000
Film and book for M cuttings	126	r76	r e65	e85	e100
Splittings	3,445	r3,968	r e2,670	e3,610	e3,600
Scrap	9,958	9,334	r e8,900	e13,910	e14,000
Powder	7,505	8,518	r e3,700	e8,000	e7,000

See footnotes at end of table.

Table 1.—India: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Mica[4] —Continued					
Exports —Continued					
Manufactured	470	396	r e325	e300	e300
Total	22,603	r23,621	r e16,660	e27,085	e26,000
Domestic use (all forms)e	r3,000	r3,000	r3,000	r3,000	3,000
Grand total	r25,603	r26,621	r19,660	e30,085	e29,000
Nitrogen: N content of ammonia[3] thousand tons	2,037	2,220	2,256	2,221	3,193
Phosphate rock (including apatite)	r740,322	r789,270	r681,486	540,932	561,944
Pigments, mineral, natural: Ocher	75,935	77,450	r99,036	86,198	79,631
Pyrites, gross weight	31,085	63,781	r67,172	83,806	57,598
Salt:					
Rock salt thousand tons	4	4	4	5	4
Other do.	5,328	6,696	7,032	e7,300	e7,300
Total do.	5,332	6,700	7,036	7,305	7,304
Sodium carbonate	567,600	590,000	610,000	600,000	600,000
Stone, sand and gravel:[5]					
Calcite	27,445	27,983	r30,161	24,028	21,167
Dolomite thousand tons	2,152	1,969	r2,077	1,887	1,955
Limestone do.	30,380	30,915	30,586	28,215	30,873
Quartz and quartzite do.	369	390	322	240	282
Sand:					
Calcareous do.	898	932	r772	772	685
Other do.	1,677	1,620	r1,670	1,532	96
Slate	21,826	14,319	r19,399	11,406	9,187
Sulfur:					
Content of pyrites	e14,080	25,500	r26,869	33,522	30,757
Byproduct:					
From metallurgical plantse	117,000	115,000	115,000	115,000	115,000
From oil refineries	7,000	7,000	r3,665	5,065	4,170
Total	138,080	147,500	r145,534	153,587	149,927
Talc and related materials:					
Pyrophyllite	34,619	38,883	r34,708	35,924	36,000
Steatite (soapstone)	247,000	298,000	r352,000	310,188	329,000
Vermiculite	2,878	1,886	r3,109	3,428	3,624
Wollastonite	3,330	1,928	r3,794	5,788	15,940
MINERAL FUELS AND RELATED MATERIALS					
Carbon blacke	59,000	55,000	54,000	NA	NA
Coal:					
Bituminous thousand tons	100,247	101,973	103,845	114,010	124,900
Lignite do.	3,632	3,613	3,264	4,548	5,500
Total do.	103,879	105,586	107,109	118,558	130,400
Coke:e					
Coke oven and beehive do.	10,000	12,100	12,000	12,000	12,000
Gashouse do.	50	47	100	100	100
Other, soft do.	3,700	50	50	50	50
Total do.	13,750	12,197	12,150	12,150	12,150
Gas, natural:					
Gross million cubic feet	96,282	97,823	100,000	82,530	3136,067
Marketable[6] do.	54,561	61,129	66,957	50,661	375,820
Petroleum:					
Crude thousand 42-gallon barrels	75,787	92,812	93,732	75,672	116,712
Refinery products:					
Gasoline do.	11,645	12,891	12,775	12,393	22,691
Kerosine do.	19,282	19,515	20,440	18,440	22,529
Jet fuel do.	8,160	9,424	8,760		NA
Distillate fuel oil do.	60,993	64,499	68,620	60,680	74,555
Residual fuel oil do.	34,938	38,601	42,340	41,845	46,307

See footnotes at end of table.

Table 1.—India: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Lubricants thousand 42-gallon barrels	2,828	3,403	2,920		2,849
Other do	32,459	34,643	36,135	[e]57,642	42,176
Refinery fuel and losses do	10,778	13,377	10,950		13,594
Total do	181,083	196,353	202,940	[e]191,000	224,701

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Sept. 29, 1982.

[2]In addition to the commodities listed, other clays (bentonite, fuller's earth, and common clays), other gem stones (aquamarine, ruby, and spinel), and uranium are also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels. In 1975, production of 6,514 tons of uranium ore containing about 3 tons of U_3O_8 was reported from 2 mines, which was only a part of total national production. Moreover, reported production of stone and sand and gravel are clearly only partial figures and exclude a number of types of stone; the amounts reported are inadequate to provide sufficient aggregate for production of concrete from domestically produced and consumed cement, nor do they provide for other supplies of aggregate for road metal and other construction uses.

[3]Data are for fiscal year beginning Apr. 1 of that stated.

[4]Data supplied here (exports plus domestic use) are provided in lieu of officially reported production because the latter figures are evidently incomplete. Officially reported production figures are as follows, in metric tons: 1977—14,671; 1978—14,273; 1979—14,180; 1980—12,355; and 1981—12,729. Data presented in this table for exports for the years 1978-81 inclusive and domestic consumption for all years are significantly revised from those appearing in the 1981 Mica commodity chapter in Volume I of the Minerals Yearbook, owing to the receipt of additional information subsequent to the preparation of that chapter.

[5]Partial figures; for details see footnote 2.

[6]Includes reinjected gas.

TRADE

Even though faced with a $6 to $7 billion trade deficit, the Government framed a FY 1982-83 trade policy aimed at liberalizing the import regulations. The policy recognized the need to assure basic inputs to industry and also to update Indian technology as preliminary steps to developing the slowly growing export market. Nearly 100 new items of raw materials and components have been brought under the Open General License (OGL) for imports. At the same time, in order to protect domestic manufactures and to encourage growing industries, 5 items of capital goods and 33 items of raw materials were removed from the OGL list. The intent throughout has been to attempt to make each import liberalization relate to a potential export increase. The new policy removes 100% export-oriented companies and free trade zones from licensing, and allows them duty-free imports.

One mineral-related change was the transfer of aluminum extrusions from OGL to the restricted list. Several new aluminum extrusion projects have been set up to meet India's projected demand of over 40,000 tons per year in the near future. Another change was that brass and copper scrap were replaced on the OGL list.[7]

Table 2.—India: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate value, thousands	$11,131	$15,678	--	U.S.S.R. $11,175; Brazil $3,358.
Metal including alloys, all forms	r10,790	4,507	59	Libya 1,368; Sri Lanka 793; Bangladesh 464.
Chromium ore and concentrate	r67,102	236,017	--	Japan 146,151; East Germany 39,867; Italy 28,000.
Copper:				
Ore and concentrate	NA	23,000	--	All to Japan.
Metal including alloys, all forms	518	1,143	8	Libya 448; Tanzania 245; U.S.S.R. 176.
Iron and steel:				
Ore and concentrate thousand tons	r19,838	24,347	55	Romania 3,110; Republic of Korea 1,886; Yugoslavia 364.
Metal:				
Scrap	75,811	10,532	21	Japan 9,394; Netherlands 746.
Pig iron, cast iron, shot, pellets	298,743	104,254	248	U.S.S.R. 60,167; Republic of Korea 11,300; North Korea 8,788.
Ferroalloys:				
Ferrochrome	9,093	9,001	--	Italy 6,663; North Korea 869; East Germany 800.
Ferromanganese	76,200	52,681	14,121	Japan 15,693; Canada 5,725; Romania 5,027.
Ferrosilicon	7,379	14,014	--	Japan 13,514.
Steel, primary forms	167,999	49,242	8	Iran 34,618; Nepal 5,886; U.S.S.R. 3,469.
Semimanufactures:				
Bars, rods, angles, shapes, sections	334,715	101,745	1,043	Kuwait 32,086; Saudi Arabia 20,214; United Arab Emirates 9,020.
Universals, plates, sheets	22,858	11,697	94	U.S.S.R. 7,293; Japan 2,000; Nepal 1,239.
Hoop and strip	1,016	176	14	Kenya 39; Iraq 34; Ethiopia 30.
Rails and accessories	60,275	7,876	2	Iran 3,079; Iraq 2,535; Egypt 700.
Wire	6,813	14,095	116	China 8,404; Yugoslavia 876; Tanzania 462.
Tubes, pipes, fittings	258,547	135,262	11,633	Saudi Arabia 38,529; China 10,203; United Arab Emirates 9,930.
Castings and forgings, rough	11,586	6,039	4,243	Saudi Arabia 322; Australia 319; Canada 267.
Lead metal including alloys, all forms value, thousands	$41	$57	--	Australia $19; Yemen Sana $12; Sri Lanka $11.
Magnesium and beryllium metals	1	--		
Manganese ore and concentrate	577,292	629,944	--	Japan 437,187; North Korea 64,035; Republic of Korea 62,341.
Nickel metal including alloys, all forms	482	4	--	Saudi Arabia 3.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$10	--		
Silver metal including alloys, unwrought and partly wrought thousand troy ounces	r21,717	3,813	16	United Kingdom 2,837; France 558.
Tin metal including alloys, all forms	2	3	--	Oman 2.
Titanium ore and concentrate	96,728	53,043	--	Japan 42,700; Taiwan 9,500.
Zinc metal including alloys, all forms	10	107	--	Sri Lanka 98.
Other:				
Ores and concentrates	545	22,416	NA	NA.
Oxides and hydroxides	3,784	NA	NA	NA.
Base metals including alloys, all forms	187	218	4	Bangladesh 177.
Nonferrous metal scrap	--	505	--	Japan 400; United Kingdom 105.
NONMETALS				
Abrasives, n.e.s.:				
Natural	2,279	347	1	Republic of Korea 200; Thailand 99.
Grinding and polishing wheels and stones	3,373	1,939	18	Japan 867; Australia 202; Afghanistan 171.
Asbestos, crude	194	413	30	West Germany 270; United Kingdom 58.
Barite and witherite	201,042	338,312	201,333	Iraq 88,397; Netherlands 23,489.
Cement	48,307	54,998	--	Nepal 53,465.

See footnotes at end of table.

Table 2.—India: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products:				
Crude: Bentonite	r19,811	19,775	--	Iraq 6,900; Iran 5,279; United Arab Emirates 3,881.
Products:				
Refractory including nonclay brick value, thousands	$817	$3,765	$3	Republic of Korea $1,846; United Arab Emirates $217; Fiji $173.
Nonrefractory do	$2,504	$1,350	$2	Sri Lanka $295; United Arab Emirates $236; Oman $219.
Diamond: Gem, not set or strung do	$665,045	$436,432	$129,734	Belgium-Luxembourg $146,054; Hong Kong $40,629; Switzerland $38,366.
Fertilizer materials: Crude, phosphatic	146	NA	NA	NA.
Kyanite and related materials	r3,875	1,659	--	Netherlands 680; Switzerland 629; Japan 250.
Lime	5,716	2,072	--	Bangladesh 1,474; United Arab Emirates 211.
Magnesite	r11,152	5,429	122	Netherlands 2,323; United Kingdom 2,023.
Mica:				
Crude including splittings and waste	r15,436	12,635	3,762	Japan 2,104; Czechoslovakia 928; France 831.
Worked including agglomerated splittings	r8,957	4,025	162	Norway 500; West Germany 479; Japan 363.
Precious and semiprecious stones except diamond:				
Natural value, thousands	$45,803	$78,542	$8,698	Cyprus $49,211; Switzerland $4,551.
Synthetic do	$741	$1,969	$926	
Salt	18,747	30,196	--	Nepal 29,603.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	163,508	219,671	1,985	Japan 143,065; Italy 34,136.
Worked	9,932	10,541	--	Japan 4,488; United Arab Emirates 4,309.
Limestone for lime manufacture	165,974	NA	NA	NA.
Gravel and crushed rock	13,248	NA	NA	NA.
Sand excluding metal-bearing	16,005	NA	NA	NA.
Sulfur: Elemental	791	NA	NA	NA.
Talc, steatite, soapstone	r12,479	13,355	--	Norway 3,200; Kenya 2,073; United Kingdom 1,559.
Other:				
Crude value, thousands	$40,206	NA	NA	NA.
Slag and waste, not metal-bearing do	NA	$13	--	West Germany $7.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	50,798	38,743	46	United Arab Emirates 22,041; Qatar 3,350; Afghanistan 3,269.
MINERAL FUELS AND RELATED MATERIALS				
Coal, all grades including briquets	445,651	93,220	--	Bangladesh 70,357; Nepal 17,086.
Coke and semicoke	4,985	433	--	All to Nepal.
Gas:				
Natural value, thousands	$1	NA	NA	NA.
Manufactured do	$83	NA	NA	NA.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	314	NA	NA	NA.
Kerosine and jet fuel do	158	NA	NA	NA.
Distillate fuel oil do	193	NA	NA	NA.
Residual fuel oil do	6	NA	NA	NA.
Lubricants value, thousands	$732	NA	NA	NA.
Unspecified 42-gallon barrels	28	NA	NA	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	20,238	NA	NA	NA.

rRevised. NA Not available.

Table 3.—India: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum:				
Alumina	620	NA	NA	NA.
Metal including alloys, all forms	r26,092	31,751	110	France 11,908; Bahrain 6,218; West Germany 2,515.
Antimony:				
Ore and concentrate, gross weight	106	1	--	All from Singapore.
Oxides and hydroxides	114	NA	NA	NA.
Metal including alloys, scrap and unwrought	r811	450	50	Taiwan 217; China 161.
Arsenic:				
Crude sulfides	7	NA	NA	NA.
Oxide and acid	685	NA	NA	NA.
Elemental	10	NA	NA	NA.
Beryllium metal including alloys, scrap and unwrought kilograms	54	NA	NA	NA.
Bismuth metal including alloys, scrap and unwrought	99	NA	NA	NA.
Cadmium:				
Oxides and hydroxides kilograms	400	NA	NA	NA.
Metal including alloys, unwrought	59	NA	NA	NA.
Chromium:				
Oxides and hydroxides	5	NA	NA	NA.
Metal including alloys, scrap and unwrought	37	NA	NA	NA.
Cobalt:				
Oxides and hydroxides	3	NA	NA	NA.
Metal including alloys, scrap and unwrought	r151	136	4	Zaire 67; Belgium-Luxembourg 32.
Copper:				
Oxides and hydroxides	8	NA	NA	NA.
Metal including alloys:				
Scrap	r15,904	34,275	10,231	Singapore 7,418; Kuwait 7,059; United Arab Emirates 2,816.
Unwrought	60,172	45,682	8	Zambia 34,543; West Germany 6,160.
Semimanufactures	5,820	6,227	479	Japan 1,905; United Kingdom 1,399; West Germany 919.
Iron and steel:				
Ore and concentrate except roasted pyrites	301	164	24	Spain 140.
Roasted pyrites	163	15	10	France 5.
Metal:				
Scrap	r109,326	144,697	57,499	United Kingdom 45,168; West Germany 13,550; France 8,815.
Pig iron and cast iron	--	625	--	Canada 553.
Sponge iron, powder, shot	803	1,022	1	Sweden 899; West Germany 97.
Ferroalloys	4,515	2,739	229	France 1,912.
Steel, primary forms	3,744	74,232	198	Republic of Korea 29,399; West Germany 14,076; Romania 8,623.
Semimanufactures:				
Bars, rods, angles, shapes, sections	85,461	282,709	1,298	United Kingdom 93,128; Japan 69,994; West Germany 31,878.
Universals, plates, sheets thousand tons	522	1,093	43	Japan 355; West Germany 165; United Kingdom 153.
Hoop and strip	13,128	15,175	614	West Germany 7,873; Sweden 2,604; Japan 2,350.
Rails and accessories	187	(1)	NA	NA.
Wire	5,116	4,123	26	Japan 1,134; West Germany 893; United Kingdom 665.
Tubes, pipes, fittings	80,711	86,522	1,723	Japan 38,219; West Germany 19,470; United Kingdom 10,073.
Castings and forgings, rough	1,260	4,937	10	Canada 3,475; Japan 663; United Kingdom 247.
Lead:				
Ore and concentrate	101	47	--	Morocco 45.
Oxides and hydroxides	272	NA	NA	NA.
Metal including alloys:				
Scrap	1,912	4,246	158	United Arab Emirates 1,095; Kuwait 1,049; Jordan 743.
Unwrought	24,967	34,613	--	Australia 30,548; Spain 2,005.
Semimanufactures	1,528	20	1	West Germany 12.
Magnesium metal including alloys, all forms	r752	493	163	United Kingdom 137; Norway 103.
Manganese:				
Ore and concentrate	4,045	5,143	50	Congo 3,000; Singapore 1,058.

See footnotes at end of table.

Table 3.—India: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS —Continued				
Manganese —Continued				
Oxides and hydroxides	330	NA	NA	NA.
Metal including alloys, scrap and unwrought	152	NA	NA	NA.
Mercury 76-pound flasks	10,158	NA	NA	NA.
Molybdenum:				
Ore and concentrate	173	NA	NA	NA.
Metal including alloys, scrap and unwrought	r35	37	10	United Kingdom 9; Sweden 5; Netherlands 4.
Nickel metal including alloys:				
Scrap	r2,690	2,377	256	Belgium-Luxembourg 380; United Kingdom 363; West Germany 339.
Unwrought	3,606	2,291	30	Canada 541; United Kingdom 426; Australia 395.
Semimanufactures	2,034	2,644	366	United Kingdom 795; Japan 376; Canada 241.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	r13,407	12,635	997	United Kingdom 5,466; U.S.S.R. 5,208.
Selenium, elemental	29	NA	NA	NA.
Silicon, elemental	1,144	NA	NA	NA.
Silver metal including alloys, unwrought and partly wrought troy ounces	13,655	NA	NA	NA.
Tantalum metal including alloys, scrap and unwrought kilograms	1,135	NA	NA	NA.
Tellurium, elemental do	719	NA	NA	NA.
Tin:				
Oxides, hydroxides, peroxides	138	NA	NA	NA.
Metal including alloys:				
Scrap	r4,553	7,466	1,747	United Kingdom 2,822; West Germany 1,193; Belgium-Luxembourg 905.
Unwrought	1,793	1,864	1	Malaysia 1,666.
Semimanufactures	31	15	2	Japan 6.
Titanium:				
Oxides	6,038	NA	NA	NA.
Metal including alloys, unwrought	20	NA	NA	NA.
Tungsten:				
Ore and concentrate	r397	255	10	Thailand 181.
Metal including alloys, scrap and unwrought	r26	21	1	United Kingdom 6; Netherlands 5; West Germany 4.
Zinc:				
Ore and concentrate	83,212	39,580	141	Peru 26,501; Australia 11,410.
Oxides and hydroxides	75	NA	NA	NA.
Metal including alloys:				
Scrap	1,015	846	442	Tanzania 107; Australia 105; Kenya 63.
Unwrought	56,496	43,241	1	Australia 13,262; U.S.S.R. 11,259; Zambia 4,992.
Semimanufactures[2]	1,417	1,622	637	Australia 365; Canada 182; Kenya 152.
Zirconium:				
Ore and concentrate	5	NA	NA	NA.
Metal including alloys, unwrought	56	NA	NA	NA.
Other:				
Ores and concentrates	126	623	113	Thailand 181; Australia 144; Kuwait 48.
Metals:				
Metalloids	36	NA	NA	NA.
Alkali, alkaline-earth, rare-earth metals	19	NA	NA	NA.
Base metals including alloys, scrap and unwrought	107	1,772	355	Japan 388; United Kingdom 289; China 161.
NONMETALS				
Abrasives, n.e.s.:				
Natural:				
Tripoli earth	17	NA	NA	NA.
Other kilograms	440	NA	NA	NA.
Dust and powder of precious and semi-precious stones except diamond do	64	NA	NA	NA.
Grinding and polishing wheels and stones	266	244	51	United Kingdom 60; West Germany 46; Japan 42.
Asbestos, crude	r51,895	48,458	310	Canada 17,876; U.S.S.R. 14,948; Australia 9,209.

See footnotes at end of table.

Table 3.—India: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
NONMETALS —Continued				
Boron materials:				
Crude natural borates	301	NA	NA	NA.
Oxide and acid	3	NA	NA	NA.
Bromine, elemental	162	NA	NA	NA.
Cement thousand tons	1,143	1,138	(3)	North Korea 542; Republic of Korea 498.
Clays and clay products:				
Crude	1,577	NA	NA	NA.
Products:				
Refractory including nonclay brick	8,751	NA	NA	NA.
Nonrefractory	75	NA	NA	NA.
Cryolite and chiolite	5	NA	NA	NA.
Diamond:				
Gem value, thousands	$534,125	$423,009	$3,567	Belgium-Luxembourg $205,733; United Kingdom $157,689.
Industrial thousand carats	r970	480	70	United Kingdom 115; Ireland 65; Sierra Leone 55.
Diatomite, kieselguhr, other infusorial earth	230	NA	NA	NA.
Feldspar and fluorspar	r5,000	5,034	--	Thailand 5,000.
Fertilizer materials:				
Crude:				
Phosphatic thousand tons	830	1,145	267	Jordan 388; Morocco 354; Senegal 96.
Potassic	23	481	--	Spain 480.
Manufactured:				
Nitrogenous thousand tons	1,910	1,039	375	Romania 121; Qatar 85; Bulgaria 82; U.S.S.R. 63.
Phosphatic	197,565	192,598	180,285	Singapore 7,000; Romania 5,313.
Potassic	552,439	392,019	17,369	Canada 164,867; West Germany 153,940.
Other including mixed	333,054	479,433	93,787	West Germany 133,710; Canada 122,722; East Germany 77,224.
Fluorine, elemental kilograms	10	NA	NA	NA.
Graphite, natural	539	NA	NA	NA.
Gypsum and plasters	6	NA	NA	NA.
Iodine, elemental	222	NA	NA	NA.
Lime	20	19	--	France 9; Japan 9.
Magnesite, crude	r7,641	27,153	11	Greece 23,004; North Korea 1,914; Japan 1,014.
Mica, worked including agglomerated splittings	145	NA	NA	NA.
Pigments, mineral:				
Iron oxides, processed	1,279	NA	NA	NA.
Other	2	NA	NA	NA.
Precious and semprecious stones except diamond:				
Natural value, thousands	$8,259	$6,715	$1,507	Switzerland $1,088; Brazil $1,087.
Synthetic and reconstructed do.	$201	$211	$21	France $83; Switzerland $50.
Pyrites, unroasted	NA	13	13	
Salt and brine	1,042	89	--	Nepal 50; Singapore 22.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	46	NA	NA	NA.
Caustic potash	55	NA	NA	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	28	41	--	Italy 39.
Worked	141	25	12	West Germany 9.
Gravel and crushed rock:				
Quartz	19	--		
Other	258	136	23	Nepal 100.
Limestone except dimension	12	12	12	
Sulfur:				
Elemental	818,168	959,152	209,001	Canada 262,671; Iraq 234,229; Poland 100,051.
Sulfuric acid	3	NA	NA	NA.
Talc, steatite, soapstone, pyrophyllite	14	NA	NA	NA.
Other:				
Crude:				
Meerschaum, amber, jet	10	NA	NA	NA.
Unspecified	8,546	NA	NA	NA.
Slag and ash, not metal-bearing	5,550	NA	NA	NA.
Oxides, hydroxides, peroxides of strontium, magnesium, barium	159	NA	NA	NA.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	161	125	7	United Kingdom 61; West Germany 49.

See footnotes at end of table.

Table 3.—India: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,681	NA	NA	NA.
Carbon black and gas carbon:				
Carbon black	1,885	NA	NA	NA.
Gas carbon kilograms	32	NA	NA	NA.
Coal, all grades including briquets	1,613	639,705	21	Australia 474,279; Canada 165,105.
Hydrogen, helium, rare gases value, thousands	$1,202	NA	NA	NA.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	107,521	120,042	--	Iraq 44,474; Saudi Arabia 22,893; U.S.S.R. 22,662.
Refinery products:				
Kerosine and jet fuel[4] do	r12,532	10,822	NA	NA.
Distillate fuel oil[4] do	r8,027	11,033	NA	NA.
Residual fuel oil[4] do	r5,415	5,994	NA	NA.
Lubricants[5] do	231	NA	NA	NA.
Liquefied petroleum gas[4] do	--	128	NA	NA.
Other[5] do	3,043	NA	NA	NA.

rRevised. NA Not available.
[1]Unreported quantity valued at $613,000.
[2]Includes blue powder.
[3]Less than 1/2 unit.
[4]Data are from the United Nation's Yearbook of World Energy Statistics 1980, 896 pp.
[5]Data are from the International Petroleum Annual, 1978.

COMMODITY REVIEW

METALS

Bauxite, Alumina, and Aluminum.—The situation in the aluminum industry changed substantially during the past year. In 1980, there were severe shortages, forcing the importation of well over 100,000 tons of aluminum. In 1981, the industry faced a surplus of unsold stock. There were several factors that contributed to this new problem.

One important problem was the failure of the state electricity boards to honor their financial commitment to purchase domestic electric-conductor-grade aluminum. The smelters were required by law to produce 50% of their output as electric-conductor-grade wire rod or ingot. The massive electrification plan for the nation was considerably behind schedule, causing long delays in purchase of the aluminum transmission cables. The situation would not be serious in most other countries such as the United States or the Federal Republic of Germany, but 55% of Indian aluminum consumption was electric-conductor-grade, compared with 11% and 6%, respectively, for the other two countries. Further complicating the problem was a Government ban on export of electric-conductor-grade aluminum imposed in 1980. As the surplus metal stocks built up, the Government found it necessary to lift the export ban in late summer of 1981.

Because of the depressed state of the world aluminum markets, price competition was very keen. Costs of production have risen steadily, but the retention price allowed the aluminum producers was strictly controlled by the Government. In addition, the domestic sale of aluminum was subject to an excise duty of 44% ad valorem. This was much higher than the per-ton duty on other common metals. The ultimate high

prices charged the consumers contributed to the increasing sales resistance and build-up in the level of unsold aluminum stocks. The sales potential for commercial-grade aluminum would be much larger in India if its price were more competitive with other materials, especially in the canning and packaging, transportation, and construction sectors.

The Government attempted to relieve some of the aluminum problems by adjusting its pricing structure to maintain equality with imported material and to adjust the excise duty to a more equitable level.

Effective December 3, 1981, basic prices for aluminum ingots and wire rods were raised by nearly $267 per ton to compensate producers for the continuing increase in raw material prices. At the same time the excise duty was reduced from 44% to 22%. After the excise duty and the 4% sales tax was added, the final price payable by consumers for ingots went up to $2,173 per ton, an increase of $19 per ton. Following the retail price increase, the Government raised retention prices at all Indian smelters by an average of $274 per ton. By raising retention prices, the Government felt it had provided suitable incentives to smelters to keep up production rates despite the spiraling costs. Some aluminum industry spokespersons, however, claimed that the subsequent steep rise in the prices of pitch and calcined petroleum coke offset the increase in the aluminum prices.

Work was underway at the Government-owned Bharat Aluminium Co., Ltd. (BALCO), plant in Korba to bring the alumina capacity up to the original design level of 200,000 tons per year. Operational problems have consistently limited the output to about 150,000 tons per year. The $5 million revamping was expected to be completed by yearend 1982.

BALCO's source of bauxite, the Amarkantak and Phutkapahar Mines in Andhra Pradesh, was running out of ore faster than planned. Therefore, BALCO investigated alternate ore sources for the post-1985 period. The Gandhamardan deposit in Orissa was found to be suitable for the Korba plant. A feasibility report was prepared for a 600,000-ton-per-year mine at an estimated cost of $31 million. The project was awaiting governmental approval at yearend 1981.

Also at Korba, the new 40,000-ton-per-year, cold-rolling mills were reported under commissioning during 1981. A new extrusion press, rated at 3,150 tons, was completed during the year and was to be commissioned by March 1982. The new unit supplements the capability and output of the existing 800- and 2,500-ton presses.

BALCO continued to have severe power shortages during the year and was only able to operate two of its four potlines at about 60% capacity. The remaining two potlines, which were completed in December 1977 and September 1978, comprise one-half of the plant's 100,000-ton-per-year capacity and have never been in operation because of the power shortage. The power available has been highly erratic, with voltage and frequency changes commonplace. There were also 87 total power outages from April to November 1981. The effect on smelting equipment, and on the cost and quality of the product is obvious and will not be detailed here.

The prospects for improvement in the power situation were fair. The Madhya Pradesh Electric Board (MPEB) had not been able to honor its power contracts in the preceding years and was not able to supply the minimum peak-load demand promised by October 1981. BALCO was hopeful, however, that this would change with the completion of new MPEB generating units in 1981 and 1982—Satpura VI and VII and Korba IV.

Another development was the imminent completion of the power grid link between Andhra Pradesh and Madhya Pradesh. This link was sanctioned specifically to meet the power requirements of BALCO.

The Andhra Pradesh alumina project continued in the planning stage. The main problem has been financing the 600,000-ton-per-year plant. The Soviet Union originally proposed financing 15% of the cost but reconsidered in 1981 and offered to supply up to 40% of the cost. Final arrangements for financing and exporting the alumina were under discussion between the two Governments.

On March 29, 1981, Prime Minister Gandhi laid the foundation stone for the alumina plant at Damanjodi in Koraput district of Orissa. The action formally began construction of the giant $1.4 billion French-aided Orissa aluminum complex.

In October 1981, the Union Energy Minister inaugurated the Bharatpur open pit coal mine, about 15 kilometers from the smelter site at Talcher. The mine will supply coal exclusively to the aluminum project's captive thermal electric powerplant.

The contract for the 600-megawatt powerplant, to be set up at Talcher near the smelter, was expected to be awarded to Bharat Heavy Electricial, Ltd., the lowest of only two bidders. The contract was to call for the installation and commissioning of the first 120-megawatt unit 39 months from the date the letter of intent is issued. Subsequent 120-megawatt units are to be installed at 5-month intervals until the full 600-megawatt capacity is reached.[8]

By yearend 1981, the chairman of the National Aluminium Co., Ltd., indicated that the project was ahead of schedule and planned commissioning was to be moved up by several months. Commercial production of aluminum was set for October 1985.

Chromite.—Of the three companies recently licensed to produce charge chrome, the private sector firm, Ferroalloy Corp., reportedly was the furthest along. The 50,000-ton-per-year export-oriented plant near Baudpur in Orissa will use the company's own technology, developed entirely by its research and development department. Although the technology will be Indian, much of the plant and equipment will be contracted to Japan because domestic machine tool companies did not have the fabricating technology required. Civil construction work was reported to be underway in 1981, and delivery of both imported and domestic machinery was scheduled to be completed in October 1982.

The Orissa Mining Corp. signed a contract in July 1981 with Vöest-Alpine AG of Austria and Outokumpu Oy of Finland to build a 50,000-ton-per-year charge chrome plant. The plant will be located in Koenjhar District of Orissa State. Work on the infrastructure and site preparation may have begun during 1981, but reportedly there were complications with financing arrangements and import of foreign equipment. Financing problems could delay the start of work on the main plant by several months.

Indian Metals and Ferroalloys, Ltd., held the third license to produce charge chrome. It already produces ferroalloys at its plant at Therubali near Bhubaneswar. This project, also with a 50,000-ton-per-year capacity, was planned for a late 1984 completion date.[9]

Copper.—The Khetri copper complex of the Government-owned Hindustan Copper, Ltd. (HCL), was again hit by severe electric power shortages throughout the year. In order to minimize damage to the smelter and refinery, which must operate continuously, the power was allocated mainly to the smelter and refinery. Power to the mines, concentrator, and byproduct fertilizer plant was cut back and production was affected accordingly. Triple-superphosphate production was not maintained at all. The resulting shortfall of concentrates had to be made up by increased imports.

The Government had been considering expanding the Khetri smelter from 31,000 to 45,000 tons per year to help meet the country's projected copper demand. However, it appears that the project will be deferred in favor of a new 40,000- to 50,000-ton-per-year smelter in the vicinity of the Rakha or Malanjkhand Mines.[10]

The possibility of putting a smelter at Rakha was brought about by HCL's plans for a major expansion at the Rakha copper mines in Bihar. The first stage of the Rakha Mine was operating and produced about 200,000 tons of ore during 1981.

If foreign financing can be arranged, HCL planned to contract the development work for a second-stage exploitation of the deposit that contains about 100 million tons of ore averaging 1.13% copper. The project will call for construction of mine shafts, ore passes, haulage ways, underground crusher chambers, and related work. Exploration drilling and a feasibility report have already been completed by HCL.

Three years from the date the project is approved, the mine should be producing 3,000 tons per day of ore. Until the shafts are completed, ore will be removed by trucks using an inclined ramp. A third phase was planned to bring the mine to a production level of 6,000 tons per day. It is estimated that 6 to 7 years will be required to complete the project at a cost of $150 million including a 100,000-ton-per-year concentrator near the mine.

To increase the long-term copper production further, HCL was seeking an engineering consultant to prepare a feasibility report for the integrated development of the Singhbhum copper belt in Bihar. The belt stretches over 120 kilometers, but development has been limited to about a 20-kilometer section that includes the Rakha Mine. Exploration has identified a number of potential mining sites with an aggregate reserve of 130 million tons of copper ore. An investment of $300 million was proposed over the next 10 years.

The proposed study calls for evaluating the reliability of the geologic mapping and exploration work already completed; identi-

fying the best areas for immediate mining; determining the optimal location for ore processing facilities, the most suitable ore transport systems, and the best locations for waste and tailings disposal; and drawing up long-term plans for maximizing the use of the resources in the Singhbhum copper belt.[11]

The largest copper development project under construction was the Malanjkhand open pit, located 90 kilometers northeast of Balaghat in Madhya Pradesh. This was the first large-scale open pit copper mine in India and will produce about 24,000 tons per year of metal from 2 million tons of ore. Over 3 million cubic meters of overburden were removed in 1980 and slightly more than that was removed in 1981. Directly minable reserves were measured at 59 million tons of 1.2% copper at a 0.45% copper cutoff. A further 44 million tons of low-grade primary ore averaging 0.22% copper and 5.5 million tons of oxidized ore averaging 0.58% copper occur within the pit limits. Much of this material will be segregated and the copper values recovered by India's first application of heap-leaching extraction from low-grade material.

Both mine development and concentrator construction were on schedule during 1981. Work on the tailing disposal and water reclamation systems was delayed, but apparently was started in 1981. The first-stage capacity of 1 million tons per year was expected to be commissioned in July 1982. The full capacity of 2 million tons per year was to be achieved 2 years later.

Present plans call for the concentrate to be shipped to the Khetri complex for smelting and refining. HCL was to expand the capacity of the Khetri smelter to handle the increased concentrates or to build a new smelter near the Malanjkhand site. The final decision apparently had not been made at yearend 1981.

Gold.—The public sector company that operates the Kolar gold mines, Bharat Gold Mines, Ltd. (BGML), completed the extensive preinvestment exploratory mining and level development work at the Yeppamana Mine in the old Ramagiri Goldfield in Andhra Pradesh. The exploration revealed 350,000 tons of measured and indicated ore grading 5.70 grams of gold per ton. Possible reserves total almost 750,000 tons of ore grading 5.56 grams of gold per ton. Further development work for commercial production was awaiting the investment decision from the Government, which was expected in early 1982. When production resumes, it will be at a planned rate of about 300 kilograms of gold per year.

BGML's Kolar gold mines returned a profit in 1979 for the first time since the 1972 formation of the company, and continued operating profitably in 1980. The financial outcome for 1981 was not known but would have been more strongly dependent on world gold prices than on the mining operations.

To maintain profitability, BGML was engaged in updating its mining, ore processing, and shaft sinking methods. A plan was drawn up using foreign technological aid for the secondary recovery of gold from the 47 million tons of tailings. A significant proportion of the tailings was believed to be suitable for heap-leaching recovery of most of the residual gold values.

GSI has been conducting a major exploration effort of old gold-producing areas and trying to locate new deposits in India. Several sites at the old Hutti Goldfields in Raichur district of Karnataka looked promising for reopening. GSI reported that the Porojarna Mine in Singhbhum district of Bihar could be reopened profitably if mined properly. Reserves there and in other parts of the district were described as high grade. The mine was abandoned in 1916 because of financial and operational problems.

Promising gold discoveries were made at Mallappakonda and Chigargunta in Chittoor district of Andhra Pradesh along a southern extension of the Kolar Shist Belt. The gold at Mallappakonda is disseminated in arsenopyrite-rich layers of a banded iron-sulfide formation. Ore reserves were estimated at 300,000 tons with an average grade of 4 grams of gold per ton.

The Chigargunta gold mineralization occurs with quartz and mica in a highly faulted zone. The ore occurs in several distinct ore blocks that range in grade from 4 to 8 grams of gold per ton. Estimated ore reserves were put at 350,000 tons to a depth of 100 meters.

Placer gold deposits were reported in Nainital and Pauri Garhwal districts of Uttar Pradesh. The gold occurs along a 2- to 5-kilometer-wide zone about 60 kilometers long.

Iron Ore.—Iron ore exports accounted for nearly 5% of India's foreign exchange earnings. Earnings for FY 1981-82 were estimated at $477 million, about 26% higher than the earnings of the previous year.

More than one-half of ore production was exported. About 23.5 million tons was shipped during 1981. National Mineral Development Corp., Ltd., the public sector corporation that operates the big mechanized mines at Bailadila and Donimalai, produced 7.7 million tons and exported 7.3 million tons in 1981. Most of the private sector exports originated around Goa and were exported through the Port of Marmogoa.

The iron ore industry, as it presently exists, will be able to supply the domestic steel industry and the current export market with little additional investment. However, with the construction of the Visakhapatnam steel complex by the end of the sixth 5-year plan, a new 6-million-ton-per-year mine will be required in the Bailadila area to supply the plant. Another new facility will be needed to supply the other coastal plant planned for the Daitari area. The most likely deposit to be exploited for the Daitari project would be the high-grade Gandhamardan deposit in Keonjhar district of Orissa where high-density drilling by Orissa Mining Corp. has shown a reserve of 250 million tons with a low overburden thickness.

The Kudremukh Iron Ore Co., Ltd., project has been causing considerable concern to Indian officials since the political and military situation in Iran caused the postponement of completing Iran's direct-reduction based steelworks for an indefinite period. Iran was to use 7.5 million tons per year of Kudremukh concentrate to feed two planned steel plants. One of these was canceled outright, and the other was located near the combat zone where construction was at a standstill during 1981.

Iranian and Indian officials were negotiating the renewal of the ore purchase agreement but at a reduced rate and much later starting date. Iran could still take around 4 million tons per year if the steel complex can be successfully and quickly completed. In light of the present Iranian situation, that seems rather doubtful. The Kudremukh Mine, concentrator, and slurry pipeline have only been operating at a level sufficient to keep the machinery in good working order.

During the year, India was actively seeking arrangements for selling at least some of the ore concentrate. Small batches of 50,000 tons were shipped for testing purposes to the Republic of Korea and to Romania. Czechoslovakia ordered 40,000 tons. Nigeria, Mexico, Bahrain, Trinidad and Tobago, Malaysia, and Indonesia were also considering testing some of the concentrate.

To increase the salability of the Kudremukh product, the Public Investments Board of the Government of India approved a $100 million expenditure for a 3-million-ton-per-year pellet plant to be built at Mangalore, the terminal of the 67-kilometer-long ore slurry pipeline. A Romanian firm signed a contract with Kudremukh on September 12, 1981, to build the plant. Lurgi Chemie & Huttentechnik of Frankfurt am Main and Lurgi S.A. Paris will supply technology, equipment, and initial startup under a separate contract with Lurgi. Fuel will be high-ash domestic coal. The contract called for completion of the plant in September 1984.

A separate contract, signed on the same day, provided for the export of 3 million tons of concentrate to Romania. The Kudremukh concentrate will be mixed with iron ore fines in sinter feed. The total Romanian imports up to FY 1984-85 would be limited to the value of the pellet plant contract.

The Mandovi pellet plant in Goa was forced to shut down in April 1981 because of increasing costs of production, particularly for fuel oil. The plant was under a long-term contract to Japanese steelmakers to supply 1.8 million tons per year of high-grade pellets.

Steel.—The five integrated steel plants under Steel Authority of India, Ltd. (SAIL), reportedly closed 1981 with a record production of 5.53 million tons of salable steel. The previous record was set in 1977 when 5.42 million tons was produced. All of the SAIL plants exceeded the 1980 levels for crude and salable steel. SAIL production was combined with 1.6 million tons of production anticipated from private sector Tata Iron and Steel Co. (TISCO) plus another 1.7 million tons from ministeel plants for a total salable production of about 9 million tons. The performance of the Indian steel industry during 1981 gained special significance against the background of declining steel production the world over—747 million tons in 1979, 718 million tons in 1980, and 705 million tons in 1981. The public sector plants could have done better, but the SAIL target of 5.73 million tons proved to be difficult because the electric power situation in Orissa and Madhya Pradesh and the shortage of railroad cars continued

to limit production. The Bhilai steel plant in Madhya Pradesh and Rourkela steel plant in Orissa, two of the more efficiently operated plants, were the hardest hit by the power shortage. Both plants were served by state electricity boards in contrast to SAIL's plants at Bokaro, Durgapur, and Burnpur, which benefited from higher power output from the Damodar Valley Corp. Persistent railcar shortages have resulted in alarmingly low coking coal stocks at these plants. The high ash content, exceeding 20.5% in some shipments has also adversely affected the performance of the steel mills.

For FY 1982-83, Indian salable steel production from all sources was projected to increase about 10% to 10 million tons with integrated steel plants accounting for nearly 8 million tons and steel miniplants accounting for about 2 million tons. SAIL's target was 6.49 million tons out of an installed capacity of 7.2 million tons. Demand was put at 11 million tons with the difference to be met from imports. The performance of the steel sector, however, will continue to depend heavily on the availability of electric power and coal.[12]

The demand for steel was estimated by the Ministry of Steel and Mines at 12.7 million tons by FY 1984-85 and 18.4 million tons by FY 1989-90. The main increase in demand will be for bars, rods, structurals, plates, and hot- and cold-rolled sheets. The Government planned to raise the installed capacity of crude steel in the integrated steel plants to nearly 20 million tons per year by 1990 to meet the demand. This was to be achieved through a blend of modernizing and expanding existing plants and construction of new plants. The major projects will be the expansion of Bhilai and Bokaro steel plants to 4 million tons each and the construction of new plants at Visakhapatnam and near Paradip. The sixth plan, FY 1980-85, envisioned an outlay of $4.14 billion for the steel industry.

There were several developments during the year. At Visakhapatnam, construction on the water and electric power supply, storage buildings, offices, approach roads, and railways was either completed or generally on schedule. The foundation of blast furnace No. 1 was completed at yearend. Foundation work on other sections was underway. An agreement for the supply of equipment worth approximately $245 million was signed with the U.S.S.R. in November 1981. Firms from the Federal Republic of Germany, Czechoslovakia, Japan, and India were among bidders to build four rolling mills at the site. The Ministry of Steel hoped to split the contract, assigning two mills to one company and one each to the other main contenders. The revised estimated cost of the project was $3.26 billion, and the first phase was to be completed by early 1986. A new company, Rashtriya Ispat Nigam, was formed during the year by the Government to implement this project. The 3.4-million-ton-per-year plant will employ several firsts for Indian steel, including selective crushing and pneumatic separation of coal, dry quenching of coke and conveyor charging, and bell-less top operation of the blast furnaces. All steel will be continuously cast.

A second grass-roots steel complex was being planned for an east coast location. A consortium headed by Davy McKee Corp. of the United Kingdom won the right to build a 3-million-ton-per-year integrated steel mill at the Orissa Port of Paradip. Davy was to be the prime contractor but will work with French and West German firms as well. A complicated series of loans and financing will be arranged through foreign banks for the project. The final contract was not to be signed until India and Davy complete negotiations over details in mid-1982, but these companies were to build the plant barring some major change.

The plan to expand the Bokaro steel plant to 4.0 million tons per year has been plagued by delays of 4 to 5 years on major components. The fifth coke oven battery and the fourth blast furnace were commissioned during 1981 several years late. Progress on the raw material handling system, the third ore sinter line, the sixth and seventh coke oven batteries, the fifth blast furnace, and the cold-rolling mill has been slow, reportedly because of slippages in the supply of critical equipment, both from domestic and foreign suppliers.[13] Management and delivery sequencing problems also contributed to delays. The three-unit captive powerplant that was recently ordered has already fallen behind schedule by about 6 months. With the recent history of power shortages, delay in completion of the powerplant will directly affect the performance of the operation of the Bokaro complex.

The long delays in construction have also caused a large increase in construction costs, up to 50% over the plan in some cases.

The operational part of the plant, despite record production for the year, was facing

raw material shortages that could limit the 1982 output if not solved. There were ample stocks available at the captive mines at Kiriburu, Bhawanthpur, and Kuteshwar, but few railway cars were available to move them to the plant.

Expansion of the Bhilai steel plant from 2.5 to 4.0 million tons per year has been proceeding with fewer problems than encountered at Bokaro. Over 270,000 cubic meters (9.5 million cubic feet) of concrete was poured, 23,600 tons of structural steel was erected, and nearly 19,000 tons of equipment was installed during 1981. Construction of the second sintering line was completed, but completion of the plate mill, to be the largest in India, was delayed until late in 1982. Work on the powerplant, blast furnace No. 7, and coke oven battery No. 9, has dropped several months behind schedule. The reasons given for the slippages were inadequate resources applied to civil works, structural, and equipment erection; repairs needed on equipment delivered by domestic and foreign contractors; a shortage of cement; and delays in equipment delivery.

Commercial production of cold-rolled stainless steel sheet began at the Salem steel plant on September 13, 1981. This marked completion of the 32,000-ton-per-year first stage of the $170 million plant. Plans called for the capacity to be doubled in the near future at a cost of $33 to $56 million.

The plant used imported stainless hot-rolled coil as feedstock, but it was intended that the alloy steel plant at Durgapur would supply feedstock when improvements underway there were completed.

When the plant began operating, it was found that the high duty levied on the imported coil made the operation uncompetitive. Finally, in January 1982, the duty was reduced from 325% to 125% ad valorem. The plant was expected to produce about 11,000 tons of product during FY 1982-83 if the chronic power shortage in Tamil Nadu does not restrict operations.

The direct-reduction iron plant at Kothagudam in Andhra Pradesh, completed in late 1980, began a highly successful trial operation in 1981. Sponge Iron India, Ltd.'s 30,000-ton-per-year coal-based pilot plant ran the 120-day guarantee run at 110% of design capacity at a plant availability of 98%. Quality of product was within design specifications using a 23% ash domestic coal. The sponge iron was tested during the year in several electric arc furnace plants with excellent results.

Since the contract for the Kothagudam plant was announced, there has been a plethora of plans for new sponge iron facilities around the country. At least eight additional plants of various types and sizes were under consideration during the year.

Furthest along was the Orissa Sponge Iron, Ltd., 150,000-ton-per-year plant in Keonjhar district of Orissa. This was to be the first commercial-size plant in India and utilized an Allis-Chalmers Corp. ported rotary kiln design that can use a variety of fuel and Indian lump iron ore. The plant was scheduled for completion in 1982, and plans were underway to double the capacity to 300,000 tons per year. With existing infrastructure and equipment, the cost of expansion should be considerably less than the $25 million cost of the original plant.

Other proposals for sponge iron plants include the following:

(1) Gujarat State Industrial Investment Corp. has applied for a license to build a 400,000-ton-per-year direct-reduction plant in the vicinity of Hajira, Surat district, based on natural gas from offshore wells.

(2) Maharashtra State Industrial Development Corp. has applied for a license to build a 300,000-ton-per-year plant, also based on offshore natural gas. Site and process technology for the proposed plant were yet to be selected.

(3) Bihar State Industrial Development Corp. has been issued a letter of intent for a 120,000-ton-per-year plant at Ranchi or Chandi. Process knowhow based on noncoking coal was likely to be supplied by Lurgi of the Federal Republic of Germany.

(4) TISCO has applied for a license to build a 100,000- to 160,000-ton-per-year plant based on its process of using noncoking coal. The proposed plant site was near Joda in Keonjhar district of Orissa.

(5) The Government was considering building a natural gas-based plant at Mangalore that would use feedstock from the pellet plant under construction there.

(6) Salem Steel, Ltd., in Tamil Nadu was looking into the possibility of using a direct-reduction plant and an electric arc furnace as the basis for integration of the present stainless steel rolling mill. The intention would be to use the nearby Neyveli lignite as the solid reductant.

Lead and Zinc.—Hindustan Zinc, Ltd. (HZL), the public sector company that operates most of the country's lead and zinc

mining and smelting activity, has been engaged in an active program to increase production. The long-term goal of HZL was to produce 60% of India's zinc needs and 70% of its lead needs. Current production of zinc concentrate furnishes less than one-half of the material needed to operate the company's 75,000-ton-per-year installed capacity smelter at design output.

Several developments occurred during the year that will affect production. Deepening of the Mochia Mine's main and auxiliary shafts, as well as the main shaft at Balaria Mine, continued during the year. A shortage of electric power set the development schedule back several months. Completion of these shafts was critical for the maintenance of production levels because the upper ore bodies were nearing depletion. Work on the lower level drifts cannot begin until the two main shafts are operational.

At the Agnigundala lead mine, expansion of the beneficiation plant from 100 to 240 tons per day was completed during 1981. Expansion of the mine workings to the same capacity was in progress and was expected to be completed in early 1982.

Work on the new 3,000-ton-per-day lead and zinc mine at Rajpura-Dariba was delayed by a shortage of cement and electric power. Installation of the hoisting system in the shaft was delayed more than a year by labor disputes. The delay will further set back the drift development and the overall project schedule at the mine.[14]

Exploration has revealed evidence of ancient mine workings at Rajpura-Dariba. Isotope-dating of wood recovered by diamond drilling to a depth of 265 meters indicated mining may have been underway at this site 1,800 to 2,500 years ago.

There were construction delays reported at the Sargipalli lead mine in Orissa during 1981. The 500-ton-per-day mine and concentration plant was scaled to supply about 10,000 tons of lead concentrate per year to the Visakhapatnam smelter.

Planning continued for the development of the large lead and zinc deposit at Rampura-Agucha in Bhelwara district of Rajasthan. Tenders were issued in 1981 for a consulting report and 20 international companies responded with offers. Of these, seven were prequalified by HZL. The final choice of contractors had not been announced at yearend.

Based on surface drilling to a depth of 275 meters over a 1.1-kilometer strike length, lead and zinc ore reserves were put at 44 million tons. In 19 boreholes drilled to a depth of 175 meters, mineralization averaged 1.9% lead, 13.7% zinc, and 9.9% iron. Grade of ore was reported to be increasing with depth in the central area. Initial plans call for an open pit mine and a concentration plant scaled to handle 3,000 tons per day of ore. Also in the planning stage was the possibility of building a new smelter nearby with a capacity of 100,000 tons per year of zinc and an appropriately sized lead-smelting capacity.

Detailed engineering was started in January 1981 for the leach residue treatment plant at the Debari zinc smelter in Rajasthan. Orders for equipment were placed in June 1981. Construction at the site was scheduled to begin in early 1982 with commissioning to be in late 1983. Treatment of the previously lost zinc values will increase the overall zinc recovery rate from 84% to about 93%. In addition to the increased zinc recovery, the new plant will incorporate equipment for the recovery of silver, cadmium, and gold.

Expansion of the lead smelter at Visakhapatnam was sanctioned by the Government in March 1981. Capacity will be increased from 10,000 to 22,000 tons per year at an estimated cost of $6.9 million. Contractors were appointed to provide engineering services. Expansion work was scheduled for completion in June 1983.

Manganese.—A new ferromanganese plant was brought into production at Tumsar by Uniferro International, a subsidiary of Universal Ferro & Allied Chemicals, Bombay. The additional capacity, rated at 65,000 tons per year for ferromanganese, increased the concentration of ferromanganese production facilities in Maharashtra State. In line with a Government relaxation of restrictions on ferromanganese exports, the new plant was export oriented. Philbro Corp. of the United States provided a production loan and had about a 40% share in the plant's equity.

Manganese Ore (India), Ltd. (MOIL), the Government-owned company that produces most of the high-grade manganese ore, continued with plans for beneficiation plants at the Balaghat and Ukwa Mines. The plants would utilize the high-grade fines that are currently wasted. The company also continued with its plans to set up a 60,000-ton-per-year ferromanganese plant at Balaghat.

Exports of manganese ore of various grades rose, according to preliminary fig-

ures, to a total of 705,000 tons in 1981, compared with 653,000 tons in 1980. Japan's share of ore exports continued to be the largest, although it decreased to about two-thirds of the total in 1981. Exports to East Europe were up significantly, with Romania and Bulgaria the chief recipients. Domestic ore requirements were projected to double by 1990. As part of the effort to meet growth in internal demand, MOIL was expanding its exploration activities to include searching in Orissa for high-grade, low-phosphorous ore that could be blended with the already known deposits of higher phosphorous ore.

NONMETALS

Barite.—Effective November 10, 1981, the Government reduced minimum export prices of American Petroleum Institute-grade, oil well drilling specifications, barite powder from $67 to $64 per ton and lumps from $42 to $38 per ton f.o.b. Indian exports of barite have dropped from 342,000 tons in FY 1979-80 to 283,000 tons in FY 1980-81 and to about 220,000 tons in FY 1981-82. This downward trend prompted the price reduction in an effort to stimulate sales. The drop in sales has been attributed to several factors, but the underlying reason was the slump in oil exploration caused by the worldwide drop in oil demand. Also, Indian sales to Iran and Iraq were strongly affected by the conflict between the two countries, which are normally India's major customers. Competition with sales from China and Thailand was also a factor. It has also been claimed that Indian regulations on barite trade tend to restrict or limit export sales. Port congestion has also contributed to the problem.

During FY 1981-82, barite production continued to decline and internal consumption remained about 100,000 tons. Exports of lump and powder, combined, came to about 220,000 tons.[15]

Cement.—During 1981, India's cement industry again fell short of supplying domestic needs and had to rely on imports for the deficit. Nearly 2 million tons of cement were supplied by the Republic of Korea, the Philippines, Indonesia, and North Korea.

At least five new Indian units began operation and three existing plants expanded their operations in 1981. A number of other units were reportedly expected to come into production by early 1982.

The major factor in the below-capacity output of India's cement plants was the continuing acute shortages of coal and electric power.

In March 1981, the Government appointed a committee to review the development of the cement industry. The committee made recommendations concerning measures to accelerate production, including incentives and fair prices. The cement industry has been under rigid price and distribution controls since India became independent in 1947.

India has approached some U.S. cement companies for technical assistance and certain countries in the Middle East for financing. The Government was offering incentives for the expansion of existing plants and construction of new cement plants, both large and small scale. In order to increase cement production rapidly, the Government was encouraging the production of pozzolan, slag, and fly ash cements by existing companies. The Cement Research Institute of India has reported development of a technology for minicement plants with vertical-shaft kilns.

The institute reported at yearend that 57 cement plants were in operation, 12 of which were managed by the Cement Corp. of India. Sixty-seven percent used the wet process and 90% used coal as fuel. The new cement plants beginning operation during 1981 included Narmada Cements, Ltd., at Jafarabad with a 1-million-ton-per-year capacity. Fuller and Co. of the United States provided the latest coal-based precalcinator technology for the plant that has a 4.57- by 60.96-meter kiln. Also commencing production were Mangalam Cement Co. of Rajasthan with an installed capacity of 400,000 tons per year, Raasi Cement Co. of Andhra Pradesh with a 300,000-ton-per-year capacity, J and K Cement Co. of Jammu and Kashmir with a 200,000-ton-per-year capacity, and Uttar Pradesh State Cement Corp., Ltd., of Chunar with a first-phase capacity of 840,000 tons per year.

Completing expansion of their plants were Mysora Cements of Karnataka, Desoram Cement of Andhra Pradesh, and Dalmia Cement (Bharat) of Tamil Nadu. In addition to those mentioned, at least 16,000 tons per day of additional capacity was under construction or in the final planning stage at yearend 1981.[16]

Diamond and Gem Stones.—The diamond industry in India was based on the import of rough diamonds and the export of cut and polished gems. Total turnover in the diamond trade reached a record of

$1,500 million in FY 1981-82. Export earnings from diamonds and jewelry rose 26% to a record $867 million. About 94% of the value was in cut and polished diamonds. The rise in demand for small diamonds, 1/2 carat and less, from the United States and Japan was largely responsible for the large growth in earnings. The U.S. share of Indian sales increased from 25% in FY 1980-81 to 33% in 1981-82. The Gem and Jewelry Export Promotion Council (GJEPC) set a target of $1,030 million in FY 1982-83.

Although export earnings were up, the industry was experiencing a profit squeeze due to recessionary conditions in the world diamond trade. While small and inferior quality diamonds have a good market potential, stocks of other varieties priced above $300 per carat were reported on the increase. Exporters anticipated competition from China and Australia by 1985 that could further depress trade prospects. To improve the quality and increase exports, GJEPC proposed a gem and jewelry design and development center in Bombay. The application of mechanization to the industry was also being stressed to increase the volume of higher quality products.

India imported rough diamonds valued at $633 million in FY 1981-82 compared with a value of $433 million in FY 1980-81. Over 90% of the imports came from the Diamond Trading Co. (DTC) of the United Kingdom and spot market purchases in Belgium. In an effort to break DTC's monopolistic control, the Government-owned Minerals and Metals Trading Corp. of India, Ltd., was seeking to enter the diamond import business by arranging supplies on a government-to-government basis from countries like Ghana, Zaire, the Central African Republic, and Sierra Leone. An agreement has already been signed with Ghana.

Domestic production of diamonds remained relatively insignificant. The Majhgawan Mine in Panna district of Madhya Pradesh produced all the diamonds in 1981. The second mine, Ramkheri, had been closed since July 1980.

Meanwhile the geological search for new diamond sources continued. GSI recovered 54 diamonds weighing a total of 19.1 carats from deposits in Andhra Pradesh. The Andhra Pradesh government, working with GSI, has identified the Anantapur, Karnool, Krishna, and Guntur districts for diamond prospecting. The capacity of the processing plant at Wajrakarur has been increased from 10 to 20 tons per day to handle the new material.

Fertilizer Materials.—In FY 1981-82, nitrogenous fertilizer capacity in India was increased by 21% to over 5.5 million tons. Production increased at more than double that rate. Production of phosphatic fertilizer (P_2O_5) also increased but at a much lower rate. An overall improvement in the country's infrastructure system, along with the more timely supply of raw materials and feedstock to the fertilizer plants, contributed to the improved performance. Capacity utilization was about 68% for both nitrogen and P_2O_5 during FY 1981-82.

Major highlights of the year included the installation of an additional naphtha reformer at the Rourkela plant and removal of mechanical and equipment problems at the Cochin, Namrup, and Barauni projects. The modernized Sindri plant reached 80% utilization. Reportedly, the industry's performance during 1981 could have been even higher had it not been for power shortages and other restrictions in Punjab and Uttar Pradesh. In addition to Kandla and Kanpur, both undergoing expansion, three new plants—Trombay V, Bharuch, and Haldia—began commercial production. In addition, seven more projects were scheduled for completion, including Namrup III and Thal-Vaishet in the public sector, and Deepak Fertilizers and Petro-chemicals Corp., Ltd. (Taloja in Maharashtra), in the private sector. The Taloja project, with a capacity of 90,000 tons per year of anhydrous liquid ammonia, is based on Bombay High (BH) gas as the feedstock.

The Government fertilizer feedstock policy was to exploit gas and coal, supplemented by naphtha in the event of a long-term disposal problem. An outlay of $2.3 billion was earmarked for setting up 19 new nitrogenous and phosphatic fertilizer plants during the sixth 5-year plan period. Among 11 proposed phosphatic projects, the Government has already approved the $204 million joint-venture project to be established at Paradip, Orissa, with an annual capacity of 117,000 tons of nitrogen and 300,000 tons of diammonium phosphate.

In addition to two gas-based projects scheduled for both Thal-Vaishet in Maharashtra and Hazera in Gujarat, at least six additional ammonia-based fertilizer plants using natural gas piped from the offshore South Bassein Gasfield were being planned. These include one each in Rajasthan and Madhya Pradesh and four in Uttar Pradesh. The capacity at each plant was

expected to be about 1,350 tons per day of ammonia with matching urea capacity. Meanwhile, owing to project delays, the cost of the Thal-Vaishet project has nearly doubled the original planned price. There were also plans for additional coal-based nitrogenous fertilizer plants, providing the recently completed Ramagundam and Talcher plants perform satisfactorily.

Consumption of fertilizer in India rose 10% to 6.13 million tons during FY 1981-82. The anticipated 4% annual growth in the agricultural sector during 1980-85 should raise demand for nitrogen fertilizer to 4.3 million tons, P_2O_5 to 1.37 million tons, and K_2O to 680,000 tons in FY 1982-83 for a total of 6.36 million tons. The Indian Government projected fertilizer demand to reach 6 million tons of nitrogen and 2.3 million tons of P_2O_5 by the end of the current sixth 5-year plan period.

Despite the increased production, India continued to be a major importer of fertilizers. Imports amounted to 2.08 million tons in FY 1981-82 valued at $667 million. This was a significant reduction from the previous year when total imports were valued at about $1 billion. In addition to the United States, a major source of diammonium phosphate and urea, suppliers included Poland, the Federal Republic of Germany, the U.S.S.R., Belgium, Romania, Qatar, Italy, Norway, Hungary, Bulgaria, France, the German Democratic Republic, and Canada.

Mica.—Mica production and processing in India was basically an export-oriented cottage industry. Export earnings totaled $60 million in FY 1981-82, up significantly from that of the previous year. Production of crude mica also improved for the first time in several years. Minehead value rose to $3.33 million compared with $3.0 million a year earlier. Production of scrap mica remained roughly constant. Official statistics continue to be somewhat misleading, generally on the low side, due to false reporting to avoid taxation and royalties. Substantial quantities also come from existing stockpiles. Bihar continued to be the leading producer, accounting for nearly 57% of the country's total production, followed by Andhra Pradesh and Rajasthan.

The highly labor-intensive mica mining was almost entirely in the private sector. However, the Government continued to regulate the industry through the Mica Trading Corp. of India, Ltd. (MITCO), which shared with the private sector all exports of crude and processed mica on a 50:50 basis.

While the total value of exports was notably higher in FY 1981-82, trade with the free convertible currency areas declined. Increasing competition from Spain, the Republic of South Africa, and China; inconsistency in the quality of Indian mica; and procedural delays were among the factors contributing to the 36% drop to $5 million in exports to market economy countries.

Indian mica exports to centrally controlled economy countries, on the other hand, rose 62% to $26.7 million with the U.S.S.R. the principal customer. The combined exports to centrally controlled economy countries, consisting mainly of expensive, larger size mica above grade 5, accounted for 84% of the total in FY 1981-82.

In addition, exports of fabricated and manufactured mica, which fall entirely in the private sector, earned India another $21.7 million and $6.7 million, respectively, in FY 1981-82, nearly double the FY 1980-81 total.

The present emphasis in the mica industry was on development of various value added products, including mica powder, mica paper, mica capacitors, silvered mica, and micanite products. A number of Indian firms were seeking to set up mica-based manufacturing facilities. More than 20 private companies have reportedly a combined annual capacity of 27,000 tons but utilization was limited to about 30%, mainly because of poor product quality. MITCO also plans to invest $44.4 million to promote a 3,000-ton-per-year mica powder plant, a 1,200-ton-per-year mica paper plant, a mica paper-based products plant, a wet-ground 1,200-ton-per-year mica powder plant, and a glass-bonded mica plant, all in Bihar. Two mica-based product plants were proposed for Rajasthan.

Mineral Sands.—The scheduled completion of the $100 million first phase of the Orissa mineral sands complex continued to slip owing to delays in delivery of equipment by fabrication contractors and to problems of cost escalation by the contractors. The new target date for completion of the plant was moved back 1 year to December 1983. The plant's design parameters, which call for an annual production of 220,000 tons of ilmenite to be processed into 100,000 tons of synthetic rutile, 30,000 tons of sillimanite, 2,000 tons of zircon, 4,000 tons of monazite, and 10,000 tons of natural rutile, remained unchanged. Work on the 25,000-ton-per-year titanium dioxide pigment plant by the state sector Kerala Minerals

and Metals, Ltd., has also slipped behind schedule and was expected to be ready by mid-1983. Travancore Titanium Products, Ltd.'s proposal to set up a titanium dioxide plant in Kerala was also facing problems, although press reports indicated that negotiations with a British company for process know-how were at an advanced stage.

Development plans of Indian Rare Earths, Ltd. (IREL), call for the renovation of its rare earths plants at Alwaye in Kerala. Additional equipment was also proposed for the minerals division to meet an increased demand for rutile and sillimanite. IREL has prepared a preliminary report for setting up a thorium plant at Trombay for production of mantle-grade thorium nitrate and thorium oxide. Meanwhile, thorium hydroxide continued to be stockpiled for future use. IREL achieved some success in its efforts to diversify production by producing compounds of rare earths, zirconium chemicals, and zircon-based products.

Production of titanium and rare-earth minerals was higher in FY 1981-82 than in FY 1980-81. The value of production rose 26% to $16.1 million. Production was handicapped by power constraints and a prolonged transport strike in Kerala during April-July 1981.

Export earnings from the sale of heavy minerals and compounds increased 11% to $589,000, over that of 1980. Exports of ilmenite, chiefly to Japan and West Europe, declined 15% in FY 1981-82 owing to port labor problems. These two market areas also became the main buyers of garnet in FY 1981-82. A spurt in domestic demand from the electrodes industry resulted in discontinuing rutile exports in FY 1981-82.

MINERAL FUELS

Coal.—Indian coal output increased significantly for the second year after a 5-year period of nearly constant production levels. Despite the increased production, transportation bottlenecks continued to plague coal producers and consumers alike, resulting in regional shortages and further buildup of record pithead stocks. In addition, consumers had to cope with a deterioration in quality and sizing of coal. Deliveries to consumers amounted to 118 million tons with power stations, steel plants, and railroads accounting for over 60% of the consumption.

To meet a projected demand of 137 million tons in FY 1982-83, the coal target was raised 8% to 135 million tons. Imports of high-grade coking coal were planned at 1.2 to 1.5 million tons. A demand of roughly 165 million tons was projected for 1985, the end of the current 5-year plan.

GSI, the Central Mine Planning and Design Institute, Ltd., and MEC were all concentrating their efforts on upgrading existing coal reserves from indicated to measured and establishing additional reserves, particularly in coking coals. Of the 112 billion tons of existing reserves, coking coal accounted for only 14 billion tons or about 50 years' supply at the present rate of consumption. The Government was taking into account the long lead time required to develop a coalfield, and a large increase in exploration activities employing the latest technology was planned. The allocation for coal exploration was put at $83.3 million during the sixth 5-year plan period.

Although coal production targets were met in 1981, nearly one-half of the increase in FY 1981-82 resulted in merely raising pithead stocks to a record 24 million tons. This occurred in spite of a 9% increase in average daily wagon loadings to 9,500. That number, however, was still far short of the 12,500 loadings per day reportedly needed. Because of the rail loading problem, 21% or 26 million tons of coal was delivered to consumers by truck in FY 1981-82 at a greatly increased delivery cost.

The rail situation did improve with a significant reduction in wagon turnaround time to 12 days in 1981 from a 16-day average in 1980. The Indian railways were beginning to introduce new coal wagons to replace the huge fleet of inoperative wagons, but this was not going to make an immediate increase in coal-carrying capacity of the railroads, as old railcars continued to break down as fast as they could be repaired or replaced.

Thus, the outlook for improved coal movement during 1982 was not encouraging. Another factor that will compound the present coal transport situation is the large increase in production planned for the mid-1980's and later. A very determined and costly effort will have to be made to improve the entire railroad network if the larger volumes of coal are to be moved efficiently.

In addition to infrastructure bottlenecks, the Indian coal industry continued to suffer from bureaucratic delays, management problems, and cost overruns. A Government source stated that 11 out of 79 Coal India, Ltd. (CIL), projects were 3 years behind

schedule. The Indian press attributed project delays and cost overruns exceeding 100% to management inefficiency, delays in delivery by domestic and foreign suppliers, conceptual shortcomings, and scanty geological data. Labor problems were also a factor as over 500,000 workerdays were lost owing to absenteeism and strikes during FY 1981-82.

Planned developments for FY 1982-83 focus on the needs of the priority consumers, namely power and steel plants. Their main needs are dependable delivery and a marked improvement in the quality of coal. Additional coal handling facilities, washers, and railroad sidings were high on the list of projects to be implemented. The annual outlay for the coal sector for FY 1982-83 was increased 30% over that of the previous year to total $978 million. Existing mines, accounting for over 50% of the coal production, were to receive about one-fifth of the outlay. An estimated 40% was also allocated for new mines, some now in production and others under investigation, in order to meet the increased production targets in the coming years.

At the same time, in order to redress consumer complaints on coal quality, over $44 million was expected to be spent on washers and coal-handling facilities. Plans called for setting up 14 additional washers with a combined annual capacity of 28.4 million tons. These would bring the total washer capacity to 49 million tons by the end of the decade, and presumably introduce the latest methods and equipment for coal beneficiation. Approximately 10 million tons of the planned increase was to be operational by the end of 1984-85. That target appeared to be optimistic as several plants under construction were already 1 to 2 years behind schedule.

Despite the substantial capital outlay in 1980-81 and the planned increase for 1982, the goal of a 165-million-ton capacity in 1985 will not be met without a further large increase in funding. This has prompted the Ministry of Energy to seek an additional $1.78 billion for coal sector programs during the remaining 2 years of the plan period. Over 80% of the allocation would be earmarked for coal mining and exploration projects, 5% for washers, and the remaining for captive powerplants, fire control, and research. Development of open pit mines would be emphasized during this period because of their shorter construction time and higher productivity.

Under a long-term investment program valued at $6.11 billion for a 20-year master development plan, reconstruction of the Jharia Coalfield, the only source of prime coking coal, was underway by Bharat Coking Coalfields, Ltd., a CIL subsidiary. Coal production was to be raised from the present 23 million tons to 90 million tons per year by the year 2000. This ambitious development program covering 258 square kilometers was to be divided into several phases. The first phase, expected to be completed by 1990, will attempt to modernize existing underground mines with the objective of freeing around 800 million tons of coal in pillars left standing by older mining techniques. Another aim was to control underground fires affecting about 40 colleries that have destroyed or denied access to an estimated 85 million tons of prime coking coal. A master plan prepared with the help of Polish experts call for the reconstruction of the Jharia Coalfield into 21 underground and 9 open pit mines. Later phases of the program, with assistance from Poland and the U.S.S.R., will provide for a number of additional high-efficiency underground mines and several large open pit mines.

Lignite.—The Neyveli Lignite Corp. (NLC) in Tamil Nadu remained India's largest producer of lignite. Production increased substantially in FY 1980-81 and again in FY 1981-82. Most of the lignite mined was consumed locally by power and fertilizer plants operated by NLC. NLC has proposed further expansion of the first mine pit to 8.5 million tons at a cost of $100 million to support either a 100- or 210-megawatt unit that will be an addition to the existing 610-megawatt powerplant.

In August 1981, the Minister of Energy laid the foundation stone for the second thermal electric power station at Neyveli. Plans are to have three 210-megawatt units, the first to be commissioned in September 1984, the second in April 1985, and the third in September 1985. Work on the second mine, which will supply lignite to the new powerplant, continued satisfactorily during the year. The total cost of the expansion program was to be about $450 million.

Aiding in the technology and construction of the mine and powerplant were companies from the Federal Republic of Germany (lignite handling system), Italy (boiler feed pumps and turbogenerators), and Hungary (boilers). An Indian company will supply the control and instrumentation system. The Federal Republic of Germany has sup-

plied most of the financing for the project at Neyveli. Plans for a third large mine and accompanying powerplant at Neyveli were being reviewed by the Government.

The Government's Central Electricity Authority has approved setting up lignite-based powerplants of 120 megawatts each at Bikaner, Rajasthan, and Kutch, Gujarat, where lignite reserves were estimated at 24 million and 200 million tons, respectively. The Federal Republic of Germany has offered technical assistance to develop the Rajasthan reserves. In addition, the Central Electricity Authority has recommended establishing a lignite mine and powerplant at Palna, Rajasthan.

Petroleum and Natural Gas.—FY 1981-82 saw a major increase in the activity of the Indian petroleum sector. Following the large rise in international crude oil prices that created a difficult balance of payments position, the Government intensified its efforts in oil exploration and development. The main effort was offshore, producing new oil and gas discoveries and higher production from the BH Oilfield. Total crude oil production for the year rose over 50%, about one-half of which came from BH.

Augmenting domestic production, India imported an average of 307,000 barrels per day of crude oil and 99,500 barrels per day of refined products during FY 1981-82 at a cost of $5.7 billion. This was a welcome drop from the record high of roughly $7 billion the previous year.

To help in the search for hydrocarbons with the ultimate aim of achieving self-sufficiency, the Government took a bold step in 1981 by inviting foreign oil companies to explore once again for oil in India on production-sharing terms. Seventeen offshore and fifteen onshore blocks were opened to foreign companies. By the end of FY 1981-82, following extended negotiations, the Government signed an agreement with Chevron Oil Co., the first oil exploration contract in about 5 years. Another round of bidding was to be invited with the number of blocks being greatly increased. Supplementing this effort, the Oil and Natural Gas Commission (ONGC) and Oil India, Ltd. (OIL), both public sector companies, have tendered for onshore contract drilling calling for the use of helicopter-transportable rigs and deep drilling equipment, which neither company currently possesses.

Under ONGC's accelerated plan of production for BH and satellite fields, crude oil was targeted to reach close to 420,000 barrels per day in FY 1982-83, with most of the increase from offshore. The goal of 600,000 barrels per day was set for 1985.

To implement the planned increases, the FY 1982-83 annual plan provides for a 92% increase in expenditures amounting to $2.16 billion for the petroleum sector. Of this amount, $1.69 billion is earmarked for oil exploration and development by ONGC. The large planned increases should enable the Government to raise the domestic proportion of crude oil requirements to 70% by 1985. Meanwhile, India's import bill should decline even further than in 1981.

Long-term ONGC plans called for expenditures as high as $33.3 billion to reach an annual production of 1.2 million barrels per day by 1990. OIL was also drawing up long-term plans that envision an outlay of $667 million and a crude output of 160,000 barrels per day by 1990. The massive proposed expenditures depend on the success ONGC and OIL have in establishing the new crude reserves needed to justify the development costs.

The increased exploration activity produced several new oil and gas discoveries during 1981. Among these, oil was found at the B-57 Structure off the west coast and gas at well PH-91 in the northern Palk Straits in the offshore Cauvery Basin. Onshore oil was struck at Kadasa and gas was struck at Daheu in Gujarat and in the Razole Structure in the Krishna-Godavari Basin. During the year, favorable oil signs were also noted at a number of sites in upper Assam and Arunachal Pradesh.

Seven rigs operated offshore India during 1981 that drilled 12 wildcat and 34 developmental wells. As of March 31, 1981, ONGC drilled a total of 155 wells offshore. Of these, 97 were oil-producing, 17 were gas wells, and 41 were dry.

Roughly 35 rigs operated onshore during 1981 and drilled 95 wells. These included 66 wells in Gujarat, 23 wells in eastern Assam, and 6 wells in the central region, which covers Tripura, West Bengal, and the Krishna-Godavari Basin.

Refinery developments were highlighted by the partial commissioning of the 120,000-barrel-per-day Soviet Union-aided Mathura refinery. India's 12 refineries, all in the public sector, now have a combined capacity of 656,000 barrels per day. By FY 1984-85, Indian refinery capacity was scheduled to be increased to 911,000 barrels per day. With the help of a $200 million Interna-

tional Bank for Reconstruction and Development (World Bank) loan, four refineries—Madras, Visakhapatnam, Cochin, and Bharat Petroleum Corp. at Bombay—were to be expanded and upgraded with secondary processing facilities. Fluid catalytic-cracker units are to be installed by Universal Oil Products Co. of the United States in each of these refineries to optimize recovery of middle distillates, which make up close to 50% of the product requirement. Total cost of the refinery expansions was to be over $1 billion. Two new refineries of 120,000 barrels per day each, plus expansion of the Haldia refinery from 50,000 to 110,000 barrels per day were proposed for the seventh 5-year plan, FY 1985-86 to 1989-90. Karnal in Haryana and Mangalore in Karnataka have been the designated locations of the new refineries. Completion of these projects would bring Indian refinery capacity close to the country's projected refined product demand in 1990.

Pipeline developments were highlighted by the completion of a 349-kilometer refined-products pipeline from the new Mathura refinery through New Delhi to Ambala. Work continued on the 164-kilometer last leg between Ambala and Jullundur.

A 156-kilometer product pipeline was proposed between Bombay and Pune. Tender orders have been issued for this project, which is to be completed by August 1984.

Other pipeline plans include the expansion of the Salaya-Viramgam section of the Salaya-Mathura crude oil pipeline by December 1982; modernization of the Barauni-Kanpur pipeline; and installation of storage tanks in the New Delhi, Ambala, and Jullundur areas following completion of the pipeline from Mathura.

A major project was the 106-centimeter undersea pipeline planned between the offshore South Bassein Gasfield and Umbhrat on the Gujarat coast, a distance of 236 kilometers. From Umbhrat, the pipeline will continue overland to Hazira. ONGC was seeking World Bank financing for the first development stage of the South Bassein Gasfield that includes the pipeline. Global tender for the pipeline was to be issued in 1982. The cost was estimated at $150 million. About 1,000 to 1,500 kilometers of pipeline will also be needed to supply gas to at least six more fertilizer plants planned for Rajasthan, Uttar Pradesh, and Madhya Pradesh.[17]

Indian gas production in 1981 was derived only in association with crude oil production, with one-third of the total coming from offshore BH. The production increased 37% over that of 1980 but utilization remained a problem, with a major share of the gas being flared at a substantial loss financially. According to the Ministry of Petroleum, between 1975 and 1981, about 155 billion cubic feet of natural gas, valued at nearly $100 million, was flared in Assam. Although the problem was being studied, the Government had no comprehensive policy that provided a rational utilization of this energy resource, estimated at 29.5 trillion cubic feet.

Only about one-half of the offshore associated gas production was used during the year. Until the $1 billion Thal Vaishet nitrogen fertilizer project comes online in 1984, disposal of the increasing amounts of BH associated gas will continue to be a problem.

Some gas was to be diverted to the Maharashtra State Electricity Board to operate a 240-megawatt powerplant being set up near Uran in 60-megawatt units. In Assam, the Government was studying a way to increase gas supplies to the Namrup fertilizer plant, and to the State Electricity Board where additional gas turbines are to be installed. Despite these efforts, flaring appears unavoidable for some time.

The South Bassein Gasfield, with reserves of 9.5 trillion cubic feet, was expected to start production by early 1985. First phase output was to be 350 million cubic feet per day rising to 700 million cubic feet per day before the end of the decade. Plans call for the gas to be used in fertilizer production and the petrochemical industry. A 180,000-ton-per-year gas-fractionation plant was to be set up at Hazira, Gujarat, along with the first two gas-based fertilizer plants.

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[1]Physical scientist, Division of Foreign Data.

[2]Former regional resources attaché, U.S. Department of State, New Delhi, India.

[3]The India fiscal year runs from April 1 through March 31.

[4]Where appropriate, Indian rupee values have been converted to U.S. dollars at the rate of Rs8.08=US$1.00 for 1979, Rs7.90=US$1.00 for 1980, and Rs9.00=US$1.00 for 1981.

[5]U.S. Embassy, New Delhi, India. Department of State Airgram A-18, May 11, 1982, p. 2.

[6]U.S. Embassy, New Delhi, India. Department of State Telegram, New Delhi 05293, dated R171021Z, March 1982, p. 1.

[7]Minerals and Metals Review, Bombay, India. New v. 8, No. 4, April 1982, p. 13.

[8]U.S. Embassy, New Delhi, India. Department of State Telegram, New Delhi 09532, dated R170613Z, May 1982, p. 1.

[9]Minerals and Metals Review, Bombay, India. New v. 7, No. 12. December 1981, p. 26.

[10]Government of India, Ministry of Steel and Mines,

Department of Mines, New Delhi, India. Report 1981-82, pp. 77-86.

[11]U.S. Embassy, New Delhi, India. Department of State Telegram, New Delhi 22382, dated P041136Z, December 1981, p. 1.

[12]U.S. Embassy, New Delhi, India. Department of State Telegram, New Delhi 02482, dated R090728Z, February 1982, p. 1.

[13]Government of India, Ministry of Steel and Mines, Department of Steel, New Delhi, India. Report 1981-82, p. 50.

[14]Work cited in footnote 10, p. 90.

[15]U.S. Embassy, New Delhi, India. Department of State Telegram, New Delhi 08744, dated R051237Z, May 1982, p. 1.

[16]Rock Products. V. 85, No. 4, April 1982, p. 88.

[17]U.S. Embassy, New Delhi, India. Department of State Airgram A-38, Aug. 10, 1982, pp. 1-20.

The Mineral Industry of Indonesia

By John C. Wu[1]

In 1981, Indonesia continued to sustain a high rate of growth in the real gross domestic product (GDP) and maintained a modest rate of inflation. Under the Indonesian 5-year development plan (1979-84), the target real economic growth was 6.5% per year. However, the country's real growth in GDP was 8.2% in 1981 compared with 9.6% (revised) in 1980. For 2 years in a row, Indonesia's real economic growth was ranked the second highest after Singapore among the five members of the Association of Southeast Asian Nations (ASEAN). Indonesia's GDP in 1973 constant dollars was estimated at $18.4 billion in 1981 compared with $17 billion in 1980. The country's GDP in current prices was about $85 billion in 1981 compared with $70 billion in 1980.[2] The inflation rate was brought down from the two-digit level of 15.4% in 1980 to the one-digit level of 8.4% in 1981.

The high growth in the Indonesian economy was contributed mainly by the higher level of production in foodstuff and manufactured goods stimulated by the expanding domestic demand. However, a relatively slower growth in 1981 was caused by a slowdown in demand for light manufactured goods, smaller increases in export earnings of oil and liquefied natural gas (LNG), a sharp drop in exports of nonoil commodities owing to a worldwide oil glut and economic recession, and a fall in investment because of the higher interest rates.

In 1981, the oil and gas sector remained the most important industry of the Indonesian economy. The output of oil reversed its downward trend and averaged 1.6 million barrels per day, while the output of natural gas continued its upward trend. During 1981, the industry's exports of oil and LNG, valued at $17.7 billion, were about 21% of the country's GDP and about 81% of total export earnings, which were valued at $21.9 billion. Indonesia remained one of the top 10 oil exporters and became the world's largest LNG exporter in 1981. Despite the worldwide oil glut, Indonesia continued its high level of oil and gas exploration. During 1981, over 300 exploratory wells were drilled, 40 new oil and gas wells were discovered, and 12 oil-exploration contracts were signed between Indonesia and foreign companies, which were committed to spend more than $900 million dollars over the next 3 to 6 years.

To increase exports of LNG to Japan, expansion programs for the LNG plants at Arun in Aceh and Bontang in East Kalimantan were started in 1981. Upon completion of the expansion programs in 1984, LNG production capacity of Indonesia will be increased from 407 billion cubic feet to 762 billion cubic feet. In line with the Government energy policy, the expansion program of coal production at the Ombilin Mine in West Sumatra also began in 1981. The projected coal output from the Ombilin Mine will reach 725,000 tons per year in 1985. In addition, the expansion program at the Bukit Asam Mine secured funds from the World Bank, Canada, and several Western European countries.

In the nonfuel minerals sector, production of most of the country's mineral products increased in 1981, except gold and silver. However, because of the weakened world market for metals, export earnings of Indonesian mineral products dropped substantially. In 1981, Indonesian tin output continued to advance because one additional dredge, Belitung I, operated offshore Belitung Island. Indonesia displaced Thailand and became the world's third largest

tin producer. The expansion program of Freeport's Ertsberg East underground copper mine in Irian Jaya was completed and brought into production in June 1981 at a total cost of only $87 million (originally estimated at $101.5 million). A 600,000-ton-per-year alumina project is expected to be initiated in the spring of 1982 with Kaiser Aluminum and Chemical Corp. of the United States and Klöckner INA of the Federal Republic of Germany as the contractors to build the plant on Bintan Island.

The first-phase construction of the Asahan hydroelectric powerplant and aluminum smelting facility was completed in December 1981. Inauguration of the complex was scheduled for January 20, 1982. Production of aluminum was expected to begin in February 1982 with a projected output of about 50,000 tons of aluminum for 1982. Indonesia's production of bauxite and nickel ore remained unchanged. However, the production of nickel matte by P.T. International Nickel Indonesia at Soroako in South Sulawesi suffered from depressed nickel prices and rising costs. The company planned to cut back its output by 50% in 1982.

Indonesia's cement industry continued to grow in 1981. The total clinker capacity reached over 8 million tons per year at the end of 1981. The country's first white cement plant was put into operation at Cibinong in West Java. A 500,000-ton-per-year new cement plant owned by P.T. Semen Baturaja at Baturaja in South Sumatra was also put into operation in 1981. Construction work on the 1-million-ton-per-year cement plant owned by a joint-venture company, P.T. Semen Andalas Indonesia at Lhoknga, Aceh, began in mid-1981 and was scheduled for completion in 1983. In addition, Indonesia planned to build a 3-million-ton-per-year cement plant at Citeureup, West Java, and a 120,000-ton-per-year cement plant at Kupang on Timor Island. Contracts for the construction were awarded in 1981. Construction of the two cement plants was expected to start in 1982 and be completed by 1984-85.

An ammonia-urea plant (Kaltim I) owned by P.T. Pupuk Kaltim at Bontang, East Kalimantan, was expected to come on-stream in 1982. The company had awarded another contract for a second plant, to be called Kaltim II, to expand the output capacity of Kaltim I. Construction of Kaltim II is expected to start in mid-1983 by Kellogg Overseas Corp. of the United States and two Japanese companies. A contract was also awarded to two Japanese companies by P.T. Petrokimia Gresik for the construction of a fertilizer complex at Gresik, East Java. Construction of the fertilizer complex was expected to start in 1982 and was scheduled for completion in 1984.

PRODUCTION

Indonesia's mineral industry continued to be dominated by the oil and natural gas sector in 1981. The output of crude oil rose by 1.3% as a result of six new oilfields put into production by P.T. Caltex Pacific Indonesia in Sumatra and three new platforms brought into operation by Independent Indonesia American Petroleum Co. in the Krisna Oilfield offshore southeastern Sumatra. The output of natural gas reached 1.1 trillion cubic feet. Production of LNG remained high at about 423 billion cubic feet. Coal output was still at an insignificant level of about 350,000 tons in 1981.

In 1981, tin production rose to about 35,000 tons with increasing output by new dredges, Bima and Belitung I, operated offshore around Pulang Tujuh and Belitung Island, respectively. Copper production also rose by about 5%, owing primarily to the newly completed expansion program of the Ertsberg East underground mine. Production of bauxite and nickel remained at the 1980 level, while production of gold and silver by the state-owned P.T. Aneka Tambang at Cikotok Mine declined. Gold and silver production by P.T. Freeport Indonesia, Inc., as a byproduct of the copper operations at Ertsberg also decreased slightly.

Cement output went over 6 million tons owing to additional output of the newly operated plant owned by P.T. Semen Baturaja. Production of urea was slightly higher than the 1980 level, while the output of ammonia sulfate and triple superphosphate jumped by 24% in 1981.

Table 1.—Indonesia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum: Bauxite, dry equivalent, gross weight thousand tons	1,301	1,008	1,052	1,249	1,203
Copper, mine output, metal content	57,120	58,952	60,210	57,985	58,360
Gold metal[2] troy ounces	82,300	66,166	57,452	57,030	52,100
Iron and steel:					
Iron sand, dry basis	311,519	233,341	79,877	62,914	85,816
Metal:					
Ferroalloys: Ferronickel	21,574	19,734	17,878	18,314	20,000
Crude steel	145,000	150,000	500,000	530,000	500,000
Manganese ore	5,976	5,889	5,909	4,299	4,500
Nickel:					
Mine output, metal content[3]	33,083	31,414	r31,037	30,521	30,744
Metallurgical products:					
Matte:					
Gross weight	--	--	8,721	20,532	19,900
Nickel content	--	--	6,715	15,810	15,300
Ferronickel:					
Gross weight	21,574	19,733	17,878	18,314	18,000
Nickel content	4,928	4,499	4,000	4196	4,000
Silver, mine output, metal content thousand troy ounces	790	826	662	693	753
Tin:					
Mine output, metal content	25,926	27,411	29,535	32,527	34,869
Metal	24,005	25,829	27,790	30,465	32,000
NONMETALS					
Asbestos[e]	60				
Cement, hydraulic thousand tons	2,651	3,694	4,698	5,818	6,300
Clays:					
Kaolin powder	38,006	37,400	58,539	75,558	80,000
Diamond:					
Industrial[e] thousand carats	12	12	12	12	12
Gem[e] do.	3	3	3	3	3
Total[e] do.	15	15	15	15	15
Iodine kilograms	11,930	7,253	25,287	29,306	30,000
Nitrogen: N content of ammonia	410,463	584,655	759,600	721,800	720,000
Phosphate rock	3,599	6,071	5,323	11,191	12,000
Salt, all types thousand tons	786	235	706	690	700
Stone:					
Granite do.	722	495	678	926	1,000
Limestone[4] do.	3,724	4,699	6,107	7,601	8,000
Marble square meters	35,217	r33,496	25,216	25,380	25,500
Quartz	269,310	307,480	127,082	260,075	270,000
Sulfur, elemental[5]	1,697	204	180	105	150
MINERAL FUELS AND RELATED MATERIALS					
Asphalt rock, bitumen content	137,701	162,000	r90,805	173,018	170,000
Coal thousand tons	231	264	279	304	350
Gas, natural:					
Gross million cubic feet	533,355	643,148	998,457	1,045,748	1,100,000
Marketed do.	199,951	384,116	398,807	695,914	NA
Natural gas liquids: Propane and butane[e] thousand 42-gallon barrels	70	11	15	NA	NA
Petroleum:					
Crude, including field condensate do.	615,123	596,698	r580,447	577,016	586,000
Refinery products:					
Gasoline do.	14,444	15,363	15,405	17,475	NA
Jet fuel do.	622	--	59	25	NA
Kerosine do.	19,948	19,187	24,217	25,988	NA
Distillate fuel oil do.	19,384	18,345	18,735	19,184	NA
Residual fuel oil do.	15,225	16,128	14,683	17,985	NA
Lubricants do.	24	264	544	499	NA
Liquefied petroleum gas do.	299	373	72	294	NA
Paraffin wax do.	328	62	338	253	NA
Naphtha do.	100	1	1	(6)	NA
Unfinished oils requiring further processing do.	38,650	28,795	40,096	41,599	NA
Unspecified do.	577	1,420	3,172	2,418	NA
Refinery fuel and losses do.	2,958	2,887	3,159	3,917	NA
Total do.	112,559	102,825	120,481	129,637	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 2, 1982.

[2]Includes Au content of copper ore and output by Government-controlled operations. Gold output by operators of so-called People's mines is not available but may be as much as 30,000 troy ounces per year.

[3]Includes a small amount of cobalt that is not recovered separately.

[4]Data represent limestone used for cement production. Excludes considerable amounts of limestone produced by enterprises under local jurisdictions for building materials, for crushed rock to be used as aggregate, and to burn for lime.

[5]Sulfur produced by other than the Frasch process.

[6]Less than 1/2 unit.

TRADE

Despite the softened world oil market and worldwide economic recession, Indonesia continued to maintain a merchandise trade surplus of about $9.4 billion in 1981. According to Indonesia's Central Bank, total export earnings were about $21.9 billion in 1981, only 1% higher than that of 1980. Export earnings of oil and LNG were $17.7 billion, a 12% increase in 1981, compared with a 62% surge in 1980. However, export earnings of nonoil commodities dropped by 29.5% in 1981. Sharp drops in prices of Indonesia's major nonoil commodities and recent Government policies restricting exports of timber and palm products were cited as the main causes of the decline.[3] Indonesia's imports were estimated at about $12.5 billion in 1981, slightly less than that of 1980. Machinery and electrical equipment, base metals, mineral products, vehicles and transport equipment, and chemical products remained the major import commodities.

In 1981, exports of crude oil and petroleum products were valued at $15.2 billion. Japan and the United States remained the two major importing countries. Exports of LNG were valued at $2.5 billion, of which $1.4 billion was exported from the Arun Gasfield, and $1.1 billion from the Badak Gasfield. Japan was the only buyer of Indonesia's LNG in 1981.

Tin, nickel, and copper along with timber, rubber, and coffee remained Indonesia's principal nonoil export commodities. Because of a sharp drop in prices of these commodities in the world market, export earnings from these commodities dropped significantly. In 1981, export earnings from timber dropped by 50% to $948 million; rubber, by 22% to $847 million; tin, by 8% to $424 million; coffee, by 43% to $372 million; nickel matte, by 19% to $108 million; and copper, by 10% to $99 million. Other export earnings of mineral products also dropped substantially. For example, cement dropped 27% to $14.8 million, and fertilizer dropped by 84% to $4.8 million in 1981.

During 1981, the major trading partners of Indonesia, based on the value of two-way trade, were Japan, the United States, Singapore, and the Federal Republic of Germany.

Table 2.—Indonesia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate ___ thousand tons__	1,091	1,113	__	All to Japan.
Metal including alloys, all forms _____	202	582	(1)	Singapore 490; Sri Lanka 90.
Chromium ore and concentrate _____	__	2,750	__	All to Japan.
Copper:				
Ore and concentrate_____	168,634	193,509	__	Japan 144,967; West Germany 48,542.
Metal including alloys, all forms _____	__	766	__	Thailand 753.
Iron and steel:				
Ore and concentrate_____	8,513	9,462	__	All to Japan.
Metal:				
Scrap _____	__	849	__	Do.
Pig iron including cast iron_____	2	92,574	__	Japan 38,983; India 18,836; North Korea 11,000.
Semimanufactures_____	123,688	24,215	__	Malaysia 19,109; Nigeria 2,973.
Manganese ore and concentrate_____	1,770	9,574	__	Taiwan 9,564.
Nickel:				
Ore and concentrate_____	781,881	883,055	__	All to Japan.
Matte, speiss, similar materials_____	29,280	42,763	3,070	Japan 34,377.
Tin:				
Ore and concentrate_____	1,624	4,857	__	Singapore 1,585; Netherlands 1,075.
Metal including alloys:				
Scrap _____	475	1,404	__	Japan 500; Singapore 404; United Kingdom 300.
Unwrought _____	26,274	26,169	__	Singapore 8,425; Netherlands 6,425; Japan 5,050.

See footnotes at end of table.

Table 2.—Indonesia: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Other:				
Ash and residue containing nonferrous metals	664	1,675	--	Japan 1,410.
Strontianite and other minerals	50	77	--	All to Singapore.
NONMETALS				
Abrasives, natural: Pumice, emery, corundum, etc	11	9	--	Japan 4; Singapore 3.
Barite and witherite	7,159	6,451	--	All to Singapore.
Cement	488,217	495,203	--	India 139,434; Thailand 122,150; Bangladesh 97,670.
Chalk	(1)	603	--	Singapore 600.
Clays, crude:				
Bentonite	1,268	2,946	--	All to Singapore.
Kaolin	1,574	5,313	--	Taiwan 5,000; Japan 208.
Other kilograms	500	--		
Fertilizer materials:				
Crude, phosphatic	--	518	--	Taiwan 500.
Manufactured, nitrogenous	233,030	230,526	--	India 98,994; Philippines 43,821; Pakistan 42,643.
Ammonia	1,138	6,043	--	Philippines 3,405; Malaysia 1,669.
Iodine	15	29	--	Japan 12; France 12.
Stone, sand and gravel:				
Dimension, crude and partly worked	405,436	523,253	--	Singapore 486,540; Malaysia 36,713.
Limestone	--	66	--	Mainly to Singapore.
Sand excluding metal-bearing thousand tons	3	2,979	4	Singapore 2,975.
Other	11	220	--	All to Singapore.
Sulfur:				
Elemental, colloidal kilograms	--	155	--	All to Malaysia.
Sulfuric acid, oleum	3	--		
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	4	--		
Coal, all grades	59,595	112,487	--	Malaysia 44,908; Taiwan 32,907; Bangladesh 16,000.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	450,226	378,479	100,310	Japan 184,276; Singapore 43,132.
Refinery products:				
Gasoline, motor do.	88	8	--	All to Sabang.
Kerosine, white spirit do.	140	29	--	Do.
Distillate fuel oil do.	199	23	--	Do.
Residual fuel oil do.	38,862	39,570	5,002	Japan 32,234.
Lubricating oils do.	--	(1)	--	Mainly to Singapore.
Liquefied petroleum gas do.	104,130	138,780	12,027	Japan 120,306.
Mineral jelly and wax do.	238	93	--	All to Singapore.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	--	6,984	--	Do.

[r]Revised.
[1]Less than 1/2 unit.

Table 3.—Indonesia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate	514	929	29	China 900.
Oxides and hydroxides	14,358	19,316	13	Japan 8,692; China 2,691; Taiwan 2,628.
Metal including alloys:				
Scrap	--	339	37	Japan 220; Singapore 66.
Unwrought	15,120	14,131	2,399	Canada 3,859; Australia 2,218.
Semimanufactures	15,623	19,918	1,777	Japan 6,692; Belgium-Luxembourg 1,347; Taiwan 1,342.
Arsenic trioxide, pentoxide, acids	107	99	(1)	France 36; Netherlands 33.

See footnotes at end of table.

Table 3.—Indonesia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Chromium:				
Ore and concentrate	1	11	--	All From Taiwan.
Oxides and hydroxides	177	107	13	Japan 39; U.S.S.R. 30.
Cobalt oxides and hydroxides	6	5	--	Japan 3.
Copper:				
Matte	31	--		
Sulfate	202	409	2	France 120; Italy 54; Japan 50; Taiwan 50.
Metal including alloys, all forms	20,852	22,640	305	Japan 14,323; Zambia 4,006; Australia 2,189.
Gold metal including alloys, unwrought and partly wrought—troy ounces	70,732	--		
Iron and steel:				
Ore and concentrate	53,159	285,046	1	Sweden 185,116; Brazil 99,929.
Metal:				
Scrap	29,770	39,009	--	West Germany 13,830; Japan 10,688; Singapore 7,110.
Pig iron including cast iron	42,253	34,963	(1)	Republic of Korea 17,000; Brazil 11,400; Australia 5,032.
Sponge iron, powder, shot	428	641	109	Japan 245; West Germany 136.
Spiegeleisen	1,270	100	--	All from Australia.
Ferroalloys	7,067	15,445	48	Japan 4,672; Australia 4,432; Taiwan 4,079.
Steel, primary forms	268,716	469,874	24,792	Mozambique 97,640; Republic of Korea 82,470; Taiwan 54,275.
Semimanufactures:				
Bars, rods, angles, shapes, sections	189,066	241,186	2,196	Japan 191,022.
Universals, plates, sheets	775,703	1,065,200	30,129	Japan 821,321.
Hoop and strip	40,101	37,478	66	Japan 30,024.
Rails and accessories	16,203	4,411	32	Japan 1,613; Taiwan 1,341.
Wire	6,664	9,495	33	Japan 5,475; Taiwan 1,594.
Tubes, pipes, fittings	119,308	249,352	34,646	Japan 162,861; Singapore 36,102.
Castings and forgings, rough	4,554	5,890	717	Japan 2,053; Singapore 799.
Lead:				
Ore and concentrate	--	300	--	All from Republic of Korea.
Oxides	943	1,081	(1)	Australia 796; West Germany 91.
Metal including alloys, all forms	4,869	7,896	279	Australia 5,920; Malaysia 661.
Magnesium metal including alloys, all forms	73	29	2	Japan 25.
Manganese:				
Ore and concentrate	6,966	11,968	--	Singapore 3,128; Belgium-Luxembourg 2,300.
Oxides	5,693	7,607	10	Singapore 4,418; Japan 2,954.
Mercury—76-pound flasks	105	1,566	9	Japan 1,434.
Molybdenum metal including alloys, all forms—kilograms	292	221	--	Netherlands 118; Taiwan 67.
Nickel:				
Ore and concentrate—do	--	50	--	All from China.
Metal including alloys, all forms	1,671	2,501	6	Republic of Korea 1,510; Japan 808.
Platinum-group metals including alloys, unwrought and partly wrought—troy ounces	322	428	97	United Kingdom 322.
Silver metal including alloys, unwrought and partly wrought—do	44,865	4,719	2,781	Australia 1,768.
Tin:				
Oxides—kilograms	400	6	6	
Metal including alloys, all forms	175	177	1	Japan 72; United Kingdom 51.
Titanium oxides	8,863	8,182	583	Japan 4,767; West Germany 1,126.
Tungsten metal including alloys, all forms	1	26	(1)	Belgium-Luxembourg 25.
Uranium and thorium oxides including rare-earth oxides	243	170	--	France 100; China 60.

See footnotes at end of table.

Table 3.—Indonesia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Oxides	324	170	2	West Germany 78; Japan 32.
Metal including alloys:				
Scrap	(1)	662	17	Australia 567; Thailand 50.
Blue powder	101	151	47	Australia 83; United Kingdom 10.
Unwrought	46,149	51,430	(1)	Australia 45,403; Japan 2,537.
Semimanufactures	1,062	917	38	Japan 439; Australia 249; Taiwan 180.
Other:				
Ores and concentrates	267	432	--	Australia 343; Taiwan 88.
Oxides, hydroxides, peroxides	216	224	8	Japan 107; West Germany 52.
Metals including alloys, all forms:				
Metalloids: Phosphorus	84	145	(1)	West Germany 82; Malaysia 37.
Alkali, alkaline-earth, rare-earth metals	42	20	(1)	West Germany 10; Japan 10.
Pyrophoric alloys	58	60	(1)	China 51; Hong Kong 8.
Base metals including alloys, all forms	1,219	1,042	1	Australia 907.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	311	435	18	Netherlands 150; Japan 120; India 45.
Dust and powder of precious and semiprecious stones kilograms	15	12	(1)	Mainly from Australia.
Grinding and polishing wheels and stones	2,281	2,805	10	China 915; Japan 432; Republic of Korea 408.
Asbestos, crude	14,616	23,047	30	Canada 10,172; Australia 5,217; China 2,680.
Barite and witherite	19,881	21,031	659	Thailand 11,805; Philippines 4,200.
Boron materials:				
Crude natural borates	3	145	14	Sabang 91; Japan 23.
Oxides and acids	238	941	907	Australia 30.
Cement	148,108	327,162	5,470	Japan 147,683; Republic of Korea 48,226; Singapore 46,891.
Chalk	163	58	1	Belgium-Luxembourg 25; West Germany 18.
Clays and clay products:				
Crude:				
Bentonite	9,164	6,137	3,040	Sabang 2,296; Singapore 606.
Kaolin	11,429	13,318	2,482	Japan 6,460; Australia 2,017.
Kyanite and sillimanite kilograms	--	85	--	Netherlands 55; West Germany 30.
Other	2,631	3,582	998	Japan 1,200; China 557.
Products:				
Refractory including nonclay brick	26,042	74,032	4,585	Japan 23,087; West Germany 15,598; United Kingdom 6,400.
Nonrefractory	2,575	1,503	2	Italy 618; Japan 501.
Cryolite and chiolite	5	4	(1)	Mainly from Taiwan.
Diamond, industrial thousand carats	1,790	1,619	575	Canada 1,040.
Diatomite and other infusorial earth	2,388	723	168	Malaysia 226; Republic of Korea 120.
Feldspar, leucite, nepheline	10,768	13,611	--	China 8,340; India 1,833; Italy 1,244.
Fertilizer materials:				
Crude:				
Nitrogenous	868	3,094	--	Japan 3,089.
Phosphatic	15,950	105	1	Singapore 104.
Potassic	1,601	101	--	Belgium-Luxembourg 100.
Other including mixed	23	17,115	21	Jordan 14,436; Taiwan 2,500.
Manufactured:				
Nitrogenous	71,057	70,467	5	Republic of Korea 48,030; West Germany 9,513; Japan 9,513.
Phosphatic	200,188	137,640	21,001	Jordan 41,946; West Germany 36,694.
Potassic	110,125	142,166	11,039	West Germany 79,175; Canada 25,068.
Other including mixed	16,747	17,371	18	West Germany 9,420; Japan 4,002; Denmark 3,078.
Ammonia	385	48	6	Singapore 22; Japan 19.

See footnotes at end of table.

Table 3.—Indonesia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Graphite, natural	90	135	--	Japan 55; Norway 30; Taiwan 22.
Gypsum and plasters	287,555	318,607	6	Australia 180,672; Japan 110,800; Thailand 23,200.
Lime	1,009	362	37	Malaysia 197; Singapore 90.
Magnesite	967	1,085	--	Japan 755; Republic of Korea 200.
Mica, all forms	148	402	145	China 71; United Kingdom 51; Australia 44.
Pigments, mineral:				
Natural, crude	596	562	37	China 455; Australia 49.
Iron oxides, processed	1,917	1,835	62	West Germany 834; China 593.
Precious and semiprecious stones except diamond, manufactured ---- value	$2,562	$875	--	Singapore $800.
Pyrite (gross weight) ---- kilograms	10,836	35	35	
Salt and brine	2,607	542	13	West Germany 319; Australia 86.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	59,076	63,410	10,992	France 21,400; West Germany 8,909; Netherlands 8,423.
Caustic potash including sodic and potassic peroxides	1,110	271	18	Japan 150; Romania 50.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	601	686	--	Republic of Korea 600.
Worked	7,344	486	2	China 211; Japan 159.
Dolomite, chiefly refractory-grade	1,680	2,471	334	Taiwan 1,300; Japan 310.
Gravel and crushed rock	606	2,757	114	Japan 1,585; France 760; China 230.
Limestone, except dimension	165	32	2	Singapore 30.
Quartz and quartzite	401	289	--	Japan 200; Australia 34.
Sand excluding metal-bearing	2,079	2,844	327	Singapore 1,644; Taiwan 350.
Sulfur:				
Elemental:				
Other than colloidal	2,643	2,623	317	Singapore 1,422; Republic of Korea 207.
Colloidal	29,366	50,608	75	Singapore 18,268; Canada 17,410; Kuwait 11,201.
Sulfur dioxide	(1)	5	--	Japan 3; Singapore 1.
Sulfuric acid, oleum	3,501	2,797	306	Singapore 2,089.
Talc, steatite, soapstone, pyrophyllite	10,533	10,948	36	China 7,000; Republic of Korea 1,274.
Other:				
Crude:				
Meerschaum, amber, jet ---- kilograms	425	3	--	All from United Kingdom.
Strontium and other minerals	3,869	2,373	--	Japan 1,940; China 400.
Slag, dross, similar waste, not metal-bearing	524	31,628	174	Japan 31,192.
Oxides, hydroxides, peroxides of magnesium, strontium, barium, n.e.s	2,181	1,965	47	Japan 1,705.
Bromine, iodine, fluorine	44	54	9	United Kingdom 27; Singapore 12.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	5,425	3,829	361	Italy 1,112; Singapore 883; Japan 750.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	11,851	21,731	2	Singapore 12,115; China 5,301; Taiwan 3,998.
Carbon black and gas carbon	19,063	25,656	210	Australia 14,637; Japan 4,933; Malaysia 3,696.
Coal, all grades including briquets	4,082	4,973	7	Republic of Korea 4,500.
Coke and semicoke	25,163	32,548	2	Japan 18,063; Taiwan 6,075; Republic of Korea 3,659.
Hydrogen, helium, rare gases	5,123	119	(1)	Singapore 76; Japan 26.
Petroleum:				
Crude and partly refined:				
Crude ---- thousand 42-gallon barrels	19,068	30,663	--	All from Saudi Arabia.
Partly refined ---- do	2,855	1,794	34	Singapore 1,660.

See footnotes at end of table.

Table 3.—Indonesia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products:				
Gasoline, motor thousand 42-gallon barrels	1,320	1,845	--	Mainly from Singapore.
Kerosine, white spirit do	6,104	6,465	3	Singapore 6,433; Liberia 28.
Distillate fuel oil do	2,009	1,698	(1)	Singapore 1,594; Liberia 104.
Residual fuel oil do	1,302	4,301	--	All from Japan.
Lubricants do	586	798	212	Singapore 386; Japan 92.
Other:				
Liquefied petroleum gas do	1	136	(1)	Singapore 135.
Mineral jelly and wax do	28	19	3	West Germany 9; China 4.
Nonlubricating oils, n.e.s do	135	154	31	China 42; Japan 35.
Petroleum coke do	(1)	8	(1)	Mainly from Singapore.
Bitumen and other residues do	486	851	(1)	Singapore 761.
Bituminous mixtures, n.e.s do	37	63	1	Singapore 57.
Total do	12,008	16,338		
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	2,229	1,677	76	West Germany 480; United Kingdom 342; Japan 256.

[r]Revised.
[1]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—In 1981, bauxite production by P.T. Aneka Tambang was about 4% lower than that of 1980. Most of the output was exported to Japan under a 10-year contract that will expire in 1984. Total exports of bauxite in 1981 were 1.15 million tons.

In July 1981, a Japanese consortium of five leading aluminum smelters withdrew from a joint bauxite-alumina project to develop a 600,000-ton-per-year-capacity alumina plant in Indonesia. Based on the feasibility studies completed by the Japanese consortium, the quality of the below export-grade bauxite on Bintan Island was lower than anticipated, and the production cost of alumina would be too high. However, the Government of Indonesia decided to finance the entire project after the Japanese consortium pulled out from the project. Kaiser Aluminum Technical Services and Kaiser Engineers International, both units of Kaiser Aluminum and Chemical Corp. of the United States, and Klöckner INA of the Federal Republic of Germany were expected to sign a contract with the Government to build an alumina plant on Bintan Island starting in April 1982.

The total cost of the 600,000-ton-per-year alumina plant was estimated at $725 million, and it was expected to be completed by mid-1986. Kaiser would be responsible for designing and managing the project as well as providing the technology, and Klöckner would be responsible for building the plant. According to Indonesia's Ministry of Mines and Energy, bauxite deposits on Bintan Island and at Kuala Tangung in North Sumatra were considered as raw material sources for the plant; however, Bintan Island was selected mainly because of its larger deposits, with estimated bauxite reserves of 75 million tons averaging 49.4% Al_2O_3 and 8.2% SiO_2, and projected lower operating costs.[4]

The first-phase construction work on Indonesia's Asahan hydroelectric powerplant and aluminum smelting complex was completed before yearend. The first 170 reduction pots of a new 75,000-ton-per-year aluminum smelter being built at Kuala Tangung was scheduled for inauguration on January 20, 1982. The smelter is powered by a 286-megawatt power station located at Singuragura, 74 miles away. Production of aluminum is expected to start in late February 1982. Based on production plans, the first year output of aluminum ingot was estimat-

ed at 50,000 tons, of which 75% is expected to be exported to Japan at a price about 11% to 12% lower than the Alcan Aluminum Ltd. export price of $1,750 per ton, and the remaining 25% is to be marketed in Indonesia.[5]

The second-phase construction of the smelter is to have an annual capacity of 150,000 tons and is scheduled for completion in 1983. When the third-phase construction is completed at the end of 1984, the smelter will have an annual capacity of 225,000 tons of aluminum ingot, and a second powerplant with a 317-megawatt capacity will also be completed at Tangga, about 4 miles from the Sigura-gura powerplant. During the early stage of operation, Indonesia will import the required alumina for the smelters from Japan and Australia until the alumina plant on Bintan Island is completed in mid-1986.

Copper.—Production of copper by P.T. Freeport Indonesia, Inc., increased slightly in 1981. The increase in the output was due to the opening of the new underground mines at Ertsberg East. During 1981, by combining the output of the old open pit mine and the new underground mine (the ratio was about 50:50), the company produced 188,260 tons of copper concentrates (averaging 31.87% copper), 46,072 troy ounces of gold, and 686,996 troy ounces of silver.

The new underground mine at Ertsberg East was brought onstream in June 1981 with a total project cost of only $87 million, about $14.5 million less than the original budget. The initial mining capacity of the new underground mine was 4,500 tons of ore per day, increasing to 6,000 tons per day by yearend. At yearend, Freeport's total milling capacity reached 9,500 tons of ore per day (the ratio of new mines output to the old was 60:40). During 1981, 75% of the copper concentrate was exported to Japan, and the remaining 25% was sold to Marc Rich, an international trader, under a 10-year contract.[6]

Gold and Silver.—Gold and silver production by the state-owned P.T. Aneka Tambang declined in 1981. The mine output of gold from the Cikotok Mine area dropped 31% to 4,571 troy ounces for the first 9 months in 1981 from 6,635 troy ounces for the same period in 1980. The mine output of silver also declined by 18% to 49,145 troy ounces for the first 9 months of 1981 from 59,802 troy ounces for the same period in 1980. The low prices of gold and silver and declining ore grade were the primary causes of this significant reduction in the output of gold and silver in 1981. The output of gold and silver as a byproduct of Freeport's copper operation at Ertsberg in 1981 was about 45,935 troy ounces of gold and 685,977 troy ounces of silver in 1981, compared with 51,906 troy ounces of gold and 606,690 troy ounces of silver in 1980.

During 1981, a joint-venture company, P.T. Sungai Dandai, was formed by P.T. Karang Sulah of Indonesia and Kajuara Mining Corp. (Pty.) Ltd. of Australia. The company was to bring onstream a gold and silver mine in the Lebong Tandai, Bengkulu Province, in Sumatra. The production is expected to start at the rate of 32,100 troy ounces of gold and 288,900 troy ounces of silver per year in 1983. The total cost of the project was estimated at $12 to $13 million.[7]

Iron Sands.—Indonesia's mine production of iron sand concentrates from the Cilacap and the Palabuhanratu Mines increased slightly in 1981. During the first 10 months of 1981, the total monthly output of the two mines averaged 6,500 tons, with the Palabuhanratu Mine accounting for about 55% of the total production in 1981. Since 1979, the average output from the Cilacap Mine had been reduced to about 3,000 tons per month and was maintained at that level during 1981 because of the continued dispute over export price and quantity with the Japanese company, Nippon Kokan Co., Ltd.

P.T. Krakatau Steel, Indonesia's state-owned steel producer, was operating at a loss during 1979-81, mainly owing to the high cost of financing and underutilization of capacity. The first phase of the company's steel mill complex began operating in October 1979. It includes a HYL-process, direct-reduction plant with an annual capacity of 1.1 million tons and electric arc furnaces with an annual capacity of 500,000 tons. However, according to company officials, the output of raw steel was only 250,000 tons, about 50% of the installed capacity, in 1981. Problems in operation training, steel pellets importing, and marketing of the steel products were cited as reasons for the underutilization of capacity in 1981.[8]

By yearend, the second phase of the company's steel mill project, which included a hot-strip mill and a slab plant, was about 60% completed and was expected to be finished in early 1983. The construction of the second phase was financed by the Government of the Federal Republic of Germany. The total investment in the compa-

ny's steel complex, which includes phases one and two, was estimated at about $3.8 billion.

In 1981, Indonesia's total demand for raw steel was estimated at about 2.9 million tons, of which about 2.3 million tons was imported, mainly from Japan and the Republic of Korea.

Nickel.—P.T. Aneka Tambang, the state-owned mining company, and P.T. International Nickel Indonesia (P.T. Inco), a subsidiary of International Nickel Co., Ltd., of Canada, remained the two Indonesian nickel producers in 1981. The combined output of nickel ore produced by P.T. Aneka Tambang from two mining operations remained at about 1.5 million tons in 1981. Nickel ore production from the Moluccas area on Gebe Island, accounting for about 51% of the company's total output, was exported to Japan. The exports of nickel ore from Gebe Island to Japan increased slightly to about 800,000 tons in 1981 from 775,000 tons in 1980. The nickel ore output from the Pomalaa area in southeast Sulawesi, accounting for 49% of the total ore output, was partially exported to Japan and partially (about 400,000 tons) shipped to the company's ferronickel smelter at Pomalaa for the production of high- and low-carbon ferronickel ingot, containing 22.4% nickel. During 1980-81, about 16,000 tons of ferronickel ingots were exported annually.

In 1981, a feasibility study for expanding the capacity of the ferronickel smelter from 20,000 to 75,000 tons per year was completed. According to Indonesia's Ministry of Mines and Energy, construction of the expansion project was expected to start in 1982 and was scheduled for completion in 1985.

P.T. Inco produced about 19,900 tons of nickel matte containing 75% nickel from its nickel mine and smelting facility at Soroako, South Sulawesi, in 1981. Because of the continuing depressed world market conditions, the company planned to cut production of nickel matte by 50% in 1982. Since 1977, the company had suffered from a series of mechanical and technical difficulties. During 1980-81, most of the difficulties reportedly had been resolved, and the second production line was also completed and put into operation. However, because of the depressed world metals market, the company had suffered a loss of about $70 million on sales of $122 million in 1981, compared with a loss of $59.4 million on sales of $140 million in 1980.

In early 1981, the Government reportedly had acquired 4% of the equity in P.T. Inco. A consortium of six Japanese companies, which also had a 2% stake in P.T. Inco, imports 14,000 tons of nickel matte from the company annually.[9]

In August 1981, P.T. Aneka Tambang announced that a large nickel deposit was discovered in the Buli Bay region following exploration work around the Halmahera area. Samples of the Buli Bay nickel ore were sent to Jakarta and Japan for further study. The quality and quantity of the deposits were unknown. However, it was reported that the quality of the ore was similar to that of Gebe Island, and ore reserves may be quite large.[10]

Tin.—Despite a 9% drop in tin prices, Indonesia's output of tin concentrates continued to increase and reached another high in 1981. The increased output resulted largely from a new large offshore dredge, Belitung I, owned and operated by P.T. Tambang Timah, and the continuing growth of tin output achieved by P.T. Koba Tin. In 1981, Indonesia became the world's third largest tin producer. Its exports of tin rose by 3.6% to 31,879 tons, but the export earnings of tin dropped by 8% to $424 million because of the lower price of tin. However, tin exports displaced coffee as Indonesia's fourth largest export commodity after oil, timber, and rubber.

For the past 4 years, Indonesia had put three new large dredges (Bangka II, Bima, and Belitung I) into operation. As a result, the tin dredging sector had become more important than gravel pumping. During 1977-80, Indonesia's production of tin concentrates by mining method was as follows, in tons:

Mining method	1977	1978	1979	1980
Dredging	12,694	13,568	15,362	15,434
Gravel pumping	12,098	12,107	12,932	12,789
Opencasting	11	75	324	519
Others	1,123	1,661	917	3,785
Total	25,926	27,411	29,535	32,527

In 1981, production of tin in Indonesia was by P.T. Tambang Timah, accounting for about 77% of the country's output; P.T. Koba Tin, about 17%; P.T. Broken Hill Proprietary Indonesia, about 1.5%; and P.T. Riau Tin Mining, 4.5%.

P.T. Tambang Timah, the state-owned tin company, produced tin concentrates mainly from inland and offshore around the islands

of Bangka, Belitung, Singkep, Kundur, and Karimun. The output from inland and offshore Bangka Island was about 55% of the company's tin production. The output from Belitung Island was about 17%. In June 1981, the company began operation of Belitung I off Tanjungpandan on the west coast of Belitung Island. Beginning in November, Belitung I was operating on the east coast of Belitung near Mangaar.

Belitung I, delivered by Mining and Transport Engineering NV of Amsterdam, is the first tin dredge built in Indonesia. The 202-meter-long dredge has 151 buckets, each with a capacity of 22 cubic feet. It can dig to a depth of 164 feet and is capable of producing about 1,100 tons of tin concentrates per year. Another planned new dredge, Singkep I, scheduled to be built during 1981-83, was reportedly being postponed.[11]

P.T. Koba Tin, 75% owned by Kajuara Mining Corp. Pty., Ltd. (equally owned by CSR, Ltd., and BMI, Ltd. of Australia), and 25% by P.T. Tambang Timah, operated 3 dredges, 13 gravel-pump mines, and 1 dry-strip mine in the southeastern areas of Bangka Island. The company's output of tin concentrates had grown from 3,803 tons in 1979 to over 6,000 tons in 1981. As of mid-1980, the proven tin reserves of the company's concession areas were estimated at 14,000 tons with a cutoff grade of almost 14 ounces per cubic meter of gravel.[12] Additional probable and possible reserves were estimated at 9,400 tons and 23,000 tons, respectively.

P.T. Broken Hill Proprietary Indonesia, a subsidiary of Australia's Broken Hill Proprietary Co., Ltd., operated a high-cost, low-grade underground mine at Kelapa Kampit on Belitung Island. The company's tin concentrates were shipped to Datuk Keramat Smelting at Georgetown in Penang, Malaysia, for refining. The annual output of tin concentrates at Kelapa Kampit was between 400 to 500 tons.

P.T. Riau Tin Mining, 90% owned by Billiton International B.V. and 10% by P.T. Tambang Timah, began operation of its new dredge, Bima, offshore Pulang Tujuh between Singkep and Bangka Islands in September 1979. During 1979-80, the technical problems caused by overheating of the top bearing left Bima underutilized. However, in 1981, all of the technical problems reportedly had been corrected. The dredge was expected to produce about 1,500 tons of tin concentrates in 1981. The tin concentrates produced by P.T. Riau Tin Mining were sold to P.T. Tambang Timah for further processing.

In mid-1981, a large tin deposit was discovered offshore Bangka Island at a depth of 30 to 40 meters. The estimated tin ore reserves were 1 million tons.[13]

NONMETALS

Cement.—In 1981, Indonesia's cement production continued its upward trend and surpassed the 6-million-ton level. The country's cement industry, which consisted of eight plants operated by seven companies, had an annual total clinker capacity of 8.7 million tons at the end of 1981. Indonesia will become the largest cement producer among the five members of ASEAN after several new cement plants are completed by the end of the third 5-year development plan (1979-84).

The Government continued to encourage the expansion of the cement industry by offering a 4-year tax holiday to any new company that established a cement plant with an annual capacity of 500,000 tons or more on the island of Java and a 5-year tax holiday for those outside Java. These tax benefits are to support the strong growing need for infrastructure and housing developments in various parts of the country. Most of the raw materials for cement manufacturing, including limestone, clays, and silica sand, as well as the iron-correcting materials, are in abundance throughout the country. To support the cement industry, gypsum is the only raw material that is being imported, and it comes from India, Thailand, and Australia. Indonesia also possesses enough required energy resources, including oil, natural gas, and coal, for the growth of the cement industry.

In March 1981, Indonesia began operating its first white cement plant at Cibinong, south of Jakarta. The 200,000-ton-per-year white cement plant, valued at $42 million, was completed in 16 months by Nihon Cement Co. and Kawasaki Heavy Industries, Ltd., using Japanese technical know-how and modern equipment. The cement plant is owned and operated by P.T. Indocement. According to company officials, of the total output of white cement produced, about 160,000 tons was for domestic consumption, and the remaining 40,000 tons would be exported to Malaysia and Singapore. In the past, all of Indonesia's white cement requirements were met by imports from Japan. Beginning in April 1982, imports of white cement were to be banned.

In 1981, P.T. Semen Baturaja started operation of its 500,000-ton-per-year, dry-process suspension preheater plant at Baturaja in South Sumatra.

In mid-1981, construction of a new $200 million cement plant with an annual capacity of 1 million tons was started at Lhoknga, Aceh, in North Sumatra. P.T. Semen Andalas Indonesia, a joint-venture company owned by Blue Circle Industries, Ltd., Cementia Holding AG (Swiss company), and P.T. Rencong Aceh Semen, was to develop and manage the project. The International Finance Corp. reportedly was to lend $48 million to the project. The project includes development of limestone, shale, and marl quarries, installation of port facilities and a power station at Lhoknga, and building of cement storage and packaging facilities at Belawan and a bulk-cement depot near Medan. All of this was scheduled for completion at the end of 1982.

A $97.3 million contract for construction of a 3-million-ton-per-year cement plant was expected to be awarded to Krupp Polysius S.A., a subsidiary of Krupp Polysius AG of the Federal Republic of Germany, in early 1982 by P.T. Perkasa Ini Abadi Indonesia Cement. The new cement plant will have two 1.5-million-ton-per-year production lines to be located at Citeureup, West Java. Construction was scheduled to start in late 1982 and was expected to be completed in mid-1984. P.T. Perkasa Ini Abadi, a member company of P.T. Indocement, was formed in late 1981 to carry out the project.[14]

P.T. Semen Kupang, another new cement company established in 1981, awarded a contract to Loesche GmbH of the Federal Republic of Germany to build a coal-fired, vertical-kiln cement plant at Kupang on Timor Island. The new cement plant, with an annual capacity of 120,000 tons, was scheduled to come onstream in 1985. P.T. Semen Kupang is jointly owned by P.T. Semen Gresik, the Provincial government of Timor, and the Indonesia State Development Bank.

Fertilizer Materials.—In 1981, Indonesia's total output of fertilizers by three companies operating six plants increased slightly over that of 1980. According to Indonesia's Central Bureau of Statistics, the production of urea remained at the 2-million-ton level, while the production of ammonia sulfate and triple superphosphate increased to about 800,000 tons in 1981 from 646,000 tons in 1980.

P.T. Pupuk Sriwijaya, the largest state-owned fertilizer company, operated four urea plants at its Palembang complex in South Sumatra. During the first half of 1981, production capacity was underutilized because of a natural gas feedstock shortage. P.T. Pupuk Kujan, the second largest state-owned fertilizer company, began production of urea at Tjikampek, West Java, in 1980. The natural gas feedstock of the 570,000-ton-per-year urea plant was from the offshore Arun Gasfield. The state-owned fertilizer company, P.T. Petrokimia Gresik, operated a phosphate and ammonium sulfate plant at Gresik, East Java. It also operated an ammonium sulfate plant and a small Italian-built urea plant at Surabaja, East Java. Both use petroleum feedstock as raw material. Indonesia's demand for fertilizer continued to grow at about 20% per year. The total demand for 1981 was estimated at 2.8 million tons. Because of a long-term agreement between Indonesia and the Philippines, Indonesia continued to export small amounts of fertilizer, valued at $4.8 million in 1981 compared with $28.7 million in 1980. During 1981, Indonesia also imported about 200,000 tons of urea from the Republic of Korea, the German Democratic Republic, and the U.S.S.R. to keep up with the growing domestic demand for fertilizer.

In an effort to meet the rapidly growing demand for fertilizer and to ultimately become an exporting country of nitrogen fertilizer, Indonesia continued to expand its fertilizer production capacity in 1981.

Construction of an ammonia-urea plant called Kaltim I, about 17 kilometers north of Bontang, East Kalimantan, was proceeding on schedule. The plant, owned by the state-owned P.T. Pupuk Kaltim, will have an annual capacity of 165,000 tons of ammonia and 570,000 tons of urea when it is completed in 1982. The Kaltim I project, valued at $300 million, was awarded to Lummus and Coppee Rust of Belgium in 1979.

In late 1981, P.T. Pupuk Kaltim signed a $406 million contract with Kellogg Overseas Corp. of the United States and two Japanese companies for construction of another ammonia-urea plant called Kaltim II at Bontang, East Kalimantan, with the same annual capacity as that of Kaltim I. Construction of Kaltim II is expected to start in mid-1983 and was scheduled for completion in 1985. Kellogg will design and build the plant with equipment and materials to be supplied by Toyo Menka Co., Ltd., and Kobe Steel Ltd. of Japan.[15]

On December 1, 1981, a $180 million contract was signed between P.T. Petrokimia Gresik, and Mitsubishi Corp. and Hitachi Shipbuilding & Engineering Co., Ltd., of Japan. The contract calls for construction of a fertilizer complex to be built at Gresik, about 30 kilometers north of Surabaja, East Java. The complex will have a 594,000-ton-per-year, brimstone-based sulfuric acid plant, a 200,000-ton-per-year phosphoric acid plant, a 250,000-ton-per-year ammonium sulfate plant, and a 500,000-ton-per-year cement retarder plant. Construction was scheduled to start in early 1982 and to be completed at the end of 1984. In December 1981, an expansion project was started to increase the company's triple superphosphate capacity from 330,000 to 514,000 tons per year. The plant is at Gresik, East Java, and the expansion program is expected to come onstream in 1983.[16]

MINERAL FUELS

Coal.—In 1981, coal exploration and development in Indonesia were intensified by a series of new contracts signed between the Government and foreign companies, and coal production by the two existing mines in Sumatra continued to increase.

The Ombilin Mine, owned and operated by P.N. Tambang Batubara (Indonesia's state-owned coal company), had added more mining equipment and completed the transport system near Sawahlunto in West Sumatra. As a result, the output of coal increased sharply by 69% to 242,000 tons in 1981. The Ombilin Mine, once proposed to be shut down in 1973, emerged as one of the most important coal production centers in Indonesia. According to the plan of Indonesia's Ministry of Mines and Energy, the Ombilin Mine is expected to be capable of producing about 400,000 tons per year of coal by 1983, about 725,000 tons per year of coal by 1985, and 1,350,000 tons per year of coal by 1990. This will require an additional mine to be opened in the Warigin region. During the expansion period, about $100 million, mainly for mining equipment, will be invested in the coal mine, and the funds will be provided by the Inter-Governmental Group of Indonesia in the form of export credits. The coal reserves at the Ombilin Mine were stated to be 187.3 million tons with measured reserves of 92.3 million tons, indicated reserves of about 10 million tons, and inferred reserves of about 85 million tons.[17]

The Bukit Asam Mine, another coal mine owned and operated by P.N. Tambang Batubara near Tanjungenim, South Sumatra, produced about 110,000 tons of coal in 1981 compared with about 160,000 tons in 1980. A significant increase in coal production will not be achieved until the major expansion program is completed in 1986. Under Indonesia's National Energy Plan, the Bukit Asam Mine is projected to produce about 500,000 tons of coal in 1984, increasing to 3.2 million tons in 1986. The total cost of the expansion project was estimated at about $850 million. Indonesia reportedly had secured a greater portion of the financing from the International Bank for Reconstruction and Development, Canada, the Federal Republic of Germany, France, and the Netherlands.

In 1981, most of the domestically produced coal was consumed by cement plants, tin and nickel smelters, the state-owned railroad company, and other private industry users. Indonesia exported about 100,000 tons of coal to the Republic of Korea, Taiwan, Bangladesh, and Singapore. According to Indonesia's Ministry of Mines and Energy, Indonesia may have to import about 1.7 million tons of coal in 1985 to meet the projected requirements of about 3.7 million tons for the coal-fired powerplant at Suralaya in West Java and cement plants in various parts of the country.[18]

During 1978-79, the Government invited 22 foreign companies to bid on the reopening of coal mines in East and South Kalimantan. Since mid-1979, the Government, through P.N. Tambang Batubara, had been negotiating with a number of successful bidders. In November 1981, three cooperative agreements on development of coal mines in Kalimantan were signed between P.N. Tambang Batubara and three foreign joint-venture firms. The contracts were based on a 30-year production-sharing system with 13.5% of the future output to the Indonesian state-owned coal company and 86.5% to the contractor. The signed production-sharing contracts are as follows:[19]

Contractor	Contract location and area (square kilometers)
P.T. Arutmin Indonesia (a 50:50 joint venture of Atlantic Richfield Co. and Utah Exploration, Inc., of the United States).	A coal concession area near Banjarmasin in South Kalimantan (12,600).
P.T. Utah Indonesia (a wholly owned subsidiary of Utah Exploration, Inc.).	A coal concession area in East Kalimantan (8,000).
P.T. Agip Consolidated Indonesia (a 50:50 joint venture of Agip Overseas, Ltd., of Italy and Consolidation Coal Co. of the United States).	Two coal concession areas: One tract (2,432) in northeast Kalimantan, another (5,310) in east Central Kalimantan.

Three more similar production-sharing contracts for exploration and development of coal mines in Kalimantan are expected to be signed between P.N. Tambang Batubara and foreign companies in early 1982. The foreign companies involved are a joint-venture firm of Conzinc Rio Tinto of Australia and British Petroleum, Ltd., of the United Kingdom, a joint-venture firm of Tasek Cement Bhd. of Malaysia and Siam Cement Co. of Thailand, and a joint-venture firm of companies from the Republic of Korea led by Samchuk Consolidated Coal Mining Co.

Petroleum and Natural Gas.—Despite relatively unchanged prices of oil caused by the worldwide oil glut and economic recession, the output of crude oil and natural gas in Indonesia increased moderately in 1981. The high level of oil and gas exploration was also maintained by the new exploration contracts signed in 1980-81.

Indonesia reversed a 3-year declining trend of its crude oil output in 1981. The output of crude oil averaged 1.61 million barrels per day in 1981 compared with 1.58 million barrels per day in 1980. Natural gas production totaled 1.1 trillion cubic feet in 1981 compared with 1.046 trillion cubic feet in 1980. A continuous upward trend in the output of oil and natural gas was projected for the coming years. This projection was based on additional new wells that came onstream in 1981 as well as the continuous high level of exploration sustained by new production-sharing and exploration contracts signed during 1979-81.

In 1981, crude oil in Indonesia was produced by PERTAMINA, the state-owned oil company, 3 companies led by P.T. Caltex Pacific Indonesia (CPI) under a contract-of-work agreement with the Government of Indonesia, and 14 companies led by Atlantic Richfield Indonesia, Inc. (ARCO), as contractors to PERTAMINA under a production-sharing agreement. The top five crude oil producers accounting for about 74% of the total oil output in 1981 were CPI, 43%; Indonesia Petroleum, Ltd. (INPEX), 9%; ARCO, 8%; Independent Indonesia American Petroleum Co. (Iiapco), 7.5%; and Total Indonesia (Compagnie Francais du Petrol), 6.5%. In 1981, the crude oil production by PERTAMINA accounted for only 5% of the total output. CPI and Iiapco contributed most to the increased level of the total oil output in 1981.

CPI, the largest oil producer in Indonesia, produced an average of 775,000 barrels per day of oil during the first half of 1981. The output level dropped to an average of 737,000 barrels per day during the second half of 1981. The company started six new oilfields: Beruk N.E., Bungsu, and Gatam in the coastal plains area and Garuk, Pemburu, and Puncak in Riau Province, in February 1981. However, the output from the Minas and Duri Fields continued to decline. The company reportedly was planning to invest about $1.8 billion for a secondary recovery (steamflood-enhanced oil recovery) program to increase the output from Duri Oilfield in Riau Province, Sumatra. The program was scheduled to begin in 1982 and to boost the output level of Duri Field from 40,000 barrels per day in 1981 to a peak level of 300,000 barrels per day in 1990.[20]

Iiapco, a division of Natomas International Co. of the United States, brought three new platforms into production in its Krisna Oilfield in the Java Sea offshore southeastern Sumatra during 1981. The output level of Krisna Fields was increased from 20,000 barrels per day in February to 57,000 barrels per day in October 1981.

In 1981, a total of 319 exploratory wells were drilled, and more than 40 new discoveries were made. Twelve new oil exploration contracts were also signed during 1981, and a total of about $900 million dollars was to be invested by the foreign companies in Indonesia over the next 3 to 6 years.

Indonesia's natural gas was produced by PERTAMINA, Lemigas (the Indonesian Petroleum Institute), 3 foreign companies, operating under a work contract agreement with the Government, and 17 foreign companies as PERTAMINA's contractors. The top five natural gas producers in 1981 were Mobil Oil at Arun, accounting for 34% of the total output; Roy M. Huffington at Badak, 20%; PERTAMINA, 13%; ARCO, 8%; and INPEX, 6%. Of the total natural

gas produced, about 22.5% was flared, about 45% was for manufacture of LNG, about 15% was for pressure maintenance, about 5% was for manufacture of fertilizer, about 4.5% was sold to Krakatau Steel Mills Ltd. and several cement plants, and the remaining 8% was for other uses.

An expansion program was started in late 1981 to increase the annual capacity of the LNG plant at Arun in Aceh, North Sumatra, from 238 to 423 billion cubic feet. This followed the signing of the agreements between PERTAMINA and the Japanese buyers group in mid-1981. Under the agreements, two additional trains, with a combined annual capacity of 169 billion cubic feet of LNG, are to be built by PERTAMINA with Chiyoda Chemical Engineering Co. of Japan as the main contractor. The construction of two trains was scheduled to be completed in early 1984. In June 1981, the Japanese buyers formed Indonesia Arun LNG Co., Ltd. (60% owned by Tohoku Electric Power Co.; 30%, by Tokyo Electric Power Co.; and 10%, by Mitsubishi Corp.), to finance the program by providing a $942 million loan. Under a separate sales contract signed by PERTAMINA and the Indonesia Arun LNG Co., Ltd., in August 1981, Indonesia is to repay the loan in the form of LNG from the Arun plant for 20 years beginning in 1984. Indonesia Arun LNG Co., Ltd., of Japan will be the distributor for Japan's import of 175 billion cubic feet of LNG annually from the Arun Plant.[21]

The expansion program to boost annual capacity from 169 to 338 billion cubic feet of LNG at the plant at Bontang, East Kalimantan, was proceeding according to schedule. The Bechtel Corp. of the United States was awarded the $850 million contract to build two additional trains, each able to produce 79 billion cubic feet of LNG annually. The expansion program at Bontang was scheduled for completion in mid-1983. In April 1981, PERTAMINA and four Japanese buyers signed a sales contract that called for Indonesia to deliver 169 billion cubic feet of LNG per year beginning in 1983 for a 20-year period. The four Japanese buyers are Chubu Electric Co., Kansai Electric Co., Osaka Gas Industrial Co., and Toho Gas Industrial Co.

Indonesia's exports of crude oil and refined products were valued at $15.2 million in 1981 compared with $13.4 billion in 1980. The main buyers of Indonesia's crude oil were Japan, accounting for 55% of Indonesia's total exports, and the United States, 30%. Indonesia overtook Algeria as the world's largest exporter of LNG in 1981. Export earnings from LNG also increased to $2.5 billion in 1981 from $2.3 billion in 1980. Japan was the sole importing country of Indonesia's LNG.

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[1]Economist, Division of Foreign Data.

[2]Where necessary, values have been converted from Indonesian rupiahs (Rp) to U.S. dollars at the rate of Rp625=US$1.00.

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[20]Petroleum News (Hong Kong). V. 12, No. 7, October 1981, p. 10.

[21]Japan Petroleum & Energy Weekly (Tokyo). V. 16, No. 24, June 15, 1981, p. 12.

The Mineral Industry of Iran

By George A. Morgan[1]

Output from the minerals sector of the economy was inconsequential in 1981, accounting for a small percentage of the gross national product (GNP). Many non-oil-related concerns including mining concerns were probably operating at less than one-third capacity. Primary reasons for the severe decline were the continuing war with Iraq and the deliberate policy of the revolutionary Government to alter economic development in light of new goals. Actual production of metals and nonmetals from active mining operations was reduced virtually to nil for part of the year, and several projects involving new smelters and reactivation of mine production were only announced at yearend.

The creation of a Ministry of Mines and Metallurgy, reported in 1980, has yet to be realized. Plans affecting the mining industry must originate in or be reviewed by the Revolutionary Council. Problems crippling the industry include severe shortages of skilled technicians, parts shortages, restriction of imports to war-related items and essential foodstuffs, and deficient transport from customs warehouses to user sites. A new Government policy considered mines as national resources only for domestic consumption.

Further studies to identify all mine deposits and resources were planned. By yearend 1981, foreign expertise, mainly from the U.S.S.R., Romania, and Yugoslavia, was used on large industry projects. Some of this expertise was provided in fulfillment of barter agreements and was utilized at powerplants, harbors, railways, steel plants, and oil refineries.

The oil industry was the backbone of the Iranian economy in 1981. It held this position despite 3 years of political and economic strife, coupled with war-related damage and outright destruction of production facilities. The oil industry assumed a larger portion of GNP in 1981 than that of previous years. In the period 1978-80, the Government claimed achievement of its stated goal of reducing the oil sector's share of GNP by 10%. By yearend 1980, war with Iraq forced Iran to rely upon its most developed and organized industry to acquire foreign exchange. Changes in petroleum laws were effected that terminated existing contracts, most of which were long term. Short-term contracts, generally at reduced prices, were the norm for most of 1981. The sharp drop in crude production in the first quarter was due to the war with Iraq.

Total GNP has declined for 4 consecutive years, while money in circulation has nearly doubled to $20 billion in 3 years.[2] Inflation has continued to rise and was estimated at 35% in 1981 compared with 10% in 1978. Foreign exchange reserves of $14 billion in 1979 were reduced to about $650 million by yearend 1981. The budget for 1981-82 was $44 billion, of which $7.3 billion was directly for the war effort and $14 billion for general defense allocation. A revision in the previous year's budget was necessitated by a decline in oil revenue from the predicted $33 billion to about $12 billion. The current budget deficit was to be made up from oil sales at more flexible prices.

PRODUCTION AND TRADE

Primary emphasis on production in the metals sector was placed on iron and steel. Demand for crude steel and steel products remained high. Failure to complete steel mill projects has forced Iran to import large tonnages of iron and steel, particularly coils

and plates. Existing production facilities used both domestically produced and imported iron ore. Limitations on output were due to the quantity and grade of ore available, as well as the availability of coke.

Output of all other metals was estimated to have declined substantially because of their limited local utilization and export-oriented nature. Transport capacity was limited, and mines in general were considered to be national resources for domestic use only. Foreign exchange was to be earned mainly from sales of petroleum. However, if production of metals was achieved in excess of local demand, it may be made available for export sale.

Nonmetal commodities experienced generally less severe declines in output than metals, mainly because of local use. Byproducts from the petrochemical and metals sector, such as barite, sulfur, and nitrogen, were affected adversely, regardless of demand. Nonavailability of parts limited production of cement. Poor transport facilities also adversely affected distribution of imported equipment to the industry.

Output of crude oil declined for the fourth consecutive year. As nearly all gas produced was associated with oil production, natural gas production and flaring declined accordingly. There were no reports of exports of natural gas to the U.S.S.R. Planned increases in gas utilization in the country will probably be from nonassociated gasfields. Such production was originally prevented while most of the associated gas was flared. Gathering lines for utilization of associated gas were being laid, but the decline in oil output and the war have resulted in earlier-than-planned production from nonassociated gasfields.

Electric generation plants experienced many of the same difficulties of the mining and petroleum sector. Power supply problems also affected the aluminum smelter at Arak.

In early 1981, a bill was approved providing for the nationalization of all foreign trade. The Government had 2 months in which to work out proposals for public control of import trade, which amounted to about $12.2 billion in 1980. The Iranian Central Bank limited imports to about $900 million per month, of which $300 million was for military hardware for direct war use. An 80% increase in the value of imports through four northern points of entry was reported to be nearly all from eastern bloc countries. Goods from the U.S.S.R. made up 20% of the total in the first 6 months. By yearend 1981, the U.S.S.R. and other eastern bloc nations were providing 60% of foreign trade. The sharp rise in barter agreements substantiated reports of exhaustion of foreign reserves. Oil was the principal barter commodity. A barter agreement with Romania provided for the exchange of $1.1 billion worth of Iranian goods, mainly crude oil, for the services of oil and gas industry experts. Romania was also to supply the industry with spare parts and to process about 30,000 barrels per day of crude oil in Romanian refineries. Similar agreements were made with Yugoslavia.

Table 1.—Iran: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum metal, primary ingot	21,100	25,500	[e]14,000	10,000	5,000
Chromium: Chromite, gross weight	233,300	198,000	[e]136,000	80,000	30,000
Copper:[e]					
Mine output, metal content	13,500	20,000	5,300	3,600	3,600
Metal:					
Smelter	7,000	6,000	700	800	800
Refined	7,000	6,000	3,000	800	800
Iron and steel:					
Iron ore, gross weight thousand tons	1,100	1,560	[e]609	600	600
Metal:					
Pig iron do.	[e]700	[e]900	[e]800	800	500
Steel, crude do.	550	[e]780	[e]700	700	500
Lead, mine output, metal content	40,000	30,000	15,000	15,000	10,000
Manganese ore, gross weight	40,000	30,000	20,000	20,000	20,000
Zinc, mine output, metal content	61,500	[e]45,000	25,000	20,000	15,000
NONMETALS					
Barite	184,650	200,000	180,000	150,000	75,000
Cement, hydraulic thousand tons	7,256	12,000	9,000	8,000	8,000

See footnotes at end of table.

Table 1.—Iran: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Clays:					
Bentonite[e]	23,400	40,000	20,000	20,000	10,000
Fire clay	72,201	[e]70,000	70,000	50,000	40,000
Kaolin	111,202	[e]180,000	160,000	150,000	100,000
Feldspar	3,000	[e]3,000	3,000	2,500	2,000
Gem stones: Turquoise, crude	82	35	NA	NA	20
Gypsum thousand tons	6,900	[e]8,000	7,000	7,000	6,000
Lime[e] do	1,000	900	500	500	500
Magnesite	5,000	5,000	[e]5,000	4,000	4,000
Nitrogen, N content of ammonia	271,300	178,400	183,300	217,800	200,000
Pigments, mineral, natural	3,500	[e]2,000	[e]1,000	500	500
Salt, rock[e] thousand tons	700	700	700	600	600
Sodium compounds: Caustic soda	NA	[e]20,000	[e]20,000	NA	10,000
Stone, sand and gravel:					
Limestone thousand tons	9,000	15,000	NA	11,000	11,000
Marble do	397	450	NA	NA	200
Silica do	300	NA	NA	NA	200
Travertine do	200	350	NA	NA	100
Other do	NA	NA	NA	NA	NA
Strontium minerals: Celestite[e]	10,000	15,000	8,000	5,000	5,000
Sulfates, natural:					
Aluminum-potassium sulfate (alum)	8,500	8,000	NA	NA	3,000
Sodium sulfate (mineral not specified)[e]	40,000	35,000	NA	NA	20,000
Sulfur:					
Native thousand tons	[e]188	[e]150	[e]75	70	50
Byproduct of petroleum and natural gas do	[e]400	[e]300	[e]200	150	100
Total do	588	[e]450	[e]275	220	150
Sulfuric acid do	260	[e]200	100	100	70
Talc	400	[e]400	[e]400	300	200
MINERAL FUELS AND RELATED MATERIALS					
Coal thousand tons	969	900	[e]900	700	600
Coke do	445	500	[e]400	400	350
Gas, natural:					
Gross million cubic feet	2,059,504	1,947,595	[e]1,100,000	NA	200,000
Marketed do	[e]795,000	687,397	[e]500,000	NA	200,000
Natural gas liquids:					
Propane thousand 42-gallon barrels	4,625				
Butane do	4,447	NA	NA	NA	NA
Natural gasoline and other do	6,798				
Total do	15,870	[e]16,000	[e]500	2,000	2,000
Petroleum:					
Crude[3] do	2,066,922	1,913,221	1,121,346	550,000	490,000
Refinery products:					
Gasoline:					
Aviation do	2,619	2,931	2,500		500
Motor do	32,243	33,996	30,000		15,000
Jet fuel do	11,995	11,038	10,000		4,000
Kerosine do	34,425	31,638	30,000	NA	15,000
Distillate fuel oil do	56,960	50,705	45,000		20,000
Residual fuel oil do	102,920	100,195	90,000		40,000
Lubricants do	2,760	3,376	3,000		500
Other:					
Liquefied petroleum gas do	4,629				
Naphtha and solvents do	7,430				
Asphalt do	NA	10,671	9,500	NA	4,000
Bitumen do	5,971				
Unspecified do	604				
Refinery fuel and losses do	11,483	4,336	4,000	NA	1,000
Total do	274,039	248,886	[e]224,000	NA	100,000

[e]Estimated. [p]Preliminary. NA Not available.

[1]Data are for years beginning Mar. 21 of that stated, except those for natural gas, natural gas liquids, and petroleum, which are for regular calendar years. Table includes data available through June 18, 1982.

[2]In addition to the commodities listed, other types of crude construction materials (such as common clays, sand and gravel, and other varieties of stone) are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Excludes petroleum reinjected into fields

Table 2.—Iran: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, semimanufactures	NA	13	--	All to Pakistan.
Chromium ore and concentrate	26,522	29,329	--	Poland 11,778; Austria 7,122; Yugoslavia 6,401.
Copper:				
Ore and concentrate	9,300	4,200	--	All to Japan.
Metal including alloys, semimanufactures	51	--		
Iron and steel metal:				
Scrap	7,500	9,184	--	Pakistan 9,005; Netherlands 113.
Semimanufactures:				
Bars, rods, angles, shapes, sections	--	154	--	All to Saudi Arabia.
Universals, plates, sheets	87	--		
Hoop and strip	--	4	--	Do.
Wire	--	8	--	All to Pakistan.
Tubes, pipes, fittings	r148	48	--	Saudi Arabia 47.
Castings and forgings, rough	17	126	--	Pakistan 125.
Lead:				
Ore and concentrate	8,742	8,817	--	U.S.S.R. 5,035; France 3,782.
Metal including alloys:				
Scrap	145	40	--	All to United Kingdom.
Unwrought	30	--		
Semimanufactures	100	--		
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	--	$2	--	All to Switzerland.
Silver metal including alloys, waste and sweepings do	$151	$367	--	France $324; Austria $43.
Zinc ore and concentrate	41,362	33,344	--	United Kingdom 17,072; U.S.S.R. 8,553; Italy 7,500.
Other:				
Ash and residues containing nonferrous metals	--	3,208	--	Belgium-Luxembourg 3,172; West Germany 21.
Oxides, hydroxides, peroxides	3	12,940	--	All to United Kingdom.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	5	17	--	Pakistan 15; United Kingdom 2.
Cement	r2,013	--		
Clay products:				
Nonrefractory	35	23	--	Qatar 16; West Germany 6.
Refractory including nonclay brick	r2	--		
Diamond:				
Gem, not set or strung value, thousands	$1,185	$383	--	Belgium-Luxembourg $176; Switzerland $155.
Industrial do	$39	--		
Fertilizer materials:				
Crude, phosphatic	11	--		
Ammonia	19,077	96,749	--	France 35,077; Spain 28,485; Brazil 19,731.
Lime	--	69	--	All to Saudi Arabia.
Magnesite	--	4	--	All to United Kingdom.
Precious and semiprecious stones except diamond:				
Natural value, thousands	$1,358	$166	$65	West Germany $91; United Kingdom $10.
Synthetic do	$28	--		
Salt and brine	r209	198	--	Oman 140; Qatar 58.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	18,496	11,360	--	Italy 11,088; Japan 179.
Worked	97	33	--	Saudi Arabia 29; Austria 3.
Gravel and crushed rock	r5,428	5,429	--	Saudi Arabia 5,156; Qatar 273.
Sulfur: Elemental, other than colloidal	22,418	214,201	--	All to Italy.
Other: Halogens	7	--		
MINERAL FUELS AND RELATED MATERIALS				
Coke and semicoke	NA	219,200	--	All to Pakistan.
Gas, natural million cubic feet	20	--		
Petroleum:				
Crude thousand 42-gallon barrels	3878,555	3291,592	8,475	Japan 106,519; West Germany 41,665; Spain 29,460.
Refinery products:				
Gasoline do	r7,809	7,203	--	Japan 3,527; Netherlands 1,048; France 581.
Kerosine do	r848	6	--	Hungary 5; Italy 1.
Distillate fuel oil do	r934	623	--	Spain 608; France 12.
Residual fuel oil do	33,595	445,458	--	Japan 12,566; France 9,567; Singapore 7,871.

See footnotes at end of table.

Table 2.—Iran: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Lubricants thousand 42-gallon barrels	7,139	223	--	All to France.
Other:				
Liquefied petroleum gas do	3,106	1,249	--	Japan 795; Spain 389.
Petroleum coke do	1	--		
Bitumen and other residues do	1	--		
Bituminous mixtures do	([5])	--		
Unspecified including bunkers do	[3] [r]26,685	3,500	--	Sri Lanka 3,432.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	789	26,126	--	All to Singapore.

[r]Revised. NA Not available.

[1]Owing to lack of available official trade data published by Iran, this table should not be taken as a complete presentation of this country's mineral exports. These data have been compiled from various sources, which include United Nations information and data published by the partner trade countries. Unless otherwise specified, data are compiled from trade statistics of individual trading partners.

[2]Excludes imports by Australia valued at $1,349,000.

[3]Annual Statistical Bulletin 1980, published by Organization of Petroleum Exporting Countries, Vienna, Austria.

[4]Excludes imports by New Zealand valued at $17,573,000.

[5]Less than 1/2 unit.

Table 3.—Iran: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	--	4	--	All from France.
Oxides and hydroxides	63	751	--	Austria 530; Netherlands 162.
Metal including alloys:				
Unwrought	2	3,140	--	Hungary 1,196; Italy 750; Sweden 550.
Semimanufactures	9,164	12,134	--	West Germany 2,467; Switzerland 1,990; Italy 1,244.
Chromium oxides and hydroxides	1	449	--	Spain 440; Austria 8.
Cobalt:				
Oxides and hydroxides kilograms	--	300	--	All from Japan.
Metal including alloys, all forms do	[r]4,500	[2]168	68	Italy 100.
Copper metal including alloys:				
Scrap	40	21	--	All from United Kingdom.
Unwrought	623	298	--	France 198; Belgium-Luxembourg 60; United Kingdom 38.
Semimanufactures	12,531	[3]30,779	--	Japan 9,443; West Germany 8,170; Spain 5,026.
Iron and steel:				
Ore and concentrate	5	2	--	All from Sweden.
Metal:				
Pig iron	367	619	--	Sweden 300; West Germany 165; United Kingdom 60.
Ferroalloys	4,818	1,915	--	West Germany 1,143; Norway 609.
Steel, primary forms	315,582	631,039	--	Japan 299,415; West Germany 230,864; Spain 50,232.
Semimanufactures:				
Bars, rods, angles, shapes, sections	609,070	[4]989,766	--	Spain 392,254; Hungary 146,701; West Germany 147,763.
Universals, plates, sheets	461,235	599,895	--	Italy 344,082; West Germany 115,732; Hungary 39,585.
Hoop and strip	25,216	[5]27,202	--	Japan 15,268;[5] West Germany 7,312; Hungary 1,539.
Rails and accessories	14,146	273	--	West Germany 123; Italy 119.
Wire	8,096	[6]12,580	--	Hungary 5,514; Japan 2,948;[6] West Germany 1,741.
Tubes, pipes, fittings	88,994	72,230	--	Spain 16,136; Japan 13,642; Thailand 8,619.
Castings and forgings, rough	1,093	1,051	--	United Kingdom 452; Italy 290; West Germany 265.

See footnotes at end of table.

Table 3.—Iran: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	160	29	--	Belgium-Luxembourg 25.
Metal including alloys:				
Unwrought	3,769	2,244	--	Australia 1,826;[7] United Kingdom 305.[7]
Semimanufactures	26	51	--	West Germany 20; United Kingdom 17; Italy 10.
Magnesium metal including alloys:				
Unwrought	--	1	--	All from United Kingdom.
Semimanufactures	20	13	--	Do.
Manganese:				
Ore and concentrate	1,785	3,188	--	Belgium-Luxembourg 1,700; Netherlands 1,488.
Oxides	50	69	--	Japan 61; France 8.
Mercury 76-pound flasks	479	435	--	Japan 290; West Germany 116.
Molybdenum metal including alloys, all forms kilograms	431	1,485	--	Switzerland 1,000; Japan 485.
Nickel:				
Matte and speiss	--	7	--	All from Austria.
Metal including alloys:				
Unwrought	47	142	--	United Kingdom 108; West Germany 12; Finland 10.
Semimanufactures	117	156	--	United Kingdom 60; West Germany 46; Austria 31.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$593	$1,389	--	West Germany $1,352; United Kingdom $37.
Silver metal including alloys, unwrought and partly wrought do	$1,711	$1,493	--	United Kingdom $921; West Germany $478; Japan $50.
Tin metal including alloys:				
Scrap	64	--		
Unwrought	263	1,081	--	Singapore 974; United Kingdom 102.
Semimanufactures	31	70	--	West Germany 35; United Kingdom 21; Singapore 10.
Titanium:				
Oxides	300	696	--	Japan 210; West Germany 172; Belgium-Luxembourg 151.
Metal including alloys, all forms	34	(8)	--	All from Japan.
Tungsten metal including alloys, all forms kilograms	r1,052	2,374	--	United Kingdom 2,000; Japan 374.
Zinc:				
Oxides and peroxides	374	408	--	Belgium-Luxembourg 195; United Kingdom 117; Italy 50.
Metal including alloys:				
Scrap	200	--		
Unwrought	1,951	4,347	--	Japan 1,999; Belgium-Luxembourg 710; United Kingdom 538.
Semimanufactures	486	272	--	United Kingdom 252; France 18.
Other:				
Ores and concentrates	--	20	--	All from Sweden.
Oxides, hydroxides, peroxides	19,711	7,504	--	United Kingdom 7,014; Japan 381; West Germany 94.
Metals:				
Metalloids	3,534	21,202	--	France 21,151; Norway 50.
Base metals including alloys, all forms	9	4	--	West Germany 3; United Kingdom 1.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	97	18	--	All from West Germany.
Artificial: Corundum	--	4	--	West Germany 3; Japan 1.
Dust and powder of precious and semiprecious stones value, thousands	$653	$13	--	All from United Kingdom.
Grinding and polishing wheels and stones	912	1,127	--	West Germany 376; Denmark 169; Japan 140.
Abestos, crude	1,757	101	--	All from Italy.
Boron materials: Oxide and acid	322	51	--	Spain 50.
Cement	290,881	53,401	--	U.S.S.R. 41,000; Italy 12,075; France 157; United Kingdom 124.
Chalk	883	589	--	Belgium-Luxembourg 394; France 139.
Clays and clay products:				
Crude	7,537	6,977	--	United Kingdom 6,824; Japan 65; Italy 38.
Clay products:				
Nonrefractory	2,856	9,465	--	Spain 5,695; Italy 2,159; Switzerland 533.

See footnotes at end of table.

Table 3.—Iran: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products —Continued				
Clay products —Continued				
Refractory including nonclay brick	8,345	7,683	--	West Germany 3,891; Austria 1,395; United Kingdom 1,295.
Cryolite and chiolite	2	--		
Diamond:				
Gem, not set or strung ---value, thousands	$6,973	$410	--	Belgium-Luxembourg $217; United Kingdom $97; Switzerland $96.
Industrial ---do---	$158	$1,373	--	All from Switzerland.
Diatomite and other infusorial earth	329	12	--	Japan 10; United Kingdom 2.
Feldspar and fluorspar	100	103	--	Finland 100.
Fertilizer materials:				
Crude:				
Nitrogenous	62	--		
Phosphatic	113,896	214,003	--	All from Morocco.
Manufactured:				
Nitrogenous	34,790	87,843	--	U.S.S.R. 87,730; Netherlands 50; West Germany 28.
Phosphatic	9,691	--		
Potassic	10,505	31	--	United Kingdom 20; West Germany 11.
Other including mixed	751	816	--	West Germany 600; Switzerland 106; United Kingdom 62.
Ammonia	72	202	--	Belgium-Luxembourg 171; West Germany 15.
Graphite, natural	81	108	--	Sri Lanka 68; Japan 27.
Gypsum and plasters	1,449	553	--	West Germany 542.
Lime	r603	583	--	All from United Kingdom.
Magnesite	736	1,575	--	Japan 1,516; Netherlands 40.
Mica:				
Crude including splittings and waste	15	--		
Worked including agglomerated splittings	1	3	--	All from West Germany.
Pigment, mineral:				
Natural, crude	7	--		
Iron oxides, processed	785	1,151	--	West Germany 978; Japan 95; United Kingdom 71.
Precious and semiprecious stones except diamond:				
Natural ---value, thousands	$895	$265	--	Thailand $173; Japan $40; Switzerland $34.
Synthetic ---do---	$50	$4	--	West Germany $3; Switzerland $1.
Salt and brine	100	508	--	United Kingdom 209; Netherlands 202.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	53	--		
Caustic soda	6,531	21,050	--	Spain 8,785; West Germany 5,398; Yugoslavia 3,200.
Soda ash	--	13,588	--	United Kingdom 4,993; France 3,999; West Germany 2,696.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	124	--		
Worked	105	124	--	Italy 102; United Kingdom 22.
Dolomite, chiefly refractory-grade	5	--		
Gravel and crushed rock	2,098	113	--	Norway 70; United Kingdom 22.
Quartz and quartzite	78	688	--	Finland 513; Sweden 70; United Kingdom 43.
Sand excluding metal-bearing	1,803	404	--	Belgium-Luxembourg 300; West Germany 56.
Sulfur:				
Elemental:				
Other than colloidal	421	227	--	West Germany 137; Japan 80.
Colloidal	5	129	--	France 108; Japan 21.
Dioxide	--	5	--	All from Austria.
Sulfuric acid, oleum	109	50	--	Netherlands 19; Belgium-Luxembourg 17.
Talc, steatite, soapstone, pyrophyllite	123	62	--	Republic of Korea 17; West Germany 16; Austria 12.
Other:				
Crude	470	1,434	--	United Kingdom 1,356; West Germany 61.
Slag, dross, and similar waste, not metal-bearing	--	10	--	All from Netherlands.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	33	70	--	West Germany 44; Italy 18.
Halogens	3	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	20	30	--	West Germany 20; France 5.
Carbon black	463	401	--	Japan 236; West Germany 164.

See footnotes at end of table.

Table 3.—Iran: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal, anthracite and bituminous	51,115	28,351	--	West Germany 28,320.
Coke and semicoke	814	55	--	United Kingdom 50.
Peat including briquets and litter	21	681	--	Finland 667.
Petroleum refinery products:				
Gasoline, 42-gallon barrels	r3,035	570	--	Italy 196; United Kingdom 119; Belgium-Luxembourg 102.
Kerosine, do.	r14,733	10,029	--	Greece 9,246; Thailand 767.
Distillate fuel oil, do.	2,589	544	--	Italy 343; West Germany 201.
Residual fuel oil, do.	17,949	3,330	--	All from Greece.
Lubricants, do.	122,598	[9]77,710	--	Saudi Arabia 29,750; West Germany 13,895; Austria 8,764.
Other:				
Liquefied petroleum gas, do.	14,535	11,797	--	Italy 10,904; France 708.
Mineral jelly and wax, do.	6,044	13,961	--	West Germany 8,350; Hungary 2,573; United Kingdom 1,731.
Nonlubricating oils, do.	42	--		
Petroleum coke, do.	3,025	4,626	--	All from West Germany.
Bitumen and other residues, do.	473	2,818	--	West Germany 2,727.
Bituminous mixtures, do.	1,830	2,763	--	Spain 2,060; West Germany 582.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	2,680	4,704	--	Saudi Arabia 4,250; United Kingdom 362; Japan 50.

rRevised.

[1]Owing to a lack of available official trade data published by Iran, this table should not be taken as a complete presentation of this country's mineral imports. These data have been compiled from various sources, which include United Nations information and data published by the partner trade countries. Unless otherwise specified, data are compiled from trade statistics of individual trading partners.

[2]Excludes exports from Sweden valued at $20,000.

[3]Excludes exports from Australia valued at $72,000.

[4]Excludes portion of Japanese exports valued at $2,282,000.

[5]Excludes exports from Japan valued at $817,000.

[6]Excludes portion of Japanese exports valued at $1,716,000.

[7]World Metal Statistics, World Bureau of Metal Statistics, London, United Kingdom.

[8]Less than 1/2 unit.

[9]Excludes portion of Japanese exports valued at $314,000.

COMMODITY REVIEW

METALS

Aluminum.—Capacity of the smelter at Arak was 50,000 tons per year. Production began in 1972 at 6,500 tons and continues to be based on imports of alumina. The plant operated at peak capacity in 1974 and 1975 but in recent years has suffered power shortages and greatly reduced alumina feed supply. Only 1% of the smelter production was controlled by the Government of Pakistan; the remainder was owned by Iran. Expansion of capacity to 120,000 tons per year was planned for 1981 but was not achieved.

Copper.—The Government of Iran requested a consortium of three Japanese firms to relinquish all remaining shares in Sherkate Sahami Khos Minakan Co. The joint Japanese-Iranian copper mining company was formed in May 1975. Japanese firms and their percentage share of ownership were Nittetsu Mining Co., 17%; Toko Zinc Co., 5%; and C. Itoh and Co., 11.3%.

In late 1981, plans were announced to complete the Sar Cheshmeh copper project, with limited production to start in 1982. All output was destined for the home market. Originally planned for completion in 1978 with an ultimate capacity of 150,000 tons per year of metal, the project was terminated and neither concentrator nor smelter was commissioned, although mining reportedly began. Delivery contracts to the United States, Japan, and Western Europe for 1979 were canceled. Yugoslavian and East German specialists were assisting in the project's completion, which has thus far cost $1.4 billion.

Iron Ore.—Discussions aimed at completing Iran's financial share in the Kundremukh iron ore project in India continued. Iran has paid only $255 million of the $630 million loan for the project. Recently, Iran has said it will take 2.5 million tons per year of concentrate. If Iran could not con-

sume the concentrate, India would be able to sell it and charge any price differential to Iran. Shipment would depend upon the war with Iraq and ultimate completion of the sponge iron plant at Ahwaz, for which the ore was originally intended.

Iron and Steel.—Production of steel in Iran came from the Aryamehr steel plant in Esfahan, built by the U.S.S.R. Ore for the blast furnaces was supplied from the Choghart deposit near Bafq, about 540 kilometers distant. Coal for the coking ovens at Aryamehr was limited because of mining problems and the necessity of blending with coal from the Federal Republic of Germany.

No work occurred on the direct-reduction plant at Ahwaz, which was about 65% complete in 1978. The pipe and rolling mill at Ahwaz, which was making 56-inch-diameter pipe for gas transport, was not operational because of the war.

The second direct-reduction plant, originally planned for a coastal site and then canceled, was now reported planned for construction at Mobarakeh, about 30 kilometers from Esfahan. Export of production has been abandoned; output is now intended solely for home use. The industry had expected to expand production to 15 million tons per year in the 10-year period beginning in 1974 with the construction of three steel centers. Delays and cancellations continue to cause heavy dependence on iron and steel imports, which accounted for about 18% of all imports in 1980. About 1.5 million tons was imported in 1980, and high import levels were expected to persist for several years.

Lead and Zinc.—The Ravaiye Mine, operated by Sogemiran S.A., experienced 130 days of concentrator downtime owing to a lack of reagents and spare parts in the year ending March 1980. Production was 3,159 tons of concentrate grading 51.3% lead and has declined since that time.

The Kouchk Mine and concentrator, located 170 kilometers northeast of Yazd in central Iran, had a plant design capacity of 600 tons per day. Lead-zinc mineralization was in a fine-grained bedded deposit that required fine grinding to minus 200 mesh. A rod and ball mill were employed in line following primary and secondary grinding to minus 0.5 inch in order to maintain maximum mineral recovery and concentrate grade. Ore grading 4.5% lead and 16% zinc was concentrated to 40% lead and 52% zinc in concentrates. Combined metal recovery ranged from 60% to 75%. Prior to the revolution, concentrates were trucked in bulk 700 kilometers to Bandar 'Abbas for export.

NONMETALS

Cement.—Total production was about 57% of the country's capacity of 14 million tons. Principal reasons cited for the low level of utilization were lack of expertise, efficiency, spare parts, and management. Cost of production was actually 25% higher than the sale price fixed by the Ministry of Commerce, which made it uneconomic to produce.

The Neka's Cement Factory, operated by Gorgan and Mazandaran Cement Co., started production in September at 75% of the rated capacity of 2,000 tons per day of portland cement. Equipment for the plant had been purchased in 1975-76 from the Humboldt Co. of the Federal Republic of Germany. One kiln was on site with crusher, loading dock, and clay dryer. Limestone and clay were mined nearby, and iron ore was supplied from Mashhad. The company began negotiations with the Industry and Mine Bank to obtain credit for spare parts, equipment, fuel, and wages.

Fertilizer Materials.—Nitrogen fertilizer in the form of urea and ammonium nitrate was produced from ammonia at petrochemical plants using natural gas feedstocks. The Iran Fertilizer Co. and the Razi Chemical Co. were the principal producers. Product capacities by Razi Chemical in tons per year follow: Ammonia, 300,000; sulfur, 375,000; urea, 710,000; sulfuric acid, 50,000; phosphoric acid, 80,000; and diammonium and monoammonium phosphate, 455,000.[3]

Iran Fertilizer had a reported capacity of 225,000 tons per year of urea, ammonium nitrate, nitric acid, and other chemicals, including mixed fertilizers. All phosphate and potash used was imported as there was no domestic production. Several phosphate rock discoveries continued to be under investigation.

MINERAL FUELS

Natural Gas.—Nearly all natural gas output in Iran was associated with crude oil production, which has declined sharply. In 1977, about 48% of associated gas produced was flared. Of the remainder, 31% was reinjected and 30% was exported to the U.S.S.R. Exports to the U.S.S.R. had been interrupted and finally terminated in 1980. Plans to eliminate all flaring by 1978 were postponed until 1980 and then mooted with the change in Government policy and the war with Iraq.

Emphasis has been placed on tapping nonassociated wells in the gulf coast for the petrochemical industry and public use. A project to expand gas distribution to 220,000 private users annually was announced. The project would take 16 years, would cost $11 billion, and was intended to reduce dependence on kerosine as a heating fuel. In conjunction with this plan, an agreement was made with an Italian company to complete a 56-inch-diameter pipeline extending from the Port of Kangan to Esfahan. There it would be joined with the main trunkline, permitting possible export to the U.S.S.R. Much of the equipment has been imported and about 50 kilometers of pipeline was completed in 1977. No further activity occurred in the past 5 years. Reserves at the Kangan Gasfield were 28 trillion cubic feet.

Petroleum.—The sharp decline in foreign exchange reserves placed new emphasis on oil exports. Authority was given to a special oil contract committee allowing it to declare null and void any agreement that it considered in conflict with the goals of nationalization of the oil industry. All oil contracts made prior to 1979 were canceled, with redress and compensation dependent upon the committee's recommendations. Short-term contracts were introduced at reduced prices to overcome the cost of higher insurance rates for vessels using the Persian Gulf and to increase sales. At yearend 1981, some prices for crude had dropped almost $8 to $30 per barrel. A surplus of oil in the international market and the Iranian Government's need to meet its budget requirements also led to a higher volume of exports and lower prices. Exports were expected to increase to about 2 million barrels per day in 1982 from 1.1 million barrels per day in 1981.

About 75% of crude oil exported was through Kharg Island, despite earlier war damage. The remainder was through the Lavan and Sirri terminals in the south. Damage in October to a major pumping station supplying Kharg Island was bypassed with the use of electric pumps. Exports to Italy, Romania, Turkey, the U.S.S.R., and Yugoslavia were the result of recent agreements. Several of these agreements involved barter of Iranian crude oil for the use of foreign refinery capacity, oil and gas specialists, and spare parts, for the industry. Romania was to receive 80,000 barrels per day in 1982, of which about 30,000 barrels per day was to be processed in Romanian refineries for Iran. The sale was to be split evenly between hard currency and the barter of crude oil.

Exploration drilling in Iran for oil and gas has virtually ceased because of equipment breakdowns, personnel shortages, and low Government priority.

The oil refineries at Tehran, Shiraz, and Esfahan with about 465,000 barrels per day total capacity appeared to be the principal operational refineries. Abadan, the largest refinery with a capacity of 610,000 barrels per day, was totally destroyed along with its 70,000-ton-per-year lubricants plant. Kermanshah, with a 20,000-barrel-per-day capacity, was also completely destroyed, and damage to the refinery at Tabriz significantly reduced its installed capacity of 90,000 barrels per day.

Nonavailability of sufficient lubricants necessitated the importation of large quantities. Several re-refiners produced a total of 20,000 tons per year, and the 100,000-ton-per-year plant at the Tehran refinery was also in operation. Of the two topping plants in the country, only the Lavan Island plant with a 20,000-barrel-per-day capacity was operational.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Iranian rials (Rls) to U.S. dollars at the rate of Rls78.60=US$1.00.

[3]U.S. Embassy, London, United Kingdom. State Department Airgram A-194, Apr. 10, 1981, p. 10.

The Mineral Industry of Iraq

By Harold R. Newman[1]

Despite the continuation of the Iran-Iraq war since September 1980, industry and development in Iraq was experiencing a high degree of progress with an overall estimated budget increase of 39% in 1981. The industrial sector had a budget allocation of $4.3 billion, which represented a 6.2% increase over that of 1980.[2] The Industrial Development Bank encouraged private sector investment through the expansion of loans that covered 60% of total project costs. Most foreign firms, whose personnel left the country immediately after the war broke out, have renegotiated contracts and resumed work.

The petroleum sector continued to dominate the mineral industry, although crude oil exports were reduced to about 1 million barrels per day because of the ongoing war with Iran. Although most of Iraqi petroleum exports were halted by yearend 1980, the country's economic strength lies primarily with petroleum reserves. Agricultural and industrial sectors continued to make increasing contributions to the overall economy. The transportation sector was receiving increasing attention from the Government, particularly railway transportation. One of the significant strategic railway projects is the Akashat Railroad, designed to provide a direct line between the phosphate mines of Akashat and Baghdad via Ramadi, Haditha, and the chemical fertilizers complex at Al-Qaim. Other strategically significant projects are the Baghdad-Maquel (Bashora) line running parallel to the Euphrates River and the line to link Marbed station (Bashra) with Kuwait. This last project would provide a railway linking Mediterranean ports with the Arab gulf ports.

Iraq has signed a $1.6 billion contract with two international firms to construct a major multiple-purpose dam across the Tigris River in northern Iraq by 1986. This will be one of the biggest in the Middle East and represents a major transition in the use of land for agriculture. It will have a water storage capacity of 11.3 billion cubic meters and 1,034 megawatts of hydroelectric power capability and will greatly improve farmland irrigation and navigation on the Tigris River. Other dams and irrigation projects, such as the Hamrin Dam, the Haditha Dam, and the Tharthar-Euphrates Canal, have improved agricultural capabilities of the country.

Iraq proposed expenditures of more than $130 billion in the Government's new 5-year national development plan and continued to place a high priority on economic development. To continue this development, the Government resorted to large loans from Saudi Arabia, Kuwait, the United Arab Emirates, and Qatar. Estimates of these loans range from $8 million to $20 million. Iraqi foreign exchange reserves at the end of 1981 were estimated at $9 billion to $14 billion, down from about $35 billion a year earlier. No official figures are available because the Government has stopped publishing any economic data since the war started.

Oil exploration and drilling projects that were delayed, after the war started in 1980, are being revived. Mobil Oil Corp. was requested by the Iraqi National Oil Co. (INOC) to reevaluate results of seismic surveys and stratigraphic drilling conducted by INOC in the Abu Jir-Kifl area. Negotiations were underway with French and Brazilian oil companies and with the Soviet Union for exploration assistance in other areas of Iraq.

PRODUCTION AND TRADE

Crude oil output continued to decline during 1981 as a result of the Iran-Iraq war. The war also caused delays in implementing planned production increases in both the fuel and nonfuel mineral sectors. However, the Government continued with its plans for expanded facilities and greater production efficiencies. Cement, steel, and refined products continue to be imported to meet the country's domestic needs. Iraq imported about 4 million tons of cement, supplementing its own production, to complete various development projects.

Mobil Oil renewed contracts for 60,000 barrels of crude oil per day. Crude exports, expected to begin in January 1982, were projected to comprise roughly 2% of U.S. crude oil imports in 1982. United States-Iraqi volume of trade continues to increase. Iraq imported almost $1 billion worth of goods from the United States in 1981 and is the fourth largest purchaser of U.S. goods among the Arab states of the Near East and North Africa.

Table 1.—Iraq: Production of mineral commodities[1]

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Iron and steel:					
Sponge iron metric tons	--	40,000	280,000	210,000	40,000
Crude steel do	--	50,000	352,000	260,000	45,000
NONMETALS					
Cement, hydraulic thousand metric tons	3,170	4,600	5,100	5,500	5,600
Gypsum[e] do	160	160	165	170	170
Nitrogen:					
N content of ammonia do	136	181	450	500	80
N content of urea do	--	100	250	300	50
Salt do	82	82	90	90	80
Sulfur, elemental:					
Native, Frasch do	620	600	550	700	700
Byproduct[e] do	40	40	70	70	70
Total do	660	640	620	770	770
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross million cubic feet	[e]370,802	[e]388,460	560,000	430,000	[3]401,173
Marketed[4] do	56,502	60,035	78,751	79,000	[3]62,154
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	1,200	[e]1,250	1,250	[e]250	400
Propane and butane do	2,500	[e]3,000	3,000	[e]3,000	990
Petroleum:					
Crude do	857,093	953,130	1,252,000	968,582	326,000
Refinery products:					
Gasoline do	8,103	12,254	9,900	10,000	NA
Jet fuel do	4,708	1,935	2,310	3,000	NA
Kerosine do	--	5,160	NA	NA	NA
Distillate fuel oil do	8,541	12,899	15,180	17,000	NA
Residual fuel oil do	9,417	14,189	16,830	18,500	NA
Lubricants do	390	580	330	400	NA
Other do	9,344	13,609	9,900	10,000	NA
Refinery fuel and losses do	8,444	3,870	6,600	8,100	NA
Total do	48,947	64,496	61,050	67,000	20,000

[e]Estimated. [p]Preliminary. NA Not available.

[1]Includes data available through July 23, 1982.

[2]In addition to the commodities listed, lime and a variety of crude construction materials (clays, stone, and sand and gravel) are also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels. In addition, limited unreported quantities of phosphate rock may have been produced for test purposes prior to inauguration of commercial production at the Al-Qaim chemical complex.

[3]Reported figure.

[4]Includes reinjected, if any.

Table 2.—Iraq: Exports of crude petroleum, by country

(Thousand 42-gallon barrels)

Country	1978	1979	1980
Australia	11,169	5,986	6,059
Canada	8,942	3,102	7,008
France	153,044	182,244	173,375
Germany, Federal Republic of	21,718	16,644	21,936
Italy	141,218	166,586	87,819
Japan	59,422	94,644	118,224
Netherlands	27,412	14,710	4,891
Portugal	18,104	23,834	22,812
Spain	44,420	43,435	45,990
United Kingdom	64,568	51,903	29,492
United States	22,630	33,653	12,191
Unspecified	297,659	558,743	367,738
Total	870,306	1,195,484	897,535

COMMODITY REVIEW

METALS

Aluminum.—Iraq has signed a joint-venture agreement with other Arab Gulf States for a 20% share of the Gulf Aluminum Rolling Mill Co. The plant, whose recommended location is in Bahrain, will have a capacity of 40,000 tons per year of semiprefabricated aluminum products and is scheduled for completion in 1983. The estimated cost of the venture is $64 million.[3]

Iron and Steel.—The Khor Al Zubair steelworks operated near its capacity of 400,000 tons per year until September 1980, when it was shut down in the early stages of the Iran-Iraq war. The plant, situated not far from the war zone, seems unlikely to resume any significant production while hostilities continue. However, the Government continued its development program with the awarding of an $85 million contract to a West German-Turkish consortium, including Thyssen Rheinstahl and Kutlutas Holding, to set up a steel foundry at Taji, 40 kilometers south of Baghdad. The plant is estimated to be completed in 1984. Also, a $10.2 million contract was concluded with Kawasaki Heavy Industries (Japan) to set up a new steel pipe factory at Um Qasr, near Baghdad. The production capacity is estimated at 50,000 tons of rolled steel per year.

NONMETALS

Cement.—Iraqi plans for the cement industry call for a 10-million-ton-per-year increase in the country's annual cement production by 1982-83. Currently, Iraq is producing about 5.5 million tons per year and is importing about 4 million tons per year. Construction work has resumed by Kawasaki and the Marubeni Corp. on two cement plants. Work was halted at the outbreak of the Iran-Iraq war. A 1-million-ton-per-year plant is to be built at Hit, west of Baghdad, and Kawasaki will also be building a new 1-million-ton-per-year plant at Al Tanim.[4] The State Organization for Industrial Design and Construction has agreements underway for building three brick factories, two thermostone projects, and two ready-made concrete projects.[5]

Fertilizer Materials.—*Nitrogenous.*—The Khor Al Zubair and the Basrah fertilizer complexes were damaged soon after the outbreak of the war with Iran. The former site has capacity for 544,000 tons per year of nitrogenous (N) ammonia and 484,000 tons per year of N urea units. The site at Basrah has capacity for 410,000 tons per year of N ammonia, 221,000 tons per year of N urea, and 27,000 tons per year of N ammonia sulfate as well as a sulfuric acid plant. Iraq is reported to be negotiating with Mitsubishi Heavy Industries (Japan) to repair the damaged fertilizer units. Exports of urea ceased in September 1980.[6]

Phosphorous.—The Akashat phosphate mine has been relatively unaffected by the war, and construction and exploration are continuing. The State Organization for Minerals (SOM) has estimated that there are reserves of about 400,000 metric tons of sedimentary phosphate rock. Two open pits will be developed initially with an estimated production of 1.7 million tons of ore per year. The average grade of the ore is 21% P_2O_5. The ore body has an average thickness

of 10.7 meters, and the limestone overburden ranges from 5 to 20 meters in thickness. The mines' output will be sent by rail to the Al-Qaim chemical complex for processing. The Al-Qaim chemical complex has a capacity to produce 600,000 tons per year of triple superphosphate, 250,000 tons per year of monoammonium phosphate, and 200,000 tons per year of other phosphate fertilizers, as well as sulfuric and phosphorate acid.[7]

Salt.—Construction and development of a salt-producing complex in southern Iraq continued through 1981. When the project reaches capacity, it is expected to supply 525,000 tons per year of industrial salt and 75,000 tons per year of packaged table salt for domestic consumption.

Sulfur.—Iraq continues as the largest producer of sulfur in the Middle East, although export shipments were halted when the war began in September 1980. The SOM has awarded a $45 million contract to a Japanese consortium, involving Kobe Steel and Marubeni Corp., to build a sulfur recovery and sulfuric acid plant in northern Iraq. The plant has a planned capacity for recovering 153,000 tons per year of sulfur from sulfur residues and for producing 60,000 tons per year of sulfuric acid. The sulfur residues will be provided by the sulfur refineries in northern Iraq. A process for treating these residues was developed by the Japanese consortium and Nissau Chemical Industries and produces a 99.9%-pure sulfur. The plant is expected to be in operation by 1984.

MINERAL FUELS

Natural Gas.—Iraq has been slow to develop its gas potential and continues to flare a major portion of natural gas produced in association with crude petroleum. However, a large development program has been initiated with 41 projects underway to allow a better utilization of associated gas. One such project is the $137.7 million contract by the Japanese Mitsubishi Corp. and Chiyoda Chemical Engineering Construction Co. to build a natural gas liquids plant at North Rumaila as part of the Southern Gas Project. The plant is due for completion in mid-1982. Total liquefied petroleum gas plant capacity was approximately 4.3 billion barrels in 1980.

Commercial production of natural gas in 1981 was 62.1 billion cubic feet, with 338.9 billion cubic feet flared. Proven reserves of gas in Iraq are put at 22,209.9 billion cubic feet.[8]

Rapid development of the Rumaila Oilfields allowed for a 30% expansion of the original Southern Gas Project contract that was signed in 1978. The new plant was expected to produce approximately 4 million tons per year of propane and butane and 1.5 million tons per year of condensate.

Petroleum.—Proven oil reserves were estimated at 30 billion barrels in 1980. Crude oil production capacity was rated at over 4 million barrels per day, and the total oil refinery capacity was projected to reach 200,000 barrels per day. Actual crude oil output was reported to be between 3 million and 3.5 million barrels per day through August 1980. Production of crude oil was not reported for 1981; however, it has been estimated at 1.5 to 2.0 million barrels per day. There were approximately 250 producing wells for most of the year. Iraq's major operating and projected oilfields are listed in table 3.

Table 3.—Major oilfields in Iraq in 1981[1]

Oilfield	Capacity[e] (millions of barrels per day)	Discovery date[2]	API gravity	Depth (feet)
Kirkuk	1.45	1927	36.0	2,800- 4,200
Northern Rumaila and Rumaila	.90	1958 (1972)	34.0	10,000-10,800
Zubair	.55	1949	34.2	11,000
Laheis	.51	(1978)	NA	NA
Bai Hasen		1953	34.0	4,800- 5,400
Jambur	.30	1954	38.0	5,500-12,500
Abu Ghurab:				
Buzurgan and Jabal Faugui	.20	(1976)	27.7	NA
Majnoon:				
Phase 1	.35	(1982)	NA	NA
Phase 2	.75	(1983)	NA	NA

[e]Estimated. NA Not available.
[1]Based on published figures prior to the Iran-Iraq war.
[2]Startup date is in parentheses.

Iraqi crude oil exports were averaging about 1 million barrels per day from Mediterranean terminals after the Iran-Iraq war started in September 1980, and it is estimated that crude exports would not exceed 1 million barrels per day while the war was ongoing. In 1981, Iraqi crude oil supplies, at its three Mediterranean terminals in Turkey, Syria, and Lebanon, were not considered to be secure because of possible guerrilla activities in the area.

Iraq has planned development of five new oilfields to increase production from a prewar level of about 4 million barrels per day to about 6 million barrels per day. The fields scheduled for development are Majnoon, Nahr Umr, and West Qurnah in the Basrah Province of southern Iraq, Halfaya in the eastern part of Amarah Province, and East Baghdad. Development of Majnoon has been postponed because of its close proximity to the Iranian border.

Refining.—Iraq continued plans to expand its refinery capacity to supply domestic transport and the growing demands of commercial industries for middle distillates.

Construction continued on the Baiji plant, which was expected to add 220,000 barrels per day to existing capacity. The Basrah refinery suffered damage by bombing in September 1980, which resulted in Iraq being a heavy importer of refined products. The Government was planning a 200,000-barrel-per-day export refinery in the southern part of Iraq that was scheduled to reach completion in 1985. Another refinery is planned in the northern part of the country to produce 250,000 tons per year of motor lubricating oil.

Petrochemicals.—C. E. Lummus and Thyssen Rheinstahl Technik (Netherlands) have basically completed work on the petrochemical complex in Basrah. The plant was to produce 150,000 tons per year of polyvinyl chloride, 135,000 tons per year of ethylene, 40,000 tons per year of caustic soda, and small amounts of other assorted organic chemicals. Startup for the plant was scheduled for 1981; however, the plantsite was heavily bombed in September 1980.

Pipelines.—The Iraqi Government was planning a 745 mile-long, large-diameter pipeline running from the southern Rumaila Field across Saudi Arabia to a Red Sea terminal somewhere near Yanbu. The capacity of the pipeline was estimated at 800,000 barrels per day. This pipeline would significantly increase the amount of crude oil being diverted from the Persian Gulf. The two main export terminals at Khor al-Amaya, Min al Bakr, and the ancillary installations at Fao, at the head of the Persian Gulf, were heavily damaged by Iranian air and naval action. Prior to that time it was estimated that 3 million barrels per day were being exported through these facilities.

Iraq was pumping all its exports through its pipeline system to the Mediterranean Sea, which includes a two-way reversible flow north-south pipeline. Crude oil was being moved from the northern oilfields at Kirkuk across Turkey to the Turkish Port of Ceyhen. Crude from the Basrah Oilfields in the south was being moved through the trans-Syria pipeline to Banias. Exports through these pipelines were estimated at about 1 million barrels per day.

The gulf terminals were expected to take up to a year to repair after the war has ended; however, Iraq was intending to use four single-bouy moorings to begin liftings as soon as possible. Each mooring was estimated to handle about 250,000 barrels per day so that the Government should be able to resume exporting about 1 million barrels per day via the gulf within a few months after a cease-fire.

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[1]Mining engineer, Division of Foreign Data.
[2]Where necessary, values have been converted from Iraqi dinars (ID) to U.S. dollars at the rate of ID0.295=US$1.00.
[3]Middle East Economic Survey. V. 24, No. 18, Feb. 16, 1981, p. 8.
[4]Rock Products. V. 84, No. 4, Apr. 1, 1981, p. 114.
[5]Baghdad Observer. July 2, 1981, p. 2.
[6]Nitrogen.No. 133. September-October 1981, p. 11.
[7]Mining Journal. Mining Annual Review (Iraq), 1981, p. 526.
[8]Petroleum Economist (Iraq). January 1982, p. 24.

The Mineral Industry of Ireland

By Tatiana S. Karpinsky[1]

The Irish economy showed slow overall growth in 1981. The 1981 gross national product increased 1.5% over that of 1980. Industrial production recovered somewhat early in 1981 from the decline of 1980, and for 1981 showed an increase of about 1% over 1980 production. Investment in industry increased 6%. Export levels showed only marginal improvement. The Irish economy was small and heavily dependent on trade and external economic factors.

In 1981, economic growth for most of Ireland's major trading partners was limited. Inflation in Ireland was at an annual rate of 19% in the first three-quarters of 1981. The most serious economic problem was the steady rise in unemployment, which reached about 11% of the labor force.

In 1981, exploration for additional hydrocarbons offshore was unsuccessful, but it was planned to continue deep drilling. The Government remained interested in stimulating new exploration and promised to be flexible on leasing agreements where necessary to promote the exploitation of deepwater or marginal fields. Ireland's metal mining industry produced at lower rates in 1981, owing to the low economic activity of its prime consumer, the United Kingdom.

PRODUCTION

Copper, lead, and zinc production declined in 1981, but output of most other mineral products was approximately at the 1980 level. In the lead-zinc industry, operations were curtailed because of strikes at the major mine, Tara. The opening of a new lead-zinc mine near Navan by Bula Mines continued to be under discussion. Production of petroleum products declined considerably, and the refinery was shut down as uneconomic in the second half of the year.

Production of minerals in 1977-81 is given in table 1.

Table 1.—Ireland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
METALS					
Copper, mine output, metal content	4,900	4,800	4,900	4,200	3,500
Iron and steel: Crude steel thousand tons	47	69	72	2	[e]10
Lead, mine output, metal content	41,000	47,800	71,000	59,000	30,500
Silver, mine output, metal content thousand troy ounces	936	631	1,059	771	596
Zinc, mine output, metal content	116,300	176,000	212,300	228,700	120,300
NONMETALS					
Barite	373,000	349,000	328,300	259,947	[e]260,000
Cement, hydraulic thousand tons	1,580	1,806	2,067	1,868	1,938
Gypsum do	342	392	417	382	[e]360

See footnotes at end of table.

Table 1.—Ireland: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Lime	80,000	92,000	73,000	31,700	46,100
Nitrogen: N content of ammonia thousand tons	28	24	171	254	[e]250
Pyrites	47,000	42,000	29,354	25,000	[e]25,000
Sand and gravel[3] thousand tons	5,464	5,726	7,168	5,376	5,400
Stone and other quarry products:					
Limestone[3] do.	8,755	11,147	11,101	11,945	9,721
Other[3 4] do.	3,068	3,396	[r]3,882	3,694	3,040
Sulfur: S content of pyrites	21,150	18,900	13,050	11,250	[e]11,250
MINERAL FUELS AND RELATED MATERIALS					
Coal, anthracite and bituminous thousand tons	54	31	62	63	70
Coke, gashouse, including breeze do.	[e]33	NA	[3]41	40	[e]40
Peat:					
For agricultural use do.	83	82	[r]91	88	81
For fuel use:					
Sod peat[5] do.	2,015	1,974	[r]1,653	1,688	1,584
Milled peat[6] do.	3,085	2,630	[r]2,013	2,738	3,774
Total do.	5,100	4,604	[r]3,666	4,426	5,358
Peat briquets[7] do.	351	334	[r]325	338	340
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	4,219	4,508	4,412	4,152	[8]1,589
Jet fuel do.	606	98	252	155	[8]60
Distillate fuel oil do.	4,585	4,821	4,566	4,019	[8]1,418
Residual fuel oil do.	6,622	6,388	7,075	5,981	[8]2,200
Other:					
Liquefied petroleum gas do.	695	719	260	238	[e]81
Naphtha do.	207	121	126	35	[e]98
Refinery fuel and losses do.	263	206	574	408	[e]151
Total do.	17,197	16,861	17,265	14,988	5,597

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 11,1982.

[2]In addition to the commodities listed, substantial quantities of stone and sand and gravel are produced by local authorities and road contractors. Ireland also produces significant quantities of manufactured diamond, but output is not quantitatively reported and available general information is inadequate to make reliable estimates of output levels.

[3]Excludes output by local authorities.

[4]Figures given as reported in source; includes granite, marble, silica rock, sand, calcspar, fire clay, and slate and clays for cement production.

[5]Includes production by farmers and by Bord Na Mona.

[6]Includes milled peat used for briquet production.

[7]Produced from milled peat.

[8]Output was recorded for the first half year; no production was reported for the third quarter, and presumably there was none in the fourth quarter.

TRADE

In 1981, the Irish economy continued to depend on imports of nonferrous metals, fuels, iron and steel, and fertilizers. Metal concentrates were exported to smelters in the United Kingdom and on the Continent.

Imports of metals and minerals came mainly from the United Kingdom, the Federal Republic of Germany, and Belgium-Luxembourg.

In 1980, the total value of exports was $8.4 billion,[2] and the value of imports was $11.1 billion. Mineral exports were valued at about $407 million, or 4.8% of the total exports; mineral imports including fuels were valued at $2.4 billion, or 21.4% of the total.

Table 2.—Ireland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	1,577	1,543	--	United Kingdom 387; Thailand 235; Italy 231.
Metal including alloys:				
Waste and scrap	2,151	3,526	--	United Kingdom 2,003; Belgium Luxembourg 423.
Unwrought	2,523	2,206	--	United Kingdom 1,485; Netherlands 291; West Germany 180.
Semimanufactures	2,099	2,495	7	United Kingdom 1,614; West Germany 299; France 254.
Chromium: Oxides and hydroxides	--	10	--	All to United Kingdom.
Copper:				
Ore and concentrate	17,703	18,888	--	Spain 8,658; East Germany 5,811; Belgium-Luxembourg 1,920.
Metal including alloys:				
Waste and scrap	5,910	6,698	--	Belgium-Luxembourg 1,930; Netherlands 1,609; United Kingdom 1,448.
Unwrought	253	454	--	Netherlands 238; United Kingdom 119; Belgium-Luxembourg 63.
Semimanufactures	2,569	1,807	415	United Kingdom 1,002; Belgium-Luxembourg 190; West Germany 76.
Iron and steel:				
Ore and concentrate (roasted pyrites)	31,160	27,092	--	All to United Kingdom.
Metal:				
Waste and scrap	40,991	84,458	--	Spain 40,766; United Kingdom 22,745; Denmark 6,529.
Pig iron, ferroalloys, similar materials	95	178	--	United Kingdom 106; Belgium-Luxembourg 55.
Steel, primary forms	437	1,813	6	United Kingdom 1,769; West Germany 12; France 11.
Semimanufactures:				
Bars, rods, angles, shapes, sections	12,694	18,636	(1)	United Kingdom 18,469; West Germany 113.
Universals, plates, sheets	3,854	6,145	102	United Kingdom 5,749; Austria 67; Italy 57.
Hoop and strip	917	830	1	United Kingdom 381; Mexico 206; India 115.
Rails and accessories	1,200	1,157	--	All to United Kingdom.
Wire	394	937	4	United Kingdom 727; Belgium-Luxembourg 74.
Tubes, pipes, fittings	6,155	6,736	2	United Kingdom 4,576; West Germany 1,605.
Castings and forgings, rough	67	42	--	United Kingdom 37; West Germany 4.
Lead:				
Ore and concentrate	115,276	110,238	--	France 28,323; West Germany 19,556; Belgium-Luxembourg 15,723.
Oxides and hydroxides	104	25	--	All to United Kingdom.
Metal including alloys:				
Waste and scrap	954	1,881	--	Belgium-Luxembourg 710; Netherlands 468; United Kingdom 259.
Unwrought	3,196	1,857	(1)	United Kingdom 1,498; Netherlands 236.
Semimanufactures	1,438	2,419	38	United Kingdom 2,047; Netherlands 43.
Magnesium metal including alloys:				
Waste and scrap	--	53	--	Italy 43; Netherlands 10.
Unwrought and semimanufactures	9	5	--	All to Belgium-Luxembourg.
Manganese:				
Ore and concentrate	18	--	--	
Oxides and hydroxides	12,381	12,374	1,314	United Kingdom 2,500; Singapore 1,530; U.S.S.R. 1,274.
Mercury 76-pound flasks	3	64	--	All to United Kingdom.
Nickel:				
Matte, speiss, sinters	--	4	--	Do.
Metal including alloys:				
Waste and scrap	23	95	--	United Kingdom 67; Denmark 20; Belgium-Luxembourg 5.
Unwrought and semimanufactures	140	240	--	Switzerland 79; West Germany 64; United Kingdom 40.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	3,826	977,928	NA	United Kingdom 959,795.

See footnotes at end of table.

Table 2.—Ireland: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Silver:				
Waste and sweepings[2] value, thousands	$711	$2,132	--	United Kingdom $1,934; Switzerland $113.
Metal including alloys, unwrought and partly wrought troy ounces	43,628	105,294	NA	United Kingdom 80,055.
Tin metal including alloys, all forms	71	422	--	All to United Kingdom.
Titanium: Oxides and hydroxides	75	21	--	Do.
Tungsten metal including alloys, unwrought	1	3	(1)	United Kingdom 1; West Germany 1.
Zinc:				
Ore and concentrate	413,872	462,096	--	Belgium-Luxembourg 190,677; West Germany 59,821; France 55,185; Italy 52,425.
Oxides and hydroxides	43	39	--	United Kingdom 37; Netherlands 2.
Metal including alloys:				
Waste and scrap	202	176	--	Belgium-Luxembourg 99; Netherlands 53; United Kingdom 24.
Unwrought and semi-manufactures	329	3,612	--	Italy 3,250; United Kingdom 359.
Other:				
Ash and residue containing nonferrous metals	2,201	1,350	NA	West Germany 259.
Metalloids kilograms	--	500	NA	NA.
Alkali and alkaline earth	7	10	--	Mainly to United Kingdom.
Base metals including alloys, all forms	115	309	71	United Kingdom 118; West Germany 74; Belgium-Luxembourg 46.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	43	53	--	United Kingdom 52.
Artificial, corundum	8	14	--	United Kingdom 10; West Germany 4.
Grinding and polishing wheels and stones	118	94	14	West Germany 38; United Kingdom 11.
Asbestos, crude	302	120	36	United Kingdom 83; France 1.
Barite and witherite	302,317	272,643	94,878	United Kingdom 74,126; Norway 21,884; Denmark 9,711.
Boron materials	20	15	--	All to United Kingdom.
Cement	133,649	96,640	--	United Kingdom 90,399.
Chalk	--	11	--	All to United Kingdom.
Clays and clay products:				
Crude	194	154	--	United Kingdom 77; Netherlands 42; Cameroon 32.
Products:				
Refractory including nonclay brick	60,243	62,735	--	United Kingdom 14,502; West Germany 11,948; Belgium-Luxembourg 6,885.
Nonrefractory	1,613	719	--	United Kingdom 710; West Germany 7.
Diamond:				
Gem, not set or strung value, thousands	$715	$59	--	Israel $31; United Kingdom $27.
Industrial carats	--	6,912	--	All to United Kingdom.
Diatomite and other infusorial earth	2	--		
Fertilizer materials:				
Crude:				
Nitrogenous	35	72	--	All to United Kingdom.
Phosphatic	150	97	--	Do.
Other including mixed	600	1,788	--	Do.
Manufactured:				
Nitrogenous	r19,364	64,548	--	France 25,463; Belgium-Luxembourg 15,772; United Kingdom 12,390.
Phosphatic	575	74	--	All to United Kingdom.
Potassic	--	221	--	All to Netherlands.
Other including mixed	17,631	36,084	--	United Kingdom 32,368; France 3,716.
Ammonia	62,921	70,376	--	United Kingdom 25,930; Spain 24,076; Portugal 9,089.
Graphite, natural	--	166	--	All to United Kingdom.
Gypsum and plasters	57,184	57,816	--	United Kingdom 25,093; Belgium-Luxembourg 38.
Lime	2,985	1,363	--	All to United Kingdom.
Magnesium materials	35,901	73,395	45,134	United Kingdom 9,124; Belgium-Luxembourg 4,330; West Germany 3,382.

See footnotes at end of table.

Table 2.—Ireland: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Mica:				
Crude including splittings and waste	46	32	--	All to United Kingdom.
Worked including agglomerated splittings	--	5	--	All to Italy.
Precious and semiprecious stones excluding diamonds value, thousands	$303	$420	--	United Kingdom $235; Switzerland $174; West Germany $11.
Salt and brine	233	689	--	All to United Kingdom.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	29	1	--	Do.
Caustic soda	536	98	--	Do.
Soda ash	7	2	--	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,290	2,378	--	All to United Kingdom.
Worked	425	752	22	United Kingdom 581; Netherlands 98.
Dolomite, chiefly refractory-grade	1	25	--	All to United Kingdom.
Gravel and crushed rock	272,442	168,318	--	West Germany 103,227; United Kingdom 47,116; France 17,975.
Limestone excluding dimension	387	231	--	United Kingdom 224.
Quartz and quartzite	84	286	--	United Kingdom 268; West Germany 18.
Sand excluding metal-bearing	5,376	6,995	--	United Kingdom 6,975.
Sulfur:				
Elemental:				
Colloidal kilograms	17,500	100	NA	NA.
Other than colloidal	2,901	25	--	All to United Kingdom.
Sulfuric acid, oleum	3,596	2,729	--	All to Netherlands.
Talc, steatite, soapstone, pyrophyllite	19	35	--	Netherlands 16; Switzerland 14; United Kingdom 3.
Other:				
Crude	4	19	--	All to United Kingdom.
Slag, dross, similar waste, not metal-bearing	3	19	--	Do.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	425	263	--	United Kingdom 57; France 51; Thailand 50.
Bromine, fluorine, iodine	24	58	--	All to United Kingdom.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	14,301	8,332	--	United Kingdom 6,575; Hong Kong 1,673.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	8	27	--	All to United Kingdom.
Carbon black	509	630	32	Netherlands 446; United Kingdom 88; West Germany 43.
Coal, all grades including briquets	65,760	38,450	--	United Kingdom 38,432.
Coke and semicoke	17,352	8,719	--	Sweden 8,686; United Kingdom 33.
Hydrogen, helium, rare gases	808	819	--	Mainly to United Kingdom.
Peat including briquets and litter	145,355	129,826	3	United Kingdom 126,840; Saudi Arabia 534.
Petroleum refinery products:				
Gasoline 42-gallon barrels	7,948	23,672	--	United Kingdom 17,323.
Kerosine do	140	--	--	
Distillate fuel oil do	2,835	70,863	186	United Kingdom 45,155; Denmark 20,388.
Residual fuel oil do	576,616	66,773	--	All to Portugal.
Lubricants do	39,158	1,289,071	21	United Kingdom 875,217; Netherlands 153,937.
Other:				
Liquefied petroleum gas do	36,505	20,648	12	United Kingdom 20,636.
Mineral jelly wax do	1,472	1,204	--	United Kingdom 645; Netherlands 268; France 118.
Bitumen and other residues do	3,703	558	--	All to United Kingdom.
Bituminous mixtures do	582	139	--	United Kingdom 109; Republic of South Africa 30.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	384	144	--	United Kingdom 143; Greece 1.

NA Not available.
[1]Less than 1/2 unit.
[2]May include other precious metals.

Table 3.—Ireland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate	--	3	--	All from United Kingdom.
Oxides and hydroxides	3,536	3,998	21	United Kingdom 3,834; Netherlands 80.
Metal including alloys:				
Waste and scrap	360	116	--	All from United Kingdom.
Unwrought	7,888	5,486	40	United Kingdom 3,905; France 823; Norway 522.
Semimanufactures	15,037	19,050	610	United Kingdom 14,251; West Germany 1,374; France 763.
Chromium:				
Ore and concentrate	6,222	1	--	All from United Kingdom.
Oxides and hydroxides	105	119	(1)	United Kingdom 86; West Germany 32.
Cobalt oxides and hydroxides	2	10	1	Canada 8; United Kingdom 1.
Copper:				
Ore and concentrate	--	2	--	All from United Kingdom.
Matte	19	1	--	All from West Germany.
Metal including alloys:				
Waste and scrap	35	121	--	United Kingdom 69; Netherlands 51.
Unwrought	148	197	--	United Kingdom 192; West Germany 5.
Semimanufactures	16,543	17,852	160	United Kingdom 12,098; Belgium-Luxembourg 1,598; West Germany 853.
Iron and steel:				
Ore and concentrate	77	36	--	All from France.
Metal:				
Waste and scrap	5,428	7,926	3	United Kingdom 7,893; Italy 30.
Pig iron, cast iron, spiegeleisen	1,352	907	--	United Kingdom 431; Belgium-Luxembourg 215; West Germany 200.
Sponge iron, powder, shot	1,660	1,418	(1)	United Kingdom 1,242; Sweden 126.
Ferroalloys:				
Ferromanganese	577	291	--	United Kingdom 113; West Germany 78; France 58.
Ferrosilicon	408	203	--	NA.
Other	66	157	--	NA.
Steel, primary forms	13,257	18,538	298	United Kingdom 9,636; West Germany 3,814; France 1,537.
Semimanufactures:				
Bars, rods, angles, shapes, sections	192,185	152,143	132	United Kingdom 85,153; Belgium-Luxembourg 22,107; France 16,996.
Universals, plates, sheets	182,376	133,392	28	United Kingdom 50,044; West Germany 24,967; Belgium-Luxembourg 18,857.
Hoop and strip	25,920	16,766	45	United Kingdom 7,865; West Germany 7,480.
Rails and accessories	11,876	11,810	--	United Kingdom 8,024; West Germany 3,708.
Wire	12,355	14,398	31	United Kingdom 6,477; France 2,495; Belgium-Luxembourg 2,478.
Tubes, pipes, fittings	74,981	59,599	529	United Kingdom 26,039; France 7,087; Italy 6,514.
Castings and forgings, rough	2,916	4,325	100	United Kingdom 1,480; Italy 1,145; Poland 806.
Lead:				
Oxides and hydroxides	2,361	2,350	1	United Kingdom 2,304; Netherlands 20; Spain 20.
Metal including alloys:				
Waste and scrap	3,906	4,203	308	United Kingdom 2,740; Netherlands 430.
Unwrought and semimanufactures	4,939	5,621	3	United Kingdom 5,569; Belgium-Luxembourg 39.
Magnesium metal including alloys:				
Waste and scrap	--	5	--	United Kingdom 4; West Germany 1.
Unwrought and semimanufactures	207	200	--	United Kingdom 97; Norway 91; West Germany 6.
Manganese:				
Ore and concentrate	27,035	32,391	17	Ghana 31,664; Netherlands 522; Brazil 120.
Oxides and hydroxides	353	281	2	United Kingdom 144; Iraq 130.
Mercury 76-pound flasks	136	220	(1)	Mainly from United Kingdom.
Nickel:				
Matte, dross, sinters	6	11	--	All from United Kingdom.
Metal including alloys:				
Waste and scrap	1	(1)	--	Do.
Unwrought and semimanufactures	403	575	24	Republic of South Africa 107.

See footnotes at end of table.

Table 3.—Ireland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	17,201	30,061	(1)	United Kingdom 26,589.
Silver:				
Waste and sweepings[2] value, thousands	(1)	$387	NA	NA.
Metal including alloys, unwrought and partly wrought troy ounces	433,134	702,043	272,927	United Kingdom 366,164.
Tin metal including alloys:				
Waste and scrap	23	3	--	All from United Kingdom.
Unwrought	25	22	--	United Kingdom 19; West Germany 3.
Semimanufactures	164	823	15	United Kingdom 682; West Germany 108; Denmark 12.
Titanium oxides and hydroxides	3,464	2,800	1	United Kingdom 1,206; France 810; Norway 350.
Tungsten metal including alloys, all forms	12	4	1	United Kingdom 2.
Zinc:				
Ore and concentrate	10	(1)	--	All from France.
Oxides and hydroxides	1,010	1,003	17	United Kingdom 886; Netherlands 22; China 20; France 20.
Metal including alloys:				
Waste and scrap	334	205	--	United Kingdom 198; Netherlands 7.
Unwrought	2,810	2,349	--	United Kingdom 1,521; Canada 607; Finland 140.
Semimanufactures	2,004	638	21	United Kingdom 548; West Germany 65.
Other:				
Ores and concentrates	51	46	5	Republic of South Africa 20; United Kingdom 15; China 5.
Ash and residue containing nonferrous metals	555	1,156	--	Netherlands 1,044; United Kingdom 72; Belgium-Luxembourg 40.
Metalloids	173	166	NA	United Kingdom 76.
Alkali and alkaline earth metals	3	71	(1)	United Kingdom 70.
Base metals including alloys, all forms	r341	238	117	United Kingdom 102 ; France 10.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	447	383	25	United Kingdom 351; West Germany 4.
Artificial, corundum	86	82	--	United Kingdom 42; Netherlands 40.
Dust and powder of precious stones kilograms	1	46	--	NA.
Grinding and polishing wheels and stones	782	764	53	United Kingdom 342; West Germany 157; Austria 60.
Asbestos, crude	7,564	8,413	2	Canada 3,984; Cyprus 2,857.
Barite and witherite	558	717	--	United Kingdom 583; West Germany 74; China 60.
Boron materials:				
Crude natural borates	1,642	1,207	--	Netherlands 1,071; Belgium-Luxembourg 100; France 36.
Oxide and acid	109	158	(1)	France 98; United Kingdom 42; Netherlands 18.
Cement	409,114	256,817	41	United Kingdom 106,434; Belgium-Luxembourg 53,774; France 43,409.
Chalk	6,139	5,282	(1)	United Kingdom 5,200; West Germany 75.
Clays and clay products:				
Crude	35,008	30,677	687	United Kingdom 21,701; Spain 6,698; Japan 811.
Products:				
Refractory including nonclay brick	18,352	19,810	74	United Kingdom 15,086; Canada 2,312; West Germany 1,650.
Nonrefractory	56,569	60,979	1	United Kingdom 50,693; Italy 7,368; Spain 722.
Cryolite and chiolite	2	1	--	All from United Kingdom.
Diamond:				
Gem, not set or strung value, thousands	$2,716	$222	--	India $111; Israel $61.
Industrial carats	5,000	20,000	NA	NA.
Diatomite and other infusorial earth	1,217	712	357	United Kingdom 347; Denmark 4.
Feldspar and fluorspar	8,578	6,106	--	Norway 4,493; United Kingdom 1,129.

See footnotes at end of table.

Table 3.—Ireland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials:				
Crude:				
Phosphatic	106,400	87,059	--	Morocco 86,804; United Kingdom 244.
Potassic	--	80	--	All from United Kingdom.
Other including mixed	1,244	1,771	--	Do.
Manufactured:				
Nitrogenous	421,056	178,120	3,902	Belgium-Luxembourg 58,755; Netherlands 49,612; United Kingdom 25,781.
Phosphatic	162,102	71,813	16,865	United Kingdom 16,867; Tunisia 15,138; France 5,617.
Potassic	377,126	272,412	(1)	West Germany 116,767; France 54,690; East Germany 36,682.
Other including mixed	432,919	311,253	29,189	United Kingdom 174,422; France 43,496; Netherlands 25,878.
Ammonia	30,827	28,960	--	United Kingdom 20,092; Netherlands 8,749.
Graphite, natural	66	14	(1)	Mainly from United Kingdom.
Gypsum and plasters	5,185	4,711	386	United Kingdom 3,168; West Germany 135; Japan 124.
Lime	2,781	2,284	--	United Kingdom 2,031; Netherlands 210; West Germany 43.
Magnesite	29,776	32,116	--	China 15,967; United Kingdom 6,317; Greece 5,156.
Mica:				
Crude including splittings and waste	847	358	15	United Kingdom 333; Switzerland 10.
Worked including agglomerated splittings	57	42	--	Mainly from United Kingdom.
Pigments, mineral: Processed iron oxides	1,540	1,716	1	West Germany 1,417; United Kingdom 164; Spain 78.
Precious and semiprecious stone except diamond, value, thousands	$1,446	$816	$152	United Kingdom $562; Japan $56.
Pyrites, unroasted	1	16	--	All from United Kingdom.
Salt and brine	87,656	87,333	2	United Kingdom 53,714; West Germany 17,496; Spain 10,882.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	861	677	--	France 346; United Kingdom 305; Sweden 16.
Caustic soda	28,847	32,726	1	United Kingdom 28,583; Spain 2,000; Netherlands 1,531.
Soda ash	15,927	5,097	--	United Kingdom 4,994; Belgium-Luxembourg 60; West Germany 43.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	4,872	4,312	--	United Kingdom 1,747; Republic of South Africa 849; India 836.
Worked	3,623	3,591	16	Italy 2,516; United Kingdom 624; Portugal 88.
Dolomite, chiefly refractory-grade	1,689	226	--	United Kingdom 166; Norway 60.
Gravel and crushed rock	409,501	444,292	12,868	United Kingdom 429,365; France 1,778.
Limestone excluding dimension	4,162	4,240	--	All from United Kingdom.
Quartz and quartzite	301	470	--	Portugal 322; United Kingdom 104; Italy 32.
Sand excluding metal-bearing	177,665	162,318	126	United Kingdom 120,444; Belgium-Luxembourg 35,055; Norway 4,488.
Sulfur:				
Elemental:				
Colloidal	113	120	1	United Kingdom 109; West Germany 10.
Other than colloidal	534	528	11	United Kingdom 453; West Germany 59; Italy 4.
Sulfuric acid, oleum	83,832	75,669	22	United Kingdom 64,961; Netherlands 7,225; West Germany 1,808.
Talc, steatite, soapstone, pyrophyllite	2,016	2,569	13	United Kingdom 1,041; China 791; Italy 565.
Other:				
Crude	8,058	8,754	NA	United Kingdom 1,510.
Slag, dross, similar waste, not metal-bearing	2,675	1,972	--	Netherlands 1,601; United Kingdom 351.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	68	43	--	Mainly from United Kingdom.
Halogens	513	371	1	Israel 190; United Kingdom 157; China 17.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	24,791	33,784	1	United Kingdom 19,012; Belgium-Luxembourg 7,625; France 5,458.

See footnotes at end of table.

Table 3.—Ireland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3,479	2,372	180	United Kingdom 1,683; Trinidad and Tobago 161; Antigua 125.
Carbon black	7,762	14,301	146	Finland 6,509; United Kingdom 6,106; Netherlands 1,377.
Coal, all grades including briquets thousand tons	1,216	1,205	409	Poland 482; United Kingdom 276.
Coke and semicoke	9,457	8,200	--	United Kingdom 6,135; France 1,625; Belgium-Luxembourg 440.
Hydrogen, nitrogen, oxygen, rare gases	5,747	2,659	(1)	United Kingdom 2,642; Denmark 5; Sweden 5.
Peat including briquets and litter	788	323	--	All from United Kingdom.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	14,897	15,528	--	Saudi Arabia 8,762; Iran 2,602; Kuwait 2,317.
Refinery products:				
Gasoline ---do---	6,237	6,923	(1)	United Kingdom 6,226; Belgium-Luxembourg 292.
Kerosine ---do---	3,317	2,299	(1)	United Kingdom 2,294.
Distillate fuel oil ---do---	6,496	5,959	--	United Kingdom 5,316; U.S.S.R. 600.
Residual fuel oil ---do---	12,597	12,350	--	United Kingdom 7,035; France 2,407.
Lubricants ---do---	436	394	9	United Kingdom 370.
Other:				
Liquefied petroleum gas do	1,553	1,727	(1)	United Kingdom 1,586; France 54.
Mineral jelly and wax do	25	23	(1)	United Kingdom 18; West Germany 4.
Bitumen and other residues do	690	574	--	Mainly from United Kingdom.
Bituminous mixtures do	61	44	(1)	United Kingdom 43.
Petroleum coke ---do---	(1)	3	--	All from Denmark.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	6,947	8,326	6	United Kingdom 7,595.

NA Not available.
[1]Less than 1/2 unit.
[2]May include other precious metals.

COMMODITY REVIEW

METALS

Aluminum.—Construction of a new alumina plant with projected capacity of 800,000 tons per year, located on Aughinish Island in the Shannon Estuary, continued in 1981. The labor problems that had delayed schedules by 1 year were solved. The chief partner, Alcan, expected the refinery to come onstream at the end of 1983. The output was expected to be shared among partners Alcan, Shell-Billiton, and The Anaconda Company in proportion to their shareholdings of 40%, 35%, and 25%, respectively.

The refinery was estimated to cost over $1 billion, compared with initial estimates of $45 million. Cost increases were mainly due to higher interest rates and to inflation. Bauxite was to be imported from Brazil and West Africa.

Copper.—Production of copper in 1981 was by the Canadian-based consortium operating at Avoca and was subsidized by the Irish Government at a cost of more than $1.6 million.

Iron and Steel.—Irish Steel Ltd. asked the Government, which was sole owner of the company, for a $80 million subsidy to help balance its budget after the commissioning of a modern steel plant at the Haulbowline site in County Cork. The construction of the new plant cost $90 million, compared with a projected cost approved by the Government in 1978 of $57 million. The plant went into operation in 1981. The company said the new plant should ensure a profit in 1985.

The new plant was to produce 300,000 tons of steel per year and 281,000 tons of

rolled products from reinforcing bars to 8 by 5 1/4 inch structural sections. A new melting shop constructed on the island site was equipped with a 90-ton 40-megavolt-ampere Tagliaferri electric arc furnace and with a continuous-casting machine, the first in Ireland. For almost 12 months from June 1980, the company produced no steel of its own but maintained customer contracts through import and resale of French steel worth about $10 million. During this period the company showed a loss of $21 million, and a similar loss was expected in the next year.

Lead and Zinc.—Workers at Ireland's major lead-zinc operation, Tara Mines Ltd., at Navan, went on strike at the beginning of July 1981, and the mine was closed for 6 1/2 months. Tara declared force majeure on July 6 on shipments of lead and zinc concentrates.

In 1980, the last full year of production, Tara produced 354,000 tons and 52,000 tons, respectively, of zinc and lead concentrates. Tara reported total losses for the first 9 months of 1981 at $4.9 million, compared with a 1980 9-month loss of $709,000. The loss of output during the second half of 1981 from the Tara Mine, the largest zinc mine in Europe and an important supplier of concentrates to many European smelters, caused difficulties for French, West German, Belgian, Spanish, and Dutch smelters.

All the company's workers had returned to work following their acceptance of the Irish Labor Court's settlement proposals in January 1982, but shipments to Tara's customers were slow to be resumed. Cost of a full production startup was estimated at $16 million. Banks, to which Tara owed $120 million already, were reluctant to make further loans, and it was likely that most of the funds would be raised from other institutions and shareholders.

Bula Mines reapplied to the Irish Government in September 1981 for permission to exploit its lead-zinc deposit near Navan, this time as an underground mine. The Irish Planning Board had rejected Bula's original request for an opencast mine in December 1979 as well as its appeal in May. Bula Mines estimated that immediate underground exploitation of the ore body (rather than after 6 years of opencast mining, as in the original plan) would increase its capital costs about 25% to about $73 million. Bula's application to develop an underground operation was subjected to 52 questions posed by the Meath County Council. The questions concerned the mine's impact on environment, health, drainage, etc. The Council's decision was expected within 2 months of receipt of Bula's answers to the questions.

The mine had a proven ore body of 20 million tons and would produce about 1 million tons per year of ore. Bula said this would yield 130,000 tons of zinc in concentrate and 20,000 tons of lead in concentrate.

Silver.—At the Tynagh Mine, operated by Northgate Exploration and Development Ltd. of Toronto, Canada, modification of the concentrator was carried out for the treatment of a surface stockpile containing 110,000 tons of silver ore from early open pit mining. Operations began in late February 1981 at a treatment rate of 600 tons per day. Expected silver recovery in concentrates was approximately 600,000 troy ounces over a 10-month period, plus flotation byproduct recovery of significant quantities of lead and copper.

NONMETALS

Barite.—Ireland continued to be the world's fourth largest producer of barites (behind the United States, U.S.S.R., and China). Major barite production continued to come from Dresser Minerals International Inc. and Milchem Minerals Ltd. Production at the Glencarbury barite mine, Ballintrillick, County Sligo, ceased in 1980.

Dresser Mineral's Silvermines deposit in Tipperary was the main center of barite production. The Silvermines deposit was a shallow-dipping, suboutcropping deposit of massive barite 10 to 16 feet thick.

In 1978, total barite production was expected to reach about 300,000 tons, but by 1980 production had fallen to 260,000 tons. The grade of barite continued at 89% $BaSO_4$ with reserves expected to last 6 to 10 years. The entire output was used for mud for drilling in the North Sea, African, and offshore Ireland oilfields.

The other major barite company in Ireland, Milchem, based at Clonakilty, County Cork, reopened the Lady's Well barite mine in 1979. Production of barite in the mine increased from 1,520 tons in 1979 to 12,650 tons in 1980 and 22,060 tons in 1981. Two grades of product were shipped through the Port of Cork, one with a specific gravity of 4.2 in crude form, and the other with varying specific gravity below 4.2. Milchem's other Irish barite operation extracted barite from the tailings pond at Northgate's closed lead-zinc mine at Ty-

nagh, County Galway. Annual capacity was about 40,000 tons. Actual production in 1981 was 33,336 tons (working 7 days a week). Production in 1982 was expected to be 32,000 tons (5 days a week). The product was mainly shipped to Egypt and West Africa, although it initially went to the North Sea market.

Diamonds.—The new General Electric Co. (GE) synthetic industrial diamond plant in Dublin continued under construction in 1981. The plant was to be the second of its type in Ireland. The first, in the Shannon Industrial Estate, was the central plant for all De Beers Ltd.'s synthetic industrial diamonds. The Shannon site also manufactured synthetic diamond cutting-tool material.

GE's plant in Dublin will produce at least 10 million carats annually. De Beers, the world's largest supplier of industrial diamonds, had about 60% of the world market of 100 million carats of synthetic diamonds, with plants in the Republic of South Africa, Sweden, and Ireland.

MINERAL FUELS

In 1981, Ireland depended largely on imported oil and coal for its primary energy supplies. Production of indigenous energy was limited to small amounts of semibituminous coal, plus peat and hydroelectric power. About 60% of Ireland's electrical energy production was oil based, but this share was expected to decrease to 40% in 1990 with the expected increase in offshore gas production and the emphasis being placed on constructing new coal-fired units.

There was still no decision as to the utilization of nuclear power in Ireland.

Coal.—Coal production continued to be insignificant. Most of the domestic coal production came from semibituminous coal deposits of the Connaught Coalfield and was used at local powerplants. About 50,000 tons of anthracite came from the Kealy Mine in Tipperary County, and some came from opencast mines in the Leinster Coalfield.

Greater future imports of coal were foreseen by the Government. The Electricity Supply Board (ESB), Ireland's state electricity monopoly, was to become a significant importer of U.S. steam coal when its first coal-fired powerplant comes online. In mid-1984, the ESB was to begin importing 300,000 tons of coal per year for the facility, already under construction in 1981 at Moneypaint on the Shannon Estuary. Imports were to increase to 2 million tons per year in 1988, when the plant becomes fully operational.

In 1981, long-term contracts for coal imports were signed with Consolidated Coal Inc. of Pittsburgh, Utah International Inc., and Freeman United Coal of Chicago, with deliveries to begin in 1984. Utah International's contract called for the delivery of more than 7 million tons of thermal coal over a period of 20 years.

Natural Gas.—The Irish Government announced that the official estimate of total recoverable reserves in the Kinsale Head Gasfield, off the southern coast, Ireland's only producing hydrocarbon resource, had been revised upward by 35% to 1.4 trillion cubic feet. Marathon Oil, discoverer and developer of the Kinsale Head Field, announced new plans to drill for oil and gas in the Celtic Sea, off Ireland's southern coast. A new important gasfield straddling the border with northern Ireland was reported, but the size could be confirmed only by further drilling.

The Irish Gas Board invited selected firms to submit bids for construction of a gas pipeline from the Kinsale Head Field, via the city of Cork, to Dublin and possibly other towns. The pipeline would be adequate to handle a projected peak of 73 million cubic feet per day (mcfd) in 1986 and 162 mcfd in 1992 and thereafter. Bidders were to submit proposals on the basis of completion of the pipeline by December 1982.

Peat.—Peat was the main indigenous source of energy in Ireland. Production was based on mechanical strip extraction and was located mainly in the flat midlands. About 16% of the electrical energy generated in 1980 was produced with peat fuel, a decline from 23% in 1975. Peat was produced mainly by the Bord Na Mona, the Irish Government Peat Board. Eleven powerplants in Eire used peat as a fuel exclusively—seven of these plants were Bord Na Mona. State-owned reserves of peat were equivalent to 40 million tons of coal, and it was anticipated that they would last about 35 years.

Petroleum.—Overall 1981 drilling results were considered disappointing, especially in view of the high hopes raised by British Petroleum's (BP) 1979 and 1980 wells in the offshore Porcupine Basin. In 1981, BP drilled two dry holes adjacent to the location of promising 1979 and 1980 wells. The most positive find was a Phillips Petroleum Co. well on block 35-8 in the center of the

Porcupine Basin, which flowed 924 barrels per day. The Phillips wells were in a large uniform structure which could hold considerable reserves. Several other wells, for a total of eight, were drilled; they contained hydrocarbon traces or showed geological potential. The overall results were just interesting enough for exploration to continue at about the same level in 1982. The Irish Government offered 108 new offshore tracts located in the Donegal Basin, Kish area, Porcupine Basin, Celtic Sea, and Slyne trough.

Ireland's Aran Energy Co. in December applied for full planning permission to build a 120,000-barrel-per-day refinery at Tarbert on the Shannon Estuary, County Kerry. Aran estimated that construction work on the $500 to $570 million project could start in 1983 and be completed in 1986. In 1980, oil consumption in Ireland totaled 42 million barrels, while capacity of the country's only refinery, the Irish Refining Co.'s plant at Whitegate, was only 18 million barrels per year. The refinery ceased operation in June 1981 when the participating companies (Esso, 40%; Shell, 24%; Texaco, 20%; and BP, 16%) decided that it was cheaper to supply their Irish markets with production from their large refineries elsewhere in Europe. The Government responded by threatening to nationalize Whitegate.

Ireland remained heavily dependent on imported oil. In 1981, the country imported about 44 million barrels of petroleum and products. The country had a stockpiling target of 11 million barrels, partly in product form, maintained by private companies and the Government.

Uranium.—A number of anomalies were identified as a result of the aeromagnetic study done in cooperation with the European Communities. Encouraging anomalies were discovered, particularly in County Donegal near Tintown, south of the Gweebarra River, where Anglo United Development Corp. Ltd. of Canada did some drilling in primary uraninite in granite. Uranium exploration was hampered in Ireland by growing environmentalist resistance to nuclear power.

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[1]Foreign mineral specialist, Division of Foreign Data.
[2]Official exchange rate during 1981 for the Irish pound (£) to U.S. dollars was 1£=US$1.62.

The Mineral Industry of Israel

By Suzann C. Ambrosio[1]

Israel's mineral industry consisted primarily of nonmetal chemicals, fertilizers, cement, and polished diamonds. Israel Chemicals Ltd. (ICL), the Government holding company for all nonmetal mineral production, estimated the 1981 sales value of nonmetals and chemicals (excluding diamonds) at $300 million.[2] Diamond exports were estimated at $950 million, reflecting an approximate 60% decline from 1980 net revenues. Depressed world markets in the diamond and fertilizer industries resulted in a decline in the value of Israeli mineral production relative to the national income. However, an increased proportion of the total mineral-derived income was attributed to fertilizers and chemicals, particularly phosphate and potash.

Economic policies initiated in 1980-81 resulted in a slowing down of the real growth rate of Israel's gross national product (GNP) to 2.3% in 1980 and an estimated 1.5% in 1981. The GNP was estimated at $4.5 billion during 1981.[3] Slight improvements in the balance of payments (BOP) were made at the cost of decreased domestic demand, sustained high rates of triple-digit inflation, and increased unemployment. As the emphasis of economic priorities was shifted from BOP improvement to inflation reduction, consequent monetary and fiscal policies during 1980-81 had the effect of (1) increasing the estimated BOP deficit by $500 million, (2) increasing unemployment to approximately 5.2% (70,000 people), (3) reducing and stabilizing the devaluation rate of the Israeli shekel against the U.S. dollar to an average of 22% per quarter during 1981, and (4) holding inflation relatively stable at an approximate annual rate of 120%.

Despite attempts to continue tight monetary and fiscal policies, including holding down the Government budget, trade subsidies, import duties, and tax benefits, the 1981 budget increased 120% over the previous fiscal year's budget to $17 billion. Approximately two-thirds of the allocations continued to go into defense ($5.5 billion) and debt service ($5.1 billion). The budget was expected to be financed by domestic sources (78%) and by receipts from abroad (22%). Foreign revenues were expected to come primarily from U.S. loans, Israeli bond sales, and loans secured in the free market.

Israel continued to import 99% of its fuel requirements, primarily oil, at a cost of $2.1 billion. The country's electricity-generating capacity was 2,600 megawatts and demand was approximately 2,300 megawatts at yearend 1981. National priorities to diversify from oil to coal and nuclear energy made some headway during the year. The first unit of the Hadera coal-fired power station was commissioned in 1981, and the three other units, each with a 350-megawatt capacity, were expected to become operational during 1982-83. Israel's first coal project, estimated to cost $750 million for the powerplant alone, experienced delays. Construction of the $87 million offshore coal-import terminal was about 1 year behind schedule. The Republic of South Africa, the United States and Australia were the major coal suppliers.

The route for the Mediterranean-Dead Sea canal was approved by the Israeli Cabinet to pass through the southern part of the Gaza Strip. However, the proposed hydroelectric complex could be potentially damaging to potash and bromine operations at the Dead Sea Works (DSW) if uncontrolled spillwater was permitted to raise the salt-lake level and flood the production facilities. Political and economic considerations of the project continued to be discussed through 1981.

Several improvements were made in the country's transportation sector. Of major

importance to the mineral industry was the construction of a new railroad line stretching 21 kilometers from Kiray Gat to Ashkelon and another 27 kilometers to the Ashdod Port. The main purpose of the line was to facilitate fertilizer material and chemical exports from the Negev via Ashdod. Approximately 2.5 million tons of mineral freight was hauled from the Negev in 1981, and the volume was expected to double over the next 4 years. The Yuval Gad cement works will also benefit from the new line, as a link to the national rail network. Minerals were estimated to comprise one-half of the total freight along the new line.

PRODUCTION AND TRADE

The industrial production index declined by approximately 4% in 1980, after a decade of 6% average annual increases. In the aggregate, nonmetal production increased and metal product output was stagnant in 1980. According to statistics, the metals, machinery, and electronics sector improved, owing primarily to large increases in the electronics industry, and the entire sector accounted for 33% of total industrial production and 35% of total industrial exports in 1980.

Israel's Central Bureau of Statistics reported that industrial production (measured in constant prices) experienced a slight recovery during the first half of 1981 owing in part to moderate increases (4% each) in the mining-quarrying and rubber-plastic product sectors. Conversely, a 4% decline was noted in the fields of basic metals and metal products. However, metals and electronics continued to become larger components of industrial exports because of declines in domestic demands, availability of labor, and the Israeli currency devaluation.

Israel continued to have an overall trade deficit in 1981, despite substantial gains in some export sectors. Between November 1980 and November 1981, total exports increased by 23.2%. The largest mineral industry gains were exhibited in quarries and nonmetallic products (up 170% to $260 million), metals, machinery, and electronics (up 75% to $1.7 billion), and chemical, rubber, and plastics (up 30% to $960 million). Diamond-export revenues for the same period declined 25% to $1 billion dollars.

The diamond industry continued to be one of the nation's largest industrial export sectors, despite substantial export and price declines since 1979. Rough-diamond imports decreased 50% and polished-diamond exports dropped 20% in the first half of 1981 compared with those of the same period in 1980. Discouraging signs evident in 1981 included an employment drop to roughly 50% of the 1978 diamond industry level and drastic reductions in the Bank of Israel's credit ceilings used by the industry to finance inventories. Israel has responded to market conditions by stepping up the cutting and polishing of small gem stones, partially relieving unemployment in the diamond industry during 1981.

Nonmetals and chemicals continued to be the bright spot in Israel's mineral production and trade. ICL increased exports in financial year 1981 (ending in March) by 45% to $340 million. The largest exporter was Negev Phosphates Ltd. (NPL) and DSW with $127 million and $108 million in sales, respectively. Despite the slump in world markets for phosphate, NPL planned to proceed with its 5-year development program. NPL annual production targets were 7 million tons of phosphate rock and 250,000 tons of phosphoric acid. DSW planned to produce 2.5 million tons per year of potash by 1985.

Owing to the incomplete nature of trade statistics, import and export tables have been temporarily omitted until more complete data become available. Some general observations on metal imports, however, were gleaned from available statistics. Israel's mineral imports continued to be largely dominated by metals and mineral fuels. Imports of precious metals, ferrous metals, semimanufactured iron and steel products, bauxite, nickel, titanium, tungsten, and mercury have increased between 1978 and 1980. There was a decline in base metal imports during 1980, most notably in lead and zinc metals. Fuel imports also declined slightly, owing to decreased consumption. For the first half of 1981, imports of rough diamonds decreased by 51%, reflecting depressed world market conditions.

The European Economic Community (EEC) continued to be Israel's largest export partner followed by the United States with 50% and 11% shares, respectively, of Isra-

el's total export market in 1980. For the first time, Israel achieved a trade surplus with the United Kingdom. The 1981 trade account with the EEC was estimated to have declined owing to stagnating European import markets. Conversely, trade with the United States increased, with Israeli exports increasing approximately 32% to $1.2 billion and U.S. exports to Israel increasing approximately 23% to $2.5 billion. Diamonds accounted for nearly one-half of the U.S. imports from Israel in 1980-81, and large increases were reported in mineral-derived products; reexported basic metals used in aircraft were up 95%, mining products and fertilizers were up 69%, and chemicals were up 39%.

Israel's exports to industrialized countries in general have been declining, while those to developing countries have been increasing. A bilateral trade agreement with Egypt was signed in March 1981. Trade progressed slowly, as expected, with the most significant impact of the agreement being the increased variety of exported products. Trade with Latin America grew to approximately 3% of Israel's total 1981 export trade. Israeli-African trade continued to increase, and Israel enjoyed a trade surplus with most African countries, except Gabon. African exports to Israel consisted primarily of cacao, cotton, and wood. Gabon supplied some of Israel's mineral fuel needs in 1981.

Table 1.—Israel: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Copper, cement (70%-80% Cu):[e]					
Gross weight	--	--	--	800	NA
Metal content	--	--	--	600	NA
Iron and steel:[e]					
Pig iron	(3)	(3)	(3)	--	--
Crude steel	72,000	94,000	107,000	115,000	120,000
NONMETALS					
Barite (60% $BaSO_4$)	--	--	500	750	NA
Bromine:					
Elemental	31,500	34,550	45,813	44,059	[4]44,020
Compounds	20,350	23,550	32,387	31,792	32,050
Cement, hydraulic (from domestic clinker) thousand tons	1,720	1,750	1,720	1,842	2,060
Clays:					
Flint clay	30,500	33,656	17,690	14,351	15,000
Bentonite	8,000	6,952	6,287	18,321	15,000
Kaolin	5,500	6,350	22,317	9,495	10,000
Other	1,000	11,450	19,686	32,073	32,000
Gypsum	r200,000	r200,000	72,500	e80,000	100,000
Lime	102,000	124,000	e124,000	e124,000	124,000
Nitrogen: N content of ammonia	68,500	67,700	68,500	54,800	42,700
Phosphate rock, beneficiated thousand tons	1,227	1,725	2,086	2,307	2,300
Potash, K_2O equivalent do	r730	r744	737	797	850
Salt, marketed (mainly marine)	e100,000	121,560	107,352	18,010	120,000
Sand:					
Glass sand	83,500	86,864	71,033	71,465	72,000
Other (for building industry) thousand cubic meters	4,983	3,705	3,787	3,900	4,500
Sodium and potassium compounds: Caustic soda	26,836	21,626	25,919	35,268	35,370
Stone:					
Dimension, marble	22,000	e24,000	31,000	14,000	14,000
Crushed thousand cubic meters	NA	NA	12,103	4,696	5,000
Sulfur:					
Byproduct from petroleum[e]	10,000	10,000	10,000	10,000	10,000
Sulfuric acid thousand tons	198	183	226	321	310
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural, marketed million cubic feet	2,010	2,016	3,531	7,769	8,000
Peat[e] thousand tons	20	20	18	20	20
Petroleum:					
Crude:					
From Israel proper thousand 42-gallon barrels	198	177	150	142	150
From occupied Sinai Peninsula[e] do	--	6,200	10,800	12,500	NA

See footnotes at end of table.

Table 1.—Israel: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products:					
Gasoline ____ thousand 42-gallon barrels	6,375	6,515	8,395	NA	NA
Kerosine and jet fuel ____ do____	5,619	5,663	6,205	NA	NA
Distillate fuel oil ____ do____	8,012	6,555	11,315	NA	NA
Residual fuel oil ____ do____	28,944	31,594	30,000	NA	NA
Lubricants ____ do____	NA	NA	NA	NA	NA
Other ____ do____	2,838	2,565	2,800	NA	NA
Refinery fuel and losses ____ do____	2,158	1,050	2,200	NA	NA
Total ____ do____	53,946	53,942	60,915	NA	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through June 30, 1982.

[2]In addition to the commodities listed, Israel reportedly has the capacity to produce 71 tons of U_3O_8 per year, but official data are not reported, and available information is inadequate to make reliable estimates of actual output levels.

[3]Revised to none.

[4]Reported figure.

COMMODITY REVIEW

METALS

Copper.—Revitalization of the Timna copper mines continued to be discussed throughout the year. Timna Copper Mines Ltd. recommended small-scale production of copper oxide and an annual output level of 10,000 tons of copper sulfate and 7,000 tons of manganese sulfate. It was estimated that a $10 million investment was needed to start production by yearend 1982.

Iron and Steel.—Israeli Steel Mills, a subsidiary of Koor Industries, completed the first-phase modernization at the Haifa steel rolling mill. Output of 110,000 tons in 1981 was expected to be expanded over the next 3 years at a cost of $10 million.

Magnesium Compounds.—Production of periclase (MgO) from the magnesia-rich Dead Sea brines continued to increase slightly. Dead Sea Periclase Ltd. was considering doubling capacity through the addition of a second 50,000-ton-per-year refractory magnesia plant.

The Israeli-United States Binational Industrial Research and Development Foundation financed a joint-venture project with ICL and General Refractories of Philadelphia. The project involved development of a low-energy process for making high-purity magnesium oxide (periclase) from Dead Sea salts. The end-use product, refractory brick, was for lining steel-producing furnaces.

NONMETALS

Bromine.—Dead Sea Bromine Ltd. succeeded in expanding plant capacity to 70,000 tons per year early in 1981. Exports of over one-half the 1980-81 production were valued at $45 million. Bromine production and bromine reserve estimates (1 billion tons) may be adversely affected if the Mediterranean-Dead Sea canal is built. Extraction would be more difficult and costly with the mixing of the less saline Mediterranean waters and mineral-rich Dead Sea waters.

Fertilizer Materials.—*Phosphorous.*—Although 1980 phosphate rock production proceeded at a rate slower than expected by NPL, total annual capacity increased to 3 million tons between 1980 and yearend 1981. The 4-year-old Zin Mine operated at 75% capacity and produced approximately one-half of the 1981 output. The remainder of the production by NPL was from the Arad, Makhtesh, and Oron Mines.

Total investments worth $44 million were slated for a capital expansion project at the Arad Mine ($25 million) and for various projects in the other phosphate fields. Expanded capacity at Arad was expected to be completed by 1982 and replace declining output from the Makhtesh Mine. Trial production of semicalcined phosphate at the Oron Mine was successful. The new prod-

uct, compared with conventionally produced calcined phosphate, had virtually identical properties and end-use potentials and required only 30% of the energy cost to produce. Expanded output of partially calcined phosphate is expected to occur at Oron.

The Mishor Rotem fertilizer plant, located near the Arad Mine, began operations in October 1981. The $90 million fertilizer complex (including infrastructure and plant facilities) has an annual capacity of 500,000 tons of washed phosphate rock, 500,000 tons of sulfuric acid, and 120,000 tons of phosphoric acid. Most of the elemental sulfur was expected to be imported. Expansion plans were made to produce 250,000 tons per year of triple superphosphate by yearend 1981 and 250,000 tons per year of granular phosphoric fertilizer by mid-1982.

NPL exported approximately 90% of its output and 10% was used for domestic fertilizer production in 1981. The value of phosphate rock exports increased by approximately 40% in 1980 to $124 million and 1981-82 sales were expected to increase only slightly. The 1981 forecast is for 2.4 million tons valued at $131 million. A new marketing office was opened in Paris during 1981 and was expected to function as a focal point of marketing and distribution operations in Western Europe. Other NPL marketing centers were located in the United States, the Netherlands, and Brazil. Transportation between Israel and the centers was assured by Negev Star, the shipping outfit established in 1979. Facilities at Israel's Port of Ashdod were improved to handle 4 million tons of phosphate rock annually and store 200,000 tons.

Potash.—DSW raised its annual potash production capacity in July 1981 by 470,000 tons. Construction of the second-phase expansion of another 560,000-ton facility was underway. A new process was successfully employed that was expected to conserve energy. The process involves separating potassium salt (sylvite) from common salt (halite) by first producing low-sodium carnallite and then processing this to remove the sodium and magnesium chlorides.

Total annual potash production capacity by yearend 1982 was expected to reach 2.1 million tons. Expansion plans were being reexamined at yearend 1981 because of the decline in world potash prices. Despite a decrease in 1981 sales revenue due to depressed prices, production increased and had a net positive effect on company profits. Marginal increases in production at the existing Sedom plant required no capital expenditures. DSW was expected to maintain production levels even at the cost of financing increased inventories.

MINERAL FUELS

Coal.—The first stage of the Israeli offshore coal-import terminal was completed in 1981, 1 year behind schedule. The first 300- by 24-meter pier and one-fourth of the 1,700-meter jetty were constructed. Adverse storm and soil conditions delayed the project and resulted in a 16% cost overrun. By yearend 1981, 40,000 tons of coal was barged to shore to feed the newly constructed 1,400-megawatt coal-fired Hadera power station. When completed, the mooring space was expected to handle ships of 130,000-to-170,000-ton capacity.

A memorandum of agreement was signed between Israel's National Company for Coal Supply and General Mining Union Corp. Group of the Republic of South Africa, making the Republic of South Africa Israel's largest coal supplier. Other supply agreements were signed with Australia and the United States, but details were not published. A contract for maximum supply of 750,000 tons of United Kingdom coal over a 5-year period was signed in May 1981.

Petroleum.—The Israeli Energy Ministry allocated $150 million over the next 3 years to carry out a program of over 100 shallow drill holes. Targeted drilling sites were located mostly in the Dead Sea area and along the southern section of the Mediterranean coastal plain. Despite attractive terms offered to foreign investors interested in participating, raising the necessary capital for the drilling has been a consistent problem.

The Israel National Oil Co. (INOC) anticipated that 50% of the drilling costs would be raised through limited partnerships with foreign investors. Approximately $40 million was allocated for seismic surveys, for a total projected investment of nearly $190 million. By yearend 1981, seismic tests confirmed the presence of favorable structures in western Galilee.

Hanah, the Government oil investment company, gave the initial approval for eight drill holes near the Dead Sea Works at Sedom. Three of the eight approved drill holes were planned for natural gas; one was

to be located in the Negev and two in the Judean Desert. By yearend 1981, pumping tests began at the 3-kilometer-deep (Notera III) gas well located in the Hula Valley. Technical assistance by the United States and Japan was expected to help produce the gas, which was reported to be mixed with water. Gas had already been discovered in two of the previous wells in the Notera series, one of which has been producing commercially.

Israel Dead Sea Oil Project (IDSOP), a U.S. limited partnership, entered into a joint operating agreement with Oil Exploration Investments Ltd. (OEL), a subsidiary of INOC, to explore and possibly drill a potential oil and gas field in the Sedom area. The $16 million project was split 40% IDSOP and 60% OEL, with OEL expected to be the project operator.

Oil Shale.—Israel and a firm from the Federal Republic of Germany were negotiating a joint-venture scheme for a $2.5 million oil shale research project. U.S. assistance was requested to construct a plant that could process shale into 40,000 barrels of oil per day by 1990. The increased interest in developing Israeli oil shale reserves was due in part to the near doubling of the Nahal Zin reserves to 4 billion tons and recent discoveries of an additional deposit north of Eilat. The UM-Barek deposit was reported to contain approximately 3 million cubic meters (18.9 million barrels) of oil.[4]

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Israeli shekels (Is) to U.S. dollars at the rate of Is11.46=US$1.00.

[3]International Monetary Fund. International Financial Statistics. V. 35, No. 3, March 1982, p. 215.

[4]Mining Engineering. World Oil Shale Deposits. V. 34, No. 1, January 1982, pp. 37-42.

The Mineral Industry of Italy

By Roman V. Sondermayer[1]

Italy remained a significant processor and consumer of imported minerals, metals, and fuels during 1981. The mining and mineral processing industry shared an estimated 11% in the country's gross national product of about $400 billion.[2]

Indexes for industry as a whole and for the mineral industry's activities all showed downward trends, as shown in the following tabulation:

	1977	1978	1979	1980	1981
All industries	123	126	134	142	138
Extractive industry	94	94	101	97	93
Mining of metals	49	45	39	r36	28
Mining of nonmetals	99	100	107	104	100

rRevised.

Employment in the mineral industry had declined during recent years. The following tabulation shows the latest data on employment in the mineral industry.

	1977	1978	1979	1980	1981
Mining of metals	5,198	4,285	3,725	3,099	2,818
Mining of nonmetals	8,061	7,104	7,001	6,550	6,033
Total	13,259	11,389	10,726	r9,649	8,851
Production of fuels	NA	NA	NA	2,289	2,304

rRevised. NA Not available.

Most of the minerals produced in Italy were of local significance. Minerals produced in the country with some importance to the world economy were ornamental stone, pumice, feldspar, pyrite, fluorspar, barite, asbestos, and zinc. As in the past, Italy was without a large copper smelter and depended almost completely on imports of copper metal to meet its demand.

The major events in the mineral industry of Italy during 1981 included, among others, (1) completion of the reorganization of the state-owned steel producer, Finsider, (2) completion of the reconstruction of the zinc smelter at Ponte Nossa, (3) resumption of mercury production, (4) closure of the Gavorrano pyrite mine, (5) development and construction of a silica sand producing facility, and (6) ratification of the new National Energy Plan by the Council of Ministers.

PRODUCTION

During 1981, private and public companies owned facilities for production and processing of minerals, metals, fuels, and products derived from them. The Government, through Ente Nazionale Idrocarburi and its affiliates, Societa per Azioni Minero-Metallurgiche (SAMIM) and Azienda Generale Italiana Petroli S.p.A.; Finsider with its subsidiaries, Nuovo Italsider and Acciaieria Piombino; and the Government-owned potash mines controlled most of the mineral producing and processing sector. Societa Mineraria e Metallurgica di Pertusola S.A. in lead-zinc, Assiaierie Ferriere Lombarde Falck in steel, and major foreign oil and gas companies were the principal privately owned companies in the sector.

During 1981, the mineral industry of the country showed mixed results. The extraction industry, mostly metals, declined. Table 1 shows the production trends for 1977-81.

Table 1.—Italy: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS					
Aluminum:					
Bauxite	34,525	24,410	26,095	23,260	19,000
Alumina	788,300	818,538	854,120	900,373	794,497
Metal:					
Primary	260,086	270,770	269,112	271,211	269,945
Secondary	225,000	222,000	245,000	266,000	e260,000
Antimony:					
Mine output, metal content	808	931	950	713	696
Metal, total	r1,548	r808	776	676	792
Of which, regulus	673	14	--	--	--
Bismuth metal	8	9	19	40	19
Cadmium metal, smelter	448	378	527	568	482
Copper:					
Mine output, metal content	700	489	489	604	748
Metal, refined, secondary	20,000	17,500	15,600	12,200	23,700
Iron and steel:					
Ore and concentrate:[2]					
Gross weight thousand tons	478	353	219	185	123
Iron content do	201	139	88	73	50
Metal:					
Pig iron do	11,411	11,340	11,327	12,149	12,260
Ferroalloys:					
Blast-furnace:					
Spiegeleisen	5,930	2,592	3,019	4,990	832
Ferromanganese	57,679	61,822	67,384	e61,000	59,302
Electric-furnace:					
Ferromanganese	17,481	28,107	21,886	e22,092	12,468
Silicomanganese	40,050	42,615	54,513	44,914	54,563
Ferrosilicon	76,511	67,700	80,521	71,857	55,144
Silicon metal	16,300	14,422	e15,000	e15,000	e15,000
Ferrochromium	39,753	36,877	42,531	41,150	10,333
Ferrochromium-silicon	--	230	(3)	--	--
Other	8,768	7,561	11,108	14,679	12,252
Total	262,472	261,926	295,962	275,682	219,894
Crude steel thousand tons	23,334	24,283	24,250	26,501	24,777
Semimanufactures:					
Wire rod do	1,483	1,775	1,758	1,933	NA
Sections do	7,591	7,965	8,331	8,782	NA
Plates and sheets do	5,591	5,545	5,457	5,895	NA
Hoop and strip do	824	822	872	871	NA
Railway track material do	199	197	221	217	NA
Ingots, semimanufactures and solids for tubes do	1,012	1,089	1,058	1,089	NA
Other do	708	602	851	859	NA
Total do	17,408	17,995	18,548	19,646	NA
Castings and forgings do	669	631	672	747	NA
Cold-rolled sheet do	2,829	2,785	2,851	NA	NA
Seamless tubes do	772	836	824	880	1,089
Lead:					
Mine output, metal content	31,500	30,500	28,057	22,879	21,568
Metal:					
Refined:					
Primary	34,215	31,110	26,840	42,057	40,408
Secondary	83,500	85,100	101,000	91,600	91,600

See footnotes at end of table.

Table 1.—Italy: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS —Continued					
Magnesium metal, primary	8,766	9,678	8,757	7,886	7,823
Manganese, mine output:					
Gross weight	9,314	9,741	9,782	9,165	8,756
Metal content	2,798	2,143	2,935	2,763	2,614
Mercury metal 76-pound flasks	406	87	--	96	5,516
Silver metal thousand troy ounces	1,222	890	1,065	1,366	1,768
Tin alloys	5,900	6,100	5,600	e5,500	NA
Zinc:					
Mine output, metal content	79,300	73,329	66,285	58,417	43,906
Metal, primary	169,391	177,552	202,272	206,430	180,903
NONMETALS					
Asbestos	149,327	135,402	143,931	157,794	137,086
Barite	152,646	236,613	214,630	203,038	177,005
Bromine	626	e590	e590	e590	e600
Cement, hydraulic thousand tons	38,204	38,232	39,289	41,772	41,553
Clays, crude:					
Bentonite do	280	235	282	332	277
Refractory excluding kaolinitic earth do	259	363	268	226	270
Fuller's earth	6,344	3,975	1,080	4,300	5,495
Kaolin thousand tons	82	70	67	89	74
Kaolinitic earth do	21	3	25	27	31
Diatomite[e]	30,000	30,000	30,000	30,000	25,000
Feldspar	213,593	250,972	294,648	344,301	428,485
Fluorspar:					
Acid-grade	143,335	130,018	134,349	124,774	128,838
Metallurgical-grade	29,220	27,500	41,557	26,229	35,397
Ceramic-grade	13,194	13,580	6,885	962	--
Total	185,749	171,098	182,791	151,965	164,235
Graphite, all grades	3,819	4,108	4,102	3,957	3,535
Gypsum, except dimension stone use thousand tons	4,180	e4,200	e4,200	e4,200	4,820
Lime, hydrated and quicklime do	2,197	2,141	2,100	2,365	2,307
Nitrogen: N content of ammonia do	1,168	1,444	1,430	1,397	1,472
Perlite[e]	90,000	90,000	90,000	90,000	85,000
Pigments, mineral: Iron oxides, natural[e]	1,700	1,400	1,000	1,000	900
Potash, crude salts:					
Gross weight thousand tons	1,879	1,636	1,527	1,302	1,418
K_2O equivalent do	e225	196	182	156	170
Pumice and related materials:					
Pumice and pumiceous lapilli do	e750	e780	e850	571	e600
Pozzolan do	e5,700	e5,800	e5,900	5,156	e6,000
Pyrites, all types, gross weight do	863	786	804	859	681
Salt:					
Marine, crude do	1,019	1,210	e1,200	e1,300	964
Rock and brine do	3,600	3,721	4,490	3,997	3,601
Sodium and potassium compounds:					
Caustic soda	11,150	9,871	9,858	9,531	8,484
Sodium carbonate[e] thousand tons	95	95	95	95	95
Sodium sulfate do	1,018	1,012	e1,010	e1,000	e900
Stone:					
Dimension:[4]					
Calcareous:					
Alabaster and onyx do	NA	NA	NA	4,000	e3,500
Limestone do	e850	e850	NA	NA	NA
Marble in blocks:					
White do	e1,100	e1,100	NA	1,200	e1,100
Colored do	e800	e800	NA	1,016	e1,000
Schist (calcareous) do	e35	e35	NA	908	e900
Travertine do	e1,330	e1,330	1,302	1,072	e1,100
Tufa do	e3,500	e3,500	NA	1,449	e1,500
Other:					
Gneiss do	448	448	NA	NA	NA
Granite do	740	740	NA	1,474	e1,500
Lava, basalt, trachyte do	5,660	5,660	NA	4,112	e4,100
Porphyry do	e350	e350	NA	932	e950
Sandstone do	e470	e470	NA	NA	NA
Slate do	100	100	NA	1,021	e1,100
Tuff, volcanic do	e2,400	e2,400	NA	8,173	e8,200
Crushed and broken:					
Calcareous:					
Dolomite do	1,000	1,000	NA	1,032	e1,100
Limestone:					
For cement and lime do	e39,000	e39,000	e40,000	56,176	e56,200
For construction do	e11,500	e12,000	e12,500		
Other:					
Porphyry do	NA	NA	NA	932	e950
Quartz and quartzite do	e480	e480	NA	NA	e1,100
Sandstone do	NA	NA	NA	1,250	NA

See footnotes at end of table.

Table 1.—Italy: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Stone —Continued					
Crushed and broken —Continued					
Other —Continued					
Serpentine[4] ____ thousand tons	[e]525	[e]525	NA	1,880	1,900
Tuff, volcanic ____ do	3,000	3,000	NA	8,173	[e]8,200
Strontium minerals: Celestite ____	[e]700	365	1,693	1,053	6,697
Sulfur:					
Gross weight of ore ____ thousand tons	628	523	108	101	96
Recovered as elemental and in compounds:					
Elemental from ore ____ do	36	104	19	23	NA
S content of pyrites ____ do	371	330	302	331	NA
Byproduct:					
Oil refining ____ do	[e]36	[e]36	[e]37	30	NA
Other sources[e] ____ do	223	214	213	220	NA
Total ____ do	666	684	571	604	567
Talc and related materials ____	165,356	167,740	157,382	165,905	163,390
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bituminous rock, natural:					
For distillation ____	64,924	46,638	124,731	117,893	NA
For paving ____	77,419	68,560			
Carbon black ____	158,630	155,763	[e]170,000	[e]170,000	NA
Coal:					
Subbituminous (sulcis coal) ____ thousand tons	[5]	--	--	--	--
Lignite ____ do	1,844	1,868	2,123	1,933	1,958
Coke, metallurgical ____ do	7,676	7,317	7,502	[e]7,600	NA
Gas, natural, marketed ____ million cubic feet	485,115	484,932	475,553	442,543	NA
Natural gas liquids: Natural gasoline thousand 42-gallon barrels	281	NA	NA	NA	NA
Petroleum:					
Crude ____ do	7,378	9,893	11,360	12,264	NA
Refinery products:					
Gasoline:					
Aviation ____ do	416	303	578	1,709	NA
Motor ____ do	135,462	138,975	141,398	124,550	NA
Jet fuel ____ do	12,988	15,680	16,520	14,720	NA
Kerosine ____ do	23,104	23,436	24,784	18,747	NA
Distillate fuel oil ____ do	198,706	222,584	225,889	190,603	NA
Residual fuel oil ____ do	305,342	318,448	333,300	244,935	NA
Lubricants ____ do	5,586	5,985	6,440	7,196	NA
Other ____ do	125,396	85,632	86,788	76,105	NA
Refinery fuel and losses ____ do	49,180	54,263	49,696	42,231	NA
Total ____ do	856,180	865,306	885,393	720,796	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Sept. 10, 1982.

[2]Excludes pelletized iron oxide derived from pyrites.

[3]Included with other if any was produced.

[4]Serpentine output for dimension stone applications (if any) is included with crushed and broken stone.

[5]Less than 1/2 unit.

TRADE

During 1981, Italy remained dependent on imports of large quantities of raw materials and fuels. Tables 2 and 3 show Italy's foreign trade in minerals and related commodities for 1979-80.

Table 2.—Italy: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	27,565	24,163	--	Greece 8,222; France 7,141.
Oxides and hydroxides	417,897	423,994	--	Netherlands 139,326; Spain 85,722; Norway 70,976.
Ash and residue containing aluminum	6,685	4,025	--	France 2,649; West Germany 1,144.
Metal including alloys:				
Scrap	1,255	1,434	--	West Germany 854; France 243; Turkey 125.
Unwrought	22,785	12,761	--	West Germany 5,239; France 5,102.
Semimanufactures	112,691	88,433	330	West Germany 22,614; France 19,556; United Kingdom 5,931.
Antimony:				
Ore and concentrate	3	82	NA	NA.
Metal including alloys, all forms	20	3	NA	NA.
Arsenic trioxide, pentoxide, acid	20	94	NA	NA.
Bismuth metal including alloys, all forms	6	5	NA	NA.
Cadmium metal including alloys, all forms	259	321	--	Belgium-Luxembourg 114; Netherlands 100.
Chromium:				
Chromite	2,673	2,034	--	Austria 1,332.
Oxides and hydroxides	1,444	2,142	105	France 1,438.
Metal including alloys, all forms	14	8	5	NA.
Cobalt:				
Oxides and hydroxides	5	(1)	NA	NA.
Metal including alloys, all forms	108	30	--	United Kingdom 18.
Columbium and tantalum metals, all forms including waste and scrap	5	(1)	NA	NA.
Copper:				
Ore and concentrate	1,232	4,125	--	Romania 2,862; Bulgaria 890.
Ash and residue containing copper	17,282	16,474	--	West Germany 10,427; Belgium-Luxembourg 3,099.
Sulfate	3,005	4,813	--	France 1,300; West Germany 978; Greece 566.
Cement copper	328	1,073	--	Spain 770; West Germany 300.
Metal including alloys:				
Scrap	15,722	11,148	--	West Germany 5,939; Belgium-Luxembourg 2,567.
Unwrought:				
Blister	72	113	--	Austria 49.
Refined, unalloyed	424	2,613	--	France 367; West Germany 139.
Alloys	4,732	1,584	--	West Germany 375; France 300; Greece 225.
Semimanufactures	96,476	96,217	134	France 24,226; West Germany 13,952; Switzerland 7,737.
Gallium, indium, thallium metals, all forms kilograms	100	800	NA	NA.
Germanium metal including alloys, all forms do	200	200	NA	NA.
Iron and steel:				
Ore and concentrate, except roasted pyrites	288	1,224	NA	NA.
Roasted pyrites	65,678	46,559	--	France 36,480.
Metal:				
Scrap	13,204	8,480	--	France 5,736; West Germany 1,327.
Pig iron, cast iron, spiegeleisen, powder, shot	21,588	12,074	82	France 3,288; Netherlands 1,810; Yugoslavia 1,017.
Ferroalloys	52,006	23,346	713	West Germany 5,805; Netherlands 5,486; France 4,958.
Steel, primary forms	675,319	695,302	18,842	France 107,256; West Germany 90,000; Lebanon 76,110.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	3,282	3,057	3	West Germany 714; France 512; Libya 368.
Universals, plates, sheets do	1,206	1,193	18	France 271; West Germany 172; U.S.S.R. 167.
Hoop and strip do	112	106	--	France 24; Greece 13; U.S.S.R. 13.
Rails and accessories do	20	11	(1)	Switzerland 4; Egypt 2.
Wire do	84	80	1	France 18; Algeria 14; West Germany 9.
Tubes, pipes, fittings do	1,515	1,615	117	U.S.S.R. 344; Libya 162; West Germany 115.
Castings and forgings, rough do	10	27	--	West Germany 3; France 2.
Lead:				
Ore and concentrate	19,359	21,353	--	Greece 10,900; Austria 4,094; U.S.S.R. 2,500.

See footnotes at end of table.

Table 2.—Italy: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Lead —Continued				
Ash and residue containing lead	12,862	7,758	--	France 7,368.
Oxides and hydroxides	720	21	NA	NA.
Metal including alloys:				
Scrap	257	21	NA	NA.
Unwrought	20,505	4,199	--	Turkey 1,522; Libya 1,196.
Semimanufactures	377	855	--	Switzerland 268; Libya 231.
Magnesium metal including alloys:				
Scrap	596	554	318	France 143.
Unwrought	5,375	4,285	--	West Germany 3,634; Austria 331.
Semimanufactures	193	249	--	France 122; Israel 40.
Manganese:				
Ore and concentrate	5	203	NA	NA.
Oxides and hydroxides	177	124	--	West Germany 115.
Metal including alloys, all forms	12	73	NA	NA.
Mercury 76-pound flasks	9,512	6,681	--	Spain 6,536.
Molybdenum:				
Ore and concentrate	184	179	--	Austria 144.
Metal including alloys, all forms	36	10	NA	NA.
Nickel:				
Matte, speiss, similar materials	10	2	NA	NA.
Metal including alloys:				
Scrap	299	271	--	India 117; Switzerland 79.
Unwrought	226	168	--	France 74; Netherlands 50.
Semimanufactures	493	500	--	Tunisia 107; Yugoslavia 39; France 38.
Platinum-group metals including alloys, unwrought and partly wrought thousand troy ounces	2,201	162	13	Israel 34; West Germany 17; United Kingdom 15.
Rare earths:				
Oxides and other compounds value	$7,579	$4,793	NA	NA.
Metals including alloys, all forms	106	26	NA	NA.
Selenium, elemental kilograms	1,700	700	--	All to Togo.
Silicon, elemental	10,246	25,064	10,492	West Germany 3,811; Japan 1,418.
Silver metal including alloys, unwrought and partly wrought thousand troy ounces	3,890	7,912	10	Switzerland 5,064; United Kingdom 1,765.
Tellurium and arsenic metals	5	11	NA	NA.
Thorium: Thoria value	--	$42,253	NA	NA.
Tin metal including alloys, all forms	376	444	--	France 111; Denmark 69; West Germany 61.
Titanium:				
Ore and concentrate	--	96	NA	NA.
Oxides and hydroxides	23,278	1,867	--	China 180; Yugoslavia 159; Switzerland 114.
Metal including alloys, all forms	125	118	2	France 26; United Kingdom 25.
Tungsten:				
Ore and concentrate value	$4,212	--		
Metal including alloys, all forms	98	65	--	West Germany 45.
Vanadium:				
Oxides and hydroxides	1	--		
Metal including alloys, all forms value	--	$6,146	NA	NA.
Zinc:				
Ore and concentrate	2,364	2,908	--	Austria 2,822.
Matte, ash, residue containing zinc	14,473	7,013	--	West Germany 5,865; Austria 583.
Oxides and hydroxides	3,105	4,756	--	West Germany 1,361; Hungary 1,022; France 910.
Metal including alloys:				
Scrap	1,418	2,138	--	West Germany 2,001.
Blue powder	288	114	--	France 48; Austria 20.
Unwrought	16,558	20,340	1,999	U.S.S.R. 4,996; France 4,355.
Semimanufactures	830	2,016	--	East Germany 360; France 300; Portugal 283.
Zirconium:				
Ore and concentrate	3,862	487	--	Algeria 75.
Metal including alloys, all forms	92	(1)	NA	NA.
Other:				
Ores and concentrates	1,379	2,746	--	France 1,172; Austria 795.
Ash and residue containing nonferrous metals	12,432	18,201	--	West Germany 9,186; France 7,860.
Oxides, hydroxides, peroxides	332	664	--	France 94; Spain 72.
Metal:				
Metalloids	2	(1)	NA	NA.
Alkali and alkaline-earth metals	440	96	--	Yugoslavia 35.
Base metals including alloys, all forms	13	13	NA	NA.

See footnotes at end of table.

Table 2.—Italy: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	210,292	220,100	36,500	United Kingdom 113,834; Algeria 40,753.
Artificial: Corundum	2,614	2,197	--	Austria 804; Bulgaria 442; France 280.
Dust and powder of precious and semiprecious stone, kilograms	108	92	NA	NA.
Grinding and polishing wheels and stones	18,435	17,667	2	France 1,982; West Germany 1,843; Saudi Arabia 652.
Asbestos, crude	74,478	63,815	--	West Germany 24,490; Nigeria 5,444; France 5,256.
Barite and witherite	88,736	105,358	--	Algeria 33,816; Egypt 20,475; Libya 9,500.
Boron materials:				
Crude natural borates	1,998	3,650	--	West Germany 2,952; Yugoslavia 441.
Oxide and acid	6,300	5,042	872	West Germany 2,439; France 740.
Cement, thousand tons	1,695	821	7	Saudi Arabia 159; Israel 156; Libya 129.
Chalk	567	554	NA	NA.
Clays and clay products:				
Crude:				
Bentonite	31,246	18,967	--	Libya 7,575; France 5,924.
Kaolin	29,490	30,008	--	France 21,757; Greece 5,324.
Other	9,485	7,295	--	Tunisia 2,650; Hungary 1,206.
Products:				
Refractory including nonclay brick	99,942	133,062	--	West Germany 14,470; Egypt 11,969; Romania 9,187.
Nonrefractory, thousand tons	2,878	2,720	123	West Germany 596; France 508; Saudi Arabia 153.
Cryolite and chiolite	(2)	28	NA	NA.
Diamond:				
Gem, not set or strung, carats	3 1,186	75,586	--	Netherlands Antilles 39,033.
Industrial, do.	82,808	142,402	NA	NA.
Diatomite and other infusorial earth	1,866	885	NA	NA.
Feldspar	37,601	37,344	--	West Germany 15,348; Switzerland 6,584; Algeria 4,120.
Fertilizer materials:				
Crude	6,797	10,070	--	France 4,885; Austria 2,012.
Manufactured:				
Nitrogenous, thousand tons	1,458	1,320	--	Turkey 285; India 259; China 238.
Phosphatic, do.	2	2	--	Mainly to Switzerland.
Potassic, do.	105	72	--	Algeria 26; Japan 10; Turkey 9.
Other including mixed, do.	335	282	--	West Germany 42; Venezuela 35; France 25.
Ammonia	16,927	53,160	--	Israel 23,744; Greece 12,023; Switzerland 11,611.
Fluorspar	55,080	83,753	46,945	Canada 9,500; Romania 6,541; Norway 5,450.
Graphite, natural	3,854	3,414	--	France 2,644.
Gypsum and plasters	11,931	13,003	--	Switzerland 6,532.
Lime	96,437	33,639	--	Switzerland 29,466.
Magnesite	151,740	120,812	--	Austria 30,474; West Germany 25,344; Netherlands 16,120.
Mica:				
Crude including splittings and waste	661	1,127	--	France 312.
Worked including agglomerated splittings	11	142	NA	NA.
Pigments, mineral including processed iron oxides	2,936	2,901	--	France 1,381; Belgium-Luxembourg 268.
Precious and semiprecious stone, except diamond:				
Natural, kilograms	11,457	17,732	NA	NA.
Manufactured, do.	548	2,778	NA	NA.
Pyrites (gross weight)	3,375	3,797	--	West Germany 1,686; Austria 631; France 579.
Salt, all forms, thousand tons	1,241	740	--	United Kingdom 313; Sweden 147; Greece 67.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	175,384	265,212	--	Yugoslavia 79,864; U.S.S.R. 31,217; Egypt 19,878.
Caustic potash	8	17	NA	NA.
Soda ash	20,190	14,605	--	Israel 7,496; Greece 3,220; Lebanon 2,474.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Calcareous	372,621	425,539	605	Saudi Arabia 58,278; Spain 53,150; Japan 29,205.

See footnotes at end of table.

Table 2.—Italy: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Dimension stone —Continued				
Crude and partly worked —Continued				
Slate	3,320	4,050	--	France 1,155; Switzerland 863; Belgium-Luxembourg 795.
Other	118,988	109,494	564	West Germany 45,747; Switzerland 13,567; Austria 13,281.
Worked:				
Slate	40,244	39,479	22,407	Australia 2,167; Canada 1,015; France 898.
Paving and flagstone	131,317	161,316	--	West Germany 73,628; Switzerland 53,216.
Other thousand tons	1,121	1,099	63	West Germany 480; Saudi Arabia 215; France 91.
Dolomite, chiefly refractory-grade	47,317	58,555	--	France 24,979; Switzerland 15,704.
Gravel and crushed rock	620,069	660,670	--	West Germany 103,967; Kuwait 91,961; Switzerland 72,704.
Limestone, except dimension	10,995	7,336	NA	NA.
Quartz and quartzite	36,220	44,779	--	Switzerland 28,292; France 7,207; West Germany 3,068.
Sand excluding metal-bearing	420,108	253,140	--	Switzerland 220,636.
Sulfur:				
Elemental, all forms	190	107	NA	NA.
Sulfuric acid	36,043	81,931	--	Turkey 45,738; Greece 16,853.
Talc, steatite, soapstone	55,181	54,015	8,792	West Germany 10,584; United Kingdom 8,295; France 8,247.
Other:				
Crude	51,289	82,329	140	United Kingdom 62,733.
Slag, dross, similar waste, not metal-bearing	354,707	378,133	--	Yugoslavia 205,652; Greece 127,502.
Oxides, hydroxides, peroxides of strontium, magnesium, barium	2,099	1,887	639	Japan 234; United Kingdom 199; Denmark 158.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	152,787	167,438	3,071	France 57,114; Libya 27,705; Tunisia 13,650.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,385	3,336	--	Cameroon 1,436; Yemen Sana 416; Ivory Coast 406.
Carbon black and gas carbon	44,989	42,998	--	Yugoslavia 14,930; Austria 10,054; France 6,341.
Coal, all grades including briquets	13,074	18,890	--	Switzerland 6,923; France 5,334.
Coke and semicoke	645,114	746,530	--	Romania 336,936; Hungary 67,080; Algeria 55,285.
Gas, natural thousand cubic feet	1,426	1,373	NA	NA.
Peat including briquets and litter	664	277	NA	NA.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	59,882	36,891	953	Netherlands 10,345; France 4,028; United Kingdom 3,663.
Kerosine do	22,951	18,880	--	Netherlands 2,661; United Kingdom 1,606; Greece 1,480.
Distillate fuel oil do	47,197	24,056	--	Syria 3,308; Tunisia 1,923; Netherlands 1,564.
Residual fuel oil do	49,311	28,481	1,223	Turkey 1,910; Algeria 1,425; Malta 714.
Lubricants do	3,648	4,331	1	Belgium-Luxembourg 545; Algeria 394; Netherlands 299.
Other:				
Liquefied petroleum gas do	4,544	3,075	--	Egypt 657; Algeria 467; France 375.
Mineral jelly and wax do	25	17	--	Poland 5; West Germany 2.
Bitumen and other residues do	904	987	--	Austria 373; Tunisia 193; Switzerland 181.
Bituminous mixtures, n.e.s do	42	51	--	Libya 13; Somalia 11.
Petroleum coke do	234	132	--	Egypt 110.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	62,587	72,122	--	France 53,790.

NA Not available.
[1]Less than 1/2 unit.
[2]Unreported quantity valued at $1,388.
[3]Excludes unreported quantity valued at $1,384.

Table 3.—Italy: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate thousand tons	2,287	2,288	--	Australia 1,623; Guinea 404.
Ash and residue containing aluminum	62,260	59,147	--	Austria 38,406; West Germany 4,143.
Oxides and hydroxides	179,690	180,187	--	France 74,837; Yugoslavia 39,159; Guinea 25,660.
Metal including alloys:				
Scrap	57,754	79,093	14,645	West Germany 19,961; France 13,269; Switzerland 12,481.
Unwrought	276,281	339,185	18,152	West Germany 72,914; France 55,191; Netherlands 26,542.
Semimanufactures	92,114	112,642	6,670	West Germany 39,302; France 25,797; Belgium-Luxembourg 13,801.
Antimony:				
Ore and concentrate	--	3	NA	NA.
Metal including alloys, all forms	121	106	NA	NA.
Arsenic trioxide, pentoxide, acids	820	852	--	Belgium-Luxembourg 387; France 308.
Beryllium metal including alloys, all forms kilograms	1,400	7,800	NA	NA.
Bismuth metal including alloys, all forms	55	62	--	United Kingdom 26.
Cadmium metal including alloys, all forms	85	68	--	West Germany 42.
Chromium:				
Chromite	232,445	171,045	--	Turkey 56,547; Republic of South Africa 39,560; Albania 39,102.
Oxides and hydroxides	2,202	1,941	--	West Germany 1,523.
Metal including alloys, all forms	206	186	--	United Kingdom 63; West Germany 59.
Cobalt:				
Oxides and hydroxides	189	192	--	Belgium-Luxembourg 80; West Germany 55; France 45.
Metal including alloys, all forms	338	258	--	Belgium-Luxembourg 77; France 72; United Kingdom 45.
Columbium and tantalum metals including alloys, all forms	26	12	5	Austria 1.
Copper:				
Ore and concentrate	10	10,479	--	Australia 10,460.
Cement copper kilograms	400	51,300	NA	NA.
Sulfate	3,063	2,205	--	Yugoslavia 1,022; Czechoslovakia 640; United Kingdom 314.
Ash and residue containing copper	670	4,599	--	Austria 4,089.
Metal including alloys:				
Scrap	76,310	99,524	881	France 27,449; West Germany 25,137; United Kingdom 21,425.
Unwrought:				
Blister	6,802	2,240	--	Chile 1,298; United Kingdom 220.
Refined, unalloyed	338,464	372,834	--	Chile 109,500; Zambia 77,387; Peru 39,322.
Alloys	17,067	21,255	--	United Kingdom 5,783; West Germany 5,522; Yugoslavia 3,564.
Semimanufactures	107,552	144,188	4,837	France 49,689; West Germany 36,069; Belgium-Luxembourg 12,656.
Gallium, indium, thallium metals including alloys, all forms kilograms	1,200	1,400	--	Canada 400; Belgium-Luxembourg 300.
Germanium metal including alloys, all forms do	200	1,200	NA	NA.
Iron and steel:				
Ore and concentrate thousand tons	17,318	16,912	--	Brazil 4,989; Liberia 3,116; Mauritania 1,897.
Roasted pyrites	2,800	762	--	France 698.
Metal:				
Scrap thousand tons	6,891	7,411	1,142	France 2,605; West Germany 2,322.
Pig iron including cast iron and spiegeleisen do	517	672	--	West Germany 168; France 147; Brazil 127.
Sponge iron, powder, shot do	119	77	--	Canada 29; France 14.
Ferroalloys:				
Ferromanganese do	122	120	--	France 50; Republic of South Africa 27; Norway 12.
Other do	220	210	1	Norway 32; France 25; Yugoslavia 21.
Steel, primary forms do	3,061	3,355	2	France 693; Belgium-Luxembourg 569; West Germany 438.

See footnotes at end of table.

Table 3.—Italy: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	768	960	(1)	France 329; West Germany 197; Austria 87.
Universals, plates, sheets do	1,822	2,087	154	France 558; West Germany 295; Belgium-Luxembourg 274.
Hoop and strip do	209	199	1	France 70; West Germany 67; Belgium-Luxembourg 22.
Rails and accessories do	139	149	6	Canada 47; West Germany 27; France 16.
Wire do	66	79	(1)	Belgium-Luxembourg 31; West Germany 14; France 11.
Tubes, pipes, fittings do	282	335	2	West Germany 168; France 82.
Castings and forgings, rough do	8	9	--	West Germany 3; Switzerland 2.
Lead:				
Ore and concentrate	45,365	44,264	--	Greece 11,473; Canada 10,997.
Ash and residue containing lead	4,038	2,149	216	Hungary 565; Lebanon 504; West Germany 459.
Oxides and hydroxides	4,829	4,514	--	West Germany 1,523; France 171.
Metal including alloys:				
Scrap	48,707	44,139	3,007	United Kingdom 12,082; West Germany 7,512; France 5,709.
Unwrought	151,411	173,235	1,807	West Germany 38,331; Republic of South Africa 19,235; Morocco 17,311.
Semimanufactures	1,538	1,468	--	Yugoslavia 683; France 437.
Magnesium metal including alloys:				
Scrap	1,746	2,558	--	West Germany 1,155; Netherlands 483.
Unwrought	1,649	1,880	841	Norway 400; Netherlands 373; France 156.
Semimanufactures	263	309	234	United Kingdom 19.
Manganese:				
Ore and concentrate	424,230	409,846	--	Republic of South Africa 188,452; Gabon 155,700; Brazil 26,539.
Oxides and hydroxides	3,219	3,082	--	Belgium-Luxembourg 1,077; Spain 718; France 457.
Metal including alloys, all forms	1,886	1,397	56	Republic of South Africa 718; France 463.
Mercury 76-pound flasks	2,321	5,120	--	Spain 2,881; Netherlands 482.
Molybdenum:				
Ore and concentrate	5,866	6,039	892	Netherlands 3,764; Belgium-Luxembourg 611.
Metal including alloys, all forms	240	163	75	Austria 47.
Nickel:				
Matte, speiss, similar materials	5,727	2,710	--	Cuba 1,180; Australia 713.
Metal including alloys:				
Scrap	314	677	36	Norway 308; Austria 49.
Unwrought	16,595	18,738	3,529	Republic of South Africa 4,081; Netherlands 3,170; Canada 2,742.
Semimanufactures	2,811	2,835	326	United Kingdom 816; West Germany 780; France 259.
Platinum-group metals including alloys, unwrought and partly wrought thousand troy ounces	580	570	3	West Germany 332; Republic of South Africa 66; Switzerland 50.
Rare-earth metals:				
Oxides and other compounds value, thousands	$966	$908	--	France $848.
Metals, all forms	117	138	--	West Germany 76; Austria 40.
Selenium, elemental	39	26	--	Japan 11.
Silicon, elemental	17,701	29,855	--	Republic of South Africa 14,450; France 9,488; Yugoslavia 2,108.
Silver metal including alloys, unwrought and partly wrought thousand troy ounces	25,068	18,782	5,993	Switzerland 3,292; West Germany 2,479; United Kingdom 1,878.
Tellurium and arsenic metals	63	57	16	Sweden 40.
Thorium: Thoria value	$9,857	$206,257	--	U.S.S.R. $183,992.
Tin:				
Ore and concentrate	508	--		
Metal including alloys:				
Scrap kilograms	900	4,600	NA	NA.

See footnotes at end of table.

Table 3.—Italy: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Tin —Continued				
Metal including alloys —Continued				
Unwrought	7,107	6,874	--	Malaysia 2,264; Indonesia 2,116; Thailand 1,090.
Semimanufactures	410	435	117	West Germany 121; United Kingdom 105; France 66.
Titanium:				
Ore and concentrate	82,166	5,450	--	Republic of South Africa 2,672; Australia 1,275.
Oxides and hydroxides	43,552	39,406	--	West Germany 14,548; France 10,944; Belgium-Luxembourg 5,048.
Metal including alloys, all forms	2,856	1,539	512	West Germany 332; U.S.S.R. 193; Austria 166.
Tungsten:				
Ore and concentrate	181	173	--	Canada 153.
Metal including alloys, all forms	144	103	16	United Kingdom 25; West Germany 23.
Uranium metal including alloys, all forms kilograms	1,800	2,700	NA	NA.
Vanadium:				
Ore and concentrate	449	24	NA	NA.
Oxides and hydroxides	864	481	--	Austria 478.
Metal including alloys, all forms kilograms	300	41,800	--	Austria 40,800.
Zinc:				
Ore and concentrate	232,587	357,062	--	Canada 75,231; Ireland 66,096; Peru 57,869.
Matte, ash, residue containing zinc	13,706	15,578	--	West Germany 6,279; France 3,943; Switzerland 2,701.
Oxides and hydroxides	2,525	5,894	--	France 1,782; West Germany 1,782; Netherlands 1,046.
Metal including alloys:				
Scrap	4,022	3,358	--	West Germany 1,667; Switzerland 658; France 531.
Blue powder	332	987	--	West Germany 364; France 222; Norway 145.
Unwrought	56,496	55,248	--	West Germany 19,494; Netherlands 9,906; Belgium-Luxembourg 7,159.
Semimanufactures	3,047	2,749	--	West Germany 1,538; France 640.
Zirconium:				
Ore and concentrate	67,273	65,696	--	Australia 59,346; Republic of South Africa 5,478.
Metal including alloys, all forms kilograms	12,000	46,100	26,300	Canada 2,400.
Other:				
Ores and concentrates	858	34,800	--	Greece 34,530.
Ash and residue containing:				
Molybdenum, columbium, tantalum, titanium	20,395	78,156	--	Republic of South Africa 76,874.
Other metals, n.e.s	13,695	10,460	--	West Germany 1,938; Greece 1,928; France 815.
Oxides, hydroxides, peroxides	8,680	6,920	32	West Germany 1,768; Belgium-Luxembourg 668; France 568.
Metals:				
Metalloids	45	14	NA	NA.
Alkali, alkaline-earth, rare-earth metals	4,862	5,520	(1)	West Germany 4,361; France 1,063.
Base metals including alloys, all forms	68	35	--	West Germany 28.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	2,138	1,986	162	Yugoslavia 435; West Germany 158.
Artificial: Corundum	27,856	33,350	--	West Germany 10,364; Austria 6,444.
Dust and powder of precious and semiprecious stones kilograms	1,421	1,839	849	Ireland 811.
Grinding and polishing wheels and stones	4,463	4,326	143	Austria 1,370; West Germany 611.
Asbestos, crude	77,151	86,550	--	Republic of South Africa 37,283; Canada 32,239.
Barite and witherite	13,634	7,530	--	France 5,606; Spain 1,273.
Boron materials:				
Crude natural borates	172,792	175,880	23,888	Turkey 138,558.

See footnotes at end of table.

Table 3.—Italy: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Boron materials —Continued				
Oxide and acid	1,622	5,022	--	Turkey 1,488; France 1,150; U.S.S.R. 884.
Cement	73,158	81,264	--	France 63,781; Yugoslavia 5,691.
Chalk	14,958	17,844	--	France 17,462.
Clays and clay products:				
Crude:				
Bentonite	29,912	55,438	1,065	Greece 49,728.
Kaolin	767,542	791,216	208,348	United Kingdom 345,099; France 91,652.
Other	741,827	861,232	3,914	West Germany 431,003; France 249,378.
Products:				
Refractory including nonclay brick	92,087	120,557	1,087	West Germany 36,865; United Kingdom 25,451; Austria 16,215.
Nonrefractory	32,140	67,634	--	West Germany 31,078; Switzerland 14,980.
Cryolite and chiolite	475	854	--	Denmark 785.
Diamond:				
Gem, not set or strung carats	155,305	354,033	--	Belgium-Luxembourg 251,716; Israel 29,238.
Industrial do	184,340	221,140	--	Belgium-Luxembourg 120,224; Republic of South Africa 53,925.
Diatomite and other infusorial earth	5,912	5,597	887	France 1,904; West Germany 1,857.
Feldspar	40,561	46,902	--	Canada 20,304; Norway 8,527; West Germany 4,659.
Fertilizer materials:				
Crude:				
Nitrogenous	3,353	4,118	--	Belgium-Luxembourg 3,715.
Phosphatic thousand tons	1,625	1,740	354	Morocco 804; Israel 244.
Potassic	22,316	16,982	--	France 14,152.
Other including mixed	3,202	4,098	--	France 2,068; Yugoslavia 664.
Manufactured:				
Nitrogenous	142,524	138,870	--	West Germany 42,794; Austria 33,212; France 23,505.
Phosphatic	152,638	171,516	--	Tunisia 73,067; France 38,185; Israel 24,786.
Potassic	742,987	705,363	--	U.S.S.R. 245,415; East Germany 105,173; West Germany 72,417.
Other including mixed thousand tons	1,182	875	594	Tunisia 89; West Germany 44.
Ammonia	307,114	340,973	13,400	U.S.S.R. 262,013; Austria 30,706.
Fluorspar	78,717	105,531	2,628	Spain 45,694; Mexico 25,541; France 23,954.
Graphite, natural	4,691	1,279	--	West Germany 697; U.S.S.R. 448.
Gypsum and plasters	16,177	20,961	1,126	Austria 17,268.
Lime	264	531	NA	NA.
Magnesite	86,270	108,662	474	Greece 77,620.
Mica:				
Crude including splittings and waste	1,024	1,089	--	India 166.
Worked including agglomerated splittings	360	352	56	Belgium-Luxembourg 69; France 61.
Pigments, mineral: Iron oxides, processed	20,440	20,776	437	West Germany 14,132.
Precious and semiprecious stones, except diamond:				
Natural kilograms	123,817	93,790	2,354	West Germany 22,799; Thailand 7,466.
Manufactured do	8,573	7,908	--	Switzerland 3,475; France 2,035.
Pyrites (gross weight)	286,351	291,010	--	U.S.S.R. 200,468; Norway 34,128.
Salt	240,244	305,538	--	Spain 200,960; Tunisia 75,440.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	96,672	80,173	--	France 50,701; West Germany 22,438.
Caustic potash	2,194	2,332	--	Romania 1,049; West Germany 778.
Soda ash	85,024	202,146	--	Switzerland 40,403; France 27,436; U.S.S.R. 22,934.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Calcareous including marble	154,843	176,265	--	Portugal 36,799; Spain 33,541; Yugoslavia 33,147.
Slate	3,338	4,546	--	France 4,319.
Other	385,477	514,965	--	Spain 119,552; Finland 87,191.
Worked, all types	4,262	4,723	--	Spain 572; Portugal 337; Bulgaria 276.
Dolomite, chiefly refractory-grade	1,024	1,644	--	Netherlands 621; Austria 220.
Gravel and crushed rock	13,222	16,211	--	France 6,268; West Germany 5,114.

See footnotes at end of table.

Table 3.—Italy: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Limestone, except dimension	388	42	NA	NA.
Quartz and quartzite:				
Piezoelectric crystals kilograms	5,910	9,548	--	West Germany 8,740.
Other	45,054	52,219	--	Switzerland 35,494; West Germany 8,049.
Sand excluding metal-bearing thousand tons	1,188	1,255	--	France 788; Belgium-Luxembourg 323.
Sulfur:				
Elemental:				
Other than colloidal	754,861	603,280	--	Canada 349,307; France 114,901; Poland 113,139.
Colloidal	1,591	1,297	--	West Germany 1,156; Yugoslavia 80.
Sulfuric acid	41,682	5,389		Switzerland 2,205; West Germany 627.
Talc, steatite, soapstone	21,790	24,046	--	Austria 13,380; France 5,771; Belgium-Luxembourg 2,247.
Other:				
Crude	87,507	111,343	3,436	U.S.S.R. 40,023; Republic of South Africa 21,684; Greece 13,299.
Slag, dross, similar waste, not metal-bearing	5,507	3,694	NA	NA.
Oxides, hydroxides, peroxides of strontium, magnesium, barium	923	974	320	United Kingdom 153.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	32,552	31,924	864	France 13,895; Yugoslavia 5,045; Austria 4,664.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,786	913	820	NA.
Carbon black and gas carbon	29,934	22,960	2,410	France 10,530; West Germany 2,782; United Kingdom 2,253.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	13,865	16,517	6,060	Republic of South Africa 3,058; Poland 2,419; Austria 1,126.
Briquets of anthracite and bituminous coal	1,224	518	--	West Germany 384.
Lignite including briquets	88,111	110,999	--	West Germany 54,986; Yugoslavia 46,565.
Coke and semicoke	168,450	100,239	--	France 65,581; West Germany 30,338.
Gas, natural:				
Gaseous million cubic feet	462,432	459,712	--	U.S.S.R. 240,611; Netherlands 219,101.
Liquefied thousand 42-gallon barrels	20,087	12,793	--	All from Libya.
Peat including briquets and litter	35,222	47,258	--	West Germany 21,073; U.S.S.R. 14,960.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	806,191	653,079	--	Saudi Arabia 222,850; Iraq 94,508; Libya 89,018.
Refinery products:				
Gasoline do	12,231	16,791	--	Saudi Arabia 2,838; Egypt 1,914; Libya 1,914; Kuwait 1,879.
Kerosine do	1,014	874	--	Trinidad 234; Netherlands 164; Libya 111.
Distillate fuel oil do	4,640	24,482	1	Romania 3,739; United Kingdom 3,669; France 2,871.
Residual fuel oil do	57,746	91,416	--	Venezuela 13,429; France 10,002; Netherlands Antilles 5,301.
Lubricants do	880	1,404	237	France 297; United Kingdom 143; Romania 132.
Other:				
Liquefied petroleum gas do	3,004	6,473	--	Saudi Arabia 1,066; West Germany 978; Libya 892.
Mineral jelly and wax do	343	289	--	West Germany 99; Hungary 47.
Bitumen and other residues do	1,784	1,679	1,406	Albania 232.
Bituminous mixtures do	11	14	1	France 4; Sweden 3.
Petroleum coke do	4,666	4,515	3,344	United Kingdom 310; West Germany 276.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	367,480	409,711	88,122	France 47,353; Yugoslavia 37,009; West Germany 18,209.

NA Not available.
[1]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Antimony.—At the Manciano Mine, owned by SAMIM, exploration continued in the San Martino sul Fiora and Salaioli concessions. At yearend, results were inconclusive. Furthermore, negative results stopped exploration for antimony near the Villasalt Mine, operated by SAMIM.

The antimony smelter at Manciano remained the only producer of antimony metal in Italy.

Iron and Steel.—Restructuring and economic difficulties were the highlights of the Italian steel industry.

During 1981, the Government of Italy through its Comitato Intra-Ministeriale per la Politica Industriale (CIPI) (Interministerial Committee for Industrial Policy) had approved restructuring of Government-owned Finsider, the largest producer of iron and steel in the country.

Three operating companies, organized according to products, Nuovo Italsider, Acciaieria Piombino, and Societa Italiana Acciai Speciali (SAIS), replaced Italsider. Nuovo Italsider, with plants at Taranto, Cornigliano, Bagnoli, and Campi, became the largest producer of pig iron, steel, and flat-rolled products in the country; Piombino, with plants at Piombino, San Giovanni Valdarno, and Marghera, became the largest producer of rails and sections in Italy; SAIS took over management of the specialty steelworks of Breda and Cogne and became the country's largest producer of specialty steels.

The economic situation of steel producers was serious, and most of the accounts closed in 1981 with large losses. The main causes for the difficulties were the high cost of credit, excessive borrowing, rising labor costs, high absenteeism, payment in revalued U.S. dollars for almost all raw materials used in the industry, increased prices for electricity, a small increase in steel prices, and payment for exports to other European Communities countries in currencies that had a fixed parity with the lira.

In April 1981, a major agreement between United States Steel Corp. and Finsider was signed. United States Steel will buy 120,000 tons per year of oilfield drill pipe through 1985, having a total value of $600 million, from Dalmine, a subsidiary of Finsider. In addition, a $400 million rolling mill for production of pipe in the United States was to be purchased in Italy. The technology for the rolling mill will be wholly Italian.

Nippon Steel Corp. and Finsider concluded an 18-month agreement on technical cooperation. The principal aim of the contract was to improve the operations at Taranto iron and steel works. About 100 professionals from Japan started to work at Taranto. During the summer of 1981, their target was to lower production costs by 8%.

Lead and Zinc.—Mines owned by SAMIM accounted for most of the lead and zinc mine production in Italy because the Salafossa Mine, operated by Pertusola, remained closed; mines owned by Piombo Zincifera Sarda were acquired by SAMIM in May 1981.

Miniera di Masua, owned by SAMIM and located in Sardinia, produced about 650,000 tons of complex lead-zinc sulfide ore from the Marx ore body. In addition, at Masua, preparation continued for production from a deeper sulfide ore body, Nebida. Exploration near the two ore bodies and in the general area of the mine have led to an increase of ore reserves, but quantities and grades were not made public. Reconstruction of the beneficiation plant at Masua started, but details were lacking.

At Mineria di Monteponi in Sardinia, owned by SAMIM, work on restructuring the mine was underway during 1981, and the new pumping station on level 200 became operational. Modernization of the flotation plant at Campo Pisano continued without interrupting production of concentrates. Monteponi and San Giovanni Mines supplied ore for the Campo Pisano plant.

At Miniera Funtana Raminosa, also a SAMIM mine in Sardinia, production stopped awaiting completion of construction of a new flotation plant.

SAMIM and Pertusola produced lead and zinc metal in Italy. About 52% of the lead and 23% of the zinc metal smelted in Italy were produced from domestic concentrates. Pertusola produced zinc at its Crotone plant. SAMIM produced zinc and lead at the Porto Vesme plant and lead at the San Garino plant, and at the Porto Marghera plant, zinc was the principal product. During 1981, at the Ponte Nossa plant, construction was completed to treat residues containing zinc and copper for recovery of

those metals.

Mercury.—At the Monte Amiata Mine, Province of Siena, owned by SAMIM, production started in 1981 after 5 years of closure. The Ministry for Industry had fixed production at 5,500 flasks per year of mercury metal.

NONMETALS

Asbestos.—The Balangero Mine, Province of Turin, owned by Amiantifera Balangero S.p.A. remained the only producer of asbestos in Italy during 1981. At the Balangero Mine, exploratory drilling was resumed to determine asbestos reserves up to a depth of 500 meters. In addition, the company improved air cleaning in its asbestos plant near the mine. Air tests made during 1981 showed two fibers per milliliter of air, which was within the limit set by Italian authorities.

Barite.—Three companies, Bariosarda Co., Edem Co., and Mineraria Baritina S.p.A., produced most of the barite in the country during 1981 from mines in Sardinia. Bariosarda was state owned, and the other two were privately owned. The largest mine was the Miniera di Barega e Mont'Ega, operated by Bariosarda Co. in Sardinia, accounting for about 30% of the country's output.

Fluorspar.—In the Gennas Tres Montes and Muscadroxiu Mines in Sardinia, owned by Mineraria Silius, work on a central shaft for both mines continued. Completion of this shaft was planned for 1984.

Potash.—During 1981, Italkali S.p.A. operated a mine at Pasquasia and a plant at Campofranco, both in Sicily. No major events related to Italy's potash industry were noted during 1981. Ore mined in Sicily was largely kainite. The latest trends in output of potash are shown in table 1.

Pyrites.—During 1981, the Gavorrano Mine, Province of Grosseto, owned by Solmine S.p.A., was closed because the reserves were exhausted.

Development of the Bocheggiano Mine, Province of Grosseto, also owned by Solmine S.p.A., continued during 1981. The mine should make up for production lost by the closure of the Gavorrano Mine. Startup was planned for 1983.

At the Niccioleta Mine, Province of Grosseto, owned by SAMIM, work continued on improving ventilation, concurrent with the introduction of diesel-powered equipment in underground workings. At yearend, three new fans were taking air out of the mine at the rate of 140 cubic meters per second.

Silica Sand.—A 100-ton-per-year silica-sand mining and processing facility was near completion at yearend 1981. The facility was located in Termoli, region of Campobasso, southern Italy, and was owned by Siro Sud S.p.A. The processing facility, with a Boxmag-Rapid H1W4 magnetic separator that had a throughput of 40 tons per hour, was expected to reduce the iron oxide content from 0.26% to 0.17%.

Talc.—Talco Graphite Valchisone S.p.A., with mines in Piedmont and Sardinia, produced more than 50% of the talc in the country. The rest was produced by a number of small operations in the Alps in central Italy.

MINERAL FUELS

Italy's new National Energy Plan was presented by the Government to the CIPI in August 1981 and was ratified by the CIPI in December 1981.

The new plan emphasized increasing the use of coal, natural gas, and nuclear power to meet growing energy demands in 1980-90, while reducing the relative share of oil from about two-thirds of total energy use in 1980 to one-half in 1990. According to the plan, 185 million tons of oil-equivalent should be used in Italy by 1990 compared with about 150 million tons in 1980.

In February, Law No. 22 expanding Italy's mandatory strategic stocks was passed after being in Parliament for over 1 year. The new law provides for the increase of Italian reserves of crude oil and its products from a 90- to 100-day supply, to be handled and financed by refinery and large storage tank owners. In addition, the bill states that operators of commercial oil storage facilities, used in internal trade, must increase their reservoir reserves from 20% to 30% of capacity.

Italy remained dependent on imports of high-grade coal, crude oil, and natural gas to meet its energy demand. Nuclear power, hydropower, and geothermal energy were the energy sources that should lower the country's dependence on imports.

Coal.—Lignite remained the only domestic solid fuel of significance as a source of energy. Two mines, Miniera Santa Barbara and Miniera Pietrafitta, both owned by the Government-owned electricity-producing Ente Nazionale Elettrica, produced all of the lignite in the country.

Work to start production in the Sulcis

Coalfield in Sardinia continued but slower than anticipated. The delay resulted from complaints by the City Hall of Porto Scuso over the location of an access road. Redesigning the road and obtaining necessary permits delayed the actual work. Activities in the Sulcis Coalfield reflect the efforts of the Italian Government to use coal, domestic and foreign, for production of energy in larger quantities than in the past.

Natural Gas.—Although gas remained the largest primary energy source produced in the country during 1981, imports of natural gas were needed to meet one-half of the country's gas demand.

Exploratory drilling led to discovery of natural gas at various locations, any of which could become commercially significant. Bonaccia, offshore Adriatic Zone B, and Falco, offshore Adriatic Zone F, appeared to be the most promising.

Italy experienced difficulties with its gas supplies during 1981. Deliveries from Libya ceased, deliveries from Algeria did not start as scheduled, and imports from the U.S.S.R. were below amounts stipulated in the contracts.

Contacts with representatives of the U.S.S.R. on Italy's purchases of natural gas from the U.S.S.R. continued during 1981. At yearend, it appeared that an agreement on delivery of 210 to 250 billion cubic feet of natural gas per year, for 25 years, at a price of about $4.65 per million British thermal units, was near conclusion.

Petroleum.—In spite of poor results in exploratory drilling, the area covered by permits for petroleum exploration increased by 14% when compared with permits granted in 1980. In addition, about 123 wells were drilled during 1981, about one-third more than that of 1980. About 20 onshore and 6 offshore rigs operated in Italy. The results of oil exploration were less successful than those for natural gas. A number of wells were positive, but only one, Vega, offshore Sicily, was thought to be of commercial value.

The petroleum refining industry had a poor year during 1981. Although Italy had the largest refining capacity in Europe, most of the refineries were obsolete. The estimated utilization of petroleum refineries was about 60% of capacity. A drop in foreign demand and internal problems of the domestic private sector were mentioned in company annual reports as the principal reasons for the lower throughput. Refineries in Sicily and Sardinia, which had a high concentration of service refineries, were affected far more than refineries in other parts of Italy because local demand could not absorb surpluses generated by low exports.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Italian lira (Lit) to U.S. dollars at the average rate for 1980 of Lit856.00=US$1.00.

The Mineral Industry of Japan

By John C. Wu[1]

Japan's economy continued to achieve a positive growth in real gross national product (GNP). However, the 2.9% real economic growth in 1981 was less than that of 1980 and was below the 4.1% predicted by the Government. According to the Economic Planning Agency, Japan's real GNP in 1975 constant yen was 194,218.4 billion yen (U.S. $880.7 billion) in 1981 compared with 188,733.6 billion yen (U.S. $832.3 billion) in 1980.[2] The slower growth in 1981 was attributed primarily to the lower level of personal consumption expenditure, private plant and equipment investment, and private housing investment. Exports, which increased 16.4% compared with the 1980 figure, remained the source of basic strength in Japan's economy in 1981. During 1981, Japan's wholesale price index increased only 1.7%, while the consumer price index rose 4.9%. Japan's unemployment rate remained between 2.0% and 2.4% of the 56.3 million labor force.

The activities of most mining and mineral-related industries were at a relatively low level in 1981 owing to the sluggish domestic demand. Two industries, aluminum smelting and petroleum refining, were experiencing serious financial difficulties. According to Japan's Productivity Research Institute, the levels of output as measured by production index (1975=100) for all industries and selected mining and mineral-related manufacturing industries for the 1978-81 period were as follows:

Industry	1978	1979	1980	1981
All industries	122.7	132.8	142.0	146.1
Mining	105.9	101.0	99.7	96.2
Coal	100.0	92.9	94.9	93.1
Metal	99.8	86.2	80.2	80.1
Nonmetal	119.1	125.5	126.6	119.2
Crude petroleum and natural gas	104.5	95.1	86.3	81.8
Manufacturing	122.9	133.3	142.9	147.2
Iron and steel	110.1	122.6	124.8	117.4
Nonferrous metals	135.0	142.9	143.5	138.9
Stone, clay, glass products	121.0	129.0	132.3	124.1
Petroleum and coal products	104.0	106.5	101.2	95.3

Despite the worldwide economic recession, Japan's foreign trade improved substantially in 1981. Two-way merchandise trade totaled $295.3 billion in 1981 compared with $270.3 billion in 1980. Japan's merchandise trade balance swung from a deficit of $10.7 billion in 1980 to a surplus of $8.7 billion in 1981 as a result of the higher export earnings from high-value-added products such as numerically controlled machine tools, energy-efficient automobiles, electronic copiers, computers, video tape recorders, and other electronic appliances.

Following the development of heavy and chemical industries during the 1950's and 1960's and two energy crises in the 1970's, the Japanese industry began to undergo a new industrial revolution in 1980. During 1980-81, many industries directly or indirectly related to petroleum were experiencing drastic structural changes. Japan's alu-

minum industry reduced output capacity by more than 50% in 1981 because of higher energy costs and competitive foreign suppliers. The Japanese ferroalloy industry was facing the same problems and was operating at 60% capacity. Japan's cement industry had converted about 84% of the industry's energy sources from C-type fuel oil to coal. The fertilizer industry scaled down its output capacity because of the reduced exports. As a result of the depreciation of the Japanese yen and reduced oil consumption, Japan's petroleum refining industry was in a serious financial situation. The industry planned to shut down about 11% of its 5.45-million-barrel-per-day capacity and to transfer crude oil stocks from private companies to the public company, the Japan National Oil Corp.

Japan's steel and nonferrous industries, however, continued their steady increase in capital equipment investment in 1981. According to the Japan Development Bank, capital equipment investment by the steel industry increased 35% to about $3.94 billion in 1981, mainly for the purposes of increasing labor productivity, conserving energy, preventing pollution, and developing new high-value-added products. Capital equipment investment by the nonferrous metal industry rose 33.2% to about $1.1 billion in 1981, mainly for new smelting facilities for copper and titanium.

Japan's total overseas economic assistance in fiscal year (FY) 1980 totaled $6.8 billion compared with $7.6 billion in FY 1979. However, Japan's Official Development Assistance (ODA) continued to increase by 25.3% to $3,303.7 million in FY 1980, of which $1,960.8 million was for bilateral official development assistance including financial grants, technical assistance, and development lending and capital to developing countries; $1,342.9 million was for contributions to multilateral institutions. According to the Ministry of International Trade and Industry (MITI), Japan's economic assistance was provided to the development needs of the recipient countries by integrating ODA with trade and investment programs into a comprehensive development package.

In the early 1970's, Japan's expenditure for research and development (R&D) increased steadily at an annual rate of about 11%, but since 1979 the rate of increase has been about 14%. In FY 1980, Japan's total expenditure for R&D increased 14.5% and reached $23.1 billion, which was about 2% of Japan's GNP. Japan ranked second, following the United States, in the amount of R&D expenditures, and accounted for about 10% of the world's total R&D expenditures. In FY 1980, of the total R&D expenditures, about 60% was by private companies, 25.5% by universities, and 14.5% by the governmental research institutes. By source of funds, 72% was from the private sector and 28% was from the Government. By types of research for the expenditures by private companies, 75.5% was for developmental research, 5% for basic research, and 19.5% for applied research; for the expenditure by universities, 57.9% was for basic research, 35.3% for applied research, and 6.8% for developmental research; and for the expenditures by the governmental research institutes, 43.9% was for developmental research, 40.7% for applied research, and 15.4% for basic research.[3]

Japan planned to raise the level of R&D expenditures from about 2% of GNP to about 3% of GNP and to raise the proportion of R&D expenditures by the governmental research institutes in the coming years. To achieve these goals, four measures were expected to be taken: (1) to strengthen coordination among industry, university, and Government; (2) to develop the program by MITI to promote home-grown technology; (3) to train sufficient numbers of R&D personnel and to provide the environment for the full utilization of personnel; and (4) to expand international cooperation in R&D. The accelerated rate of increase in R&D expenditures over the past few years was in line with a shift of Japanese industry from heavy reliance on foreign technology to heavy investment in original invention by Japanese private companies and public institutions and is one of the most important aspects in the process of the new industrial revolution in the 1980's.

In December 1981, the Government of Japan approved a Government-supported stockpile program for chromium, cobalt, molybdenum, nickel, and tungsten for a goal of about 10 days' consumption. The Special Metal Stockpiling Association is expected to administer the program, which was scheduled to begin in July 1982. To finance the program, the association planned to borrow about $53 million from the Japanese city banks, and the Government was to provide about $2.3 million through the Metal Mining Agency of Japan for the payment of about two-thirds of the interest on the fund.[4] In FY 1980, the Government

also provided the Metallic Mineral Stockpiling Association with an $80 million loan for the stockpile program of copper, zinc, and aluminum. At the end of 1981, the Metallic Mineral Stockpiling Association held 4,781 tons of copper, 86,180 tons of zinc, and 21,990 tons of aluminum. The Government of Japan was also considering a plan to set up a 60-day stockpile program for chromium, nickel, cobalt, tungsten, molybdenum, manganese, palladium, columbium, strontium, antimony, and vanadium. The program is expected to be introduced in 1983.

PRODUCTION

Japan's domestic mine production of barite, lead, manganese, silver, and tin was at a slightly higher level than in 1980, but production of chromium, copper, gold, iron ore, molybdenum, limestone, perlite, pyrophyllite, sulfur, coal, crude oil, and natural gas declined. The continuing high cost of domestic mine production and the lower ore grades were the primary causes of the decline in most of Japan's mineral output.

Production of metals in general was at a lower level than that of 1980. The output of aluminum dropped to under 800,000 tons because of high energy costs and mounting imports. Crude steel output also dropped to about 102 million tons owing to sluggish domestic demand and reduced exports. Other metal production that suffered from lower level domestic activities, high cost of production, and/or high level of imports included cobalt, gold, ferroalloys, primary magnesium, refined nickel, selenium, tin, tungsten, and primary zinc. Production of cement and fertilizer also declined in 1981 because of sluggish domestic demand and reduced exports. However, metal production of high-purity aluminum, antimony metal, bismuth, chromium metal, refined copper, primary lead, silver, and titanium increased in 1981 owing to the growing demand from domestic markets for these metals.

Japan remained among the world's top 10 producers of aluminum, cobalt, copper, zinc, cement, and fertilizer. It dropped to third place in world steel production but maintained second place in world production of titanium sponge. Japan also was a major world producer of bismuth, indium, selenium, and tellurium metal and was the world's leading producer of iodine, lime, and magnesia.

Table 1.—Japan: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS					
Aluminum:					
Alumina, gross weight ____ thousand tons__	1,785	1,502	[r]1,545	1,936	1,344
Metal:					
Primary:					
Regular grades _____do____	1,188	1,058	1,010	1,091	771
High-purity _____do____	5	4	4	4	6
Secondary _____do____	587	660	768	800	815
Antimony:					
Oxide _____	5,571	5,427	6,079	6,482	6,238
Metal _____	1,302	1,017	512	356	390
Arsenic, white (equivalent of arsenic acid) _____	119	91	182	284	[e]300
Bismuth _____	698	624	458	338	478
Cadmium _____	2,844	2,531	2,597	2,173	1,977
Chromium:					
Chromite, gross weight _____	17,881	8,696	11,905	13,610	10,959
Metal _____	2,743	2,885	3,158	3,621	3,625
Cobalt metal _____	1,093	1,864	2,653	2,867	2,421
Columbium and tantalum: Tantalum metal ____	[r]45	41	55	65	[e]55
Copper:					
Mine output, metal content _____	81,395	71,951	59,100	52,553	51,459
Metal:					
Blister and anode:					
Primary _____	848,400	854,500	853,700	889,500	[e]930,000
Secondary _____	66,800	51,400	67,700	40,300	[e]50,000
Total _____	915,200	905,900	921,400	929,800	[e]980,000

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS —Continued					
Copper —Continued					
Metal —Continued					
Refined:					
Primary	[r]848,390	854,474	853,693	889,497	929,967
Secondary	[r]85,313	104,596	130,007	124,795	120,153
Total	933,703	959,070	983,700	1,014,292	1,050,120
Germanium:					
Oxide	16	17	15	16	12
Metal	13	11	10	13	11
Gold:					
Mine output, metal content thousand troy ounces	149	145	128	102	99
Metal do	1,219	1,357	1,311	1,217	1,214
Indium metal do	231	209	[r]289	482	482
Iron and steel:					
Iron ore and iron sand concentrate:					
Gross weight thousand tons	685	595	460	477	442
Iron content do	400	361	284	294	275
Roasted pyrite concentrate (50% or more Fe) do	571	487	432	318	355
Metal:					
Pig iron and blast furnace ferroalloys do	85,886	78,589	83,826	87,041	80,048
Electric furnace ferroalloys:					
Ferrochrome	398,782	274,421	365,490	402,997	306,104
Ferromanganese	527,418	455,729	603,019	569,147	567,746
Ferronickel	224,339	198,482	303,716	276,829	244,135
Ferrosilicon	291,446	270,052	319,553	303,754	234,524
Silicomanganese	333,692	303,249	299,680	310,714	282,852
Ferrochromium-silicon	11,411	[2]9,208	[2]12,623	[2]20,531	[2]10,469
Other:					
Calcium silicon	5,634	1,896	3,349	3,859	2,590
Ferrocolumbium	1,281	1,193	1,207	1,159	825
Ferromolybdenum	3,705	3,904	3,406	4,367	3,056
Ferrotungsten	371	243	251	242	362
Ferrovanadium	2,546	3,193	4,628	3,526	4,063
Unspecified	7,352	9,637	9,298	10,360	3,167
Total	1,807,977	[3]1,531,207	[3]1,926,220	[3]1,907,485	[3]1,659,893
Steel, crude thousand tons	102,405	102,105	111,748	111,395	101,675
Semimanufactures, hot-rolled:					
Of ordinary steels do	79,617	79,625	89,075	88,888	79,788
Of special steels do	10,304	11,669	12,522	12,872	13,282
Lead:					
Mine output, metal content	54,764	56,489	46,929	44,746	44,932
Metal, refined:					
Primary	221,398	228,442	221,247	220,934	226,242
Secondary	56,496	53,537	53,376	74,187	80,046
Magnesium metal:					
Primary	9,416	11,162	11,368	9,252	5,667
Secondary	7,584	10,938	16,382	23,872	28,436
Manganese:					
Ore and concentrate:					
Gross weight	126,156	104,147	87,929	79,579	87,208
Manganese content	[r]32,850	[r]28,657	[r]23,224	19,065	21,134
Oxide	27,429	31,131	36,110	39,487	44,296
Metal	7,267	6,463	4,029	4,431	4,232
Molybdenum:					
Metal content of concentrate	182	123	117	95	80
Metal	275	309	409	388	388
Nickel metal:					
Refined	24,139	21,636	[r]25,031	24,798	23,790
Ni content of ferronickel	69,761	57,564	75,970	73,566	63,008
Total	93,900	79,200	[r]101,001	98,364	86,798
Platinum-group metals:					
Palladium metal troy ounces	22,716	24,021	22,495	28,968	25,748
Platinum metal do	9,737	10,176	12,142	12,366	10,521
Rare-earth metals:					
Lanthanum oxide	[r]112	[r]105	[r]151	188	227
Cerium metal	409	403	491	670	[e]600
Selenium, elemental	456	481	510	471	428
Silicon metal	289	259	[r]338	476	594

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS —Continued					
Silver:					
Mine output, metal content thousand troy ounces	r9,603	9,664	8,680	8,603	8,982
Metal, primary do	38,184	r38,782	39,104	37,828	40,252
Tellurium, elemental	65	r68	56	69	62
Tin:					
Mine output, metal content	605	603	660	549	562
Metal, smelter	1,280	1,141	1,251	1,319	1,314
Titanium:					
Slag	1,228	175	180	NA	NA
Metal	6,395	r9,174	13,190	13,961	24,938
Tungsten:					
Mine output, metal content	772	775	746	668	667
Metal	1,549	1,479	1,736	2,055	1,820
Uranium metal kilograms	r4,967	3,602	3,377	5,218	e5,000
Zinc:					
Mine output, metal content	275,731	274,629	243,354	238,108	242,042
Oxide	58,297	56,785	61,514	63,497	e63,000
Metal:					
Primary	778,406	767,949	789,352	735,187	670,162
Secondary	26,547	24,770	26,973	49,917	50,272
NONMETALS					
Asbestos	6,307	5,746	3,502	3,897	e3,500
Barite	58,213	70,967	55,722	55,916	56,663
Bromine, elemental[e]	12,000	12,000	12,000	12,000	12,000
Cement, hydraulic thousand tons	73,138	84,882	r87,803	87,958	84,832
Clays:					
Bentonite[e]	400,000	400,000	400,000	548,328	500,000
Fire clay	902,263	1,475,608	1,432,241	1,529,741	e1,500,000
Kaolin	226,329	227,134	218,137	228,255	211,422
Feldspar and related materials:					
Feldspar	42,403	42,119	37,548	29,782	25,577
Aplite	394,639	377,548	394,240	302,749	349,275
Gypsum thousand tons	5,551	5,794	6,273	6,105	6,137
Iodine, elemental	6,100	6,000	6,250	6,525	6,862
Lime: Quicklime thousand tons	9,022	9,058	9,628	9,350	e8,500
Nitrogen: N content of ammonia do	2,292	2,454	r2,323	2,149	e2,000
Perlite	70,000	73,000	75,000	77,000	e75,000
Salt, all types thousand tons	1,056	1,073	1,090	1,102	e1,100
Sodium compounds, n.e.s.:					
Sodium carbonate	1,178,899	1,161,570	1,354,442	1,355,433	e1,350,000
Sodium sulfate	324,030	320,177	338,467	310,743	e310,000
Stone, crushed and broken:					
Dolomite thousand tons	5,764	6,087	6,119	6,206	5,786
Limestone do	154,121	172,543	182,781	184,780	176,691
Sulfur:					
S content of pyrites do	389	327	r300	311	293
Byproduct:					
Of metallurgy do	1,336	1,296	1,350	1,300	e1,200
Of petroleum do	1,100	1,105	1,241	1,173	e1,000
Talc and related materials:					
Talc	127,616	139,491	120,403	121,670	118,831
Pyrophyllite	1,671,386	1,555,434	1,588,461	1,627,128	1,427,659
Vermiculite[e]	14,000	15,000	16,000	17,000	17,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black thousand tons	e425	489	538	575	e550
Coal:					
Anthracite do	(4)	r1	r3	10	34
Bituminous coal[5] do	r18,571	r18,548	r17,640	18,017	17,653
Lignite do	r53	39	32	27	e30
Total do	r18,624	r18,588	r17,675	18,054	17,717
Coke including breeze:					
Metallurgical do	e43,000	40,546	43,189	45,146	44,864
Metallurgical breeze do	e2,000	e2,000	2,000	2,318	2,378
Gashouse including breeze do	3,717	3,342	3,226	3,494	3,448
Fuel briquets, all grades do	e450	421	479	453	e450
Gas, natural:					
Gross[6] million cubic feet	99,025	93,255	85,250	77,593	74,245
Marketed do	96,281	90,440	83,455	75,545	71,594
Natural gas liquids:					
Natural gasoline[e] thousand 42-gallon barrels	37	37	37	37	37

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Natural gas liquids —Continued					
Liquefied petroleum gas from natural gas (field plants only)[e] thousand 42-gallon barrels	300	300	300	300	300
Peat[e]	70	60	60	60	60
Petroleum:					
Crude thousand 42-gallon barrels	4,334	3,963	3,522	3,169	2,868
Refinery products:					
Gasoline:					
Aviation do	157	170	138	88	101
Other do	196,317	209,449	215,910	214,614	219,168
Jet fuel do	24,077	26,074	26,669	28,839	28,273
Kerosine do	183,405	187,073	193,537	178,718	174,548
Distillate fuel oil do	114,870	122,975	135,652	135,633	134,476
Residual fuel oil do	803,850	780,226	779,628	697,507	601,412
Lubricants do	14,221	11,440	12,277	12,636	11,806
Other:					
Asphalt and bitumen do	28,103	31,219	30,618	28,411	27,078
Liquefied petroleum gas do	37,135	48,645	52,413	47,067	47,475
Naphtha do	126,796	120,057	118,563	110,512	92,403
Paraffin do	1,132	1,088	1,195	1,101	1,101
Petroleum coke do	1,730	440	503	692	717
Unfinished oils do	44,224	38,300	45,362	44,557	12,076
Refinery fuel and losses do	125,446	110,768	83,441	[r]110,411	113,002
Total do	1,701,463	1,687,924	1,695,906	1,610,786	1,463,636

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 23, 1982.

[2]For reasons not evident in sources, these figures are reported as negative numbers. (See also footnote 3.)

[3]Sum of listed detail as reported, but adding quantity bearing footnote 2 as positive numbers. Japanese sources provide the following totals for ferroalloy output in the years indicated: 1978, 1,512,791; 1979, 1,900,974; 1980, 1,866,423; and 1981, 1,638,955. These totals represent the sum of listed detail using the quantities bearing footnote 2 as negative numbers, thereby not only omitting the footnoted numbers, but actually subtracting them from the sum of all other alloys. The reason for this procedure in source publications is not explained.

[4]Revised to zero.

[5]Includes coking coal and steam coal.

[6]Includes output from gas mines and coal mines.

[7]May include some additional unfinished oils.

TRADE

Japan's merchandise trade balance rebounded to an $8.7 billion surplus from a record high deficit of $10.7 billion in 1980. This substantial improvement in trade balance was a result of a much larger increase in export earnings compared with the increase in import bills.

Export earnings totaled $152 billion compared with $129.8 billion in 1980. The 17% increase in export earnings was contributed largely by exports of machinery and equipment, which increased to $100.2 billion in 1981 from $81.5 billion in 1980. Exports of iron and steel products increased to $16.7 billion in 1981 from $15.5 billion in 1980 despite a 4% drop in volume. Other exports of mineral products, including metal products, rose 9% to $4.3 billion, and exports of nonmetallic mineral products rose 13.9% to $2.11 billion. However, exports of fertilizers dropped 5.8% to $355 million because of lower world prices and reduced exports to China. Japan's export earnings were about 14% of its GNP in 1981 and accounted for about 8.4% of the total exports in the Western World.

Japan's total 1981 imports were $143.2 billion compared with $140.5 billion in 1980. The 2% increase was mainly due to a smaller increase in imports of mineral fuels and a substantial drop in the import price of metal ores and other raw materials. Imports of crude petroleum and refined petroleum products rose only 1.4% to $58.7 billion in 1981, mainly owing to a 10.4% drop in the import volume of crude oil. However, imports of coal rose sharply by 23.8% to $5.5 billion as a result of a slight increase in the coal price and a 13.7% increase in import volume. Imports of nonferrous metal ores dropped 19.3% to $3 billion, while imports of iron ore remained at about $3.5 million.

In 1981, the United States remained the major customer for Japanese exports. Ja-

pan's exports to the United States rose 23% to $38.6 billion, about 25.4% of Japan's total exports. Other principal customers of Japan's exports in 1981 were the Federal Republic of Germany, $6 billion; the Republic of Korea, $5.7 billion; Taiwan, $5.4 billion; Hong Kong, $5.3 billion; and China, $5.3 billion. In terms of the increase in exports in 1981, Japan's exports to Australia jumped 41% to $4.8 billion, those to Indonesia increased 19% to $4.1 billion, those to the U.S.S.R. increased 17% to $3.3 billion, and those to Singapore increased 14% to $4.5 billion.

The United States remained the principal supplier of Japanese imports in 1981. Japan's imports from the United States rose 3.6% to $25.3 billion and accounted for about 18% of Japan's total imports. Other major suppliers to Japan were Saudi Arabia, $21.5 billion; Indonesia, $13.3 billion; Australia, $7.4 billion; and China, $5.3 billion.

The United States was a major buyer of Japanese motor vehicles, steel and metal products, machinery and equipment, and nonmetallic mineral products and was a principal supplier of agricultural products, machinery and equipment, coal, chemicals, metal ores and scrap, and wood. Saudi Arabia and Indonesia remained the principal suppliers of crude oil and major purchasers of Japanese machinery and equipment as well as other manufactured consumer goods. Other major trade partners included Australia, the Federal Republic of Germany, the Republic of South Africa, Taiwan, the Republic of Korea, and China.

Table 2.—Japan: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	1,000	--		
Oxides and hydroxides	259,583	398,544	901	Canada 150,975; Egypt 90,481; Republic of Korea 61,173.
Metal including alloys:				
Scrap	292	858	11	Republic of Korea 658; Taiwan 166.
Unwrought	7,946	7,644	4	Australia 3,129; Philippines 1,944.
Semimanufactures	98,959	73,567	14,001	China 11,903; Hong Kong 5,805; Taiwan 5,784.
Antimony metal including alloys, all forms	47	30	10	Indonesia 8; Tanzania 7.
Beryllium metal including alloys, all forms kilograms	6	5	--	Taiwan 4.
Bismuth metal including alloys, all forms	182	242	66	West Germany 49; Netherlands 48; Poland 34.
Cadmium metal including alloys, all forms	151	229	--	Netherlands 95; Republic of South Africa 50; United Kingdom 30.
Chromium:				
Chromite	1,786	5,678	--	North Korea 4,426; Republic of Korea 1,232.
Oxides and hydroxides	1,965	3,368	577	China 1,281; Taiwan 666; Republic of Korea 343.
Cobalt oxides and hydroxides	41	85	--	Netherlands 54.
Columbium and tantalum: Tantalum metal including alloys, all forms	30	40	6	Austria 18; West Germany 16.
Copper:				
Sulfate	246	254	--	Taiwan 178; Indonesia 45.
Metal including alloys:				
Waste and scrap	47,233	206,255	122,538	Taiwan 51,847; China 10,970.
Unwrought	5,535	10,662	5,643	Republic of Korea 2,390; Taiwan 1,041; Belgium 1,003.
Semimanufactures	175,974	192,441	24,107	Hong Kong 33,631; Taiwan 27,035; Singapore 17,451.
Iron and steel:				
Ore and concentrate	49	99	--	Hong Kong 53; Taiwan 45.
Metal:				
Scrap	150,562	159,366	266	Republic of Korea 81,052; Hong Kong 60,469.
Pig iron including cast iron	50,225	5,852	--	Republic of Korea 3,537; Hong Kong 1,000.
Sponge iron, powder, shot	10,537	8,719	2,330	Hong Kong 1,720; Republic of Korea 1,203; Australia 763.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys:				
Ferromanganese	92,886	40,271	11,786	North Korea 10,006; Qatar 5,202; Malaysia 3,116.
Other	39,559	30,268	6,480	Netherlands 14,070; Romania 2,489.
Steel, primary forms thousand tons	4,568	3,950	389	Republic of Korea 1,021; Taiwan 539; Philippines 235.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	7,202	7,595	1,007	China 1,201; Saudi Arabia 828; Iraq 459.
Universals, plates, sheets, uncoated do	6,019	7,492	566	China 995; Taiwan 655; Republic of Korea 349.
Tinned plates and sheets do	834	890	189	China 126; Philippines 70; Singapore 70.
Other coated plates and sheets do	2,381	2,118	639	China 165; Saudi Arabia 74; Taiwan 66.
Hoop and strip do	633	692	49	China 157; Indonesia 63; Taiwan 43.
Rails and accessories do	139	144	56	Brazil 24.
Wire do	302	291	93	Iraq 17; China 11.
Tubes, pipes, fittings do	6,630	6,578	1,854	U.S.S.R. 793; Saudi Arabia 378; Iraq 227.
Castings and forgings, rough do	26	26	12	Taiwan 2.
Lead:				
Ore and concentrate	8,266	6,139	--	All to U.S.S.R.
Oxides	243	51	--	Taiwan 24; Republic of Korea 12; Philippines 12.
Metal including alloys, all forms	r15,812	10,506	10	Taiwan 4,209; Republic of Korea 2,501; U.S.S.R. 1,255.
Magnesium metal including alloys, all forms	r89	97	1	Republic of Korea 55; North Korea 30.
Manganese:				
Ore and concentrate	6,230	1,855	--	Republic of Korea 910; Indonesia 354; Pakistan 300.
Oxides	19,436	22,944	6,497	Indonesia 2,724; Tanzania 1,836; Australia 1,346.
Mercury 76-pound flasks	15,662	9,340	4,779	Netherlands 2,627; Republic of Korea 420.
Molybdenum metal including alloys, all forms	71	37	1	Hungary 22; Taiwan 6.
Nickel:				
Ore and concentrate	40	--		
Metal including alloys, all forms	2,623	2,031	756	Taiwan 230; Indonesia 225; Republic of Korea 139.
Phosphorus, elemental (red)	91	105	(2)	Taiwan 50; Vietnam 20; Philippines 16.
Platinum-group metals including alloys, unwrought and partly wrought thousand troy ounces	137	189	14	Taiwan 93; United Kingdom 19; Switzerland 17.
Selenium, elemental	313	342	30	Netherlands 124; United Kingdom 33; Belgium 26.
Silver:				
Waste and scrap value, thousands	$1,493	$2,478	--	All to Republic of Korea.
Metal including alloys, unwrought and partly wrought thousand troy ounces	4,155	7,084	529	United Kingdom 3,925; Taiwan 551; Malaysia 384.
Tin:				
Oxides	35	49	--	Belgium 34.
Metal including alloys, all forms	1,405	1,262	3	Tanzania 240; Singapore 215; Burma 121.
Titanium:				
Oxides	13,818	16,768	6,330	Taiwan 3,205; China 2,252; Republic of Korea 1,372.
Metal including alloys, all forms	4,887	8,070	3,332	United Kingdom 2,451; Netherlands 1,870.
Tungsten metal including alloys, all forms	209	216	60	U.S.S.R. 52; West Germany 16.
Zinc:				
Ore and concentrate	798	--		
Oxides	690	455	--	Republic of Korea 138; Thailand 84; Taiwan 55.
Metal including alloys, all forms	42,642	45,157	18	Taiwan 8,969; Republic of Korea 8,376; Philippines 6,555.
Other:				
Ores and concentrates:				
Of molybdenum, tantalum, titanium, vanadium, zirconium	844	109	--	Republic of Korea 85; Taiwan 24.
Of base metals, n.e.s	2	--		

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Other —Continued				
Ash and residue containing nonferrous metals	10,898	13,273	1,622	Republic of Korea 6,430; United Kingdom 1,546.
Oxides, hydroxides, peroxides	1,592	1,736	252	Republic of Korea 477; Taiwan 361; Indonesia 139.
Metals:				
Alkali, alkaline earth, rare-earth metals	861	832	198	Taiwan 446; Singapore 79.
Pyrophoric alloys	76	76	20	France 30.
Base metals including alloys, all forms	r5,794	5,852	2,131	Netherlands 1,165; Australia 484; West Germany 447.
NONMETALS				
Abrasives, n.e.s.:				
Natural:				
Emery	1,340	916	(2)	Republic of Korea 389; Taiwan 239; Indonesia 134.
Unspecified	506	1,114	--	Taiwan 696; Republic of Korea 239; Malaysia 70.
Artificial corundum	16,735	15,560	575	Taiwan 5,076; Italy 902; Australia 877.
Dust and powder of precious and semi-precious stones -- thousand carats	934	1,045	700	Republic of Korea 110; Taiwan 110; India 75.
Grinding and polishing wheels and stones	r6,218	6,297	754	Singapore 686; Thailand 595; Hong Kong 553.
Asbestos, crude	147	428	--	Republic of Korea 281; Singapore 40; India 36.
Barite and witherite	1,002	1,902	--	U.S.S.R. 1,200; Republic of Korea 700.
Boron materials:				
Crude natural borates	381	620	--	Republic of Korea 409; Taiwan 176.
Oxides and acids	150	219	(2)	Republic of Korea 95; Taiwan 50; Vietnam 40.
Cement -- thousand tons	10,814	8,786	474	Saudi Arabia 2,158; Kuwait 1,883; Singapore 1,249.
Chalk	13	--		
Clays and clay products:				
Crude	79,267	77,643	--	Taiwan 48,497; Republic of Korea 12,184.
Products:				
Refractory including nonclay bricks	196,270	275,797	4,338	Republic of Korea 59,698; China 45,999; Taiwan 43,650.
Nonrefractory[3]	44,896	46,470	13,267	Hong Kong 9,313; Singapore 7,332; Australia 4,558.
Diamond:				
Gem, not set or strung -- carats	1,031	450,471	4	China 450,000.
Industrial -- do	1,286	11,562	1	Taiwan 11,055.
Diatomite and other infusorial earth	1,277	1,891	--	Taiwan 604; Vietnam 400; Cuba 315.
Feldspar	23,630	22,889	6	Taiwan 21,071; Indonesia 1,171.
Fertilizer materials:				
Manufactured:				
Nitrogenous -- thousand tons	1,816	1,554	--	China 1,186.
Phosphatic	26,243	23,477	--	Burma 10,118; Taiwan 5,950.
Potassic	2,006	6	--	Bangladesh 2; New Zealand 2.
Other including mixed	141,185	203,188	1,272	Thailand 130,667; Malaysia 17,806.
Ammonia	169,675	153,578	--	Philippines 152,133.
Fluorspar, leucite, nepheline, nepheline syenite	115	625	--	Vietnam 350; New Zealand 150.
Graphite, natural	1,554	1,745	233	Taiwan 786; Republic of Korea 226.
Gypsum and plasters	6,157	6,370	5	Taiwan 2,228; Indonesia 1,165; Republic of Korea 1,071.
Kyanite and related materials	22,721	21,460	--	Taiwan 14,642; Republic of Korea 2,761; Thailand 2,229.
Lime	28,581	20,076	--	Papua New Guinea 15,902; Australia 2,505.
Magnesium materials:				
Magnesite and magnesia clinker	133,832	113,440	5,739	Republic of Korea 20,179; Australia 19,060; Poland 17,000.
Oxides	4,467	5,822	732	Taiwan 1,009; West Germany 947; U.S.S.R. 800.
Mica, all forms	714	951	--	Hong Kong 375; Taiwan 307.
Pigments, mineral including processed iron oxides	16,731	19,532	4,451	Taiwan 7,368; Mexico 1,532; Egypt 1,352.
Precious and semiprecious stones except diamond:				
Natural -- kilograms	50,044	41,033	129	Taiwan 17,440; Republic of Korea 15,082.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Precious and semiprecious stones except diamond —Continued				
Manufactured kilograms	29,934	43,030	5,529	Republic of Korea 11,154; Malaysia 9,867; West Germany 7,725.
Salt and brine	2,774	2,299	1,622	Maldives 193; North Korea 113.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	243,413	380,677	21	Australia 327,462; Republic of Korea 31,667.
Caustic potash including sodic and potassic peroxides	5,268	7,083	135	Australia 1,928; Taiwan 1,796.
Soda ash	114,598	96,578	--	Indonesia 44,050; Philippines 16,005; Taiwan 14,307.
Stone, sand and gravel:				
Dimension stone	1,010	2,202	55	Taiwan 1,240; Republic of Korea 330.
Dolomite, chiefly refractory-grade	8,470	6,890	--	Indonesia 3,130; Philippines 2,428; Taiwan 1,077.
Gravel and crushed rock	213,617	90,797	28	Australia 77,506; Republic of Korea 10,816.
Limestone except dimension thousand tons	1,427	1,159	--	Australia 1,107.
Quartz and quartzite	1,209	1,276	18	Saudi Arabia 364; Republic of Korea 275; China 205.
Sand excluding metal-bearing	4,667	3,738	14	Kuwait 1,230; Taiwan 927; Saudi Arabia 463.
Sulfur:				
Elemental:				
Other than colloidal	414,884	364,268	--	Republic of Korea 267,784; Taiwan 86,532.
Colloidal	221	1,029	--	Republic of Korea 768; Cuba 115.
Sulfur dioxide[4]	33	81	34	Taiwan 26; Philippines 10.
Sulfuric acid	362,387	301,751	--	Philippines 74,923; Peru 64,246; Turkey 62,855.
Talc, steatite, soapstone	1,145	1,691	16	Taiwan 619; Vietnam 352; Republic of Korea 210.
Other:				
Crude	12,335	12,080	49	Taiwan 3,329; Republic of Korea 2,915; Burma 1,133.
Slag, dross, and similar waste, not metal-bearing	528,972	417,829	1,500	Singapore 117,400; Republic of Korea 108,693; Philippines 96,497.
Oxides, hydroxides, peroxides of magnesium, strontium, barium, n.e.s	27,019	14,898	249	Poland 10,502; Philippines 2,255.
Fluorine, bromine, iodine	5,524	5,707	2,304	West Germany 847; United Kingdom 708; France 683.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3	31	--	Taiwan 27.
Carbon black	26,883	15,941	139	Indonesia 3,240; India 1,618; China 1,534.
Coal, all grades, including briquets	59,563	70,726	--	Republic of Korea 62,161; Philippines 4,120.
Coke and semicoke thousand tons	2,081	2,330	198	Romania 415; Brazil 364; Philippines 204.
Hydrogen, helium, rare gases	1,008	680	17	Taiwan 413; Singapore 84; Malaysia 71.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	62	56	--	Taiwan 47; Republic of Korea 8.
Kerosine do	56	25	17	Republic of Korea 8.
Distillate fuel oil do	(2)	(2)	--	Mainly to Republic of Korea.
Residual fuel oil do	452	(2)	(2)	
Lubricants do	1,889	1,909	272	Republic of Korea 671; Taiwan 302.
Other:				
Mineral jelly and wax do	554	633	8	Republic of South Africa 174; Republic of Korea 90; Taiwan 54.
Liquefied petroleum gas do	367	2	--	Burma 1.
Petroleum coke do	37	149	53	Italy 74; Netherlands 17.
Bitumen do	7	100	--	Vietnam 80.
Unspecified do	101	116	(2)	Republic of Korea 67; Taiwan 24.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	163,991	133,142	7,657	U.S.S.R. 45,100; Taiwan 17,711; Vietnam 8,227.

[r] Revised.

[1] Excludes exports under the Japanese-United States Mutual Defense Agreement or for account of the U.S. military forces.

[2] Less than 1/2 unit.

[3] Excludes mosaic tiles valued at $82,918,000 in 1979 and $111,235,000 in 1980.

[4] May contain some arsenic trioxide and pentoxide.

Table 3.—Japan: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate thousand tons	4,597	5,708	4	Australia 3,715; Indonesia 1,225; Malaysia 650.
Oxides and hydroxides do	761	735	2	Australia 702.
Metal including alloys:				
Scrap	181,531	275,696	225,801	Canada 18,951; Australia 9,385.
Unwrought	748,438	910,085	308,712	Venezuela 131,523; Canada 123,589; New Zealand 93,079.
Semimanufactures	33,055	46,173	12,981	Romania 9,705; Venezuela 6,604; France 4,201.
Antimony:				
Ore and concentrate	6,702	6,996	--	Bolivia 6,055; Republic of South Africa 446.
Metal including alloys, all forms	3,202	1,563	(2)	China 1,432.
Arsenic:				
Natural sulfides	30	10	--	All from China.
Trioxide, pentoxide, acid	999	716	(2)	France 528; Mexico 116.
Beryllium:				
Oxides	75	85	85	
Metal including alloys, all forms kilograms	2,197	1,611	1,604	U.S.S.R. 7.
Chromium:				
Ore and concentrate	962,251	950,039	--	Republic of South Africa 407,429; Philippines 208,376; India 170,280.
Oxides and hydroxides	2,977	2,286	1,117	West Germany 765; U.S.S.R. 340.
Cobalt:				
Oxides and hydroxides	651	292	14	Belgium 248.
Metal including alloys, all forms	r1,669	1,653	335	Zaire 672; Belgium 465.
Columbium and tantalum:				
Columbium (niobium) ore and concentrate	1,659	1,764	29	Canada 915; Brazil 700.
Tantalum:				
Ore and concentrate	304	309	--	Thailand 141; Malaysia 131.
Metal including alloys, all forms	61	46	36	West Germany 4; Taiwan 4.
Copper:				
Ore and concentrate thousand tons	2,969	3,104	295	Philippines 919; Canada 705; Papua New Guinea 292.
Matte	1,580	2,574	2,549	Taiwan 22.
Sulfate	730	570	(2)	China 278; U.S.S.R. 100; Taiwan 54.
Metal including alloys:				
Scrap	50,158	49,929	22,522	Hong Kong 14,618; Taiwan 6,353.
Unwrought	395,062	290,803	3,711	Zambia 131,725; Peru 48,392; Chile 45,131.
Semimanufactures	3,295	3,330	2,014	West Germany 321; Republic of Korea 243.
Germanium:				
Dioxide	15	19	(2)	Belgium 11; West Germany 7.
Metal including alloys, all forms kilograms	9	134	2	China 125.
Gold metal including alloys, unwrought and partly wrought thousand troy ounces	r2,332	1,170	16	Switzerland 538; United Kingdom 376.
Indium metal including alloys, all forms kilograms	6,572	3,017	131	Canada 1,200; Belgium 701.
Iron and steel:				
Ore and concentrate except roasted pyrite thousand tons	130,268	133,721	--	Australia 60,040; Brazil 28,523; India 16,507.
Roasted pyrite	1,495	--		
Metal:				
Scrap thousand tons	3,346	2,986	2,581	Australia 184; U.S.S.R. 119.
Pig iron including cast iron do	551	739	20	China 224; Australia 101; Republic of Korea 90.
Sponge iron, powder, shot	13,054	42,722	395	Indonesia 30,253; Sweden 11,450.
Ferroalloys	503,796	477,293	18,424	Republic of South Africa 237,501; Norway 29,106; Canada 19,601.
Steel, primary forms	648,629	522,466	16,904	Republic of Korea 331,812; Sweden 73,575.
Semimanufactures	37,203	32,525	2,575	Republic of Korea 23,058.
Lead:				
Ore and concentrate	218,544	258,634	--	Canada 164,878; Peru 43,474.
Oxides	1,492	1,463	68	Mexico 1,023; China 173.

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Lead —Continued				
Metal including alloys:				
Scrap	2,023	5,020	3,188	Australia 923; Kuwait 293.
Unwrought	62,672	90,712	6,112	North Korea 22,485; Mexico 17,377; Peru 13,544.
Semimanufactures	31	382	208	Peru 149.
Lithium:				
Elemental	20	20	20	
Oxides	780	603	405	U.S.S.R. 195.
Magnesium metal including alloys, all forms	12,230	12,907	9,008	Norway 1,797; Canada 1,546.
Manganese:				
Ore and concentrate thousand tons	2,692	2,953	--	Republic of South Africa 1,299; Australia 613; India 519.
Oxides	216	762	3	Belgium 756.
Mercury 76-pound flasks	3,143	2,662	1	Algeria 1,750; Mexico 811.
Molybdenum:				
Ore and concentrate	18,431	20,379	10,570	Canada 6,190; Chile 2,525.
Trioxide	613	826	807	North Korea 13.
Metal including alloys, all forms	73	55	33	West Germany 21.
Nickel:				
Ore and concentrate thousand tons	4,015	3,950	--	New Caledonia 2,000; Indonesia 1,310.
Matte, speiss, similar materials	42,041	51,751	--	Indonesia 26,763; Australia 19,864.
Metal including alloys:				
Scrap	1,948	1,824	795	Taiwan 680.
Unwrought	19,719	15,645	644	Canada 3,998; U.S.S.R. 2,401; Australia 2,288.
Semimanufactures	3,291	3,613	2,088	United Kingdom 889; Canada 335.
Platinum-group metals:				
Waste and sweepings value, thousands	$723	$1,250	$4	Taiwan $1,185.
Metal including alloys, unwrought and partly wrought:				
Platinum thousand troy ounces	980	1,010	120	Republic of South Africa 589; U.S.S.R. 160; United Kingdom 126.
Palladium troy ounces	967,254	766,824	87,454	U.S.S.R. 491,313; Republic of South Africa 104,677.
Rhodium do	38,677	26,290	7,990	U.S.S.R. 10,169; Republic of South Africa 6,861.
Iridium, osmium, ruthenium do	30,479	27,533	3,863	Republic of South Africa 12,329; United Kingdom 11,125.
Alloys do	37,777	23,468	2,200	West Germany 14,877; Switzerland 4,536.
Rare-earth metals:				
Oxides and crude chlorides	2,652	3,333	584	China 2,040.
Metals (yttrium, scandium, intermixtures)	86	42	1	Brazil 32.
Selenium, elemental kilograms	726	1,036	5	Canada 1,031.
Silicon:				
Elemental	58,191	59,683	8,941	Republic of South Africa 8,798; Portugal 8,589; Canada 8,090.
Dioxide	3,013	3,307	1,827	Republic of Korea 721; China 368; West Germany 313.
Silver:				
Ore and concentrate	4,113	3,400	--	All from Republic of Korea.
Waste and sweepings value	$158,096	$137,322	--	Republic of Korea $66,739; Singapore $51,264.
Metal including alloys, unwrought and partly wrought thousand troy ounces	23,523	19,090	953	Mexico 11,650; Peru 4,060.
Tellurium, elemental kilograms	14,681	9,779	3	U.S.S.R. 8,000; Peru 1,771.
Tin:				
Oxides	5	5	--	Australia 4.
Metal including alloys, all forms	30,555	31,155	5	Malaysia 18,455; Indonesia 6,324; Thailand 6,166.
Titanium:				
Ore and concentrate	420,433	409,080	--	Malaysia 173,380; Australia 111,121.
Slag	75,864	152,663	--	Canada 89,251; Republic of South Africa 63,412.
Oxides	3,939	4,098	96	United Kingdom 1,056; Belgium 850; West Germany 814.

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Tungsten:				
Ore and concentrate	3,133	3,480	101	Republic of Korea 733; Canada 675; Australia 557.
Metal including alloys, all forms	134	135	5	Republic of Korea 112.
Uranium and thorium:				
Ore and concentrate	30	--		
Oxides (composed of thorium and uranium depleted in U-235) kilograms	565	839	339	United Kingdom 500.
Vanadium pentoxide	4,633	3,404	39	Republic of South Africa 3,066; West Germany 214.
Zinc:				
Ore and concentrate	959,229	804,851	--	Australia 272,425; Canada 259,214; Peru 196,707.
Oxides	4,317	4,544	9	Taiwan 1,388; Republic of Korea 1,301; Singapore 1,065.
Metal including alloys, all forms	41,027	45,892	285	North Korea 32,110; Republic of Korea 7,014.
Zirconium:				
Ore and concentrate including zircon sand	161,505	190,109	15	Australia 164,312; Republic of South Africa 25,127.
Metal including alloys, all forms	144	103	32	France 36; Canada 18.
Other:				
Ores and concentrates	128	53	--	Zaire 51.
Ash and residue containing nonferrous metals	64,033	59,042	21,621	Philippines 16,123; Australia 7,928.
Oxides, hydroxides, pentoxides	1,651	2,148	134	China 580; Canada 421; Norway 294.
Metals:				
Metalloids	r12,444	14,018	4,992	Canada 4,849; U.S.S.R. 1,982.
Alkali and alkaline-earth metals	97	99	96	West Germany 2.
Pyrophoric alloys	15	7	5	United Kingdom 1.
Base metals including alloys, all forms	r312	10	(2)	West Germany 9.
NONMETALS				
Abrasives, n.e.s.:				
Natural, crude	4,571	4,344	1,088	India 2,429.
Artificial corundum	10,875	13,900	132	Brazil 5,409; India 3,692; China 1,658.
Dust and powder of precious and semi-precious stones excluding diamond kilograms	37,495	67,258	--	All from West Germany.
Grinding and polishing wheels and stones	169	200	65	Italy 64; West Germany 23.
Asbestos, crude	291,531	305,408	13,044	Canada 122,491; Republic of South Africa 90,658.
Barium materials:				
Barite and witherite	24,565	40,173	--	China 35,585; Thailand 4,573.
Oxides and hydroxides	292	280	--	Italy 234; China 46.
Boron materials:				
Crude, natural borates	67,378	63,548	--	Turkey 60,770.
Oxides and acids	20,330	17,262	14,208	U.S.S.R. 1,944; China 877.
Cement	2,128	4,149	1,677	Republic of Korea 2,080.
Clays and clay products:				
Crude:				
Kaolin	578,548	565,404	450,898	Republic of Korea 60,526.
Kyanite, andalusite, sillimanite	22,801	26,682	8,301	Republic of South Africa 15,287.
Other	300,509	288,221	90,347	China 119,188; Republic of South Africa 45,428.
Products:				
Refractory including nonclay brick	7,988	8,578	960	Sweden 3,633; Republic of South Africa 1,532.
Nonrefractory	22,520	23,446	503	Italy 9,392; Republic of Korea 5,867.
Cryolite and chiolite	279	230	--	Denmark 119; Greenland 111.
Diamond:				
Gem, not set or strung thousand carats	732	744	29	India 243; Israel 234.
Industrial do	624	681	207	Republic of South Africa 168; United Kingdom 83; Zaire 76; Belgium 73.
Powder and dust do	18,633	20,275	11,815	Ireland 7,536.
Diatomite and other infusorial earth	5,962	7,464	7,454	Mexico 10.
Feldspar, leucite, nepheline, nepheline syenite	5,269	5,568	19	China 2,589; India 1,393.

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials:				
Crude:				
Nitrogenous (natural sodium nitrate)	3,000	3,000	--	All from Chile.
Phosphatic thousand tons	2,828	2,762	1,585	Morocco 645; Jordan 316.
Manufactured:				
Nitrogenous	24,349	34,937	998	Chile 22,000; Norway 4,666; Republic of Korea 4,518.
Phosphatic	76,814	58,924	26,812	Republic of Korea 31,817.
Potassic thousand tons	1,342	1,533	195	Canada 645; U.S.S.R. 288.
Other including mixed	211,427	224,089	206,436	Republic of Korea 8,470; Canada 5,498.
Ammonia	32	25	25	
Fluorspar	467,135	487,455	--	China 223,118; Republic of South Africa 131,990; Thailand 126,512.
Graphite, natural	70,955	69,605	88	Republic of Korea 26,088; China 21,215.
Gypsum and plasters	29,796	33,235	1,666	Morocco 31,500.
Magnesium materials:				
Magnesite and magnesia clinker	121,511	180,450	1	North Korea 105,323; China 68,678.
Oxides	r626	271	46	West Germany 117; United Kingdom 84.
Mica, all forms	8,209	11,660	324	India 4,822; China 2,380; Republic of Korea 1,720.
Pigments, mineral including processed iron oxides	6,182	5,821	1,408	China 2,087; West Germany 1,856.
Precious and semiprecious stones except diamond:				
Natural	645	606	39	Brazil 367; Republic of South Africa 71.
Manufactured	35	62	42	West Germany 9.
Pyrites, gross weight	7,300	--		
Salt and brine thousand tons	6,818	7,480	20	Mexico 3,759; Australia 3,006.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	49,009	67,977	23,655	Republic of Korea 43,954.
Caustic potash and sodic and potassic peroxides	106	111	96	West Germany 15.
Soda ash	561	4	--	Mainly from United Kingdom.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	577,604	593,183	29,824	India 171,829; Republic of Korea 129,184; Republic of South Africa 64,562.
Worked	83,028	74,801	25	Republic of Korea 42,845; Italy 12,906.
Dolomite including agglomerates	247,202	214,977	1,858	Taiwan 122,233.
Gravel and crushed rock	236,790	326,788	21	Taiwan 314,816.
Limestone except dimension	787	698	--	All from France.
Quartz and quartzite	100,177	92,933	148	China 34,524; Republic of Korea 29,840; India 13,954.
Sand excluding metal-bearing	693,410	890,169	975	Australia 601,709; Taiwan 163,152.
Sulfur:				
Elemental, colloidal	574	818	810	West Germany 8.
Sulfuric acid kilograms	50	631	335	West Germany 275.
Dioxide do	--	9	9	
Talc, steatite, soapstone, pyrophyllite	550,265	501,086	18,255	China 341,882; Australia 75,461.
Other:				
Crude:				
Meerschaum, amber, jet	31	179	--	Mainly from Spain.
Unspecified	320,350	249,487	5,211	Republic of Korea 164,865; Spain 32,025.
Slag, dross, similar waste, including kelp, not metal-bearing	171,699	140,538	1	India 61,257; Republic of Korea 56,235.
Oxides, hydroxides, peroxides of magnesium, strontium, barium, n.e.s	53	125	19	China 100.
Bromine and iodine	1,543	1,929	42	Israel 1,875.
Boron and arsenic	62	42	8	Sweden 34.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	4,281	4,460	3,340	Trinidad 1,100.
Carbon black	9,966	9,021	4,794	Canada 1,956; Mexico 1,139.
Coal and briquets:				
Anthracite thousand tons	1,028	1,191	38	China 470; Vietnam 334; Republic of South Africa 168.

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal and briquets —Continued				
Bituminous:				
Heavy coking, less than 8% ash thousand tons	16,242	18,259	11,603	Australia 4,094; Canada 1,348.
Heavy coking, more than 8% ash do	26,918	28,286	3,715	Australia 13,800; Canada 9,196.
Other do	14,366	20,492	4,205	Australia 11,417; Republic of South Africa 2,899.
Lignite and lignite briquets do	42	34	1	Australia 16; U.S.S.R. 15.
Coke and semicoke do	11	53	28	Australia 24.
Hydrogen, helium, rare gases	201	248	247	France 1.
Peat including briquets and litter	7,815	8,964	43	Canada 8,816.
Petroleum:				
Crude and partly refined:				
Crude thousand 42-gallon barrels	1,718,622	1,543,915	(2)	Saudi Arabia 528,838; Indonesia 222,585; United Arab Emirates 217,276.
Partly refined do	22,379	39,702	--	Saudi Arabia 22,603; Kuwait 7,673.
Refinery products:				
Gasoline do	65,027	56,884	264	Saudi Arabia 14,796; Singapore 12,898; Kuwait 12,588.
Kerosine and jet fuel do	4,587	3,974	313	Singapore 2,740; China 459.
Distillate fuel oil do	29,962	18,744	5	Saudi Arabia 13,830; China 1,885.
Residual fuel oil do	89,343	69,624	458	Indonesia 24,991; Singapore 12,088; Kuwait 6,838.
Lubricants do	871	62	57	NA.
Mineral jelly and wax do	155	104	38	Singapore 53.
Other:				
Liquefied petroleum gas do	223,101	307,533	9,965	Indonesia 101,800; Brunei 64,375; Saudi Arabia 60,727.
Paraffin liquid do	76	94	94	
Petroleum coke do	12,464	13,606	10,935	China 1,265.
Bitumen and other residues do	1,425	21	10	United Kingdom 8.
Unspecified do	95	229	225	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	199,648	238,604	46,790	Republic of Korea 98,936; China 91,365.

rRevised. NA Not available.

[1]Excludes imports under the Japanese-United States Mutual Defense Agreement or for account of the U.S. military forces.

[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—In 1981, Japan's aluminum industry experienced the worst year in its history. The industry's capacity was reduced from 1.64 million tons per year in 1979 to 1.3 million tons per year in 1980. During 1981, almost every primary producer except Sumikei Aluminum Industries, Ltd., either temporarily reduced capacity or closed down its plants. As a result, primary capacity was reduced to 1.14 million tons by yearend. Annual capacity of primary aluminum in 1979-81 and capacity and output in 1981 by company and by plant are shown in table 4.[5]

Because of high energy costs, rising imports, falling domestic demand, and growing stocks, Japan's aluminum industry was forced to cut back its primary production to the 770,000-ton level in 1981. During 1981, Nippon Light Metal Co., Ltd., was operating at 77.5% of capacity, Showa Light Metal Co., Ltd., at 56.4%, Sumitomo Aluminum Smelting Co., Ltd., at 68.6%, Mitsubishi Light Metal Industries Co., Ltd., at 53.2%, Mitsui Aluminum Co., Ltd., at 71.8%, and Sumikei Aluminum at 93.9%. The industry as a whole was operating at 67.8% of capacity.

High energy costs had weakened the competitiveness of Japanese aluminum not only in the world market but also in the domestic market. Because of cheap foreign

aluminum, Japan's imports of primary aluminum surged again by 16.6% and reached another record of 980,921 tons in 1981. Imports of aluminum and aluminum alloy ingots totaled 1,129,322 tons in 1981 compared with 910,085 tons in 1980. Of the total imports in 1981, 23.6% were from the United States, 14.3% from Venezuela, 10.3% from Canada, 9.6% from New Zealand, 6.2% from Australia, 5.8% from the U.S.S.R., 5.1% from Argentina, and 25.1% from other countries.

Japan's domestic demand for primary aluminum fell further, to 1.57 million tons in 1981 from 1.64 million tons in 1980. Demand for primary aluminum from rolling mills, accounting for 76% of total consumption, dropped 6.4%, and demand from wire and cable mills dropped 10%. The decline in demand was a result of reduced manufacturing of sash, wire, and cable caused by sluggish housing construction.

Japan's primary aluminum stocks were at an alltime high of 768,166 tons at the end of 1981 compared with 470,446 tons in 1980. Aluminum stocks at producers' plants rose 32.9% to 307,760 tons, those at dealers' warehouses, 370.5% to 226,895 tons; and those at fabricators' plants, 10.9% to 211,521 tons. A stockpile of 21,990 tons held by the Japanese Light Metal Stockpiling Association was reported in 1981 for the first time since 1978.

To save Japan's aluminum industry from further deterioration, several measures were proposed by MITI and approved by the Aluminum Committee of the Industry Structure Council in October 1981. These measures included plans to curtail the industry's smelting capacity to 712,000 tons per year, to introduce a tariff quota system for imports of aluminum ingots, and to lighten electric power costs within the limits of the current power rate system. In December 1981, an understanding was obtained by MITI from the Ministry of Finance on a tariff quota system for aluminum imports. According to the plan proposed by MITI, a 9% tariff will not be imposed on aluminum ingots imported by Japanese smelters under the development-and-import scheme for 3 years beginning in April 1982. However, a 9% tariff will be imposed on aluminum ingots imported under long-term contract and on a spot basis. The aluminum ingot to be imported by Japanese smelters duty free in FY 1982 was estimated at between 400,000 and 450,000 tons. An estimated $136 million fund was to be appropriated and raised by the tax exemption in 3 years for helping the industry to slash its capacity to 700,000 tons per year.

According to industry sources, the cumulative deficit of the six primary aluminum smelters was about $450 million and the combined loan amounted to over $4.5 billion in 1981. The industry's financial difficulty was a direct result of weakened international competitiveness caused by higher energy costs. In 1981, only about 200,000 tons per year of the industry's 1.14-million-ton-per-year capacity was considered low cost and remained profitable and competitive in the world market. In an effort to reduce deficits and to survive, three measures were taken by the Japanese aluminum smelters: (1) increased investment in overseas smelting operations, (2) acceleration of the conversion of smelting energy from oil- to coal-fired generating plants, and (3) increasing the added value of aluminum products of the smelters through additional downstream fabrication.

For the past year, the Japanese major aluminum smelters had gone overseas to expand their aluminum smelting operations in New Zealand, Canada, Venezuela, the United States, Indonesia, Australia, and Brazil. A summary of these overseas smelting projects is shown in table 5.[6]

The energy source for projects in Brazil, Canada, Indonesia, New Zealand, and Venezuela will be from hydropower plants, while coal will provide the energy for the projects in Australia and the United States.

In 1982, the Asahan project in Indonesia and the Gladston project in Australia will start to operate their smelters, and the Japanese smelters will import portions of the aluminum output from these two countries duty free for 3 years.

Of the 12 smelters operated by 6 primary aluminum producers in 1981, only 2 plants were not using oil as a smelting energy source. Nippon Light Metal used hydropower at Kambara, and Mitsui Aluminum used coal at Miike, which had converted the powerplant at Omata to coal in 1980. During 1981, Sumitomo Aluminum invested over $260 million in a joint venture with Kokuriku Power Co. to build a new coal-fired powerplant for its smelter at Kikumoto, which had been shut down since 1975. Other smelters were either planning or seriously considering conversion from oil to other energy sources; e.g., coal in the short run and nuclear power in the long run.

Mitsui Aluminum reportedly succeeded in experiments with a new aluminum process that involves direct smelting of bauxite

with coking coal and chemical additives in a blast furnace at about 2,000° C. In an effort to cut down energy cost of aluminum smelting, six smelters have joined MITI in an industry-Government research program on developing the new aluminum process. According to Mitsui Aluminum, the new process could reduce the energy consumption per ton of aluminum to 10,000 kilowatt-hours from 15,000 kilowatt-hours required currently. Showa Aluminum and Mitsubishi Light Metal Industries reportedly have developed independently a new low-cost process to produce superpurity aluminum. Mitsubishi Light Metal planned to build a new production facility with the new process to produce 3,000 tons per year of superpurity aluminum (99.999%) by mid-1982, while Showa Aluminum planned to expand its pilot plant capacity from 250 to 1,000 tons per year.[7]

In becoming further vertically integrated, Nippon Light Metal had completed its entry into aluminum fabricating in 1981. Other aluminum smelters were expected to follow suit in the coming years.

Table 4.—Japan: Primary aluminum annual capacity and production

(Metric tons)

Company and plant location	Annual installed capacity		1981 shutdown capacity	1981	
	3/31/79	3/31/81		Capacity	Output
Mitsubishi Light Metal Industries Co., Ltd.:					
Naoetsu	160,160	160,160	--	[1]160,160	NA
Sakaide	192,480	147,190	70,760	76,430	NA
Total	352,640	307,350	70,760	236,590	125,872
Mitsui Aluminum Co., Ltd.: Miike	163,830	163,830	19,460	144,370	103,683
Nippon Light Metal Co., Ltd.:					
Kambara	94,960	63,850	--	63,850	NA
Niigata	147,660	--	--	--	NA
Tomakomai	134,410	134,410	--	134,410	NA
Total	377,030	198,260	--	198,260	153,607
Showa Light Metal Co., Ltd.:					
Kitakata	28,720	28,720	11,800	16,920	NA
Ohmachi	42,800	23,720	5,780	17,940	NA
Chiba	170,290	127,510	--	127,510	NA
Total	241,810	179,950	17,580	162,370	91,633
Sumikei Aluminum Industries, Ltd.: Sakata	98,710	98,710	--	98,710	92,664
Sumitomo Aluminum Smelting Co., Ltd.:					
Isoura	78,980	78,980	--	78,980	NA
Nagoya	52,800	--	--	--	NA
Toyama	177,680	177,680	59,230	118,450	NA
Toyo	98,710	98,710	--	98,710	NA
Total	408,170	355,370	59,230	296,140	203,143
Grand total	1,642,190	1,303,470	167,030	1,136,440	770,602

NA Not available.
[1]Shut down in October 1981.

Table 5.—Japan: Overseas aluminum smelting projects

Country and project name	Annual capacity (thousand tons)	Japanese output share (thousand tons)	Status of project
New Zealand: Bluff	152	75	Completed in 1977.
Canada: Kitimat	90	45	Do.
Venezuela: Venalum	280	160	Completed in 1979.
United States: Alumax, Mount Holly, S.C.	180	45	Completed in 1980.
Indonesia: Asahan	225	170	Scheduled for partial completion in 1982.
Australia: Gladston	203	101	Scheduled for completion in 1982.
Australia: Hunter Valley	232	([1])	Scheduled for completion in 1984.
Brazil: Albras	320	160	Scheduled for partial completion in 1984.

[1]Undetermined.

Antimony.—Production of antimony was by Nihon Mining and Concentrating Co., Ltd. (metal and trioxide), Sumitomo Metal (trioxide), Hibino Metal Industries Co., Ltd. (metal and trioxide), Sankoku Refinery Co., Ltd. (metal and trioxide), and Nippon Mining (trioxide).

Japan imported 6,531 tons of antimony ores and concentrates, principally from Bolivia (87%) and China (11%) for the production of antimony metal and trioxide. Imports of 2,366 tons of antimony metal were mainly from China (95%). Japan also imported 1,048 tons of antimony trioxide, principally from China, 49%; the U.S.S.R., 28%; and the United Kingdom, 22%.

About 1,400 tons of antimony metal was consumed by the manufacturers of storage batteries, 60%; in antifriction alloys, 8%; for hard lead casting, 5%; for printing type, lead pipe and sheet, plating, and other uses, 27%. Consumption of antimony trioxide was estimated at 5,500 tons; about 85% was for the production of flame retardants, and the remaining 15% was for manufacturing glass, enamel, and other.

Cadmium and Bismuth.—Japan was the world's second largest producer of cadmium metal, following the U.S.S.R., and the fourth largest producer of bismuth metal in 1980. Cadmium was produced as a byproduct of zinc smelting, while bismuth was produced as a byproduct of lead refining. According to industry sources, the output share by producer for the two metals in 1980 was as follows in percent:[8]

Company	Output share	
	Cadmium	Bismuth
Dowa Mining Co., Ltd	15.5	23.3
Furukawa Mining Co., Ltd	—	3.0
Mitsubishi Metal Corp	18.8	11.5
Mitsui Mining and Smelting Co., Ltd.	22.5	28.2
Nippon Mining Co., Ltd	19.0	15.8
Nisso Metal Co., Ltd	2.8	--
Sumitomo Metal Smelting Co., Ltd.	9.3	7.0
Toho Zinc Co., Ltd	12.1	11.2
Total	100.0	100.0

In 1981, the production of cadmium declined slightly, reflecting the reduction in exports. About 1,000 tons of cadmium was consumed in 1981, about 46% for nickel-cadmium batteries, 31% for pigments and paints, 9% for alloys, and 14% for others. During 1981, 938 tons of cadmium metal was exported, mainly to the German Democratic Republic, 36%; the United Kingdom, 15%; Taiwan, 10%; and other East European countries, 28%.

Production of bismuth rose sharply, reflecting increased demand for the metal in both domestic and foreign markets. Domestic consumption of bismuth in 1981 was about 300 tons, of which about 31% was for metallurgical additives, 22% for ferrites, 21% for low-melting alloys, 10% for pharmaceuticals, and 16% for other. During 1981, Japan exported 252 tons of bismuth metal, principally to the U.S.S.R., the United States, the Federal Republic of Germany, Poland, and the Netherlands.

Chromium.—Domestic output of chromite ores and concentrates dropped to the 11,000-ton level in 1981, and the average chromium content of the concentrates was about 33%. Japan continued to import over 97% of its requirements for chromium. Japan imported 743,937 tons of chromium ores and concentrates from the Republic of South Africa, 47%; the Philippines, 20%; India, 19%; the U.S.S.R., 6%; Albania, 4%; and 4% from China, Vietnam, Pakistan, Turkey, Cuba, and Finland.

Consumption of chromium ores and concentrates was mainly by the iron and steel industry for the manufacture of high- and low-carbon ferrochromium. In 1981, total consumption of chromite for the production of ferroalloys was 593,888 tons compared with 798,066 tons in 1980. About 50,000 tons of chromite was also consumed by the steel producers as refractory materials, and 189,928 tons of ferrochromium was imported for the manufacture of stainless steel. The major overseas suppliers were the Republic of South Africa, 66%; Brazil, 15%; Zimbabwe, 11%; and 8% from China, India, the United States, the Philippines, Yugoslavia, Sweden, and the Federal Republic of Germany.

A relatively smaller quantity of chromium ores and concentrates was consumed by the manufacturers of chromium metal and chromium compounds. Chromium metal was produced by Toyo Soda Manufacturing Co., Ltd., and Nippon Denko Co., Ltd. The annual capacity of Toyo Soda at its Yamagata plant was expanded from 3,000 to 3,600 tons of chromium metal in October 1981. Nippon Denko's annual capacity was about 700 tons. According to industry sources, about 2,000 to 2,500 tons of high-purity chromium metal was exported, and about 1,300 tons was consumed domestically for the manufacture of superalloys, 55%; aluminum-copper alloys, 24%; welding rods, 19%; and other, 2%. Consumption of chro-

mium compounds estimated at 35,000 to 40,000 tons of sodium dichromate was mainly for metal surface treatment, 37%; paints, 22%; leathers, 19%; ceramics, 6%; and other, 16%. Exports of sodium dichromate totaled 66,193 tons in 1981, of which about 66% went to China, 11% to the Republic of Korea, 9% to Taiwan, 8% to the United States, and 6% to other countries in Southeast Asia.

Cobalt.—Production of cobalt was by Sumitomo Metal with an annual production capacity of 1,600 tons and Nippon Mining with an annual capacity of 1,200 tons. The two companies received all of their raw material from overseas. Sumitomo Metal imported mixed nickel-cobalt sulfides from Marinduque's Surigao nickel refinery of the Philippines for cobalt refining at its Niihama plant, and Nippon Mining received mixed nickel-cobalt sulfides from Greenvale of Australia for cobalt refining at its Hitachi plant.

Cobalt production dropped 16% as a result of a 21% reduction in domestic demand. Imports of 886 tons of cobalt were principally from Belgium, 28%; Zaire, 24%; the United States, 16%; and Finland, 11%.

Consumption of cobalt was for the manufacture of magnetic alloys, 30%; specialty steels (including high-speed, heat-resistant, and other alloy steels), 17%; ultra-hard alloys (cemented carbides), 10%; catalysts, 8%; and other, 31%. Stocks of cobalt at the end of 1981 were 617.5 tons in 1981 compared with 679.5 tons in 1980.

Copper.—Japan's copper mine output declined further in 1981; however, production of refined copper reached another record high. The share of imported ores and concentrates in Japan's refined copper production has increased from 82.0% in 1977 to 84.4% in 1981, while the share of domestic ore decreased from 8.9% to 4.2%.

Japan's refined copper production by sources of raw materials in 1977-81 was as follows:

Year	Share of production (percent)		
	Domestic ore	Imported ore	Scrap and others
1977	8.9	82.0	9.1
1978	5.9	83.2	10.9
1979	5.2	81.6	13.2
1980	4.8	82.9	12.3
1981	4.2	84.4	11.4

During 1981, Japan's imported ores and concentrates totaled 3,338,326 tons. The supplying countries were the Philippines, accounting for 25.8%; Canada, 23.0%; the United States, 14.6%; Papua New Guinea, 9.0%; Chile, 6.0%; Indonesia, 4.4%; Malaysia, 4.0%; Australia, 3.7%; Zaire, 3.1%; and others, 6.4%.

According to MITI's annual report, the substantial increase in imports of copper concentrate from the United States was the main contributing factor for the increase in production of refined copper in 1981. Imports of copper concentrates from the United States rose 65.5% to 488,462 tons in 1981, of which about 390,000 tons of copper concentrates containing 25% to 28% copper was supplied by Anaconda Copper Co. under a 7-year contract signed in December 1980. During 1981, Japan also imported 241,146 tons of refined copper, of which 61.0% was imported from Zambia, 15.2% from Chile, 14.5% from Peru, and 9.3% from other countries.

Japan's domestic demand for refined copper rose 2.2% to 1,354,000 tons in 1981. The increased demand was due to a 5% increase in consumption of refined copper by the manufacturers of electric wire. During 1981, about 906,700 tons was consumed by the electric wire sector, 424,900 tons by the brass mill sector, and 23,300 tons by manufacturers of cast copper alloys, coins, and others. For the past decade, as a result of the positive Government investment policy and active private investment, consumption of refined copper by the manufacturers of electric wire increased from 666,000 tons to over 900,000 tons, while consumption by brass mills increased from 255,000 tons to over 420,000 tons. The increased use of telecommunication and increased activities in electrical machinery and electrical power industries contributed to the strong growth in demand from the electric wire sector, while increased production of automobiles and electrical machinery and equipment were the major driving forces for the continuing growth in demand from the brass mill sector.

Japan's exports of refined copper were only 38,301 tons in 1981, an 81% drop from those of 1980. The importers of Japanese refined copper in 1981 were Taiwan, accounting for 36.8%; Indonesia, 22.3%; the United States, 12.8%; the Republic of Korea, 11.5%; the U.S.S.R., 10.5%; and others, 6.1%. The worldwide economic recession was the primary cause of the decline in exports.

The total stocks of refined copper at the end of 1981 declined slightly from those of

1980. Stocks at producer plants fell from 53,851 tons at the end of 1980 to 50,591 tons at the end of 1981. Stocks held by consumers (wire manufacturers and brass mills) also dropped, from 88,457 tons in 1980 to 71,481 tons in 1981; however, stocks held by dealers rose from 18,606 tons in 1980 to 40,484 tons in 1981.

During 1981, Japan's copper refining industry was operating at about 84% of its 1.25-million-ton-per-year capacity. Because of increasing imports of ores and concentrates from Anaconda, Nippon Mining Co., Ltd., and Sumitomo Metal Mining Co., Ltd., were reportedly expanding their refining capacities at Nippon Mining's Saganoseiki plant and at Sumitomo Metal's Toyo plant. Upon completion of the expansion programs by September 1982, refining capacity of Nippon Mining at Saganoseiki will be increased from 168,000 to 204,000 tons per year, and capacity at the Toyo plant of Sumitomo Metal will increase from 48,000 to 84,000 tons per year. In September 1981, Hibi Kyodo Smelting Co., Ltd., reportedly had increased its refining capacity at Tamano from 102,000 to 134,000 tons per year. The cost of this expansion program was estimated at $7.3 million.

In September 1981, Rasa Industries Co., Ltd., sold its smelter at Miyoko to Godo Shigen Sangyo. Beginning in October 1981, Godo was operating the smelter to toll smelt copper ore for Mitsui Mining and Smelting Co., Ltd., under a long-term agreement. Sumitomo Metal was planning to expand its smelting capacity of blister copper from 168,000 to 180,000 tons per year at Toyo and to expand its refining capacity from 132,000 to 153,000 tons per year at Niihama.

The Metal Mining Agency of Japan reportedly is expected to extend loans of about $9 million to China for developing the Anquin copper mine during 1982-86. The formal joint-venture agreement was signed between the two Governments in November 1981. According to the agreement, a Japanese technological assistance team is expected to arrive in China in April 1982. Exploration activities will include shaft sinking, diamond drilling, underground mapping, and data analysis. Based on preliminary exploration, the Anquin copper deposit has potential ore reserves of about 31 million tons, grading 1.34% copper.[9]

In October 1981, Japan extended a $475,800 loan to develop the Kutcho copper mine in Canada. The mine was being developed by a consortium in which Sumitomo Metal has a stake. The estimated ore reserves were 15.7 million tons, grading 1.6% copper and 2.16% zinc.

Gold and Silver.—Mine production of gold declined, while mine production of silver increased in 1981. Domestic mine output of gold supplied only about 7% of gold metal refining production, while mine output of silver supplied about 21% of silver metal refining production in 1980-81. Metal production of gold and silver was by eight companies. Their output shares for FY 1981 by company were as follows, in percent:[10]

Company	Output share	
	Gold	Silver
Dowa Mining Co., Ltd	7.7	18.0
Furukawa Mining Co., Ltd	5.1	5.2
Mitsubishi Metal Corp	32.4	19.2
Mitsui Mining and Smelting Co., Ltd	18.8	22.1
Nippon Mining Co., Ltd	21.4	15.6
Nittetsu Mining Co., Ltd	1.5	.8
Sumitomo Metal Mining Co., Ltd	12.5	11.6
Toho Zinc Co., Ltd	.6	7.5
Total	100.0	100.0

During 1981, imports of gold reached an alltime record of 5.38 million troy ounces, which was about five times that of 1980. The sharp increase in 1981 gold imports was attributable partially to the lower price of gold but was largely due to a shift of investment from savings accounts to gold hoarding by the Japanese bank depositors as an investment alternative motivated by a proposed tax bill that will prevent depositors from taking advantage of certain tax-free savings accounts in Japanese banks. The major overseas gold suppliers were the United Kingdom, 39%; Switzerland, 35%; and the U.S.S.R., 22%. Japan imported 14.3 million troy ounces of silver, mainly from Mexico, 63%; Peru, 17%; and Australia, 11%.

Demand for gold and silver by end user in 1981 remained about the same as in 1980 except that gold purchases for private hoarding increased very sharply by about 280% in 1981.

According to the Metal Mining Agency of Japan, a new gold deposit was discovered at Hishikari, Isa County of Kaogoshima, in southern Kyushu. The property is owned by Taio Mining Co., Ltd., a subsidiary of Sumitomo Metal. According to an interim report prepared by Sumitomo Metal following the agency's earlier exploration, the gold deposit is about 600 meters long from east to west and 100 to 150 meters in depth. Sumitomo

Metal was expected to spend $18 million for detailed exploration.[11]

Iron and Steel.—Japan's crude steel production fell 8.7% in 1981 from that of 1980. The total crude steel output, accounting for 14.4% of the world's total output in 1981, was the lowest since 1972, and Japan slipped back to third place in world steel production, following the U.S.S.R. and the United States. Japan's production of pig iron also dropped by 8% to just a little over 80 million tons in 1981. The cutback in production of iron and steel was due to a sharp fall in domestic demand, a slower liquidation of steel inventory, and a decrease in exports of steel in 1981.

Japan's production of crude steel was principally by five integrated steelmakers. Their combined output of crude steel accounted for 72.4% of Japan's total steel production in 1981. The crude steel production of these steelmakers and their ranking among the world's top 35 crude steel producers in 1980-81 were as follows:[12]

Company	World ranking		Output (million tons)	
	1980	1981	1980	1981
Nippon Steel Corp	1	1	32.93	29.64
Nippon Kokan K.K	3	4	16.15	14.55
Kawasaki Steel Corp	8	8	12.68	11.40
Sumitomo Metal Industries, Ltd.	7	9	12.70	11.38
Kobe Steel Ltd	18	23	7.43	6.70

The output, capacity, and capacity utilization of the iron and steel industry in 1981 are shown in table 6.

Table 6.—Japan: Output, capacity, and capacity utilization of the iron and steel industry

Facility	Number of units	Output (thousand tons)	Capacity (thousand tons)	Utilization (percent)
Production of pig iron:				
Blast furnaces	65	79,884	135,959.00	58.8
Electric furnaces	10	35	93.96	37.2
Other furnaces	2	129	191.90	67.2
Total	77	80,048	136,244.86	58.8
Production of crude steel:				
Open hearth	--	--	--	--
Basic oxygen furnaces	94	76,479	130,012.00	58.8
Ultrahigh power electric furnaces	604	25,197	28,378.37	88.8
Total	698	101,676	158,390.37	64.2

Production of pig iron by blast furnaces remained at 99.8% in 1981, while production of crude steel by basic oxygen furnaces was 75.2% and by ultra-high-power electric furnace, 24.8%. The ratio of pig iron to crude steel was 78.7% in 1981 compared with 78.1% in 1980.

In processing the crude steel, six new continuous-casting machines were added during 1981. By yearend, there were 147 continuous-casting machines operating with a capacity of 75,294,000 tons per year. The capacity utilization of continuous-casting machines by the steel mill producers was 95.4% in 1981. The percentage of continuous-casting processing of crude steel output was 70.7 in 1981 compared with 59.5 in 1980. The percentage of rolled ordinary steel was 74.8 in 1981 compared with 63.3 in 1980, while the percentage of rolled specialty steel was 49.9 in 1981 compared with 38.3 in 1980. As a result of these increases, substantial improvements in energy saving and product yield were made in 1981.

Japan's mine production of iron ore and concentrate continued to decline and remained insignificant in 1981. Almost all of the iron ore, pellets, iron sand, and ferruginous manganese ore required by the Japanese iron and steel industry were imported. Japan imported 123.4 million tons of iron ore in 1981, of which 44.5% was from Australia, 22.0% from Brazil, 12.7% from India, 5% from Chile, 4.7% from the Republic of South Africa, 3.6% from Canada, 2.9% from the Philippines, 2.2% from New Zealand, and 2.4% from other countries.

In 1981, Japan's iron and steel industry consumed 101.3 million tons of iron ore, 2.5 million tons of iron sand, 10.3 million tons of pellets, and 2.9 million tons of sinter. The industry also consumed 39.6 million tons of iron and steel scrap, 63.8 million tons of coking coal (92.7% imported), 43.8 million tons of coke, 1.4 million tons of manganese ore, 933,000 tons of ferruginous manganese ore, and 14.1 million tons of limestone. Consumption of fuel oil declined 44.2% to

16,711,000 barrels in 1981 as a result of oil-free blast furnace operations by all integrated steel mills. The industry also consumed 5,170 million cubic meters of oxygen and 68.6 billion kilowatt-hours of electricity in 1981.

Japan's iron and steel industry employed about 270,000 workers in 1981, of whom about 194,000 were production workers. The average hourly earnings of the Japanese steelworkers were $9.02 in 1981 compared with $8.13 in 1980.

Because of the decrease in demand for steel from the domestic civil engineering and construction sector caused by reduced public investment and housing starts, Japan's estimated apparent steel consumption dropped to 71 million tons of crude steel equivalent in 1981 from 79 million tons in 1980. Domestic orders for ordinary and special steel products by end use for 1980-81 were as follows in thousand tons:

End use	Ordinary steel products		Specialty steel products	
	1980	1981	1980	1981
Automobiles	9,470	8,805	1,487	1,493
Construction and repairing	14,845	13,084	441	489
Conversion and processing	3,770	3,064	2,797	2,778
Electrical machinery and equipment	2,524	2,257	73	73
Home and office appliances	752	688	199	159
Industrial machinery and equipment	2,435	2,008	1,079	1,043
Rolling stocks	245	202	69	45
Shipbuilding and marine equipment	3,802	3,896	73	77
Steel dealers	15,084	13,712	845	777
Tanks and containers	1,841	1,780	130	110
Other	350	316	85	78
Total	55,118	49,812	7,278	7,122

Japan's exports of ordinary steel dropped 2.4% to 21.5 million tons, while exports of specialty steel rose 11.7% to 4.5 million tons. Japan's exports of iron and steel products were 29.1 million tons in 1981 compared with 30.3 million tons in 1980. The 4% drop in exports was primarily caused by a 31% decline in exports to China and a significant drop in exports to Southeast Asian countries. The major importers of Japanese iron and steel products were the United States, 6.2 million tons; China, 2.2 million tons; the U.S.S.R., 2 million tons; Saudi Arabia, 1.8 million tons; the Republic of Korea, 1.6 million tons; Taiwan, 1.5 million tons; and Indonesia, 1.3 million tons. Despite a drop in the volume of exports, export earnings of iron and steel rose 6.7% to a record $17 billion in 1981, owing to the increase in the average export unit value for all steel products from $524 per ton in 1980 to $582 per ton in 1981.

During 1981, Japan's imports of iron and steel, including pig iron and ferroalloys, totaled 3.1 million tons, a 29.7% increase over those of 1980; 1.1 million tons was pig iron, 503,024 tons was ferroalloys, 1.3 million tons was ordinary steel, and 200,000 tons was other. Imports of plates and hot coil accounted for the major portion of the imported steel products with the Republic of Korea supplying over 80%.

Because of the increasing cost of production and the sluggish steel market, most of Japan's integrated steelmakers suffered losses from sales of ordinary steel products. However, the major steel producers were able to offset their deficit by the profit made from sales of seamless steel pipe and other high-value-added products such as single-surface galvanized steel sheet, electrolytic galvanized steel sheet, and zinc-nickel alloy-coated steel sheet. In an effort to overcome their financial difficulties, Japan's steelmakers planned to restructure production facilities and to develop new products such as seamless pipe, surface-treated sheets, stainless steel for extra-low-temperature service, heat-resistant steel, and electrical sheets. Japan's five integrated steelmakers invested a total of about $2.9 billion during 1981, a 43% increase over that of 1980. The bulk of the investment was in expanding seamless pipe production capacity, increasing the efficiency of existing production facilities, advancing steelmaking technology, and increasing the continuous-casting ratio.

Nippon Steel Corp. was to spend about $950 million for the expansion of its seamless pipe facility at Yawata, which was scheduled for completion by March 1983, and for a continuous-casting plant at Nagoya. Nippon Kokan K.K. was to spend about $474 million for the construction of a 600,000-ton-per-year seamless pipe facility at Keihin, which was to be completed in 1983-84, and for the expansion of its existing plant's seamless pipe capacity from 88,000 to 138,000 tons per year. Sumitomo Metal, the leading seamless pipe producer with a capacity of 135,000 tons per year, was to spend $616 million for building a new 20,000-ton-per-year seamless pipe mill at Kainan and for increasing its continuous-casting capacity. Kawasaki Steel Corp. was

to spend about $567 million for expanding its small-diameter seamless pipe capacity from 25,000 to 32,000 tons per year at Chiba by September 1981 and its medium-diameter pipe capacity from 204,000 to 384,000 tons per year by March 1982. Kobe Steel Ltd. was to spend $498 million for construction of a continuous annealing and pickling line at Kakogawa and for relining its No. 3 blast furnace and providing gas treatment facilities at Kobe.[13]

Lead and Zinc.—Japan's lead and zinc ore production was by Mitsui Mining and Smelting, Dowa Mining Co., Ltd., Syakanai Mining Co., Ltd., Hosokura Mining Co., Ltd., Toyoha Mining Co., Ltd., and Nippon Zinc Mining Co., Ltd. In 1981, domestic mine output of both lead and zinc increased slightly and supplied 21.6% of the refined lead production and 35.5% of the refined zinc production. For the past 4 years, Japan's refined lead and zinc production by sources of raw materials was as follows:[14]

Year	Production of metal (thousand tons)	Share of production (percent)		
		Ore		
		Domestic	Imported	Scrap and other
Lead:				
1978	228.4	26.0	55.5	18.5
1979	221.2	22.6	57.1	20.3
1980	220.9	22.8	56.5	20.7
1981	226.2	21.6	55.9	22.5
Zinc:				
1978	767.9	33.8	55.2	11.0
1979	789.4	30.3	56.9	12.8
1980	735.2	32.5	53.2	14.3
1981	670.2	35.5	50.4	14.1

Japan imported 255,765 tons of lead ore and concentrate containing 145,705 tons of lead metal in 1981, principally from Canada (45%), Peru (21.4%), the United States (10.4%), the Republic of South Africa (9.1%), Australia (4%), Thailand (3.9%), and the Republic of Korea (3.3%); and 887,995 tons of zinc ore and concentrate containing 429,092 tons of zinc metal mainly from Canada (31.1%), Australia (29.8%), Peru (28.8%), and North Korea (5.7%). Japan's imports of refined lead dropped 23.4% to 49,179 tons, and imports of refined zinc dropped 27.2% to 30,439 tons because of weakened domestic demand. The principal suppliers were Australia, Peru, North Korea, and Mexico for refined lead and North Korea, the Republic of Korea, and China for refined zinc.

Primary production of refined lead in 1981 was at a slightly higher level than in 1980; the eight producers were operating at about 76% of their 297,240-ton-per-year capacity. Primary production of refined zinc was at a much lower level than in 1980, and the eight producers were operating at only 65.7% of their 1,019,640-ton-per-year capacity.

Dowa Mining Co. expanded the capacity of its electrolytic lead smelter at Kosaka from 20,800 to 25,200 tons per year. Mitsui Mining and Smelting shut down its 21,600-ton-per-year electrolytic zinc smelting plant at Miike in February 1981 and planned to further scale down its 116,400-ton-per-year distillation zinc smelting plant at Miike to 58,000 tons per year. It was reported that the Miike smelter will be separated from Mitsui Mining and Smelting and will become an independent company in July 1982.

Domestic consumption of primary lead dropped 2.8% to 271,151 tons in 1981. Of the total consumption of primary lead, 44.5% was for the manufacture of storage batteries, 25.0% for inorganic chemicals, 9.3% for cable sheathing, 6.9% for pipe and sheet, and 14.3% for manufacturing solder, bearing metals, tubes, casting, plating, and other lead products. Consumption of primary zinc dropped 6.4% to 687,909 tons in 1981, mainly because of a decline in the demand for galvanized steel sheet. By end use, 39.6% was for sheet galvanizing; 16.4% for wire, tube, and general galvanizing; 17.6% for diecasting; 13.7% for brass; and 12.7% for manufacturing rolled zinc, galvanic anodes, inorganic chemicals, copper-alloy castings, and other zinc products.

During 1981, Japan exported 2,791 tons of refined lead, mainly to Taiwan (1,263 tons) and the Republic of Korea (1,005 tons), and exported 51,278 tons of refined zinc principally to the Philippines, 10,303 tons; the Republic of Korea, 8,117 tons; Taiwan, 7,904 tons; the United States, 5,850 tons; Thailand, 4,782 tons; Nigeria, 3,198 tons; and Indonesia, 3,152 tons.

Stocks of primary lead at producer plants were 15,556 tons at the end of 1981 compared with 13,081 tons for 1980. Stocks of primary zinc at producer plants were 94,324 tons at the end of 1981 compared with 108,371 tons for 1980.

According to the Metal Mining Agency of Japan, in August 1981, a new lead and zinc deposit was discovered between Tochibora and Mozumi near the Kamioka Mine in Gifu Prefecture. The property is owned by Mitsui Mining and Smelting. The estimated ore reserves were 3 to 5 million tons, averaging 18.9% lead and 14.5% zinc, as well as 2.96 troy ounces of silver per ton of ore.[15]

Magnesium.—Production of primary magnesium metal continued to drop during 1981, while production of secondary magnesium increased. The drastically reduced demand for primary magnesium from the manufacture of aluminum alloys and nodular cast iron, the high cost of energy, and the high level of stocks forced the two primary producers—Furukawa Magnesium Co. and Ube Industries, Ltd.—to cut back their production. The industry operated at about 44% of its 13,000-ton-per-year installed capacity.

Imports of magnesium metal also dropped by 12.2% to 10,952 tons in 1981. The major supplying countries were the United States, 6,927 tons; Norway, 2,517 tons; and Canada, 1,178 tons.

Consumption of primary magnesium metal in 1981 was by light metal rolling, 7,822 tons; aluminum alloys, 4,717 tons; nodular cast iron, 1,571 tons; powder, 1,055 tons; light metal casting and diecasting, 979 tons; and other, 1,902 tons. Consumption of secondary magnesium as a reducing agent for titanium and zirconium smelting totaled 31,342 tons. Exports of magnesium metal also dropped 53% to 42 tons. The major buyers of the Japanese magnesium metal were the Republic of Korea (25 tons) and Taiwan (12 tons).

Manganese.—Production of manganese ores increased 9.6%. However, over 95% of the requirement for manganese was met by imports. Japan imported about 1.5 million tons of manganese ores and concentrates principally from the Republic of South Africa, 54.6%; Australia, 28.2%; Brazil, 7.3%; and Mexico, 4.4%. Japan also imported 959,870 tons of ferruginous manganese ores and concentrates, mainly from the Republic of South Africa, 55.4%, and India, 40.7%.

The major overseas supplying companies of manganese ores and concentrates were Broken Hill Proprietary Co., Ltd., of Australia; South African Manganese, Amcor, Ltd., and Associated Manganese Mines of South Africa, Ltd., of the Republic of South Africa; and Industria e Comercio de Minerios, S.A., of Brazil.

Consumption of manganese ores and concentrates by the iron and steel industry was 980,000 tons, of which 962,084 tons was imported ore and 17,916 tons was domestic ore. Consumption of manganese ores and concentrates for the manufacture of electrolytic manganese for welding rod and chemical use and others totaled 40,004 tons, of which 23,395 tons was domestic ore and 16,609 tons was imported ore. Consumption of ferruginous manganese ores and concentrates was 707,200 tons, of which 316,077 tons was for manufacturing sinter, 216,511 tons was for making pig iron, and 174,612 tons was for manufacturing ferroalloys and steel products.

Production of manganese dioxide rose 12% in 1981. The increase in output was due to the increased capacity of Toyo Soda Industries Co., Ltd., at Hinata and the 6,000-ton-per-year capacity of the Japan Metal and Chemical Industries Co. at Takaoka stimulated by the continued growth in demand for the metal. The expansion program of Mitsui Mining and Smelting at its Takehara plant from a 19,200- to a 25,000-ton-per-year capacity was rescheduled for completion by mid-1982. Japan's annual production capacity of manganese dioxide by company and plant location was as follows in tons:[16]

Company	Location	Capacity
Daiichi Carbon Co	Yokohama	3,000
Japan Metal and Chemical Industries Co.	Takaoka	6,000
Mitsui Mining and Smelting Co., Ltd.	Takehara	19,200
Toyo Soda Industries Co., Ltd	Hinata	24,000
Total		52,200

Production of manganese metal by Chuo Denki Kagyo and Toyo Soda declined slightly in 1981. The combined output was about 44% of installed capacity of 9,600 tons per year.

Japan imported 10,872 tons of manganese dioxide ores and concentrates from Australia, 4,443 tons; Gabon, 4,200 tons; and China, 2,229 tons for the production of manganese dioxide and manganese metal.

Molybdenum.—Production of molybdenum ores and concentrates by Taenaka Mining Co. at the Higashiyama Mine was insignificant at less than 100 tons. Almost all requirements for molybdenum were met by imports. Japan imported 16,276 tons of molybdenum oxides (roasted concentrates) principally from the United States, 52.2%; Canada, 29%; and Chile, 14.8%. Imports of unroasted molybdenum ore and concentrate were only 14 tons in 1981 compared with 101 tons in 1980. Imports of molybdenum trioxide were 660 tons in 1981 compared with 826 tons in 1980. The United States remained the most important supplier of molybdenum trioxide.

Consumption of molybdenum was by briquet clinkers, about 48%; the manufacturers of ferromolybdenum, about 35%; inorganic pharmaceutical, 5%; molybdenum

metal, about 3%; and other products, 9%.

Production of ferromolybdenum dropped 30% owing to the high cost of energy and the lower level of specialty steel production. Imports of ferromolybdenum also dropped 39% to 273 tons in 1981 because of reduced demand from the specialty steel industry.

Nickel.—Production of refined nickel declined slightly. The reduced output was mainly due to an operation curtailment of Sumitomo Metal at its Niihama nickel refinery for plant remodeling. The other refined nickel producer was Nippon Mining, which operated a refinery at Hitachi. The nickel refining industry operated at about 89% of its installed capacity. The annual capacity of nickel refining in tons and its overseas sources of raw materials by company were as follows:

Company and plant	Capacity	Overseas source
Nippon Mining Co., Ltd.: Hitachi.	4,100	Mixed nickel-cobalt sulfides from Greenvale nickel-cobalt project of Metal Exploration Ltd. and Freeport-McMoran Co. of Australia.
Sumitomo Metal Mining Co., Ltd.: Niihama.	22,780	Nickel matte from P. T. International Nickel Co. of Indonesia and Western Mining Ltd. of Australia.
		Mixed nickel-cobalt sulfides from Marinduque Mining and Industrial Corp. of the Philippines.
Total	26,880	

Japan's requirements for nickel were 100% dependent on overseas sources. During 1981, Japan imported 3,462,801 tons of nickel ores and concentrates from New Caledonia, 48%; Indonesia, 33.6%; and the Philippines, 18.4%. Imports of nickel matte and speiss totaled 36,608 tons, of which 18,648 tons was from Indonesia, 15,408 tons from Australia, and 2,552 tons from New Caledonia. Japan also imported 17,732 tons of refined nickel principally from Canada, 29%; the U.S.S.R., 18%; Australia, 16%; the Philippines, 11%; the United States, 8.5%; and Zimbabwe, 6%.

Consumption of refined nickel dropped 6.6% to 34,114 tons. The reduced demand was caused mainly by a 23% drop in the manufacture of nonferrous alloys. Of the total refined nickel consumed, 38% was for the manufacture of specialty steel, 20% for plating, 17% for nonferrous alloys, 7% for magnetic materials, 7% for fabricated products, 3% for storage batteries, 1% for catalysts, and 7% for others.

The ferroalloy industry consumed about 2.4 million tons of nickel ore compared with 2.9 million tons in 1980. Production of ferronickel was by Nippon Mining at Saganoseki; Nippon Yakin Kogyo Co. at Miyazu and Toyama; Pacific Metal Co. at Hachinohe; Shimura Kako Co. at Date, Hokkaido; and Sumitomo Metal at Hyuga. Japan imported 26,493 tons of ferronickel from New Caledonia, 49%; Indonesia, 36%; Dominica, 14%; and the United States, 1%.

Selenium and Tellurium.—Japan is the world's largest producer of selenium and tellurium, accounting for 30% and 29%, respectively, in 1980. According to industry sources, the output share of selenium and tellurium by company in 1980 was as follows in percent:

Company	Output share	
	Selenium	Tellurium
Asia Bussei Zairyo	7.4	--
Mitsubishi Metal Corp.	41.2	50.2
Mitsui Metal Mining Co., Ltd.	10.0	18.9
Nippon Mining Co., Ltd.	24.1	18.5
Shinko Chemical Co., Ltd.	3.6	--
Sumitomo Metal Mining Co., Ltd.	13.7	12.4
Total	100.0	100.0

Consumption of selenium was about 200 tons, mainly by dry photocopiers, which use selenium in the light-sensitive drum. About 250 tons of selenium was exported. Consumption of tellurium was as an additive to enhance the effectiveness of free-cutting steel, as a catalyst for use in the chemical industry, as a vulcanizing agent in synthetic rubber, in tellurium-copper, and as a coloring agent for glass.

Japan also produced other metals and compounds of high purity and of significant quality by world standards. These metals included cerium, germanium, germanium oxide, indium, lanthanum oxide, silicon, tantalum, and uranium. Most of the output of these metals was from imported materials.

Titanium.—Japan remained the world's second largest titanium sponge producer. Production of titanium sponge reached another record high of 25,000 tons owing to the expanded capacity of Osaka Titanium Co., Ltd. The industry's installed annual capacity was 26,000 tons in 1980 and 27,400 tons in 1981; by early 1982, another 5,000 tons of annual capacity will be added by Osaka Titanium. The installed annual capacity of titanium sponge by company for 1981 and projected 1982 capacity was as follows in tons:[17]

Company	Location	Installed capacity	
		1981	1982
Nippon Soda Co., Ltd	Nihongi	2,200	2,200
Osaka Titanium Co., Ltd.	Amagasaki	13,200	18,200
Toho Titanium Co., Ltd.	Chigasaki	12,000	12,000
Total		27,400	32,400

Osaka Titanium and Toho Titanium Co., Ltd., produced titanium sponge by the magnesium reduction process (Kroll method), while Nippon Soda Co., Ltd., used the sodium reduction process (Hunter method). The industry operated at about 90% of its installed capacity.

Japan's requirements of titanium ores and concentrates were 100% dependent on imports. Imports of 323,057 tons of rutile and ilmenite were mainly from Malaysia, 48%; Australia, 22%; India, 17%; and Sri Lanka, 12%.

According to the Japan Titanium Society, domestic sales of titanium sponge, including internal plant consumption, surged by 31% over those of 1980 to 14,483 tons in 1981, while exports of titanium sponge rose 25% over those of 1980 to 10,005 tons in 1981. The major importing countries were the United States, 4,291 tons; the United Kingdom, 2,725 tons; and the Netherlands, 2,219 tons.

Because of the worldwide economic recession, particularly the slump in the aviation industry, Japan's titanium industry planned to cut back its output by 5% to 10% in 1982. During 1981, several importers of Japanese titanium sponge requested deferred shipments as well as a reduction in the long-term contract price. However, according to the president of Osaka Titanium, the program to boost capacity by 5,000 tons per year at the Amagasaki plant remained unchanged.

Tungsten.—Output of tungsten ores and concentrates continued to decline because of the rising cost of extraction and lower ore grades. The important producers were Kaneuchi Mining Co., Ltd., accounting for 32% of output; Awaniura Mining Co., Ltd., 25%; Yaguki Mining Co., Ltd., 16%; Tanaka Mining Co., Ltd., 14%; Chitose Mining Co., Ltd., 7%; and two small producers, 6%. In 1980-81, the requirements for tungsten ores and concentrates were 75% to 80% dependent on overseas sources, primarily the Republic of Korea, Portugal, Australia, Bolivia, and China.

Imports of tungsten ores and concentrates totaled 2,256 tons. Japan also imported 155 tons of tungsten powder and flakes mainly from the Republic of Korea (86%) and the Federal Republic of Germany (8%).

Consumption of tungsten was mainly for the manufacture of tungsten metal, 65%; calcium tungsten acid, 18%; ferrotungsten, 15%; and inorganic chemicals and other, 2%. The estimated consumption of tungsten ores and concentrates was 2,900 tons.

NONMETALS

Cement.—Production of cement continued to decline because of the reduced demand caused by the Government's policy to hold zero growth in public works projects. However, exports of cement increased to 10 million tons in 1981 from 8.7 million tons in 1980.

The industry continued its efforts to reduce the costs of production by switching its energy source from C-type fuel oil to coal. According to the Japan Cement Association, as of March 1981, 83.6% of the heat used in calcining was from coal. Among the 24 cement producers, Ube Industries, Chichibu Cement Co., and Mitsui Mining and Cement used only coal for calcination. Others had remodeled their kilns, crushers, and dryers and set up coal depots to receive and store coal for the cement plants.

In 1981, Sumitomo Cement Co., Ltd., completed a 4,800-ton-per-day kiln conversion at its Ako plant and a 2,100-ton-per-day precalcining system at its Tochigi plant. Chichibu Cement completed a 4,800-ton-per-day kiln conversion to precalcining at its Chichibu No. 1 plant and a 2,000-ton-per-day kiln conversion at Chichibu No. 2 plant. Nittetsu Cement Co., Ltd., also had completed a 2,900-ton-per-day kiln conversion at its Muroran plant. Osaka Cement Co., Ltd., was expected to install the world's largest roller mill at its Kochi plant. The new line has a clinker capacity of 7,200 tons per day and was scheduled for startup in 1982.[18]

Domestic consumption of cement remained at about the 80-million-ton level. The domestic market share by major cement producers in 1981 was Onoda Cement Co., Ltd., 16.1%; Nippon Cement Co., Ltd., 15.9%; Sumitomo Cement, 12.6%; Mitsubishi Mining and Cement, 11.5%; and 43.9% by 20 other companies. The ready-mix concrete industry remained the dominant end user, accounting for about 60% of the total demand. Other significant end users included manufacturers of cement products,

accounting for about 13.6%; public and private buildings, 3.4%; civil engineering, 2.6%; and all others, 20.4%. Exports totaled 10,011,391 tons of portland cement. The major importing countries were Saudi Arabia, 2.5 million tons; Kuwait, 2.3 million tons; Singapore, 1.4 million tons; and Taiwan, 1.1 million tons. Because of the build-up of cement output capacity in the Southeast Asian countries, future exports of cement to these developing countries were expected to decline.

Fertilizer Materials.—Production of ammonium sulfate remained at 1.8 million tons in 1981, while the output of urea continued its downward trend to 1.5 million tons in 1981. In the past year, about 80% to 90% of Japan's urea production was exported to China. Since 1979, China has emerged as one of the leading urea producers in the world and has cut back imports of urea from Japan and turned to other countries such as Kuwait and Saudi Arabia for supply. It was reported that during 1981 the price of urea from Kuwait and Saudi Arabia fell 41% to about $150 to $160 per ton, while the Japanese price was about $200 per ton.

Because of reduced exports and domestic consumption of nitrogen fertilizer, Japan continued to cut its surplus capacity. As of July 1980, 26% of ammonia production capacity and 42% of urea capacity was eliminated. During 1981, the output of urea dropped 23.5% owing to a 25.7% decline in domestic demand and a 16.5% drop in exports. Consumption of urea in Japan was for fertilizer use (266,000 tons) and industrial use (482,000 tons). In 1981, exports of urea totaled only 788,000 tons compared with 944,000 tons in 1980. Although the output of ammonium sulfate remained relatively unchanged in 1981, domestic consumption by the manufacturers of fertilizer dropped to 1.0 million tons in 1981 from 1.2 million tons in 1980 owing to bad weather and reduced exports of ammonium sulfate. As a result, stocks at the end of 1981 rose 84% to 283,000 tons.

In 1981, Japan's production of ammonium chloride was about 560,000 tons, of which 217,000 tons was for the manufacture of fertilizer, 21,000 tons was for industrial use, and about 300,000 tons was exported. The output of calcium cyanamide in 1981 was about 143,000 tons. Of the total demand, 133,000 tons was for the manufacture of fertilizer, 13,000 tons was for industrial use, and 1,000 tons was exported.

The estimated supply and demand for high-analysis fertilizer and superphosphate for FY 1981 were as follows in thousand tons:

Item	High-analysis fertilizer	Super phosphate
Stocks at the beginning	664.3	65.3
Production	2,735.7	497.9
Shipments	2,700.0	492.9
Exports	130.0	5.0
Stocks at the end	570.0	65.3

Requirements for phosphate ore were 100% dependent on imports. Japan imported about 2.3 million tons of natural calcium phosphates, natural aluminum-calcium phosphates, and apatite and phosphatic chalk. Major suppliers were the United States, 1.3 million tons; Morocco, 606,200 tons; and Jordan, 220,000 tons.

Iodine.—Japan remained the world's largest producer of iodine in 1981. Production of iodine in Japan was mainly from subsurface brine accompanied by wet-type natural gas in the southern Kanto Gasfield in Chiba, Tokyo, and Kanagawa Prefectures. The output from these areas accounted for about 80% of Japan's total output of iodine. The remaining 20% of iodine production was from the Niigata and Nakajo Gasfields in Niigata Prefecture and the Sadowara Gasfield in Miyazaki Prefecture in southern Kyushu. Southern Okinawa and Oshamanbe in southern Hokkaido were the other areas proven to have occurrences of iodine.

Annual capacity and production of iodine by company and plant location in 1980 were as follows in tons:

Company	Location (Prefecture)	Output	Capacity
Ise Chemical Industry Co	Chiba	2,174	3,000
	Niigata	651	960
	Miyazaki	146	240
Kanto Natural Gas Development Co.	Chiba	662	720
Nippon Chemical Co	do	311	360
Nippon Halogen Chemical Co.	Niigata	324	360
Nippon Natural Gas Industry Co.	Chiba	936	1,260
United Resources Industry Co.	do	1,321	1,800
Total		6,525	8,700

According to a 1976 estimate, the recoverable iodine reserves in Japan were about 10 million tons.[19]

Japan exported about 90% of its 1981 output, principally to the United States, Western European countries, and India.

Because of the increase in extraction costs caused by the dispersion of wells drilled in early 1981, the export price for iodine rose 23% to $16 per kilogram of iodine.

The first Japanese-United States joint venture project for the production of iodine from oil brine in Kingfisher County, Okla., was started in September 1981. The cost was estimated at $2.3 million, and the project was scheduled to come onstream in the second quarter of 1982 with an annual capacity of 120 to 160 tons of iodine using newly developed advanced technology. North American Brine Resources Co., the joint venture company, is owned 50% by Godoe (U.S.A.), Inc., a subsidiary of Japan's United Resources Industry Co.; 40% by Beard Oil Co. of the United States; and 10% by Inorgchem Development, Inc., a subsidiary of Japan's Mitsui and Co. (U.S.A.), Inc.[20]

Limestone.—Japan's mine production of limestone dropped slightly by 4.4% to the 177-million-ton level because of the reduced demand from cement and iron and steel industries. Japan is self-sufficient in limestone and remained a leading producer and exporter of limestone in the world. The industry employed about 9,300 workers, or about 54% of the total labor force in Japan's nonmetal mining sector in 1981. The major limestone mining companies were Ube Industrial Co., Ltd.; Mitsubishi Mining Cement Co., Ltd.; Nittetsu Mining Co., Ltd.; Todaka Mining Co., Ltd.; Onoda Cement; and Nippon Cement Co., Ltd.

Consumption of limestone was mainly by the cement industry, iron and steel industry, and civil engineering sector. Limestone consumed by major end users for 1980-81 was as follows in thousand tons:

Industry	1980	1981
Cement	104,583	98,976
Civil engineering	36,875	37,578
Iron and steel	22,205	20,274
Lime	12,211	10,707
Other	10,589	11,718
Total	186,463	179,253

Other industries consuming limestone in 1981 included soda and glass, ceramic wares, tile, inorganic chemicals, pesticides, paper manufacturing, and the manufacture of construction materials.

During 1981, Japan exported about 1.3 million tons of limestone, principally to Australia, 1.2 million tons; and Singapore, 49,200 tons.

Salt.—Salt production from evaporates was estimated at 1.0 million tons in 1981, while imports of salt were 6.5 million tons. Major overseas suppliers in 1981 were Mexico, 3.0 million tons; Australia, 2.9 million tons; and China, about 550,000 tons. Consumption of salt for general use was estimated at 1.6 million tons, and about 6.3 million tons was consumed by the manufacturers of caustic soda.

The estimated production of caustic soda by the chlor-alkali industry was about 3 million tons in 1981. During 1981, Japan imported about 53,000 tons of caustic soda in aqueous solution, principally from the Republic of Korea, 24,353 tons; and Canada, 22,800 tons. Japan also imported about 280 tons of caustic soda in solid form as follows: the United States, 125 tons; the Federal Republic of Germany, 98 tons; and Sweden, 55 tons.

Consumption of caustic soda remained at about 2.9 million tons in 1981. A total of 287,500 tons of caustic soda was exported, mainly to Australia, 251,300 tons; Thailand, 19,000 tons; and the Republic of Korea, 7,200 tons.

Sulfur.—Because of the reduced oil imports and a slowdown in petroleum refining in Japan, the output of recovered sulfur from petroleum refining declined in 1981, while domestic consumption remained at 855,000 tons. Exports of sulfur decreased owing to the tight supply situation in the domestic market. The output of sulfuric acid remained at 6.7 million tons in 1981, while domestic consumption and exports increased slightly. The demand and supply situation of sulfur and sulfuric acid for FY 1980 and FY 1981 were as follows in thousand tons:

	FY 1980[r]	FY 1981
Sulfur:		
Production	1,132	1,092
Demand:		
Sulfuric acid	568	573
Other	286	282
Exports	312	235
Sulfuric acid:		
Production	6,684	6,676
Demand:		
Fertilizer	2,072	2,087
Industrial use	4,170	4,194
Exports	352	436

[r]Revised.

The Republic of Korea and Taiwan were the major importing countries of Japanese sulfur, while Australia and the Philippines

were the major importing countries of Japanese sulfuric acid.

Other Nonmetals.—Other nonmetallic minerals produced in significant quantities included dolomite, magnesia clinker, gypsum, pyrites, and pyrophyllite. Other nonmetallics in less significant quantities were feldspar, clays, barite, and talc.

MINERAL FUELS

Coal.—Domestic production of coal declined to 17.7 million tons. The October coal mine accident at the Yubari Mine in Hokkaido, the third worst mine disaster in Japan's history, reduced coal output from the Hokkaido area. Increased imports of cheap foreign coal and the high production cost of domestic coal prevented the domestic coal producers from achieving the 20-million-ton target set by the Government's national policy in 1981.

About 20 coal companies were operating 45 coal mines, of which 30 were located in Hokkaido, 9 in Kyushu, and 6 in Honshu, the main island. Of the total coal produced in 1981, 35% was coking and 65% was steam coal. By coal district, 59.7% of the total coal output was from Hokkaido, 39.7% was from Kyushu, and 0.6% was from Honshu. During 1981, the industry employed about 18,200 coal miners, about 11,700 in Hokkaido, 6,400 in Kyushu, and 90 in Honshu. Labor productivity was about 81 tons of coal per month per miner in 1981.

Domestic coal supplied about 20% of demand for coal, which was about 97.1 million tons, and the remaining 80% was imported. Japan imported about 65 million tons of coking coal to help meet requirements of about 71 million tons. The major foreign countries supplying coking coal were Australia, 29.1 million tons; the United States, 21.5 million tons; Canada, 9.2 million tons; and the Republic of South Africa, 2.7 million tons. Because of a drastic increase in demand for steam coal to 25.5 million tons in 1981 from 17.2 million tons in 1980, imports of steam coal rose sharply to 11.8 million tons in 1981 from 5.2 million tons in 1980. This surge in demand was due to sharply increased uses in the cement and utility industries. The major foreign steam coal suppliers were Australia, 5.4 million tons; the United States, 2.1 million tons; and China, 1.2 million tons. Japan also imported 797,000 tons of anthracite from the following suppliers: China, 419,000 tons; Vietnam, 196,000 tons; and other countries, 182,000 tons.

The demand for coal rose 10% in 1981 compared with that of 1980 as a result of a sharp increase in demand from cement and utility industries, which were shifting their energy source from oil to coal. Coal demand by consuming sector and by source for 1981 was as follows:

Consuming sector	Quantity (thousand tons)	Source of coal (percent)	
		Domestic	Imports
Manufacturing:			
Coke	5,135	25.1	74.9
Cement and ceramic	10,305	24.5	75.5
Iron and steel	63,999	5.8	94.2
Other	2,269	37.4	62.6
Total	81,708	10.3	89.7
Utilities:			
Electric power	12,471	73.9	26.1
Gas	1,442	46.4	53.6
Total	13,913	71.1	28.9
Other	1,465	96.8	3.2
Grand total	97,086	20.3	79.7

Taikey Otanko was rehabilitating its coal mine in Hokkaido after a 10-year period of shutdown. The mine was scheduled to come onstream in 1983 with an annual output of about 350,000 tons of coal.

According to information provided for the 1980 World Energy Conference, Japan's coal reserves were estimated at 8,532 million tons, of which about 1,050 million tons, mostly bituminous coal, was economically recoverable.[21]

According to the latest MITI projections on the long-term energy supply and demand forecast for FY 1990, Japan's coal requirements were estimated at 153 million tons. The domestic coal supply was estimated at 18 to 20 million tons, and the remaining 133 to 135 million tons of coal requirements were to be met by imports. In an effort to secure and diversify the sources of the future coal requirements, Japan continued to seek overseas coal resources, particularly in the Western United States, Canada, and China.

In mid-1981, the Foreign Coal Problems Council, a private advisory organ of the MITI Natural Resources and Energy Agency, published an interim report in which it encouraged Japanese-United States joint development of coal resources in the Western United States.[22] During 1981, a feasibility study was conducted by the Rocky Mountain Energy Co., a subsidiary of Union Pacific Railroad Co., to develop the Coral

Canyon Mine in Wyoming as a joint-development proposal. Japan Coal Development Co. (JCDC) reportedly expressed interest in the project. Other projects reportedly have been proposed to the JCDC for the joint development of coal in Colorado and other states in western regions of the United States.

A major coal agreement was signed in early 1981 between a consortium of Japanese steel producers and two Canadian mining companies for Japan to import a total of 95 million tons of coking coal and 15 million tons of steam coal over a 15-year period from the Peace River Coalfield (new mines to be developed) in northeast British Columbia. The first delivery is expected to start in October 1983. The two Canadian mining companies involved were Denison Mines, Ltd.; and Teck Corp. Denison will supply 70 million tons of coking coal and 15 million tons of steam coal, while Teck will supply 25 million tons of coking coal.

Another coal agreement between a group of Japanese major steel producers and Manalta Coal, Ltd., of Calgary, Alberta's largest coal producer, was also signed in early 1981. The agreement calls for Manalta to supply Japanese steel producers with a total of 31.5 million tons of coking coal over a 15-year period starting in 1983 with 2.1 million tons per year. The Japanese reportedly agreed to have a 40% equity participation in the coal development. The coal mine to be developed is located in the Hinton area of Alberta.

Japan will extend about $200 million in loans for the development of coal in China. In FY 1980, about $90 million in loans was extended to three coal projects in Hebei and Shanxi Provinces and related shipping facilities in Qinhuangdao. According to an agreement signed in September 1980, China promised to export 10 million tons per year of coal to Japan starting in 1985, of which 6.5 million tons will be steam coal and 3.5 million tons will be coking coal.

A coal trade agreement between 16 Japanese companies and the Chinese Government was signed in mid-1981 for the Japanese companies to import 1.5 million tons of coking coal from China during FY 1982.

In November 1981, construction work on the coal liquefaction pilot plant was started in the Morwell district of the Latrobe Valley, about 150 kilometers southeast of Melbourne in Victoria, Australia. The brown coal liquefaction project was promoted as a national project of Japan and Australia. The total construction cost of the plant was estimated at $205 million. Japan was to provide the financing for the construction, while Australia will provide the coal, the plant site, and related facilities.

Petroleum and Natural Gas.—Japan's domestic crude oil output was equivalent to about 0.2% of its requirements for crude oil in 1981. Production of crude oil dropped 9.5% to 2.87 million barrels in 1981 compared with that of 1980. Imports of crude oil also dropped by 10.4% to 1,448 million barrels in 1981. Overall consumption of crude oil declined 9.7% to 1,327 million barrels in 1981 as a result of Japan's continuing efforts on energy conservation and shifting of energy sources from oil to coal, liquefied natural gas (LNG), and nuclear power.

Imported crude oil remained significant in Japan's overall energy supply, however, representing about 66% of the 1981 energy supply. According to MITI's latest long-term energy supply and demand forecast, the share of imported oil was to be reduced to 49.1% of total energy supply in FY 1990 from 66.4% in FY 1980. Japan's imports of crude oil were about 3,967,000 barrels per day in 1981 compared with 4,414,000 barrels per day in 1980.

By regional source, the Middle East accounted for 69% of the total imports in 1981 compared with 73.2% in 1980; Asia, 24.6% in 1981 compared with 23.4% in 1980; Latin America, 3.9% in 1981 compared with 1.8% in 1980; and Africa, 2.4% in 1981 compared with 1.5% in 1980. The major supplying countries were Saudi Arabia, 34.2% in 1981 compared with 31.6% in 1980; Indonesia, 15.7% in 1981 compared with 14.3% in 1980; the United Arab Emirates, 13.6% in both 1980 and 1981; other Middle East countries (Oman, Kuwait, Qatar, Iran, Iraq, Bahrain, and Neutral Zone), 21.2% in 1981 compared with 28.0% in 1980; and China, 4.6% in 1981 compared with 3.6% in 1980.

Two supplying countries nearly tripled their exports of crude oil to Japan in 1981: Mexico exported 74,000 barrels per day in 1981 compared with 25,000 in 1980, and Nigeria exported 21,000 barrels per day in 1981 compared with 7,000 in 1980. Three countries increased by more than 50% their exports to Japan: Egypt exported 5,000 barrels per day in 1981 versus 3,000 barrels per day in 1980, Algeria exported 46,000 barrels per day in 1981 versus 28,000 barrels per day in 1980, and Ecuador exported 26,000 barrels per day in 1981 versus 17,000 barrels per day in 1980.

According to the report released by MITI in mid-1981, Japan saved 125.8 million barrels in oil consumption in FY 1980, which represented a 10.1% drop from the FY 1979 level. Energy conservation by industry and households, shifting from oil to coal and LNG, and greater use of hydro and nuclear power were cited as the major contributing factors to the drop in oil consumption. MITI had set a goal of savings in oil consumption by another 157 million barrels for FY 1981.

Domestic production of natural gas dropped 4.3% to 74,245 million cubic feet in 1981. The output of gas from natural gasfields was 98%, and the remaining 2% was produced from oilfields and coalfields. About 75% of the country's natural gas output was from the Niigata Gasfields and 20% was from the Chiba Gasfields. The total output of natural gas accounted for about 0.6% of Japan's total energy supply in 1981.

Consumption of domestically produced natural gas was estimated at 95,400 million cubic feet in 1981. About 28.8% was consumed by the chemical industry, 21.0% by the oil and gas mining industries, 23.5% by the electric industry, 22.8% by the gas industry, 3.2% by other manufacturing industries, and 0.7% by others.

During 1981, Japan imported 16,832,000 tons of LNG as follows: Indonesia, 51%; Brunei, 31%; Abu Dhabi, 12%; and the United States, 6%. Consumption of LNG in Japan was by electric utilities, 76.4%; city gas companies, 20.3%; and the manufacturing industry, 3.3%. By 1986, Japan will import an additional 18.5 million tons of LNG from Indonesia, Malaysia, and Australia. The signed contracts for the additional LNG imports by country are as follows:[23]

Country	Shipments	
	Beginning	Million tons per year
Malaysia (Sarawak)	1983	6.0
Indonesia (Badak)	1983	3.2
Indonesia (Arun)	1984	3.3
Australia	1986	6.0

Uranium.—In August 1981, the Metal Mining Agency of Japan started construction of the world's first pilot plant to extract uranium from seawater at the town of Nio in Kagawa Prefecture on Shikoku Island. The $11 million plant was scheduled for completion in 1983 and to begin test operations in 1984. The technology of extracting uranium from seawater, which uses titanic acid absorbent, was jointly developed by the Industrial Science and Technology Agency of MITI, the Institute of Industrial Science of the University of Tokyo, and the Mitsubishi Chemical Industries Research Institute. According to the agency's plan, the pilot plant will be capable of producing 10 kilograms of uranium per year. The plant is expected to collect data for the development of full-scale extraction in the future. The operating costs were budgeted at about $7.7 million.[24]

[1]Economist, Division of Foreign Data.
[2]Where appropriate, values have been converted from Japanese yen (Y) to U.S. dollars at the rate of Y226.75=US$1.00 for 1980 and Y220.53=US$1.00 for 1981.
[3]U.S. Embassy, Tokyo, Japan. State Department Airgram A-24, Mar. 17, 1982.
[4]Japan Metal Journal (Tokyo). V. 11, No. 51, Dec. 21, 1981, p. 7.
[5]———. V. 11, No. 38, Sept. 21, 1981, p. 5; v. 11, No. 51, Dec. 21, 1981, p. 5; v. 12, No. 4, Jan. 25, 1982, p. 2; v. 12, No. 9, Mar. 1, 1982, p. 7.
[6]Aluminum (Tokyo). No. 617, January 1982, p. 44.
[7]American Metal Market. V. 89, No. 117, June 18, 1981, p. 15.
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[9]Page 31 of work cited in footnote 8.
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[10]Japan Metal Journal (Tokyo). V. 12, No. 24, June 14, 1982, p. 10.
[11]———. V. 12, No. 12, Mar. 22, 1982, p. 9.
[12]Metal Bulletin Monthly (London). April 1982, p. 25.
[13]Metal Bulletin (London). Mar. 31, 1981, p. 33.
[14]Japan Metal Journal (Tokyo). V. 12, No. 12, Mar. 22, 1982, p. 5.
[15]———. V. 11, No. 33, Aug. 17, 1981, p. 1.
[16]Industrial Rare Metals (Tokyo). No. 75, Annual Review, 1981, p. 131.
[17]Suiyokwai-Shi (Journal of the Mining and Metallurgical Association, Kyoto). V. 19, No. 7, December 1981, p. 512.
[18]Rock Products. V. 85, No. 4, April 1982, p. 92.
[19]Industrial Minerals (London). No. 19-8500, April 1982, pp. 101, 103.
[20]Japan Chemical Week (Toyko). Sept. 3, 1981, p. 1.
Chemical Marketing Reporter. V. 220, No. 3, July 20, 1981, pp. 3, 24.
[21]World Coal. V. 7, No. 5, July-August 1981, p. 15.
[22]U.S. Embassy, Tokyo, Japan. State Department Airgram A-120, Sept. 25, 1981.
[23]Japan Petroleum and Energy Weekly (Tokyo). V. 17, No. 19, May 10, 1982, pp. 2, 12.
[24]U. S. Embassy, Tokyo, Japan. State Department Telegram 2121, Feb. 6, 1981.

The Mineral Industry of Kenya

By Thomas O. Glover[1]

In 1981, the growth of the mining and quarrying sector of Kenya's economy remained relatively unchanged. Although the real gross domestic product (GDP) was up approximately 2.5% at $4.3 billion,[2] the mining and quarrying sector accounted for less than 1% of GDP, or $10.8 million. The economy was very vulnerable to energy costs as the country imported the majority of its energy-producing materials. Kenya had no known resources of oil, coal, gas, or nuclear fuel. It was estimated that known hydroelectric resources will be fully developed within the next 15 or 20 years. Geothermal energy was still in its early stages of development, and the potential was estimated to be between 170 and 1,000 megawatts. Kenya's various natural resources are depleting rapidly, and with the demand for energy growing steadily owing to increased population and higher industrialization and modernization of the rural sector of the economy, the country faces a potential energy shortage that has no easy solution.

Kenya opened a major hydroelectric dam in December 1981 that was built with West European aid and designed to avert further crises such as the crippling power reductions of 1980. The powerplant is located on the Tana River, 161 kilometers northeast of Nairobi, and will produce 40 megawatts, which will be a 10% addition to Kenya's national grid. The European Economic Community, the Federal Republic of Germany, and the United Kingdom put up loans and grants of $90 million of the $110 million required for the plant. Kenya furnished the final $20 million.

Toward the end of 1980, two technical cooperation agreements were signed. The first was between the Kenyan and British Governments in which the Kenyan Mines and Geological Department and the British Institute of Geological Sciences will undertake a 4-year joint geological mapping and mineral exploration program. The project, known as the Samburu-Marsabit Geological Mapping and Mineral Exploration Project, aims at producing geological maps on the scale 1:250,000 of an area of approximately 100,000 square kilometers in north-central Kenya. A geochemical exploration program, which will contribute to the compilation of a preliminary inventory of mineral occurrences in the area, will be undertaken as well.

The second agreement was signed with the Finnish Government. In this agreement, the Mines and Geological Department of the Finnish Geological Survey will undertake a joint industrial minerals assessment program. The project aims at carrying out a countrywide assessment of industrial minerals, offering specialized services to the private sector, creating awareness of the importance of the industries that are related to industrial minerals, and eventually beginning mining and processing of the deposits.

Also toward the end of 1980, a team from the United Nations Revolving Fund for Natural Resources Exploration undertook a mineral exploration program for any economic minerals in the Lolgorien-Migori Belt on the southwestern border with Tanzania near Lake Victoria.

PRODUCTION AND TRADE

The principal mineral commodities produced continued to be soda ash and fluorspar. Soda ash was Kenya's leading mineral export, with most going to Southeast Asian countries.

Magadi Soda Co., a major foreign-exchange earner, was expanding its soda ash production capacity from 220,000 to 300,000 tons per year. Plans were under way to expand rail- and port-handling facilities to cope with the increased production. Production of fluorspar and barite decreased slightly in 1981 after a considerable increase in 1980. Most other mineral production was on a low-volume basis, with local markets predominating as the primary users. Cement capacity was increased as demand was up in the major cities. The value of gem stone exports amounted to over $18 million in foreign exchange. Active prospecting for gem stones, particularly garnet and ruby, continued in the Taita-Taveta districts.

Table 1.—Kenya: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Beryl, gross weight	--	--	(2)	(2)	--
Gold, mine output, metal content troy ounces	135	205	e200	125	100
Iron and steel:					
Iron ore:					
Gross weight	16,000	20,129	20,000	14,567	14,000
Iron content[e]	9,600	12,077	12,000	9,469	9,000
Crude steel[e]	10,000	10,000	10,000	10,000	10,000
NONMETALS					
Barite	429	298	e300	6,647	6,000
Cement, hydraulic thousand tons	1,144	1,125	851	1,272	1,300
Clays: Kaolin	495	1,514	e1,500	1,487	1,400
Corundum	--	(2)	e(2)	(2)	--
Diatomite	2,441	1,690	1,266	1,677	1,700
Feldspar	1,869	949	e1,000	387	400
Fluorspar	124,000	106,564	77,104	93,378	90,000
Gem stones, precious and semiprecious:					
Aquamarine kilograms	10	275	NA	35	NA
Garnet[3] do	160	274	NA	237	NA
Ruby do	532	316	NA	414	NA
Sapphire do	4	1	NA	148	NA
Tourmaline do	23	23	NA	39	NA
Gypsum and anhydrite	25,999	e30,000	30,000	30,000	30,000
Lime	77,826	e50,000	27,000	26,025	27,000
Magnesite	3,575	e4,000	e4,000	1	10
Meerschaum	--	--	--	--	NA
Phosphatic materials: Guano	55	19,943	NA	--	50
Salt:					
Crude	39,932	19,514	21,846	26,966	27,000
Refined	12,300	e12,000	e12,000	20,050	21,000
Sodium compounds, n.e.s.:					
Soda, crushed, raw	2,293	114	NA	1,530	1,600
Soda ash	109,444	152,522	223,845	203,768	250,000
Stone, sand and gravel:					
Calcareous:					
Calcite	600	e600	NA	--	NA
Coral (for cement manufacture)[e]	950,000	950,000	NA	(4)	1,000,000
Kunkur (for cement manufacture)	44,914	111,647	NA	121,460	125,000
Limestone (for cement manufacture)	50,197	e50,000	NA	e1,540,777	500,000
Sand	17,665	23,758	NA	e960	25,000
Shale	e825,000	257,402	NA	295,183	300,000
Talc (pyrophyllite)	270	--	--	--	--
Vermiculite	4,320	1,863	2,260	2,558	2,600
Wollastonite	300	100	NA	--	50
MINERAL FUELS AND RELATED MATERIALS					
Carbon dioxide, natural	1,960	2,243	NA	3,014	3,000
Petroleum refinery products:					
Gasoline, motor thousand 42-gallon barrels	3,112	3,230	4,060	3,629	NA
Jet fuel do	3,013	3,023	4,209	3,492	NA
Kerosine do	--	--	--	--	NA
Distillate fuel oil do	4,126	4,103	1,211	4,540	NA

See footnotes at end of table.

Table 1.—Kenya: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum refinery products —Continued					
Residual fuel oil thousand 42-gallon barrels	7,395	7,925	7,574	[6]8,824	NA
Other:					
Asphalt do	207	[e]212	24	188	NA
Liquefied petroleum gas do	225	232	186	280	NA
Unspecified do	60	[e]70	461	693	NA
Refinery fuel and losses do	781	[e]809	932	679	NA
Total do	18,919	19,604	18,657	22,325	22,000

[e]Estimated. [p]Preliminary. NA Not available.
[1]Table includes data available through Sept. 13, 1982.
[2]Less than 1/2 unit.
[3]Quality (gem or industrial) not specified.
[4]Coral for cement manufacture apparently has been included with limestone for cement manufacture.
[5]Probably an incomplete figure.
[6]Includes some fuel oil also described as unfinished oil.

Table 2.—Kenya: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate kilograms	3	--		
Alumina do	10	--		
Metal including alloys:				
Waste and scrap	525	795	--	Japan 522; Pakistan 122; Mozambique 75; Angola 70.
Unwrought kilograms	750	40	--	Uganda 28; Tanzania 12.
Semimanufactures	194	176	--	Zaire 102; Uganda 31; Rwanda 23.
Arsenic: Oxides and acids kilograms	--	15	--	NA.
Chromium: Oxides and hydroxides do	3	--		
Copper:				
Ore and concentrate	21	30	--	India 22; Belgium 8.
Metal including alloys:				
Unwrought kilograms	1,918	105	--	All to Zambia.
Waste and scrap	590	407	--	India 196; United Kingdom 99; West Germany 50; Belgium 43.
Semimanufactures	5	5	--	Uganda 3.
Gold metal including alloys, unwrought troy ounces	--	7	7	
Iron and steel:				
Ore and concentrate kilograms	20	544	--	All to West Germany.
Roasted pyrite do	180	--		
Metal:				
Waste and scrap	69	294	--	Belgium 168; India 86; Japan 32.
Pig iron, cast iron, powder, shot kilograms	300	303	--	Burundi 222; Sudan 80.
Steel, primary forms	289	25	--	Mainly to Uganda.
Semimanufactures:				
Bars, rods, angles, shapes, sections	1,865	3,317	--	Rwanda 1,275; Uganda 1,256; Burundi 344.
Universals, plates, sheets	4,766	3,625	--	Uganda 1,095; Rwanda 804; Sudan 690; Zaire 456.
Hoop and strip	75	145	--	Rwanda 73; Uganda 56.
Rails and accessories	44	4	--	Mainly to Uganda.
Wire	328	434	--	Uganda 264; Central African Republic 83; Nigeria 40.
Tubes, pipes, fittings	791	778	--	Uganda 346; Rwanda 295; Sudan 64.
Castings and forgings, rough	51	14	--	Rwanda 12.
Lead:				
Ore and concentrate kilograms	40,069	5	--	All to Sudan.
Oxides and hydroxides do	500	50	--	Do.
Metal including alloys:				
Waste and scrap	392	--		
Unwrought	([1])	7	--	Mainly to Uganda.
Semimanufactures	1	2	--	Mainly to Mauritius.

See footnotes at end of table.

Table 2.—Kenya: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Magnesium metal including alloys:				
Waste and scrap	18	20	10	Italy 10.
Unwrought	--	17	--	All to Italy.
Manganese:				
Ore and concentrate kilograms	--	5	--	All to Uganda.
Oxides and hydroxides do	--	500	--	All to Burundi.
Mercury do	43	12	--	Uganda 10; Burundi 2.
Nickel metal including alloys:				
Waste and scrap	--	63	--	India 33; Belgium 30.
Semimanufactures	8,050	53	--	All to Sudan.
Platinum-group metals including alloys, unwrought and partly wrought:				
Platinum troy ounces	161	--		
Unspecified do	64	2,954	7	United Kingdom 2,947.
Silver metal including alloys:				
Waste and sweepings[2] value	$34,631	--		
Unwrought and partly wrought troy ounces	7,298	249	3	Japan 151; West Germany 95.
Tin:				
Oxides and hydroxides	500	4	--	All to Uganda.
Metal including alloys:				
Waste and scrap	1,625	22	--	All to India.
Unwrought kilograms	5,503	100	--	Do.
Semimanufactures do	66,123	10	--	All to Tanzania.
Titanium: Oxides and hydroxides	8	30	--	Uganda 17; Burundi 12; Rwanda 1.
Uranium and thorium: Compounds kilograms	--	40	--	All to Zaire.
Zinc:				
Ore and concentrate do	--	400	--	All to Burundi.
Oxides and hydroxides	30	37	--	Zambia 30; Tanzania 6.
Metal including alloys:				
Waste and scrap	185	150	--	India 135; Spain 15.
Blue powder	--	37	--	All to India.
Semimanufactures	166	1	--	Mainly to Zaire.
Other:				
Ash and residue containing nonferrous metals	580	272	--	India 245; Netherlands 15; Spain 12.
Metalloids kilograms	3,377	470	--	NA.
Metal including alloys, unwrought and waste and scrap including cermets	62	112	--	Belgium 63; India 35; West Germany 14.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	154	1	--	Mainly to Uganda.
Artificial: Corundum	120	--		
Dust and powder of precious and semiprecious stones	142	80	--	All to Swaziland.
Grinding and polishing wheels and stones	4	1	--	Mainly to Uganda.
Asbestos, crude	(1)	35	--	Do.
Barite and witherite	18	4,140	--	United Arab Emirates 4,114.
Boron materials:				
Borates and perborates kilograms	--	101	--	Burundi 50; Uganda 46; Rwanda 5.
Oxides and acids do	3	30	--	All to Tanzania.
Cement	526,721	530,529	--	Mauritius 175,425; Oman 94,850; Reunion 59,494.
Chalk	331	777	--	Somalia 328; Uganda 265; Yemen Arab Republic 100.
Clays and clay products:				
Crude	70	172	(1)	Zambia 140; Burundi 20.
Products:				
Nonrefractory	188	68	--	Tanzania 41; Uganda 18.
Refractory including nonclay brick	1	1	--	Mainly to Somalia.
Diamond:				
Gem, worked or partly worked, not set or strung carats	177,000	32,500	27,500	Canada 5,000.
Unsorted and unworked do	--	179,940	52,070	India 49,000; West Germany 33,600; United Kingdom 27,500.
Diatomite and other infusorial earth	296	581	--	Swaziland 430; Republic of South Africa 60; India 31.
Feldspar, leucite, nepheline, nepheline syenite	37,788	43,804	10,051	U.S.S.R. 19,100; Netherlands 11,179; Greece 3,145.

See footnotes at end of table.

Table 2.—Kenya: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials:				
Manufactured:				
Nitrogenous	231	7	--	Uganda 5.
Phosphatic	42	--		
Potassic	261	3	--	Mainly to Tanzania.
Other including mixed	7	11	--	Zaire 10.
Ammonia	24	62	--	Uganda 54.
Fluorspar	21,564	56,870	--	U.S.S.R. 25,235; Netherlands 13,412; Japan 11,603.
Gypsum and plasters	270	607	--	Madagascar 600.
Lime	333	453	--	Uganda 318; Djibouti 100; Sudan 33.
Mica:				
Crude including splittings and waste kilograms	--	200	--	All to Burundi.
Worked including agglomerated splittings do	261	1,349	--	Tanzania 740; Uganda 500.
Pigments, mineral:				
Crude, natural	6	1	--	All to Netherlands.
Iron oxides, processed	(1)	1	--	All to Burundi.
Precious and semiprecious stones except diamond:				
Natural kilograms	646	1,420	531	United Kingdom 473; Thailand 156.
Synthetic and reconstituted grams	112,030	472	--	All to West Germany.
Pyrite, unroasted	--	10	--	All to Greece.
Salt and brine	150	35	--	Zambia 18; Sudan 6; Uganda 4.
Sodium and potassium compounds, n.e.s.:				
Caustic potash kilograms	28,349	37	--	Uganda 27; Rwanda 10.
Caustic soda	9,982	69	--	Burundi 40; Tanzania 20; Somalia 8.
Soda ash[3]	219,969	192,832	--	Philippines 26,965; Indonesia 22,200; Malaysia 21,500.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3	27	--	Uganda 26.
Worked	31	1	--	Mainly to West Germany.
Dolomite, chiefly refractory-grade	205	20	--	All to Swaziland.
Gravel and crushed rock	997	700	--	All to Uganda.
Limestone excluding dimension	--	1,020	--	Uganda 1,010.
Quartz and quartzite kilograms	--	168	--	All to Uganda.
Sand excluding metal-bearing	22	34	--	France 14.
Sulfur:				
Elemental:				
Other than colloidal	5,969	3,520	--	Tanzania 3,510.
Colloidal	520	340	--	Tanzania 200; Somalia 140.
Dioxide kilograms	15,500	20	--	All to Zaire.
Sulfuric acid	92	47	--	Uganda 27; Somalia 6; Burundi 4; Sudan 4.
Other:				
Crude: Meerschaum and jet	--	10	--	All to Tanzania.
Halogens				
Oxides, hydroxides, peroxides of barium, magnesium, strontium	61	4	--	Ethiopia 3.
Slag and dross:				
From iron and steel manufactures kilograms	10	4	--	NA.
Unspecified	--	16	--	Belgium 9; United Kingdom 6.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	4	2	--	Mainly to Uganda.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	28	538	--	Burundi 420; Sudan 78; Tanzania 35.
Carbon black	1	1	--	All to Mozambique.
Hydrogen, helium, rare gases	85	100	--	Somalia 58; Uganda 10; Tanzania 7.
Petroleum and refinery products:				
Crude 42-gallon barrels	7	7	--	All to Sudan.
Refinery products:				
Gasoline:				
Aviation thousand 42-gallon barrels	941	1,696	--	NA.
Motor do	1,123	1,182	--	Uganda 777; Rwanda 204; Burundi 125.
Jet fuel do	369	516	--	Uganda 108; Rwanda 31; Comoros 27.
Kerosine do	442	440	--	Uganda 424.
Distillate fuel oil do	1,477	1,387	--	Uganda 568; Rwanda 92; Burundi 74.

See footnotes at end of table.

Table 2.—Kenya: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products —Continued				
Refinery products —Continued				
Residual fuel oil thousand 42-gallon barrels	3,457	6,357	--	Singapore 3,153; Italy 498; Djibouti 450.
Lubricants do	245	258	--	Yemen Arab Republic 89; Uganda 69; Zambia 49.
Other:				
Liquefied petroleum gas do	13	15	--	Uganda 12.
Mineral jelly and wax do	9	6	--	Uganda 5.
Nonlubricating oils do	5	5	--	Uganda 4.
Bitumen and other residues do	18	10	--	Uganda 7; Rwanda 2.
Bituminous mixtures do	3	4	--	Rwanda 2; Uganda 1.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	23	6	--	Somalia 3; Uganda 2.

NA Not available.
[1]Less than 1/2 unit.
[2]May include other precious metals.
[3]May include unidentified crude mineral products.

Table 3.—Kenya: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	--	1,502	--	India 1,500.
Oxides and hydroxides	1,434	1,047	--	United Kingdom 535; India 300; Belgium 204.
Metal including alloys:				
Unwrought	256	575	--	Japan 200; France 145; Canada 140.
Waste and scrap	28	290	--	Uganda 220; Rwanda 56.
Semimanufactures	1,808	3,201	1	United Kingdom 787; Greece 545; Bahrain 439.
Arsenic: Oxides, trioxide, acids	5	--		
Chromium:				
Ore and concentrate	50	30	--	All from West Germany.
Oxides and hydroxides	23	23	1	West Germany 11; United Kingdom 10.
Cobalt: Oxides and hydroxides kilograms	20,931	5	--	All from United Kingdom.
Copper:				
Matte, speiss, similar material do	28	--		
Metal including alloys:				
Unwrought	38	87	--	Zambia 76; United Kingdom 11.
Waste and scrap	8	3	--	Burundi 2; Uganda 1.
Semimanufactures	981	1,056	34	United Kingdom 680; Zambia 76; Belgium 66.
Gold:				
Waste and sweepings value	$994	$34	--	All from Switzerland.
Metal including alloys, unwrought and partly wrought troy ounces	2,366	39,257	6,720	United Kingdom 32,537.
Iron and steel:				
Pyrite, roasted	--	22,603	--	Switzerland 13,303; Greece 9,300.
Metal:				
Waste and scrap	37	1,630	--	Uganda 1,561.
Pig iron, spiegeleisen, powder, shot	12	874	--	Mainly from United Kingdom.
Ferroalloys	259	639	--	Norway 136; Japan 112; West Germany 100.
Steel, primary forms	17,834	32,196	(1)	West Germany 10,041; Belgium 9,957; United Kingdom 5,050; Spain 4,987.

See footnotes at end of table.

Table 3.—Kenya: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections	20,881	33,973	23	Japan 8,534; Czechoslovakia 7,535; United Kingdom 6,917.
Universals, plates, sheets	113,037	162,478	1,007	Japan 136,630; Italy 9,403; United Kingdom 5,942.
Hoop and strip	784	865	11	Japan 250; Poland 247; United Kingdom 186.
Wire	9,296	3,165	--	United Kingdom 2,879.
Rails and accessories	13,658	16,392	2	Romania 3,095; Poland 2,589; China 1,810.
Tubes, pipes, fittings	7,210	10,720	53	Italy 5,502; West Germany 1,322; India 1,199.
Castings and forgings, rough	4	58	--	Belgium 49.
Lead:				
Ore and concentrate	1	2	--	All from United Kingdom.
Oxides and hydroxides	62	19	--	West Germany 12; United Kingdom 7.
Metal including alloys:				
Waste and scrap—kilograms	11,810	21	--	All from United Kingdom.
Unwrought	272	162	18	United Kingdom 90; West Germany 30; Belgium 24.
Semimanufactures	34	40	--	United Kingdom 25; West Germany 8; Belgium 4.
Manganese:				
Ore and concentrate	3,199	1,404	--	Singapore 1,401.
Oxides and hydroxides	17	118	--	Japan 100.
Metal including alloys:				
Waste and scrap	(1)	14	--	Mainly from Uganda.
Unwrought	--	1	--	All from Norway.
Mercury—76-pound flasks	20	10	--	Mainly from United Kingdom.
Nickel metal including alloys, semimanufactures	89	14	6	United Kingdom 2; France 1; Netherlands 1.
Platinum-group metals including alloys, unwrought and partly wrought—troy ounces	3,328	50	--	All from United Kingdom.
Silver metal including alloys, unwrought and partly wrought—do	9,178	7,109	6,109	Switzerland 792; United Kingdom 208.
Tin:				
Ore and concentrate	5	1	--	All from United Kingdom.
Oxides and hydroxides—kilograms	1,000	286	--	India 155; United Kingdom 131.
Metal including alloys:				
Waste and scrap	95	--		
Unwrought	17	22	--	United Kingdom 15; Malaysia 7.
Semimanufactures	206	175	100	United Kingdom 53; Hong Kong 12.
Titanium: Oxides and hydroxides	1,624	1,292	--	West Germany 718; United Kingdom 500.
Tungsten metal including alloys, unwrought and scrap—kilograms	162	105	--	All from United Kingdom.
Uranium and thorium metals including alloys, all forms—do	--	5	--	Do.
Zinc:				
Ore and concentrate	1	--		
Oxides and hydroxides	19	11	--	West Germany 10.
Metal including alloys:				
Waste and scrap	30	186	--	Uganda 157; Rwanda 19.
Unwrought	4,735	7,232	--	Zambia 4,642; Belgium 915; Canada 798.
Blue powder	8	9	--	Norway 5; United Kingdom 4.
Semimanufactures	1,876	1,115	--	West Germany 871; Japan 164.
Other:				
Ores and concentrates	(1)	2	(1)	Mainly from Australia.
Ash and residue containing nonferrous metals—kilograms	350	100	--	All from West Germany.
Metals:				
Metalloids	14	27	--	West Germany 23.
Rare-earth metals	3	3	--	India 2.
Compounds of uranium, yttrium, scandium—kilograms	14	209	--	All from United Kingdom.
Waste and scrap:				
Of precious metals—value	$756	$988	--	Do.
Of base metals including cermets	6	--		

See footnotes at end of table.

Table 3.—Kenya: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	10	12	--	India 5; West Germany 5.
Artificial: Corundum -- kilograms	10	86	5	United Kingdom 81.
Dust and powder of precious and semiprecious stones do	19	28	23	United Kingdom 5.
Grinding and polishing wheels and stones	86	196	(1)	United Kingdom 80; India 38; Switzerland 29.
Asbestos, crude	1,348	1,403	--	Swaziland 670; Switzerland 350; Australia 320.
Barite and witherite	2	--		
Boron materials:				
Borates and perborates -- kilograms	1,100	180	--	All from India.
Oxide and acid do	819	1,140	--	West Germany 1,024.
Cement	946	26,544	(1)	Spain 24,378.
Chalk	15	11	--	Mainly from United Kingdom.
Clays and clay products:				
Crude	1,174	1,770	793	United Kingdom 501; India 241; Uganda 140.
Products:				
Nonrefractory	2,285	4,296	5	Czechoslovakia 1,159; Italy 961; West Germany 403.
Refractory including nonclay brick	3,141	4,696	65	West Germany 1,911; United Kingdom 1,499.
Diatomite and other infusorial earth	401	343	327	United Kingdom 13; West Germany 3.
Diamond:				
Gem, not set or strung carats	42,010	5,045	--	Netherlands 5,000.
Industrial value	$285	--		
Fertilizer materials:				
Natural:				
Nitrogenous	89	85	--	West Germany 60; Denmark 20.
Phosphatic	--	30	--	All from United Kingdom.
Manufactured:				
Nitrogenous	41,187	61,829	10,200	Netherlands 26,901; West Germany 17,750; Italy 3,686.
Phosphatic	11,455	25,466	--	Israel 14,842; Netherlands 6,513; Belgium 2,100.
Potassic	91	613	--	Israel 500; Belgium 100.
Other including mixed	10,833	41,763	5,001	Netherlands 17,028; Italy 9,250; West Germany 6,950.
Ammonia	442	289	--	West Germany 159; Poland 70; Belgium 40.
Graphite:				
Natural kilograms	7,397	193	--	United Kingdom 144; West Germany 49.
Artificial	1	18	(1)	India 12; West Germany 5.
Gypsum and plasters	14,198	38,480	--	Spain 38,217.
Lime	(1)	1	--	All from India.
Magnesite	12	41	--	India 40.
Mica:				
Crude including splittings and waste	33	40	10	United Kingdom 28.
Worked including agglomerated splittings	5	1	--	Mainly from United Kingdom.
Pigments, mineral:				
Crude, natural	350	699	3	India 407; United Kingdom 184; China 49.
Iron oxides, processed	347	424	--	West Germany 374; United Kingdom 29.
Precious and semiprecious stones excluding diamond:				
Natural kilograms	776	476	39	Swaziland 229; Brazil 86; Zimbabwe 62.
Synthetic and reconstructed do	52	189	113	West Germany 74.
Salt and brine	27,981	17,914	72	Ethiopia 16,284.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	52	81	5	Belgium 19; United Kingdom 16; France 15; Sweden 13.
Caustic soda	7,238	11,032	(1)	Italy 5,352; West Germany 1,889; France 1,278.
Soda ash	155	225	--	Bulgaria 50; France 49; West Germany 41.

See footnotes at end of table.

Table 3.—Kenya: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	298	54	--	Mainly from Italy.
Worked	391	566	(1)	India 400; Italy 129.
Dolomite, chiefly refractory-grade	386	660	--	Italy 650.
Gravel and crushed rock	3	8	--	Mainly from India.
Limestone excluding dimension	--	1	--	All from India.
Quartz and quartzite	80	50	--	West Germany 40.
Sand excluding metal-bearing	231	484	1	Belgium 425; United Kingdom 24; Netherlands 18.
Sulfur:				
Elemental:				
Other than colloidal	1,199	6,901	11	Canada 5,048; West Germany 1,237.
Colloidal	84	516	--	West Germany 402; Netherlands 100.
Dioxide kilograms	50	260	--	Netherlands 210; Australia 50.
Sulfuric acid	2	306	--	Netherlands 230; West Germany 71.
Talc and steatite	2,556	2,997	1	India 2,835; United Kingdom 67; Norway 45.
Other:				
Crude	10	78	(1)	India 52; West Germany 20.
Halogens	1	5	--	Israel 2; United Kingdom 1; West Germany 1.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	19	52	12	India 28; Netherlands 6; United Kingdom 4.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	559	39	--	India 35.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	718	368	1	Trinidad and Tobago 240.
Carbon black	2,760	2,044	693	Israel 803; Japan 248; India 156.
Coal, all grades including briquets	15,875	15,563	--	Mozambique 15,333.
Coke and semicoke	206	1,383	--	United Kingdom 1,010; West Germany 364.
Hydrogen, helium, rare gases[2]	46	60	15	United Kingdom 21; Japan 16.
Peat including briquets and litter kilograms	6,523	303	--	All from Italy.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	18,289	23,029	--	Saudi Arabia 12,460; Qatar 3,451; Kuwait 2,386.
Refinery products:				
Gasoline:				
Aviation 42-gallon barrels	107,776	49,068	--	Italy 26,635; People's Democratic Republic of Yemen 13,111.
Motor do	367,272	197,961	23,786	Italy 51,449; Saudi Arabia 28,671; Yemen Arab Republic 24,409.
Jet fuel do	616,626	511,102	52,811	Bahrain 216,090; Italy 131,895; Saudi Arabia 98,228.
Kerosine do	41,257	30,635	--	Netherlands 18,219; Belgium 12,416.
Distillate fuel oil do	107,324	323,754	46,256	Italy 115,638; Bahrain 82,944; Saudi Arabia 31,422.
Residual fuel oil do	864,663	664,634	--	Saudi Arabia 471,058; People's Democratic Republic of Yemen 65,382.
Lubricants do	335,523	384,391	28,221	United Kingdom 100,468; Saudi Arabia 91,206; Australia 73,775.
Other:				
Liquefied petroleum gas do	3	(1)	--	All from United Kingdom.
Mineral jelly and wax do	14,775	41,015	6,165	West Germany 8,518; China 7,280; Indonesia 4,641.
Nonlubricating oils do	30,202	17,965	1,538	China 4,972; West Germany 3,571; Netherlands 3,023.
Pitch, bitumen, other residues do	1,005	26,194	--	Bahrain 24,240.
Bituminous mixtures do	122	464	123	United Kingdom 173; France 76; India 61.
Mineral tar and other coal-, petroleum,- and gas-derived crude chemicals	716	1,351	(1)	United Kingdom 1,234.

[1]Less than 1/2 unit.
[2]May include oxygen and nitrogen.

COMMODITY REVIEW

METALS

Production of metallic minerals in Kenya was virtually nil. About 14,000 tons of magnetite was produced in 1981.

Steel.—A group of international interests, including Marubeni Corp. of Japan and Chandaria and Sha of India, formed the Kenya Steel Co. They planned to construct a reversing cold-rolling steel mill in Mombasa with a capacity of 100,000 tons per year of sheet steel. The mill was to be installed by the end of 1981. This was the second such mill constructed in East Africa. The first was constructed in 1978 in Tanzania.

NONMETALS

Cement.—Two cement plants were operated in 1981—the Bamburi plant of the Bamburi Cement Co., near Mombasa, with a capacity of 1.25 million tons per year, and the Athi River plant of the East African Cement Co., near Nairobi, with a capacity of 450,000 tons per year. The plants operated at 76% capacity in 1981. A third plant was being considered for western Kenya, provided sufficient raw materials are available.

The principal producer continued to experience transportation problems because of a shortage of railroad cars. The shortage has persisted since production capacity was expanded several years ago at the two cement plants to meet increased local demand. Most of the supply was destined for construction in Nairobi.

Bamburi Cement Co.'s portland cement factory in Mombasa was to begin importing coal from Swaziland to replace oil as its fuel. The move was designed to reduce production costs by one-half. An agreement had not yet been reached, but talks were taking place between factory management and the Minister of Labor in hopes of being able to substitute coal for oil by the end of 1981.

Fertilizer Materials.—National Agricultural Chemicals & Fertilizers of Kenya Ltd. has an agreement with a Netherlands company for the design and construction of Kenya's first nitrogen fertilizer project. A previous plan to erect an ammonia synthesis plant using naphtha feedstock was abandoned. Products to be produced at the Mombasa project will be nitric acid, calcium ammonium nitrate and nitrophosphate, and monoammonium and diammonium phosphate. Port facilities would be built to handle imports of ammonia and phosphoric acid. Commissioning of the facilities was scheduled for late 1981.

Soda Ash.—Magadi Soda Co., a subsidiary of Imperial Chemical Industries, Inc., of the United Kingdom, produced soda ash at Lake Magadi. Production of an estimated 250,000 tons of soda ash in 1981 was a 23% increase over 1980 production. Expansion plans call for a total capacity of 500,000 tons per year by 1983. Mining and crushing of soda ash or trona was done by a pontoon-mounted dredge. The material was pumped in slurry form, via a flexible pipe, to an onsite treatment plant. Treatment included washing, screening, dewatering, and calcination, to yield a product having a total alkalinity as Na_2CO_3 of 97.4%. Shipment from Lake Magadi was by way of a 146-kilometer branch line to the Kenya-Uganda railroad at Konza. Warehouses and a deep-water pier for bulk handling of soda ash are owned and operated by Magadi Soda Co. at Kilindini Harbor. The soda ash was shipped principally to Thailand, Indonesia, Malaysia, and Singapore.

Vermiculite.—Production of vermiculite remained nearly the same in 1981 as it was in 1980. Approximately 2,600 tons was produced. Several deposits were worked for vermiculite, with most of it being exported. The vermiculite consumed locally was used in the production of lightweight concrete products and acoustic plaster.

The open pit mine at Kenze, east of Nairobi, had reserves of 0.5 million tons of vermiculite. Crude vermiculite, crushed and screened at the minesite, was shipped to Nairobi for use in the building and construction industry.

The Wasini Mine near Lodosoit was the principal vermiculite mining operation. Reserves have not been assessed but are considered substantial. Production was by the Iwatania-Lonata Vermiculite Co. of Kenya, Ltd. Output was geared to specific customer requirements.

MINERAL FUELS

Petroleum.—Kenya was dependent upon imports of crude oil for the major portion of total energy consumed. Approximately 12% of all energy consumed in Kenya was derived internally, all of which was from hydro-

electric powerplant generation. About 4% of the total energy consumption was in the form of electricity imported from Uganda. The country's only refinery is located at Mombasa. A prefeasibility study has been made concerning the expansion of the Mombasa refinery by Shell Oil Co., but there was no action taken by yearend. This expansion would allow the refinery to convert a large portion of the residuals, now exported at lower prices, into distillates. Kenya would require fewer crude imports to produce the same amount of domestic product and could export more distilled product. The result would be a sizable foreign exchange savings.

Kenya-Cities Service, Inc., has given assurances that its company would cease operations in Kenya and that oil exploration was being done, as planned and in comformity with the agreement with the Government. A concession was acquired by Kenya-Cities Service in 1979, but only one well has been drilled to date.

The Kenyan Government, in November 1981, increased by 18% the prices oil companies will charge for all their petroleum products. The Government has also established the Kenya National Oil Corp., which will now be responsible for the purchase of all foreign oil. Kenya spent 37% of its foreign exchange currency in 1981 on oil.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Kenyan shillings (K Sh) to U.S. dollars at the rate of K Sh9.05=US$1.00 for 1981.

The Mineral Industry of the Republic of Korea

By E. Chin[1]

Under the 5-year economic development plan, the Republic of Korea's gross national product (GNP) was to grow at an annual rate of 9.2% between 1977 and 1981. In constant 1975 prices, GNP was estimated at $30.6 billion[2] in 1981 compared with $28.6 billion in 1980, reflecting a real growth of 7%.[3] Input by sector to GNP in 1981 was as follows, in billion dollars: manufacturing, 10.5; agriculture, forestry, and fishing, 5.6; sales and services, 4.7; transport, storage, and communications, 2.6; social services, 1.9; finance and business services, 1.3; and other, 4.0.[4] Mining and quarrying accounted for only $367 million of GNP in 1981. Projected growth in 1982 was 5%, or a GNP of $32.2 billion.

Between 1974 and 1979, the South Korean currency (won) was convertible to U.S. currency at the rate of 484 won to $1.00. In January 1980, the South Korean currency was devalued by 20% and allowed to float. At yearend 1980, the rate was 659.9 won. By the end of February 1981, the won equivalence was 670.5; thereafter, the Bank of Korea posted monthly devaluations. At yearend 1981, the won conversion was 700.5, representing a devaluation of about 6% for the year.

In 1981, employment in the mining sector totaled 124,000 persons, and monthly earnings averaged about $345. Monthly earnings in metal mining were $449, followed by coal, $361, and other mining, $274. In comparison, monthly earnings in selected manufacturing sectors were petroleum refining, $691; iron and steel, $356; nonmetallic mineral products, $288; nonferrous metals, $252; and fabricated metal products, $240. The national average for monthly earnings in 1981 was $258 based on 24.8 workdays.

The wholesale price index (1975=100) for all commodities was 275.8 in 1981 compared with 225.2 in 1980. Between 1980 and 1981, the wholesale price index for producer goods increased from 235.5 to 290.1; capital goods, from 150.9 to 167.5; and consumer goods, from 221.8 to 271.9. In the same period, the export price index rose from 168.7 to 177.8, and for imports, 175.2 to 185.6. Wholesale prices for selected major commodities in 1981 were nitrogenous fertilizers, $316 per ton, up 45%; phosphatic fertilizer, $119 per ton, up 45%; compound fertilizer, $264 per ton, up 44%; cement, $63 per ton, up 19%; electrolytic copper, $2,553 per ton, up 4%; bunker C oil, $0.26 per liter, up 35%; and anthracite coal, $42 per ton, up 40%.

On August 21, 1981, the Economic Planning Board released the final version of the fifth 5-year economic and social development plan for 1982-86. The three major goals of the plan were to establish price stability, continue high economic growth, and promote equity in income distribution. Targets under the plan included real annual GNP growth of 7.6%, per capita GNP growth of 5.9%, export growth of 11.4%, imports growth of 8.4%, and an unemployment level of 4.0% by 1986.[5]

Expanding exports will continue to be the basis for growth of the economy. Exports were to rise from $21 billion at current prices in 1981 to $53 billion in 1986. To strengthen the competitiveness of export industries, the Government was to encourage joint ventures between foreign and domestic firms and to upgrade technical skills of workers by providing educational opportunities. Product quality of domestic manufacturers was to be stimulated by increasing competition through import liberalization.

Nineteen major development projects were to be expedited during the plan period. Projects related to the minerals sector were expansion of the Pohang iron and steel complex, construction of a second iron and steel complex, and construction of a lead smelter. The proposed construction of a third petrochemical complex was deleted from the final version of the economic plan.

The new economic plan placed heavy emphasis on developing ocean transport. The Korean Maritime and Port Administration (KMPA) set a target of transporting 50% of the total seaborne cargo by using national-flag vessels by 1986. Based on an estimated arrival and departure of a total of 190 million tons of seaborne cargo annually by 1986, earnings would increase to $5 billion from the current $1.8 billion. To this end, KMPA planned to increase the total tonnage of the country's vessels from 5.4 million tons presently to 12 million tons in 1986 and to increase stevedoring capabilities of seaborne cargo from 82 to 150 million tons.

To secure mineral resources, the Government relaxed measures for domestic companies investing in overseas projects. Clearance for overseas projects were to be approved only by the Ministry of Energy and Resources (MER) and the Bank of Korea. In 1981, 10 companies were involved in overseas resource development projects, 5 projects in the United States, 4 in Australia, 2 in Indonesia, and 1 in Canada for coal; 1 project each for zinc and tin in Thailand; 1 project for limestone in the Philippines, and 1 for oil in Indonesia.

Under a proposed revision of a long-term power development program, MER was planning to expand the role of nuclear energy generation, thereby reducing South Korean dependence on foreign oil. Eleven nuclear plants were to be completed by the end of 1991. The United States was to supply five reactors; France, two; Canada, one; and suppliers for the remaining three had not yet been chosen. In another measure to reduce the country's dependence on oil, 12 power generating plants were to be converted to coal and liquefied natural gas. Conversion of the plants were to be completed by 1987.

The Ministry of Construction announced the formation of the Overseas Construction Association of Korea, which will fund the development of new markets and technology to enhance South Korean construction exports. The Association plans to establish an automated data bank for information on overseas construction activities. In 1981, South Korean construction companies won a total of $13.6 billion in overseas contracts, 2.5 times the value of domestic construction projects.

PRODUCTION

Anthracite coal was the most important South Korean mine product. The country was also a significant world producer of graphite, kaolin, pyrophyllite, talc, and tungsten. Although mineral raw materials for most of the industrial needs were imported, there was limited domestic mine output of copper, lead, zinc, fluorite, gold, silver, and iron ore. Most of the country's production of primary metals, such as aluminum, copper, and iron and steel, was from imported ores and concentrates. There was no domestic production of oil and natural gas. In 1981, shipments exceeded mine production for agalmatolite, anthracite coal, fluorite, kaolin, lead, and zinc. On the other hand, production levels exceeded shipments for copper, gold, silver, iron ore, molybdenum, talc, and tungsten.

The industrial production index (1975=100) for all items in 1981 was 231.7 compared with 119.1 for mining and 238.8 for manufacturing. The 1981 index for coal mining was 113.7; for metal mining, 111.3; and for all other mining, 146.3. The 1981 index for petroleum refining was 146.9; nonmetal mineral products, 185.6; iron and steel, 382.8; nonferrous metals, 581.4; and fabricated metal products, 299.2.[e]

Table 1.—Republic of Korea: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum metal, primary	18,340	20,155	21,751	21,265	[2]17,515
Arsenic, mine output, white arsenic equivalent	647	548	[r]NA	NA	NA
Bismuth metal	[r]134	122	87	123	100
Cadmium metal, smelter	20	40	50	365	325
Copper:					
Mine output, metal content	1,748	[r]715	475	372	[2]1,142
Metal:					
Smelter	36,800	54,900	48,200	64,100	95,000
Refined including secondary	[r]42,880	52,442	63,082	72,931	[2]107,984
Gold metal troy ounces	[r]21,380	[r]27,393	[r]24,081	41,218	[2]40,639
Iron and steel:					
Ore and concentrate:					
Gross weight thousand tons	791	693	639	619	[2]494
Iron content do	443	388	358	347	[2]277
Pig iron do	2,425	2,741	5,063	5,577	[2]7,928
Ferroalloys:					
Ferromanganese	36,500	47,500	53,000	54,279	64,000
Ferrosilicon	26,826	30,800	38,000	29,712	35,000
Other	507	584	21,151	24,761	28,485
Total	63,833	78,884	112,151	108,752	[2]127,485
Crude steel excluding castings thousand tons	[r]4,347	[r]4,969	[r]7,610	8,558	[2]10,754
Lead:					
Mine output, metal content	16,552	16,100	11,073	11,407	[2]11,446
Metal, smelter	6,742	7,218	7,600	5,479	[2]9,257
Manganese ore and concentrate:					
Gross weight	664	747	35	81	75
Manganese content	266	299	14	32	30
Molybdenum, mine output, metal content	101	220	189	300	[2]311
Silver metal thousand troy ounces	2,106	1,385	2,278	2,292	[2]3,148
Tin, mine output, metal content	15	[r]20	31	8	10
Tungsten, mine output, metal content	2,635	[r]2,681	2,713	2,737	[2]2,642
Zinc:					
Mine output, metal content	68,355	66,440	62,477	56,787	[2]56,525
Metal, primary	32,756	58,970	83,014	79,150	[2]83,915
NONMETALS					
Asbestos	6,180	13,616	14,804	9,854	10,000
Barite	[r]2,645	1,005	728	410	400
Cement, hydraulic thousand tons	14,196	15,133	16,413	15,631	[2]15,617
Clays: Kaolin	356,660	366,370	374,423	273,767	[2]224,550
Diatomaceous earth	22,980	18,845	23,915	25,101	25,000
Feldspar	49,374	69,200	[r]36,238	71,972	70,000
Fluorspar, metallurgical-grade	12,981	11,368	8,450	6,912	[2]6,159
Graphite:					
Crystalline	3,446	2,534	2,453	1,429	[r]1,500
Amorphous	62,509	53,785	54,240	59,157	59,500
Total	65,955	56,319	56,693	60,586	61,000
Kyanite and related materials: Andalusite	115	61	60	82	75
Lime, slaked thousand tons	60	[e]60	60	210	200
Mica: Sericite	10,133	16,923	10,005	10,330	10,000
Nitrogen: N content of ammonia	725,133	896,911	960,623	847,871	[2]746,723
Pyrites, gross weight	--	--	562	460	500
Salt	794,000	650,000	500,000	455,000	450,000
Sodium compounds: Sodium carbonate, manufactured	170,467	[r]176,090	203,792	221,920	[2]202,063
Stone, sand and gravel:					
Agalmatolite	375,509	397,573	430,890	371,932	[2]302,975
Crushed and broken limestone thousand tons	22,734	24,153	28,112	28,024	28,000
Quartzite do	333	265	392	291	300
Sand including glass sand do	335	348	513	510	500
Sulfur:					
S content of pyrites	--	--	169	138	150
Byproduct:					
Of metallurgy[e]	33,000	47,000	54,000	54,000	54,000
Of petroleum[e]	31,000	34,000	36,000	36,000	36,000
Total	64,000	81,000	90,169	90,138	90,150
Talc and related materials:					
Pyrophyllite	443,304	463,005	541,383	514,511	510,000
Talc	171,926	202,078	236,824	204,662	205,000

See footnotes at end of table.

Table 1.—Republic of Korea: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	38,248	51,989	58,284	74,122	[2]57,329
Coal: Anthracite thousand tons	17,268	18,054	18,208	18,624	[2]19,994
Coke do	1,165	1,319	2,331	2,550	[2]3,797
Fuel briquets: Anthracite briquets do	NA	NA	16,942	17,000	17,000
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	7,004	7,989	8,712	7,085	[2]6,205
Jet fuel do	5,835	5,390	5,495	4,920	[2]5,409
Kerosine do	4,522	6,791	8,912	8,811	[2]8,154
Distillate fuel oil do	30,242	34,444	38,056	38,199	[2]40,622
Residual fuel oil do	79,932	85,953	91,135	90,766	[2]85,532
Lubricants do	1,191	1,386	1,512	1,403	[2]1,354
Other do	24,840	26,168	27,747	29,725	[2]31,926
Refinery fuel and losses do	3,937	5,857	7,024	1,952	[2]3,614
Total do	157,503	173,978	188,593	182,861	182,816

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Includes data available through July 9, 1982.
[2]Reported figure.

TRADE

During the past decade, there was a fourteenfold increase in the Republic of Korea's two-way trade. In 1970, total trade was valued at $2.8 billion, and in 1980 had reached $39.8 billion. Total trade in 1981 was $47.4 billion. Because of rapid industrialization, the Republic of Korea largely relies on imports of raw materials. For instance, imports of petroleum and petroleum products were only $0.1 billion in 1970 but grew to $7.8 billion in 1981. Receipts of other major mineral commodities included coal, iron ore, manganese, aluminum, and copper. The country's largest imports in 1981 by commodity group were as follows, in billion dollars: mineral fuels and related materials, 7.8; machinery and transportation equipment, 6.0; crude, inedible materials, 3.6; manufactured goods, 2.9; materials chiefly for food, 2.7; and chemicals and related products, 2.1. On the other hand, exports of the two largest South Korean commodity groups—manufactured goods and machinery and transport equipment—totaled $18.6 billion, or 87% of the total value of all exports.

In 1981, imports by principal supplying country were as follows, in billion dollars: Japan, 6.3; the United States, 6.0; Saudi Arabia, 3.6; Kuwait, 1.6; Australia, 0.9; the Federal Republic of Germany, 0.7; Malaysia, 0.6; and Canada, 0.5. The principal export destinations were as follows, in billion dollars: the United States, 5.7; Japan, 3.5; Hong Kong, 1.2; Saudi Arabia, 1.1; the Federal Republic of Germany, 0.8; the United Kingdom, 0.7; and Canada, 0.5.[7]

The Republic of Korea's total trade value was expected to surpass $100 billion by 1986, consisting of $53 billion in exports and $55.5 billion in imports. To accomplish this goal, the Government has scheduled ambitious development projects under the fifth 5-year economic and social development plan. More immediately, a new annual trade plan for July 1, 1982, to June 30, 1983, was to be released in May 1982 announcing the gradual liberalization of trade restrictions. The criteria for foreign trading licenses were to be eased, and current trade restrictions were to be revised in favor of minimal controls on exports and imports.

On February 1, 1982, the import deposit system required for certain commodities under deferred or installment payment terms was to be abolished. Moreover, all commodities were to be freely imported on a deferred payment basis unless included on the list of exceptions. In addition, a revised customs law was to be effective on January 1, 1982, adjusting tariff rates on 340 items.

Table 2.—Republic of Korea: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	72	22	--	Bangladesh 10; Thailand 5; Pakistan 3.
Metal including alloys:				
Unwrought	622	1,531	--	All to Japan.
Semimanufactures	3,766	11,920	7	Saudi Arabia 8,046; Japan 1,555.
Antimony metal including alloys, all forms	5	4	2	Saudi Arabia 2.
Arsenic: Oxides and hydroxides	60	116	16	West Germany 32; Malaysia 32; Australia 16.
Cadmium metal including alloys, all forms	566	314	190	Netherlands 95; Japan 22.
Chromium: Oxides and hydroxides	387	224	--	Hong Kong 150; Thailand 38; Indonesia 35.
Cobalt metal including alloys, scrap kilograms	--	68	68	
Copper:				
Oxides and hydroxides ----do----	500	--		
Sulfate	17	68	--	All to Singapore.
Metal including alloys:				
Scrap	730	627	--	All to Japan.
Unwrought	--	5,243	1,000	Japan 2,493; China 1,600.
Semimanufactures	1,158	4,083	650	China 925; India 715; Singapore 296.
Iron and steel:				
Ore and concentrate	30	--		
Metal:				
Scrap	12,565	9,675	--	China 5,050; Japan 4,599.
Pig iron, sponge iron, powder, shot	32,983	151,049	7	Japan 102,179; Indonesia 17,003; Bangladesh 15,000.
Ferroalloys	11,249	2,500	--	Japan 2,225; Pakistan 95.
Steel, primary forms thousand tons	898	1,209	19	Japan 372; Italy 204; China 135.
Semimanufactures:				
Bars, rods, angles, shapes, sections ----do----	417	1,027	38	Saudi Arabia 552; India 86; Japan 38.
Universals, plates, sheets do	1,264	1,530	304	Japan 457; China 92; Singapore 80.
Hoop and strip	17,344	21,888	103	Japan 6,873; Indonesia 6,261; Singapore 4,159.
Rails and accessories	1,783	3,825	--	China 2,019; Singapore 602; Canada 434.
Wire	52,431	75,578	8,502	Saudi Arabia 28,115; United Arab Emirates 6,640.
Tubes, pipes, fittings	508,789	826,112	536,724	Saudi Arabia 104,858; Japan 75,119.
Castings and forgings, rough	36,002	11,504	3,977	Japan 6,621.
Gold:				
Ore and concentrate ------value--	$591,705	--		
Sweepings, waste, scrap ----do----	$92,408	--		
Metal including alloys, unwrought and partly wrought troy ounces	--	8,512	6,422	Japan 2,090.
Lead:				
Ore and concentrate	6,600	4,000	--	All to Japan.
Oxides and hydroxides	17	11	--	All to Bangladesh.
Metal including alloys:				
Scrap	1,833	708	--	All to Japan.
Unwrought	2,595	3,320	--	Japan 3,203; Kuwait 107.
Semimanufactures	17	143	--	Saudi Arabia 85; Kuwait 8.
Magnesium metal including alloys:				
Scrap	97	30	--	All to Japan.
Semimanufactures ---- kilograms	100	--		
Manganese ores and concentrates:				
Pyrolusite	--	165	--	All to Singapore.
Molybdenum:				
Ore and concentrate	374	322	--	West Germany 193; Canada 62; Netherlands 57.
Metal including alloys, semimanufactures ------ kilograms	16	964	--	Libya 950; Japan 14.
Nickel metal including alloys:				
Scrap	9	56	--	All to Japan.
Unwrought	48	18	--	Do.
Semimanufactures	3	7	--	Saudi Arabia 6.

See footnotes at end of table.

Table 2.—Republic of Korea: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals:				
Sweepings, waste, scrap ____ value__	--	$62,746	$4,144	West Germany $58,602.
Metal including alloys, unwrought and partly wrought troy ounces__	187	4,378	257	Japan 2,706; United Kingdom 1,415.
Silicon: Elemental _____	68	--		
Silver:				
Ore and concentrate value, thousands__	$3,490	$10,067	--	All to Japan.
Sweepings, waste, scrap ____ value__	$9,562	$61,700	--	Do.
Metal including alloys, unwrought and partly wrought thousand troy ounces__	1,805	1,137	689	Japan 415; United Kingdom 33.
Tin:				
Ore and concentrate _____	10	--		
Metal including alloys, semimanufactures _____	1	18	--	Saudi Arabia 9; Libya 7.
Tungsten:				
Ore and concentrate _____	1,915	1,712	25	Japan 733; West Germany 365; Sweden 273.
Metal including alloys, all forms ___	599	604	244	Japan 111; United Kingdom 72; West Germany 58.
Zinc:				
Oxides and peroxides _____	1,379	1,490	--	Japan 1,328; Sudan 159.
Metal including alloys:				
Scrap _____	84	255	NA	Philippines 100; China 50.
Unwrought _____	8,885	11,612	2,200	Japan 7,036; Pakistan 1,500.
Blue powder _____	15	38	--	Japan 20; Singapore 18.
Semimanufactures _____	16	54	1	Japan 48.
Other:				
Ash and residue containing nonferrous metals _____	1,821	2,006	--	Japan 1,917; United Kingdom 54.
Metal including alloys:				
Pyrophoric alloys _____	65	--		
Rare-earth metals _____	10	--		
Base metals including alloys, all forms _____	12	9	--	Mainly to Japan.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc _____	50	1,000	--	All to Japan.
Dust and powder of precious and semiprecious stones ____ kilograms__	1,621	1,576	--	Canada 1,415; West Germany 148.
Grinding and polishing wheels and stones _____	592	226	3	Saudi Arabia 93; Indonesia 52; Japan 39.
Asbestos, crude _____	8	30	--	All to Japan.
Boron materials: Oxide and acid____	4	--		
Cement _____ thousand tons__	2,439	4,754	--	Hong Kong 837; India 830; Saudi Arabia 500.
Clays and clay products:				
Crude:				
Bentonite _____	1,070	10	--	All to Bangladesh.
Chamotte and dinas earth____	28,010	29,335	--	Japan 29,035; China 300.
Kaolin _____	82,416	76,920	--	Japan 59,380; China 15,950.
Other _____	5,308	3,097	--	Japan 2,999.
Products:				
Nonrefractory _____	72,959	62,747	16,478	West Germany 14,053; Hong Kong 9,034.
Refractory including nonclay brick _____	13,241	15,792	2,238	Japan 11,157; Malaysia 968; Indonesia 480.
Diamond:				
Natural:				
Gem, not set or strung __ value__	$573,667	$842,788	$9,907	Japan $602,168; China $181,986.
Industrial _____ do____	$28,878	--		
Synthetic and reconstructed:				
Gem, not set or strung __ do____	$2,834	$23,233	$23,233	
Industrial _____ do____	$28,513	--		
Diatomite and other infusorial earth ___	60	120	--	All to Indonesia.
Feldspar _____	13,380	19,672	--	China 19,140; Japan 532.

See footnotes at end of table.

Table 2.—Republic of Korea: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials, manufactured:				
Nitrogenous	474,961	635,257	NA	Philippines 226,931; Indonesia 130,000; Hong Kong 41,000.
Phosphatic	28,135	33,875	--	Japan 31,875; Fiji 2,000.
Potassic	1	--		
Other including mixed	623,366	624,253	NA	Turkey 107,982; Iran 94,000; India 29,630.
Fluorspar	470	500	--	All to Japan.
Graphite, natural	46,520	45,416	NA	Japan 26,088; China 12,565; Indonesia 4,500.
Gypsum and plasters	59,319	79,819	--	China 47,386; Japan 17,500.
Lime	544	10,873	NA	Australia 4,750; Papua New Guinea 3,045.
Magnesium materials:				
Magnesite	750	1,000	--	All to Japan.
Oxides	150	--		
Mica:				
Crude including splittings and waste	656	--		
Worked including agglomerated splittings	16	--		
Pigments, mineral: Iron oxides, processed	25	26	NA	Japan 15.
Precious and semiprecious stones except diamond:				
Natural ---------- kilograms	7	[1]25,469	299	Japan 12,372; China 10,210.
Synthetic and reconstructed value, thousands	$5,087	$6,447	$5,208	Japan $458; Hong Kong $405.
Salt and brine	399	99	2	Saudi Arabia 38; Qatar 19; United Arab Emirates 16.
Sodium and potassium compounds, n.e.s:				
Caustic potash	--	3	--	All to Sudan.
Caustic soda	--	40,307	--	Japan 24,438; Australia 11,409.
Soda ash	8,100	11,614	NA	Indonesia 7,500; Kuwait 500.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	229,831	312,483	45	Japan 310,552; China 1,886.
Worked	41,680	49,564	23	Japan 48,955; Saudi Arabia 448.
Dolomite, chiefly refractory-grade	126,657	96,400	--	All to Japan.
Gravel and crushed stone	2,772	1,873	--	Japan 1,453; China 250.
Limestone excluding dimension	10	--		
Quartz and quartzite	36,104	30,872	--	Japan 30,472; China 200; Indonesia 200.
Sand excluding metal-bearing	4,203	5,206	--	Japan 5,200.
Sulfur:				
Elemental, other than colloidal	--	1,603	--	Indonesia 1,205; Singapore 323.
Sulfuric acid	7	23	--	Libya 16; Saudi Arabia 7.
Talc including natural steatite	69,134	53,478	1,703	Japan 31,258; Thailand 6,870; Philippines 6,800.
Other:				
Crude	301,800	284,531	--	Japan 170,095; China 114,000.
Slag, dross, similar waste, not metal-bearing	72,325	53,500	--	All to Japan.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	4,099	5,157	--	Saudi Arabia 2,049; Kuwait 938; Libya 838.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	5	--		
Coke and semicoke	1	--		
Petroleum refinery products:				
Kerosine ------ 42-gallon barrels	--	5,773	NA	NA.
Jet fuel ---------- do	--	3,520	--	All to Philippines.
Distillate fuel oil ---------- do	--	22,156	NA	NA.
Residual fuel oil ---------- do	62,937	658,294	5,874	Singapore 276,843; Thailand 254,299.
Lubricants ---------- do	27,308	74,850	186	Indonesia 4,851; Singapore 4,321; Burma 3,384.
Other:				
Liquefied petroleum gas do	229,251	132,124	--	Hong Kong 72,964; Philippines 30,044; Thailand 23,177.
Mineral jelly and wax do	6,261	6,889	NA	Japan 1,574; Hong Kong 1,573; Chile 1,180.
Nonlubricating oils do	351,725	712	--	Sudan 651; Kuwait 56.
Bitumen and other residues do	41,635	76,733	--	Indonesia 34,609; Hong Kong 22,695; Singapore 8,484.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	95,621	125,447	--	Japan 91,864; China 21,209; Netherlands 5,211.

[r]Revised. NA Not available.
[1]Excludes an unreported quantity valued at $13,568.

Table 3.—Republic of Korea: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	1,860	2,247	--	Japan 1,370; Hong Kong 850; Sweden 27.
Oxides and hydroxides:				
For use in manufacturing	31,139	30,940	--	All from Japan.
Other	32,190	28,387	595	Japan 26,960; Taiwan 604.
Metal including alloys:				
Scrap	5,308	3,868	3,471	Japan 157; Australia 136.
Unwrought	82,803	73,821	31,332	Japan 13,645; Canada 11,982; Egypt 3,810.
Semimanufactures	19,954	19,610	2,858	Japan 7,758; France 5,278; Spain 1,663.
Antimony:				
Ore and concentrate	480	224	--	All from Thailand.
Oxides and hydroxides	80	52	--	Japan 47; United Kingdom 5.
Metal including alloys, all forms	69	NA	NA	NA.
Arsenic: Trioxide and acid	20	--		
Beryllium metal including alloys, all forms kilograms	14	1,000	--	All from Japan.
Bismuth metal including alloys, all forms do	273	NA	NA	NA.
Cadmium metal including alloys, all forms	4	NA	NA	NA.
Chromium:				
Ore and concentrate	9,344	5,264	NA	Philippines 2,355; Japan 1,919.
Oxides and hydroxides	1,213	1,147	574	Japan 362; West Germany 192.
Cobalt:				
Ore and concentrate kilograms	4	--		
Oxides and hydroxides	16	9	2	Netherlands 3; Japan 2.
Metal including alloys, all forms	70	NA	NA	NA.
Copper:				
Ore and concentrate	128,809	233,999	--	Philippines 124,358; Mexico 39,377; Canada 34,394.
Oxides and hydroxides	30	42	--	All from Japan.
Metal including alloys:				
Cement	1,848	3,341	2,135	Australia 1,132.
Scrap	51,259	19,637	15,046	Japan 2,602; United Arab Emirates 504; Kuwait 427.
Unwrought	26,277	15,471	2,020	Japan 6,156; Peru 1,371; Chile 1,170; Canada 1,026.
Semimanufactures	20,302	14,472	267	Japan 11,903; Australia 1,789.
Gold:				
Ore and concentrate value	--	$375,638	--	All from Singapore.
Metal including alloys, unwrought and partly wrought troy ounces	155,420	128,380	42,974	Japan 82,498; Singapore 1,648.
Indium metal including alloys, all forms kilograms	1,008	NA	NA	NA.
Iron and steel:				
Ore and concentrate thousand tons	7,517	9,142	--	Australia 3,883; India 2,160; Peru 1,680.
Metal:				
Scrap do	1,580	1,932	1,508	Australia 156; Japan 83; Canada 36.
Pig iron, sponge iron, powder, shot	82,681	23,434	1	India 9,983; Japan 4,598; Indonesia 4,575.
Ferroalloys	8,014	6,734	215	Japan 3,508; Norway 500; United Kingdom 118.
Steel, primary forms thousand tons	1,548	1,490	16	Japan 1,277; France 111; Australia 69.
Semimanufactures:				
Bars, rods, angles, shapes, sections	522,414	407,429	4,254	Japan 369,439; United Kingdom 23,799.
Universals, plates, sheets	429,564	449,257	1,193	Japan 442,876; Sweden 530; West Germany 526.
Hoop and strip	216,747	73,710	110	Japan 71,235; West Germany 2,042.
Rails and accessories	23,768	7,644	1,032	Japan 5,635; United Kingdom 774; France 102.
Wire	60,532	31,121	447	Japan 29,935; Norway 144; Italy 142.
Tubes, pipes, fittings	96,001	145,120	16,495	Japan 121,172; West Germany 4,899; United Kingdom 1,496.
Castings and forgings, rough	14,814	1,036	1	Japan 1,029; United Kingdom 4.

See footnotes at end of table.

Table 3.—Republic of Korea: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides and hydroxides	70	236	2	Mexico 187; Australia 34; Japan 13.
Metal including alloys:				
Scrap	29,437	23,388	16,281	Kuwait 4,599; Saudi Arabia 796; Canada 504.
Unwrought	19,750	20,617	2,099	Peru 7,120; Mexico 3,244; Japan 2,822.
Semimanufactures	168	150	3	Japan 109; West Germany 29.
Lithium:				
Oxides and hydroxides	35	12	11	Belgium 1.
Elemental	28	8	(1)	Mainly from Japan.
Magnesium metal including alloys:				
Unwrought including scrap	339	479	291	Japan 178; France 10.
Semimanufactures	14	14	12	Japan 2.
Manganese:				
Ore and concentrate:				
Pyrolusite	4,807	3,435	--	Singapore 2,154; Japan 1,191; Australia 90.
Other	225,829	204,765	NA	Australia 123,768; India 77,908.
Oxides and hydroxides	1,744	1,321	--	Japan 1,172; Belgium 113.
Mercury 76-pound flasks	761	836	65	Japan 756; Switzerland 14.
Molybdenum metal including alloys, all forms	9	20	3	Japan 14; West Germany 3.
Nickel:				
Oxides and hydroxides	108	102	--	Canada 77; France 10; Japan 7.
Matte, speiss, similar material	89	31	--	All from Canada.
Metal including alloys:				
Scrap	77	11	(1)	Norway 10.
Unwrought	1,927	2,777	300	Canada 1,505; Netherlands 200; Philippines 200.
Semimanufactures	727	533	72	Japan 250; West Germany 44; Australia 40.
Phosphorus: Elemental	44	879	432	Canada 396; India 30.
Platinum-group metals:				
Sweepings, waste, scrap value	$36,436	--		
Metal including alloys, unwrought and partly wrought troy ounces	99,592	75,579	25,669	West Germany 23,795; Japan 16,247.
Rare-earth metals including alloys, all forms	14	1	--	Mainly from Japan.
Selenium: Elemental	2	5	(1)	Japan 4.
Silicon: Elemental	880	603	292	France 119; Japan 91; Norway 84.
Silver:				
Sweepings, waste, scrap value	$286,405	$640,886	$5,527	Japan $635,359.
Metal including alloys, unwrought and partly wrought thousand troy ounces	876	[2]2,472	297	Japan 255; United Kingdom 14.
Tantalum metal including alloys, all forms kilograms	9	NA	NA	NA.
Tin:				
Ore and concentrate	543	331	--	Singapore 149; Malaysia 137; Indonesia 45.
Metal including alloys:				
Unwrought including scrap	6,428	1,234	1	Malaysia 781; Indonesia 354; Singapore 57.
Semimanufactures	74	95	4	Japan 66; Thailand 20.
Titanium:				
Ore and concentrate:				
Rutile	4,631	3,740	--	All from Australia.
Ilmenite	12,314	31,150	--	Malaysia 30,868; Australia 282.
Oxides and hydroxides	3,783	1,976	105	Japan 1,084; West Germany 514; Australia 122.
Metal including alloys, all forms	82	NA	NA	NA.
Tungsten:				
Ore and concentrate	--	67	--	All from Australia.
Metal including alloys, all forms	29	16	1	Japan 14.
Vanadium: Pentoxide kilograms	1,465	739	163	Japan 576.
Zinc:				
Ore and concentrate	42,601	43,760	--	Australia 37,070; Peru 6,690.
Oxides and hydroxides	413	226	40	Japan 161; West Germany 10.
Metal including alloys:				
Scrap	11,060	9,191	1,470	Japan 7,035; Australia 652.
Unwrought	3,131	1,986	--	Japan 1,254; Australia 675; Panama 37.
Blue powder	155	NA	NA	NA.
Semimanufactures	86	301	65	Japan 236.

See footnotes at end of table.

Table 3.—Republic of Korea: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zirconium: Ore and concentrate	1,274	1,208	--	Australia 678; Japan 275; Malaysia 255.
Other:				
Oxides, hydroxides, peroxides	174	165	1	Japan 154; Belgium 5.
Ash and residue containing nonferrous metals	22,035	28,664	--	Japan 28,629; Australia 35.
Metals:				
Alkaline-earth metals	15	14	1	Japan 10; West Germany 3.
Base metals including alloys, all forms	332	610	58	Japan 230; Belgium-Luxembourg 17.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	1,031	369	11	Japan 357.
Artificial: Corundum	8,525	9,833	6	Japan 8,922; United Kingdom 450.
Dust and powder of precious and semiprecious stones excluding diamond kilograms	4,561	2	2	
Grinding and polishing wheels and stones	733	530	36	Japan 447.
Asbestos, crude	58,616	36,787	4,728	Canada 4,817; Australia 1,326.
Barium materials:				
Barite and witherite	162	100	--	All from Thailand.
Hydroxide	59	50	(1)	Italy 18; Netherlands 18; Japan 13.
Boron materials:				
Crude natural borates	345	941	--	Peru 500; Japan 441.
Oxide and acid	2,198	1,052	943	Taiwan 68; Japan 39.
Cement	467,748	5,112	275	Japan 4,737; France 75; Singapore 25.
Chalk[3]	15	NA	--	All from West Germany.
Clays and clay products:				
Crude	51,612	54,501	23,989	Japan 25,054; Hong Kong 3,849.
Products:				
Nonrefractory	6,847	2,638	25	Japan 1,384; Italy 571; Philippines 342.
Refractory including nonclay brick	216,355	93,437	1,888	Japan 61,135; West Germany 20,352; United Kingdom 9,745.
Diamond:				
Natural:				
Gem, not set or strung value, thousands	$1,489	$1,782	$3	Japan $817; Belgium $634.
Industrial do	$1,307	$830	$600	Japan $184; United Kingdom $27.
Dust and powder do	$2,763	$2,751	$40	Japan $2,672; United Kingdom $39.
Synthetic and reconstructed:				
Gem, not set or strung do	$83	$5	$5	
Industrial do	--	$11	--	All from Japan.
Dust and powder do	$3,418	$3,019	$2,899	Japan $120.
Diatomite and other infusorial earth	58	49	49	
Fertilizer materials:				
Crude: Phosphatic thousand tons	1,845	1,670	1,512	Nauru 69; Denmark 39.
Manufactured:				
Nitrogenous	12,896	3,584	(1)	Japan 2,200; Chile 1,373.
Phosphatic	21	20	--	All from Japan.
Potassic	359,302	259,087	120	Canada 217,273; Belgium 21,500; Israel 13,702.
Other including mixed	23	38	14	Japan 20; West Germany 4.
Ammonia	19	18	1	Japan 17.
Fluorspar	11,338	21,718	--	All from Thailand.
Graphite, natural	269	322	24	Japan 246; India 30.
Gypsum and plasters	5,078	8,425	21	Morocco 8,400.
Halogens	161	125	33	Israel 47; Japan 25.
Lime	50	--		
Magnesium materials:				
Magnesite	51	123	--	All from Japan.
Oxides and hydroxides	7,683	14,004	5	Japan 13,987.
Mica:				
Crude including splittings and waste	163	134	10	India 101; Japan 17.
Worked including agglomerated splittings	74	33	(1)	Japan 32.
Pigments, mineral including processed iron oxides	1,303	1,844	315	Japan 1,383; West Germany 134.
Precious and semiprecious stones except diamond:				
Natural[4] kilograms	1,362	53,155	13,749	Japan 31,978; West Germany 4,029; Brazil 3,350.
Synthetic and reconstructed do	816	222,470	59,591	Singapore 150,000; Japan 11,211.

See footnotes at end of table.

Table 3.—Republic of Korea: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979[r]	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Salt and brine	489,880	716,288	NA	Australia 539,208; Yemen Arab Republic 90,195.
Sodium and potassium compounds, n.e.s:				
Caustic potash	1,358	937	112	Japan 801.
Caustic soda	184,643	56,970	21,081	Japan 24,025; Taiwan 10,721.
Soda ash	33,148	25,406	22,006	Japan 3,400.
Stone, sand and gravel:				
Dimension stone, crude and partly worked	2,192	52,479	1	Japan 50,528; Italy 1,525.
Dolomite, chiefly refractory-grade	420	567	--	All from Japan.
Gravel and crushed rock	539	438	--	France 425; Japan 13.
Limestone excluding dimension	136,035	20,907	--	All from Japan.
Quartz and quartzite	89	96	2	Sweden 67; Belgium 18; Japan 9.
Sand excluding metal-bearing	180,727	119,474	20	Australia 92,614; Japan 21,881.
Sulfur:				
Elemental:				
Other than colloidal	582,055	519,184	--	Japan 257,767; Canada 253,481.
Colloidal	673	342	204	Japan 122; West Germany 16.
Dioxide	4	7	--	All from Japan.
Sulfuric acid	90	9,766	50	Japan 9,710; Canada 6.
Talc, steatite, soapstone	334	268	10	Japan 258.
Other:				
Crude	7,222	4,691	151	Japan 1,584; Australia 1,286.
Slag, dross, similar waste, not metal-bearing	227,384	86,520	15	Japan 86,505.
Building materials of asphalt, asbestos and fiber cements, unfired non-metals	1,033	1,534	685	Japan 845; United Kingdom 4.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	338	103	--	All from Japan.
Carbon black and gas carbon	19,132	12,250	11,123	Japan 1,007; West Germany 62.
Coal including briquets:				
Bituminous coal -- thousand tons	4,217	4,911	914	Australia 2,412; Canada 1,156.
Anthracite and unspecified -- do	2,121	2,386	196	China 223; Japan 222; Hong Kong 108.
Briquets of anthracite and bituminous coal	105,465	8	--	All from Japan.
Lignite including briquets	16,462	117	--	All from Australia.
Coke and semicoke	131,789	120,657	485	Japan 112,419; New Zealand 5,184; Australia 2,377.
Hydrogen, helium, rare gases	49	81	2	Japan 79.
Peat briquets	12	46	--	Finland 19; Canada 17; United Kingdom 10.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	183,330	181,743	4	Saudi Arabia 109,186; Kuwait 49,935; Iran 6,333.
Refinery products:				
Gasoline do	39	141	--	Netherlands 60; Italy 49; Taiwan 32.
Kerosine and jet fuel do	2	117	1	Singapore 93; Italy 15.
Distillate fuel oil do	4	2	--	Mainly from Japan.
Residual fuel oil do	9,978	12,844	7	Kuwait 3,106; Iran 2,767.
Lubricants do	1,239	1,007	61	Japan 556; Taiwan 339; Singapore 45.
Other:				
Liquefied petroleum gas do	222	734	[1]	Indonesia 268; Japan 225; Saudi Arabia 192.
Nonlubricating oils do	108	1,002	131	Singapore 344; Bahrain 198; Japan 191.
Petroleum jelly and wax do	130	125	9	Japan 87; Singapore 27.
Petroleum coke	694	337	125	Canada 172; Japan 40.
Bitumen and other residues do	122	233	[1]	Mainly from Taiwan.
Pitch and pitch coke do	2	2	--	Mainly from Japan.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	54,251	94,757	55,987	Japan 37,083.

[r]Revised. NA Not available.

[1]Less than 1/2 unit.

[2]Includes reported 1,879,723 troy ounces of material listed as "sheets and strips of silver, partly worked" valued at $0.07 per troy ounce with the source listed as the region where the Korean Customs Law is enforced.

[3]Imports in 1979 were valued at $4,715; unreported quantity imported in 1980 valued at $1,000.

[4]Excludes unreported quantity valued at $486,269 in 1979 and $229,283 in 1980.

COMMODITY REVIEW

Domestic mine production met the demand for only a few mineral commodities. Although the Republic of Korea was wholly self-sufficient for limestone, mica, molybdenum, and tungsten, it was entirely dependent on imported ores and minerals such as aluminum, bituminous coal for coke, chromium, cobalt, nickel, and platinum-group metals. Moreover, the country was over 90% dependent on foreign sources of copper, iron ore, and tin. More importantly, it lacks domestic resources of oil and natural gas, driving up costs in the manufacturing sector as a result of high-priced imports.

METALS

The Government offers financial and tax concessions to industry to stockpile strategic metals. The metals stockpile was to deal with changes in market conditions as well as emergencies. During 1982, stockpile acquisition was to total 223.2 million (compared with $136.4 million in 1981), allocated as follows: aluminum, $19.2 million; lead, $4.9 million; nickel, $9.1 million; tin, $10.1 million; scrap iron, $36.5 million; coal, $35.6 million; and $107.8 million for other materials for emergency use. Materials in the latter category were to be determined after interministerial review.

South Korean capacity to produce primary nonferrous metals was largely limited to aluminum, copper, and zinc. The country's largest metal sector was iron and steel.

Aluminum.—Aluminum of Korea Ltd. (Koralu) operated the only smelter in the country, a 17,500-ton-per-year plant at Ulsan. Koralu is jointly owned by Hyundai Heavy Industries, Ltd., and Pechiney Ugine Kuhlmann of France. All of the smelter's requirements for alumina were imported from Japan. Domestic consumption for metal has been about 105,000 tons per year. To meet the shortfall in supply, the Republic of Korea imports metal and semimanufactures from Canada, France, and Japan.

Copper.—The Republic of Korea had two copper refineries, the Korea Mining & Smelter Co. at Changhang with an annual capacity of 40,000 tons, and Onsan Copper Refinery Co., Ltd., at Onsan with an annual capacity of 80,000 tons. Domestic mine production of copper continued to be small, and virtually all ore for the smelters was imported as concentrates from the Philippines, Mexico, and Canada, in order of quantity. In addition, the country imports about 50,000 tons of copper metal and semimanufactures, principally from Japan and in lesser quantities from Australia, Chile, and Peru.

Lead.—Mine output of lead from copper-zinc-lead ore and zinc-lead ore in Kyungsang averaged about 11,500 tons per year of contained lead. Lead metal was recovered by the copper smelter of Korea Mining at Changhang, which had a lead production capacity of 12,000 tons per year. Annual lead consumption was about 50,000 tons. Close to 75% of the country's supply was from imports of scrap and unwrought metal. The proposed 50,000-ton-per-year lead smelter of Korea Zinc Co. remained in the feasibility stage.

Iron and Steel.—Pohang Iron & Steel Co., Ltd. (Posco), a state-run enterprise, dominated the steel industry in the Republic of Korea. Moreover, Posco was the only integrated steelmaking facility in the country. In addition to Posco's complex at Pohang, the major iron and steel centers were located at Busan, Daegu, Inchon, Masan, Sam Cheok, Seoul, and Ulsan.[8]

The industry utilized five large blast furnaces for pig iron production. The inner volume for the two largest were 3,795 and 2,254 cubic meters. Total pig iron production capacity in 1981 was 8,019,000 tons.

Supplementing Posco's crude steel output of 8.5 million tons per year were 15 mills operating electric furnaces and 15 other installations engaged in various aspects of steel processing. For steelmaking, the industry operated 6 basic-oxygen furnaces and 39 electric arc furnaces with a combined capacity of 12,335,000 tons per year. South Korean production capacity by process as of June 1981 was as follows, in thousand tons:

Process	Capacity
Blast furnace	8,019
Basic-oxygen furnace	8,535
Electric arc furnace	3,680
Open-hearth furnace	120
Continuous casting	6,230
Slabbing and blooming	5,490
Rolling mill	13,353

Since the early 1970's, there has been spectacular growth in the iron and steel industry. Production of pig iron grew from 455,000 tons in 1973 to 7,928,000 tons in

1981; correspondingly, crude steel output increased from 1,240,000 to 10,754,000 tons. Significantly, the country is impoverished of natural resources to feed its largest metallurgical sector. Domestic production of iron ore supplied about 5% of current consumption, while the remainder was imported from Australia, Brazil, India, New Zealand, and Peru. The imports by type were 61.2% fine-size ore, 36.3% lump-size ore, and 2.5% pellets. The industry also imports about 2 million tons of iron and steel scrap annually, composed of direct receipts and metal from the country's ship-scrapping sector. Moreover, the Republic of Korea lacks resources of bituminous coal and must import the entire amount of coking coal needed by the steel industry. The country's receipts of coking coal have been from Australia, Canada, and the United States. Posco was developing a coal mine in Tanoma, Pa., to secure coal supplies and was negotiating similar arrangements in Australia and Canada.

Posco was expected to complete the expansion program for its Pohang complex, increasing annual capacity to 8.5 million tons from 5.5 million tons in early 1982. Construction of the Republic of Korea's second integrated iron and steel complex was expected to begin in July 1985. The complex, to be constructed at the southern coastal city of Kwangyang near Yosu, would have an initial rated annual capacity of 2.7 million tons of crude steel and would be under the supervision of Posco. The Government was to subsidize $280 million for developing basic groundwork—roads, railway, waterfront loading docks, and electrical and communications installations. When completed in March 1988, the complex will have facilities for producing coke, pig iron, cast iron, steel, and hot-rolled steel. It was expected that a second-stage expansion would follow, increasing the annual steel capacity at Kwangyang to 6 million tons.

Tungsten.—South Korean production of tungsten constituted about 5% of world output. The Sangdong Mine of the Korea Tungsten Mining Co., Ltd., a state-run enterprise, accounted for about 93% of national production. The remainder of the production was by Chungyang Co., Okbang Mining Co., Ltd., and other operators of small mines at Daewha, San-Nae, Ssangjon, and Wol-Ak. Korea Tungsten's mill at Sangdong had the capacity to process 2,000 tons of ore per day to produce a 70% tungsten oxide concentrate. The concentrate was shipped to the company's plant at Taegu where it was processed to produce tungsten powder and carbide and up to 2,500 tons of ammonium paratungstate.

Zinc.—The Republic of Korea had two zinc refineries, the 31,000-ton-per-year refinery of Young Poong Corp. at Sukpo and the 50,000-ton-per-year refinery of Korea Zinc Co. at Onsan. Significantly, domestic mine output accounted for about 70% of the ore requirement with the remainder imported largely from Australia. Although the South Korean metal market was small, the zinc market was relatively large at about 80,000 tons per year.

A lead-zinc deposit was discovered in North Kyongsang Province, in the Ponghwa-Ulchin area, 220 kilometers southeast of Seoul. The deposit, with estimated reserves of 6.3 million tons, reportedly has a potential value of $80 million.

Other Metals.—Bismuth and molybdenum were produced as a byproduct of tungsten processing by Korea Tungsten Mining Co., Ltd. The increase in copper refining, due to the operation of the new Onsan copper plant, resulted in higher byproduct recovery of silver and gold. A small amount of arsenic was also recovered from copper processing. Production of other metals during the year included minor amounts of antimony, manganese, and tin.

During 1980, Korea Mining Promotion Corp., a state-run enterprise, announced the discovery of a larger molybdenite deposit in Yongwol County, Kangwon Province. However, because of its low grade and the low price of molybdenum in the international market, there were no plans for a feasibility study of ore body development.

Amax Exploration Inc. of the United States and Hyundai Corp. reportedly have agreed in principle to explore jointly for molybdenum in the Republic of Korea. The initial exploration project was likely to be small scale, estimated at $400,000.

NONMETALS

Cement.—Ssangyong Cement Industrial Co., Ltd., the largest cement producer in the Republic of Korea, constituted about 42% of the total capacity in 1981. The expansion of Ssangyong's largest plant at Donghae was completed in 1980, raising capacity from 6.021 to 8.821 million tons per year. Ssangyong also has a 2,122,000-ton-per-year plant at Yeong-Weol and a 567,000-ton-per-

year plant at Mungyeon, in addition to grinding facilities at Changdong, Daegu, and Daejeon. Tong Yong Cement Manufacturing Co. Ltd. was the second largest producer with a 6,108,000-ton-per-year plant at Samcheog. Other producers of cement included, with capacities given in million tons per year, Hamil Cement Manufacturing Co., Ltd., 2.75; Sungshin Cement Industrial Co., Ltd., 2.41; Hyundai Cement Co., Ltd., 2.222; Asia Manufacturing Co., Ltd., 1.87; and Koryo Cement Manufacturing Co., Ltd., 0.587. The Sosa plant of Union Corp. had a 100-ton-per-day white cement capacity. Halla Cement Manufacturing Co. was completing the construction of its 1-million-ton-per-year plant outside of Seoul.

The expansion of the cement industry began in the 1960's. The target for cement-making was 30 million tons in 1986. However, the industry's price competitiveness has been beset with higher costs, primarily for fuel and electricity. Cement production in 1981 represented only 57% of capacity. Moreover, to reduce the dependence on oil, the industry made investments to convert as rapidly as possible to coal-fired kilns. By the end of 1981, coal accounted for 82.5% of industry capacity and was expected to increase to 86.9% by the end of 1982. To compound the difficulties, traditional export markets, such as Indonesia and Thailand, were developing their own cement industries. To overcome these problems, the cement industry was depending upon increased activity in domestic and foreign construction to improve financial performance.

Fertilizer Materials.—Manufacturers of chemical fertilizers were also adversely affected by higher energy costs and failing export markets. Although production of urea fertilizers increased 10% to 1.1 million tons in 1981, output of fused phosphate was down 23% to 93,596 tons, and production of complex fertilizers was down 16% to 1.2 million tons. Exports of fertilizers increased substantially between 1976 and 1980. Exports in 1980 were valued at $344 million but fell to $188 million in 1981.

Other Nonmetals.—The Republic of Korea was a large producer of graphite and was best known for its amorphous graphite. Production of other nonmetallic minerals included agalmatolite, andalusite, asbestos, barite, diatomaceous earth, feldspar, fluorite, salt, and talc. Cyprus Mining Co. was reportedly entering into an agreement with Ilshin Industry Co., Ltd., for joint development of talc in Yesan, South Ch'ungchiong Province.

MINERAL FUELS

There has been no commercial production of oil and natural gas in the Republic of Korea. The only indigenous fuel source was anthracite coal. Electric power generation in 1981 totaled 40,307 kilowatt-hours. Thermal powerplants accounted for 86% of the total power generated, followed by hydropower plants at 6.7%. Total electric power consumption during the year was 29,281 million kilowatt-hours. Consumption by the mining sector in 1981 totaled 715 million kilowatt-hours. The large electric power consumers were as follows, in million kilowatt-hours: primary metal producers, 4,945; textiles, 4,854; chemicals, 4,518; metal products, 2,666; and nonmetal sector, 2,642.

Petroleum's share of South Korean energy consumption was estimated at 60%. The Government's energy policy for the 1980's emphasizes a reduction in dependence on oil and the development of alternative energy sources. By 1991, a total of 11 nuclear powerplants are expected to be in operation. Also, four coal-fired electric powerplants with a combined capacity of 2 million kilowatts and a number of hydroelectric powerplants with a combined capacity of 1,950,000 kilowatts are targeted for completion by 1991. Under the proposed guidelines, South Korean dependence on oil is to be reduced to 27.6% of the total energy consumption in 1991.[9]

Coal.—Under the Government's long-term supply-demand program (1981-91), the country's demand for coal was to grow by 11.1% annually. The share of coal in total energy demand, however, was to reach 35% in 1986 and then be reduced to 32.1% in 1991.

According to MER, coal production in 1981 was the highest ever recorded in the country. Output was 5.2% more than the target set for 1981. Dai Han Coal Corp., a state-run enterprise, produced 4,883,000 tons, exceeding its target by 83,000 tons. Private mines produced 15,111,000 tons during the year. MER attributed the increase in production to the Government's efforts to boost domestic output and to the dry summer conditions in the mining area.

The Republic of Korea has been importing 6 to 7 million tons of coal annually, which includes coal for steam generation and for metallurgical coke. In 1981, the

Government authorized Dai Han Coal to be the country's sole importer of coal. Korea Electric Co. and others who have imported coal, however, will be allowed to sell imported coal in accordance with terms set by the state-run coal corporation.

In an attempt to secure foreign sources, South Korean firms have invested in the development of overseas coal projects. Posco has invested about $38 million in the development of the Mt. Thorley coal mine in Australia and was expected to begin exporting some coal in late 1982. Posco has likewise invested $68 million in the Tanoma Mine in the United States; shipments to the Republic of Korea were expected to begin in 1983. Posco has also invested in the development of the Greenhill Mine in Canada. Daesung Consolidated Coal Mining Co., Ltd., and Hyundai Corp. were developing a coal mine in Australia and were expected to begin shipping coal in 1983.

Petroleum and Natural Gas.—Exploration for oil continued on the Continental Shelf between the Republic of Korea and Japan. Following seismic surveys in 1979, test drilling in 1980 was conducted in the fifth and seventh subzones of the joint development zone. There were no indications of seabed oil. Nine additional test drillings were planned through 1987. Japanese and South Korean concessionaires were involved with subzones two through eight. Owing to the withdrawal of the Japanese applicant, subzones one and nine were to be explored later. Zapata Exploration Co. of the United States and Korea Petroleum Development Corp. completed in 1981 a 600-kilometer seismic survey southwest of Cheju Island and were to drill one well in early 1982. This area reportedly had the highest potential for commercial crude production in South Korean offshore areas.[10]

On February 26, 1981, a protocol was signed between the Governments of the Republic of Korea and Indonesia for the establishment of a 50-50 joint venture for the exploration and development of Indonesian oil resources off northwest Java. The area involved 8,000 square kilometers offshore Madura Island, and exploration and test drilling were projected to cost $60 million. Under the terms of the protocol, the contracting company for each country was to develop a master plan and set up detailed execution procedures through consultation.

In 1981, South Korean daily oil refining capacity reached 790,000 barrels. Korea Oil Corp. operated a 280,000-barrel-per-day refinery at Ulsan on the southwest coast. Homan Oil Refinery Co. completed the expansion of its refinery at Yosu to 380,000 barrels per day. The refinery of Kyung In Energy Co. had a daily refining capacity of 60,000 barrels. Kuk Dong Oil Co., Ltd., had its refinery in Pusan with a daily refining capacity of 10,000 barrels. Ssangyong Oil Refining Co. completed the construction of its 60,000-barrel-per-day refinery and began test operations in 1980. Ssangyong was a joint venture with the National Iranian Oil Corp. However, National Iranian, a state-run firm, withdrew in August 1980.

The Republic of Korea was negotiating a long-term purchase contract for Indonesian liquefied natural gas (LNG) at the rate of 1.5 million tons per year beginning in 1985. A receiving terminal for the LNG was proposed near the Pyongtaek powerplant on Asan Bay. A pipeline would link the Seoul-Inchon area with the terminal. Cost of the proposed LNG project was estimated at $785 million.

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[1]Physical scientist, Division of Foreign Data.
[2]Where necessary, values have been converted from Korean won (W) to U.S. dollars at the rate of W700=US$1.00 for 1981.
[3]U.S. Department of Commerce. Foreign Economic Trends (Korea), March 1982, 13 pp.
[4]The Bank of Korea. Monthly Bulletin (Seoul), April 1982, 156 pp.
[5]———. Quarterly Economic Review (Seoul), March 1982, 29 pp.
[6]Federation of Korean Industries. Korean Business Review (Seoul), v. 60, December 1981, 40 pp.
[7]Economic Planning Board. Monthly Statistics of Korea (Seoul), March 1982, 167 pp.
[8]Korea Iron & Steel Association. Korea's Iron & Steel Industry (Seoul), 1981, 24 pp.
[9]Yonhap News Agency. Korea Annual (Seoul), 1981, 752 pp.
[10]Petroleum News Southeast Asia, Ltd. Petroleum News (Hong Kong), v. 12, No. 10, January 1982, pp. 29-30.

The Mineral Industry of Kuwait

By Roman V. Sondermayer[1]

As in the past, the Government-owned petroleum industry completely dominated the economy of Kuwait during 1981. The glut of oil on world markets had adverse effects on Kuwait's economy in two ways. First, Government revenues and foreign exchange earnings dropped as the result of the decision to limit crude oil production. Second, all natural gas necessary for power generation and production of petrochemicals was associated gas. Consequently, lower crude oil production resulted in lower production of natural gas, which adversely affected operation of the gas plant and petrochemical industry of Kuwait. Many commitments by Kuwait for delivery of gas and petrochemical products had to be revised downward. Premium prices made Kuwait's crude oil one of the most expensive crudes sold on the world market. During the year, resistance of buyers was mounting and the premium of $5.50 per barrel was dropped. During 1981, the Government was not encouraging development of industry in the country except where related to petroleum and natural gas. The Government of Kuwait sought to maximize its oil income. Excess capital generated by the crude oil industry was used by the Kuwaitis for investments abroad. In the United States, Kuwait Oil Corp. (KOC) concluded arrangements to buy the Santa Fe Drilling Co. of Alhambra near Los Angeles. Reportedly, Santa Fe Drilling will become a subsidiary of KOC, which will pay $51 per share for Santa Fe Drilling's outstanding shares. All necessary Kuwaiti approvals have been granted. However, the final approval for this acquisition from the appropriate Government offices in the United States had not been granted at yearend.

Principal events in the mineral industry of Kuwait were lowering of crude oil and natural gas production, expansion of ammonia-producing facilities, preparations with Saudi Arabia for construction of a cement plant, testing of two deep wells for gas, and modernization of petroleum refineries.

PRODUCTION

During 1981, according to preliminary reports, Kuwait was among the largest producers of crude oil in the world. In addition to crude oil and associated gas production, Kuwait had three petroleum refineries and one gas-processing plant in operation. Total capacity of the refineries was 594,000 barrels per day, and that of the gas plant was 3 billion cubic meters per year. Output of other minerals was minimal and had only domestic significance. The petroleum sector was Government owned or controlled, while production of other minerals was in private hands. Table 1 shows Kuwait's mineral production trends for the most recent 5-year period.

Table 1.—Kuwait: Production of mineral commodities[1]

Commodity and unit of measure	1977	1978	1979	1980[p]	1981[e]
Cement ---- metric tons	329,339	621,334	[e]630,000	625,000	625,000
Clay products, nonrefractory: Sand-lime bricks cubic meters	215,020	262,528	[e]270,000	265,000	265,000
Gas, natural:[2]					
Gross ---- million cubic feet	362,751	392,838	460,324	300,000	210,000
Marketed ---- do	210,510	221,069	304,128	260,000	190,000
Lime: Hydrated and quicklime ---- metric tons	19,656	3,837	[e]11,800	12,000	12,000
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	5,638	5,415	6,000	6,100	6,000
Liquefied petroleum gas (propane and butane) do	14,965	13,853	16,000	28,215	25,400
Total ---- do	20,603	19,268	22,000	34,315	31,400
Nitrogen: N content of ammonia ---- metric tons	402,000	431,000	[e]435,000	440,000	450,000
Petroleum:					
Crude[2] ---- thousand 42-gallon barrels	718,685	777,961	912,610	608,914	415,000
Refinery products:					
Gasoline, motor ---- do	6,205	7,458	8,541	7,921	7,100
Jet fuel ---- do	4,088	3,104	6,935	7,000	6,300
Kerosine ---- do	3,979	10,608	18,000	16,535	14,900
Distillate fuel oil ---- do	30,222	30,160	30,843	27,558	24,800
Residual fuel oil ---- do	60,006	58,334	66,138	52,706	47,500
Other:					
Naphtha ---- do	18,891	18,581	21,800	16,534	15,000
Asphalt ---- do	502	729	[e]800	800	800
Unspecified ---- do	1,303	1,551	7,000	9,782	5,000
Refinery fuel and losses ---- do	1,132	2,860	3,000	2,800	2,600
Total ---- do	126,328	133,385	163,057	141,636	124,000
Salt ---- metric tons	16,703	18,973	19,000	19,600	19,500
Sodium and potassium compounds: Caustic soda do	6,499	8,009	8,000	8,500	8,500
Sulfur:					
Elemental, petroleum byproduct ---- do	79,000	100,000	100,000	120,000	110,000
Sulfuric acid ---- do	5,112	NA	NA	NA	NA

[e]Estimated. [p]Preliminary. NA Not available.
[1]Table includes data available through June 23, 1982.
[2]Includes Kuwait's 1/2 share of production in the Kuwait-Saudi Arabia Partitioned Zone.

TRADE

Tables 2 and 3 show the trend in Kuwait's foreign trade for 1979, the latest year for which complete data were available. Except for petroleum exports, foreign trade in minerals was modest by world standards.

Table 2.—Kuwait: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, unwrought and semimanufactures ----	456	1,054	--	Syria 664; United Arab Emirates 133; Saudi Arabia 75.
Copper metal including alloys, unwrought and semimanufactures ----	64	110	--	Saudi Arabia 69; Iraq 26; United Arab Emirates 12.
Iron and steel metal:				
Scrap ----	6,019	21,460	--	West Germany 13,001; Syria 3,691; Jordan 2,817.
Pig iron and ferroalloys ----	--	9,535	--	United Arab Emirates 9,500; Syria 35.
Semimanufactures:				
Bars, rods, angles, shapes, sections ----	37,123	56,435	--	Saudi Arabia 38,842; Iraq 9,365; Jordan 6,933.
Universals, plates, sheets ----	11,997	8,608	--	Saudi Arabia 6,784; Iraq 634; Jordan 512.
Wire ----	436	482	--	Saudi Arabia 465; Iraq 10.
Tubes, pipes, fittings ----	12,600	13,249	--	Saudi Arabia 9,716; Iraq 1,468; Jordan 783.

See footnotes at end of table.

Table 2.—Kuwait: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS —Continued				
Lead metal including alloys, unwrought and semimanufactures	259	914	--	Saudi Arabia 738; Iraq 102; Syria 66.
Nickel metal including alloys, unwrought and semimanufactures	--	1	--	All to Saudi Arabia.
Tin metal including alloys, unwrought and semimanufactures	r1	2	--	Do.
Zinc: Blue powder	102	219	--	Do.
Other:				
Oxides, hydroxides, peroxides	31	16	--	Do.
Pyrophoric alloys: Ferrocerium	1	1	--	Do.
Metals including alloys:				
Scrap	14,129	50,132	--	India 28,313; Republic of Korea 11,651; Pakistan 2,852.
Unwrought and semimanufactures	1	2	--	Bahrain 1; Saudi Arabia 1.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	25	32	--	Saudi Arabia 30; Iraq 2.
Asbestos, crude	--	2	--	All to Saudi Arabia.
Cement	19,584	60,541	--	Bahrain 40,804; Saudi Arabia 17,962; Iraq 1,433.
Clays and clay products:				
Crude clays: Bentonite	21,012	3,217	--	Iran 3,025; Iraq 113.
Products:				
Nonrefractory	2,258	3,790	--	Saudi Arabia 2,720; Iraq 868; Jordan 82.
Refractory including nonclay brick	399	378	--	Saudi Arabia 371; Jordan 4; Iraq 3.
Fertilizer materials:				
Crude	66	142	--	Saudi Arabia 117; Iran 25.
Manufactured:				
Nitrogenous	602,973	563,862	--	China 155,355; Iran 106,541; Sudan 93,870; India 92,583.
Other including mixed	72,852	129	--	Bahrain 100; Somalia 25.
Ammonia	133,425	87,683	--	India 47,852; Turkey 17,500; Spain 7,704; Tanzania 7,530.
Graphite, natural	2	1	--	All to Saudi Arabia.
Gypsum and plasters	37	6	--	Saudi Arabia 4; Iraq 2.
Lime	19	1	--	All to Qatar.
Precious and semiprecious stones excluding diamond carats	r1,000	8,000	--	All to Italy.
Salt and brine	1,510	745	--	Jordan 415; Iraq 150; Saudi Arabia 121.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	6,987	5,526	--	Iraq 4,675; Saudi Arabia 646; United Arab Emirates 128.
Soda ash	15	15	--	All to Saudi Arabia.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	78	119	--	Saudi Arabia 69; Lebanon 50.
Worked	959	1,494	--	Saudi Arabia 1,124; Qatar 160; Lebanon 126.
Gravel and crushed rock	r1,307	1,478	--	Saudi Arabia 1,258; Qatar 135; Lebanon 80.
Sand excluding metal-bearing	1,825	411	--	Iran 200; United Arab Emirates 200; Jordan 11.
Sulfur:				
Elemental, colloidal	164,257	72,530	--	India 34,540; Italy 9,895; People's Democratic Republic of Yemen 8,634; Pakistan 8,034.
Sulfuric acid, oleum	212	1,851	--	Saudi Arabia 1,008; Iraq 840; Qatar 3.
Other:				
Crude	20	85	--	Saudi Arabia 54; Jordan 25; Iraq 6.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	1,760	15,570	--	Saudi Arabia 12,805; Iraq 2,743.
MINERAL FUELS AND RELATED MATERIALS				
Coal, all grades including coke and briquets	50	16	--	Iran 11; Saudi Arabia 5.
Hydrogen, helium, rare gases	79	138	(2)	Iraq 56; United Arab Emirates 35; Saudi Arabia 24.
Petroleum:				
Crude thousand 42-gallon barrels	649,373	765,402	5,393	Japan 208,476; Netherlands 94,743; Italy 73,814.

See footnotes at end of table.

Table 2.—Kuwait: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products:				
Shipments other than bunkers:				
Gasoline including natural thousand 42-gallon barrels	r1,094	8,342	247	Japan 2,792; Netherlands 1,847; People's Democratic Republic of Yemen 632.
Kerosine and jet fuel ---do---	10,675	12,694	--	Indonesia 4,106; Pakistan 3,773; Italy 615; India 538.
Distillate fuel oil ---do---	26,335	29,032	--	Pakistan 6,489; Japan 3,400; Indonesia 3,240; West Germany 2,909.
Residual fuel oil ---do---	38,304	45,520	--	Italy 11,947; Japan 7,780; Australia 6,388; Taiwan 5,697.
Lubricants ---do---	r21	21	(2)	Saudi Arabia 13; Lebanon 3; Iraq 2.
Other:				
Liquefied petroleum gas ---do---	r12,980	31,910	1,193	Japan 20,224; Netherlands 3,390; Turkey 3,001.
Mineral jelly and wax ---do---	(2)	(2)	--	All to Saudi Arabia
Naphtha ---do---	24,543	27,001	--	Japan 13,502; Netherlands 5,929; Italy 2,516.
Bituminous mixtures ---do---	1	1	--	Mainly to United Arab Emirates.
Bitumen and other residues ---do---	129	6	--	Saudi Arabia 4; Iraq 1.
Bunkers:				
Gasoline ---do---	--	1,339	NA	NA.
Kerosine and jet fuel ---do---	13	5	NA	NA.
Distillate fuel oil ---do---	597	776	NA	NA.
Residual fuel oil ---do---	15,870	16,107	NA	NA.
Lubricants ---do---	3	1	NA	NA.
Naphtha ---do---	--	1,339	NA	NA.

rRevised. NA Not available.
[1]Includes Kuwait's share of former Neutral Zone exports.
[2]Less than 1/2 unit.

Table 3.—Kuwait: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, unwrought and semimanufactures	9,815	11,683	217	Bahrain 2,690; Turkey 2,044; Republic of Korea 1,395.
Copper metal including alloys, unwrought and semimanufactures	1,783	1,764	117	Japan 532; United Kingdom 514; Taiwan 151.
Iron and steel metal:				
Scrap	609	2,978	1,549	Saudi Arabia 1,094; United Kingdom 203.
Pig iron and ferroalloys	25	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	341,876	465,274	5,217	Japan 169,150; Qatar 74,219; India 36,227; China 30,658.
Universals, plates, sheets	80,650	104,264	791	Japan 70,979; Australia 6,127; Republic of Korea 4,462.
Wire	5,974	9,734	22	West Germany 2,357; China 2,135; United Kingdom 1,178.
Tubes, pipes, fittings	152,091	145,956	2,002	Japan 84,589; United Kingdom 15,821; U.S.S.R. 7,277.
Lead metal including alloys, unwrought and semimanufactures	947	2,956	3	Iran 2,600; Italy 160; Republic of Korea 123.
Nickel metal including alloys, unwrought and semimanufactures kilograms	200	1,446	--	All from United Kingdom.
Tin metal including alloys, unwrought and semimanufactures	6	6	--	Malaysia 3; Belgium-Luxembourg 2.

Table 3.—Kuwait: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS —Continued				
Uranium, radium, thorium, metals including alloys, all forms ____ value, thousands__	r$249	$288	$47	United Kingdom $235; West Germany $5; France $1.
Zinc: Blue powder _____	240	591	4	West Germany 512; China 35; United Kingdom 23.
Other:				
Oxides, hydroxides, peroxides _____	1,446	2,390	__	Hungary 1,832; United Kingdom 111; West Germany 78.
Pyrophoric alloys: Ferrocerium kilograms__	1,309	431	__	United Kingdom 360; Austria 71.
Metals including alloys:				
Scrap _____	6,348	16,766	41	Saudi Arabia 14,711; Iraq 211; United Kingdom 150.
Unwrought and semimanufactures __	42	165	2	Norway 100; Netherlands 25; France 18.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones _____	604	566	2	Italy 385; Czechoslovakia 36; Belgium-Luxembourg 21.
Asbestos, crude _____	6,285	10,044	__	Swaziland 6,949; Canada 2,003; Netherlands 1,030.
Cement _____ thousand tons__	2,346	2,633	(1)	Japan 1,956; Spain 236; U.S.S.R. 115.
Clays and clay products:				
Crude clays:				
Bentonite _____	35,607	1,731	515	West Germany 852; India 325; United Kingdom 20.
Other _____	190	__		
Products:				
Nonrefractory _____	59	45,709	157	Italy 25,934; Spain 3,609; United Kingdom 3,596.
Refractory including nonclay brick __	2,352	1,288	2	India 719; Romania 160; United Kingdom 137.
Diamond: Gem, not set or strung __ carats__	3,750	23,470	__	United Kingdom 13,250; Belgium-Luxembourg 5,000; Thailand 3,000; India 1,230.
Fertilizer materials:				
Crude _____	5	2	__	All from United Kingdom.
Manufactured _____	404	438	__	France 300; West Germany 87; Netherlands 28.
Ammonia _____	17	1	__	All from United Kingdom.
Graphite, natural _____ kilograms__	r50,000	200	__	All from Republic of Korea.
Gypsum and plasters _____	81,603	60,453	14	Saudi Arabia 16,074; Spain 14,570; Egypt 13,712; Morocco 11,801.
Lime _____	27,459	31,880	__	United Arab Emirates 12,195; Yugoslavia 9,159; Spain 6,537.
Precious and semiprecious stones except diamond _____ kilograms__	471	72	__	India 33; Taiwan 11; China 10; Japan 8.
Salt and brine _____	5,674	5,701	101	Saudi Arabia 3,587; Netherlands 1,250.
Sodium and potassium compounds, n.e.s.:				
Caustic soda _____	171	439	__	Saudi Arabia 423; Yugoslavia 16.
Soda ash _____	339	318	__	United Kingdom 150; China 90; West Germany 78.
Stone, sand and gravel:				
Dimension stone:				
Unworked and partly worked:				
Marble _____	2,019	3,129	__	Italy 2,021; Iran 379; Greece 366; Jordan 231.
Other _____	472,102	52,435	__	Saudi Arabia 24,737; United Arab Emirates 24,030.
Worked:				
Marble _____	47,426	55,531	(1)	Italy 45,947; Greece 3,166; Jordan 2,609.
Other _____	49,829	53,366	__	Jordan 47,879; Iraq 4,028.
Gravel and crushed rock _____	r457,535	906,197	__	United Arab Emirates 737,717; Italy 73,998; Iran 65,286.
Sand excluding metal-bearing _____	435	399	58	Jordan 211; France 76; United Arab Emirates 18.
Sulfur: Sulfuric acid, oleum ___ kilograms__	r47,135	12	12	
Other:				
Crude, unspecified _____	2,450	1,629	(1)	India 729; United Kingdom 609; West Germany 92.
Agricultural soil and clay _____	358	947	__	Jordan 480; Netherlands 375; Saudi Arabia 48.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals____	39,909	1,411	__	India 360; Yugoslavia 263; Iraq 258.
MINERAL FUELS AND RELATED MATERIALS				
Coal, all grades including coke and briquets__	369	1,242	77	Switzerland 750; France 178; Iran 144.
Hydrogen, helium, rare gases _____	229	497	39	Netherlands 332; United Kingdom 59; France 45.

See footnotes at end of table.

Table 3.—Kuwait: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Gasoline, aviation ___42-gallon barrels__	961	--		
Kerosine and jet fuel _____do____	3,608	1,008	31	West Germany 775; United Kingdom 202.
Lubricants _____do____	213,130	299,507	29,629	Singapore 93,712; Belgium-Luxembourg 64,255; United Kingdom 30,354.
Other:				
Mineral jelly and wax _____do____	68	--		
Bituminous mixtures _____do____	12,101	9,849	220	United Kingdom 6,480; Italy 1,610; Japan 1,153.
Bitumen and other residues _do____	144,169	4,124	135	Iran 3,327; United Kingdom 662.

[r]Revised.
[1]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Kuwait did not report production of metals during 1981. A project to construct an aluminum smelter using natural gas resources for generating electric power was under consideration. Implementation was uncertain at yearend. Iron and steel products were produced by the Kuwait Metal Pipe Industry. Its main product was welded pipe used by the oil industry.

NONMETALS

Ammonia.—The Petrochemical Industries Co., a wholly owned subsidiary of KOC, continued to expand its ammonia-producing facilities at the petrochemical complex at Shuaiba. Equipment for a fourth ammonia train was ordered during 1981. The new facility was planned for a capacity of 1,000 tons per day. Costs were reported at $112 million, and startup was scheduled for the second half of 1982. The new train will replace an older unit, and after completion, the capacity for production of ammonia at Shuaiba should reach 1 million tons per year.

Cement.—During 1981, most of the preliminary work necessary for construction of a 2.5-million-ton-per-year cement plant at Khuraniyah, 100 kilometers north of Dammam, Saudi Arabia, was completed. Krupp Polysius A.G. of the Federal Republic of Germany won the construction contract. The project should make Saudi Arabia, which owns 55% of the project, and Kuwait, which owns the other 45%, self-sufficient in cement.

MINERAL FUELS

Petroleum and Natural Gas.—Kuwait limited its crude oil output during 1981 in line with the policy of the Organization of Petroleum Exporting Countries (OPEC). OPEC's aim was to reduce world supplies of crude oil and consequently retard the decline of oil prices on the saturated world market. The decision affected production at the gas-processing plant at Shuaiba. The plant was forced to operate at one-half of its capacity because most of the natural gas produced in Kuwait came from gas which is produced along with oil.

During 1981, KOC continued its exploration for natural gas and crude oil. However, most exploration efforts sought natural gas. At yearend, results were inconclusive as tests were underway on gas zones in the Permian Khuff formation, reached by two deep wells. Four other areas were in various stages of exploration for crude oil and natural gas: Deep under the Burgan Field, in the Fars heavy oil formation in northern Kuwait, offshore Kuwait, and in the Neutral Zone. About five rigs were active in the country, and total drilling was estimated at about 33,000 meters.

At the beginning of 1981, the total number of wells in Kuwait capable of producing crude oil and associated gas was 556. Approximately two-thirds were out of production. Some of them were awaiting workover, but most were shut-in owing to the decision to reduce production.

In the Neutral Zone, where production was split evenly between Kuwait and Saudi

Arabia, offshore drilling totaled about 10,000 meters in 1980, the latest year for which drilling data were available. Some 410 oil wells were in production at the beginning of 1981. All associated gas produced in the Neutral Zone was flared except that used in the field. In May 1981, KOC started to work on the development of the Southern Gas Project. When completed, the facility will gather and compress associated gas from the Wafra and Khafji Fields. Kuwait expects that this previously flared gas will do much to relieve the shortage of natural gas used for making natural gas liquids at the Shuaiba gas-processing plant.

The modernization of refineries in Kuwait continued during 1981. When all refinery expansion programs are completed, Kuwait should have a refinery capacity of about 700,000 barrels per day. Completion was targeted for 1984. During the summer, a fire damaged the largest refinery in Kuwait at Shuaiba. The fire burned for a week and damaged 10 storage tanks.

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[1]Physical scientist, Division of Foreign Data.

The Mineral Industry of Liberia

By George A. Rabchevsky[1]

Mining remained Liberia's most important industry in 1981, although its share of the gross domestic product (GDP) has fallen steeply in recent years. In 1981, the Liberian mining and minerals industry continued the decline owing to the stagnant overall economic conditions of 1979 and disruptions following the coup of April 1980. Oil price increases, sluggish demand for iron ore, and loss of confidence among foreign investors contributed further to the decline in the GDP and in foreign currency reserve levels. Domestic production and foreign trade fell off, and all potential investments were under reconsideration by the Government.

The iron ore industry in 1981, as in the past, dominated the Liberian GDP and export earnings. Because of the political turmoil and economic uncertainty of 1980, two of the three operating iron ore mines were kept in operation largely from subsidies by the Liberian Government in 1981.

In addition to iron ore, other mineral production in Liberia included the traditional output of alluvial diamonds and gold from small mines and production from the petroleum refinery in Monrovia. Geologically, the country possesses a wide variety of minerals of potential economic value, and the Liberian Government continued to encourage exploration and mining by foreign companies, particularly in the area of diamonds and gold.

Further economic development will largely depend on the extent to which Liberia can regain the confidence of foreign investors. In view of the continuing decline in developed country markets and the uncertainty of price increases in Liberia's exports, an economic revival in Liberia does not appear likely in the near future.

PRODUCTION AND TRADE

Production of minerals in Liberia in 1977-81 is given in table 1. Production for export stemmed mainly from foreign companies attracted by generous tax relief, unrestricted transfer of profits and capital, and the sole right of exploration and development for natural resources.

The United States in 1981, as in previous years, was Liberia's preeminent trading partner and is expected to continue as a leading source of capital and technical assistance. Liberia's currency is fully convertible with the U.S. dollar with no exchange controls or restrictions on the transfer of funds, which are mostly targeted for the development of Liberia's infrastructure.

Iron ore remained Liberia's major export, accounting for over one-half of the total exports in 1981, followed by rubber and diamonds. Oil dominated domestic imports, accounting for almost 30% of the total in 1981.

Table 1.—Liberia: Production of mineral commodities[1]

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
Cement, hydraulic thousand metric tons	[e]100	132	145	140	150
Diamond:					
Gem thousand carats	163	128	170	123	132
Industrial do	163	180	132	175	204
Total do	326	308	302	298	336
Gold[e] troy ounces	NA	NA	1,086	7,243	16,720
Iron ore thousand metric tons	17,660	17,989	18,345	17,900	19,704
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	NA	112	541	500	500
Jet fuel do		45	252	250	250
Kerosine do		24	68	60	60
Distillate fuel oil do		166	800	1,000	1,000
Residual fuel oil do		317	1,842	1,800	1,800
Other do		18	44	40	40
Refinery fuel and losses do		71	261	250	250
Total do	NA	753	3,808	3,900	3,900

[e]Estimated. [p]Preliminary. NA Not available.
[1]Table includes data available through July 19, 1982.
[2]In addition to the commodities listed, a variety of crude construction materials (clays, stone, and sand and gravel) were produced, but available information is inadequate to make reliable estimates of output levels.

Table 2.—Liberia: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, unwrought	--	1	--	All to France.
Gold metal including alloys, unwrought and partly wrought troy ounces	65	7,243	2,508	Belgium-Luxembourg 1,807; Switzerland 1,446; West Germany 1,268; Canada 214.
Iron and steel:				
Ore and concentrate thousand tons	19,866	17,199	1,617	West Germany 5,562; Italy 3,090; France 2,204.
Metal:				
Scrap	1,855	--		
Semimanufactures	10	3	--	Mainly to Guinea.
Lead metal including alloys, unwrought	5	--		
Other: Metals including alloys, waste and scrap	23,957	6,262	--	Italy 3,400; Yugoslavia 2,300.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones value	$4,167	--		
Cement	796	990	--	Guinea 791; Sierra Leone 199.
Diamond: Industrial carats	301,808	298,446	41,513	Belgium-Luxembourg 167,175; United Kingdom 83,354.
Fertilizer materials: Manufactured, nitrogenous	212	153	--	Togo 100; Ivory Coast 50.
Salt and brine	--	1	--	All to Guinea.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	2	--		
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline 42-gallon barrels	57	155	--	All to Guinea.
Kerosine do	--	85	--	Do.
Distillate fuel oil do	--	136	--	Guinea 134; United Kingdom 2.
Residual fuel oil do	--	45,865	--	Netherlands 45,844; Guinea 20.
Lubricants do	61	10	--	All to Guinea.
Bituminous mixtures do	--	46,420	--	All to Netherlands.

Table 3.—Liberia : Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	958	487	28	Switzerland 159; Japan 101; Sweden 57.
Copper metal including alloys, all forms	45	61	9	West Germany 28; United Kingdom 17.
Iron and steel metal:				
Scrap	--	2	--	All from United Kingdom.
Pig iron, ferroalloys, similar materials	344	322	71	West Germany 109; United Kingdom 86.
Steel, primary forms	322	391	112	Sweden 152; West Germany 83; China 25.
Semimanufactures:				
Bars, rods, angles, shapes, sections	3,892	4,318	272	Belgium-Luxembourg 1,560; Spain 489; Brazil 474.
Universals, plates, sheets	4,206	4,584	145	Japan 3,148; Belgium-Luxembourg 358; West Germany 246.
Hoop and strip	126	12	--	West Germany 6; Netherlands 5.
Rails and accessories	930	1,579	334	Netherlands 1,244.
Wire	118	162	37	Belgium-Luxembourg 59; Japan 26; United Kingdom 14.
Tubes, pipes, fittings	1,289	1,787	556	West Germany 231; Belgium-Luxembourg 207; China 175.
Castings and forgings, rough	96	5	4	NA.
Lead metal including alloys, all forms	49	70	2	West Germany 33; Sweden 13; U.S.S.R. 12.
Nickel metal including alloys, all forms kilograms	336	919	--	Belgium-Luxembourg 627; West Germany 239.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	119	75	75	
Silver metal including alloys, unwrought and partly wrought do.	199	4	--	Mainly from West Germany.
Tin metal including alloys, all forms	35	20	10	West Germany 10.
Uranium and thorium metals: Uranium depleted in U-235	--	1	--	All from Belgium-Luxembourg.
Zinc metal including alloys, all forms	488	973	80	Japan 637; Belgium-Luxembourg 252.
Other:				
Ores and concentrates	16,585	--		
Oxides, hydroxides, peroxides	927	274	68	West Germany 147; United Kingdom 33.
Metals including alloys:				
Waste and scrap	6,829	--		
Unwrought and semimanufactures value	$47	--		
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc value	$25,912	--		
Grinding and polishing wheels and stones do.	$61,440	$40,213	$668	Italy $23,759; West Germany $6,692; Sweden $6,131.
Asbestos, crude	65	52	--	Netherlands 21; United Kingdom 18; West Germany 13.
Cement	71,534	98,834	36	Norway 97,444.
Clays and clay products:				
Crude clays	31,033	24,460	--	West Germany 20,595; United Kingdom 3,843.
Products:				
Nonrefractory[1]	958	540	13	Czechoslovakia 139; Italy 129; France 100.
Refractory including nonclay brick	109	159	60	Netherlands 62; Spain 19.
Fertilizer materials:				
Natural:				
Nitrogenous	1,688	307	7	West Germany 292.
Phosphatic	75	632	--	Belgium-Luxembourg 567; West Germany 65.
Potassic	--	6	--	All from Belgium-Luxembourg.
Other	467	228	94	United Kingdom 104; Belgium-Luxembourg 27.
Manufactured:				
Nitrogenous	20,009	9,326	1,768	Norway 3,534; West Germany 1,876.
Phosphatic	900	1,162	2	Netherlands 725; Ghana 148; Greece 126.
Potassic	863	202	(2)	West Germany 132; Belgium-Luxembourg 47.
Other	1,453	1,346	406	Belgium-Luxembourg 513; United Kingdom 259.
Ammonia	1,668	3,342	2,364	West Germany 955; United Kingdom 23.

See footnotes at end of table.

Table 3.—Liberia : Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Graphite, natural ____ kilograms__	--	165	165	
Gypsum and plasters ____	2,524	1,073	56	Norway 931.
Lime ____ thousand tons__	1,858	145	15	United Kingdom 64; West Germany 64.
Mica: Worked including agglomerated splittings ____ value__	$317	--		
Precious and semiprecious stones not set or strung ____ value__	$54	$3,429	--	Switzerland $2,258; Ivory Coast $1,171.
Salt and brine____	6,117	3,138	128	West Germany 1,810; Netherlands 567; United Kingdom 230.
Sodium and potassium compounds, n.e.s.: Caustic soda ____	1,317	935	390	West Germany 242; United Kingdom 238.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked ____	553	--		
Worked____	52	7	--	Italy 5.
Gravel and crushed rock ____	6,203	5,186	--	Italy 5,073.
Limestone excluding dimension ____	2,589	25,868	--	United Kingdom 24,360; West Germany 1,508.
Sand excluding metal-bearing ____	114	--		
Other: Crude ____	--	15	--	France 9; United Kingdom 3.
MINERAL FUELS AND RELATED MATERIALS				
Lignite and peat including briquets____	2	10	8	West Germany 2.
Petroleum and refinery products:				
Crude_ thousand 42-gallon barrels__	4,003	4,325	--	All from Saudi Arabia.
Refinery products:				
Gasoline ____do____	183	8	3	United Kingdom 3.
Kerosine and jet fuel ___do____	443	(2)	--	NA.
Distillate fuel oil ____do____	1,222	2	(2)	Mainly from Netherlands.
Residual fuel oil____do____	430	(2)	--	All from United Kingdom.
Lubricants ____do____	72	57	22	United Kingdom 23.
Mineral jelly and wax __do____	4	1	(2)	NA.
Other:				
Liquefied petroleum gas do____	1	1	(2)	NA.
Bituminous mixtures do____	8	22	(2)	Spain 13; United Kingdom 7.
Unspecified____do____	1	(2)	NA	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals ____	64	37	3	United Kingdom 23; Netherlands 11.

NA Not available.
[1]Excludes unreported quantities valued at $30,608 in 1979 and $6,498 in 1980.
[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Gold.—According to geological reports, gold occurrences have been found extensively in Liberia with exploitable concentrations occurring randomly, mostly in placer deposits. Most recently, however, several hard-rock concessions have also met with some success.

Exploration for gold intensified in 1981. Most of the activity was carried out in Eastern Liberia, along the Lofa River in Grand Cape Mount County by Bentley International Mining Co. on a private concession and by a team from the United Nations Revolving Fund for Mineral Exploration. Efforts to introduce modestly mechanized power shovel and crusher operations in addition to traditional washers and sluice box techniques were successful, with promising potential for future increased production.

Iron Ore.—In 1981, iron ore continued to be the most important source of foreign exchange for Liberia; all iron ore production is exported. In 1980, exports equaled 17.1 million tons valued at $313.4 million, or 52% of the value of Liberia's total exports. In 1981, iron ore exports rose to 20.4 million tons valued at $333.8 million despite the

decrease of 25% in shipments by the National Iron Ore Co. Ltd. (NIOC). With the decline in the market value of other commodities in 1981, iron ore increased its share of total export earnings for Liberia to 62%.

Following an 8.1% increase in 1980, iron ore production in 1981 remained constant at 19.6 million tons. However, the earnings of the three iron ore mining companies deteriorated appreciably owing to such factors as increased energy costs and negligible capital reinvestment, even though ore shipments increased by 3.3 million tons. The major importers of this ore in 1981 were the Federal Republic of Germany (27.3%), Italy (18.6%), France (12.1%), the United States (9.6%), and the Netherlands (7.5%). In the 1970's, Liberia shipped about 228 million tons of ore to steel plants in the European Economic Community, the United States, and Japan.

In 1981, the Lamco Joint Venture (LJV) increased its exports of iron ore to world markets to 11.5 million tons. This tonnage included 15,000 tons of pellets from stockpiles.[2] LJV's high-grade deposits at Nimba are located within the enriched portion of a banded iron formation, with the hematite and goethite ore averaging 63% Fe. The underlying itabirite at 32% Fe is not considered ore at present. In addition to the high-grade ores at Nimba, medium-grade ores of approximately 50% to 54% Fe are mined at Tokadeh, Gangra, and Yuelliton. Mining is by conventional open pit methods. Both ore and waste are taken in 10-meter benches. The slopes between berms are designed at 63° in ore and 45° in phyllite. About 80% of the ore and 70% of the waste has to be drilled and blasted. The mine, at full capacity, produces up to 13 million tons of waste and 13.5 million tons of crude ore annually, including 1.2 million tons of ore from Tokadeh. The 13.5 million tons of crude ore yields 12.7 million tons of finished products, including 4.5 million tons of washed lumps, 6.3 million tons of washed fines, and 1.9 million tons of pellets.[3]

The Bong Mining Co., Liberia's second largest iron ore mining company, established a new production high in 1981, at 8 million tons.[4] The Bong deposit consists of several narrow synclines approximately 13 kilometers long in the western part of the Bong Range. The deposit is an itabirite that has been weathered only slightly. The iron ore has a 61:39 magnetite-to-hematite ratio. The mine has a capacity of 30,000 tons of ore daily, while concentrate production averages 18,500 tons per day at an analysis of 65.5% Fe and 6.5% SiO_2. The throughput of each pellet plant is about 8,000 tons daily, providing some 6,000 tons of pellets with an average iron content of 63.5%. Concentrates and pellets are transported by rail 80 kilometers to the port of Monrovia. Storage capacity at the port is 800,000 tons of concentrates and 500,000 tons of pellets.[5]

Liberia's third largest iron ore mining company, NIOC, exported a total of 1 million tons of iron ore in 1981, all produced at its Mano River Mine.[6] The NIOC deposit at Mano River consists of six ore-bearing hills, of which four are fully developed for mining. The ore-bearing formation occurs mainly on the west-to-northwest slope of each hill. Average haulage distance from the open pit to the crusher is 4 kilometers.[7]

Reportedly, the Liberian Government was to receive $20 million in loans in 1982 from the World Bank to assist in making improvements to the Mano River iron ore mine. The loans will go toward a project costing $67.1 million, aimed at improving the mine's operating facilities and its railway links to the port of Monrovia. By the 1984 completion date, it is expected that output from the Mano River concentrator will be raised to 3.25 million tons per year.[8]

Under prevailing economic circumstances in Liberia in 1981, the outlook for significant expansion of iron mining operations appeared dim. Given the downward trends in operating results since 1978 at the Bong Mine and NIOC, both were threatened with closure. The Government of Liberia expressed hope that the LJV would proceed forthwith to expand operations at the Western Extension because high-grade deposits at Lamco's main ore body were expected to be depleted by 1986. Opening of new mines was possible at Wologisi near the Lofa River in northern Liberia and in the Bea Mountains. Though a concession was granted to the Liberian Iron and Steel Corp. in 1967, production has been delayed. The possibility of opening the new high-grade Nimba-Mifergui project in neighboring Guinea provided continuity to the Lamco operation. Nimba-Mifergui is the extension of Nimba Mountain into Guinea. Because the distance from the deposit to any port might render the project uneconomical, Mifergui has plans for the use of LJV rail and port facilities. If these various projects, together with the upgrading of the Mano Mine, come to fruition, the outlook for iron ore mining

in Liberia may not be as gloomy as would otherwise be the case.[9]

Manganese.—Reconnaissance surveys for manganese continued in 1981 by the Liberian Ministry of Lands, Mines, and Energy, with help from U.S. Peace Corps volunteer geologists. Exploration centered on the Mount Dorthrow area of Grand Gedeh County in Eastern Liberia.

Other Metals.—Efforts to bring deposits of rutile and ilmenite into production were deferred, because production reportedly would not be profitable at existing titanium ore market prices.

NONMETALS

Barite.—There was little followup activity during the year on the barite deposits northeast of Monrovia explored by the Senwein Mining Corp. in 1980.

Diamond.—Diamond deposits exist throughout Liberia. Some degree of exploration or mining was underway in each of the country's nine counties in 1981. Diamond exploration generally focused on alluvial sand and gravel deposits. The major production of diamonds in 1981 was confined to the alluvial deposits of the Lofa River Valley in the Saniquellie and Bahn Districts.

Diamonds in Liberia are mined by licensed local producers to a limited extent. Some 1,200 prospecting licenses and 1,170 mining licenses were current during 1980 and 1981. According to official trade data, diamonds account for about 7% of Liberia's exports. The value of diamonds exported in 1980 was $13.5 million, obtained mainly from small claims production. During the first 6 months of 1981, Liberia reportedly exported 143,000 carats for receipts of $10.6 million.

The long-term prospects of the Liberian diamond industry hinge on finding the geological sources of the diamonds. Potential sources still have not been extensively explored. Diamonds are closely associated with kimberlite, small dikes of which are found in Liberia, but no diamond-bearing pipes have yet been discovered.

As of July 1981, the Ministry of Lands, Mines, and Energy listed four diamond and gold concessions in Liberia: Bentley International Trading Co., Bruce J. Clayman, Weasua Mining and Development Corp., and the United Nations Revolving Fund for Mineral Exploration. Bentley International was the only one of the four listed as being in a "production phase" of operation. The concessions include land claims in Grand Gedeh, Sinoe, and Maryland Counties. Bruce Clayman had a concession for exploration on 185,000 acres along Kana Creek on the Grand Gedeh and Maryland County boundary. The Weasua Mining and Development Corp. operated in lower Lofa County, with exclusive rights to explore for gold and diamonds in a 230-square-mile area. The United Nations Fund operated in an exploration phase of its agreement in an 8,000-square-mile area of Eastern Liberia, beginning what is expected to be several years of study.

MINERAL FUELS

Petroleum.—The name of the Ministry of Lands and Mines of Liberia was changed to the Ministry of Lands, Mines, and Energy in 1981. A decree was issued giving the new ministry formal responsibility for petroleum matters, and a national energy committee was established to coordinate energy policy.

Exploration of Liberia's offshore oil potential continued in 1981. Based on encouraging results obtained from previous drilling, a contract was awarded under a $5 million World Bank loan to conduct a $3.1 million seismic survey and to reexamine past geophysical data. A French firm, Compagnie Générale de Géophysique, was awarded $1.5 million for the seismic survey, while the U.S. oil consulting firm of J.C. Ferrand of Houston, Tex., will process and interpret the data at a cost of $1.6 million.

The Liberian Petroleum Refining Co. operated a 15,000-barrel-per-day refinery at Monrovia. This Government-owned facility depends totally on imports. There is no strategic oil reserve. The plant normally attempts to maintain some reserve stock to permit orderly marketing, but owing to financial and administrative difficulties, such stocks are to all practical purposes nonexistent.

Uranium.—Exploration for uranium in 1981 was encouraged by the new Liberian Government. Active exploration for uranium was conducted by Coastal Liberian Uranium Enterprises, a subsidiary of Coastal States Gas Co. (United States). Reportedly, an airborne survey located encouraging anomalies over the 15,000-square-mile concession area.

Competitive-grade uranium deposits, of undisclosed value and quantity, were reportedly discovered in 1981 in Bong and Lofa Counties.

[1]Physical scientist, Division of Foreign Data.
[2]Skillings' Mining Review. V. 71, No. 3, Feb. 20, 1982, p. 20.
[3]Mining Magazine (London). September 1981, p. 205.
[4]Work cited in footnote 2.
[5]Work cited in footnote 3.
[6]Work cited in footnote 2.
[7]Work cited in footnote 3.
[8]Metal Bulletin (London). Jan. 29, 1982, p. 35.
[9]Work cited in footnote 3.

The Mineral Industry of Libya

By John R. Lewis[1]

Although Libya's economy remained dominated by its tremendous oil and gas reserves, they were not its only mineral resources in 1981. The iron deposit at Wadi Shati contains more than 720 million tons of 45% to 50% iron-content ore, some of which is manganiferous, which will be used as the raw material feed for the new Misratah iron and steel complex. Gypsum was present in commercial quantities; salt occurs in a number of places; and there were abundant raw materials for construction and cementmaking needs. Oil and liquefied natural gas (LNG) constituted 99.9% of Libya's exports and were responsible for the generation of about 66% of its 1981 gross national product of about $30 billion.[2] Libya's proven oil reserves in 1981 made it the ninth largest producer among the 67 oil-producing nations of the world.

Even with petroleum sales plummeting in 1981, Libya's national income exceeded expenditures by a comfortable margin, and the trade balance remained favorable.

Many Libyan contracts, worth billions of dollars, were awarded in 1981, mostly to European industrial equipment and construction firms and consortia, in furtherance of the Transformation Plan, which was aimed at diversifying the oil-based economy into the industrial and agricultural sectors.

Government Policies and Programs.—The Libyan General People's Congress, in January 1981, approved the draft of the Second Transformation Plan that takes into account the problems encountered and the delays experienced in the previous plan. Revenues from oil sales in 1981 accounted for about 66% of Libya's total income. The new plan will seek to reduce oil and gas income to about 46% of total revenue and will encourage corresponding increases from the agricultural and industrial sectors. Under the second plan, for example, the petrochemical industry is expected to rise by about 22%, while agricultural development will seek to wipe out some, if not all, of Libya's dependence on foreign food sources. Expenditures under the second plan were projected to be about $62.5 billion.

The national electrical grid system was well under way during the year. In one area, six powerplants, with total generating capacity of 40,810 megawatts, were under construction. Increasing the output from present powerplants was another goal that was well under way, and work on a whole network of electrical transmission, distribution, and feeder lines was moving ahead as was work on a large number of transformer stations throughout the more populated areas. Nine minipowerplants were well along in construction, and four desalination plants with output totaling 181 cubic meters of fresh water per day were also being built.

The U.S. Embassy in Libya was closed during 1980. On May 14, 1981, the Government of Libya announced that the 2,000 to 2,500 Americans in Libya, mostly oil and petrochemical technicians, would not be bothered because they were necessary to Libyan development. Late in December, Esso Standard Libya, Inc., and Esso Sirte, Inc., removed their corporate presence from Libya and were paid $95 million for their plants and other assets, considerably less than their reported book values. Shortly thereafter, Esso's personnel departed, and the Libya National Oil Corp. (NOC), which took over both of the Esso operations, imported 200 oil technicians from Iran's National Oil Co. to assist in keeping the plants operating while training Libyan personnel to perform these tasks.

During the summer, Libya offered a Bombay, India, firm, the Kamani Engineering Corp., a partial payment in oil for a transmission construction project upon which Kamani was bidding. The company

turned the proposal over to the state-owned Indian Oil Corp. for study. There were also indications that the Soviet Union, in an economic protocol with Libya, will provide increased technical assistance to the Libyan oil and gas industries, to pipeline gathering centers, and for the manufacture of oil well drilling equipment.

PRODUCTION AND TRADE

Exports totaled about $17 billion, and 99% of this was petroleum or its associated products. Imports, mostly food and many types of machinery, totaled $10 billion, which left a surplus balance of trade of $7 billion, somewhat less than that of preceeding years. Nonfuel minerals played a miniscule role in Libya's trade and economy during the year. The country's mineral production is shown in table 1.

Crude oil production in Libya averaged 1.8 million barrels daily in 1980. However, in 1981, the daily average production was down to 1.2 million barrels; toward the very end of the year, production may have been as low as 0.6 million barrels daily. Crude oil was produced from about 925 wells, about two-thirds of which were on some form of artificial lift. Prices for top-grade Libyan crude reached $39.90 per barrel on July 1, 1981, and remained at this level until very late in the year when, based upon action by the Organization of Petroleum Exporting Countries (OPEC), the price went down to $37.90 per barrel.

Libyan crude exports went primarily to Western Europe and the United States. In Western Europe, the Federal Republic of Germany, Spain, and Italy were the "big three," taking considerably more crude during the year than did the United States. In 1981, however, Libya exported about 130 million barrels of crude to the United States, an average of about 360,000 barrels daily and a 40% decline from that of 1980.

Despite pricing disputes that caused interruptions in LNG deliveries from Libya, Italy and Spain received nearly all exports of this product.

Table 1.—Libya: Production of mineral commodities[1]

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
Cement, hydraulic thousand metric tons	2,500	3,200	3,200	3,200	3,200
Gas, natural:					
Gross million cubic feet	[r]706,573	[r]749,913	828,491	719,414	432,000
Marketed[3] do.	[r]178,300	[r]180,771	239,510	182,501	108,000
Gypsum thousand metric tons	290	180	181	180	180
Iron and steel: Crude steel[e] metric tons	10,000	10,000	10,000	10,000	10,000
Lime thousand metric tons	300	220	225	230	235
Nitrogen: N content of ammonia[e] metric tons	--	80,000	133,000	150,000	150,000
Petroleum:					
Crude thousand 42-gallon barrels	753,129	[r]723,613	763,471	669,780	407,705
Refinery products:					
Gasoline do.	2,409	[r]3,431	5,110	6,000	6,150
Kerosine and jet fuel do.	9,672	[r]11,534	5,840	6,000	6,150
Distillate fuel oil do.	9,016	[r]10,731	13,505	14,000	14,300
Residual fuel oil do.	13,067	[r]15,658	18,615	19,000	19,500
Other do.	219	[r]292	365	300	300
Refinery fuel and losses do.	1,387	[r]4,161	1,825	1,055	1,050
Total do.	35,770	[r]45,807	45,260	46,355	47,450
Salt[e] thousand metric tons	10	15	10	10	10
Sulfur, byproduct of petroleum and natural gas[e] metric tons	17,000	19,000	20,000	22,000	16,000

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Aug. 9, 1982.

[2]In addition to the commodities listed, a variety of construction materials (sand and gravel, crushed stone, brick, and tile) is produced, but available information is inadequate to make reliable estimates of output levels. Natural gas liquids are also produced but are blended with crude petroleum and are reported as part of that total.

[3]Series revised to exclude gas reinjected into reservoirs.

Table 2.—Libya: Exports of crude petroleum and refinery products and hydrocarbon gases, by country

(Thousand 42-gallon barrels unless otherwise specified)

Country	1978	1979
Crude petroleum:[r]		
Austria	7,397	6,772
Bahamas	4,628	23,157
Belgium-Luxembourg	1,224	2,994
Brazil	5,554	2,366
Bulgaria	2,650	3,648
Denmark	--	402
France	36,819	41,671
Germany, Federal Republic of	74,185	109,100
Ghana	--	745
Greece	--	6,525
Iceland	664	--
Italy	146,490	130,765
Japan	639	2,282
Netherlands	16,943	16,902
Netherlands Antilles	663	--
Poland	--	4,379
Romania	15,824	16,128
Spain	39,682	35,235
Sri Lanka	--	457
Sweden	--	768
Switzerland	604	2,548
Trinidad and Tobago	1,311	668
Turkey	18,451	15,233
United Kingdom	9,785	5,156
United States	291,807	277,788
Yemen, People's Democratic Republic of	--	379
Yugoslavia	3,225	6,291
Unspecified African countries	2,571	--
Unspecified Asian countries	--	9,614
Other	8	--
Total	681,124	721,973
Refinery products:		
Kerosine:		
Germany, Federal Republic of	122	--
Greece	1,733	1,846
Italy	929	341
Netherlands	599	405
Norway	1,226	532
Portugal	118	106
Sweden	307	--
United Kingdom	162	--
Total	5,196	3,230
Distillate fuel oil:		
Canada	--	300
France	2,532	1,577
Germany, Federal Republic of	3,758	3,111
Greece	463	987
Italy	4,701	1,262
Japan	455	--
Netherlands	2,520	2,886
Norway	346	327
Spain	--	206
Tunisia	412	125
United Kingdom	2,605	915
United States	601	--
Total	18,393	11,696
Residual fuel oil:		
Belgium-Luxembourg	--	423
France	315	818
Germany, Federal Republic of	--	724
Greece	386	403
Italy	--	1,080
Japan	--	252
Netherlands	697	1,090
Norway	--	206
Spain	276	--
Sweden	2,614	2,006
Tunisia	1,167	--
United Kingdom	--	904
United States	6,860	3,461
Total	12,315	11,367
Petroleum gas, liquefied:		
Algeria value, thousands	$5,051	$7,511

See footnotes at end of table.

Table 2.—Libya: Exports of crude petroleum and refinery products and hydrocarbon gases, by country —Continued

(Thousand 42-gallon barrels unless otherwise specified)

Country		1978	1979
Refinery products —Continued			
Petroleum gas, liquefied —Continued			
Cyprus	value, thousands	$142	$120
Denmark	do	--	$162
France	do	--	$2,527
Japan	do	--	$917
Lebanon	do	$977	$961
Malta	do	--	$255
Morocco	do	$1,880	$1,846
Portugal	do	$233	$972
Syria	do	$1,911	$6,979
Tunisia	do	$3,187	$948
Turkey	do	$922	$747
United States	do	--	$11,058
Total	do	$14,303	$35,003
Gas, hydrocarbon:			
Natural, liquefied:			
Italy	do	$109,629	$147,702
Spain	do	$66,044	$103,169
Total	do	$175,673	$250,871

ʳRevised.

Table 3.—Libya: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Unwrought	5	61	--	Greece 31; Finland 30.
Semimanufactures	4,395	5,609	596	Greece 1,718; Yugoslavia 1,303; Italy 881.
Copper metal including alloys:				
Unwrought	1,804	113	--	All from Greece.
Semimanufactures	2,198	1,176	22	Italy 375; United Kingdom 362; Poland 333.
Iron and steel metal:				
Pig iron, ferroalloys, powder, shot	--	33	--	All from Italy.
Steel, primary forms	9,287	7,067	--	Italy 5,458; Bulgaria 1,001; Belgium-Luxembourg 313.
Semimanufactures:				
Bars, rods, angles, shapes, sections	33,419	41,116	150	Italy 27,636; West Germany 2,607; Romania 2,587.
Universals, plates, sheets	23,711	26,736	31	Italy 5,505; France 5,232; West Germany 4,263; U.S.S.R. 4,247.
Hoop and strip	3,843	10,372	--	Italy 5,392; Spain 1,913; West Germany 959.
Rails and accessories	173	564	--	United Kingdom 250; Bulgaria 50; France 13.
Wire	166,391	307,029	35	Italy 230,277; Spain 17,820; Greece 8,247; Poland 6,895.
Tubes, pipes, fittings	164,862	146,930	4,141	West Germany 41,296; Italy 36,536; Japan 25,288.
Castings and forgings, rough	1,381	78	--	United Kingdom 74; Yugoslavia 2.
Lead metal including alloys:				
Unwrought	812	1,587	--	Italy 1,315; West Germany 265; United Kingdom 7.
Semimanufactures	168	275	--	Italy 203; Romania 41; United Kingdom 13.
Nickel metal including alloys, semimanufactures	--	4	--	All from Italy.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$3	--		
Silver metal including alloys, unwrought and partly wrought	$2,862	$3,685	--	West Germany $1,977; France $1,183; United Kingdom $39.
Tin metal including alloys:				
Unwrought	359	11	--	Italy 10; United Kingdom 1.
Semimanufactures	2	19	--	Italy 16; West Germany 3.

Table 3.—Libya: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS —Continued				
Zinc metal including alloys:				
Unwrought	151	55	--	Italy 51; United Kingdom 3; West Germany 1.
Semimanufactures	856	725	--	Italy 547; Japan 153; West Germany 13.
Other: Base metals including alloys, unwrought and semimanufactures	--	2	2	
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	NA	7	--	Italy 5; France 1.
Grinding and polishing wheels and stones	568	318	2	Italy 307; France 6.
Asbestos, crude	5,033	2,050	--	All from Switzerland.
Cement thousand tons	983	1,044	(1)	Greece 363; Italy 227; Spain 190; U.S.S.R. 124.
Chalk	NA	452	--	France 442; West Germany 8.
Clays and clay products:				
Crude clays	12,146	33,101	8,599	Greece 10,499; Italy 7,890; Tunisia 4,920.
Products:				
Nonrefractory	43,777	114,593	136	Italy 98,691; Spain 4,836; Greece 3,138.
Refractory including nonclay brick	6,115	3,789	--	West Germany 2,090; United Kingdom 904; Italy 438.
Fertilizer materials, manufactured:				
Nitrogenous	2,248	6,317	1,157	Italy 3,542; Australia 1,058; United Kingdom 500.
Phosphatic	10,509	9,201	--	Bulgaria 7,600; Finland 1,251; West Germany 350.
Potassic	16,165	17,576	--	Belgium-Luxembourg 6,400; Romania 6,350; Italy 2,525.
Other including mixed	42,420	79,685	919	Romania 34,230; Belgium-Luxembourg 31,450; Italy 12,716.
Gypsum and plasters	NA	303	--	Italy 126; Switzerland 115; Romania 62.
Lime	32,878	7,996	--	Italy 5,737; Romania 1,657; Greece 602.
Mica: Worked including agglomerated splittings	NA	31	--	Italy 30; West Germany 1.
Pigments, mineral: Crude, natural	NA	13,352	--	Greece 6,653; Ireland 2,850; Italy 2,301.
Salt and brine	7,745	4,920	--	All from Tunisia.
Stone, sand and gravel:[2]				
Dimension stone:				
Crude and partly worked	NA	16,506	--	Italy 14,629; Greece 999; West Germany 600.
Worked	14,906	16,987	--	Italy 15,447; Greece 767; Denmark 620.
Gravel and crushed rock	NA	38,727	3	Italy 25,617; Greece 11,920; France 645.
Limestone other than dimension	NA	600	--	All from Bulgaria.
Sand other than metal-bearing	NA	516	--	Italy 450; India 30; West Germany 25.
Sulfur: Elemental, not purified	NA	43	--	West Germany 30; Italy 13.
Talc, steatite, soapstone, pyrophyllite	NA	497	--	Turkey 154; West Germany 123; Hungary 120.
Other:				
Crude:				
Meerschaum, amber, jet	NA	3	--	All from France.
Unspecified	6,219	1,060	177	United Kingdom 410; Italy 293; Yugoslavia 155.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	68,830	36,409	2	Italy 14,907; Greece 4,670; West Germany 3,150.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	NA	14,376	--	Spain 12,002; United Kingdom 2,119; France 216.
Coal, all grades including briquets, coke and semicoke	NA	136	7	Italy 100; France 29.
Petroleum refinery products:				
Residual fuel oil 42-gallon barrels	--	7	--	All from France.
Lubricants do	157,493	98,525	91	Netherlands 36,204; Belgium-Luxembourg 21,287; France 13,454; Italy 11,557.

See footnotes at end of table.

Table 3.—Libya: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products —Continued				
Other:				
Liquefied petroleum gas 42-gallon barrels	4,396	7,505	--	Italy 2,668; Sweden 1,868; France 1,775.
Mineral jelly and wax do	2,172	598	--	U.S.S.R. 566; Italy 24; Belgium-Luxembourg 8.
Bitumen and other residues do	1,002,457	932,525	--	Spain 572,349; Greece 165,408; Albania 121,988; China 24,173.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	NA	307	--	Italy 187; United Kingdom 101; Netherlands 13.

NA Not available.
[1]Less than 1/2 unit.
[2]A total of 64,298 tons of unworked dimension stone, gravel, and sand was reported imported in 1978.

COMMODITY REVIEW

METALS

Aluminum.—During the summer of 1981, it was announced by official sources in both Libya and Yugoslavia that plans were going forward for a plant to produce aluminum from Yugoslavian alumina and petroleum coke, the latter to then be used in the aluminum smelting process.

A joint company of the Socialist People's Libyan Arab Jamahirya and the Yugoslav enterprise known as Energoinvest contracted to build adjacent facilities at a cost of $1 billion to make petroleum coke and carbon electrolytic anodes and to smelt aluminum. The location was reported by one source as Zuwarah, which is on the Mediterranean coast about 80 kilometers west of Tripoli. Another report puts the facility in the Amikat al Khams region, about the same distance east of Tripoli. Plans called for an output of about 110,000 to 120,000 tons of aluminum annually, together with electrolytic carbon anode material from 170,000 barrels annually of residual fuel oil. When it was announced, the project was targeted for completion by 1986. About 1,200 persons are to be employed. Electric power requirements will run about 240 megawatts daily at startup. A rapidly expanding electrical grid system is believed adequate for this load when it is imposed. A new 720-megawatt, oil-fired powerplant is to be built at Zuwarah as part of the overall Libyan 1981-85 plan.

Kaiser Engineers and Constructors, Inc., furnished procurement and engineering assistance to the Libyan Secretariat of Heavy Industries and will also supply construction management services during the actual work. The 2-potline smelter, each line containing 160 electrolytic pots, will be technologically supported by the National-Southwire Aluminum Co. of Hawesville, Ky. The complex will have its own Mediterranean seaport, an electrode plant, metal-casting facilities, and general plant buildings.

Iron and Steel.—Construction of the fully integrated iron and steel complex of the Libyan General Co. for Iron and Steel Projects began to get under way at Misratah during 1981. This centerpiece in Libya's 1981-85 development plans lies 225 kilometers east of Tripoli on the Mediterranean coast. Designed by MN Dastur of India, the plant will be erected in three phases with assistance from many contractors in the Federal Republic of Germany, Austria, Japan, and elsewhere. Assistance during phase two will also be extended by the Soviet Union. By the year 2005, Libya hopes to have a steel capacity of 7 to 8 million tons annually. Upon completion of phase one, however, steelmaking capacity will be 1.3 million tons per year. This phase is scheduled for completion by 1985 and will cost $3.3 billion. It will use imported iron ore. The second phase is slated for completion in 1991, will cost $1.3 billion, and will increase capacity to a reported 5 million tons per year. Libyan iron ore, hauled on the new railroad that is to be built from Sabah in the Wadi Shati iron deposit area to the Misratah area, will go into use in the complex with completion of phase two.

Many of the contracts for the components that are part of phase one were let during 1981. Everything from design, construction, delivery, and installation to operations and training of Libyan technicians was negotiated.

In the Misratah plant, the first stage of steelmaking will be direct reduction of the ore. In April 1981, a consortium headed by Korf Engineering GmbH at Duesseldorf, Federal Republic of Germany, and including Vöest-Alpine AG of Austria was awarded a $300 to $340 million contract to build two Midrex direct-reduction plants, each rated at 550,000 tons per year, to produce the highly metallized iron ore known as sponge iron. Fuel for the two units will be natural gas brought via pipeline from the Hateiba Field deep in the Sahara Desert. The output from these plants will serve as the feed for two electric steelmaking furnaces. Contracts for the two electric units were also made public during the year. One unit, to be built by Korf Engineering and Vöest-Alpine, will cost $539.3 million and will produce 670,000 tons per year of steel blooms and billets. The second contract was with Friedrich Krupp GmbH and a consortium of mainly West German firms to build a $674.2 million, 650,000-ton-per-year plant to make steel slabs and sheet metal.

A number of rolling and other type mills were also to be erected under contracts awarded during 1981. A cold-rolling mill, which will make up to 140,000 tons annually of cold-rolled sheet metal and 100,000 tons of undipped sheet metal, was to be built by Vöest-Alpine and West German companies at a cost of $360 million. Electrical facilities for this mill are to be installed by Brown Boveri & Cie. AG of Mannheim, Federal Republic of Germany, at a cost of $90 million. Hot-rolling facilities will be built by Kobe Steel Ltd. of Japan and the Marubeni Corp. A hot-rolling mill to produce from 400,000 to 580,000 tons of steel strip per year will be joined by a 400,000-ton bar and wire rod mill reported as costing from $700 to $800 million. Samsung Construction Co. of the Republic of Korea received a subcontract from Kobe Steel for some of the construction work on these two facilities. The major features of the planned infrastructure to support the Misratah iron and steel complex are detailed below.

Port.—Late in 1980, a $282 million contract was awarded to the Turkish firm, Sezai Turkes Feyzi Akkaya Insaat, to augment Mediterranean port facility work that had been started in earlier years. The new work is to be completed about midsummer 1984 and will handle the unloading of 2,000 tons per hour of iron ore or 1,300 tons per hour of coal. At some future time, the port may be enlarged to handle up to 8,000 tons of iron ore per hour. Sezai Turkes, the contractor, has been engaged to operate the port for 18 months after its completion. Dredging of the port area was subcontracted to Royal Bos Kalis Westminster of the Netherlands.

Railroad.—An all new 1,350-kilometer, standard-gauge railroad system is planned for Libya. There will eventually be three lines, converging at Misratah. The longest, Desert Line, will connect the Misratah iron and steel complex with the Sabhah area iron-mining district. A branch will extend off the Desert Line to limestone quarries at Sidadah. The iron ore rail terminal will be built near the steel mill at a place called Talut. By the year 2000, the Desert Line is expected to be handling about 12.6 million tons of cargo annually, most of which will be iron ore. Preliminary estimates indicate requirements for operation will include 18 road locomotives, 625 freight and ore-carrying hopper cars, 25 passenger coaches, 11 work-train units, and about 2,100 employees. The Desert Line, 900 kilometers in length, will not be operational before 1989 or 1990. Contracts for its construction are anticipated during 1983. A Yugoslavian firm, Projekt-Inzenjering, designed the railroad system.

Utilities.—Due for completion during 1982 are the Misratah complex's power and desalination plants. The power-generating facility, consisting of three 83.5-megawatt steam turbine-driven electric-generating units, was contracted for with Korf and Siemens AG of the Federal Republic of Germany. Electricity will be distributed on a 220-kilowatt wire system. The seawater desalination plant and water-cooling system, capable of processing 890 cubic meters of water daily, will be operated and managed by contractor-trained Libyan nationals. The water intake from the Mediterranean for this plant is to be part of the new port facility already under construction.

A water-purification plant, a repair shop, and electric transformer stations were contracted in April 1981 with a consortium led by Fiat Engineering S.p.A. and Techint Compagnia Technica Internazionale S.p.A., both of Italy.

NONMETALS

Cement.—Demand, created by vigorous construction activity in the residential, commercial, industrial, and transportation sectors, continued to encourage expansion in Libya's cement industry. Although capacity of the country's cement plants appeared to be approaching the annual requirement of 5 million tons, production itself was variously reported to be between 2 and 2.5 million tons in 1981, with the balance coming from Italy and other foreign sources.

Ample raw materials for making cement are available within the country, and although information is meager with respect to fuel used in the process, natural gas is probably predominant. Libya's cement-producing facilities are detailed in table 4.

Construction of the 1-million-ton cement plant at Derna was contracted to Mitsubishi Heavy Industries Ltd. of Japan and to Polimex Cekop, a Polish state concern. The new 1-million-ton-per-year plant at Homs will be managed, operated, and maintained by about 250 engineers and technical personnel who are employees of the Kuljian Corp. to whom a contract for these services was awarded. Kuljian was also retained to perform all required technical services in connection with planning and constructing the 500,000-ton-per-year plant at Sebha in southern Libya.

Other cement plants were under consideration for possible construction in the near future at various places in Libya. Should all of these materialize, capacity would be about 7.5 million tons annually, and Libya probably would have cement for export.

Meanwhile, a new lime plant was reported as completed at Benghazi during 1980 and operating in 1981.

Table 4.—Libya: Cement production facilities

Location	Owner	Kilns, rotary dry process	Startup	Capacity, end of 1980 (thousand tons per year)
Homs (Al-Khums), on the coast, 50 miles east of Tripoli.	National Cement & Building Materials Co.	2 1	1968 1979	1,433 1,000
Hawari, near Benghazi	Libyan Cement Co	5	1972	1,500
Souk el Khamis, short distance south of Tripoli.	Souk el Khamis General Cement Co.	2	1977	1,000
Derna, east of Benghazi	Dernacement	2	Expected onstream in August 1982.	1,000
Zliten, 100 miles east of Tripoli.	Under construction by Kawasaki Heavy Industries.	--	Cornerstone laid in 1980; operations to begin in 1983.	1,000
Zawia, on the coast, 100 miles east of Benghazi.	Zawia Oil Refinery	--	Construction began in 1980.	100

MINERAL FUELS

Natural Gas.—Increasing use of natural gas for domestic consumption was well on the way to realization in 1981. Formerly, all natural gas production was exported as LNG or was flared. However, when the steelworks at Misratah are ready, they will be fired with natural gas from the Hateiba Gasfield, deep in the Sahara Desert. Further volumes of gas will go into feedstocks for the burgeoning petrochemical industries presently under development.

As the year began, the LNG plant at Marsa el-Brega was exporting its product at a rate of 235 million cubic feet of gas daily to Ente Nazionale Idrocarburi at Genoa, Italy, while an additional 110 million cubic feet per day was going to Gaz Natural at Barcelona, Spain. The contract price, agreed upon a year earlier, was $3.45 per million British thermal units. Early in January 1981, a price dispute surfaced. Under an OPEC-endorsed pricing policy, Libya called for an increase in LNG prices so that they would be at parity with recent crude oil price increases. Italy stood firm and refused to pay an increased price; Libya then ceased shipments to both Italy and Spain. Prompt settlement of differences and payment of a higher price to Libya by the Spanish interests resulted in little or no disruption of LNG deliveries to that country. Because other gas apparently became available to Italy, delivery of Libyan LNG was not resumed.

In September, a new gas-processing and condensate-recovery plant for the Benghazi

area was announced. The plant will use 100 million cubic feet of natural gas daily from central Libya's Messla Field. The Arabian Gulf Oil Co. awarded a $4 million contract for the plant to Worley Engineering Co., the U.S. subsidiary of William Press & Son Ltd., a British firm. Detailed engineering, procurement assistance, and inspection are expected to be completed in mid-1982. Logistics, construction management, and startup are part of phase two, for which no fixed dates were established. The contractor for phase two will also train Libyan personnel on operation of the plant and equipment maintenance.

Petroleum.—*Exploration.*—Libya's policy is to seek to replace, through new discoveries, whatever oil it produces each year. The country, therefore, has as a condition in its crude oil purchase contracts that each buyer will invest in exploration ventures within Libya's boundaries. Late in 1980, the French majority state-owned petroleum group, Elf-Aquitaine, concluded a production-sharing agreement under which it would explore for new oil in tracts totaling 15,800 square kilometers. Five separate blocks were involved; there were three onshore blocks in the Sirte Basin and one in the Hamada Plateau in the northwest part of the country about 400 kilometers southwest of Tripoli. These four blocks totaled 15,000 square kilometers. The fifth block was in western Libya's offshore waters adjoining acreage already held by Elf-Aquitaine and consisted of 800 square kilometers. However, in mid-January 1981, the Board of Directors of Elf-Aquitaine decided to postpone implementation of the exploration contract because of deteriorating relations between France and Libya over the latter's approach to the domestic affairs of Chad, its neighbor to the south and former French colony. About mid-July, the French Government decided to rescind its suspension of this and other contracts with Libya, thereby allowing, among other events, the resumption of the oil-exploration program. Two Canadian companies, in December 1981, reportedly acquired about 10% of the 5 production-sharing blocks and announced that they would perform a minimum of 7,600 line kilometers of seismic work and drill 17 exploratory wells in the ensuing 4 years.

Occidental Petroleum Corp. signed an exploration and production-sharing agreement in late 1981 for three blocks totaling approximately 10 million acres. Resolution of a continuing dispute between Malta and Libya over exploration rights on the Continental Shelf lying between the two countries was the subject of a meeting of the United Nations Security Council in late July. Evidence was presented showing that Libya has drilled about 30 offshore wells in the area and that Malta finds itself prevented from doing any drilling. The Security Council adjourned without taking any known action, nor did it set a date for a future meeting on this matter.

About 35 drilling rigs were reportedly operating in Libya in 1981, but indications of reduced exploration activity, due mainly to production cutbacks made necessary because of world oil supply-demand conditions, were beginning to be noted. Petroleum industry sources working in Libya indicated that if production improvement was not forthcoming, further cutbacks might be necessary.

Production.—For the first 4 months of 1981, Libya's crude production was running between 1.6 and 1.7 million barrels daily. A price of $39.90 per barrel, reduced from $41.00 per barrel, for top-quality Libyan crude was established in April and became effective on July 1, 1981. Responding to reduced world demand, output was down to about 1 million barrels per day by early July, to 900,000 barrels per day by the end of July, to 800,000 barrels per day in August, and some sources estimated that by September, production was down to 600,000 barrels per day, a drop of about 65% in about one-half of a year. Taken as a year's average, Libyan production was 1,117,000 barrels per day, an annual dropoff of 38.9%. By the middle of August, Libyan officials began discussing a price of $37 per barrel, and in late December, there were indications that this price had become official. There was little information available, however, as to what effect the lowered price, which was still somewhat above that being charged by OPEC nations located to the east of Libya, was having on Libya's ability to sell more crude oil.

These events led to concern in Libya that reduced petrodollar earnings would cause slowdowns both in exploration and development of Libya's oil resources as well as in the ambitious economic development of the country.

Exports.—Western Europe remained Libya's best crude oil customer in 1981, taking 48% of its crude exports. North America was Libya's second best customer, taking 35%, and Latin America was third, with 8%. Brazil's state-owned company,

Petróleo Brasileiro S.A., was increasing its liftings from Libya, owing to disruption of its regular sources by the Iraq-Iran war. Most of Libya's crude was being shipped through the port at Marsa el-Brega.

Refining.—Two refineries operated in Libya in 1981, and a large new plant was under construction. The 120,000-barrel-per-day refinery of NOC at Azzawiya satisfied most of the petroleum project needs of the country. The plant had capacities of 13,000 barrels per day in catalytic reforming and 16,000 barrels per day in catalytic hydrotreating. There was also in the NOC complex an asphalt plant with an output of 1,720 barrels per day.

In November 1981, Exxon Corp. notified the Libyan Government that it would relinquish its concessionary interests in that country. An agreement was negotiated that resulted in an orderly withdrawal from all operations along with the transfer to the Government of Libya, as of December 1, 1981, of Exxon's Libyan properties, including crude oil processing facilities and a LNG plant with associated exporting facilities. According to Exxon, this agreement resulted in a payment to the corporation that was somewhat lower than the net book value of its properties in Libya. Industry sources, in January 1982, indicated that Exxon had been paid $95 million, about $28 million less than the estimated net value.

A wholly owned subsidiary of NOC, identified as the Sirte Oil Co., was established to operate the former Esso Sirte installation, most commonly identified as the 9,500-barrel-per-day Marsa el-Brega refinery, which has catalytic reforming, hydrorefining, and hydrotreating processing facilities.

Ras Lanuf is located on the coast, not far east of Tripoli. It is here that Libya's third, and by far its largest, refinery and petrochemical complex was under development throughout 1981. The plant was owned by the Zavia Refinery Co., a subsidiary of NOC. At the outset, crude throughput capacity will be 220,000 barrels per day, but plans call for an eventual capacity of 280,000 barrels per day. Construction will be accomplished in several phases.

Work on the Ras Lanuf refining and petrochemical complexes was about on schedule during 1981. The refinery will make petroleum products for export. It will also supply raw materials for major ethylene plants, which in turn will feed a range of other petrochemical plants. A new seaport, on the Mediterranean, is being built from scratch, and adequate fresh processing water will be supplied from desalination plants, which are also under construction. Crude oil will arrive at the refinery petrochemical plant site via a new 42-inch pipeline from the producing oilfields in the desert to the south. Two entirely new towns are being built nearby to house the refinery employees and their families.

Petrochemicals.—There are two petrochemical centers in Libya. The Marsa el-Brega complex is not far south of Benghazi, on the Gulf of Sirte; a newer complex is under development at Abu Kamash, also on the coast, but far to the west, near the Tunisian border.

During 1981, demand for products from the Marsa el-Brega methanol plant were heavy enough to necessitate operating two daily shifts. In the first quarter of the year, output was 96,474 tons, about a third of the previous full year's record high production.

In September 1981, a 365,000-ton-per-year urea-based fertilizer plant was inaugurated at the Marsa el-Brega petrochemical complex. Cornerstones were also laid at the same time at Marsa el-Brega for a second urea plant, which will have a capacity of 1,750 tons per day, and for another 1,000-ton-per-day methanol plant. The urea plant, to cost $150 million, is to be built by a consortium of two Italian and one West German company.

Among numerous petrochemical units to be built at Ras Lanuf to use the ethylene feedstock that will be produced, there is a 60,000-ton-per-year low-density-polyethlene (LDP) plant. This product can withstand the temperatures of boiling water and is used for many household and industrial applications. During 1981, letters of intent worth $14.7 million were issued by the Zawiya Refinery Co. to Britain's Imperial Chemical Industries Ltd. for technology and high-pressure LDP devices and to Sim-Chem of the United Kingdom's Simon Engineering Ltd. Group for design engineering, procurement services, and a technical and advisory staff.

Transportation.—Libya's oil tanker fleet, by mid-1981, had grown to 13 ships with a total capacity of 1.2 million tons.

Early in April, at Goteborg, Sweden, the vessel *al-Gardabiya*, a 155,000-ton tanker measuring 279 meters long and 49 meters of beam, was delivered to her owners, Libya's National Corp. for Marine Transport (NCMT). She was the second of three ships of the same type built in Sweden for the NCMT. With delivery of the three tankers, Libya became the third largest Arab tanker

fleet owner.

Libya's pipeline network continued to expand during the year. It was reported in July that the Brega Petroleum Marketing Co. was to build oil storage tankage capable of holding up to 1.8 million barrels of petroleum products and a connecting pipeline system, all near Misratah, site of Libya's new steel mill complex. Construction was to be undertaken by the Republic of Korea's Samsung Construction Co. under a $75 million contract. Completion was scheduled for March 1983.

A 24-inch crude oil pipeline was also under construction from the Mobil Oil Corp. depot to the Ras Lanuf refinery, a distance of 12 kilometers. The builder was Saipem; completion was due during the summer of 1982.

The Italian construction firm, Snam Progetti S.p.A., was working on an ocean pipeline network that will feed, by 1984, into the El Sider marine terminal under construction and to be operated by the Oasis Oil Co. of Libya, Inc.

Seaport.—The NOC Ras Lanuf complex will require a new seaport to handle incoming materials and the huge volume of petroleum and petrochemical products that will be exported to world markets. A $300 million construction contract to build the port was awarded during 1980 to Hyundai Construction of the Republic of Korea. Completion was scheduled for September 1983.

Uranium.—A 400-megawatt nuclear powerplant has been in the planning stage in Libya for several years. The country has made several overtures to the Soviet Union in connection with this project. At one point, the Finnish state-owned power utility, Imatran Voima Oy (IVO), was interested in participating with the Soviet Union in the construction. In 1981, it was reported that IVO had abandoned its interest in working on this particular plant.

Libyan authorities have reportedly announced plans to mine uranium, and they claim that prospects for a viable operation are good. Meanwhile, Libya's purchases of neighboring Niger's uranium have climbed steadily. In 1978-80, acquisition totaled 788 tons. In the first 6 months of 1981, purchases from Niger were about 425 tons. Libya has only one small research reactor using, at the most, 12 kilograms of enriched uranium, and the country reportedly has no facilities for reprocessing. Therefore, the uranium can only be stored or exported. There is no available information to indicate disposition.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Libyan dinars (LD) to U.S. dollars at the rate of LD.296 = US$1.00.

The Mineral Industry of Madagascar

By Kevin Connor[1]

The year 1981 brought little relief to Madagascar's economy, which continued to suffer from agricultural production problems, increasing import needs, and accumulated debt. Although there was a slowdown in 1981 in the contracting of new debts, total external debt increased from slightly over $1 billion in 1980 to $1.3 billion in 1981.[2] The service to debt ratio, which had been 4% in 1977 and 12% in 1980, rose to an estimated 30% in 1981. Despite the wide variety of large, potentially commercial mineral deposits known to exist in Madagascar, only three, chromite, graphite, and phlogopite mica, are presently being exploited. Total mineral production from these three sources accounted for less than 1% of Madagascar's gross domestic product in 1981, making the minerals industry a minor contributor to the Madagascar economy. However, as in past years, mineral production did play a somewhat greater role in terms of foreign exchange earnings, their export value accounting for approximately 4% of the country's total for the year.

Like many of the developing countries of Africa, Madagascar's need for petroleum imports is putting a sizable strain on the country's economy and is the leading cause in its growing balance-of-trade deficit. In 1981, Madagascar's petroleum trade bill increased by 33% over that of the previous year to approximately $130 million and represented 23% of Madagascar's total import costs. Madagascar's indigenous hydrocarbon deposits of tar sands, heavy oil, coal, and potential deposits of oil and gas have until recently been interesting geologically but never exploitable. However, at today's import oil prices, Madagascar has been pursuing all available avenues of domestic energy development, with petroleum exploration leading the way. In December 1981, two agreements were signed between the Government of Madagascar and Western oil companies to conduct exploratory drilling for petroleum on both offshore and onshore sites. In the area of tar sands and heavy oil deposits, Madagascar's National Military Office for Strategic Industries (OMNIS) worked in 1981 to prove the technology and economics of extracting crude oil from the island's deposits. In yet another area of energy development, construction of a large hydroelectric dam complex continued during the year, bringing the island an important step closer to energy independence. The project is the largest engineering endeavor in the island's history.

The 58-megawatt hydroelectric dam at Andekaleka, located roughly halfway between the capital city of Antananarivo and the country's principal port of Tamatave, was nearing completion at the end of 1981. The dam project, if completed on schedule during the latter part of the spring of 1982, will have cost approximately $150 million, $35 million over the original estimate. The end of 1981 marked the second full year of construction work on the project. Financing of the project has been provided by several institutions; the largest contributor was the International Development Association, with a loan of $43 million. Although the dam is small by world standards, it is expected to satisfy the electrical needs of both the Antananarivo and Tamatave areas for at least the next decade. The sophisticated dam complex has been constructed to eventually house four turbine generators, each with a generating capacity of 29 mega-

watts. The initial 58-megawatt output can be doubled to its maximum capacity in the future by installing the remaining two turbine generators. Madagascar's main sources of fuel until now have been imported oil and firewood. The new hydroelectric dam should reduce the island's fuel import bill by approximately $30 million annually.

Progress on the second phase of the expansion work to double the capacity of the Madagascar Petroleum Co. oil refinery by June 1982 was 70% completed as of the end of 1981. The new annual capacity of the plant will be 0.5 million barrels of diesel oil, 43,000 barrels of gasoline, and 20,000 tons of asphalt. The complex, which is located at Tamatave, is the only petroleum refinery within Madagascar.

PRODUCTION AND TRADE

Tonnage figures for mineral production in 1981 showed decreases for the three major minerals mined in Madagascar. Production of chromite, Madagascar's most important mineral commodity, was down by 40% from the 1980 final figure. Graphite production was down by almost 20%, and mica production was only a fraction of the 1980 total. Export earnings from mineral production trade were also considerably lower than that of 1980, with depressed international market conditions cited as the main cause.

Chromite is the most important mineral mined in Madagascar. Production, however, dropped substantially in 1981 to just under 100,000 tons, which was a 40% decrease from the 1980 tonnage. The decline was mainly due to the softening world market in steel. Part of the marketing problem for Madagascar chromite is the buyer's preference for ferrochrome, which Madagascar is presently unable to produce. A ferrochrome processing plant for Madagascar has been in the planning stage for several years, but unfortunately, technical and financial problems continue to deter its construction.

Madagascar is the world's leading producer of high-grade, natural crystalline flake graphite used in refractories, foundries, and steelmaking. All graphite production in Madagascar is by private producers. Graphite output for 1981 decreased 18% from that of 1980. A lack of foreign exchange capital to buy needed replacement parts and new equipment contributed to the decline. Mica production for 1981 was only 19% of that of 1980. Declining world markets for the resource have been cited as the reason.

The total value of 1981 imports for Madagascar was estimated at $557 million compared with only $382 million for exports. Increased import expenditures of greater than 24% over that of the previous year were attributed to domestic agricultural shortfalls in production and escalating oil prices. The majority of Madagascar's trade continued to be with the European Communities, particularly France. Trade with Africa continues to grow, as does economic relations with Japan, North Korea, and China. Trade with the United States has been declining since 1978, and continued to do so in 1981.

Table 1.—Madagascar: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Beryllium: Beryl concentrate, industrial grade, gross weight	[e]15	11	10	[e]10	10
Chromium: Chromite concentrate, gross weight	164,710	137,552	128,347	180,000	99,689
Gold, mine output, metal content—troy ounces	76	125	125	114	110
Nickel, mine output, metal content	--	NA	NA	100	NA
NONMETALS					
Abrasives, natural: Garnet (industrial only)—kilograms	NA	10,500	5,000	[e]5,000	5,000
Cement, hydraulic	52,229	66,044	70,000	60,050	65,000
Clays: Kaolin	2,152	2,596	1,899	2,858	1,746
Feldspar—kilograms	1,093	[e]1,000	1,830	[e]1,800	1,800
Gem and ornamental stones:					
Agate—do.	147,200	98,400	7,514	14,381	45,822
Amazonite—do.	133	2,800	1,459	1,300	711
Amethyst:					
Gem—do.	4,700	26	31	10	24
Geodes—do.	NA	NA	2,393	3,400	350
Apatite (ornamental only)—do.	536	491	175	200	29
Aragonite	1,366	770	1,120	969	1,166
Beryl—kilograms	1	1	5	--	--
Calcite (ornamental only)	--	--	2	--	--
Celestine—kilograms	19,586	29,532	24,846	22,758	24,882
Citrine, gem—do.	47	NA	7	8	33
Cordierite—do.	49	[3]	158	154	348
Garnet:					
Gem—do.	NA	9	5	1,666	--
Other ornamental—do.	NA	616	1,251		
Jasper—do.	8,850	1,030	2,930	2,305	2,850
Labradorite—do.	4,389	7,504	7,500	24,806	3,084
Quartz:					
Rose quartz—do.	29,019	64,800	39,683	84,460	58,842
Geodes—do.	NA	--	950	57	60
Other ornamental—do.	547	3,515	1,299	21,649	3,527
Rhodonite—do.	--	--	11,990	350	--
Tourmaline:					
Gem—do.	NA	1,563	734	1,745	--
Other ornamental—do.	NA	1,915	1,134		
Graphite, all grades	15,727	16,625	14,242	12,252	10,073
Mica, phlogopite:					
Block	NA	NA	61	84	334
Splittings and sheet	1,498	1,566	1,106	1,647	--
Scrap	NA	NA	NA	NA	49
Total	NA	NA	NA	NA	383
Quartz, piezoelectric—kilograms	115	200	52	167	73
Salt, marine	26,000	30,000	[e]30,000	[e]30,000	30,000
Stone:					
Calcite, industrial	46,915	303	1,973	[e]2,000	2,000
Marble, cipoline	12,000	2,136	4,017	470	500
Other: Bastnasite—kilograms	19,586	NA	22,313	[e]23,000	23,000
MINERAL FUELS AND RELATED MATERIALS					
Petroleum refinery products:					
Gasoline—thousand 42-gallon barrels	826	796	478	[e]500	544
Kerosine and jet fuel—do.	425	365	275	[e]300	335
Distillate fuel oil—do.	912	761	502	[e]500	747
Residual fuel oil—do.	1,419	1,123	1,151	[e]1,200	935
Other—do.	59	87	44	[e]50	37
Refinery fuel and losses—do.	404	428	[e]335	[e]350	--
Total—do.	4,045	3,560	2,785	[e]2,900	2,598

[e]Estimated. [p]Preliminary. NA Not available.

[1]Table includes data available through Sept. 10, 1982.

[2]In addition to the commodities listed, opal and modest quantities of unlisted varieties of crude construction materials, (clays, stone, and sand and gravel) presumably are produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[3]Less than 1/2 unit.

Table 2.—Madagascar: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Beryllium: Elemental ____ kilograms__	217	NA		
Chromium: Ore and concentrate _____	109,147	85,910	18,434	France 46,639; Sweden 20,833.
Copper metal including alloys, semimanufactures_____ kilograms__	69	NA		
Iron and steel:				
Ore and concentrate _____	396	--		
Metal:				
Powder and shot _____	--	1	--	All to Japan.
Semimanufactures:				
Universals, plates, sheets __	159	228	5	West Germany 70; Algeria 45; Belgium-Luxembourg 41.
Tubes, pipes, fittings kilograms__	118	NA		
Castings and forgings, rough do____	197	NA		
Lead: Oxides and hydroxides_____	213	NA		
Silver:				
Waste and sweepings[1] __ kilograms__	1,197	NA		
Metal including alloys, unwrought and partly wrought _ troy ounces__	96	NA		
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones _____ kilograms__	42	NA		
Clays, crude _____	--	146	--	All to West Germany.
Graphite, natural _____	14,588	9,481	2,209	United Kingdom 3,264; West Germany 1,467; Japan 1,408.
Mica:				
Crude including splittings and waste _	1,205	691	1	Belgium-Luxembourg 537; France 114; Poland 30.
Worked including agglomerated splittings _____	--	4	--	France 2; West Germany 2.
Precious and semiprecious stones other than diamond:				
Natural _____ kilograms__	103,868	(2)		
Synthetic _____ do____	25	--		
Salt and brine_____	2,575	996	--	Reunion 473; Comoros 343; Mauritius 179.
Stone, sand and gravel:				
Dimension stone, worked _____	1	1	--	All to France.
Quartz and quartzite_____	186	85	--	All to Australia.
Other: Crude _____	--	457	--	All to Japan.
MINERAL FUELS AND RELATED MATERIALS				
Coal, all grades excluding briquets ____	--	31,176	--	Do.
Petroleum refinery products:				
Nonbunker:				
Gasoline ___42-gallon barrels__	3,073	8	--	All to Reunion.
Kerosine and jet fuel ___do____	3,302	15,864	--	France 9,385; Reunion 1,682; Tanzania 1,248.
Distillate fuel oil _____do____	4,366	82	--	All to Kuwait.
Residual fuel oil _____do____	513,101	368,911	--	Gibraltar 164,362; Jamaica 131,095; Reunion 73,453.
Lubricants _____do____	3	35	--	All to France.
Unspecified _____do____	--	333	--	All to Netherlands.
Bunkers:				
Gasoline _____do____	--	5,006		
Kerosine and jet fuel ___do____	--	2,209		
Distillate fuel oil _____do____	11,109	8,042		NA.
Residual fuel oil _____do____	99,740	358,308		
Lubricants _____do____	--	11,781		

NA Not available.

[1]May contain other precious metals.

[2]Value only reported at $688,000, of which $442,000 went to West Germany, $139,000 to France, $28,000 to Switzerland, and $4,000 to the United States.

Table 3.—Madagascar: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	(1)	3	--	France 2; Australia 1.
Metal including alloys:				
Unwrought and scrap	589	154	--	All from West Germany.
Semimanufactures	543	830	(1)	France 556; Belgium-Luxembourg 77; Tanzania 64.
Arsenic: Oxides and acids	3	NA		
Chromium: Oxides and hydroxides	1	2	--	Mainly from France.
Cobalt: Oxides and hydroxides	--	7	--	Mainly from Spain.
Copper:				
Sulfate	1	NA		
Metal including alloys:				
Unwrought and scrap	7	--		
Semimanufactures	34	59	(1)	France 56; West Germany 1; Italy 1.
Iron and steel metal:				
Scrap	(1)	8	--	All from France.
Pig iron, ferroalloys, similar materials	7	157	--	United Kingdom 141; France 11; West Germany 5.
Semimanufactures:				
Bars, rods, angles, shapes, sections	20,058	18,680	--	France 10,747; Belgium-Luxembourg 3,300; Mozambique 2,386.
Universals, plates, sheets	25,277	21,750	65	Japan 16,154; France 5,014.
Hoop and strip	317	799	--	France 518; West Germany 160; Mozambique 95.
Rails and accessories	77	95	--	France 81; China 14.
Wire	3,243	3,930	(1)	Mozambique 2,436; France 608; Japan 522.
Tubes, pipes, fittings	2,855	6,657	58	France 6,248; Japan 62; China 61.
Lead:				
Oxides and hydroxides	6	17	--	France 15; Netherlands 2.
Metal including alloys:				
Unwrought and scrap	268	--		
Semimanufactures	17	202	--	France 199; Hong Kong 2.
Magnesium metal including alloys, all forms	(1)	5	--	All from Hong Kong.
Manganese: Oxides and hydroxides	(1)	2	--	All from France.
Mercury 76-pound flasks	1	(1)	--	Do.
Nickel metal including alloys, semimanufactures kilograms	52	(2)	--	Do.
Silver metal including alloys, unwrought and partly wrought troy ounces	18,725	NA		
Tin metal including alloys:				
Unwrought and scrap	1	1	--	Do.
Semimanufactures	3	4	--	France 3; West Germany 1.
Titanium: Oxides and hydroxides	93	NA		
Tungsten metal including alloys, all forms	(1)	1	--	All from France.
Uranium and thorium: Oxides and other compounds kilograms	3	NA		
Zinc:				
Oxides and hydroxides	21	21	--	West Germany 14; China 5; France 1.
Metal including alloys, semimanufactures	641	488	--	France 484; Canada 3.
Other:				
Ores and concentrates	--	2	--	All from China.
Oxides and hydroxides	105	NA		
Metals:				
Alkali, alkaline-earth, rare-earth metals	(1)	2	--	United Kingdom 1.
Metalloids	--	1	--	Mainly from France.
Pyrophoric alloys	1	NA		
Metals including alloys, all forms	10	4	--	Spain 3; France 1.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc value	(3)	$15,000	--	West Germany $13,000; France $1,000.
Artificial: Corundum	1	3	--	All from Japan.
Grinding and polishing wheels and stones	29	53	--	France 45; China 5.
Asbestos, crude	15	NA		
Boron materials:				
Crude, natural borates	118	95	--	Mainly from Belgium-Luxembourg.
Oxide and acid	3	3	--	Mainly from West Germany.
Cement	46,565	69,196	--	Mozambique 43,749; North Korea 5,844; Kenya 4,095.
Chalk	77	1	--	All from United Kingdom.

See footnotes at end of table.

Table 3.—Madagascar: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
* Clays and clay products:				
Crude	218	441	--	West Germany 391; Hong Kong 20; Japan 19.
Products:				
Nonrefractory	662	975	--	France 436; Spain 263; Italy 233.
Refractory including nonclay brick	181	652	--	United Kingdom 476; France 63; Morocco 62.
Diatomite and other infusorial earth	9	(4)	--	All from West Germany.
Fertilizer materials:				
Crude	4	28	--	All from France.
Manufactured:				
Nitrogenous	6,216	5,666	--	West Germany 3,721; United Kingdom 1,500; France 250.
Phosphatic	586	4,416	--	Czechoslovakia 3,460; Belgium-Luxembourg 956.
Potassic	7,443	3,795	513	France 2,286; Belgium-Luxembourg 719; East Germany 277.
Other including mixed	5,074	7,511	4	Netherlands 4,808; Italy 2,060.
Ammonia	38	52	--	France 36; West Germany 11; Belgium-Luxembourg 5.
Graphite, natural kilograms	5	NA		
Gypsum and plasters	4,679	2,359	--	France 1,759; Kenya 600.
Lime	2,150	1,608	--	Belgium-Luxembourg 763; West Germany 487; Kenya 358.
Magnesite	2	4	--	West Germany 3; Japan 1.
Mica, all forms	(1)	1	--	All from Japan.
Pigments, mineral: Iron oxides, processed	63	42	--	West Germany 32; France 10.
Precious and semiprecious stones other than diamond: Natural kilograms	8	NA		
Salt and brine	38	3	--	France 2; West Germany 1.
Sodium and potassium compounds, n.e.s:				
Caustic potash including sodic and potassic peroxides	5	8	--	Belgium-Luxembourg 4; Italy 3.
Caustic soda	3,340	3,418	--	West Germany 2,396; East Germany 724; Italy 161.
Soda ash	825	1,237	--	Kenya 896; Netherlands 92; France 86.
Stone, sand and gravel:				
Dimension stone, all forms	(1)	1	--	Mainly from Italy.
Gravel and crushed rock	2	--		
Quartz and quartzite	30	18	--	All from West Germany.
Sand other than metal-bearing	6	8	--	West Germany 5; France 3.
Sulfur:				
Elemental, all forms	23	14	--	All from France.
Sulfuric acid	154	242	--	France 132; Belgium-Luxembourg 61; Netherlands 46.
Talc, steatite, soapstone, pyrophyllite	14	10	--	All from France.
Other:				
Crude	1,416	1,020	110	France 901; West Germany 9.
Halogens	5	NA		
Oxides, hydroxides, peroxides of barium, magnesium, strontium	1	(5)	--	All from Japan.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	613	875	--	France 852; Italy 22.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black and gas carbon:				
Carbon black	2	6	--	France 5.
Gas carbon	10	NA		
Coal, all grades, including briquets	28,863	27,114	4,988	Mozambique 4,763.
Coke and semicoke	108	102	--	Belgium-Luxembourg 70; France 32.
Hydrogen, helium, rare gases	2	NA		
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	2,230	971	--	Mainly from Iraq.
Refinery products:				
Gasoline do	203	1,200	--	Iraq 1,107; Mozambique 39.
Kerosine and jet fuel 42-gallon barrels	71,708	148,924	--	France 62,070; Kuwait 51,956; People's Democratic Republic of Yemen 34,301.
Distillate fuel oil do	9	187,731	--	France 137,398; People's Democratic Republic of Yemen 32,496; Italy 17,718.
Residual fuel oil do	485,117	175,338	--	All from Kuwait.

See footnotes at end of table.

Table 3.—Madagascar: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products —Continued				
Refinery products —Continued				
Lubricants 42-gallon barrels	11,409	8,442	154	France 7,861; China 119.
Other:				
Liquefied petroleum gas do	576	56,921	--	Saudi Arabia 50,158; Belgium-Luxembourg 6,723.
Mineral jelly and wax do	37,908	59,781	--	West Germany 20,438; Japan 14,906; China 9,877.
Nonlubricating oil do	347	--		
Bitumen and bituminous mixtures do	12,641	15,823	6	Singapore 13,187; Kenya 1,485; France 806.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	144	7,396	--	Mozambique 4,235; Reunion 2,944; France 125.

NA Not available.
[1]Less than 1/2 unit.
[2]Unreported quantity valued at $2,000.
[3]Total of 17 tons valued at $371.
[4]Unreported quantity valued at $1,000.
[5]Unreported quantity valued at $4,000.

COMMODITY REVIEW

METALS

Chromite.—All of Madagascar's chromite was produced for export, as the country supplied approximately 2% to 3% of total world demand. Kraomita Malagasy, the Government agency responsible for all chromite mining on the island, was working with a group of technical partners from the Federal Republic of Germany, France, and Norway in 1981 to complete a ferrochrome plant feasibility study for Madagascar. Initial designs have established a 60,000-ton-per-year capacity for the plant, which would be located on the island's eastern escarpment near the town of Moramanga. However, technical problems remain to be solved before a serious decision can be made on construction of the facility. Collectively, the problems concern the suitability of Kraomita's chromite deposits for use as feedstock in a modern ferrochrome processing plant. The lumpy chromite ore most suitable for processing has yet to be produced from the main source of chromite production in Madagascar, the Andriamena Mine. Experimental ore processing was well underway in 1981, in an effort to economically bulk-produce the ore in the requisite form.

Iron Ore.—The Soalala iron ore deposit in northwest Madagascar, 150 kilometers south of the port city of Majunga, continued to be an object of in-depth study in 1981. The principal evaluator, Italsider S.p.A. of Italy, estimated ore reserves at 300 million tons with a 48% iron content. A decision on the economic viability of the project has yet to be made. However, the size of capital investment necessary to develop the mine, move the ore 150 kilometers to Majunga, and to construct port facilities there to handle the ore would be considerable. In these times of industrial austerity, construction this decade seems unlikely.

NONMETALS

Fertilizer Materials.—Construction on the Ze-Ren fertilizer plant at Tamatave continued throughout 1981 with completion scheduled for the end of 1982. The plant was designed to produce 90,000 tons of urea per year, which in turn held the potential of increasing rice production on the island by 300,000 tons per year. Madagascar, which used to be a rice exporter, had to import almost 200,000 tons of this food staple during 1981 to meet domestic needs. The estimated cost of the urea project is $65 million,

20% of which is U.S. financing from the N-Ren International Co. of the United States. This was the only U.S. investment in Madagascar as of the end of the year.

Mica.—Madagascar is currently the sole world producer of phlogopite mica, and reserves on the island are extensive. Mica production was adversely affected by competition from synthetic products in some electronic uses and by a low-cost substitute for phlogopite splittings made in India from mica scrap. About 15% of Madagascar's production is phlogopite splittings. Madagascar's mica is mainly sold to a variety of western buyers, including the United States, Japan, France, Spain, and Belgium. The drop in mica production for 1981 was attributed primarily to the surge in competition from the synthetics and substitutes.

MINERAL FUELS

Coal.—Negotiations between the Government agency OMNIS with a Belgian-French group and a British company on the development of the Sakoa coal reserves in southwest Madagascar continued in 1981. Madagascar would greatly like to see a project develop that at least might satisfy the local demand for coal for a cement plant and municipal and domestic heating uses. As is the case with many other resource sites in Madagascar, lack of infrastructure is the biggest hindrance to development of the coal. The capital outlay for the construction of mine, rail, and port facilities would be considerable and has deterred investors so far.

Petroleum.—Seeking assistance in developing a domestic petroleum industry, the Government of Madagascar negotiated a $13 million loan from the International Development Association of the World Bank (International Bank for Reconstruction and Development), in early 1980. This loan has played a key role in successfully promoting petroleum exploration within the country. Under the direction of World Bank advisors, a new petroleum code was adopted in mid-1980 by the Government, and shortly thereafter a tender was issued inviting international oil companies to bid for exploration rights. This groundwork resulted in the signing of exploration agreements between the Government of Madagascar and two U.S. petroleum companies, the Mobil Oil Corp. and Occidental Petroleum Corp., in December 1981.

Occidental was expected to begin about 18 months of seismic activities on a 5.3-million-acre block of land northwest of Tulear on the island's southwest coast, starting in late spring of 1982. Mobil negotiated for an offshore tract, and its specially equipped seismic vessel, the *T. W. Nelson*, was scheduled to arrive off Madagascar's west-central coast early in the spring of 1982 to conduct 40 to 50 days of studies. Additional seismic studies were tentatively scheduled for late 1982 or early 1983.

The two agreements signed thus far involved joint ventures with the Madagascar Government agency AKORAMA (National Enterprise for Hydrocarbons), which was officially formed in 1981 as a special petroleum company to handle state affairs in the research, exploitation, and transportation of hydrocarbons. AKORAMA is a subsidiary of the state organization OMNIS that was formed in 1975 to handle hydrocarbon development, chromite production, and potential uranium development. AKORAMA will control a 51% share in any operations developed by Mobil or Occidental, as required by Madagascar law. The oil companies assume all costs and risks prior to actual production and will have to pay taxes and royalties on any barrel of oil produced, as well as Madagascar taxes on their respective share of any profits.

In 1981, three formal bids were solicited by the Government for oil and gas exploration under the World Bank loan program. They were as follows: a January bid for geophysical operations for oil and gas prospecting in southern Tsimiroro, 450 kilometers northwest of Antananarivo; a September bid for seismic studies in the region of Morombe, on the west coast between Tulear and Morondava; and a November bid invitation to enter into joint ventures for oil exploration in the Tsimiroro area.

Aside from the agreements signed with Mobil and Occidental late in 1981, negotiations were well underway with the Amoco Oil Co., United States, by the end of the year, and an exploration-exploitation contract was expected to be signed by early spring of 1982. Also, two European oil companies were reported to be seriously negotiating exploration-exploitation agreements.

Tar Sands and Heavy Oil.—Late in 1981, OMNIS signed an agreement with the European company Compagnie Europeene de Petrole (CEP) for conducting preliminary studies on the exploitation of tar sand deposits at Bemolanga on the west coast. The reported $150 million agreement will

cover evaluating 360 square kilometers of area at Bemolanga, which is estimated to contain 3 billion tons of tar sands, 25% of which can be easily extracted. The agreement calls for 60% financing by the Government of Madagascar and 40% by CEP. This latest study followed feasibility work conducted in 1980 and 1981 under loans from the World Bank and the European Development Bank to define the preliminary reserve potential and engineering conditions necessary for exploitation. Also, feasibility work continued on evaluating the potential of the Tsimiroro heavy oil deposits, located 55 kilometers south-southwest of Bemolanga. Reserves by one estimate were placed at more than 4.5 billion barrels of oil in place at depths below 250 meters. An International Development Association-funded project in 1980-81 conducted a core drilling and chemical analysis program as a preliminary step in establishing the commerical potential of the area.

Uranium.—Madagascar possesses sizable deposits of uranium. The French Commissariat for Atomic Energy, and private mining companies, exploited deposits in the Fort Dauphine area of southern Madagascar from 1953 to 1968. Production was stopped in 1968 for political and economic reasons, but evidence indicates that only a small portion of the reserves have been exhausted. During 1981, a joint United Nations Development Program and International Atomic Energy Agency project, valued at $1.4 million, was reexamining the Fort Dauphine deposit for potential production, as well as another deposit 80 kilometers south of the capital of Antananarivo. Commercial production is not expected before 1985.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Madagascar francs (FMG) to U.S. dollars at the rate of FMG280=US$1.00 in 1981.

The Mineral Industry of Malaysia

By John C. Wu[1]

After a remarkable 8.2% growth in real gross national product (GNP) in 1980, the Malaysian economy managed to achieve a 6.9% growth in GNP under the adverse international environment in 1981. The slower growth in 1981 was a result of the slower expansion in agriculture and manufacturing and a negative growth of mining because of a decline in the output of tin and petroleum. The construction sector continued its strong growth stimulated by public spending on infrastructure. Malaysia's GNP, in 1970 constant dollars, was $11.6 billion in 1980 and was estimated at $12.4 billion for 1981.[2]

During 1980-81, the rate of inflation was between 6% and 9% per year, while the rate of unemployment was between 5% and 6%. Based on past records of economic growth and inflation and unemployment rates, Malaysia was rated as the third best economy in Southeast Asia after Taiwan and Singapore.

Under the fourth 5-year plan, Malaysia's gross domestic product (GDP), in millions of 1970 constant Malaysian dollars, by sector of origin for 1980 and 1985, is given in the following table:[3]

Table 1.—Malaysia: Gross domestic product, by sector of origin

(Millions of 1970 constant Malaysian dollars unless otherwise specified)

Sector of origin	1980	Share of gross domestic product (percent)	1985	Share of gross domestic product (percent)	1980-85 Average annual growth rate (percent)
Agriculture	5,809	22.2	6,720	17.8	3.0
Mining	1,214	4.6	1,607	4.3	5.8
Manufacturing	5,374	20.5	9,040	23.9	11.0
Construction	1,186	4.5	1,824	4.8	9.0
Government services	3,398	13.0	5,228	13.8	9.0
Other sectors	9,207	35.2	13,405	35.4	7.8
Total or average	26,188	100.0	37,824	100.0	7.6

For the coming 5-year period, the mining industry of Malaysia will continue to grow at between 5% and 6% annually and will contribute between 4.3% and 4.6% to Malaysia's GDP. Under the fourth 5-year plan, the Government of Malaysia has allocated about $21 million to the Departments of Geology and Mining. The corresponding budget for the two departments under the previous 5-year plan was only about $7 million.

In 1981, the mining industry remained important to the Malaysian economy. Despite its relatively insignificant contribution to the country's employment, the export earnings of tin and crude petroleum alone have contributed 32% to Malaysia's total export earnings. Other export minerals that also made contributions to export earnings were copper, bauxite, and byproduct minerals such as ilmenite, monazite, and zircon.

Malaysia was still the world's largest tin producer in 1981, despite a moderate decline in output. Its output of tin in concentrate was about 30% of the world's total, and the production of tin metal was about 35% of the world's total. In October 1981, Malaysia Mining Corp. (MMC) and Malaysian Tin Dredging (MTD) merged. The new tin mining company, also called Malaysia Mining Corp., became the world's largest tin company with a capital of $1.1 billion and controlled 38 of Malaysia's 55 dredges. Its annual tin output would represent 30% of the country's tin production.

In 1981, the State government of Sabah decided to build a $152 million copper smelter in Kota Belud in Sabah and also awarded a contract to Vöest-Alpine AG of Austria and Midrex of the United States for construction of a direct-reduction iron plant on Labuan Island.

A $350 million project was awarded by the Malaysian Government to a Japanese consortium to build a direct-reduction iron processing and electric-furnace steel complex.

The cement expansion project of the Associated Pan Malaysia Cement, Sdn. Bhd. at Rawang, Selangor, was to be built according to the schedule. A new cement company, Kedah Cement Sdn. Bhd. was established to operate a 4,000-ton-per-day, coal-fired cement plant on Langkawi Island in Kedah.

A fertilizer (ammonia-urea) complex would be built at Bintulu in Sarawak.

In the mineral fuel sector, Malaysian crude oil output dropped from an average 280,000 barrels per day in 1980 to an average 230,000 barrels per day in 1981. However, the country's oil reserves were revised from 1.8 to 2.5 billion barrels, which put Malaysia in 22d place in the world. The construction work on the $1.4 billion liquefied natural gas (LNG) plant at Bintulu was moving according to schedule. Malaysia also revised its nonassociated gas reserves from 33 to 36 trillion cubic feet.

Malaysia's export earnings declined from $12.8 billion in 1980 to an estimated $12.2 billion in 1981. Export earnings of tin, rubber, and sawed logs declined, while export earnings of palm oil, crude petroleum, and manufactured goods rose moderately. The worldwide economic recession and the oil glut weakened the international markets for most Malaysian export commodities.

Malaysia's total import bills rose from $10.7 billion in 1980 to an estimated $12.1 billion in 1981. Imports of all major items including machinery, transport equipment, and other manufactured goods increased substantially. The growth in imports reflected continued strong demand for Malaysian capital goods overseas.

Malaysia's overall merchandise trade balance has shrunk from $2.1 billion in 1980 to an estimated $0.09 billion in 1981 as a result of an 18% increase in import costs and a 0.6% decrease in export earnings.

PRODUCTION

Malaysia's tin mine output still remained the world's largest. In 1981, the tin mining industry suffered from a price reduction during the first half of the year and a 12% increase in the cost of production. The output of tin increased slightly during the second half of 1981 because of the recovery in tin prices. The output of bauxite also suffered from the depressed world market. Mine output of bauxite dropped 25% with only one mine operating in 1981.

Production of copper concentrates continued to increase in 1981, reflecting higher demand for copper ore by Japanese copper smelters and refiners. The output of iron ore increased sharply from last year with two additional mines operating in Perak.

Production of cement increased in 1981 because of increased output capacity by the Associated Pan Malaysia Cement, Sdn. Bhd., at its Rawang plant in Selangor. In mineral fuels, Malaysia was producing between 200,000 and 230,000 barrels per day of crude oil in 1981 versus an average 280,000 barrels per day in 1980 owing to the worldwide oil glut and the mandated cutback to conserve the country's limited oil reserves.

Table 2.—Malaysia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum: Bauxite, gross weight thousand tons	616	615	387	920	701
Antimony, mine output, metal content (Sarawak)	[r]266	[r]263	307	131	191
Columbium and tantalum concentrate, gross weight	45	23	40	33	23
Copper, mine output, metal content (Sabah)	[r]23,656	[r]24,877	[r]24,018	26,989	30,082
Gold, mine output, metal content:					
Malaya troy ounces	4,172	[r]6,252	[r]5,493	4,621	5,768
Sarawak do	742	971	[r]1,063	381	100
Total do	4,914	[r]7,223	[r]6,556	5,002	5,868
Iron and steel:					
Iron ore and concentrate thousand tons	330	320	350	371	532
Crude steel do	194	203	233	200	200
Manganese ore and concentrate, gross weight	45,396	42,721	31,605	4,003	--
Rare-earth metals, gross weight:[3]					
Monazite	1,977	1,263	669	400	350
Xenotime (yttrium mineral)	75	--	--	--	--
Silver, mine output, metal content (Sabah) thousand troy ounces	410	[r]459	433	432	430
Tin:					
Mine output, metal content	58,703	62,650	62,995	61,404	59,938
Metal, smelter[4]	66,304	71,953	73,068	71,318	68,500
Titanium: Ilmenite concentrate, gross weight[3]	153,666	186,816	199,819	189,121	144,559
Tungsten, mine output, metal content	99	72	53	37	67
Zirconium: Zircon concentrate, gross weight[3]	1,810	927	1,271	470	680
NONMETALS					
Barite	11,074	5,079	1,401	--	--
Cement, hydraulic thousand tons	1,777	2,196	2,265	2,349	2,600
Clays: Kaolin	31,856	31,174	32,934	46,324	44,074
Nitrogen: N content of ammonia	34,000	39,800	52,000	41,100	43,000
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural (Sarawak):					
Gross million cubic feet	95,850	85,121	105,623	94,510	NA
Marketed do	32,755	35,624	39,528	29,249	NA
Petroleum:[5]					
Crude thousand 42-gallon barrels	66,984	79,171	103,296	100,916	83,950
Refinery products:					
Gasoline do	6,733	7,517	[e]9,000	NA	NA
Jet fuel do	1,203	1,445	[e]1,700	NA	NA
Kerosine do	2,436	2,311	[e]2,800	NA	NA
Distillate fuel oil do	9,695	11,078	[e]13,000	NA	NA
Residual fuel oil do	14,405	15,912	[e]19,000	NA	NA
Other do	4,809	4,614	[e]5,500	NA	NA
Refinery fuel and losses do	675	738	[e]900	NA	NA
Total do	39,956	43,615	[e]51,900	NA	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]All production is from peninsular Malaysia (Malaya) unless otherwise specified. Table includes data available through Aug. 2, 1982.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone), salt, and fertilizers are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Based on export figures.

[4]Includes small amounts of tin from the smelter in Singapore.

[5]Includes production from Malaya and Sarawak.

TRADE

In 1981, exports of crude petroleum were estimated at $2.9 billion compared with $3.0 billion in 1980. Exports of tin were estimated at $1.0 billion in 1981 against $1.1 billion in 1980 owing to a decrease in tin prices. Malaysia continued to increase imports of machinery and transport equipment as well as manufactured goods. In 1981, imports of machinery and transport equipment were estimated at $4.7 billion, an increase of 15% over $4.1 billion registered in 1980. Imports of manufactured goods were estimated at $2.5 billion, a 17.7% increase over the $2.2 billion in 1980.

The Malaysian trade by major component during 1980-81 was as follows, in billion dollars:[4]

Table 3.—Malaysia: Trade by major components

(Billion U.S. dollars)

	1980	1981
Exports:		
Petroleum	3.04	2.93
Manufactured goods	2.80	2.87
Rubber	2.10	1.80
Sawed logs	1.19	1.01
Palm oil	1.14	1.25
Tin	1.14	.98
Other	1.39	1.34
Total	12.80	12.18
Imports:		
Machinery and transport equipment	4.13	4.70
Manufactured goods	2.23	2.51
Food, beverage and tobacco	1.21	1.30
Petroleum	.85	.87
Other	2.27	2.70
Total	10.69	12.08
Overall trade balance	+2.11	+.10

The overall trade balance of Malaysia shrank from $2.12 billion in 1980 to an estimated $0.09 billion in 1981, as a result of the reduction in export prices of raw materials and the continued increase in the value of imported capital goods and manufactured goods. During 1980-81, Japan, the United States, the United Kingdom, the Federal Republic of Germany, and Singapore were the major trading partners of Malaysia based on the total value of two-way merchandise trade.

Exports of Malaysian crude oil, accounting for 24% of total export value in 1980-81, went mainly to Japan, Singapore, and the United States. Exports of tin, accounting for 9% of total export value in 1980 and 8% in 1981, went principally to the Netherlands, Japan, the United States, the U.S.S.R., and India. Exports of copper concentrate and bauxite were mostly shipped to Japan.

Malaysia imported about $0.9 billion of heavier crude oil mainly from Saudi Arabia, Kuwait, and Iraq during 1980-81. Imports of capital goods and manufactured goods, valued at $6.4 billion in 1980 and over $6.9 billion in 1981, were from Japan, the United States, the United Kingdom, the Federal Republic of Germany, and Singapore.

Table 4.— Malaysia: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	(1)	470,151	--	Japan 226,100; Denmark 44,800; Philippines 8,850.
Oxides and hydroxides	76	10	--	All to Singapore.
Metal including alloys:				
Scrap	1,659	2,578	15	Japan 1,768; Pakistan 556.
Unwrought and semimanufactures	1,642	2,603	54	Singapore 1,875; Indonesia 370; Japan 139.
Chromium ore and concentrate	3	3	--	Singapore 2; Burma 1.
Copper:				
Ore and concentrate	122,050	102,054	--	All to Japan.
Matte	--	16	--	All to Singapore.
Metal including alloys:				
Scrap	2,562	5,413	103	Singapore 2,469; India 1,435.
Unwrought and semimanufactures	97	651	4	Singapore 415; India 113; Japan 90.
Iron and steel:				
Ore and concentrate	17,205	17,825	--	Singapore 6,621; Thailand 1,191.
Metal:				
Scrap	13,392	13,770	80	Singapore 4,062; Japan 493.
Pig iron, ferroalloys, similar material	353	898	--	Singapore 637; Hong Kong 160; United Kingdom 100.
Steel, primary forms	24	250	--	Singapore 216; Indonesia 24; Japan 6.
Semimanufactures:				
Bars, rods, angles, shapes, sections	4,194	4,257	3	Singapore 3,740; Indonesia 316; Thailand 104.
Universals, plates, sheets	1,315	2,487	2	Singapore 1,633; Indonesia 278; Brunei 242.
Hoop and strip	90	249	--	Singapore 248.
Rails and accessories	223	882	--	Singapore 866; Papua New Guinea 13.
Wire	370	641	--	Singapore 305; Kenya 251; Japan 53.
Tubes, pipes, fittings	8,949	11,286	1,384	Singapore 6,350; Japan 1,374; Indonesia 1,197.
Castings and forgings, rough	646	1,337	2	Singapore 637; Indonesia 483; Thailand 196.
Lead:				
Oxides and hydroxides	13	2	--	All to Singapore.
Metal including alloys, all forms	973	1,034	95	Singapore 642; Indonesia 107; Hong Kong 69.
Manganese ore and concentrate	5,000	11,500	--	NA.
Mercury, 76-pound flasks	--	232	--	All to West Germany.
Nickel metal including alloys, all forms	160	376	76	Hong Kong 189; Singapore 39; Japan 30.
Platinum-group metals including alloys, unwrought and partly wrought, value, thousands	$1	--		
Silver:				
Ore and concentrate[2], do.	$1,106	$6,400	$37	Netherlands $5,291; Singapore $723; Japan $293.
Waste and sweepings[2], do.	$110	$162	$49	Saudi Arabia $49; West Germany $28; Hong Kong $25.
Metal including alloys, unwrought and partly wrought, do.	$19	$71	$31	Thailand $20; Singapore $11; Indonesia $9.
Tantalum metal including alloys, all forms	25	--		
Tin:				
Ore and concentrate	--	560	--	All to Netherlands.
Metal including alloys:				
Scrap	74	961	4	Singapore 883; Hong Kong 73.
Unwrought	70,219	72,181	21,959	Japan 17,727; Netherlands 12,781; U.S.S.R. 5,565.
Semimanufactures	9	82	--	Singapore 64; Hong Kong 15; Philippines 3.
Titanium oxides and hydroxides	16	15	--	Singapore 12; Bangladesh 2; Burma 1.
Tungsten ore and concentrate	59	134	40	West Germany 84; India 10.
Uranium and thorium ore and concentrate, value, thousands	$387	$142	$61	United Kingdom $34; India $29; New Zealand $17.
Zinc:				
Oxides and hydroxides	211	374	--	Japan 253; Singapore 60; Philippines 36.
Metal including alloys:				
Scrap	565	1,061	--	Japan 618; Singapore 395.
Unwrought and semimanufactures	12	97	--	Singapore 71; Burma 15; Indonesia 9.
Other: Ores and concentrates	167,279	214,676	70	Japan 175,772; Republic of Korea 16,910.

See footnotes at end of table.

Table 4.— Malaysia: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	115	92	--	Japan 36; Burma 1.
Grinding and polishing wheels and stones value, thousands	$20	$42	--	Singapore $17; Bangladesh $2; Japan $2.
Asbestos, crude	11	48	--	Singapore 47; Thailand 1.
Barite and witherite	1,262	2,281	--	All to Singapore.
Boron materials: Crude natural borates	7	--		
Cement	64,483	74,618	--	Thailand 68,922; Singapore 4,841; Brunei 650.
Chalk	264	1,354	--	Singapore 1,353.
Clays and clay products:				
Crude clays	20,172	29,452	--	Singapore 11,980; Japan 5,108; Indonesia 4,159.
Clay products:				
Nonrefractory value, thousands	$2,582	$3,558	--	Singapore $3,492; Papua New Guinea $17.
Refractory including nonclay brick	659	154	--	Singapore 135; Indonesia 14; West Germany 5.
Diamond:				
Gem, not set or strung value, thousands	$2,757	$4,736	$119	Belgium-Luxembourg $4,445; West Germany $90.
Industrial do	$154	--		
Diatomite and other infusorial earth	121	304	--	Netherlands 300; Singapore 4.
Feldspar, fluorspar, leucite	--	41	--	All to Singapore.
Fertilizer materials:				
Crude	464	520	--	Singapore 467; Brunei 53.
Manufactured	1,582	838	--	Indonesia 669; Singapore 136; Brunei 12.
Ammonia	193	437	1	Thailand 233; Singapore 200.
Gypsum and plasters	--	2	NA	NA.
Lime	22,621	18,314	NA	Singapore 18,273; Thailand 30.
Magnesite	--	26	--	All to Singapore.
Mica, worked including agglomerated splittings	2	(3)	--	All to Thailand.
Pigments, mineral: Processed iron oxides	5	22	--	Singapore 18; Indonesia 4.
Precious and semiprecious stones, except diamond:				
Natural value, thousands	$246	$318	--	Australia $147; Saudi Arabia $144.
Synthetic do	--	$280	--	All to Japan.
Salt and brine	473	793	--	Philippines 428; Indonesia 329.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	5	1	--	All to Indonesia.
Soda ash	3	657	--	Republic of Korea 500; Singapore 157.
Stone, sand and gravel:				
Dimension stone, crude and worked	263	306	--	Singapore 287; Indonesia 9.
Dolomite, chiefly refractory-grade	5,550	8,327	--	Singapore 7,313; Papua New Guinea 914.
Gravel and crushed rock thousand tons	705	1,018	--	Singapore 994; Brunei 23.
Limestone, except dimension	259	489	--	All to Singapore.
Quartz and quartzite	2,747	5,010	--	Do.
Sand excluding metal-bearing	313,689	364,541	--	Singapore 269,667; Japan 76,800; Philippines 15,500.
Sulfur:				
Elemental, all forms	10	10	--	Singapore 6; Hong Kong 1.
Sulfuric acid, oleum	5	703	--	Singapore 701; Burma 2.
Talc, steatite, soapstone, pyrophyllite	114	9	--	All to Indonesia.
Other:				
Crude	--	15	--	Japan 14; Singapore 1.
Slag, dross, and similar waste, not metal-bearing	211	329	--	Singapore 137; Indonesia 33.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	5,231	4,268	--	Singapore 2,849; Hong Kong 807; Brunei 605.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	55	10	--	All to Singapore.
Carbon black and gas carbon	1,142	3,590	--	Singapore 2,120; Indonesia 1,227; India 221.
Coal, all grades including briquets	71,701	71,438	1,755	Panama 11,282; Singapore 5,919; Republic of Korea 5,226.
Coke and semicoke	35	15	--	All to Thailand.
Hydrogen, helium, rare gases value, thousands	$10	$9	--	Singapore $8; Indonesia $1.

See footnotes at end of table.

Table 4.— Malaysia: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products:				
Crude ___ thousand 42-gallon barrels__	70,559	92,770	26,262	Japan 41,507; Singapore 15,340; Thailand 3,834.
Refinery products:				
Gasoline _____do____	1,019	1,377	__	Singapore 1,376; Brunei 1.
Kerosine and jet fuel _____do____	194	289	__	Singapore 287.
Distillate fuel oil _____do____	19	48	__	Brunei 46.
Residual fuel oil_____do____	1,479	1,594	17	Singapore 758; United Kingdom 224; Japan 133.
Lubricants _____do____	219	170	__	Singapore 112; Indonesia 24; Hong Kong 13.
Other:				
Liquefied petroleum gas 42-gallon barrels	(4)	23	__	All to Singapore.
Mineral jelly and wax __do____	142	937	__	Japan 598; Thailand 212; Singapore 110.
Bitumen and other residues do____	85	133	__	All to Singapore.
Bituminous mixtures ___do____	1,279	776	__	Singapore 424; Thailand 303; Brunei 48.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals_____	493	544	__	Singapore 507; Thailand 25.

NA Not available.
[1]Unreported export quantity valued at $4,792,000 in 1978; quantity exported in 1979 valued at $6,133,000.
[2]May include platinum-group metals.
[3]Unreported quantity valued at $1,000.
[4]Less than 1/2 unit.

Table 5.—Malaysia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite_____	500	825	17	China 763; Japan 45.
Oxides and hydroxides _____	8,103	10,241	677	Japan 9,185; China 268.
Metal including alloys:				
Scrap _____	16	17	__	All from Singapore.
Unwrought_____	8,566	14,489	1,127	Canada 5,348; Japan 956; Ghana 836.
Semimanufactures _____	14,443	22,951	5,114	Sweden 6,248; France 3,300; Japan 2,097.
Chromium:				
Chromite_____	40	85	__	Japan 60; Australia 25.
Oxides and hydroxides _____	79	60	8	West Germany 26; United Kingdom 10.
Cobalt oxides and hydroxides _____	2	145	(1)	Australia 144; Japan 1.
Copper:				
Ore and concentrate including matte_	4	1	__	All from United Kingdom.
Metal including alloys:				
Scrap _____	63	91	14	Japan 46; Singapore 29.
Unwrought_____	142	111	__	United Kingdom 107; Singapore 3.
Semimanufactures _____	11,750	15,875	225	Japan 6,702; Australia 5,266.
Iron and steel:				
Scrap_____	7,552	6,345	2,640	Japan 1,484; France 504; Hong Kong 316.
Pig iron, cast iron, spiegeleisen ____	6,981	16,267	__	Australia 5,988; China 5,391; Japan 4,855.
Sponge iron, powder, shot_____	359	298	125	Japan 71; India 47; United Kingdom 23.
Ferroalloys _____	3,490	4,830	143	Australia 3,146; Japan 623.
Steel, primary forms_____	92,511	159,579	3,633	Republic of Korea 29,121; Poland 24,818; Canada 16,935.

See footnotes at end of table.

Table 5.—Malaysia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections	260,478	308,707	1,593	Japan 166,350; Singapore 46,604; Indonesia 19,644.
Universals, plates, sheets	448,615	542,494	3,355	Japan 417,307; Republic of Korea 64,580; West Germany 12,353.
Hoop and strip	16,048	16,509	57	Japan 12,365; United Kingdom 895; Singapore 642.
Rails and accessories	2,650	41,677	28	Poland 21,094; United Kingdom 9,987; Australia 3,472.
Wire	15,652	17,951	49	China 5,264; Japan 3,727; Singapore 2,329.
Tubes, pipes, fittings	37,276	43,028	1,976	Japan 27,950; United Kingdom 4,969; Singapore 3,160.
Castings and forgings, rough	897	3,677	16	Japan 1,248; China 951; Belgium-Luxembourg 477.
Lead:				
Ore and concentrate	40			
Oxides and hydroxides	935	976	83	Australia 511; Singapore 275.
Metal including alloys:				
Scrap	2,357	1,443	--	Singapore 813; Australia 562; Republic of Korea 64.
Unwrought	3,672	5,367	33	Australia 4,535; United Kingdom 333.
Semimanufactures	7,641	5,558	1,269	Japan 1,114; Singapore 1,053; Australia 797.
Magnesium metal including alloys, all forms	52	13	--	United Kingdom 1; West Germany 1.
Manganese:				
Ore and concentrate	2,253	2,498	--	Singapore 2,492; United Kingdom 6.
Oxides and hydroxides	1,249	1,678	3	Japan 538; Singapore 531; United Kingdom 237.
Mercury 76-pound flasks	145	87	--	Japan 58.
Molybdenum metal including alloys, all forms	15	2	(1)	Australia 1; Netherlands 1.
Nickel:				
Ore and concentrate including matte	3	7	5	Canada 1; West Germany 1.
Metal including alloys:				
Scrap	38	4	4	
Unwrought	4,686	6,889	4,768	France 238; Singapore 191; Hong Kong 121.
Semimanufactures	1,286	1,194	269	Japan 224; Hong Kong 188; Singapore 33.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$99	$22	--	West Germany $14; Singapore $4; Australia $2.
Silver:				
Ore and concentrate[2] do	$15	$1	$1	
Waste and sweepings[2] do	$5	$2	$2	
Metal including alloys, unwrought and partly wrought do	$353	$580	$9	Singapore $401; Japan $61; United Kingdom $56.
Tantalum metal including alloys, all forms	41	--		
Tin:				
Ore and concentrate	17,245	18,865	--	Australia 15,417; Indonesia 1,168; Burma 644.
Metal including alloys, all forms	504	563	113	Singapore 129; Japan 90; United Kingdom 62.
Titanium oxides and hydroxides	4,444	5,327	1,284	Australia 1,236; West Germany 967; Japan 765.
Tungsten:				
Ore and concentrate	81	147	--	Singapore 78; Thailand 62.
Metal including alloys, all forms	15	59	3	Hong Kong 33; United Kingdom 12.
Uranium and thorium:				
Ore and concentrate value, thousands	--	$51	--	All from Republic of Korea.
Metal including alloys, all forms do	--	$1	$1	
Zinc:				
Ore and concentrate	2	53	--	Australia 51; United Kingdom 1.
Oxides and hydroxides	337	333	3	Singapore 131; West Germany 72.
Metal including alloys:				
Scrap	470	540	--	Australia 451; Singapore 73; Japan 12.
Unwrought	12,174	14,177	--	Australia 10,308; Canada 2,049; Japan 1,225.
Semimanufactures	2,274	2,911	5	Japan 2,433; Singapore 128; Australia 127.

See footnotes at end of table.

Table 5.—Malaysia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS —Continued				
Other:				
Ore and concentrates	51	54	3	Australia 25; Belgium-Luxembourg 5; Japan 5.
Alkali, alkaline-earth, rare-earth metals	25	59	2	Japan 34; United Kingdom 17.
Base metals including alloys, all forms value, thousands	$253	$464	$33	Singapore $198; United Kingdom $178.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	224	241	31	Japan 89; Singapore 69.
Artificial: Corundum	(1)	7	--	Japan 5; France 2.
Dust and powder of precious and semi-precious stones value, thousands	$18	$7	--	Belgium-Luxembourg $6; Japan $1.
Grinding and polishing wheels and stones do	$2,236	$2,374	$48	Japan $766; China $247; United Kingdom $218.
Asbestos, crude	23,961	37,861	955	Canada 23,564; Singapore 9,604; China 2,112.
Barite and witherite	265	224	--	West Germany 151; United Kingdom 31; Australia 23.
Boron materials:				
Crude natural borates	24	52	18	Romania 19; China 15.
Oxide and acid	198	175	146	Romania 18.
Cement	225,161	461,277	388	Japan 236,613; Singapore 172,425.
Chalk	102	219	--	Hong Kong 122; Japan 40; Singapore 31.
Clays and clay products:				
Crude clays	15,905	28,439	12,356	Japan 6,875; West Germany 3,892.
Products:				
Nonrefractory value, thousands	$7,517	$10,819	$4	Italy $3,971; Japan $1,797; Australia $1,048.
Refractory including nonclay brick	19,759	109,147	65	United Kingdom 100,468; Japan 5,206.
Diamond:				
Gem, not set or strung value, thousands	$2,261	$4,073	--	Belgium-Luxembourg $3,518; India $377.
Industrial do	$406	$135	--	Belgium-Luxembourg $134.
Diatomite and other infusorial earth	804	910	613	Philippines 237; Japan 39.
Feldspar, fluorspar, leucite, etc	12,377	15,802	--	India 8,678; China 3,205; Finland 1,568.
Fertilizer materials:				
Crude:				
Nitrogenous	663	201	--	All from West Germany.
Phosphatic	222,494	224,447	164	Christmas Island 109,826; Jordan 47,144.
Potassic	1,245	214	--	Canada 210; United Kingdom 4.
Manufactured:				
Nitrogenous	164,887	379,050	49,452	Republic of Korea 59,087; Japan 56,916; Indonesia 49,207.
Phosphatic	20,162	20,270	5,911	Thailand 1,461; Belgium-Luxembourg 1,298.
Potassic	284,546	378,112	53,693	West Germany 68,421; U.S.S.R. 47,327.
Other including mixed	145,371	171,862	10,322	West Germany 117,779; Belgium-Luxembourg 16,790.
Ammonia	7,194	488	20	Japan 219; Indonesia 163.
Graphite, natural	170	465	3	China 258; Republic of Korea 100.
Gypsum and plasters	75,041	94,931	15	Thailand 81,836; Japan 11,302.
Lime	7,537	3,271	--	Singapore 2,389; Japan 244.
Magnesite	699	3,192	--	Spain 2,394; West Germany 351; Japan 286.
Mica, all forms	47	86	3	United Kingdom 59; France 10.
Pigments, mineral: Processed iron oxides	1,540	5,934	19	West Germany 5,272; United Kingdom 263.
Precious and semiprecious stones, except diamonds:				
Natural value, thousands	$374	$788	--	China $316; Thailand $145; Hong Kong $126.
Synthetic do	$8	$50	--	Japan $32; Czechoslovakia $10; Singapore $6.
Salt and brine	144,509	203,909	22	Thailand 134,190; Australia 43,967; Ethiopia 10,892.

See footnotes at end of table.

Table 5.—Malaysia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
NONMETALS —Continued				
Sodium and potassium compounds, n.e.s.:				
Caustic potash	495	419	1	Spain 168; Japan 76; West Germany 75.
Caustic soda	5,216	13,542	226	Romania 6,328; West Germany 2,375; Italy 1,295.
Soda ash	29,896	45,084	2	Kenya 25,329; Japan 9,073; Romania 5,321.
Stone, sand and gravel:				
Dimension stone, crude and worked	2,683	126,868	6	Indonesia 121,500; China 2,159; Italy 1,965.
Dolomite, chiefly refractory-grade	1,250	307	--	Norway 73; United Kingdom 18.
Gravel and crushed rock	6,978	5,178	26	Brunei 2,486; India 1,336; China 322.
Limestone excluding dimension	598	446	--	Japan 120; Singapore 81; China 55.
Quartz and quartzite	22	99	44	United Kingdom 20; Netherlands 15.
Sand excluding metal-bearing	1,003	2,176	1,007	West Germany 570; Singapore 293.
Sulfur:				
Elemental	16,710	27,211	59	Singapore 23,125; West Germany 772.
Sulfuric acid, oleum	339	372	29	Singapore 274; United Kingdom 35.
Talc, steatite, soapstone, pyrophyllite	7,232	17,975	10,675	China 3,643; Republic of Korea 1,702.
Other:				
Crude	17,491	7,208	1,324	West Germany 5,566.
Slag, dross, and similar waste, not metal-bearing	3,775	8,570	296	Japan 4,848; Australia 2,300.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	367	543	92	Australia 255; Japan 166.
Building materials of asphalt, asbestos and fiber cements, unfired non-metals	6,301	8,690	976	Singapore 5,806; Japan 1,344.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,164	3,347	24	Singapore 2,338; Republic of Korea 853.
Carbon black and gas carbon	1,976	52,769	302	Australia 51,730; Japan 497.
Coal including briquets:				
Anthracite and bituminous coal	14,236	24,799	--	Indonesia 24,127; Thailand 631.
Lignite	354	880	--	All from Australia.
Coke and semicoke	22,833	29,480	--	Japan 24,512; West Germany 433.
Gas, hydrocarbon[3] value, thousands	$4,413	$7,903	$3	Singapore $7,506; Indonesia $314.
Peat including briquets and litter	5	--		
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	30,950	32,303	--	Kuwait 17,158; Saudi Arabia 13,870; Iran 1,275.
Refinery products:				
Gasoline do	2,387	2,856	3	Singapore 2,709; Bahrain 140.
Kerosine and jet fuel do	1,208	1,136	(1)	Singapore 1,081; Bahrain 54.
Distillate fuel oil do	5,151	12,007	--	Singapore 11,623; Bahrain 382.
Residual fuel oil do	1,611	3,431	(1)	Singapore 3,360; Bahrain 70.
Lubricants do	1,023	1,001	40	Singapore 765; Australia 124.
Other:				
Liquefied petroleum gas 42-gallon barrels	244	174	139	Singapore 23.
Mineral jelly and wax do	67,713	78,747	2,038	China 28,970; Indonesia 26,215.
Petroleum coke do	14,410	22,616	22,605	NA.
Bitumen and other residues do	111,795	153,803	170	Singapore 137,926.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	16,815	20,099	702	Singapore 16,827; Australia 1,239.

NA Not available.
[1]Less than 1/2 unit.
[2]May include platinum-group metals.
[3]This material is presumed to be petroleum refinery gases although it was reported as natural gas.

COMMODITY REVIEW

METALS

Aluminum.—The production of bauxite from the Telok Ramunia (Pengerang) Mine and the Sri Medan Mine (which stopped operations in March 1981) in Johore declined in 1981. A declining overseas market, particularly to Japan where most of the output was exported, was the primary cause of the reduction in mine output. In 1980, Malaysia's exports of bauxite were valued at $9.5 million, up 55% from $6.1 million in 1979. The increase in export earnings of bauxite was largely due to an increase in export quantity rather than an increase in unit value.

Copper.—Despite the depressed world copper market, copper production of Overseas Mineral Resources Development Sabah Bhd. at the Mamut Mine in Sabah increased in 1981. During 1981, the monthly production of copper ore at the mine was 500,000 tons, averaging 0.57% copper, while the monthly production of copper concentrate was 10,400 tons, grading 25% copper. The copper concentrate was exported to Japan for processing.

A $152 million copper smelter with an annual capacity of 50,000 tons of blister copper was to be built in Kota Belud in the State of Sabah. The State government of Sabah has invited bids for a turnkey smelter following a feasibility study completed by an independent consulting firm under State government supervision. The proposed copper smelter would use the copper concentrates produced from the Mamut Mine, about 112 kilometers from the proposed smelter site.[5] Until the copper smelter is completed, Malaysia will continue to export the copper concentrate to Japan. In 1980, Malaysia's output of copper concentrate was valued at $51 million.

A copper deposit was discovered by the Malaysian Geological Survey in the Pekan district of Pahang State in central Malaysia. The deposit was reportedly of a higher grade with a larger reserve than the Mamut Mine in the State of Sabah. The ore reserves and average grade of the area would be estimated after further exploration by the Malaysian Geological Survey.

Iron and Steel.—Production of iron ore increased substantially in 1981. The output of the largest mine at Gunung Jerain in Kedah accounted for about 30% of the total production; the output of seven small mines in Perak for 30%; and the output of four mines in Johore for 38%. Of 371,000 tons of iron ore produced in 1980, 97% was consumed domestically by Malayanata Steel Bhd. in Prai, and the remaining 3% was exported.

The Government of Malaysia awarded a contract to the eight-member Japanese consortium led by Nippon Steel Corp. for the construction of a direct-reduction iron processing and electric-furnace steelmaking complex at Tanjung Berhala, Trengganu, on November 9, 1981. The $350 million project was expected to be operated by a Malaysian-Japanese joint-venture company with a $109 million equity capital. The Japanese consortium reportedly was expected to take 30% of this equity capital.

Based on the terms of the contract, Nippon Steel Corp. is to engineer, supply, and build a 600,000-ton-per-year, direct-reduction plant with Daido Steel Co. to supply a 580,000-ton-per-year electric furnace; Mitsubishi Heavy Industries Ltd., a 560,000-ton-per-year billet continuous-casting machine; Chiyoda Chemical Engineering & Construction Co., the gas equipment and systems; and C. Itoh & Co., Mitsui & Co., Mitsubishi Corp., and Nittetsu Corp., the raw materials for the complex. The steelmaking complex will have an annual capacity of 600,000 tons of sponge iron, of which 560,000 tons will be for the manufacturing of steel billets, and the remainder will be for consumption by local foundry manufacturers. The complex was scheduled for completion in mid-1984 or early 1985.[6]

The Sabah State government signed a $145 million contract with Vöest-Alpine and Midrex for the turnkey construction of a 600,000-ton-per-year, direct-reduction iron plant on Labuan Island off the southwest coast of Sabah in May 1981. The construction work was expected to start in November 1981 and was scheduled for completion in early 1984. Based on the plan, all of the sponge iron produced from the plant will be exported exclusively to the steel industries of the Association of Southeast Asian Nations (ASEAN) and other Far East countries such as the Republic of Korea. The project will be operated by the Sabah Iron and Steel Sdn. Bhd., a joint-venture company owned 51% by the Sabah State government, 30% by the Heavy Industries Corp. of Malaysia, and 5% by Vöest-Alpine. The remaining 14% was expected to be taken by investors from Singapore, Thailand, Japan, and the Philippines.[7]

Tin.—Malaysia remained the world's largest tin producer in 1981. The output of

the Malaysian tin in concentrate accounted for 31% of the world's total in 1980 and about 29% in 1981. The output of the Malaysian tin metal was 36% of the world's total in 1980 and about 34% in 1981.

In 1981, the output of tin in concentrate declined slightly from that of 1980. The severe reduction in tin prices during the first half of 1981 and the rising cost of tin mining were the primary causes of the decline. The total number of active production units at the end of 1981 was 730 compared with 852 units at the end of 1980. Of the total number of production units active at the end of 1981, 617 units were gravel pumps, 57 were dredges, 33 were opencasts, 20 were underground, and 5 were other types.

Of the total tin concentrates produced in 1981, 56% was mined by gravel pumping; 29%, by dredging; 4%, by opencasting; 2%, by underground mining; and 9%, by retreatment, dulang, and other methods. Of the total concentrates produced in 1981, about 58% was from Perak; 31%, from Selangor; 4%, from Pahang; 3%, from West Persekutuan; and the remaining 4% was from Trengganu, Johore, Kedah, North Sembilan, Malacca, and Perlis.

Employment in the Malaysian tin industry dropped 12% to only 35,063 persons at the end of September 1981 from 39,720 persons at the end of the same period in 1980. Over 87% of the labor force employed by the tin mining industry was in the States of Perak and Selangor, where most of the gravel pumping and dredging mines were concentrated.

Exports of tin declined in 1980. However, because of a 12% increase in unit value in 1980, the value of tin exports increased 8.2% from $1,007 million in 1979 to $1,139 million in 1980. The value of tin exports accounted for 8.9% of the total value of Malaysia's merchandise exports in 1980. In 1981, because of the low tin prices, the value of tin exports was estimated at $978 million, a 10.3% drop from that of 1980. However, its share in the total value of merchandise exports remained at about 8%.[8]

The Government of Malaysia, in an effort to nationalize the Malaysian tin industry through MMC, has further broadened its assets base and brought about a vertical integration of its operations from exploration to production and direct marketing of tin in 1981.

In April 1981, MMC and Straits Trading Co. (STC) reached an agreement to establish a new tin smelting company, Malaysia Smelting Corp. (MSC) to operate the 60,000-ton-per-year tin smelter at Butterworth, Penang. MSC would be owned 42% by MMC and 58% by STC. The MSC was expected to smelt all tin concentrates produced by the MMC group including MTD and 15 other tin mining companies. MMC was reportedly to acquire an interest in Datuk Keramat Smelting (DKS), another major tin smelter at Georgetown on the Island of Penang with an annual capacity of 70,000 tons. DKS is owned 50.6% by Amalgamated Metal Corp., which in turn is owned 79.5% by Preussag of Hanover and 20.5% by MMC.[9]

MTD and MMC were merged into the world's largest tin mining company also called Malaysia Mining Corp. Bhd. on October 10, 1981. The newly enlarged tin mining company, with capital of $1.1 billion, will produce annually about 18,000 tons of tin, accounting for 30% of Malaysia's tin production, by controlling 38 of the country's 55 dredges. The new Malaysia Mining Corp. is owned 56.6% by Permodalan National Bhd., the Malaysian Government investment agency, 14.5% by Charter Consolidated Ltd., 3.8% by Datuk Keramat Holdings Bhd., and 25.1% by the public.[10] MMC has a marketing office in London, a new office in Japan, and was planning to open another new office in New York in the near future.

Other Metals.—Malaysia's gold production increased in 1981. Production of gold came 48% from seven small gold mines operated in the States of Pahang and Sarawak and 52% as a byproduct of tin mining operations in the Bidor area of Perak and the Kuala Lumpur area in Selangor. In 1980, gold production as a byproduct from the Mamut copper mine in Sabah amounted to about 60,800 troy ounces.[11]

Malaysia ceased production of manganese ore in July 1980. Other metallic minerals produced in Malaysia including columbite, ilmenite, monazite, scheelite, wolframite, xenotime, and zircon were recovered from tailings of dredging operations. There was small-scale mining of antimony ore from the Lucky Hill Mine in Sarawak.

NONMETALS

Cement.—Production of cement continued to increase in 1981. Malaysia's total clinker capacity has increased from 2.5 million tons in 1980 to 3.2 million tons in 1981. Malaysia's cement and clinker capacities, by company, for 1980-81 were as follows, in thousand tons:

Table 6.—Malaysia: Cement and clinker capacity, by company

(Thousand metric tons)

Company	Location	Cement capacity	Clinker capacity	
		1980	1980	1981
Associated Pan Malaysia Cement Sdn. Bhd	Kanthan, Perak	457	534	540
Do.	Rawang, Selangor	667	428	1,044
Cement Industries Malaysia, Sdn. Bhd	Kangar, Perlis	500	450	450
Cement Manufactures Sarawak, Sdn. Bhd.[1]	Pending, Kuching	260	--	--
Malaya Industrial & Mining Corp. Bhd	Batu Caves, Selangor	60	60	60
Tasek Cement, Bhd	Ipoh, Perak	1,050	1,046	1,100
Total		2,994	2,518	3,194

[1]A clinker-grinding plant.

Demand for cement in Malaysia was estimated at 2.5 to 2.6 million tons in 1980-81. Malaysia was still a cement-importing country in 1980-81.

In October 1981, Kedah Cement Sdn. Bhd., a new cement company, was established to build a 4,000-ton-per-day, coal-fired cement plant on Langkawi Island in Kedah State. The $130 million plant will be built by Ishikawajima-Harima Heavy Industries Co., Ltd., of Japan on a turnkey basis. One-half of the output will be for domestic consumption and one-half will be exported to Singapore in the form of clinker.[12]

Fertilizer Materials.—The output of chemical fertilizer remained at the 450,000-ton level in 1981. Malaysia was a net importer of fertilizer materials and chemical fertilizer. Malaysia imported phosphate rock from Togo, Jordan, and Christmas Island; urea from Indonesia, Japan, Romania, and the U.S.S.R.; ammonium nitrate and ammonium sulfate from Japan, the Republic of Korea, and Romania; and superphosphate from the United States.

A natural gas-based, ammonia-urea complex is to be built at Bintulu in Sarawak. The project is a joint ASEAN venture similar to the fertilizer complex in North Aceh of Indonesia. The total project cost was estimated at $300 million, of which about $210 million would be financed by Japan (70% from the Overseas Economic Cooperation Fund at 4% interest for 20 years, and 30% from the Export-Import Bank of Japan at 7.75% interest for 10 years), and the remaining $90 million would be contributed by Malaysia, 60%; Indonesia, Thailand, and the Philippines, 13% each; and Singapore, 1%. The fertilizer plant with an annual capacity of 272,000 tons per year of N as ammonia and 228,000 tons per year of N as urea was scheduled for completion in 1985. Stone and Webster of the United States was awarded a contract as a technical consultant to the project in late 1980. In August 1981, the Government of Malaysia, through Petroleum National Bhd. (Petronas), invited three consortia to bid for the building of the fertilizer complex at Bintulu in Sarawak. The contract was expected to be awarded in early 1982.[13]

Other Nonmetals.—To meet increasing demand for building construction materials by the expanding domestic construction industry, the output of limestone, crushed rock and granite, gravel, sand, and clay have increased substantially over the past 2 years. More than two-thirds of the limestone produced in Malaysia was used for construction purposes, and the remainder was for cement production.

Mine production of kaolin was about 46,000 tons in 1981. Of the total output, 84% was from 12 mining units operated in the Bidor area of Perak, 9% from the Jemaluang and Pontian areas of Johore, and 7% from the Cheras and Rawang areas of Selangor. About 25% of the kaolin output was exported, and the remainder was consumed domestically for fillers in rubber, paint, and plastics and for the manufacturing of floor and wall tiles, whiteware, sanitary ware, and white cement.

MINERAL FUELS

Coal.—A joint-venture company is to be established by local Malaysian interests and Kawasho Corp., a Japanese trading company (an affiliate of Kawasaki Steel Corp.), to produce coal in Selatik of Sarawak in early 1983. The Selatik (Silantek) coal deposit has been investigated several times by Nippon Coal Mining Co. and the Ataka Co. of Japan and Utah Pacific Inc. of the United States. The most recent estimate of coal reserves in Selatik was 12 million tons. Based on the plan, Kawasho Corp. will be in charge of mining operations. The coal mine output at the early stage would be about 500,000 tons

of coal per year. About 50% of the output would be exported, mainly to the Philippines, and the remainder would be consumed by the new coal-fired cement plant now under construction on Langkawi Island in the State of Kedah.[14]

Natural Gas.—Malaysia's recoverable nonassociated gas reserves were estimated at 36 trillion cubic feet (or 6 billion barrels of oil equivalent) by Petronas, the state-owned oil and gas company, in 1981. About 18 trillion cubic feet of nonassociated gas reserves in Sarawak was to be used by the LNG plant in Bintulu, Sarawak. The nonassociated gas to be used by the LNG plant would be produced from the Central Luconia Fields about 81 miles offshore Bintulu, Sarawak, at the rate of 1,250 million cubic feet per day for 20 years.

The construction work of the $1.4 billion LNG plant at Tanjong Kindurong, Bintulu, was about 76% complete for first-stage production at yearend. The construction of the LNG plant was by JGC Corp. of Japan and M. W. Kellogg (formerly Pullman Kellogg) of the United States. Under the plan, the plant was scheduled to start operations at the end of 1982 with an annual output of 1.5 million tons of LNG the first year, 3 million tons the second year, and 4.5 million tons the third year. At the end of 1985, full-capacity output is expected to reach 6 million tons of LNG per year. All of the LNG produced from the Bintulu plant will be exported to Japan beginning in 1983 under a 20-year contract. The Tokyo Electric Power Co. (taking two-thirds of the output) and the Tokyo Gas Co. are the two Japanese buyers. LNG Malaysia Sdn. Bhd., the owner and operator of the Bintulu LNG project, is owned 65% by Petronas, 17.5% by Shell Gas B.V. (a unit of the Royal Dutch/Shell), and 17.5% by Mitsubishi Corp. of Japan.[15]

The nonassociated gas from the Central Luconia Fields was also to be used as a feedstock for the ASEAN ammonia-urea plant in Bintulu, at the rate of 35 million cubic feet per day in 1985.

The remaining 18 trillion cubic feet of nonassociated gas reserves were reportedly in areas off the coast of Trengganu, of which about 17 trillion cubic feet are located in the contract area of Esso Production Malaysia Inc. and 1 trillion cubic feet in the contract area of Petronas Carigali Sdn. Bhd. The nonassociated gas from the Carigali Duyong Gasfield was to be used for firing a 450-megawatt, combined-cycle powerplant at Paka, Trengganu, at the rate of 70 million cubic feet per day in mid-1985.[16]

Malaysia's associated gas reserves were estimated at 9 trillion cubic feet in 1981. In 1980, about 260 million cubic feet per day of gas was produced. However, most of the output was flared.

Petroleum.—Malaysia's production of crude oil was from 14 oilfields in 1981. Three oilfields were in Sabah, eight in Sarawak, and three in Trengganu. Crude oil was reduced from an average of 280,000 barrels per day in 1980 to an average of 230,000 barrels per day in 1981 because of the glut in the world oil market. In 1980, Malaysia exported an average of 170,000 barrels per day of crude oil, mainly to Japan, Singapore, and the United States. Export earnings from mineral fuels rose by 52% to $3 billion in 1980 from $2 billion in 1979. In 1980, Malaysia also imported about 4 million tons of the heavier crude oil valued at $0.9 billion from Saudi Arabia, Kuwait, and Iraq to meet the requirements of its domestic refineries. Malaysia's consumption of crude oil was estimated at 7.5 million tons in 1980 and about 8.2 million tons in 1981.[17]

In 1981, Malaysia's recoverable oil reserves were revised by Petronas from 1.8 billion barrels to 2.5 billion barrels, which could last about 25 years at the present rate of production and allow Malaysia to remain a net exporter of crude oil until 1990.[18]

In late July 1981, the Government of Malaysia, through Petronas, awarded a contract to JGC Corp. and C. Itoh & Co. for design and construction of a 30,000-barrel-per-day oil refinery. The refinery would be built near Kerteh, Trengganu, about halfway between Kuala Trengganu and Kuantan. The $87 million project was expected to be completed in the first half of 1983 based on a turnkey contract. The refinery complex would have an atmospheric distillation unit, a gas-turbine, power-generation unit, storage tanks, and offsite utilities facilities including offshore shipping facilities.[19]

A $120 million project was awarded to Fluor Ocean Services Ltd. by Petronas for construction of a crude oil terminal at Trengganu. The system would have a 240,000-barrel-per-day capacity and a 45,000-barrel-per-hour tanker-loading rate and is scheduled for completion in mid-1983.[20]

[1]Economist, Division of Foreign Data.
[2]Where necessary, values have been converted from Malaysian dollars (M$) to U.S. dollars at the rate of M$2.2=US$1.00 in 1980 and M$2.3=US$1.00 in 1981.
[3]The Fourth 5-Year Plan 1981-85. Kuala Lumpur, Malaysia, p. 200.
[4]Far East Economic Review. Oct. 30, 1981, p. 46.
[5]U.S. Embassy, Kuala Lumpur, Malaysia. State Department Telegram 6664, Jan. 6, 1982.
[6]Metal Bulletin (London). No. 6637, Nov. 13, 1981, p. 37.
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[7]———. May 20, 1981, p. 30.
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[8]Work cited in footnote 4.
[9]Tin International. V. 54, No. 11, November 1981, p. 438.
[10]Tin News (Washington, D.C.). V. 30, No. 9, Oct. 15, 1981, p. 4.
U.S. Embassy, Kuala Lumpur, Malaysia. State Department Telegram 9794, Oct. 21, 1981.
[11]Work cited in footnote 5.
[12]Pit & Quarry. V. 74, No. 4, October 1981, p. 28.
[13]Business Times (Kuala Lumpur). Aug. 4, 1981, p. 20.
The British Sulphur Corp., Ltd. Nitrogen. No. 132, July-August 1981, p. 17.
[14]The Asian Wall Street Journal. V. 6, No. 56, Nov. 16, 1981, p. 6.
[15]Petronas. Bebe Chooi, Profile of Petroleum Resources in Malaysia. August 1981, p. 6.
Business Times (Kuala Lumpur). Dec. 14, 1981, p. 1.
[16]Petroleum News. August 1981, p. 30.
[17]U.S. Embassy, Kuala Lumpur, Malaysia. State Department Telegram 4625, Feb. 4, 1981.
[18]Work cited in footnote 5.
[19]Oil & Gas Journal. Dec. 14, 1981, p. 138.
[20]———. Jan. 4, 1982, p. 70.

The Mineral Industry of Malta

By Roman V. Sondermayer[1]

Malta remained a modest producer of limestone and salt in 1981. Some imported nonferrous metals, steel, and diamonds were worked, and the economy was heavily dependent on imported minerals and fuels to meet its requirements.

During 1981, the Government signed the first production-sharing oil exploration contract with a consortium led by Reading and Bates, Inc., of the United States. The contract covered an area of approximately 2,200 square kilometers in Block 8, Area 3, located southwest of the Island of Gozo. The contract is for 25 years, and the Government will reimburse the contractor for exploration expenses only if crude oil is discovered and commercial production starts.

In addition, another production-sharing oil exploration contract was concluded with a subsidiary of the Italian Azienda Generali Italiana Petroli S.p.A. This contract covers approximately 2,000 square kilometers in Block 3, Area 3, located northwest of Malta. Contract conditions are the same as for the previously mentioned agreement, except that drilling was to start before December 31, 1981.

[1] Physical scientist, Division of Foreign Data.

Table 1.—Malta: Production of mineral commodities[1]

Commodity and unit of measure	1977	1978	1979	1980[p]	1981[e]
Lime—thousand metric tons	32	28	30	31	32
Limestone—thousand cubic meters	[2]802	[e]386	400	400	410
Salt—metric tons	797	600	500	550	540

[e] Estimated. [p] Preliminary.
[1] Table includes data available through July 1, 1982.
[2] Figures represent reported output plus an estimate for quantitatively unreported output.

Table 2.—Malta: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Waste and scrap	90	130	--	Italy 69; Netherlands 50; United Kingdom 10.
Semimanufactures value	$141,319	$274,695	--	Italy $98,042; Libya $93,606; Saudi Arabia $30,558.
Copper metal including alloys:				
Waste and scrap	546	450	--	Netherlands 137; Belgium-Luxembourg 117; Denmark 73; United Kingdom 49.
Semimanufactures value	$16,026	$75,483	--	Libya $59,495; Denmark $15,988.
Iron and steel metal:				
Waste and scrap	3,441	5,828	--	Italy 5,525; Netherlands 274.
Grit, shot, pellets	4	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections value	$298,974	$28,932	--	United Kingdom $27,870.
Universals, plates, sheets do	$60,542	$2,259	--	All to Libya.
Hoop and strip do	--	$20	--	All to Italy.
Wire do	$14	$268,932	--	All to Egypt.
Tubes, pipes, fittings do	$190,442	$1,130	--	All to Libya.
Lead metal including alloys: Waste and scrap	549	353	--	All to Italy.
Nickel metal including alloys:				
Waste and scrap	3	2	--	All to United Kingdom.
Semimanufactures value	$49,774	$15,290	--	All to West Germany.
Silver metal including alloys, unwrought and partly wrought troy ounces	--	186	--	All to United Kingdom.
Tin metal including alloys: Semimanufactures value	--	$12,475	--	Do.
Zinc metal including alloys:				
Waste and scrap	90	17	--	Do.
Semimanufactures: Plates and sheets value	$223	--		
NONMETALS				
Abrasives, n.e.s.:				
Natural: Emery, pumice, corundum, etc do	$340	--		
Dust and powder of precious and semiprecious stones do	--	$18,323	--	All to Belgium-Luxembourg.
Grinding and polishing wheels and stones do	$275,071	$648,994	--	Yugoslavia $331,353; Algeria $162,834; West Germany $77,906.
Cement kilograms	--	50	NA	NA.
Clay products: Nonrefractory value	--	$776	--	Libya $703; United Kingdom $73.
Diamond, gem:				
Uncut and unworked value, thousands	r$336	$1,125	--	All to Belgium-Luxembourg.
Cut, not set do	$3,047	$918	--	Belgium-Luxembourg $768; Kuwait $150.
Diatomite and other siliceous earths value	--	$53,419	--	All to Tunisia.
Mica, crude, including splittings and waste do	$742	--		
Precious and semiprecious stones except diamond, natural do	--	$161,157	--	All to Belgium-Luxembourg.
Stone, dimension:				
Unworked, calcareous do	$1,222	$3,100	--	All to United Kingdom.
Worked do	$13,662	$4,783	--	Libya $4,501; Israel $282.
Sulfur, elemental: Colloidal	--	20	--	All to Lebanon.
Other: Building materials of asphalt, asbestos and fiber cements, and unfired nonmetals value	$1,396	--		
MINERAL FUELS AND RELATED MATERIALS				
Petroleum:				
Partly refined 42-gallon barrels	32,512	16,425	--	All to Italy.
Refinery products:				
Lubricating oils and grease do	5,428	5,496	--	Bunkers 5,227; Sudan 79; Belgium-Luxembourg 66.
Unspecified value	$16,095	--		

rRevised. NA Not available.

Table 3.—Malta: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides value	$2,255	$18,399	--	Yugoslavia $16,917; United Kingdom $807.
Metal including alloys, all forms value, thousands	$3,383	$5,622	$675	Italy $3,856; United Kingdom $657; Netherlands $314.
Arsenic trioxide, pentoxide, acid value	$1,809	--		
Chromium oxides and hydroxides do	$3,592	--		
Copper:				
Matte kilograms	980	--		
Metal including alloys:				
Blister and other unrefined	6	--		
Scrap	90	--		
Unwrought	12	16	--	United Kingdom 9; Sweden 6.
Semimanufactures value, thousands	$1,746	$3,643	$8	West Germany $1,975; United Kingdom $1,032.
Gold metal including alloys:				
Bullion, unwrought troy ounces	20,662	3,918	--	West Germany 2,508; United Kingdom 1,410.
Waste and sweepings value	$2,607	--		
Leaf and other partly wrought do	$23,758	$57,513	--	West Germany $44,998; United Kingdom $12,515.
Iron and steel metal:				
Scrap	5	208	--	Libya 207; Italy 1.
Pig iron, sponge iron, powder, shot, ferroalloys	1,694	4,147	--	West Germany 4,007; United Kingdom 59.
Steel, primary forms	34	5,634	--	West Germany 3,260; Spain 1,750.
Semimanufactures:				
Bars, rods, angles, shapes, sections value, thousands	$6,029	$7,932	$2	United Kingdom $1,988; Belgium-Luxembourg $1,908; France $1,333.
Universals, plates, sheets do	$5,935	$6,919	(1)	Japan $2,495; France $1,510; United Kingdom $790; Belgium-Luxembourg $733.
Hoop and strip do	$254	$622	--	Italy $232; United Kingdom $125; France $121.
Rails and accessories do	$1	$115	--	Belgium-Luxembourg $111; United Kingdom $3.
Wire do	$1,422	$1,956	$4	West Germany $581; Romania $402; France $341.
Tubes, pipes, fittings do	$4,639	$5,986	$91	United Kingdom $1,698; Italy $1,452; France $613.
Lead:				
Oxides value	$151,920	$231,013	--	United Kingdom $192,788; France $36,494.
Metal including alloys:				
Scrap	180	--		
Unwrought	22	60	--	United Kingdom 56; West Germany 4.
Semimanufactures value	r$61,888	$34,867	$336	United Kingdom $26,621; Finland $3,106.
Magnesium metal including alloys, all forms do	$980	$1,717	--	All from United Kingdom.
Manganese oxides do	$1,144	$601	--	All from Netherlands.
Mercury do	$145	$429	--	West Germany $198; Switzerland $99; United Kingdom $71.
Nickel metal including alloys:				
Unwrought kilograms	450	250	--	All from Canada.
Semimanufactures value, thousands	r$3,527	$6,953	--	West Germany $4,589; Switzerland $1,954; Ireland $384.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	69	(1)	--	All from United Kingdom.
Silver metal including alloys, unwrought and partly wrought do	90,530	58,111	--	West Germany 32,796; United Kingdom 25,091; France 224.
Tantalum metal including alloys, all forms value	$2,336	--		
Tin metal including alloys:				
Unwrought	$158,727	4	--	All from United Kingdom.
Semimanufactures value		$530,073	--	Italy $215,926; United Kingdom $197,812; France $115,859.
Titanium:				
Ore and concentrate kilograms	--	252	--	All from United Kingdom.
Oxides value	$279,646	$311,590	--	United Kingdom $167,976; West Germany $70,124; Italy $46,142.
Tungsten metal including alloys, all forms do	$2,224	--		

See footnotes at end of table.

Table 3.—Malta: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Uranium and thorium metals including alloys, all forms ____ value__	$9,612	$5,071	--	West Germany $4,295; United Kingdom $776.
Zinc:				
Oxides ____ do____	$50,748	$53,314	--	Netherlands $30,643; Sweden $18,634.
Metal including alloys:				
Scrap ____	24	--		
Blue powder ____ kilograms__	1	10	--	All from Italy.
Unwrought ____	90	50	--	Belgium-Luxembourg 25; North Korea 25.
Semimanufactures ____ value__	$186,124	$63,059	--	United Kingdom $44,389; West Germany $6,848; Belgium-Luxembourg $6,048.
Other:				
Oxides, hydroxides, peroxides of metals do____	$38,191	$34,300	--	West Germany $20,972; United Kingdom $10,532.
Metalloids ____ do____	$1,195	$2,163	--	United Kingdom $1,559; Italy $604.
Alkali, alkaline-earth, rare-earth metals do____	$168	--		
Base metals including alloys, all forms, n.e.s ____ do____	$5,164	$19,314	--	All from West Germany.
NONMETALS				
Abrasives, n.e.s.:				
Emery, pumice, natural corundum, etc. do____	$36,681	$36,313	--	Yugoslavia $15,892; Italy $6,328; Austria $5,486.
Corundum, artificial ____ do____	$4,898	$15,364	--	United Kingdom $8,296; Yugoslavia $7,068.
Dust and powder of natural or synthetic precious and semiprecious stones do____	$41,610	$21,742	--	Belgium-Luxembourg $16,818; Ghana $3,798.
Grinding and polishing wheels and stones ____ do____	$380,159	$670,490	$6,260	Yugoslavia $240,670; West Germany $151,226; United Kingdom $116,432.
Asbestos, crude ____ do____	$6,763	$47,461	$4,357	Italy $41,491; United Kingdom $1,595.
Boron:				
Borates and perborates ____ do____	$1,024	$5,611	--	United Kingdom $4,964; Netherlands $647.
Oxides and acids ____ do____	$798	$3,741	--	Netherlands $2,818; United Kingdom $734.
Cement ____	123,920	133,686	NA	NA.
Chalk ____ value__	$44,465	$67,193	NA	United Kingdom $38,320; France $19,054; Italy $3,580.
Clays and clay products:				
Crude:				
Plastic ____	254	63	1	United Kingdom 26; Italy 24; Belgium-Luxembourg 12.
Fire clay ____	15	14	--	All from China.
Other, not expanded or activated__	217	270	--	United Kingdom 214; Italy 56.
Products:				
Nonrefractory value, thousands__	$2,640	$4,761	(1)	Italy $4,277; United Kingdom $411.
Refractory including nonclay brick value__	$77,923	$137,952	$11,847	United Kingdom $70,957; North Korea $32,583; China $12,410.
Cryolite and chiolite ____ do____	$1,488	--		
Diamond:				
Gem:				
Uncut and unworked value, thousands__	$6,717	$4,229	(1)	Ghana $1,742; Republic of South Africa $876.
Cut, not set ____ value__	$8,527	$1,443	--	All from United Kingdom.
Industrial ____ do____	$97,423	$521,828	--	Ghana $509,771; Republic of South Africa $6,483.
Diatomite and other infusorial earth do____	$17,584	$17,544	--	Belgium-Luxembourg $9,502; West Germany $4,219; United Kingdom $2,468.

See footnotes at end of table.

Table 3.—Malta: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials:				
Natural, phosphatic ____ kilograms__	--	300	--	All from Italy.
Manufactured:				
Nitrogenous _____	2,136	3,051	--	Italy 2,400; West Germany 516.
Phosphatic _____	10	31	--	Israel 18; Belgium-Luxembourg 10; United Kingdom 3.
Potassic _____	13	--	--	
Other including mixed _____	22	2,136	2	Yugoslavia 1,000; North Korea 500; West Germany 425.
Ammonia _____ value__	$36,976	$38,947	--	United Kingdom $31,671; France $3,126; Sweden $1,573.
Graphite:				
Natural _____ kilograms__	34	(1)	--	All from United Kingdom.
Artificial _____ value__	$170	$14,850	--	All from France.
Colloidal _____ do____	$399	$424	--	Italy $387; West Germany $37.
Gypsum and plasters _____ do____	$43,117	$30,637	$5,410	Spain $23,389; West Germany $963.
Lime _____	--	51	--	Italy 50; United Kingdom 1.
Magnesite _____ value__	$1,451	--		
Mica:				
Crude including splittings and waste do____	$9,141	$5,306	--	United Kingdom $3,027; India $1,358.
Worked including agglomerated splittings _____ do____	$215,920	$277,361	--	West Germany $270,691; United Kingdom $4,639.
Pigments, mineral:				
Natural, crude _____ do____	$1,443	$8,356	--	United Kingdom $8,028; West Germany $328.
Iron oxides, processed _____ do____	$8,993	$10,993	--	United Kingdom $7,195; Spain $3,798.
Precious and semiprecious stones except diamond:				
Natural, worked and unworked do____	$324,228	$31,995	--	Switzerland $24,742; Belgium-Luxembourg $4,224.
Synthetic or reconstituted, worked and unworked _____ do____	$42,614	$2,437	--	West Germany $2,064; Italy $373.
Salt and brine[2] _____ do____	$213,444	$310,584	$71	United Kingdom $245,631; Tunisia $46,280.
Sodium and potassium compounds, n.e.s.:				
Caustic potash _____ do____	$92	$1,415	--	All from United Kingdom.
Caustic soda _____ do____	$254,155	$239,320	--	Italy $74,964; West Germany $73,131; United Kingdom $37,431.
Soda ash _____	81	47	--	West Germany 30; United Kingdom 16; Sweden 1.
Other _____ value__	--	$1,223	--	United Kingdom $878; West Germany $344.
Stone, sand and gravel:				
Dimension stone:				
Unworked -- value, thousands__	$1,015	$1,760	--	Italy $1,686; Greece $64.
Worked _____ value__	$185,603	$95,520	--	Italy $88,246; United Kingdom $6,543.
Gravel and crushed rock ____ do____	r$576,924	$855,646	$71	Italy $850,021; Sweden $2,767.
Quartz and quartzite _____ do____	$374	$2,604	*	All from United Kingdom.
Sand excluding metal-bearing _____	349	6,966	--	Netherlands; 5,783; Italy 801; United Kingdom 292.
Sulfur:				
Dioxide _____ value__	$6	$25,817	NA	West Germany $16,468; Italy $7,299.
Elemental:				
Colloidal _____	15	--		
Sublimated or precipitated _____	78	170	--	Italy 168; United Kingdom 2.
Other _____ kilograms__	2,020	175	--	All from United Kingdom.
Sulfuric acid, oleum _____ value__	$53,829	$41,034	--	Netherlands $37,824; United Kingdom $1,852.
Talc and steatite _____ do____	$24,405	$23,002	--	Norway $13,607; Australia $4,973.
Other:				
Crude, unspecified _____ do____	$89,846	$93	--	All from Sweden.
Amber and meerschaum ____ do____	$3,243	$1,714	--	United Kingdom $1,316; West Germany $398.
Halogens _____ do____	$98,660	$111,612	--	United Kingdom $111,186.
Oxides, hydroxides, peroxides of strontium, magnesium, barium __ do____	$15,616	$15,677	$2,714	Japan $12,738.
Mineral products, activated __ do____	$8,170	$12,215	--	United Kingdom $8,835; West Germany $2,459.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s ____ value, thousands__	$1,249	$1,275	$2	Italy $974; Greece $142; United Kingdom $78.

See footnotes at end of table.

Table 3.—Malta: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2	5	--	All from West Germany.
Carbon black value	$348,162	$424,735	$16,648	Italy $191,642; West Germany $128,732; Canada $34,175.
Coal and briquets:				
Anthracite and bituminous	--	534	--	United Kingdom 525; Australia 8.
Briquets	336	82	--	Poland 54; West Germany 28.
Coke and semicoke	88	160	--	All from United Kingdom.
Hydrogen, helium, rare gases value	$9,241	$20,201	--	Italy $16,640; West Germany $2,843.
Peat including briquets and litter	177	275	--	Sweden 108; Finland 45; United Kingdom 41.
Petroleum refinery products:				
Lubricants[3] 42-gallon barrels	27,198	26,064	110	Netherlands 11,496; United Kingdom 5,352; Italy 5,139.
Mineral wax do	3,463	2,694	(1)	China 1,418; Hungary 924.
Mineral jelly value	$11,388	$5,074	$3	United Kingdom $5,071.
Nonlubricating oils do	$69,699	$88,049	$3,380	United Kingdom $76,279; Italy $4,298.
Pitch coke and tar 42-gallon barrels	2,998	1,192	--	All from United Kingdom.
Bitumen do	4,791	13,692	--	All from Italy.
Bituminous mixtures value, thousands	$1,747	$1,489	$5	Spain $1,276; United Kingdom $198.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals value	$36,103	$35,652	--	United Kingdom $15,855; France $8,217.

[r]Revised. NA Not available.

[1]Less than 1/2 unit.

[2]Of the totals imported, 724 tons valued at $90,817 were reported in 1979 and 1,528 tons valued at $194,895 were reported in 1980.

[3]Excludes unreported quantities valued at $354,964 in 1979 and $287,748 in 1980.

The Mineral Industry of Mauritania

By Thomas O. Glover[1]

About one-fourth of the country's estimated $700 million[2] gross domestic product (GDP) originated in the traditional sector, principally from cereal cultivation, fishing, and livestock. The modern sector, which includes mining, transportation, and a small manufacturing sector, contributed another 20% of the total GDP, with Government and other services representing the remainder. The mining sector contributed to approximately 80% of Mauritania's foreign export revenues in 1981. Iron ore was the main industry in the country, and Mauritania's stagnant economy was directly related to depressed world iron ore markets.

The country is heavily dependent on its iron ore exports and will allocate 50% of projected investment expenditures in the next plan period to the mining sector. The mines at Kedia d'Idjill, now producing 9 million tons of iron ore annually, will be exhausted in 1990. The Guelbs project is being developed to replace this production. Total investment in the first phase of Guelbs will be $500 million, financed largely by loans from Iraq, Kuwait, Saudi Arabia, Abu Dhabi, France, Japan, the World Bank, the African Development Bank, and the Organization for Petroleum Exporting Countries Fund for International Development.

The low grade of the Guelbs iron ore will require substantial amounts of petroleum to process, adding significantly to operating costs. An oil refinery in Nouadhibou, completed in 1977, is scheduled to open next year, and consideration was being given to reopening the Akjoujt copper mine, which closed in 1978 when world copper prices fell.

PRODUCTION

Production of Mauritania's major mineral commodity, iron ore, declined slightly in 1981, mostly because of poor market conditions. Iron ore output was down 1% from 1980 but was still well above the low of 7 million tons in 1978, when the conflict with Western Sahara was at its peak. Market conditions precipitated the decline in production as well as an overall decline in export value for the year. Crude steel production, from a new scrap mill in Nouadhibou, increased slightly from 9,000 tons in 1980 to 9,100 tons of reinforcing bars in 1981. Since the closing of the Akjoujt copper mine in 1978, the only other minerals being exploited were gypsum and salt. Gypsum production decreased about 6% in 1981, and salt production remained stable.

Table 1.—Mauritania: Production of mineral commodities[1]

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
Cement, hydraulic ---- metric tons	--	--	--	--	60,000
Copper, mine output, metal content ---- do	7,640	1,773	--	--	--
Gold ---- troy ounces	28,000	8,000	--	--	--
Gypsum ---- metric tons	10,176	13,438	16,051	[r e]14,000	12,000
Iron and steel:					
Iron ore:					
Gross weight ---- thousand metric tons	9,794	6,934	9,373	8,936	8,704
Iron content[e] ---- do	6,317	4,299	5,811	5,332	5,243
Crude steel ---- metric tons	--	--	6,200	9,000	9,100
Steel, semimanufactures ---- do	--	--	--	--	4,400
Rare-earth metals: Monazite concentrate, gross weight[e] ---- do	100	100	100	--	--
Silver ---- troy ounces	[e]26,000	19,000	--	--	--

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Aug. 23, 1982.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, stone, and sand and gravel) and salt presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

TRADE

During 1981, domestic indebtedness rose to $315 million while direct foreign aid grants declined, leaving the deficit before foreign loans at $136 million.

Iron exports from the Government-owned Société Nationale Industrielle et Minière (SNIM) mines in Zouirat in 1981 totaled 9 million tons. In 1980, SNIM exported 8.73 million tons of iron ore at an average sales price of $17.63 per ton. The European Economic Community purchased 77% of 1980 iron ore exports. SNIM exported all of its gypsum production to Senegal in 1980 at an approximate value of $440,000. A new company Société Akjoujt Minière was established to reopen the copper mines of Akjoujt, with 37.5% Mauritanian ownership, and $72 million capital. Some restoration of the old site has started, and copper exports are expected to recommence in 1984. Petroleum was brought into the country by the British Petroleum Co. under a "processing" agreement for a trial period of 1 year.

COMMODITY REVIEW

METALS

Copper.—Several studies have been conducted since 1979 concerning the feasibility of reopening the Akjoujt copper mine. The mine closed in 1978 because of heavy financial losses after being operational for 8 years. Copper oxide ores were mined and then processed to form concentrates. The treatment process used to concentrate the ore encountered technical problems, and only a limited amount of concentrate was ever produced. The copper oxide ores were nearly exhausted by 1978. Financial losses, caused by low production levels and the use of a highly energy-intensive treatment process, caused the mine to close.

The Government has attempted to attract investors to exploit the estimated 17 million tons of copper sulfide ore remaining at Akjoujt since the mine closed in 1978. The Government has received $100 million in financing from Arab countries to reopen the mine late in 1981 or early 1982, using more modern technology. Exports are expected to commence sometime in 1984.

Iron Ore.—Iron ore output declined slightly for the second consecutive year in 1981, mostly owing to the weakness of the world market for iron ore. Mining was carried out under the direction of Complexe Minière du Nord (COMINOR), which was owned entirely by SNIM. COMINOR operated three mines—Tazadit, F'Derik, and Rouessa—all in the Kedia d'Idjill deposit, near the city of Zouirat. The average grade of ore from the mines is about 65% iron. Production from these deposits began in 1960 under the direction of the Société Anonyme des Mines de Fer de Mauritanie, in which the Government held a 5% interest. The mines were nationalized in 1974, and iron ore production peaked at 11.9 million tons that year. The 1980 SNIM

annual report showed production at the Tazadit Mine of 4.41 million tons, up 20% over that of 1979. The Rouessa Mine produced 3.39 million tons of iron ore, down 13%, and the F'Derik Mine produced 1.14 million tons, down 15% from that of 1979. Stockpiled iron ore at the end of 1980 was reported at 1.2 million tons.

At the country's current rate of production, reserves at Kedia d'Idjill were expected to be depleted in the early 1990's. To ensure continued production of the country's major export, SNIM is developing the major new Guelbs iron ore project to exploit the El-Rhein and Oum Arwagen deposits. The Guelbs project is the country's top development priority. Work on the first stage of the project began in 1980.

The word Guelbs is actually applied to a group of about 25 deposits, all within a 50-kilometer radius of Zouirat. The first stage of the project was to develop the El-Rhein deposit, which contains over 260 million tons of ore, grading 35% iron. The deposit was to produce approximately 3 million tons per year in 1984 and then rise to 6 million tons per year by 1987. Included in this plan was the construction of a concentrating plant to raise the iron content to 65%. Concentration was to be dry magnetic separation, which is very important for a country with limited quantities of water. Total investment in the first stage of the project was estimated at nearly $500 million.

The second phase of the Guelbs project was centered around the Oum Arwagen deposit, where reserves were estimated at an additional 200 million tons, with an iron content of about 35%. Annual production capacity from Oum Arwagen was to be 4 million tons in 1990, rising to 6 million tons by 1992. This phase of the project, along with commissioning the second part of the concentration plant, was to take place in 1990. Concentrates from both deposits were to be transported by the 650-kilometer railroad that already links the Kedia d'Idjill deposit to Nouadhibou.

In 1981, SNIM exported 8.7 million tons of iron ore to 11 countries. The principal quantities were shipped to France, Italy, and Belgium, with less than 1 million tons going to eight other countries.

Following the startup of its first steelworks, Mauritania is now seeking quotations for the shipment of 15,000 tons per year of billets. Despite having a melting capacity of only 12,000 tons per year, the new Nouadhibou steelworks is capable of rolling up to 36,000 tons per year of rebars. The order is for 10,500 tons per year of 100-millimeter square billets and 4,500 tons per year of 80-millimeter square billets.

NONMETALS

Gypsum.—Mauritania possesses an estimated 1 billion tons of 98% pure gypsum. Since the closing of Mauritania's copper mine, the only other mining operation under SNIM's authority has been the extraction of gypsum from this deposit. The estimated 12,000 tons produced in 1981 was exported to Senegal for use in its cement plant at Rufisque. The Government hopes to expand mining operations and seek a worldwide market when the new deepwater port at Nouakchott is completed. Mauritania commenced operation of its first cement plant in 1981, producing an estimated 60,000 tons.

Phosphate.—Phosphate deposits near Mauritania's southern border are being studied to determine their economic potential. Reserves at the deposits were estimated at between 20 and 40 million tons of ore. The mining rate being considered is about 500,000 tons per year.

MINERAL FUELS

Petroleum.—In an October 1981 agreement, Mobil Oil Corp. of the United States selected two of the nine oil exploration blocks offered by the Ministry of Mines and Energy. Covering 34,000 square kilometers around Nouakchott, Mobil's acreage will be subject to a thorough seismic survey before a decision on drilling exploratory wells is taken. In November, Mobil dispatched a specially equipped ship, the Nelson, along the coastline for a preliminary geophysical appraisal.

Only 12 wildcat wells have been spudded in Mauritania's vast desert territory, and until now results have not been encouraging. Two sedimentary basins have attracted a number of international oil groups in the past: The Taoudeni Basin along the Malian frontier where Texaco Inc. and Azienda Generali Italiana Petroli S.p.A. (AGIP) were active, and the coastal or Atlantic Basin stretching from the Port of Nouadhibou southwards practically to the Senegalese border, where Amoco Oil Co. and AGIP completed an unsuccessful search. Negotiations during the first 6 months of 1982 are expected to lead to the signing of several

exploration agreements with other companies.

Refining.—Algerian technical assistance and financial aid will help bring Mauritania's new 1-million-ton-per-year refinery at Nouadhibou onstream toward the end of 1982. Completed in 1977 at a cost of $90 million, the refinery never started operations because it was designed to process only light Algerian crude oil, and until Mauritania signed a peace treaty in mid-1979 with the Algerian-backed Polisario, Algeria refused to supply crude to Mauritania.

The Algerians are supplying $20 million to refurbish the refinery, and the Jeddah-based Islamic Development Bank is to loan $10 million to finance feedstock purchases. When the refinery reaches its full production capacity of 20,000 barrels per day, about 80% of the output will be exported, as domestic consumption remains limited at 4,000 barrels per day.

Uranium.—The Mauritanian Government has disclosed the presence of a plan that is being implemented through an agreement between Mauritania and Iraq to extract uranium in Mauritania. Production is expected to begin within the next 3 years.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Mauritanian ouguiyas (UM) to U.S. dollars at the rate of UM48.16=US$1.00.

The Mineral Industry of Mexico

By Doris M. Hyde[1]

In 1981, Mexico maintained a strong rate of real economic growth, and it was the fourth consecutive year that the growth rate exceeded 8%. The gross domestic product (GDP) reached an estimated $239 billion,[2] as a result of high levels of public spending and strong performances in most sectors of the economy, especially petroleum. The rate of inflation in 1981 was 29%, down 1% from that of 1980.

Foreign loans were used to complement domestic resources to finance national development programs, such that by the end of 1981, Mexico's foreign debt was slightly under $50 billion. Many observers believed the Mexican peso to be overvalued by 25% to 30%, and this has made Mexican exports less competitive and imports attractively cheaper.

In 1981, Mexico ranked fourth in world production of crude oil, following the U.S.S.R., the United States, and Saudi Arabia. Although the petroleum sector accounted for only 6% of the GDP, its rapid growth rate over the past few years has affected other sectors and created a boom economy. The plentiful supply of oil for domestic development has greatly reduced constraints on growth. Petroleum export revenues have permitted increased importation of goods and services and facilitated Mexico's ability to obtain foreign loans.

The 1981 trade deficit, excluding the value added by the in-bond assembly plants, was $3.7 billion. Despite a lower rate of import growth in 1981, Mexico also experienced lower than expected income from petroleum exports as well as generally depressed world prices for some traditional exports, such as coffee, silver, and copper.

The $14.6 billion value of petroleum exports accounted for 75% of merchandise export earnings. Although this represented a 40% increase over petroleum export earnings in 1980, it was less than the $19 billion expected before market price and demand reductions.

Export earnings from nonfuel minerals were also less than anticipated. In some instances, an increasing domestic demand for minerals lessened volumes available for export. In other instances, world market prices were lower than projected. Income from silver exports was particularly disappointing as the market price dropped from an average of $20.60 per troy ounce in 1980 to $11 per troy ounce in 1981. In 1980, about one-half of the value of Mexico's nonfuel mineral exports was attributed to silver. In 1981, copper concentrate exports more than tripled those of 1980, but the associated earnings were less than double and did not compensate for the decline in silver prices.

The larger U.S. firms holding minority equity positions in Mexican mining and metals companies included AMAX, Inc., 40% interest in Cía. Fresnillo S.A. (silver); The Anaconda Company, 34% interest in Cía. Minera de Cananea (copper); ASARCO Incorporated, 34% interest in Mexico, Desarrollo Industrial Minera S.A. (copper, silver, lead, and zinc); and Texasgulf, Inc., 34% interest in Cía. Exploradora del Istmo, S.A. (sulfur).

Government Policies and Programs.—In mid-1981, the Government repealed the excess profits tax on gold and silver, first levied in January 1980 when precious metal prices reached unprecedented levels. By the time of its repeal, these prices had fallen sharply such that the tax had become largely a psychological impediment to increased mine production and investment.

Another reported Government incentive for the mining industry was to grant Certifi-

cates of Fiscal Promotion. These certificates allowed liberal tax credits to companies that increased employment, invested in additional exploration, or invested in equipment and plant facilities designed to increase production.

PRODUCTION

Mineral fuels continued to dominate Mexico's total mineral production. The production of crude oil in 1981 increased 19%, following a 33% increase in 1980. Natural gas production in 1981 increased 14% over that of 1980. Crude oil and condensate production averaged 2.3 million barrels per day during 1981. The output of refined petroleum products reached slightly less than 1.3 million barrels per day in 1981, a 10% increase over 1980 production. Petróleos Mexicanos (PEMEX) continued to use toll refining and processing facilities in Spain and France for its crude oil and also initiated new processing contracts in Italy and the United States.

The total value of production from 16 metallic and 26 nonmetallic minerals by Mexico's mining sector reached about $2.7 billion in 1980. Volumetric production gains in 1981 were not able to compensate for the generally downward trend in world market prices. As a result, the total value of production from the mining sector declined to an estimated $2.1 billion in 1981. Prominent among those minerals that declined in value was silver, whose 1980 value of $980 million fell to $550 million in 1981, despite a 12% increase in volume. Other leading minerals that were produced in greater quantity but fell in value were gold, lead, and copper.

Mexico's mining sector achieved some historic gross production records in 1981. The highest output gain was in the copper industry, which had a 30% production gain because of increased output from the La Caridad Mine. Alltime production records were also reached for iron ore, manganese, and molybdenum. Silver, barite, and phosphate rock production were the highest in the last 10 years, while gold and fluorspar production exceeded those of the last few years. Lead production gained over that of 1980 but failed to reach the higher level achieved in 1979.

Table 1.—Mexico: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum metal, primary	42,720	43,092	43,195	[e]43,200	43,000
Antimony:[3]					
Mine output, metal content	2,698	2,457	2,872	2,176	1,800
Metal (in mixed bars and refined)	934	490	557	422	354
Arsenic, white[4]	5,744	6,245	6,537	6,332	6,489
Bismuth[5]	729	978	754	770	656
Cadmium:					
Mine output, metal content	1,781	1,894	1,778	1,791	1,433
Metal, refined	908	897	830	778	590
Copper:					
Mine output, metal content	89,662	87,186	107,109	175,399	230,466
Metal:					
Blister (primary only)	87,457	86,978	83,857	85,695	7,898
Refined (primary and secondary)	73,062	74,990	81,781	85,610	61,301
Gold:					
Mine output, metal content, troy ounces	212,709	202,003	190,364	195,991	203,160
Metal, refined, do.	196,634	190,718	187,439	185,863	176,861
Iron and steel:					
Iron ore:					
Gross weight[6], thousand tons	5,381	5,334	6,061	7,631	9,181
Metal content, do.	3,587	3,556	4,041	5,087	6,059
Metal:					
Pig iron and sponge iron, do.	4,329	5,137	5,027	5,275	5,453
Ferroalloys:					
Ferromanganese, do.	99	107	120	126	131
Silicomanganese, do.	27	34	35	31	26
Ferrosilicon, do.	23	25	25	28	23
Other, do.	3	5	5	1	5
Total, do.	152	171	185	186	185

See footnotes at end of table.

Table 1.—Mexico: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS —Continued					
Iron and steel —Continued					
Metal —Continued					
Crude steel ____ thousand tons	5,601	6,776	7,117	7,156	7,605
Semimanufactures ____ do	4,302	5,253	5,844	6,220	6,395
Lead:					
Mine output, metal content	163,479	170,593	173,455	145,549	157,384
Metal:					
Smelter:					
Primary	153,948	166,098	172,988	144,968	156,677
Secondary (refined)[e]	62,300	49,300	50,000	50,000	50,000
Total	216,248	215,398	222,988	194,968	206,677
Refined:					
Primary (including lead content of antimonial lead)	143,742	159,342	167,149	140,294	150,350
Secondary[e]	62,300	49,300	50,000	50,000	50,000
Total	206,042	208,642	217,149	190,294	200,350
Manganese ore:					
Gross weight[7]	486,623	523,167	492,664	447,128	578,300
Metal content	175,184	188,340	177,359	160,966	208,193
Mercury, mine output, metal content 76-pound flasks	9,660	2,205	1,973	4,206	4,000
Molybdenum, mine output, metal content	1	11	48	102	350
Nickel, mine output, metal content	34	22	1	—	—
Selenium, elemental	50	80	75	46	12
Silver:					
Mine output, metal content thousand troy ounces	47,030	50,779	49,408	47,344	53,204
Metallurgical products, metal content do	43,913	48,903	48,601	45,410	50,151
Tin:					
Mine output, metal content	220	73	23	60	28
Metal, smelter, primary[8]	1,000	1,000	1,268	1,642	1,600
Tungsten, mine output, metal content	[r]191	234	252	266	199
Zinc:					
Mine output, metal content	265,469	244,892	245,477	238,231	211,629
Metal, smelter, primary	174,376	173,094	161,723	143,868	126,537
NONMETALS					
Barite	270,674	231,485	151,162	269,322	317,738
Cement, hydraulic ____ thousand tons	13,227	14,056	15,178	16,260	18,066
Clays:					
Bentonite	59,169	140,325	169,848	176,028	180,000
Fuller's earth	61,369	40,615	48,820	51,360	52,000
Kaolin	178,211	179,500	76,994	143,318	150,000
Common	70,313	114,000	149,000	153,472	155,000
Diatomite	23,574	40,862	43,606	43,544	40,000
Feldspar	114,319	109,808	110,869	133,106	127,000
Fluorspar, all grades ____ thousand tons	660	960	875	916	925
Graphite, all grades	58,432	52,264	50,880	44,506	41,142
Gypsum and anhydrite, crude	1,495,750	1,757,870	2,021,006	1,708,924	1,882,913
Lime ____ thousand tons	[e]4,150	[e]4,445	4,579	4,350	4,500
Magnesite	66,400	76,035	81,620	86,987	80,000
Mica, all grades	771	401	243	331	400
Nitrogen: N content of ammonia	780,321	1,303,914	1,358,800	1,547,971	1,794,555
Perlite	22,429	24,517	41,988	44,379	45,000
Phosphate rock	285,470	322,076	171,069	283,246	353,700
Salt, all types ____ thousand tons	4,900	5,635	6,169	6,575	7,365
Sodium compounds:					
Soda ash (sodium carbonate) ____ do	[e]420	414	420	[e]450	450
Sodium sulfates, natural (bloedite)	109,489	330,804	361,123	372,092	365,001
Stone, sand and gravel:					
Calcite, common	8,784	19,753	109,138	141,002	150,000
Dolomite	433,429	249,244	282,342	378,316	371,000
Limestone ____ thousand tons	[9]4,750	22,565	24,086	31,173	32,000
Marble	1,348	144,554	155,578	164,392	165,000
Quartz, quartzite, glass sand (silica)	626,715	532,209	537,299	728,304	850,390
Strontium minerals (celestite)	45,633	34,224	39,519	37,518	33,996
Sulfur, elemental:					
Frasch process ____ thousand tons	1,723	1,650	1,773	1,700	1,652
Byproduct:					
Of metallurgy[e] ____ do	80	100	100	150	150
Of natural gas ____ do	133	168	252	402	426
Total ____ do	1,936	1,918	2,125	2,252	2,228
Talc	163	2,639	7,835	8,840	9,000
Wollastonite	692	10,956	11,892	14,400	15,000

See footnotes at end of table.

Table 1.—Mexico: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	109,728	[r]228,834	270,082	280,039	335,906
Coal, bituminous thousand tons	6,610	6,756	7,357	7,010	7,128
Coke:					
Metallurgical do	2,815	2,808	2,974	2,845	3,031
Imperial do	12	11	13	16	12
Breeze do	65	87	65	91	90
Total do	2,892	2,906	3,052	2,952	3,133
Gas, natural:					
Gross million cubic feet	746,863	934,911	1,064,559	1,298,581	1,482,196
Marketable do	600,051	744,891	914,873	1,129,288	1,214,240
Natural gas liquids:					
Field condensate thousand 42-gallon barrels	105	1,259	3,597	139	309
Other do	38,136	42,689	53,644	70,791	88,145
Petroleum:					
Crude do	357,985	441,348	533,329	708,454	843,933
Refinery products:					
Gasoline:					
Aviation do	525	585	638	622	554
Other do	83,492	88,643	102,888	118,855	130,559
Jet fuel do	7,749	7,390	9,154	10,089	10,558
Kerosine do	12,416	13,840	14,698	15,164	15,047
Distillate fuel oil do	66,574	72,461	78,584	89,392	98,530
Residual fuel oil do	85,122	88,963	86,684	112,903	126,665
Lubricants do	2,823	2,931	2,836	2,860	3,512
Liquefied petroleum gas do	24,030	27,024	33,058	43,829	49,595
Asphalt do	4,403	4,819	5,390	6,155	6,651
Unspecified do	6,135	6,138	7,690	6,656	7,533
Refinery fuel and losses do	15,460	13,834	16,647	18,478	21,856
Total do	308,729	326,628	358,267	425,003	471,060

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Sept. 14, 1982.

[2]In addition to the commodities listed, pumice and additional types of crude construction materials are produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[3]Sb content of ores for export plus Sb content of antimonial lead and other smelter products produced.

[4]Calculated white As equivalent of metallic As content of products reported.

[5]Bi content of refined metal, bullion, and alloys produced indigenously, plus recoverable Bi content of ores and concentrates exported for processing.

[6]Calculated from reported Fe content on the basis of concentrate and pellets containing 66.67% iron.

[7]Calculated from reported Mn content of mine production on the basis of ore containing 36% manganese.

[8]Estimates by the International Tin Council.

[9]Excluding that for cement production.

TRADE

Mexico's international trade in mineral commodities is given in table 2 for exports and table 3 for imports. Comparative estimates of the value of Mexico's 1980 and 1981 mineral exports follow, in millions of dollars:

	1980	1981
Total Mexican exports	$15,308	$19,379
Crude oil exports	$9,449	$13,305
Crude oil share	61.7%	68.7%
Mining, metallurgical exports	[r]$1,347	[e]$1,256
Mining, metallurgical share	[r]8.8%	6.5%

[e]Estimated. [r]Revised.

The total petroleum export values increased 40% owing to increased volumes, but the export contribution by mining and metallurgical products decreased 8%. The volume of mineral exports was up 20% for silver, 296% for copper concentrate, 66% for manganese, 14% for sulfur, and 9% for zinc concentrate. On the downward side of mineral volume exports were refined zinc, down 63%; refined lead, 9%; unrefined lead, 30%; lead concentrate, 30%; mercury, 38%; and fluorspar, 16%.

The value of Mexico's silver exports fell to an estimated $439 million, a 35% decrease from the $676 million received in 1980. This was the result of a sharp decline in world market prices. In 1981, copper export volumes more than tripled those of 1980, although their value fell short of doubling. The value of the principal nonfuel mineral exports to the United States in 1981 is shown below, in millions of dollars:

Commodity	Value
Silver	$197.6
Sulfur	108.2
Mica, quartz, feldspar, cryolite, etc	59.0
Precious metal ores and concentrates	38.2
Fluorspar	34.8
Lead and lead alloys, unwrought	25.1
Copper and copper alloys, unwrought	23.5
Sodium chloride (salt)	20.1
Ferroalloys	18.9
Copper ores and concentrates	13.7
Zinc and zinc alloys, unwrought	13.5
Total	552.6

In 1981, crude oil export volumes averaged 33% higher than the average of 827,750 barrels per day exported during 1980. Petroleum product exports were valued at $600 million, or a 53% increase over those of 1980. Petrochemical exports also increased in volume and value over those of 1980. Natural gas exports to the United States averaged 288 million cubic feet per day, for a total value of $526 million for the year. The combined value of petroleum exports reached slightly less than $14.6 billion in 1981 and represented 75% of the total value of all exports.

Mexico exported crude oil to 25 countries during 1981 and, in addition, exported only petroleum products and petrochemicals to 7 other countries. The crude oil exports were 44% Istmus light crude oil and 56% Maya heavy crude oil.

After the first semester of 1981, Mexico's prices for petroleum generally became more competitive with world market price trends. At the beginning of 1981, Istmus light crude oil was valued at about $38.50 per barrel, but at the end of the year, it had fallen to $35 per barrel. Maya heavy crude oil began the year at $34.50 per barrel but was $28.50 by the end of 1981.

Mexican imports by mineral sector are shown below, in millions of dollars:

Sector	1980	1981
Extractive:		
Crude oil and natural gas	8	8
Metallic minerals	55	58
Nonmetallic minerals	194	191
Manufacturing:		
Petroleum derivatives	292	348
Petrochemical	535	522
Metallurgy	385	574
Iron and steel	1,824	2,126
Total	3,293	3,827
Percent share of total imports	18	17

Source: Informe Anual 1981, Banco de México S.A.

Table 2.—Mexico: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	5	(1)	(1)	
Antimony:				
Ore and concentrate	1,311	1,051	1,002	West Germany 49.
Metal including alloys, all forms	534	193	133	Brazil 48; El Salvador 10.
Arsenic trioxide, gross weight	r3,274	3,816	3,563	Brazil 175; New Zealand 36.
Bismuth metal including alloys, all forms	r240	165	165	
Cadmium metal including alloys, all forms	633	559	352	Brazil 164; Argentina 8; Colombia 6.
Cobalt, content of concentrates	(1)	--		
Copper:				
Ore and concentrate, copper content	18,742	89,787	--	West Germany 36,910; Japan 21,473; Spain 14,864.
Metal including alloys, all forms	r1,931	1,345	1,083	Japan 258; Sweden 2.
Iron and steel:				
Ore and concentrate, gross weight	413	981	981	
Metal including alloys:				
Scrap	1,153	3,367	3,264	Mainly from France.
Pig iron	567	(1)		
Sponge iron, powder, shot	449	16	14	
Steel, semimanufactures	15,298	12,504	11,918	Guatemala 166; Colombia 129.
Lead:				
Ore and concentrate, lead content	2,565	1,343	1,343	
Metal including alloys, all forms	r77,014	62,470	12,034	Japan 18,572; Italy 14,872; China 5,485.
Manganese ore and concentrate	r201,549	135,901	33,349	Japan 55,810; France 16,256.
Mercury 76-pound flasks	r183	386	32	Brazil 193; Argentina 38; Netherlands 31.
Nickel metal including alloys, all forms kilograms	r1,918	5,318	--	Belize 3,400.
Selenium, elemental	34	20	--	United Kingdom 9; Brazil 6; Honduras 5.
Silver metal, all forms thousand troy ounces	r30,264	33,800	8,322	Japan 9,838; United Kingdom 6,780; Switzerland 2,145.
Tin metal including alloys, all forms	15	--		
Tungsten: Ore and concentrate	r310	396	396	
Zinc:				
Ore and concentrate	r123,947	141,140	22,925	Belgium-Luxembourg 98,115; Brazil 7,596; Finland 5,299.
Metal including alloys, all forms	r74,074	59,624	23,559	Brazil 27,360; Guatemala 2,193; Colombia 1,813.
NONMETALS				
Abrasives, natural, n.e.s	(1)	1	(1)	
Asbestos	r32	21	--	Switzerland 18; Guatemala 2; Ecuador 1.
Barite and witherite	r126,664	115,596	115,546	Jamaica 50.
Clays, crude, n.e.s.:				
Bentonite	74	199	47	Dominican Republic 151.
Fuller's earth	16,557	20,673	727	Brazil 4,985; Peru 4,430; Turkey 4,085.
Kaolin	4	1,503	(1)	Cuba 1,500; Guatemala 1; Spain 1.
Diamond, gem, not set or strung carats	5,000	--		
Diatomite	r3,797	3,055	217	Peru 711; Brazil 525; Argentina 490.
Feldspar	127	20	--	Guatemala 20.
Fluorspar	r708,738	722,904	511,270	Canada 118,659; Poland 28,797; Brazil 12,666.
Graphite, natural	r36,694	36,705	36,612	Guatemala 68; Nicaragua 14; Venezuela 11.
Gypsum and plaster thousand tons	1,838	1,607	1,607	
Magnesite including magnesium oxide	260	4,019	56	Yugoslavia 2,790; Republic of South Africa 1,065.
Mica: Crude including splittings and waste	19	12	12	
Perlite: Crude, activated, expanded	r2,906	1,881	49	Brazil 813; Peru 211; Colombia 206.
Precious and semiprecious stones excluding diamond kilograms	r2,596	4,190	40	Japan 2,353; France 680.
Salt thousand tons	5,233	5,257	1,460	Japan 3,706; Nicaragua 44; Canada 39.
Sodium compounds, n.e.s.:				
Sodium hydroxide	252	1,692	--	Guatemala 684; El Salvador 544.
Sodium sulfate	r152,094	166,028	20	Brazil 127,563; Venezuela 18,657; Colombia 6,844.
Stone, sand and gravel:				
Dimension stone: Marble	1,003	898	314	Colombia 450; Guatemala 81; China 53.
Dolomite, crude and calcined, chiefly refractory-grade	2,461	788	--	Guatemala 750; El Salvador 37.
Gravel and crushed rock	NA	NA	NA	NA.
Quartz and quartzite	252	708	707	West Germany 1.

See footnotes at end of table.

Table 2.—Mexico: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Sand excluding metal-bearing	15,419	NA	NA	NA.
Strontium minerals (celestite)	39,963	31,954	31,543	Japan 411.
Sulfur, elemental, all forms thousand tons	r1,120	1,150	995	Brazil 44; France 43; Spain 21.
Talc and steatite	(1)	(1)	(1)	
Vermiculite	1,228	276	276	
Wollastonite	339	984	500	Nicaragua 382; Panama 97.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	983	624	44	Belize 580.
Carbon black	1,079	697	566	Argentina 75; Uruguay 23; Cuba 20.
Coal, all grades including briquets	r488	(1)	(1)	
Coke and semicoke	10	12	1	Nicaragua 10; Japan 1.
Petroleum:				
Crude oil thousand 42-gallon barrels	194,485	302,129	NA	NA.
Refinery products:				
Gasoline do.	--	--	NA	NA.
Kerosine do.	--	137	NA	NA.
Distillate fuel oil do.	98	446	NA	NA.
Residual fuel oil do.	1,442	NA	NA	NA.
Liquefied petroleum gas do.	2,161	5,313	NA	NA.

rRevised. NA Not available.
1Less than 1/2 unit.

Table 3.—Mexico: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	r38,559	37,527	24,846	Venezuela 7,267; Canada 2,552; France 2,406.
Arsenic kilograms	99	1	1	
Beryllium: Ore and concentrate do.	4,645	23	13	Japan 9.
Bismuth metal including alloys, all forms do.	r31	35	33	
Cadmium metal including alloys, all forms do.	r504	30	17	West Germany 7.
Chromium: Chromite	r55,086	36,906	23,769	Cuba 9,026; Philippines 1,682.
Cobalt metal including alloys, all forms do.	r69	76	31	Belgium-Luxembourg 37; Canada 6.
Copper metal including alloys, all forms	r22,678	43,287	21,492	United Kingdom 7,836; Chile 5,565; Netherlands 2,489.
Iron and steel:				
Ore and concentrate	571,916	381,418	256,967	Brazil 44,700; Bahamas 27,036; Canada 25,729.
Metal:				
Pig iron and similar materials	r49,995	98,335	88,698	Italy 8,126; Brazil 1,334.
Scrap	r356,097	232,883	232,143	
Sponge iron and powder	r21,651	38,259	38,255	
Steel, primary forms	r4,230	9,571	2,199	Italy 3,873; Ecuador 3,497.
Lead metal including alloys, all forms	r388	1,278	1,278	
Magnesium metal including alloys, all forms	r2,247	5,576	5,232	Canada 175; Norway 119; West Germany 45.
Manganese: Ore and concentrate	29,637	99,298	15,068	Congo 64,218; Brazil 20,012.
Mercury 76-pound flasks	82	(1)	(1)	
Molybdenum:				
Ore and concentrate	693	289	278	West Germany 11.
Metal including alloys, all forms	234	152	132	West Germany 17; Austria 2.
Nickel:				
Matte, speiss, similar materials	r4,590	3,208	2,287	France 356; Canada 212; Cuba 104.
Metal including alloys, all forms	r265	135	36	France 51; Belgium-Luxembourg 18; West Germany 16.

See footnotes at end of table.

Table 3.—Mexico: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals, all forms:				
Palladium ---------- troy ounces	r4,758	3,440	322	Switzerland 2,990; West Germany 64; Republic of South Africa 64.
Platinum ---------- do	r455	1,192	408	West Germany 579; Spain 109; Republic of South Africa 64.
Selenium, elemental ---------- kilograms	2,508	9	1	West Germany 8.
Tin:				
Ore and concentrate, gross weight	2,016	2,482	831	Peru 712; Singapore 445; Chile 247.
Metal including alloys, all forms	610	585	585	
Titanium:				
Ore and concentrate:				
Ilmenite	59,724	63,587	7,852	Australia 55,735.
Rutile	2,692	2,938	2,083	Australia 819; Switzerland 30.
Titaniferous slag	68	8,460	8,460	
Tungsten metal including alloys, all forms	r102	92	46	West Germany 46.
Zinc metal including alloys, all forms	r578	192	192	
NONMETALS				
Abrasives, natural, n.e.s	1,352	1,005	961	West Germany 42.
Asbestos	r71,648	79,013	24,315	Canada 42,189; Republic of South Africa 6,069; Switzerland 2,198.
Barite	92,832	127,490	58,469	Peru 28,503; India 22,697.
Boron materials:				
Crude natural borates	r59	275	275	
Clays, crude, n.e.s.:				
Bentonite	r9,735	6,675	6,666	United Kingdom 9.
Fuller's earth	r214	160	160	
Kaolin	r69,663	82,170	81,757	United Kingdom 131; Belgium-Luxembourg 66; Spain 60.
Cryolite	181	168	96	Denmark 70; West Germany 1.
Diatomite	228	801	799	West Germany 2.
Feldspar	3,434	3,184	3,181	Switzerland 2; Denmark 1.
Graphite, natural	310	380	364	West Germany 11; Switzerland 3.
Gypsum	r26,325	27,867	27,766	Italy 74; China 22.
Magnesite	28,794	29,098	26,569	Brazil 2,500; Netherlands 22.
Mica:				
Crude including splittings and waste	r72	98	66	Canada 23; Belgium-Luxembourg 2.
Worked including agglomerated splittings	549	446	432	Japan 8; Spain 3; West Germany 2.
Precious and semiprecious stones excluding diamond ---------- kilograms	r236,029	25,223	25,005	West Germany 208; Chile 10.
Quartz, piezoelectric and other crystal ---------- do	104	156	130	Japan 26.
Salt	864	1,339	1,339	
Stone, sand and gravel:				
Dimension stone: Marble	r3,309	3,367	142	Italy 1,853; Guatemala 1,240.
Dolomite, chiefly refractory-grade	125	105	105	
Quartz and quartzite excluding electrical-grade	2,115	2,065	1,388	Sweden 431; Switzerland 215.
Sulfur, elemental, all forms	r1,343	1,089	1,085	West Germany 2; Italy 2.
Talc, steatite, pyrophyllite	r160,090	150,308	146,384	Italy 3,738.
Vermiculite	683	877	877	
MINERAL FUELS AND RELATED MATERIALS				
Carbon black and gas carbon:				
Carbon black	r1,615	398	398	
Gas carbon	202	176	176	
Coal, all grades including briquets	701,557	816,259	670,020	Canada 88,485; Colombia 57,713.
Coke and semicoke	r126,818	110,228	101,025	Colombia 9,203.
Peat including peat briquets and litter	403	109	109	
Petroleum, refinery products:				
Gasoline --- thousand 42-gallon barrels	46	--	NA	NA.
Kerosine and jet fuel ---------- do	228	225	NA	NA.
Distillate fuel oil ---------- do	--	332	NA	NA.
Residual fuel oil ---------- do	5,593	NA	NA	NA.
Lubricants ---------- do	998	1,732	NA	NA.
Other:				
Liquefied petroleum gas ---------- do	2,944	3,053	NA	NA.
Paraffin ---------- do	7	16	NA	NA.
Unspecified ---------- do	--	21	NA	NA.

rRevised. NA Not available.
1Less than 1/2 unit.

COMMODITY REVIEW

METALS

Antimony.—At the end of 1980, NL Industries, Inc., sold its 49% share in Cía. Minera Refinadora Mexicana, S.A., to LIG Overseas Ltd., a subsidiary of Lead Industries Group, Ltd., of London. LIG interest was to be managed by the firm's U.S. subsidiary, Anzon America, Inc. Minera Refinadora operated an antimony mine at Wadley and has been the major supplier of ore to Anzon's antimony oxide plant at Laredo, Tex. Anzon expected that Minera Refinadora would initiate mine expansion plans. Anzon did not plan to build an antimony oxide plant in Mexico but expected to use the increased mine production to supply its expanding Laredo antimony plant.

Copper.—An estimated 80% of Mexico's copper production originated from mines in the State of Sonora. The opportunity for Mexico to provide more of its refined copper requirements remained dependent on the completion of the Mexicana de Cobre S.A. La Caridad smelter and refinery. Until then, Mexico must import significant amounts of refined copper while exporting significant amounts of copper concentrate. In 1981, Mexico imported over 105,000 tons of copper in various forms at a cost of $230 million.

A study by the Mexican Copper Producer's Association indicated that even if 1990 production capacity reached the projected target of 380,000 tons per year, internal demand could increase at a greater rate and reach 388,000 tons or more per year.

Increased production from the La Caridad Mine near Nacozari, Sonora, was the major reason for Mexico's upswing in total 1981 copper production. Even so, La Caridad's 1981 production and export of about 450,000 tons of copper concentrate was 22% below earlier projections. The 180,000-ton-per-year smelter under construction was expected to come onstream in 1983. The La Caridad complex was also to include a 150,000-ton-per-year refinery, a wire factory, and a 1,800-ton-per-day molybdenum plant. By the end of 1981, Mexicana de Cobre, a joint venture of private Mexican interests (56%) and Government agencies (44%), had invested over $1 billion in La Caridad, and completion of the smelter and molybdenum plant was estimated to require another $500 million. The refinery cost was estimated at an additional $100 million. The high costs were attributed to inadequacies in the original design of the tailings pond and the increased cost of building the smelter. A heavy investment was also required for the development of infrastructure.

In 1981, the Cía. Minera de Cananea mine and smelter produced about 38,000 tons of blister and electrolytic copper and 353,660 ounces of silver. The company was proceeding with a major expansion project, which included opening the Kino and Colorado-Veta open pits for mining and increasing capacities at the concentrator, smelter, and electrolytic facilities.

In 1981, Atlantic Richfield Co. sold its 34% interest in Cananea to the Nacional Financiera, the Government development bank. This Government bank then had a 49% equity in Cananea, while private Mexican interests held the remainder.

Industria Minera Mexico, S.A. (IMMSA), produced about 34,000 tons of copper as a coproduct from several of its mining operations. The more important of these were the San Martin unit in Zacatecas State, Charcas unit in San Luis Potosí State, Santa Barbara unit in Chihuahua State, Tecolote unit in Sonora State, and Inguaran unit in Michoacan State. The IMMSA 42,000-ton-per-year copper smelter at San Luis Potosí also processed concentrate from other producers.

The three major copper producers mentioned above accounted for about 92% of Mexico's total mine output of copper.

Iron Ore.—Mexico's domestic iron ore production was expected to meet the needs of the Siderúrgica Mexicana (SIDERMEX) controlled steel producers until the 1990's, after which it probably would be necessary to import ore. Pellet production by the major iron ore-producing companies is shown in table 4.

Table 4.—Mexico: Pellet production of major iron ore producers

(Million metric tons)

Company (principal mines)	1979	1980	1981	Average iron content (percent)
Consorcio Minero Benito Juarez—Peña Colorado (Peña Colorado Mine)	1.9	2.1	2.4	68
HYLSA—Grupo Industrial Alfa, S.A. (Las Encinas Mine)	1.5	1.5	1.6	67
Siderúrgica Lázaro Cárdenas-Las Truchas, S.A. (Ferrotepec Mine)	1.0	1.1	1.5	64
Fundidora de Monterrey S.A. (Cerro de Mercado and Hércules Mines)	.7	NA	.9	63
Altos Hornos de México S.A. (La Perla Mine)	.3	.4	.3	63
Total	5.4	[1]5.1	6.7	

NA Not available.
[1]Incomplete.

Hojalata y Lamina, S.A. (HYSLA), the steel company of Grupo Industrial Alfa, S.A., produced about 2 million tons of iron ore from its Las Encinas Mine, Colima State. In 1981, ore reserves at Las Encinas were estimated at 24 million tons. The ore was pelletized onsite. Las Encinas ore averaged 55% iron content compared with the 47% iron content of ore HYSLA received through its 28.5% equity in the Peña Colorado Mine.

HYSLA was actively exploring for new iron ore deposits in the States of Michoacan, Chihuahua, and Guerrero. Its development of the Aguila iron deposit in Michoacan State has been delayed, and mine production was not expected to begin until 1985. This mine was expected to produce 1.5 million tons of ore per year averaging 42% iron. HYSLA plans included the construction of a second pelletizing plant at the Las Encinas site to handle the increased input. The Aguila Mine is 91 kilometers from the Las Encinas site.

The Las Hércules Mines, Coahuila State, of Fundidora de Monterrey S.A. (FMSA) were not expected to produce above minimal levels until 1983 when the 90-kilometer, 8-inch slurry pipeline from the Altos Hornos de México S.A. (AHMSA) La Perla Mine in Chihuahua State was scheduled for completion. This pipeline was to feed into a 310-kilometer, 14-inch pipeline under construction from the Las Hércules Mines to Monclova. The FMSA Cerro de Mercado Mines in Durango State were expected to close in 1983, when both of the Las Hércules Mines in Coahuila State were to be operational. The Body No. 9 Mine at Las Hércules has been operational for 10 years, but the mine called Cascolinas had not yet opened. An estimated 1.5 million tons of concentrated ore would be pumped annually from La Perla to the Las Hércules site, where 3.5 million tons of concentrated ore would be added for further transport to AHMSA facilities at Monclova. Iron ore reserves at the Las Hércules Mines were revised upwards from 53 to 85 million tons. Ore reserves at the AHMSA La Perla Mine were estimated at 46 million tons.

Iron and Steel.—Although high interest rates and shorter periods for servicing debts continued to threaten many Latin American steel expansion projects, Mexican producers have proceeded with their ambitious plans to more than double their combined installed capacity by 1990.

On the whole, the Mexican steel companies have not encountered problems in obtaining financing. Financial difficulties of the Grupo Industrial Alfa, S.A., were reportedly caused by a combination of servicing large overseas loans and the Government relaxation of some controls on the importation and commercialization of steel products. In 1981, Alfa received a $680 million loan from the Government-owned Banco National de Obras Publicas S.A. Alfa budget reductions were not expected to affect the HYSLA expansion project at Monterrey.

HYSLA, Mexico's largest private steelmaker, formed one of the three Grupo Alfa divisions. The HYSLA main steelworks had a crude steel capacity of 970,000 tons per year and was located in Monterrey. Lower capacity HYSLA steelworks have been established at Xoxtla near Puebla (500,000 tons per year) and at Mezquital near Mon-

terrey (100,000 tons per year). HYSLA combined crude steel capacity approximated 1.6 million tons per year.

The HYSLA Monterrey expansion, Project 1600, involved a two-step process to raise capacity to 1.6 million tons per year by the end of 1983 and 2 million tons per year by 1985. To accomplish this, HYSLA planned to convert its No. 3 direct-reduction plant to the new continuous direct-reduction process known as HYL III. Through this modification, the plant capacity would be increased slightly from 480,000 tons per year to 500,000 tons. A new 750,000-ton-per-year direct-reduction plant, a new electric melting shop, improvements to the hotstrip and plate mills, a continuous cold mill, and soaking pits were also scheduled as part of the expansion project. The Puebla and Mezquital plants were also programed for a combined steel capacity increase from 600,000 tons per year to 1.1 million tons per year. Total combined HYSLA capacity in 1990 was projected at 3 million tons per year.

SIDERMEX, Mexico's state steel holding company, was programing steel and direct reduction plant expansions for the companies under its control—AHMSA, FMSA, and Siderúrgica Lázaro Cárdenas-Las Truchas, S.A., also known as SICARTSA. Tubos de Acero de México S.A., also known as TAMSA, Mexico's sole producer of seamless pipe and the second largest private producer of crude steel, expected to invest $700 million by 1985 to meet increased demands from PEMEX.

Reported capacity expansions planned by public and private steel-producing companies are shown below, in thousands of tons:

Company	1981	1986	1990
SIDERMEX:			
AHMSA	3,300	4,200	4,200
FUNDIDORA	1,150	1,350	1,350
SICARTSA	900	2,800	3,200
Future plant	--	1,800	6,100
Total	5,350	10,150	14,850
HYSLA:			
Monterrey plant	1,000	2,000	2,000
Mezquital plant	100	1,000	1,000
Puebla plant	500		
Total	1,600	3,000	3,000
TAMSA	440	820	900
Others	1,100	1,600	2,000
Grand total	8,490	15,570	20,750

Lead and Zinc.—In 1981, Mexico ranked seventh in world zinc mine production and sixth in world lead mine production. The decrease in silver prices influenced associated zinc production as some companies curtailed output from mines with low-grade silver values. Lead and zinc concentrate production was expected to rise in the future as several of the larger producers complete expansion programs.

The 114,000-ton-per-year electrolytic zinc refinery of IMMSA at San Luis Potosí was not completed in 1981. A revised date for startup testing was given as October 1982.

Molybdenum.—Mexico's entire 1981 molybdenum production was from the State of Sonora. In 1981, the Cumobabi Mine of Minas Cumobabi S.A., a subsidiary of Minera Frisco S.A. de C.V., completed its first full year of operation with a production of 467 tons of molybdenum trioxide. The company was reportedly experiencing some technical difficulty separating the molybdenum from associated copper.

AMAX entered into a joint venture with Cía. Minera Fresnillo to develop a molybdenum property at Opodope, also in Sonora State. This deposit was reported to have 150 million tons of medium-grade ore reserves.

The molybdenum plant at the La Caridad copper complex was to have been operational in 1981 but was rescheduled to open in 1982.

Silver.—In 1981, Mexico was again the leading world producer of silver, and despite the continuing downward trend of world market prices, production rose to a record level. The $550 million value of 1981 production was 44% below the value of 1980

production, even though the 1981 volume was 12% higher.

Silver reserves were last estimated in 1979 at 950 million troy ounces. Precise estimates are difficult to obtain because most silver is mined as a byproduct of other metals. Total annual mining capacity in 1978 was estimated at 60 million troy ounces, but by the end of 1982, this capacity was expected to increase to 75 million troy ounces. This increased capacity was expected to come from the Real de Angeles Mine, the La Minita barite mine, the Cuale Mine, and expanded capacity at the Taxco, San Martin, Fresnillo, and Santa Barbara Mines. Annual refining capacity in 1981 was about 50 million troy ounces.

In 1981, there were about 62 companies engaged in silver mining. Of these, seven accounted for about 70% of production, and the remainder came from small- and medium-size producers. The largest private producers were Industrias Peñoles S.A. de C.V., IMMSA, Minera Frisco S.A. de C.V., Minas de San Luis S.A., Minera Mexicana Sombrerete S.A., and Cía. Minera de Cananea.

The largest silver producer was Industrias Peñoles S.A. de C.V., whose major silver-producing mines were the Fresnillo and Naica units. These two mines were operated by Cía. Fresnillo S.A., in which Peñoles held a 60% equity and AMAX held 40%. The Fresnillo group of mines produced 7.9 million troy ounces of silver and 5,600 troy ounces of gold in 1981. Peñoles owned an electrolytic refinery at Torreon, Coahuila State, where ore purchased from other Mexican producers was also refined. Peñoles treated foreign concentrates, primarily from Peru, under temporary import permits. In 1981, Peñoles refined about 35 million troy ounces of silver, of which about 12 million troy ounces originated from its own mines or from the mines of its affiliated companies.

IMMSA was Mexico's second largest silver producer. IMMSA was the largest subsidiary of the joint holding company Mexico, Desarrollo Industrial Minera S.A. (MEDIMSA), in which Asarco, of the United States has maintained a 34% interest. All of the MEDIMSA-held affiliated companies produced 18.9 million troy ounces of silver and 52,900 troy ounces of gold in 1981. IMMSA produced about 7.5 million troy ounces of silver from its own mines.

Minera Frisco S.A. de C.V., a large silver producer from its own mines, joined with Placer Development, Ltd., of Canada (34%) and the Comisión de Fomento Minera (33%) to form Minera Real de Angeles S.A. de C.V. as the operating company for the Real de Angeles silver mine in the State of Zacatecas. When fully operational, this $170 million project was expected to be the largest open pit silver mine in the world and have a production of 7 million troy ounces of silver per year. Mine development was well underway, and production was scheduled to begin in May 1982. In 1981, Frisco joined with Armco, Inc., of the United States, to form Minera Cerro de Plata S.A. de C.V. to explore for silver ore in northwestern Mexico.

Industrias Luismin S.A. de C.V., Minera Mexicana Sombrerete S.A., and Government-owned Cía. Real del Monte y Pachuca S.A. have each produced about 3 million troy ounces of silver per year, as has Cía. Minera de Cananea, a major copper producer.

A number of silver projects have been held back owing to high financing and development costs and lower than projected silver prices. The 40% excess profits tax on silver imposed in 1980 was a deterring factor to mine development. Given silver's subsequent price decline, the effect of this tax became largely psychological, and it was removed in June 1981. The unfavorable factors governing increased output, primarily silver prices, may continue to dominate company decisions on expansions and new projects. Small producers were especially susceptible to silver price declines, and many were threatened with closure.

Tungsten.—In 1981, about 250 tons of tungsten concentrate was produced in the State of Sonora, representing about 90% of Mexico's total production. Sonora's output was dominated by three companies, of which Tungsteno de Baviacora, S.A., was the largest producer. The producing companies have been seriously affected by reduced market prices and were reported as preparing to scale down their operations.

Two Canadian companies have formed a joint venture with Grupo Alfa to develop the San Alberto Mine near Alamos, Sonora State. San Alberto ore reserves were estimated at 6 million tons averaging 0.6% tungsten. Production was scheduled to begin in 1983, although the expected rate of mine output was unannounced.

NONMETALS

Barite.—The brisk demand for barite from the oil industry continued to prompt new mining investment in Mexico. Production by one of the newer companies, Government-owned Barita de Sonora S.A. de C.V., reached 500 tons of barite per day in 1980. The company estimated that production would eventually reach 300,000 tons per year. The company reported proved reserves of 15 million tons and had acquired exclusive exploration rights on a 76,800-hectare tract near Mazatan, Sonora. Barita de Sonora budgeted over $24 million for exploration work in 1982.

The other large barite producer under development in Sonora State was Minera Baucarit S.A., a privately held company formed by F.M.C. Corp. of the United States and Protexa, S.A., of Mexico. Baucarit's open pit mine, located 100 kilometers east-southeast of Hermosilla, had reported proven reserves of 20 million tons. About 475,000 tons of material was to be mined annually, including 290,000 tons of ore and 145,000 tons of waste.

In the area surrounding Tecolotlán, Jalisco State, approximately 23 barite mines were under development at a total initial investment cost of almost $3 million.

The La Minita barite mine, owned by Peñoles and located in Michoacan State near the towns of Aguililla, Taricato, and Chinicuila, initiated production in 1981. It was expected to eventually produce 240,000 tons of barite per year plus 30,000 tons of zinc concentrate, 4,000 tons of lead concentrate, and some silver. The ore averages 59% barium carbonate-barium sulfate. Barite demand by the Mexican oil industry was expected to be over 600,000 tons in 1982, well above the present production capability of the domestic producers.

Fluorspar.—Mexico retained its position as the largest fluorspar producer and in 1981 accounted for 19% of world production. A substantial volume of Mexican acid-grade fluorspar was used by four domestic plants to produce hydrofluoric acid. Mexico's sales of fluorspar by grade are shown in the following tabulation, in thousand metric tons:

	1978	1979	1980	1981
Grade:				
Submetallurgical	226	178	210	193
Metallurgical	298	278	300	307
Ceramic	45	78	104	108
Acid	490	534	492	508
Total	1,059	1,068	1,106	1,116

Mexico's major export markets continued to be the United States and Canada. Competition from South African acid-grade material and Chinese metallurgical-grade, both lower priced, has had some affect on Mexico's export sales, which declined 16% to 604,900 tons in 1981. The Instituto Mexicana de la Fluorita has set the export price for Mexican fluorite, primarily to protect the small producer.

Although there were about 140 mines producing fluorspar in Mexico, 9 of these accounted for 85% of production. Mexico's largest individual producer was Cía. Minera Las Cuevas, S.A., operating in the State of San Luis Potosí. Las Cuevas, which alone contributed 33% to Mexico's total production, planned to increase acid-grade capacity from 200,000 to 300,000 tons per year by 1983.

Phosphate Rock.—Under Mexican mining law, phosphate mining is closed to companies with foreign participation. In January 1981, phosphate production began at the new state-owned Roca Fosfórica Mexicana S.A. de C.V. (ROFOMEX) mine in Baja California. Full production of 60,000 tons per month of phosphorus pentoxide at the ROFOMEX San Juan de la Costa Mine was reportedly reached at the end of the year. All output was shipped by sea to the Fertilizantes Mexicanos S.A. plant at Lázaro Cárdenas, about 200 miles northwest of Acapulco.

The San Juan de la Costa reserves, located 35 miles north of La Paz on the Gulf of California, were reported at 45 million tons grading 18% P_2O_5. The beneficiation and concentration processes used seawater, and fresh water was used after flotation to remove chlorides. ROFOMEX, concerned with environmental effects, was experi-

menting with several different techniques to reduce the discharge of effluents into the sea.

The Santo Domingo phosphate operation on Baja California's Pacific coast, about 150 miles northwest of La Paz in the area of Bahia de Magdalena, was in the construction phase with startup scheduled for late 1982. ROFOMEX expected Santo Domingo output to reach 1.5 million tons per year by late 1983. Proven reserves at Santo Domingo were reported at 1.1 billion tons, averaging less than 5% P_2O_5. The proven reserves represented about 4% of the whole phosphate-bearing beach sand in the area. The planned mining technique was to be dredging. Although a low-grade ore, the sand-grain nature of Santo Domingo reserves offered the advantage of lower mining and processing costs.

Sulfur.—In 1981, Mexico, the biggest sulfur producer in Latin America and the fourth largest in the world, planned to raise sulfur output from 2.1 million tons in 1980 to 3.2 million tons in 1985. Sulfur was an important source of foreign exchange, and domestic needs were estimated to reach 1.8 million tons by 1985. This would leave 1.4 million tons for export. The main sulfur producers in Mexico were Azufrera Panamericana, S.A. (APSA), and Cía. Exploradora del Istmo, S.A., both state-owned companies. The two firms shared a merged management and also were responsible for the international marketing of the recovered sulfur produced by PEMEX in its refineries.

In 1981, sulfur was mined in Jaltipan, Texistepec, and Coachapa. Mesquital, a group of deposits near Minatitlan and Hidelgotilan, Veracruz, was being considered for exploitation. The newest APSA sulfur venture was the fully automated $66 million Coachapa plant that went into operation in September 1981. The plant had an initial capacity of 600,000 tons per year. APSA had also invested another $66 million in a new sulfuric acid plant in Jaltipan, Veracruz.

During the period 1977-80, the United States imported 43% of its foreign sulfur from Mexico, the second most important source after Canada.

MINERAL FUELS

In February 1981, the Mexican National Energy Plan (NEP) was passed into law. The major parts of the NEP were discussed in the 1980 Minerals Yearbook, Volume III, chapter on Mexico. An impact assessment of the NEP was difficult because it had been in effect for only a short time and was based on then-existing planning in the various energy sectors. Some of the NEP goals have shown signs of proving elusive. Namely, the readjustment of domestic fuel and electricity prices, particularly gasoline and diesel fuel, the demand for which has been increasing faster than anticipated. This has had repercussions in the refining sector where it was reported that expansion plans may need to be accelerated. The NEP was also tied to the National Industrial Development Plan and the economic and energy growth forecasted by that plan.

Regardless of whether some reevaluations or adjustment in the NEP become necessary, the plan represented an official commitment to develop all energy resources as opposed to allowing energy development to fall into overdependence on petroleum.

Coal.—Almost 100% of the coal produced in Mexico originated in the State of Coahuila. There are eight well-known coal basins in that State that contain 90% of Mexico's 2.4 billion tons of proven coal reserves—Sabinas, Las Esperanzas, Saltillo, Lampacitos, San Patricio, Las Adjuntas, Monclovia, and El Salvador.

About 44% of Mexico's producing operations have utilized longwall mining techniques, 36% utilized open pit mining, 14% involved traditional room and pillar techniques, and 6% employed other removal techniques.

In December 1981, the Comisión Federal de Electricidad, also known as CFE, inaugurated the first generating unit planned for Rio Escondido, Mexico's first large-scale coal-fired electric generating plant. This $630 million complex was designed to have four 300-megawatt generating units. The second generating unit was expected to become operational in 1982, followed by the remaining two units in 1983. The facility was under construction about 29 kilometers south of the town of Piedras Negras in Coahuila State. The facility was to service an area where electricity demands have been increasing rapidly, including Monterrey and Monclovia.

Coal to fuel the plant was to be mined from nearby underground and surface mines by the state-operated Minas Carbonifera Rio Escondido S.A. Proved noncoking steam coal reserves in the vicinity were placed at 322 million tons. Probable reserves, estimated at 600 million tons, were

considered sufficient to provide fuel for three plants the size of Rio Escondido for 30 years or more. The coal has been described as having a high-ash and low-sulfur content. Pollution controls have been incorporated into the thermoelectric facility design, and no environmental problems were anticipated. About two-thirds of the 37% ash residue expected from burning the coal was to be recovered from exhaust gases and stored for use in the cement and building-material industries. The remaining one-third of ash residue would be recovered from the bottom of the boilers. Not considered recyclable, it would be buried in designated areas to prevent wind-carried contamination.

Petroleum and Natural Gas.—The official 1980 estimate of 60 billion barrels of proved crude oil, natural gas liquids, and dry natural gas liquid equivalents was increased to 72 billion barrels in 1981. Discounted as erroneous were reports that these hydrocarbon reserves had reached 106 billion barrels. Without the dry natural gas liquid equivalent reserves, Mexico tied with Iran to rank fourth in the world in proven petroleum reserves. Higher reserve figures were generally expected to be announced in 1982, if discoveries made during 1981 in southern Mexico prove to be as large as preliminary data indicated.

The increased proven reserves were principally due to the discovery of deposits in the Gulf of Campeche, Mesozoic deposits in the Chiapas-Tabasco areas, and a re-evaluation of the paleocanal deposits of Chicontepec. The proven hydrocarbon reserve components included 48 billion barrels of crude oil, 9 billion barrels of natural gas liquids, and 15 billion barrels of dry natural gas liquid equivalent. Proven hydrocarbon reserves, by zone, are shown in table 5.

Table 5.—Mexico: Proven hydrocarbon reserves

(Million 42-gallon barrels, unless otherwise specified)

Zone	Dry natural gas (billion cubic feet)	Liquid hydrocarbons				
		Crude oil	Condensate	Dry natural gas liquid equivalent	Total 1981	Total 1980
Northern	11,248	432	295	2,250	2,977	2,761
Central[1]	3,782	1,410	196	756	2,362	2,526
Southern	33,599	35,312	7,102	6,659	49,073	37,235
Chicontepec	26,724	10,930	1,322	5,345	17,597	17,605
Total[2]	75,352	48,084	8,915	15,010	72,008	XX
Total 1980	64,511	44,161	3,063	12,902	XX	[2]60,126

XX Not applicable.
[1]Includes Angostura and Poza Rica.
[2]Data may not add to totals shown because of independent rounding.

Source: Petróleos Mexicanos. Memoria de Labores, 1980, 1981.

In 1981, total crude oil production increased 19% over that of 1980, mainly because of a 21% increase in output from the Southern Zone. Within this zone, the Gulf of Campeche and the Comalcalco district were especially productive. As shown in table 6, the Southern Zone was again the predominant producing area, overshadowing the other zones with a 92% share of total crude oil production.

In 1981, natural gas production was very close to early projections of just over 4 billion cubic feet per day. Almost 17% of this gas was flared. All of the associated gas produced in the offshore Campeche fields was flared at the production site. PEMEX had almost completed a pipeline system from these wells to shore, which would allow almost all of the Campeche natural gas to be collected. Facilities to remove sulfur were under construction, as were increases in gas transmission capacities and new links in the national gas pipeline network.

Table 6.—Mexico: Petroleum and natural gas production

Region and district	Natural gas (million cubic feet)		Crude oil (thousand 42-gallon barrels)	
	1980	1981	1980	1981
Northern Zone:				
Northeastern Frontier	192,034	168,108	r [1]313	[2]237
Northern	20,065	20,719	12,833	12,400
Southern	7,314	8,959	7,006	7,233
Total	219,413	197,786	r20,152	19,870
Central Zone:				
Poza Rica	56,238	45,727	[3]42,466	[4]42,895
New Golden Lane	7,147	14,578	--	--
Papaloapan Basin	13,109	18,621	r [5]4,447	[6]5,811
Total	76,494	78,926	r46,913	48,706
Southern Zone:				
Agua Dulce	23,177	21,390	20,571	18,442
Ciudad Pemex	157,123	184,813	47	28
Comalcalco:				
Tertiary	7,246	6,752	7,856	7,761
Cretaceous	701,039	778,306	365,458	333,648
El Plan	18,271	19,360	21,192	18,912
Nanchital	1,332	1,621	1,893	1,760
Gulf of Campeche	94,486	193,242	224,511	395,114
Total	1,002,674	1,205,484	641,528	775,665
Grand total	1,298,581	1,482,196	r708,593	844,241

rRevised.
[1]Includes 124,440 barrels of condensate.
[2]Includes 105,485 barrels of condensate.
[3]Includes 39.5 million barrels of light crude and 2.9 million barrels of heavy crude.
[4]Includes 40.4 million barrels of light crude and 2.5 million barrels of heavy crude.
[5]Includes 14,640 barrels of condensate.
[6]Includes 203,305 barrels of condensate.

Source: Petróleos Mexicanos. Memoria de Labores, 1980, 1981.

PEMEX completed 342 developmental wells in 1981, of which 69 produced gas, 201 produced oil, 27 were for injection, and 45 were abandoned. Successful gas wells were drilled in the Reynosa, Monclova, Central Papaloapan, Comalcalco, and Ciudad Pemex districts. Successful oil wells were drilled in the Ebano, Cerro Azul, Poza Rica, Central Papaloapan, Nanchital, Agua Dulce, Comalcalco, and Campeche Sound districts.

In 1981, PEMEX drilled 70 exploration wells, of which 12 found natural gas, 12 encountered oil, 39 were dry holes, and 7 were stratigraphic tests. The gas discoveries were made in Reynosa, Monclova, and Comalcalco districts, and the oil discoveries were made in Monclova, Cerro Azul, Poza Rica, El Plan, Agua Dulce, and Comalcalco districts.

By the end of 1981, PEMEX estimated some type of exploration work had been carried out over 15% of Mexico, leaving to be explored 65% of the remaining land area. The remaining 20% of land area was not considered to have any potential.

New crude oil discoveries in the Chiapas, Tabasco, and Campeche Sound area lent credence to the hypothesis that Mexico's southern oil-producing region constitutes a single vast interconnected reserve system instead of separate oil-bearing areas.

Onshore wells drilled north of Cardenas were reported as encountering large reservoirs of light crude oil. The new Mora area in the State of Tabasco was designated as within the Huimanguillo oil province, which extended from the coast for 100 kilometers inland to the Chiapas Mountains. The Mora reserves were described as occurring in Upper Jurassic rocks thought to cover a surface area of 30 square kilometers and averaging 500 meters in thickness. Additional work north of Huimanguillo in an offshore area adjacent to the Arrastradero Field has reportedly established a relationship between the onshore and offshore deposits. PEMEX planned to concentrate

exploratory drilling in these areas to evaluate the potential volume of these all-important light crude oils. Most of the crude oil from the Campeche areas have been of heavy grades, and the prospect of adding significant reserves of light-grade oil was encouraging.

Gas discoveries in the Gulf of California near the mouth of the Colorado River were not scheduled for immediate development. Although they represented potentially large fields covering 40,000 square kilometers, PEMEX expected that the offshore Campeche gas pipeline completion and gas available from the onshore Huimanguillo area would assure Mexico a sufficient gas supply for the near future. Baja California and Sonora State gas requirements were expected to be met by the transmission of Mexican east coast gas through the United States and back into Mexico.

In 1981, basic petrochemical production reached 9 million tons and represented a 27% increase over that of 1980. In 1981, PEMEX had 84 petrochemical plants that produced 41 products to meet 85% of domestic demand. Additional petrochemical plants at El Tejar in Veracruz State and Morales, Tabasco 1, and Huimanguillo in Tabasco State were under construction. Two other plants, at Laguna de Ostión and Altimira, were in the engineering stages.

Uranium and Nuclear Power.—Mexico's commitment to nuclear power development became more decisive as bids were solicited for a $2 billion contract to complete the first nuclear complex near Laguna Verde in Veracruz State. The expanded capacity was expected to add about 2,400 megawatts to the 1,300 megawatts under construction at the site. Mexico's publicized plans called for the installation of 20,000 megawatts of nuclear power by the year 2000.

Uranio Mexicano, S.A., also known as URAMEX, the state-owned entity responsible for the exploration, exploitation, beneficiation, and marketing of radioactive minerals in Mexico, classified uranium reserves in three categories: proven, probable, and potential. Proven reserves were further divided into mineral and geologic reserves. Mineral reserves were those considered to be economically recoverable, and geologic reserves were those that have been measured but were not evaluated as to economic recoverability. Probable reserves were based on preliminary findings indicating the existence of mineral and/or geologic ores. Potential reserves referred solely to estimates based on indications of uranium deposits, with no regard to the current economic recoverability of the deposits.

Total proven uranium reserves were reported at 19,261 tons of yellow cake equivalent, of which 15,000 tons was considered economically recoverable. The proven reserves were distributed in the States of Chihuahua (5,092 tons), Durango (210 tons), Nuevo Leon (2,984 tons), Oaxaca (10,000 tons), Sinoloa and Baja California (500 tons), and Sonora (475 tons).

Other uranium reserves were reported as associated with the Cananea copper deposits in the State of Sonora and with the phosphate rock deposits in Baja California Sur. The Baja California Sur deposits at the San Juan de la Costa and Santo Domingo areas were considered in the potential category and have been estimated at 150,000 tons. Studies indicated that the phosphate deposits at these locations average from 100 to 120 parts per million uranium oxide. It was thought that the large-scale mining operations planned for the two deposits would make the extraction of uranium oxide economically feasible. The copper solution at the Cananea copper mine was estimated to contain 6 parts per million of uranium oxide and could result in the recovery of 80 tons per year of yellow cake.

The first uranium mining and processing operation was expected to take place in 1982 at the Los Amoles deposit in Sonora State where proven reserves were reported at 475 tons.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Mexican pesos (Mex$) to U.S. dollars at the average rate for 1981 of Mex$24.51=US$1.00.

The Mineral Industry of Morocco

By Kevin Connor[1]

The mineral exports of Morocco contributed approximately 7% of the country's total gross national product (GNP) in 1981, which was valued at $15.1 billion. A series of problems in 1981 largely beyond Morocco's control caused early setbacks in its new 5-year development plan. They were a severe winter-spring drought, a 35% devaluation of the Moroccan dirham against the dollar, a rise in interest rates worldwide, continuing high oil import costs, and a billion-dollar-per-year military defensive effort over the disputed annexation of the Western Sahara by Morocco.[2] All of these factors combined created a 1981 trade-balance deficit of $2.1 billion;[3] which is a 50% decline from that of 1980 and a good indication of a poor year for the Moroccan economy.

Morocco's important minerals sector generally stagnated in 1981. The Minerals Production Index published by the Moroccan Government slipped 1 percentage point to 148 for the year (1969=100), reflecting flat production levels caused largely by a generally soft world market for most of the country's mineral exports. This was especially true for phosphates, Morocco's largest single export. Uncertainty among European farmers over market prices led to decreased fertilizer consumption, cutting the demand for phosphates in the country's major market. The dollar-dominated price of phosphates on the world market also led Morocco's traditional European customers to drawdown stocks to some extent in hopes that the dollar would soon devaluate relative to their currencies. Exports of most other mineral ores did no better, with the notable exceptions of zinc and barite.

In spite of overall stagnation and falling world prices in the minerals sector, Morocco continued to invest heavily in this area. Investment is estimated to have reached approximately $1 billion in 1981. With an 84% dependence on imported crude petroleum that cost about $1.75 billion for the year, Morocco embarked on major programs to search for indigenous oil deposits and develop its known large reserves of oil shale.[4] Recently reported Moroccan plans for developing its oil shale reserves include the construction of a commercial retorting plant capable of producing 70,000 barrels per day of oil by the early 1990's. Morocco's oil shale reserves are presently listed as the fourth largest in the world, after those of the Soviet Union, the United States, and Brazil. Reserve tonnages are calculated at an equivalent 23 billion barrels of oil within the country's three known major oil shale fields. Other activities in the oil shale sector are moving forward fueled by the recently announced $20 million oil shale project loan financed by the World Bank. An important gas find in the Essaouira Basin area in December 1981, drilled with World Bank financing, spurred interest by several major oil companies. Two contracts were signed recently for important offshore exploration programs.

Morocco's phosphate monopoly and largest employer and revenue generator, the Office Cherifien des Phosphates (OCP), initiated an approximate $6 billion 5-year development plan that will allow the firm to double its rock production by the end of the decade and process 30% of that production into finished products by the turn of the century. Owing to expansion efforts at the Bleida copper mine, Morocco became the Arab world's largest producer of copper. The country now also is the Arab world's only gold producer and continues to produce

10% of the world's cobalt. Coal, copper, silver, gold, and lead production are planned to increase in the coming years along with phosphate and barite. These and other expansion plans, smelting and foundry projects, and exploration efforts mean opportunities for foreign investors. The new Mining Investment Code, which should be promulgated before the end of 1982, will likely contain increased incentives for foreign investors, who are becoming increasingly interested in Morocco's mineral potential.

The United States and Moroccan Governments jointly sponsored a Mining Colloquium held in Morocco during March 1981. The colloquium provided an opportunity for exchange of information on investment potential and conditions under which investment was possible in each country. Also, the current state of mining operations and recent technological breakthroughs in each country were discussed, especially in the fields of pollution control, energy efficiency, and usage of scarce water resources in the beneficiation process.

Government Policies and Programs.—A new investment code drafted by the Moroccan Government will be implemented during 1982. The code will allow foreigners a 100% shareholding in industrial enterprises and a majority representation on the board of directors. Under the old code, foreigners were allowed a maximum of 50% shareholding in companies, and the board of directors had to have a majority of Moroccan nationals, including the chairperson. There are many benefits and tax incentives built into the new code to entice foreign investments into the more underdeveloped parts of the country. Also, to encourage labor-intensive projects that will help mitigate the country's unemployment problem, the Government will be offering a cash bonus to investors for each permanent job created by the new enterprises.

The Moroccan Parliament adopted legislation in 1981 to set up an exclusive economic zone extending to 370 kilometers off the country's coast. This legislation gave Morocco sovereign rights to the economic exploitation of mineral resources and fishing in the defined zone along both it's Atlantic and Mediterranean coastlines, including the coastal waters off Western Sahara. Previously, Morocco's claim to territorial waters extended only to a distance of 22 kilometers, and its fishing zone stretched to 130 kilometers.[5]

Responsibility for hydrocarbons exploration and development was transferred from the Moroccan Bureau de Recherches et de Participations Minières (BRPM) in April 1981 and invested in a newly formed governmental organization, the Office National de Recherches et de l'Exploitation des Petroles (ONAREP). ONAREP is responsible for oil and gas exploration as well as oil shale development and undertakes these activities through its own in-house efforts and the granting of joint-venture concessions to foreign exploration companies.

PRODUCTION AND TRADE

Morocco's minerals sector was relatively stagnant in 1981, and overall production was unchanged from that of the previous year. Exports increased only 3% on a tonnage basis, although revenue value was up 27%. This was due mainly to increased phosphate prices at the beginning of the year and the fact that all phosphate trading is done in dollars, which appreciated considerably against the Moroccan dirham. Increases in production were limited to barite, fluorine, mica, zinc, and anthracite. Moroccan barite remained high in demand because Iranian production declined seriously over the past years, as attested by the 45% increase in Moroccan production tonnage and the 33% increase in the export price attained over the 1980 price. Zinc export prices also were up, increasing an average of 45% over those of the previous year. Owing to the continued depressed state of the steel industry worldwide, iron ore production and trading were at a several-year low. Copper was another commodity that fared poorly in the marketplace this year as reflected by the 1% increase in export revenues versus the 15% increase in tonnage traded. Although anthracite production was up only 3%, the Government planned to mechanize the mine and double production over the next 3 years.

In 1981, the Moroccan Government continued to place heavy emphasis on its search for and development of, indigenous energy resources. The country's continuing heavy dependence on imported energy remains a major contributor to Moroccan economic difficulties. Imported petroleum crude amounted to $1.3 billion in 1980, or 30% of total imports. Estimates for import-

ed crude in 1981 increased to $1.75 billion. At present, domestic fuel resources only meet about 16% of the country's demands. As a result, Morocco has become intent on discovering and developing more of its own energy resources. In response to this crisis, both onshore and offshore oil exploration activities have been stepped up, with major offshore oil exploration agreements signed in 1981 with Mobil Oil Co. and Atlantic Richfield Co. (ARCO) of the United States. Using a $50 million loan from the World Bank, ONAREP conducted exploratory drilling in the Essaouira area and made a major high-pressure gas find late 1981. To exploit Morocco's oil shale reserves, estimated at well over 20 billion barrels of oil equivalent, the Government, in 1981, finalized agreements with Royal Dutch/Shell Oil Co., Davy McKee Co., Science Applications Inc., and the Tosco Corp. of the United States for developing pilot-scale retorting facilities and conducting in-depth feasibility studies for industrial-scale exploitation of the reserves.

As part of Morocco's current 5-year development plan, six new mines will be opened to boost Moroccan nonphosphate production. Three of these projects are copper mines. Of the remaining three, one will produce lead, zinc, silver, and gold; one, just lead and zinc; and the third, only silver. More than $150 million is slated over the 5-year plan period for nonphosphate mineral exploration.[6]

With a World Bank loan of $9.5 million, Morocco will carry out a pilot project to improve production from small mines in the southern Atlas region. The loan will be used by Centrale d'Achat et de Developpement de la Region Miniere du Tafilalet et de Figuig (CADETAF), an organization formed by the Government to market production from mines in Errachidia, Figuig, and part of Ouarzazate Provinces. CADETAF will acquire a mobile lead concentrator, a mobile zinc concentrator, a crushing and grinding unit, and mining equipment such as compressors, mine cars and tracks, and pumps. A study will be conducted to assess the impact of the pilot project on mining production and the income and welfare of the 7,500 miners involved in the project. The World Bank loan is for 17 years, including a grace period of 4 years, with interest at 11.6% per year.

Expansion work is continuing at the Port of Mohammedia, northwest of Casablanca, to improve handling capabilities of the port for safely accommodating ships of over 10,000 tons. The improvement work will provide the port with sheltered stations for unloading large oil tankers, which at present are susceptible at the open port to ocean surges that are considered a safety risk over one-third of the year. The expansion work, begun in mid-1980, will provide 2,600 meters of protective jetty, with six tanker sections for 10,000- to 150,000-ton ships. The estimated cost of the work is $117 million, including the construction of pipelines that will link unloading oil tankers to the Moroccan-Italian Refining Corp. (SAMIR) oil refinery, which has recently doubled its production capacity.

Morocco's OCP has reportedly signed a contract with the Soviet Union's Tsvetmetproexport under which the Soviets will loan Morocco $20 million to finance the exploitation of phosphate reserves at Meskala, in the southern part of the country. The two main areas of phosphate-bearing rocks in this region are to the north of Imi-n-Tanout on the northern slopes of the western High Atlas mountain range and still further north to the west of Chichaoua. The Soviet loan is to cover a 20-year period at 2 1/2% interest and will be paid back in phosphate rock output from the Meskala region. Development of the new mining venture will take place in three stages with production startup anticipated in 1983. The Soviet Union's interest in the Meskala deposit is enhanced by the uranium content of the rock as well as its phosphoric value.

Table 1.—Morocco: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Antimony concentrate:					
Gross weight	3,355	5,265	4,384	1,278	1,120
Metal content	1,409	2,211	1,973	550	470
Cobalt concentrate:					
Gross weight	7,805	8,719	8,008	6,704	6,265
Metal content	1,015	1,134	961	838	752
Copper concentrate:					
Gross weight	12,112	12,217	23,500	24,067	23,304
Metal content	4,845	4,657	7,050	7,220	6,710
Iron and steel:					
Iron ore, direct-shipping:					
Gross weight	441,044	58,938	61,700	78,020	49,854
Iron content	282,268	37,720	39,488	49,933	31,150
Metal:					
Pig iron[e]	12,000	12,000	12,000	12,000	12,000
Steel, crude[e]	5,000	6,000	6,000	6,000	6,000
Lead:					
Concentrate:					
Gross weight	155,685	167,054	165,300	172,320	168,406
Metal content	93,411	100,230	115,710	115,454	121,000
Metal:					
Smelter, primary only[e]	33,200	28,600	35,300	40,300	40,000
Refined:					
Primary	33,136	28,518	35,275	40,261	40,000
Secondary[e]	1,500	1,500	1,500	2,100	2,100
Total	34,636	30,018	36,775	42,361	42,100
Manganese ore, largely chemical-grade	113,547	126,200	135,700	131,315	109,645
Nickel, Ni content of cobalt ore[e]	156	174	160	134	130
Silver, mine output, metal content thousand troy ounces	2,820	3,131	3,283	3,154	2,500
Tungsten, mine output, metal content kilograms	--	--	1,134	3,165	3,200
Zinc concentrate:					
Gross weight	22,153	12,217	12,900	13,798	14,669
Metal content	7,754	4,276	4,515	6,071	6,300
NONMETALS					
Barite	149,920	176,813	286,467	320,585	463,869
Cement, hydraulic thousand tons	2,870	2,819	3,276	3,552	3,600
Clays, crude:					
Bentonite	4,807	4,800	1,015	3,284	3,300
Fuller's earth (smectite)	21,025	8,000	13,586	17,430	18,000
Montmorillonite (ghassoul)	NA	2,065	5,518	4,271	4,300
Feldspar	--	--	--	1,594	1,600
Fluorspar, acid-grade	40,000	54,200	63,200	64,400	65,000
Mica	--	--	363	331	1,805
Mineral water cubic meters	24,213	20,400	46,007	69,124	70,000
Phosphate rock:					
Morocco proper thousand tons	17,572	19,713	20,000	18,824	18,824
Western Sahara do	232				
Pigments, mineral: Natural iron oxide (goethite)	35	[e]20	25	121	100
Pyrites and pyrrhotite, gross weight	149,972	190,400	197,115	124,576	120,000
Salt, all types	12,442	34,813	102,000	67,477	70,000
Sulfur, S content of pyrites	44,992	60,924	63,077	36,052	38,400
MINERAL FUELS AND RELATED MATERIALS					
Coal, anthracite thousand tons	707	720	710	680	703
Fuel briquets do	7,962	[e]7,000	NA	NA	6,000
Gas, natural:					
Gross million cubic feet	3,037	2,898	2,666	[e]3,000	3,000
Marketed do	3,002	2,800	2,600	[e]2,900	2,400
Petroleum:					
Crude thousand 42-gallon barrels	167	187	140	[e]365	300
Refinery products:					
Gasoline do	3,411	2,017	3,810	2,980	3,000
Jet fuel do	1,788	1,196	2,028	NA	2,100
Kerosine do	NA	550	506	NA	500
Distillate fuel oil do	5,200	5,081	8,838	8,840	10,200
Residual fuel oil do	8,358	9,412	12,399	12,100	12,400
Other do	1,070	833	1,783	1,800	2,000
Refinery fuel and losses do	1,160	1,126	[e]1,650	NA	1,800
Total do	20,987	20,215	31,014	NA	32,000

[e]Estimated. [p]Preliminary. NA Not available.

[1]Includes data available through July 26, 1982.

[2]In addition to the commodities listed, a variety of crude construction materials is produced, but available information is inadequate to make reliable estimates of output levels.

Table 2.—Morocco: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	1,184	650	--	Belgium-Luxembourg 373; Italy 149; France 10.
Semimanufactures	7	15	--	All to France.
Copper:				
Ore and concentrate	21,272	22,274	--	Spain 12,699; Belgium-Luxembourg 2,928; West Germany 2,646.
Matte	1,219	1,743	--	West Germany 1,426; Belgium-Luxembourg 317.
Metal including alloys, all forms	1,902	21	--	Belgium-Luxembourg 18; France 3.
Iron and steel:				
Ore and concentrate	99,686			
Pyrites, roasted	--	143,502	--	West Germany 69,881; Yugoslavia 33,501; Switzerland 26,100.
Metal:				
Scrap	88,559	34,667	--	Italy 12,710; Spain 12,480; Egypt 8,700.
Steel, primary forms	1,700	750	--	All to Spain.
Semimanufactures	406	280	--	Switzerland 203; Mauritania 74.
Lead:				
Ore and concentrate	118,540	111,637	--	France 24,056; Tunisia 20,382; Italy 12,459.
Metal including alloys, unwrought	34,250	32,806	--	Italy 18,815; Romania 10,411.
Magnesium metal including alloys, waste and scrap	10	--	--	
Manganese ore and concentrate	139,351	112,317	27,385	France 27,251; Spain 12,594; Netherlands 12,187.
Silver metal including alloys, unwrought and partly wrought value, thousands	$9,255	$18,330	--	United Kingdom $7,736; Switzerland $7,337; France $3,128.
Tungsten: Ore and concentrate	5	--		
Zinc:				
Ore and concentrate	16,317	12,948	--	Italy 4,598; France 3,700; West Germany 2,649.
Metal including alloys:				
Scrap	278	257	--	France 160; Spain 97.
Semimanufactures	7	--		
Other:				
Ores and concentrates	10,916	10,228	--	France 9,407; Yugoslavia 561.
Ash and residue containing nonferrous metals	567	323	--	France 203; Spain 120.
Oxides, hydroxides, peroxides	--	3	--	France 2.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	(1)	8	--	All to Tunisia.
Barite and witherite	277,346	333,820	169,270	Norway 56,042; Netherlands 33,575.
Cement	--	1,241	--	Spain 645.
Clays and clay products:				
Crude	21,721	25,963	2	Spain 14,397; Gibraltar 600.
Products:				
Nonrefractory	170	32	--	Niger 12.
Refractory including nonclay brick	1,769	3,257	--	Egypt 1,129; Lebanon 851; Iraq 780.
Feldspar and fluorspar	62,997	64,069	6,700	Norway 14,059; West Germany 9,960.
Fertilizer materials:				
Crude, phosphatic - thousand tons	17,867	16,527	235	France 2,374; Spain 2,321; Belgium-Luxembourg 1,554.
Manufactured:				
Phosphatic	183,995	161,792	--	U.S.S.R. 53,199; Bangladesh 38,800; Sri Lanka 21,063.
Other including mixed	12,509	6,064	--	Belgium-Luxembourg 3,150; United Kingdom 2,901.
Gypsum and plasters	236,881	206,022	--	Nigeria 138,710; Japan 16,500; Republic of Korea 8,400.
Lime	4	88	NA	NA.
Mica: Crude including splittings and waste	1,010	485	--	All to France.
Pigments, mineral, including processed iron oxides	1	1	--	Do.
Salt and brine	--	3,001	--	Denmark 3,000.

See footnotes at end of table.

Table 2.—Morocco: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3,809	1,668	--	Italy 834; France 350; West Germany 221.
Worked	1	2	--	Belgium-Luxembourg 1; France 1.
Gravel and crushed rock	23,496	42,944	NA	NA.
Quartz and quartzite	268	--		
Sand excluding metal-bearing	6,991	7,363	NA	NA.
Talc, steatite, soapstone, pyrophyllite	250	--		
Other: Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	3,875	6,506	--	Nigeria 2,716; Tunisia 2,201; Liberia 990.
MINERAL FUELS AND RELATED MATERIALS				
Coal, all grades including briquets	77,622	84,162	--	United Kingdom 56,632; Tunisia 10,700.
Petroleum refinery products:				
Gasoline—42-gallon barrels	1,380,128	1,698,844	--	Netherlands 1,559,546; Switzerland 127,602.
Kerosine, white spirit—do	--	528,720	--	Bunkers 450,972; Netherlands 77,748.
Distillate fuel oil—do	93,824	94,645	--	All to Bunkers.
Residual fuel oil—do	128,791	570,982	--	Spain 237,762; Bunkers 171,695; Portugal 76,923.
Lubricants—do	2,674	1,967	--	All to Bunkers.
Liquefied petroleum gas—do	100,920	194,242	NA	France 74,704; Portugal 54,868; Italy 34,742.
Other—do	418,726	--		

NA Not available.
[1]Unreported quantity valued at $1,000.

Table 3.—Morocco: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	810	519	--	All from Italy.
Oxides and hydroxides	1,853	2,399	--	France 2,358.
Metal including alloys:				
Unwrought	331	1,060	--	France 827; East Germany 100.
Semimanufactures	6,585	4,466	2	France 2,463; Spain 349; Yugoslavia 305.
Chromium:				
Ore and concentrate	40	40	--	All from Belgium-Luxembourg.
Oxides and hydroxides	16	11	--	United Kingdom 4; France 3; West Germany 3.
Cobalt: Oxides and hydroxides	1	3	--	Belgium-Luxembourg 2; France 1.
Copper metal including alloys:				
Unwrought	298	303	--	All from France.
Semimanufactures	7,066	8,293	2	Spain 3,229; France 2,662.
Iron and steel:				
Scrap	1	174	--	All from Spain.
Pig iron including cast iron	625	1,423	--	Belgium-Luxembourg 499; Spain 486; France 253.
Sponge iron, powder, shot	276	113	--	U.S.S.R. 50; France 29; West Germany 19.
Ferroalloys	303	391	--	France 124; West Germany 93; Spain 63.
Steel, primary forms	29,791	22,336	--	Spain 12,068; France 6,476; West Germany 3,792.

Table 3.—Morocco: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections	375,930	318,163	--	Spain 236,909; Italy 26,101; France 24,475.
Universals, plates, sheets	120,705	125,584	--	France 63,123; West Germany 27,014; Spain 15,883.
Hoop and strip	13,097	17,008	1	France 10,088; Spain 4,236.
Rails and accessories	4,255	1,704	--	France 1,616.
Wire	9,846	11,173	1	Belgium-Luxembourg 5,275; France 3,985.
Tubes, pipes, fittings	18,471	16,028	13	France 7,060; Spain 3,741; West Germany 2,588.
Castings and forgings, rough	393	154	3	France 121; Italy 15.
Lead:				
Oxides and hydroxides	237	267	--	France 258.
Metal including alloys:				
Unwrought	1	34	--	Netherlands 32.
Semimanufactures	179	66	--	France 32; Netherlands 28.
Magnesium metal including alloys, all forms —value	$1,000	$1,000	--	NA.
Manganese:				
Ore and concentrate	475	900	--	United Kingdom 500; Belgium-Luxembourg 400.
Oxides and hydroxides	469	579	--	Belgium-Luxembourg 555.
Mercury —76-pound flasks	203	290	232	Spain 58.
Molybdenum metal including alloys, all forms —value	$30,000	$53,000	--	Poland $34,000; West Germany $18,000.
Nickel:				
Matte, speiss, similar materials	4	6	--	All from France.
Metal including alloys:				
Scrap	1	--	--	
Unwrought	4	8	--	France 6; United Kingdom 1.
Semimanufactures	853	1,257	--	West Germany 671; Italy 276; France 275.
Platinum-group metals including alloys, unwrought and partly wrought —value	--	$2,000	--	All from France.
Silver metal including alloys, unwrought and partly wrought —do	$80,000	$94,000	--	France $50,000; Italy $23,000; United Kingdom $11,000.
Tin metal including alloys, all forms	175	200	--	Thailand 80; Malaysia 75.
Titanium: Oxides and hydroxides	2,445	1,737	--	West Germany 745; France 501; Italy 305.
Tungsten metal including alloys, all forms	4	(1)	--	Mainly from Poland.
Zinc:				
Oxides and peroxides	504	543	--	France 358; Netherlands 141.
Metal including alloys:				
Blue powder	25	--	--	
Unwrought	3,023	3,298	--	Belgium-Luxembourg 1,160; Netherlands 751; France 727.
Semimanufactures	283	239	--	France 214.
Other:				
Ores and concentrates	20	--	--	
Oxides, hydroxides, peroxides	--	102	10	West Germany 73.
Metalloids	28	41	2	France 34.
Alkali, alkaline-earth, rare-earth metals	3	2	2	
Pyrophoric alloys	1	--		
NONMETALS				
Abrasives, natural, n.e.s.:				
Natural: Pumice, emery, corundum, etc	82	52	--	Italy 21; France 16; Greece 13.
Artificial: Corundum	97	80	--	France 65; West Germany 15.
Grinding and polishing wheels and stones	685	339	(2)	Italy 163; Denmark 70; France 64.
Asbestos, crude	4,756	6,770	200	Africa, n.e.s. 4,860; Canada 1,486.
Boron materials:				
Crude natural borates	700	650	650	
Borates and perborates	182	140	10	Spain 70; Netherlands 30; France 30.
Oxide and acid	21	10	2	France 6.

See footnotes at end of table.

Table 3.—Morocco: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Cement	539,685	39,122	--	Spain 19,357; Poland 14,793.
Chalk	7,597	7,008	--	France 6,044; Spain 738.
Clays and clay products:				
Crude	11,385	19,050	7	France 11,450; Guyana 4,100.
Products:				
Nonrefractory	14,502	6,048	--	Spain 2,477; Italy 2,255.
Refractory including nonclay brick	6,257	5,276	2	Spain 1,612; France 1,352; West Germany 1,057.
Diamond, industrial value	$21,000	--		
Diatomite and other infusorial earth	176	255	15	Spain 210.
Feldspar and fluorspar	108	444	--	All from France.
Fertilizer materials:				
Crude, nitrogenous	50	50	--	All from West Germany.
Manufactured:				
Nitrogenous	252,647	258,006	--	West Germany 77,100; France 52,765; U.S.S.R. 35,571.
Phosphatic value	$4,000	--		
Potassic	82,836	78,394	--	East Germany 43,555; Spain 24,785; U.S.S.R. 5,791.
Other including mixed	27,326	500	--	Belgium-Luxembourg 300; West Germany 74.
Ammonia	32,091	42,087	5,985	U.S.S.R. 33,231.
Graphite:				
Natural	--	23	--	France 17; United Kingdom 4.
Artificial	9	--		
Gypsum and plasters	15	104	--	All from France.
Lime	900	600	--	Do.
Magnesite	109	140	2	Austria 136.
Mica:				
Crude including splittings and waste	15	9	7	Norway 1.
Worked including agglomerated splittings	13	1	--	Mainly from Spain.
Pigments, mineral:				
Natural, crude	270	--		
Iron oxides, processed	829	972	--	West Germany 553; United Kingdom 249; Spain 106.
Precious and semiprecious stones, synthetic value	$2,000	--		
Salt and brine	9,454	5	--	West Germany 4.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	349	250	--	France 86; West Germany 77; Italy 69.
Caustic soda	8,466	8,857	--	France 8,215; Italy 298.
Soda ash	3,457	5,611	--	France 4,960; Bulgaria 500.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	--	71	--	Italy 66.
Worked	328	323	--	Italy 247; France 60.
Dolomite, chiefly refractory-grade	313	90	--	All from France.
Gravel and crushed rock	95	11	--	Do.
Quartz and quartzite	53	23	--	Belgium-Luxembourg 10; France 7; West Germany 6.
Sand excluding metal-bearing	24,250	31,108	--	Belgium-Luxembourg 30,972.
Sulfur:				
Elemental	587,559	702,386	128,335	Canada 278,444; Poland 200,786.
Sulfuric acid, oleum	14	15	--	Belgium-Luxembourg 8; West Germany 5.
Talc, steatite, soapstone, pyrophyllite	797	917	--	France 830; China 20.
Other:				
Crude	177	620	--	Spain 475; France 86.
Oxides, hydroxides, pentoxides of barium, magnesium, strontium	16	21	--	France 16; West Germany 5.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	76	1	--	All from France.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	9	3	1	West Germany 1.
Carbon black	4,270	5,092	84	Spain 2,866; France 864; United Kingdom 628.
Coal, all grades	10,474	9,956	--	West Germany 5,000; Italy 2,621; Netherlands 1,328.

See footnotes at end of table.

Table 3.—Morocco: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coke and semicoke	28,703	18,619	--	All from Italy.
Hydrogen, helium, rare gases	45	57	--	France 38; Italy 18.
Peat including briquets and litter	4,537	3,180	--	All from Netherlands.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	33,640	29,621	--	Iraq 13,082; Saudi Arabia 10,953; U.S.S.R. 3,413.
Refinery products:				
Gasoline do	20	66	--	Netherlands 54; Belgium-Luxembourg 9.
Kerosine, white spirit do	52	(2)	--	All from France.
Distillate fuel oil do	349	286	--	Poland 248.
Residual fuel oil do	9	--		
Lubricants do	292	351	2	France 299; Romania 19.
Other:				
Liquefied petroleum gas do	1,553	986	--	Spain 402; France 251.
Mineral jelly and wax do	118	188	1	Venezuela 85; Greece 36; Spain 32.
Nonlubricating oils do	68	--		
Bitumen and other residues do	100	97	--	Spain 91.
Bituminous mixtures do	3	3	--	All from France.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	1,252	878	--	Netherlands 250; France 235; West Germany 183.

NA Not available.
[1]Unreported quantity valued at $87,000.
[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Copper.—Among the small, new nonferrous mines scheduled for full-scale startup during the 1981-85 development plan is the Bou Gafer copper mine located in Ouarzazate Province of southern Morocco. The mine began production in 1981, and will produce 90,000 tons per year of ore when the four known deposits at the mine location are fully exploited. The Moroccan Government is supplying 10% of the total development cost of $10 million. Due onstream in 1984 is the Tizert copper mine in Agadir Province located in southwest Morocco. Development plans call for the mine to produce 84,000 tons per year of ore yielding 4,000 tons per year of concentrate containing 40% copper.[7] The Bleida copper mine in Ouarzazate Province was undergoing expansion. The Bleida ore body is about 8 kilometers long and 350 meters thick. The expansion efforts will quadruple production capacity to 300,000 tons per year of ore, which should result in about 55,000 tons of high-grade copper concentrate. Capital investment for the mine expansion project was $50 million. During the 1981-85 development plan, a related copper smelter is planned for fabrication at Agadir and will produce 50,000 tons per year of blister copper for export. Estimated foreign exchange revenues from the initial smelting operation will be $120 million per year.

Iron and Steel.—In May 1981, a contract was finalized between the Moroccan Iron and Steel Co. and Davy Loewy of Great Britain to construct a wire rod and reinforcing bar mill, outside Nador. The construction of the mill is the first step of a long-range project to build a steel fabricating complex within Morocco. The mill, preliminarily designed with a production capacity of 420,000 tons per year of finished product, was expected to come online in the latter half of 1983. The project falls within the framework of a British-Moroccan cooperative agreement. The mill construction was being financed by British credits. The total cost of the Nador iron and steel complex was estimated at $2 billion.

Lead and Zinc.—The Bou Madine multimetal mine in Errachidia Province was scheduled for startup in 1984 and will pro-

duce zinc, lead, silver, and gold metals. Production of 60,000 tons per year of ore was expected to yield 900 tons per year of 60% lead concentrate and 6,000 tons per year of 53% zinc concentrate. Total investment was estimated at $7.5 million, with the Moroccan Government contributing 15%. Development of the Sidi Lahcen operation, a lead and zinc mine in Oujda Province, continued in northwest Morocco. Plans called for production of 5,700 tons per year of lead concentrate and 3,000 tons per year zinc concentrate, starting in 1982. Development costs for the project totaled $10 million. Initial exploratory drilling of the lead and zinc deposits at Jbel Khitrem has been encouraging. Work concentrated on finding lateral and deeper seated extensions of old workings.

Silver and Gold.—The Zgounder silver mine in Ouarzazate Province was scheduled to open in 1982. Planned production was 26 tons per year of 90% concentration silver, milled from 56,000 tons of ore, by mid-1983. Capital costs for the mine were approximately $10 million. At the Tizert copper mine in Agadir Province, over 32 troy ounces of silver per ton of copper concentrate is expected to be produced when this operation goes online in 1984. The Bou Madine multimetal mine, also scheduled for a 1984 startup date, should produce 9.6 troy ounces of silver per ton of zinc concentrate processed. At the planned lead-zinc mine at Sidi Lahcen, in Oujda Province, almost 10 tons of silver production is expected from the approximately 80,000 tons of ore processed per year. The lead concentrate at this mine should produce a minor amount of silver and almost one-third of a troy ounce of gold per ton. In other new precious metals developments, BRPM opened up the Arab world's first gold mine at Tiouit near Tinherir, and exploration field work continued on a gold and silver deposit found at Bou Gafer. Additional exploration and mining of the silver deposits in central Jbilets of Roc Blanc paid off. What was earlier thought to be a depleted vein, No. 5, turned out to be a productive situation at deeper levels.

NONMETALS

Phosphate Rock.—Impressive as Morocco's plans for expanding phosphate rock mining are, OCP is concentrating primarily on the development of downstream phosphate rock to acid conversion capacity for the next several years. The focus of this effort will be in the phosphoric acid sector. The basic rationale behind the current OCP 5-year plan is to not only increase rock exports but to supply processed P_2O_5, also for export. The $2.7 billion OCP investment program, planned for completion in 1987, will substantially change the structure of the vitally important Moroccan phosphate industry. Currently, Morocco has the capacity to produce about 26 million tons of phosphate rock per year, with about three-quarters of this capacity coming from the Khouribga area. By 1985, the OCP plans to have increased capacity to 37 million tons, by expanding operations at Kouribga and Youssoufia and opening mines at Ben Guerir and Sidi Hajjaj. Long-term OCP goals include 30% total rock conversion to phosphoric acid and its derivatives by 1990.[8] This will amount to the conversion of over 10 million tons of phosphate rock production per year. In 1981, approximately 2 million tons of rock was converted into downstream products at the Safi chemical plants.

Morocco is the world's largest exporter and third largest producer of phosphate rock, accounting for over 30% and 14%, respectively, of these totals per year. Phosphate exports supply the major proportion of foreign currency earnings in Morocco and also provide a major source of tax revenue. As a user of services and a large labor employer, the phosphate industry is a powerful factor in the country's overall economy. The majority of Morocco's phosphate rock exports go to Western European fertilizer manufacturers, whose proximity give Morocco a competitive market advantage, particularly regarding freight costs. Despite falling world demand for phosphate rock, Morocco is maintaining its share of the export market. Total exports in 1981 were 15.6 million tons, down from the 16.5 million tons exported in 1980. Domestic sales were 3.5 million tons, which is a 1.1-million-ton increase over 1980 internal sales. Domestic sales of phosphate rock have increased quite rapidly in recent years, owing to its increased use in agriculture. In 1970, the domestic market accounted for only 3% of the rock production. In 1981, this figure reached over 18%.

The long-term plans stress the building of more chemical plants to produce phosphoric acid. With the rapidly rising cost of transporting high-volume, low-value rock and with increasing environmental constraints on new industrial developments in the in-

dustrialized countries, Morocco is concentrating on the manufacture and sale of finished phosphoric products on the world markets, as the United States has been doing for some years. OCP plans for the 1980's include two projects that will result in an additional 6,000 tons per day of P_2O_5 capacity for production of phosphoric acid. These plants will be located in the coastal areas of Jorf Lasfar and Nador. These projects are in addition to the expansion at Safi, where phosphoric acid capacity will stand at 4,500 tons per day processed P_2O_5 feedstock when Maroc Phosphore II comes onstream toward the end of 1982. At that time, there will be four separate operating complexes at Safi. Plans for the Maroc Phosphore III project at Jorf Lasfar include the construction of eight phosphoric acid units of 500-ton-per-day P_2O_5 capacity each. Current plans are for the plants to be brought onstream over a 3-year period, commencing in 1983. In addition to the 4,000 tons per day P_2O_5 to be processed into merchant-grade acid, OCP has decided to build units for production of superphosphoric acid and diammonium phosphate (DAP). The new port at Jorf Lasfar is expected to be completed by the end of spring 1982, whereupon work will begin on the OCP handling and storage facilities. In addition to the facilities at Jorf Lasfar, OCP plans to locate further facilities at the Moroc Phosphore IV project at Nador, in northeast Morocco. Four phosphoric acid units, each of 500-ton-per-day P_2O_5 feedstock capacity are planned, with construction to be phased in with the developments at Jorf Lasfar.

The expanded integration of Morocco's phosphate industry and the development of new port facilities clearly demonstrates OCP intentions to move away from being strictly a supplier of raw material to the world market. However, in view of the poor prevailing market conditions for phosphoric acid at present, the timing of the massive expansion plans may have to be periodically reviewed and revised.

MINERAL FUELS

Bituminous Shale.—The Royal Dutch/Shell Oil group and the Moroccan Government signed an agreement in 1981 for a three-phase joint-venture oil shale project. The first phase will cost between $40 and $50 million and will be a comprehensive survey of the shale deposits of Tarfaya conducted by Shell and the National Office of Petroleum Research and Exploitation. The second phase, if justified by the survey, would be the construction of a $450 million pilot plant. Finally, subject to successful pilot plant results, a 70,000-barrel-per-day plant costing an estimated $45 billion would be constructed and onstream as early as 1992. The Davy McKee Corp. of the United States has been awarded a contract by Morocco's BRPM to furnish project management services for the construction of a small $7 million shale oil pilot plant in the Timahdit oil shale region. The pilot plant was scheduled for completion in the latter half of 1982 and was designed to process up to 50 tons of shale per day to produce 25 barrels of shale oil. The process to be used is a semicontinuous, aboveground retort developed by the BRPM.

Also interested in the Timahdit area, the Tosco Corp. and the French bank Paribas signed an agreement in 1981 with the Moroccan Government to conduct an 18-month feasibility study of the potential commercial development of the oil shale deposits. The Timahdit deposits are located in the middle Atlas Mountains, south of the city of Fez. The region contains several billion tons of oil shale and, according to a report by Tosco, averages about 25 gallons of oil per ton. Some of the largest known oil shale deposits in the world are located in Morocco. Principal deposits are located at Tanger, Tarfaya, and Timahdit, with estimated resources of 3, 5, and 15 billion barrels, respectively. Shale grades average about 17 gallons of oil per ton.

Coal.—Anthracite production from Charbonnages du Maroc's underground mine at Jerrada in northwest Morocco increased only slightly in 1981 to 703,000 tons. The Government was mechanizing the mine and expected to increase production in 1982 to 790,500 tons. By 1984, production is hoped to be well over 1 million tons per year. The Government accorded the Jerrada coal deposits growing importance as the country turned to greater use of indigenous fuel sources for its energy needs. Of the present anthracite tonnage produced at the mine, about 80% of it is burned at the Soviet-built electrical power generation station constructed there some years ago. Two other giant power-generating facilities at Casablanca and Mohammedia are being modified to accept coal as well. The ambitious expansion program at Jerrada has led Charbonnages du Maroc to sign an exploration

contract with the Polish agency POLSERVICE and a production agreement with Westphalia of the Federal Republic of Germany.

Exploration drilling continued in 1981 for lignite in the Guercif Basin. So far only thin seams have been proven out, with thicknesses ranging from 5 to 50 centimeters. A geologic study in the Haut Aouli Basin northwest of Ghafsai discovered a number of outcroppings of quality lignite, justifying a continuation of the prospecting activities. Exploration for new anthracite reserves south of the present working at Jerrada resulted in the discovery of an estimated 50 million tons of lignite at Qued Nja.

Natural Gas.—The Government-operated ONAREP, financed with a World Bank loan of $50 million, discovered gas in the Essaouira Basin in December 1981. The well was drilled 31 kilometers east of Essaouira City, which is located on the Atlantic coast. The Meskala-101 well flowed 6 million cubic feet per day with a small amount of petroleum when last reported. Additional drilling and evaluation of the area was slated for 1982.[9]

Petroleum.—World Bank participation in onshore drilling for oil has been accompanied by increased interest on the part of major oil companies in offshore exploration along Morocco's Continental Shelf. ARCO signed a $50 million exploration contract in September 1981 for a concession in the Souss River Basin off Agadir, and Mobil negotiated a $117 million contract for a 12-year exploration lease south of the ARCO concession off Tarfaya. The Souss River Basin off Agadir is in the middle of a larger offshore basin that runs from Essaouira in the north down to Tarfaya in the south, and many of the big oil companies have expressed an interest in this almost totally unexplored area. In the meantime, Standard Oil of Indiana (AMOCO) continues to negotiate a contract for a $80 million exploration program in the Mediterranean.

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[1]General engineer, Division of Foreign Data.

[2]U.S. Embassy, Rabat, Morocco. Economic Trade Report. State Department Airgram A-35, Nov. 13, 1981, p. 34.

[3]Where necessary, values have been converted from Moroccan dirhams (DH) to U.S. dollars at the rate of DH5.10=US$1.00.

[4]U.S. Embassy, Rabat, Morocco. Industrial Outlook Report. State Department Airgram A-13, Apr. 12, 1982, p. 2.

[5]Mining Magazine. Morocco Acts On Law Of The Sea. V. 144, No. 2, February 1981, p. 133.

[6]———. Moroccan Mining Finance. V. 146, No. 3, March 1982, pp. 197-199.

[7]Engineering and Mining Journal. Moroccans Launch Drive To Develop Non-Phosphate Mineral Resources. V. 183, No. 2, February 1982, pp. 35-39.

[8]Fertilizer International. Morocco: Diversification in the Phosphate Industry. No. 153, March 1982, pp. 4-5.

[9]Petroleum Economist (Morocco). V. 49, No. 3, March 1982, p. 112.

The Mineral Industry of Mozambique

By Miller W. Ellis[1]

During 1981, Mozambique's mineral industry consisted chiefly of coal mining at Moatize and the production of tantalum minerals from pegmatite deposits northeast of Quelimane. A substantial amount of mineral-related income was derived from rail transport and shipping of coal and chromite from the Republic of South Africa through port facilities at Maputo, and from remittances from Mozambicans working in South African mines. Additional revenue was derived from the import and handling through Maputo, Beira, and Nacala of petroleum destined for Malawi, Swaziland, and the Republic of South Africa. The German Democratic Republic (GDR) continued to provide technical management for the Moatize coal mine and at the tantalum-mining operations and to import most of their export production.

The Government of the People's Republic of Mozambique (GPRM), controlled by the Mozambique Liberation Front, was again unable to prevent the Mozambique National Resistance Movement from repeatedly interrupting both railroad traffic from Zimbabwe to Mozambique's ports and the supply of electricity from the Cabora Bassa power dam on the Zambezi River to the Republic of South Africa. The high-tension, direct-current powerline to the major transformer station near Pretoria, in the Republic of South Africa, which also feeds Maputo, was inoperable more than 60% of 1981.

In late October, railroad traffic between Zimbabwe and Beira was halted after the bridge over the Pungwe River, 65 kilometers west of Beira, was destroyed by an explosion. The wrecked bridge, which also carried the Beira-Umtali oil pipeline, was replaced by December 18 with a pontoon structure that was subsequently washed out by floodwaters of the early rainy season. Rehabilitation of the country's railroad system was far behind schedule, largely because of a shortage of rock for ballast. Replacement of the old track with new 54-kilogram-per-meter rail on the 88-kilometer stretch from Maputo to Ressano-Garcia at the Mozambique-Republic of South Africa border, started in 1980, was rescheduled for completion by the end of 1982.

In the area of technical aid, both the GDR and Portugal have provided extensive assistance in training Mozambique students in the fields of geology and mining. Portugal also expressed interest in participating in aerial photography and in the production of marble and ornamental stone.

On June 12, 1981, a delegation from the U.S.S.R., led by the Soviet Minister of Geology, arrived in Maputo to participate in geophysical studies and prospecting operations for coal, gas, pegmatites, and gem stones. On June 18, they reassembled in Maputo for discussions of the projects and final arrangements.

On July 24, 1981, the Council of Ministers published Decree No. 10/81 providing for GPRM regulation of trade and exports of the country's natural resources. The following day, Decree No. 11/81 was published to establish the National Directorate for Geology and Mines and Protection of the Subsoil as the agency responsible for regulating and supervising mining activity in relation to gold, silver, and other precious metallic ores. The agency was to safeguard the interests of the national economy by controlling the production and commercial movement of precious metals. The Bank of Mozambique was to be the sole agent for buying or selling precious metals and the sole custodian of coins, bars, and ingots.

Early in 1981, Hunting Geology and Geophysics Ltd. of Great Britain was awarded a contract for the mineral inventory of 275,000 square kilometers, including 344,000 line kilometers of airborne magnetometer and gamma-ray spectrometer survey. LANDSAT data were to be processed and interpreted to provide base maps for compiling survey results, and provision was made for followup ground surveys as required. It was later reported that the Yugoslavian state enterprise Geozavod of Belgrade had been awarded a contract for prospecting in six of Mozambique's Provinces. Czechoslovakia was also reported as contracting to explore for iron, feldspar, gold, and tin in Nampula, Zambezia, and Niassa Provinces. The United Nations approved a $2.14 million project for detailed mineral exploration of a 15,000-square-kilometer area in Tete Province, a 6,000-square-kilometer area in Zambezia Province, and a 700-square-kilometer area in Manica Province.

Estimates of Mozambique's mineral production are listed in table 1, but reports of the country's trade were not available.

Table 1.—Mozambique: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum: Bauxite, gross weight	2,000	--	--	--	--
Beryllium: Beryl concentrate, gross weight	NA	NA	28	20	20
Columbium and tantalum ores and concentrates, gross weight:					
Columbite[e] kilograms	2,300	2,300	2,300	NA	NA
Microlite do	39,866	39,866	[e]31,750	NA	NA
Tantalite[e] do	36,300	36,300	31,750	NA	NA
Copper, mine output, salable ore and concentrate:					
Gross weight	--	460	1,125	1,000	1,000
Metal content	--	130	225	200	200
NONMETALS					
Asbestos, anthophyllite	--	--	789	800	800
Cement, hydraulic thousand tons	323	[e]327	273	275	600
Clays:					
Bentonite (including montmorillonite)	2,744	[e]3,000	1,656	1,500	1,500
Kaolin (including china clay):					
Crude	--	--	223	200	200
Washed	--	--	139	100	100
Feldspar[e]	900	900	--	--	--
Gem and ornamental stones:					
Beryl crystals kilograms	14	15	1,920	2,000	2,000
Garnet do	1,871	2,000	11,200	12,000	12,000
Tourmaline do	26	25	NA	NA	NA
Lime, hydraulic[e]	100,000	10,000	10,000	10,000	10,000
Mica, mainly scrap	800	[e]900	251	200	200
Salt, marine	28,000	[e]28,000	[e]28,000	28,000	28,000
Sulfuric acid	18,750	NA	NA	NA	NA
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous thousand tons	310	118	320	408	600
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	621	510	336	510	NA
Kerosine do	178	296	282	330	NA
Jet fuel do	128				
Distillate fuel oil do	865	634	1,668	746	NA
Residual fuel oil do	1,438	1,132	236	1,332	NA
Other do	63	85	227	323	NA
Refinery fuel and losses do	299	270	128	130	NA
Total do	3,592	2,927	2,877	3,371	NA

[e]Estimated. [p]Preliminary. NA Not available.

[1]Table includes data available through July 6, 1982.

[2]In addition to the commodities listed, crude construction materials and additional varieties of gem and ornamental stones presumably are produced, chiefly for local consumption, but information is inadequate to make reliable estimates of output levels.

COMMODITY REVIEW

METALS

Iron and Steel.—Mozambique's Industrial Foundry and Rolling Mill Co. commenced production of steel ingots in July 1981, using funds from the United Nations Industrial Development Organization. Production capacity was estimated at 6,000 tons for 1982. The plant at Maputo was to reroll billets supplied by the Zimbabwe Iron and Steel Corp.

Tantalum.—In early May, the manager of Mozambique's Marropino pegmatite mine, at a meeting in Bad Harzburg in the Federal Republic of Germany, stated that the GPRM was trying to attract loans from several Western nations, including the United States. The funds were to be used to promote increased production of tantalum minerals in Mozambique. The country's potential for tantalum minerals has long been recognized as high, and its preindependence output was nearly double the 29,000 to 32,000 kilograms of tantalum minerals reportedly produced in 1981. The pegmatite deposits of Zambezia Province accounted for nearly one-half of Mozambique's mineral output in terms of value, and tantalite was its most valuable mineral export. Beryl, gem stones, bismuthinite, feldspar, mica, and other minerals were also recovered from Zambezia Province pegmatites.

NONMETALS

Cement.—Mozambique's cement industry was reportedly expanding into the export market with sales of 10,000 tons in July to Tanzania and an estimated 7,000 tons in August to Malawi. The country's three cement plants, with a total annual production of 600,000 tons, were located at Matola, Nacala, and near Dondo in Sofala Province, where the GDR was financing construction of a $1.5 million training center for cement workers.

Salt.—A newly completed salt-flat complex at Nova Mambone near Inhambane was officially opened in November 1981. The complex was built and operated by technicians from North Korea. It was the country's third largest salt production unit and was to have a capacity of 7,500 tons of salt per year by 1985. A subsurface reservoir containing 350 million cubic meters of saline water was reported to underlie part of the Gaza Province. It was estimated that 5 million tons of salt and 150,000 tons of sodium carbonate can be recovered from the reservoir.

MINERAL FUELS

Coal.—The Mozambique coal mining company, Carbonifera de Mozambique (Carbomoc), halted operation at its four mines at Moatize near Tete in December because of a shortage of explosives. Carbomoc was reported to employ 2,600 workers including 100 technical experts from the GDR. Production was reportedly meeting the goals set by the Central State Plan, but lack of railway facilities, including trucks, prevented movement of the stockpiled coal to the ports for export or for consumption in the cement plant at Dondo. Substantial numbers of railroad trucks were reportedly out of circulation because they were used as storage shelters during the rainy season. According to an agreement signed in Brazil in early October, Mozambique was to benefit from an $8.3 million coal project. The Organization of Petroleum Exporting Countries was to provide $3 million of the financing; Brazil was supplying the remaining $5.3 million, as well as providing technical expertise to assist with a project to expand Mozambique's coal output to 6 million tons of high-quality coal per year. Most of the increased production was to be exported for consumption by the Brazilian steel industry.

Substantial quantities of coal from the Republic of South Africa were exported through the Maputo coal terminal during the first 9 months of 1981. In October, a loaded railroad gondola reportedly fell through the hold of a ship loading at the terminal, and exports had not been resumed by yearend.

Petroleum and Natural Gas.—In May, a delegation of specialists from Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures, the Algerian state oil enterprise, arrived in Maputo to assist the Secretariat of Coal and Hydrocarbons (SECH) to plan the resumption of exploration for petroleum and natural gas. During the 1960's and early 1970's, four groups, Mozambique Gulf Oil Co.-Mozambique Amoco Oil Co.; Sunray Mozambique Oil Co.; Société Nationale des Petroles d'Aquitaine; and Hunt Interna-

tional Petroleum Co.; had completed extensive seismic surveys and drilled 48 onshore and 12 offshore wells. Substantial gasfields were discovered in the Pande, Buzi, and Temane areas with proven and recoverable gas reserves at Pande estimated at 18 billion cubic meters and possible recoverable reserves at 60 billion cubic meters. This field was proposed as the energy source for projected industrial complexes to produce ammonium fertilizers, urea, and sponge iron, but there has been no investigation of the field since independence.

In June, contracts for extensive onshore and offshore seismic surveys were signed with a U.S. firm, Western Geophysical Co., and with the Geophysical Co. of Norway. Western Geophysical was to commence offshore surveys between Beira and Maputo with its survey vessel *Western African* in August. A Norwegian ship, *The Geco Delta*, was to undertake offshore surveys northeast of Beira to Rovuma in October. Both surveys were to extend from the coast to depths of 2,000 meters with more intensive investigation of the sea floor at depths of less than 500 meters.

At a press conference in late June SECH announced that the contractors would bear the costs of the surveys in return for the right to participate in any profits derived from the exploitation of their discoveries. The survey results were to be sold openly to interested oil companies as soon as available after survey completion in mid-1982. Regulations for the conduct of the surveys, and for subsequent negotiations and operations resulting therefrom, were drafted and published. By yearend more than 30 oil companies from Europe, the United Kingdom, and North America had expressed interest in the results.

In August, SECH announced that the Mineralimpex organization of Hungary, Compagnie Generale de Geophysique (CGG) of France, Geosource Inc. of the United States, and an Italian company had submitted proposals to evaluate the gas resources and petroleum potential of Pande, Buzi, and adjacent areas. SECH subsequently announced that CGG had been awarded a $6 million contract to assess the potential of the Pande and Buzi areas, and that a British firm, Energy Resource Consultants, and its subcontractors, Scott Pickford & Associates, had been retained by CGG.

The 300-kilometer Mozambique-Zimbabwe pipeline, from the Port of Beira to the British-owned Lonrho refinery at Feruka near the border town of Umtali, was being reconstructed and pressure-tested during 1981, but completion was delayed by destruction of the bridge over the Pungwe River west of Beira. The line, with a proposed capacity of 1.2 million tons of oil liquids per year, was expected to be used for refined motor fuels until the refinery reopens. The GPRM proposed to charge $30 per ton of oil pumped through the pipeline.

[1]Physical scientist, Division of Foreign Data.

The Mineral Industry of Namibia

By George J. Coakley[1]

The mineral industry of the territory of Namibia was a major world producer of diamonds and uranium. The 23,000 to 25,000 industry workers also produced copper, lead, zinc, silver, tin, and tungsten among others. Namibia ranked as the fourth largest producer of nonfuel minerals on the African continent in terms of total value. Both the gross domestic product (GDP) and the contribution of the mining and quarrying sector to the GDP have been declining in constant dollar terms since 1978. For 1981, the GDP was estimated at $1.5 billion.[2] The mining sector made up an estimated 35% to 40% of GDP in 1981. Diamond mining, normally the major contributor to national revenues, was a disappointment; diamond revenues to the state amounted to only $44 million compared with a projected 1981 state budget estimate of $142 million. Namibia maintained a strong economic dependency on the Republic of South Africa as the latter expended over $1.15 billion in the country for 1981 including $230 million in direct aid and $460 million toward the defense of the country. Rossing Uranium Ltd. (RUL), which has had taxation deferred until it recovers its initial capital investment, is expected to be a further significant source of state revenues beginning in 1983. Most of Namibia's mineral products were produced and exported by three mining companies, Tsumeb Corp. Ltd., largely controlled by U.S. base-metal mining companies; Consolidated Diamond Mines (Pty.) Ltd. (CDM), a major subsidiary of De Beers Consolidated Mines Ltd. of the Republic of South Africa; and RUL.

From 1968 to 1978, control of mining in Namibia rested in Pretoria. In 1978, control was transferred to the Directorate of Economic Affairs, Department of Mines, Windhoek.[3]

Namibia's mining laws were fairly liberal, and foreign exploration and development was encouraged. Prospecting and mining were still governed by the Mines Works and Minerals Ordinance as enacted in 1968 with minor amendments. All mineral rights were vested in the state. The Namibian Central Government can grant exclusive rights to prospect in any defined area for any or all minerals. The prospecting grant carried with it a minimum expenditure obligation that varies with the size of the grant. Prospecting titles were easily converted to mining titles. There were no obligations to reinvest profits, recruit local personnel, process minerals locally, or restrict output volumes. The Government, however, still required a minimum of 25% local participation in large foreign mining investments.

Diamond mines paid an effective tax rate of over 60%. Uranium was taxed on a sliding scale or formula basis, similar to the system of taxing gold in the Republic of South Africa, from zero to over 70%. Other minerals, such as copper, were taxed at the normal corporate rate of 40%. Taxes were, however, further reduced in practice by substantial writeoffs on capital expenditure. Under the present system, no taxes are paid until capital investment has been fully recovered.

Mining in the former black homelands, now controlled by the second-tier "representative" governments, was formerly controlled by the South African Bantu Mining Corp. However, by AG Proclamation 57 of 1978, authority over homelands mineral

concessions was also transferred to Windhoek. Firms applying for a prospecting title in an area controlled by a black ethnic government had to agree to use local African labor, if possible, and pay 10% of any mining profit that may eventually arise from the prospecting grant to the local second-tier government. To date, these payments seemed not to have been a substantial source of revenue to second-tier governments. Companies could get prospecting rights directly anywhere in Namibia. Individuals, however, could only prospect and peg claims in their own ethnic areas.

Namibia also continued work on expanding the infrastructure of the country. Work began on dredging and deepening Walvis Bay Harbor to handle cargo ships of up to 70,000 tons. Preliminary negotiations were also underway with Botswana to build a $1 billion rail link between Walvis Bay and the huge coal deposits in the Morupule area of southern Botswana. Plans discussed involved a rail line that would run 10,000 tons of coal in unit trains and that would take 10 years to complete. Work continued on the new powerline between Windhoek and the Republic of South Africa that would hook up the Republic of South Africa to the Ruacana hydroelectric scheme and also provide cheaper electricity to southern Namibia.

PRODUCTION AND TRADE

The production statistics in table 1 were compiled largely from annual reports of some of the companies operating within Namibia. Publication of separate production statistics was suspended by the South-West African Administration in 1965. Although the country's economy depends on mineral exports, specific reporting of their magnitude and value remained unavailable and were no longer included in statistics published by the Minerals Bureau of the Republic of South Africa. The Namibian Department of Finance, however, estimated that in 1980 overall exports were 72% of gross domestic expenditure while exports were 74% of the GDP. Total exports in 1980 were estimated at $1.4 billion, with mining exports accounting for $1 billion of this figure.

Despite low world market prices, major base-metal production of copper, lead, and zinc increased from 9% to 24% over that of 1980. Estimated tin and tungsten output remained stable, while silver and uranium oxide production declined slightly. Diamond mining was hardest hit by poor demand and prices as production declined by 20% from that of 1980 and by 38% from the peak 1977 output of 1.9 million carats.

Diamonds continued to be marketed through De Beers Central Selling Organization and were exported to the Republic of South Africa and overseas. RUL uranium concentrates were exported from Walvis Bay to contract customers in Western Europe and Japan. Tsumeb's metal production was transported on the company's 640-kilometer railroad to its loading facilities at Walvis Bay for export to overseas customers. Other metal concentrates were railed to smelters and refineries in the Republic of South Africa.

Namibia's largest metal mining company, Tsumeb, produced 37,800 tons of contained lead, 30,300 tons of copper, 6,950 tons of zinc, 1.89 million troy ounces of silver, 3,800 tons of sulfur, and 1,370 tons of arsenic from four mines and three mills. The Tsumeb copper and lead smelters produced 39,719 tons of blister copper and 41,729 tons of refined lead with 66% and 75%, respectively, coming from their own operations and the remainder from toll and purchased material. The cadmium plant was shut down and the arsenic plant was operated on an intermittent basis by Tsumeb in 1981 as a cost-saving measure. Gross metal sales by Tsumeb in 1981 were just under $100 million.

Table 1.—Namibia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS[3]					
Arsenic, white[4]	2,615	2,401	2,221	1,288	1,370
Cadmium: Metal, refined	88	79	81	69	--
Copper:					
Mine output, metal content of concentrate[5]	[r]51,200	[r]39,000	[r]44,800	42,300	46,185
Metal, blister	53,371	45,919	42,707	40,004	39,719
Lead:					
Mine output, metal content of concentrate	[r]38,800	[r]34,800	[r]44,200	50,200	59,121
Metal, refined	42,743	39,512	41,695	42,654	48,479
Silver: Mine output, metal content of concentrate[6] thousand troy ounces	1,758	1,866	[r]3,617	3,365	3,258
Tin, mine output, metal content, recoverable	994	1,250	1,042	1,000	1,000
Tungsten, mine output, metal content, recoverable[e]	150	150	[e]165	[e]150	150
Uranium, U_3O_8 content	2,760	3,175	4,518	4,767	4,681
Vanadium, mine output, metal content[e]	750	440	--	--	--
Zinc, mine output, metal content[7]	38,300	36,600	23,300	31,908	39,600
NONMETALS					
Diamond:[8]					
Gem[e] thousand carats	1,901	1,803	1,570	1,482	1,186
Industrial[e] do.	100	95	83	78	62
Total do.	2,001	1,898	1,653	1,560	1,248
Lithium minerals[9]	2,548	NA	NA	NA	NA
Salt[e]	230,000	230,000	230,000	230,000	230,000
Sulfur, S content of pyritic concentrate	3,834	3,013	3,538	3,692	8,361

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Sept. 15, 1982.

[2]In addition to the commodities listed, Namibia, prior to 1967, produced bismuth concentrates, cesium ore, columbite-tantalite concentrates, gold, manganese ore, molybdenum concentrates, graphite, lime, mica, precious stones, kyanite, sillimanite, and a variety of crude construction materials (clays, stone, sand and gravel). No official statistics have been published since yearend 1966, and available information is inadequate to ascertain whether production has been continued or not, and if so, at what levels.

[3]Data are compiled from operating company reports as follows: Tsumeb Corp. Ltd. (arsenic, white, refined cadmium, mine and blister copper, mine and refined lead, mine and smelter silver, mine zinc, and pyrite concentrate); South-West Africa Co. Ltd. (SWACO) (mine lead, mine tin, mine tungsten, mine vanadium, and mine zinc); South African Iron and Steel Industrial Corp. Ltd. (ISCOR) for Imcor Zinc (Pty.) Ltd.'s Rosh Pinah Mine (mine lead and mine zinc), and for ISCOR's own Uis mine (mine tin); General Mining and Finance Corp. Ltd. for Klein Aub Koper Maatskappy Ltd.'s mine near Rehoboth (mine copper and mine silver); and Falconbridge Nickel Mines Ltd. for Oamites Mining Co. (Pty.) Ltd.'s mines (mine copper). Data from Tsumeb and Falconbridge are for calendar years; data from other companies are for fiscal years ending June 30 of that stated.

[4]White arsenic equivalent of all arsenic products reported as being produced.

[5]Figures comprise reported production of Tsumeb and Oamites plus estimates for Klein Aub and Otjihase copper mine (bought by Tsumeb in December 1980).

[6]Figures comprise reported production of Tsumeb plus estimates for Oamites, Rosh Pinah, and Klein Aub.

[7]Figures comprise reported production of Tsumeb estimates for SWACO for 1977 and 1978, as well as estimates for Rosh Pinah.

[8]Total figures reported by De Beers Consolidated Mines Ltd. in company annual reports for calendar years. Detail on gem and industrial diamonds are estimates, assuming output to be 95% gem quality.

[9]Output has not been officially reported since 1966, but presumably has continued since a number of countries record imports from "South Africa," which in total quantity considerably exceed the reported output of the Republic of South Africa and presumably include shipments from Namibia. Quantities given represent imports of the United States and the European Communities reported as originating in the Republic of South Africa, but the reader is cautioned that a portion of the material may have been mined in Zimbabwe.

COMMODITY REVIEW

METALS

Copper.—Tsumeb, Namibia's dominant copper producer, was managed and 29.6% owned by Newmont Mining Corp. of the United States. Amax, Inc., became the largest shareholder in February 1981, increasing its interest in Tsumeb to 30.2%. The British firm Selection Trust Ltd. owned 14.2% and O'okiep Copper Co. Ltd. owned 9.5%, with the remainder owned by other firms.

The largest polymetallic mine in the country was the Tsumeb Mine, north of Windhoek. Tsumeb, concentrating on higher grade areas of its mines, in 1981 mined and milled 493,708 tons of ore containing 3.60% copper, 7.32% lead, and 2.08% zinc. The 23,429 tons of copper concentrates produced averaged 35.49% copper and 33.3 troy

ounces of silver per ton. The company also operated the Matchless Mine, 42 kilometers south of Windhoek, which produced 111,247 tons of pyritic copper ore containing 2.37% copper and 11.47% sulfur in 1981. The Matchless mill generated 12,313 tons of concentrates, which contained 20.46% copper, 30.55% sulfur, and 2.5 troy ounces of silver per ton. With the exception of one new stope, all underground development work was stopped at the Matchless Mine to limit costs.

Tsumeb also produced 297,933 tons of 2.80% copper and 1.90% lead ore from its Kombat and Asis West Mines. The Kombat mill treated the ore producing 22,868 tons of concentrates with an average grade of 29.76% copper, plus lead, and 9.3 troy ounces of silver per ton.

The Tsumeb Exploration Co. Ltd. (TECO) portion of the Asis West Mine produced 12,522 tons of ore from a copper-rich portion of the mine averaging 7.54% copper and 2.31% zinc. This ore was milled at the Kombat concentrator and yielded 2,551 tons of copper concentrate containing 33.12% copper, some lead, and 8 troy ounces of silver per ton.

Under a December 1980 joint-venture agreement with Otjihase Mining Co. Ltd., Tsumeb acquired a 70% interest in Otjihase for approximately $41 million. Under the terms of the joint venture, Tsumeb agreed to reopen the mine and to make the first interest-free purchase installment 1 year after the target production rate of 65,000 tons of ore milled per month is reached, which is expected in the second quarter of 1982. The joint venture may be dissolved by mutual agreement if cash shortfalls reach defined limits or at the end of the life of the Otjihase Mine. Up to 100% of Tsumeb's undivided interest in the property could be transferred to Otjihase Mining in full settlement of any balance then outstanding on the purchase price. Subject to the fulfillment of the agreement, Otjihase Mining continued to be owned by Johannesburg Consolidated Investment Co. Ltd., which had a 49% direct interest plus an indirect interest through an associate. During restartup in 1981, Tsumeb mined and milled 206,900 tons of Ojithase ore containing 1.54% copper and 16.6% sulfur, from which 14,242 tons of copper concentrates averaging 20.2% copper and 2.2 troy ounces of silver per ton were recovered. The copper concentrates were shipped to the Tsumeb smelter, and an additional 26,800 tons of pyrite concentrates were delivered to RUL.

Tsumeb maintained exploration development drilling programs at the Tsumeb Kombat and Asis West and Otjihase Mines during the year while reducing exploration activity elsewhere in Namibia. Exploration of the Tschudi copper-silver prospect, 20 kilometers west of Tsumeb, was suspended while work continued at the Andundu gold prospect where the first four completed drill holes reported 0.26 troy ounce of gold per ton in the quartz veins, which constitute 7.7% by volume of the mineralized zone.

Ore reserves at most Tsumeb mines increased relative to 1980 levels. At the end of 1981, positive ore reserves at the Tsumeb Mine increased to 3,528,000 tons averaging 4.27% copper, 5.99% lead, and 1.77% zinc. The total reserves at the Kombat Mine area increased to 2,442,000 tons averaging 1.83% copper and 2.07% lead. Total reserves at Asis West were 1,580,000 tons averaging 5.54% copper and 2.77% lead. Proven reserves at the Matchless Mine were 371,000 tons averaging 2.22% copper. Total reserves at the Otjihase Mine remained almost unchanged at 10,117,000 tons averaging 2.23% copper.

The Oamites Mining Co. (Pty.) Ltd., jointly owned by Falconbridge Nickel Mines Ltd. of Canada (74.9%) and the International Development Corp. (IDC) of the Republic of South Africa, continued to be the country's second largest copper producer. The Oamites Mine, 55 kilometers south of Windhoek, was extracting low-grade ore by a sublevel open-stoping method. In 1981, Oamites milled 530,000 tons of ore containing 4,827 tons of recoverable copper, down 17% from the 1980 output. Silver production decreased by 13,000 troy ounces to 216,000 troy ounces in 1981. Faced with operating losses and difficult mining conditions, the company suspended operations at the nearby Swartmodder Mine in March. Production at Oamites was also reduced from 45,000 tons per month to 35,000 tons per month of ore milled. Ore reserves at the Oamites Mine at yearend were 2,027,000 tons grading 1.13% copper.

Lead and Zinc.—Two of Tsumeb's established mines produced complex ores with a mixture of lead, zinc, and copper containing other valuable constituents. The Tsumeb Mine was the country's largest lead producer and one of its two sources of zinc. The 493,708 tons of ore contained 7.32% lead and 2.08% zinc, from which the Tsumeb concentrator produced 97,970 tons of lead

concentrates that contained 31.1% lead, with 8.1% copper, 6.46% zinc, and 7.9 troy ounces of silver per ton. Its zinc concentrate weighed 1,196 tons and contained 51.94% zinc, 3.02% copper, 9.67% lead, and 10.4 troy ounces of silver per ton. Ores from the Kombat and Asis West sections of the Kombat Mine also contained lead, and the Kombat mill recovered 6,825 tons of lead concentrate with 30.5% lead, 14.0% copper, and 4.0 troy ounces of silver per ton on behalf of the parent company and 177 tons of lead concentrate containing 34.8% lead, 11.5% copper, and 4.3 troy ounces of silver per ton from Asis West ore on behalf of TECO.

The country's top zinc producer was the Rosh Pinah open pit mine in the Namib Desert, 27 kilometers north of the Orange River, operated by and for Imcor Zinc (Pty.) Ltd., a subsidiary of the South African Iron and Steel Industrial Corp. Ltd. (Iscor). Rosh Pinah Mine's capacity was 160,000 tons per month of ore. In the 1980-81 business year, 47,200 tons of 40% zinc concentrate and 20,200 tons of 45% lead concentrate were produced compared with 44,000 tons of zinc concentrate and 17,900 tons of lead concentrate in 1979-80. Both concentrates were trucked 180 kilometers to the railhead at Aus, where they were railed to Iscor's steelworks at Vanderbijlpark in the Transvaal Province of the Republic of South Africa.

Stockpiled ore at the closed Berg Aukas Mine was concentrated into zinc pellets, which were railed to Vogelstruibult in Transvaal Province, the Republic of South Africa, for further refining in the Kiln Product Ltd. smelter. Byproduct vanadium and lead may also be extracted from the Berg Aukas stockpile, which is being worked at a loss and is expected to be depleted in 1982.

Tantalum.—A subsidiary of Utah International Inc. of the United States, Southern Mining and Development Co. Ltd., carried out preliminary exploration for tantalum in 1981 and located one deposit with a potential output of 18,000 kilograms of tantalite per year.

Tin.—Most of the country's tin production continued to be derived from Iscor's Uis Mine near Brandberg, northeast of Swakopmund. The tin concentrate was shipped directly to the Vanderbijlpark Steelworks in the Republic of South Africa, where it was smelted and used to produce electrolytic tin plate for local consumption. In 1981, 1,220 tons of tin concentrate was produced, up 14% over that of 1980. Iscor reported extensive drilling at Uis proved the existence of large additional tin reserves extending the life of the mine by several decades at the present rate of production.

NONMETALS

Diamond.—Production of diamonds by CDM continued to decline as total ore treated increased to 12,540,000 tons containing 9.95 carats per 100 tons. The ore consisted of marine gravels and required the removal of 37,698,000 tons of barren sand and gravel overburden. At yearend, stripped reserves remained 6 months ahead of mining requirements. The 20% reduction in total carats produced in 1981 reflected a decision by CDM to reduce production temporarily by suspending operations at one of the four production plants, at both field screening plants, and at the 50-grid sampling plant. Mining continued to the maximum safe distance of 100 meters seaward of the high water mark, and maintenance of the seawall will continue until foreshore mining in the No. 4 plant area is completed during 1982. At that stage the bucket wheel excavator will be moved to a new site further south. CDM maintained an active diamond prospecting program in its concession areas, where it held the mineral rights until December 31, 2010. Results continued to be disappointing, with the north bank of the Orange River within Diamond Area No. 1 being the only site that showed encouraging results. In 1981, CDM contributed over $40 million to the after-tax profits of De Beers.

MINERAL FUELS

Coal.—In the early 1950's, the Anglo American Corp. Ltd. discovered coal on the north bank of the Nossob River near the Aminuis Reserve, and during 1980, its affiliated company, CDM, applied for extensive prospecting grants on both sides of the Nossob River in the Aranos area. Estimated drilled reserves of about 3 billion tons of coal have been identified to date; however, its potential exploitability may be complicated by an overburden of as much as 300 meters in some places and by an underground lake above at least part of the deposit. Exploration for coal was reported to have continued in the Etosha Pan area and along the Kaokoveld coast. The Anglo American Nossob River coal discovery and reports that another Anglo American associate, B&O Mineral Exploration, Ltd., had recently discovered coal on five adjoining farms in the southeastern corner of the

Otjiwarongo district, bordering Hereroland West, precipitated a "coal rush" and forced the Mining Commission to enforce strict requirements before granting any new concession areas.

Petroleum.—The Etosha Petroleum Co., owned by Briland Mines Ltd., has held an oil and gas exploration concession near the Angolan boundary in northern Namibia for a number of years and in February 1980 signed a letter of intent giving Superior Oil Co. a contract to execute test drilling operations over a portion of the Etosha area. Financing was reportedly arranged through Allen & Co. Inc. of New York. In 1981, Superior Oil initiated negotiations with the Administrator General of Namibia to obtain permission to search for oil along the northern perimeter of Etosha Game Park. The Government-owned Southern Oil Exploration Corp. (South-West Africa) (Pty.) Ltd. continued to be responsible for granting oil exploration concessions, and its parent company, Southern Oil Exploration Corp. (Pty.) Ltd., continued to hold offshore concessions south of Walvis Bay.

Uranium.—RUL, in which the United Kingdom's Rio Tinto Zinc Corp. Ltd. (RTZ) holds a 46.5% controlling interest, operated the Western world's largest single open pit uranium mine 65 kilometers northeast of Swakopmund. In 1981, RUL treated 14.9 million tons of ore yielding 4,681 tons of uranium oxide, down 2% from that of 1980 and still slightly short of its annual design capacity of 5,000 tons of U_3O_8. The principal ore mineral, uraninite, is ground to a pulp and treated by a sulfuric acid leach followed by ion exchange, solvent extraction, and an ammonia precipitation of the uranium oxide. RTZ reported net profits from RUL for a year, allowing for deferred taxation, of $41 million. Their partners in RUL included the General Mining and Finance Corp. Ltd. and IDC of the Republic of South Africa, Total Compagnie Minière et Nucleaire of France, and Rio Algom Mines Ltd. of Canada.

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[1]Supervisory physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from South African rand (R) to U.S. dollars at the rate of R1 = US$1.2854 for 1980 and R1 = US$1.1490 for 1981.

[3]South-West Africa Gazette (Windhoek, Namibia). AG Proclamation 4 of 2978, Issue 3696, Jan. 30, 1978.

The Mineral Industry of the Netherlands

By George A. Rabchevsky[1]

The economy of the Netherlands continued to decline slowly, by more than 1% in 1981. Private consumption fell by about 3% and investments fell by about 10% of gross national product (GNP); unemployment reached about 10%, a postwar high. Even though inflation was halted somewhat, industrial output was down by approximately 3.5%, with the largest decline in natural gas.

The services sector, which in 1981 contributed a significant two-thirds of the GNP, fell less sharply, mainly because of continued rises in Government spending. The slowdown in the Netherlands' economic activity, evident since the mid-1970's, turned into a recession in the second half of 1980, which continued through 1981. An official 1981 forecast, based on the assumption of no major policy changes, projected real GNP growth in 1985 at an annual average of 1%.

PRODUCTION

Production in the metals industry was down by approximately 3% in 1981 and was at the lowest level since 1978; output was down by over 30% in the important energy sector, especially petroleum refining. Mining and natural gas output were down by over 8%.

Production of minerals for the past 5 years is given in table 1.

Table 1.—Netherlands: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum metal:					
Primary	241,269	261,164	257,719	258,621	[3]261,983
Secondary	41,591	43,991	46,643	53,725	[3]56,197
Cadmium metal	302	402	416	455	[3]506
Iron and steel:					
Sintered ore (from imported ore) thousand tons	2,709	3,012	2,929	2,723	[3]3,042
Pig iron including blast furnace ferroalloys do.	3,922	4,613	4,814	4,328	[3]4,600
Crude steel do.	4,927	5,590	5,806	5,272	[3]5,472
Semimanufactures do.	4,251	4,732	4,993	4,475	[3]4,732
Lead metal:[4]					
Smelter[e]	3,300	500	6,800	6,000	2,500
Refined:					
Primary	21,132	18,172	16,432	13,902	[3]7,015
Secondary	12,700	13,700	14,700	13,900	[3]16,000
Total	33,832	31,872	31,132	27,802	[3]23,015

See footnotes at end of table.

Table 1.—Netherlands: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS —Continued					
Tin metal, refined:[e]					
Primary	2,100	1,600	1,445	1,370	2,100
Secondary	180	180	180	180	180
Zinc metal (slab), primary	109,398	135,399	153,982	169,539	[3]177,363
NONMETALS					
Cement, hydraulic thousand tons	3,895	3,918	3,701	3,745	3,500
Nitrogen: N content of ammonia do.	2,140	2,148	[r]1,916	1,874	[3]1,874
Salt, all types do.	3,111	2,939	3,951	3,464	[3]3,578
Sand, industrial do.	25,600	23,500	NA	24,600	24,600
Sodium compounds:					
Sodium carbonate do.	276	280	[e]420	[e]420	420
Sodium sulfate, synthetic do.	50	50	50	50	50
Sulfur:					
Elemental byproduct:					
Of metallurgy[e] do.	64	60	60	60	60
Of petroleum do.	[r]30	[r]24	18	22	22
Total do.	[r]94	[r]84	78	82	82
Sulfuric acid, 100% H_2SO_4 do.	1,572	1,680	1,744	1,726	1,700
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	90,700	86,800	93,000	95,300	85,400
Coke thousand tons	2,501	2,401	2,528	2,455	2,242
Gas:					
Manufactured, all types[5] million cubic feet	218,942	264,531	[r]233,553	210,011	200,000
Natural:					
Gross do.	3,421,940	3,133,456	3,407,425	3,219,023	300,000
Marketed do.	NA	NA	3,291,947	3,266,842	3,240,000
Natural gas liquids thousand 42-gallon barrels	1,836	1,003	2,253	3,162	[3]6,816
Peat[e] thousand tons	400	400	400	400	400
Petroleum:					
Crude thousand 42-gallon barrels	9,420	9,556	8,970	8,724	8,600
Refinery products:					
Gasoline:					
Aviation do.	1,095	1,157	907	774	500
Motor do.	54,460	60,588	[r]69,352	61,821	56,032
Jet fuel do.	24,320	21,728	[r]28,832	27,112	26,900
Kerosine do.	4,487	3,860	4,270	3,658	2,527
Distillate fuel oil do.	133,974	139,726	[r]148,133	130,632	107,424
Residual fuel oil do.	131,868	124,475	121,319	99,707	96,000
Lubricants do.	3,892	4,200	3,955	3,955	3,955
Bitumen do.	5,660	} 53,363	{ 5,563	5,327	5,300
Liquefied petroleum gas do.	11,832		13,897	10,730	10,500
Other do.	57,574		44,288	31,509	30,000
Refinery fuel and losses do.	18,943	17,807	29,864	24,971	24,000
Total do.	448,105	426,904	[r]470,380	400,196	363,138

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through July 12, 1982.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, stone, and gravel) presumably is also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]In previous editions, refined lead production, both primary and secondary, was erroneously captioned as smelter lead production, and actual smelter output was unreported; these errors have been corrected in this edition.

[5]Coke oven and blast furnace gas only.

TRADE

Declining imports, improved export competitiveness, and the sharply higher prices for natural gas exports were the main causes of the 1981 surplus in the balance of payments account, the Netherlands' first since 1977. Netherlands exports accounted for over 50% of total GNP.

The Netherlands in 1981 continued to be the third largest European market for U.S. exports and was the sixth largest in the world. With the Netherlands' industrial output, investment, and consumption falling, however, the strong advances made by U.S. exports in the recent past may not be repeated in the near future. Declines in U.S. exports in the first half of 1981 were 27% in metal ores and scrap, 57% in nonferrous metals, and 23% in metal-working machinery. Gains in the same period were 31% in fertilizers and 82% in bituminous coal.

Table 2.—Netherlands: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ash and residue containing aluminum	7,847	7,394	--	West Germany 4,507; France 1,887.
Bauxite	26,323	13,441	--	West Germany 9,695; Belgium-Luxembourg 1,641.
Oxides and hydroxides	59,486	51,856	--	West Germany 15,390; France 9,214; Romania 6,205.
Metal including alloys:				
Scrap	67,297	74,331	39	West Germany 49,766; France 12,882.
Unwrought	359,399	365,336	231	Belgium-Luxembourg 109,460; West Germany 107,907; France 83,691.
Semimanufactures	96,080	106,032	70	West Germany 49,823; Belgium-Luxembourg 15,704; France 12,182.
Antimony:				
Oxides	474	341	--	West Germany 300.
Metal including alloys, all forms	136	79	--	United Kingdom 37; West Germany 24; France 16.
Arsenic oxides and acids	81	33	--	France 26; West Germany 5.
Bismuth metal including alloys, all forms	27	31	--	France 8; West Germany 8.
Cadmium metal including alloys, all forms	528	404	72	Belgium-Luxembourg 125; West Germany 106.
Chromium:				
Chromite	14,417	18,726	--	France 7,354; West Germany 6,815; Switzerland 1,605.
Oxides and hydroxides	183	197	--	United Kingdom 69; West Germany 43; Belgium-Luxembourg 34.
Cobalt:				
Oxides and hydroxides	78	48	--	France 25; West Germany 9.
Metal including alloys, all forms	254	196	5	West Germany 69; United Kingdom 50.
Columbium and tantalum metals including alloys, all forms	8	188	4	West Germany 178.
Copper:				
Ore and concentrate	9	--		
Oxide	35	57	18	United Kingdom 15.
Ash and residue containing copper	5,434	4,216	--	West Germany 2,566; Belgium-Luxembourg 1,052.
Sulfate	612	766	NA	France 294; Belgium-Luxembourg 230; United Kingdom 101.
Metal including alloys:				
Scrap	56,006	58,390	31	Belgium-Luxembourg 26,522; West Germany 22,366.
Unwrought	5,327	5,945	310	West Germany 1,612; Italy 1,342; Turkey 1,333.
Semimanufactures	55,112	48,908	9,482	West Germany 10,906; France 6,049; Italy 3,437.
Germanium metal including alloys, all forms value	r$22,566	$470	NA	NA.
Gold metal including alloys, unwrought and partly wrought troy ounces	948,167	922,407	600	Switzerland 542,859; France 219,867.
Iron and steel:				
Ore and concentrate except roasted pyrite	119,490	273,619	--	West Germany 268,387.
Roasted pyrite	76	87	NA	NA.
Metal:				
Scrap thousand tons	1,241	1,194	--	West Germany 542; Belgium-Luxembourg 320; Spain 193.
Pig iron, ferroalloys, similar materials	32,453	22,501	26	West Germany 11,061; United Kingdom 2,536; Italy 1,841.
Steel, primary forms thousand tons	1,979	1,799	147	West Germany 524; Belgium-Luxembourg 387; United Kingdom 136.
Semimanufactures:				
Bars, rods, angles, shapes, sections	431,883	424,203	2,303	Belgium-Luxembourg 137,118; West Germany 88,352; United Kingdom 50,268.
Universals, plates, sheets thousand tons	1,803	1,567	86	United Kingdom 302; West Germany 242; Belgium-Luxembourg 200.
Hoop and strip	134,493	118,395	59	West Germany 61,290; Switzerland 22,389; France 6,749.
Rails and accessories	28,381	29,916	5	Italy 14,535; West Germany 11,300.
Wire	40,142	42,330	109	West Germany 11,728; Belgium-Luxembourg 10,747; France 8,110.

See footnotes at end of table.

Table 2.—Netherlands: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures —Continued				
Tubes, pipes, fittings	438,109	488,899	3,001	West Germany 117,062; Belgium-Luxembourg 57,729; Argentina 43,562.
Castings and forgings, rough	24,680	23,166	19	Belgium-Luxembourg 17,319; West Germany 4,042.
Lead:				
Oxides	5,153	6,302	--	Italy 2,983; West Germany 2,463; U.S.S.R. 450.
Ash and residue	5,328	2,846	--	Belgium-Luxembourg 2,030; West Germany 358.
Metal including alloys:				
Scrap	35,362	36,153	--	Belgium-Luxembourg 12,578; West Germany 12,578; France 10,260.
Unwrought	18,707	19,696	--	West Germany 13,896; Spain 1,074; Belgium-Luxembourg 1,035.
Semimanufactures	1,738	1,782	--	Norway 784; Belgium-Luxembourg 376.
Magnesium metal including alloys:				
Scrap	1,304	1,421	505	Italy 461; West Germany 423.
Unwrought and semimanufactures	6,002	4,691	--	West Germany 2,402; United Kingdom 1,123; Italy 832.
Manganese:				
Ores and concentrates	37,422	39,536	--	West Germany 14,592; Belgium-Luxembourg 5,143; Switzerland 2,000.
Oxides	10	88	NA	NA.
Metal including alloys, all forms	2,083	2,487	--	West Germany 1,610; United Kingdom 363; France 197.
Mercury 76-pound flasks	2,930	5,482	--	West Germany 1,770; United Kingdom 580; Romania 638.
Molybdenum:				
Oxide	1,445	2,247	--	Austria 949; Italy 256; United Kingdom 256.
Metal including alloys, all forms	185	181	16	Belgium-Luxembourg 103; France 41.
Nickel:				
Matte, speiss, similar materials	4,034	3,686	--	West Germany 2,106; France 702; Sweden 302.
Oxides and hydroxides	488	572	--	Italy 151; France 143; Belgium-Luxembourg 68.
Metal including alloys:				
Scrap	2,071	2,168	39	West Germany 633; Finland 365; Sweden 304.
Unwrought	3,816	4,446	--	Italy 2,816; West Germany 503; France 392.
Semimanufactures	525	288	--	West Germany 89; Switzerland 35; Belgium-Luxembourg 30.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	49,931	40,576	1,325	United Kingdom 9,806; West Germany 8,101; Belgium-Luxembourg 6,329.
Selenium, elemental	3	2	NA	NA.
Silver metal including alloys, unwrought and partly wrought thousand troy ounces	10,100	8,127	48	Belgium-Luxembourg 2,631; France 2,020; West Germany 1,253.
Tellurium and arsenic, elemental	44	61	--	France 30; West Germany 6.
Tin:				
Oxides	8	7	--	All to Belgium-Luxembourg.
Metal including alloys:				
Scrap	513	361	--	United Kingdom 175; West Germany 128.
Unwrought	1,275	1,945	--	West Germany 1,430; Belgium-Luxembourg 368.
Semimanufactures	738	795	2	West Germany 448; Belgium-Luxembourg 124; Sweden 45.
Titanium:				
Ore and concentrate	2,599	26,386	--	West Germany 5,495; United Kingdom 4,208; Turkey 3,406.
Oxides	1,089	831	--	West Germany 243; Belgium-Luxembourg 166; Italy 149.
Metal including alloys, all forms	114	77	3	Italy 22; France 19; Belgium-Luxembourg 12.

See footnotes at end of table.

Table 2.—Netherlands: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Tungsten:				
Ore and concentrate	1,161	1,656	40	U.S.S.R. 939; Czechoslovakia 248; United Kingdom 140.
Metal including alloys, all forms	202	202	--	Belgium-Luxembourg 166; West Germany 16.
Zinc:				
Ash and residue containing zinc	12,359	11,854	--	Belgium-Luxembourg 5,918; West Germany 4,154; France 1,592.
Ore and concentrate	11,501	7,306	--	Belgium-Luxembourg 6,512; France 769.
Metal including alloys:				
Scrap	4,419	6,576	--	West Germany 2,822; Belgium-Luxembourg 1,994; France 1,300.
Dust (blue powder)	3,457	2,933	NA	NA.
Unwrought	136,807	163,201	9,037	West Germany 43,884; United Kingdom 34,228; France 22,816.
Semimanufactures	2,554	3,815	--	West Germany 2,616; Republic of South Africa 294; Belgium-Luxembourg 244.
Zirconium ore and concentrate	270	24,840	--	West Germany 14,227; France 4,182; United Kingdom 2,253.
Other:				
Ores and concentrates	23,363	29,159	--	West Germany 7,229; United Kingdom 4,692; Italy 4,482.
Ash and residue containing nonferrous metals	18,295	8,774	--	West Germany 4,291;United Kingdom 1,102; Belgium-Luxembourg 892.
Oxides, hydroxides, peroxides	46	51	--	France 17; United Kingdom 10; West Germany 10.
Base metals including alloys, all forms	38	21	--	Belgium-Luxembourg 7; West Germany 5.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	19,680	8,002	31	West Germany 3,430; Thailand 1,100; United Kingdom 604.
Corundum, artificial	306	411	--	Belgium-Luxembourg 170; Australia 96; West Germany 7.
Dust and powder of precious and semi-precious stones, including diamond kilograms	152	171	8	East Germany 54; Sweden 20; United Kingdom 15.
Grinding and polishing wheels and stones	3,543	4,118	18	West Germany 982; United Kingdom 819; France 677.
Asbestos, crude	56	36	NA	NA.
Barium materials:				
Barite and witherite	77,458	122,537	7,036	United Kingdom 51,722; Norway 20,589; Cameroon 16,072.
Oxides	388	603	--	Belgium-Luxembourg 237; West Germany 220.
Borates, crude, natural	369,997	400,154	--	West Germany 86,417; France 78,963; United Kindgom 55,828.
Cement	370,797	391,278	--	West Germany 181,098; Nigeria 99,766; Belgium-Luxembourg 69,653.
Chalk	25,753	26,757	--	Belgium-Luxembourg 25,313.
Clays and clay products:				
Crude:				
Bentonite	26,462	35,210	--	Belgium-Luxembourg 12,227; United Kingdom 8,050; France 4,401.
Fuller's earth, dinas earth, chamotte	3,270	2,087	--	West Germany 903; Belgium-Luxembourg 791; Nigeria 99.
Kaolin	88,931	79,203	--	Belgium-Luxembourg 67,164; West Germany 7,540.
Kyanite and sillimanite	519	1,896	--	Belgium-Luxembourg 708; West Germany 369.
Other	85,636	80,080	--	West Germany 57,212; Belgium-Luxembourg 17,211.
Products:				
Refractory including nonclay brick	34,975	33,845	17	West Germany 14,073; Belgium-Luxembourg 5,338; Italy 2,695.
Nonrefractory	833,476	852,100	269	West Germany 623,535; Belgium-Luxembourg 156,001; France 41,475.

See footnotes at end of table.

Table 2.—Netherlands: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Diamond excluding dust and powder:				
Worked:				
Gem carats	122,300	107,228	4,800	Belgium-Luxembourg 28,759 Switzerland 27,271; Israel 14,706.
Industrial do	11,468	7,994	992	Hong Kong 2,510; Japan 1,452; United Kingdom 1,113.
Unworked:				
Gem do	21,439	87,967	749	Belgium-Luxembourg 83,734; Switzerland 2,115.
Industrial do	833,999	825,518	218,321	Belgium-Luxembourg 189,291; United Kingdom 118,543; Japan 59,683.
Unsorted do	295,223	59,541	9,063	Israel 23,617; Belgium-Luxembourg 17,734; West Germany 3,580.
Diatomite and other infusorial earth	559	657	NA	France 178; Belgium-Luxembourg 160.
Feldspar, fluorspar, leucite	7,863	15,696	--	West Germany 9,229; Belgium-Luxembourg 4,914.
Fertilizer materials:				
Crude:				
Phosphatic	71,426	64,064	--	West Germany 47,113; Belgium-Luxembourg 14,170.
Other including mixed	77,507	106,894	--	Belgium-Luxembourg 83,644; West Germany 17,748.
Manufactured:				
Nitrogenous thousand tons	3,137	2,882	263	India 524; France 409; West Germany 342; Brazil 302.
Phosphatic including Thomas slag	326,500	279,071	--	France 115,762; West Germany 29,590.
Potassic	3,346	5,694	--	Nigeria 3,056; Denmark 791; Oman 642; Sudan 450.
Other including mixed thousand tons	1,077	1,033	--	France 407; West Germany 128; United Kingdom 104.
Ammonia	540,642	609,061	3,980	Belgium-Luxembourg 349,414; West Germany 69,054; France 46,730.
Graphite, natural	644	515	--	West Germany 388; East Germany 35.
Gypsum and plasters	3,475	2,170	--	Belgium-Luxembourg 1,232.
Lime	4,940	5,297	--	West Germany 3,849; Nigeria 592; Belgium-Luxembourg 449.
Magnesium materials:				
Magnesite	34,376	30,934	176	West Germany 14,362; France 3,859; Belgium-Luxembourg 2,503.
Oxide	13	85	57	Belgium-Luxembourg 1.
Mica, crude and worked	1,233	983	--	United Kingdom 220; West Germany 210; Belgium-Luxembourg 116.
Pigments, mineral, including processed iron oxide	6,567	7,488	1,654	West Germany 2,110; France 1,791; United Kingdom 619.
Precious and semiprecious stones except diamond kilograms	1,480	2,056	NA	West Germany 1,000.
Salt and brine thousand tons	2,475	2,159	30	Belgium-Luxembourg 577; West Germany 441; Finland 420.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	157,193	189,748	4,318	China 70,674; Belgium-Luxembourg 17,519; Sweden 16,937.
Caustic potash	109,333	37,602	--	West Germany 33,694.
Soda ash	151,905	154,896	--	West Germany 37,548; Denmark 17,594; Belgium-Luxembourg 13,272.
Stone, sand and gravel:				
Dimension stone:				
Unworked and partly worked	5,138	7,408	--	West Germany 5,648; Belgium-Luxembourg 898.
Worked	9,579	26,949	--	Belgium-Luxembourg 19,484; West Germany 6,478.
Dolomite	10,568	15,483	--	West Germany 7,791; Belgium-Luxembourg 6,141.
Gravel and crushed stone thousand tons	4,493	4,090	--	Belgium-Luxembourg 3,757; West Germany 319.
Limestone, excluding dimension	119	59,942	--	Belgium-Luxembourg 59,893.
Quartz and quartzite	13,169	13,393	--	West Germany 10,209; Belgium-Luxembourg 1,421; Austria 746.
Sand, excluding metal-bearing thousand tons	9,304	9,341	--	Belgium-Luxembourg 8,940; West Germany 307.
Strontium material, oxide	5	329	NA	NA.

See footnotes at end of table.

Table 2.—Netherlands: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental	11,015	16,038	--	Belgium-Luxembourg 15,514.
Sulfuric acid, oleum	160,579	143,341	1,107	Belgium-Luxembourg 81,570; Turkey 19,115; Mexico 10,093.
Talc and steatite	4,066	8,011	--	West Germany 4,100; Belgium-Luxembourg 1,468.
Other:				
Crude	263,859	197,104	72	West Germany 78,672; Belgium-Luxembourg 62,471; France 39,601.
Slag, dross, similar waste, not metal-bearing:				
From iron and steel manufacture	137,543	36,993	--	West Germany 28,286; Belgium-Luxembourg 7,942.
Unspecified	131,103	209,263	200	Belgium-Luxembourg 105,954; United Arab Emirates 24,075; Norway 23,848.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals[1]	17,836	14,973	--	Belgium-Luxembourg 9,454; West Germany 3,568.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	7	4,540	--	West Germany 4,535.
Carbon black	84,091	82,059	123	France 37,821; West Germany 17,555; Belgium-Luxembourg 10,379.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	1,032	1,547	--	Belgium-Luxembourg 583; West Germany 409; Finland 173.
Briquets of anthracite and bituminous coal	9,862	1,702	--	Belgium-Luxembourg 1,498.
Lignite including briquets	1,259	1,689	--	Belgium-Luxembourg 1,606.
Coke and semicoke	739,373	751,921	--	France 277,284; Belgium-Luxembourg 240,188; West Germany 149,661; United Kingdom 20,812.
Gas, hydrocarbon:				
Manufactured	235,346	222,982	--	Belgium-Luxembourg 118,109; West Germany 74,919.
Natural million cubic feet	1,990,439	1,931,653	--	West Germany 910,954; France 393,760; Italy 277,652.
Hydrogen, helium, rare gases	28,371	32,745	--	West Germany 17,935; Belgium-Luxembourg 6,208; France 3,685.
Peat including briquets and litter	112,425	160,432	--	Belgium-Luxembourg 104,601; France 26,323; West Germany 25,937.
Petroleum:				
Crude 42-gallon barrels	104,878	100,079	--	Belgium-Luxembourg 65,740; West Germany 34,339.
Refinery products:[2]				
Gasoline thousand 42-gallon barrels	84,115	79,900	370	West Germany 41,535; United Kingdom 11,311; Belgium-Luxembourg 8,030.
Kerosine do	24,626	21,554	--	West Germany 9,621; Denmark 2,663; Nigeria 2,000.
Distillate fuel oil do	107,759	100,345	2	West Germany 49,331; Belgium-Luxembourg 12,152; Denmark 6,660.
Residual fuel oil do	99,956	84,491	174	United Kingdom 9,363; Belgium-Luxembourg 9,259; West Germany 8,618.
Lubricants do	4,357	4,377	21	Belgium-Luxembourg 784; United Kingdom 412; West Germany 270.
Other:				
Liquefied petroleum gas do	3,363	2,561	--	Belgium-Luxembourg 1,405; West Germany 581.
Mineral jelly and wax do	605	634	4	West Germany 197; United Kingdom 191; France 49.
Petroleum coke do	390	396	19	West Germany 205; Italy 47; France 45.

See footnotes at end of table.

Table 2.—Netherlands: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products:[2] —Continued				
Other —Continued				
Bitumen and other residues thousand 42-gallon barrels	2,092	2,522	--	West Germany 920; Denmark 739; Norway 405.
Bituminous mixtures do	420	265	--	West Germany 104; Norway 36; Sudan 29.
Unspecified do	559	567	--	Belgium-Luxembourg 256; West Germany 85; France 38.
Total do	328,242	297,612		
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r674,359	827,830	15,712	West Germany 564,099; United Kingdom 84,585; Belgium-Luxembourg 53,065.

rRevised. NA Not available.
[1]Excludes quantity valued at $7,695,618 in 1979 and $7,459,967 in 1980.
[2]Includes bunkers.

Table 3.—Netherlands: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	193,695	196,261	109	Greece 183,987; Guyana 4,960; China 4,174.
Oxides and hydroxides	587,570	603,900	686	Suriname 233,266; Greece 211,237; France 96,684.
Ash and residue containing aluminum	2,819	4,299	--	West Germany 3,064; France 529; Spain 457.
Metal including alloys:				
Scrap	33,468	44,713	8,292	West Germany 18,045; United Kingdom 5,141.
Unwrought	167,331	215,831	9,545	Norway 115,172; West Germany 27,832; United Kingdom 15,567.
Semimanufactures	107,368	116,952	7,379	West Germany 36,451; Belgium-Luxembourg 24,874; France 8,814.
Antimony:				
Oxides	1,141	985	--	Bolivia 286; United Kingdom 258; Belgium-Luxembourg 203.
Metal including alloys, all forms	132	112	--	China 61; Belgium-Luxembourg 39.
Arsenic oxides and acids	153	24	--	West Germany 5; Mexico 4.
Beryllium metal including alloys, all forms	2	7	--	United Kingdom 5.
Bismuth metal including alloys, all forms	54	62	5	Belgium-Luxembourg 32.
Cadmium metal including alloys, all forms	85	68	--	Zaire 30; France 10.
Chromium:				
Chromite	6,866	27,176	--	Republic of South Africa 25,743.
Oxides and hydroxides	888	790	11	West Germany 644.
Metal including alloys, all forms	59	126	--	West Germany 102.
Cobalt:				
Oxides and hydroxides	286	197	55	Belgium-Luxembourg 88; United Kingdom 22.
Metal including alloys, all forms	194	180	10	Brazil 46; West Germany 37; East Germany 20.
Columbium and tantalum	1	2	NA	NA.
Copper:				
Ore and concentrate	68	--		
Oxides and hydroxides	1,103	618	--	West Germany 280; Italy 200; Norway 81.
Sulfate	4,285	4,401	34	Belgium-Luxembourg 2,100; France 1,244; U.S.S.R. 592.

See footnotes at end of table.

Table 3.—Netherlands: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Copper —Continued				
Metal including alloys:				
Scrap	21,139	29,459	1,188	West Germany 8,626; France 6,152; United Kingdom 5,691.
Unwrought	31,166	21,616	622	Belgium-Luxembourg 4,556; West Germany 3,400; Zambia 2,623.
Semimanufactures	103,781	104,881	1,615	West Germany 44,888; Belgium-Luxembourg 30,935; France 13,468.
Gold:				
Waste and sweepings value, thousands	$821	$2,247	--	Denmark $1,756; United Kingdom $402.
Metal including alloys, unwrought or partly wrought thousand troy ounces	1,086	762	103	United Kingdom 185; Switzerland 145; France 139.
Iron and steel:				
Ore and concentrate except roasted pyrite thousand tons	7,431	7,585	102	Brazil 2,265; Sweden 1,900; Canada 1,195.
Roasted pyrite	25	169	NA	NA.
Metal:				
Scrap	197,088	153,115	2,661	West Germany 59,093; United Kingdom 51,904; Belgium-Luxembourg 20,058.
Pig iron, spiegeleisen, sponge iron, powder, shot	75,215	65,005	20	Brazil 15,928; West Germany 15,071; Belgium-Luxembourg 8,609.
Ferroalloys	43,674	46,074	385	Norway 16,536; France 9,190; West Germany 5,065.
Steel, primary forms	367,253	298,689	--	West Germany 123,254; Norway 113,633.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	1,196	1,306	(1)	Belgium-Luxembourg 526; West Germany 430; France 160.
Universals, plates, sheets do	1,016	1,057	2	Belgium-Luxembourg 469; West Germany 380.
Hoop and strip	187,099	226,496	84	West Germany 129,655; Belgium-Luxembourg 76,197.
Rails and accessories	51,735	45,863	44	West Germany 31,685; France 10,991.
Wire	83,089	75,649	60	Belgium-Luxembourg 37,026; West Germany 29,232.
Tubes, pipes, fittings	607,888	758,235	2,130	West Germany 474,258; France 88,277; Belgium-Luxembourg 52,167.
Castings and forgings, rough	19,011	21,547	17	West Germany 12,013; Belgium-Luxembourg 6,468.
Lead:				
Oxides	8,055	6,148	31	West Germany 3,809; Belgium-Luxembourg 2,212.
Ash and residue containing lead	4,676	3,313	52	West Germany 1,603; United Kingdom 1,000.
Metal including alloys:				
Scrap	10,022	9,752	1,318	West Germany 5,253; Ireland 769; Switzerland 692.
Unwrought	56,073	62,620	5,702	United Kingdom 16,261; Belgium-Luxembourg 15,361; Australia 8,230.
Semimanufactures	4,728	5,737	--	Belgium-Luxembourg 3,754; West Germany 943; France 941.
Magnesium metal including alloys:				
Scrap	875	838	--	West Germany 485; United Kingdom 110; Belgium-Luxembourg 91.
Unwrought	6,858	5,580	5,062	France 241; Norway 234.
Semimanufactures	272	298	--	West Germany 194; Switzerland 24.
Manganese:				
Ores and concentrates	89,268	46,779	--	Australia 5,578; Belgium-Luxembourg 1,204.
Oxides	1,075	1,151	40	Belgium-Luxembourg 990.
Metal including alloys, all forms	2,090	2,558		Republic of South Africa 2,298.
Mercury 76-pound flasks	3,481	5,947	87	West Germany 2,205; Spain 899; France 870.
Molybdenum:				
Oxides	64	107	102	France 3.
Metal including alloys, all forms	235	175	7	Belgium-Luxembourg 59; West Germany 48.
Nickel:				
Oxides and hydroxides	725	1,127	40	Canada 599; Australia 385.
Matte, speiss, similar materials	4,267	3,695	--	Cuba 3,587.

See footnotes at end of table.

Table 3.—Netherlands: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Nickel —Continued				
Metal including alloys:				
Scrap	875	1,021	76	United Kingdom 397; West Germany 167; France 110.
Unwrought	5,078	5,567	--	Republic of South Africa 2,344; U.S.S.R. 905.
Semimanufactures	1,951	1,196	181	United Kingdom 419; West Germany 357.
Platinum-group metals including alloys, unwrought or partly wrought troy ounces	64,447	63,174	3,147	West Germany 22,500; France 9,090; United Kingdom 7,305.
Silver metal including alloys, unwrought and partly wrought thousand troy ounces	4,703	6,949	176	West Germany 1,786; France 1,294; United Kingdom 1,161.
Tellurium and arsenic, elemental	63	59	38	Sweden 11; China 10.
Tin:				
Ore and concentrate	3,437	3,338	5	Bolivia 2,207; Republic of South Africa 447.
Oxides	86	115	--	United Kingdom 88; West Germany 15.
Metal including alloys:				
Scrap	470	402	37	West Germany 204; France 82.
Unwrought	5,539	5,761	70	Thailand 1,718; Malaysia 1,250; West Germany 598.
Semimanufactures	138	128	--	West Germany 53; Belgium-Luxembourg 39.
Titanium:				
Ore and concentrate	4,257	37,138	--	Australia 12,278; Republic of South Africa 10,406; Sri Lanka 8,255.
Oxides	9,040	5,886	196	West Germany 3,647; United Kingdom 487; Finland 477.
Metal including alloys, all forms	260	239	85	West Germany 39; Japan 35.
Tungsten:				
Ore and concentrate	99	232	--	Portugal 120; Singapore 76.
Oxides	1	9	--	All from West Germany.
Metal including alloys, all forms	123	142	2	Belgium-Luxembourg 64; United Kingdom 46.
Vanadium oxides, hydroxides, peroxides	8	14	--	West Germany 13.
Zinc:				
Ore and concentrate	340,492	346,655	--	Ireland 106,004; Canada 61,982; Australia 52,660.
Oxides and peroxides	3,774	3,836	15	United Kingdom 1,451; West Germany 911; Belgium-Luxembourg 718.
Matte	192	257	--	France 182; West Germany 68.
Ash and residue containing zinc	13,323	17,541	--	West Germany 16,420; France 562.
Metal including alloys:				
Scrap	9,447	9,805	--	West Germany 6,540; Belgium-Luxembourg 1,766.
Dust (blue powder)	2,327	2,351	--	West Germany 1,152; Belgium-Luxembourg 1,107.
Unwrought	22,699	25,521	--	West Germany 10,592; Spain 8,702.
Semimanufactures	4,710	4,890	--	West Germany 2,833; Belgium-Luxembourg 1,714.
Zirconium:				
Ore and concentrate	214	27,011	--	Australia 23,564; Republic of South Africa 2,291.
Oxide[2]	85	55	30	West Germany 10.
Other:				
Ores and concentrates	27,944	28,247	24,767	Chile 3,125.
Ash and residue containing nonferrous metals	r58,879	50,914	135	Canada 45,078.
Metal:				
Metalloids:				
Phosphorus	143	147	--	West Germany 135.
Selenium	10	7	--	Canada 2; Japan 1.
Silicon	6,428	5,455	--	Republic of South Africa 3,367; West Germany 922; France 729.
Alkali, alkaline-earth, rare-earth metals	95	162		West Germany 125.
Base metals including alloys, all forms	61	12	2	France 3.
Oxides, hydroxides, peroxides	157	218	7	Belgium-Luxembourg 196.

See footnotes at end of table.

Table 3.—Netherlands: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	394,378	449,876	136	West Germany 441,807.
Corundum, artificial	6,057	6,326	569	West Germany 4,195; France 716.
Dust and powder of precious and semi-precious stones, including diamond kilograms	208	165	6	Ireland 92; United Kingdom 30.
Grinding and polishing wheels and stones	2,825	2,752	241	West Germany 1,214; Austria 480; Italy 219.
Asbestos, crude	28,235	19,042	593	Canada 12,050; Italy 3,266.
Barium compounds:				
Barite and witherite	201,894	81,728	--	China 23,386; Morocco 21,112; Italy 18,990.
Oxides, hydroxides, peroxides	409	673	--	U.S.S.R. 363; West Germany 207.
Boron materials:				
Crude natural borates	383,922	426,411	405,406	Turkey 12,430.
Oxide and acid	2,473	2,382	666	France 1,300.
Cement thousand tons	3,268	3,308	--	Belgium-Luxembourg 1,682; West Germany 1,601.
Chalk	67,613	64,605	--	France 40,046; West Germany 12,037; Belgium-Luxembourg 11,220.
Clays and clay products:				
Crude:				
Bentonite	62,633	64,756	22,704	Greece 30,265; West Germany 6,181.
Fuller's earth, dinas earth, chamotte	36,479	34,829	1,835	West Germany 20,597; France 5,866.
Kaolin	438,693	469,562	66,338	United Kingdom 195,954; West Germany 132,945.
Kyanite and sillimanite	1,464	3,359	--	Republic of South Africa 1,907; West Germany 822.
Unspecified	774,769	676,930	16,133	West Germany 643,251.
Products:				
Refractory including nonclay brick	60,463	56,724	699	West Germany 30,961; United Kingdom 11,036; Austria 5,528.
Nonrefractory	367,879	310,098	5	West Germany 102,596; Belgium-Luxembourg 92,977; Italy 62,987.
Cryolite and chiolite	314	221	--	All from Denmark.
Diamond:				
Worked:				
Gem carats	141,479	150,071	2,629	Belgium-Luxembourg 66,896; Israel 35,436.
Industrial do	21,669	13,741	--	France 12,176.
Unworked:				
Gem do	63,770	77,968	53	Belgium-Luxembourg 40,202; Republic of South Africa 14,172.
Industrial do	855,816	575,506	46,485	United Kingdom 225,002; Ireland 149,481; Belgium-Luxembourg 110,316.
Unsorted do	557,676	138,899	17,253	United Kingdom 97,085; Ireland 10,346.
Diatomite and other infusorial earth	17,460	16,489	1,949	Denmark 11,353.
Feldspar, fluorspar, leucite	63,086	68,703	--	Norway 32,569; Canada 9,009; Belgium-Luxembourg 7,375.
Fertilizer materials:				
Crude:				
Nitrogenous	23,019	23,872	--	Chile 23,738.
Phosphatic thousand tons	2,451	2,485	799	Morocco 788; Togo 652; Israel 224.
Potassic	8,130	4,793	--	West Germany 2,947; France 1,846.
Other including mixed	86,578	87,068	1	West Germany 79,472; Belgium-Luxembourg 5,480.
Manufactured:				
Nitrogenous	292,820	291,283	1	Belgium-Luxembourg 134,389; United Kingdom 46,827; West Germany 33,272.
Phosphatic	67,082	63,733	--	Belgium-Luxembourg 48,467; West Germany 8,326; East Germany 3,644.
Potassic	394,648	389,800	1	West Germany 127,347; U.S.S.R. 73,208; East Germany 54,848.
Other including mixed	155,748	136,763	1,222	West Germany 55,463; Belgium-Luxembourg 33,308; United Kingdom 15,528.
Ammonia	160,562	156,988	NA	NA.
Graphite, natural	1,169	782	--	West Germany 341; China 300; United Kingdom 125.
Gypsum and plasters	370,565	425,223	70	West Germany 234,662; France 158,141.
Lime thousand tons	938	801	--	Belgium-Luxembourg 485; West Germany 316.

See footnotes at end of table.

Table 3.—Netherlands: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Magnesium compounds:				
Magnesite	69,224	71,352	--	Greece 22,586; China 19,075; U.S.S.R. 8,568.
Oxides, hydroxides, peroxides	72	142	--	United Kingdom 88; West Germany 27.
Mica:				
Crude including splittings and waste	2,151	1,999	203	Norway 813; United Kingdom 376; Canada 341.
Worked including agglomerated splittings	29	26	1	Switzerland 9; Belgium-Luxembourg 6.
Pigments, mineral: Iron oxides, processed	15,111	14,239	73	West Germany 12,475; United Kingdom 465.
Precious and semiprecious stones, natural and synthetic other than diamond, unworked and worked kilograms	60,885	69,623	28,250	West Germany 19,008; Uruguay 4,378.
Salt and brine	313,733	71,173	88	West Germany 41,466; Belgium-Luxembourg 14,825; Italy 12,000.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	189,967	234,615	--	West Germany 97,884; Belgium-Luxembourg 94,634; East Germany 32,339.
Caustic potash	6,755	7,252	60	Belgium-Luxembourg 2,994; France 2,515; West Germany 667.
Soda ash	58,080	63,276	19,039	France 13,225; East Germany 12,633; West Germany 10,848.
Stone, sand and gravel:				
Dimension stone:				
Unworked and partly worked thousand tons	1,026	1,619	--	West Germany 803; Belgium-Luxembourg 688.
Worked	60,890	59,811	--	Italy 30,692; West Germany 7,949; Portugal 6,481.
Dolomite thousand tons	995	923	--	Belgium-Luxembourg 770; West Germany 127.
Gravel and crushed rock do.	15,515	17,090	--	West Germany 11,331; Belgium-Luxembourg 3,451; United Kingdom 1,236.
Limestone excluding dimension do.	841	841	--	Belgium-Luxembourg 808.
Quartz and quartzite	18,402	28,146	--	West Germany 12,944; Norway 12,910.
Sand excluding metal-bearing thousand tons	8,120	7,593	--	West Germany 6,782; Belgium-Luxembourg 780.
Strontium: Oxides, hydroxides, peroxides	193	49	NA	NA.
Sulfur:				
Elemental	455,752	468,098	179,964	West Germany 127,718; France 87,114; Poland 65,220.
Sulfuric acid, oleum	370,860	293,930	10,013	West Germany 228,398; Belgium-Luxembourg 33,286.
Talc, steatite, pyrophyllite	23,404	32,827	585	Norway 11,430; Austria 8,509; Finland 3,665.
Other:				
Crude:				
Quartz, electronic grade kilograms	5	34	NA	NA.
Other thousand tons	1,659	1,960	7	West Germany 1,010; Belgium-Luxembourg 927.
Slag, dross, similar waste, not metal-bearing:				
From iron and steel manufacture do.	3,956	2,585	--	Belgium-Luxembourg 1,328; West Germany 1,093.
Unspecified do.	664	673	--	West Germany 571; Belgium-Luxembourg 101.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals[3]	148,093	157,122	1,539	Belgium-Luxembourg 94,350; West Germany 25,862.

See footnotes at end of table.

Table 3.—Netherlands: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	12,985	3,533	992	West Germany 2,426.
Carbon black and gas carbon	9,007	[4]11,724	827	West Germany 7,887; France 1,934.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	6,211	7,155	2,802	West Germany 1,376; Australia 1,174; Poland 942.
Briquets of anthracite and bituminous coal	6,610	5,582	--	West Germany 5,238.
Lignite including briquets	183,448	194,101	--	All from West Germany.
Coke and semicoke	849,264	856,789	103,317	West Germany 572,459; United Kingdom 142,528.
Gas, hydrocarbon:				
Natural million cubic feet	115,304	133,448	--	West Germany 119,371; Norway 14,076.
Manufactured	112,884	117,993	--	East Germany 63,266; France 24,760; Belgium-Luxembourg 23,391.
Hydrogen, helium, rare gases	2,883	3,113	([1])	Belgium-Luxembourg 2,126; West Germany 412; France 318.
Peat including briquets and litter	476,538	524,046	--	West Germany 501,649.
Petroleum:[5]				
Crude thousand 42-gallon barrels	450,862	371,720	--	Saudi Arabia 141,309; Nigeria 79,778; Kuwait 41,301.
Refinery products:				
Gasoline do	66,878	60,961	151	U.S.S.R. 12,522; Belgium-Luxembourg 5,677; Algeria 4,564.
Kerosine and jet fuel do	4,656	2,321	22	France 693; Belgium-Luxembourg 414; United Kingdom 340.
Distillate fuel oil do	23,944	25,714	5	U.S.S.R. 11,944; Belgium-Luxembourg 4,790; United Kingdom 1,431.
Residual fuel oil do	25,149	36,212	--	United Kingdom 6,528; Belgium-Luxembourg 5,740; Iran 3,664.
Lubricants do	[r]2,036	2,301	190	Belgium-Luxembourg 641; France 277; United Kingdom 264.
Other:				
Liquefied petroleum gas do	5,191	6,895	--	Saudi Arabia 2,107; United Kingdom 1,683; Belgium-Luxembourg 1,296.
Mineral jelly and wax do	432	404	16	Austria 116; West Germany 98; France 58.
Petroleum coke do	[r]2,777	2,985	1,758	West Germany 665; Netherlands Antilles 254.
Bitumen do	1,454	1,663	655	Belgium-Luxembourg 753; West Germany 250.
Bituminous mixtures do	157	175	1	Belgium-Luxembourg 96; West Germany 58.
Unspecified do	[r]89	93	5	West Germany 45; France 21; Belgium-Luxembourg 17.
Total do	[r]132,763	139,724		
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	[r]804,614	761,003	26,038	West Germany 213,582; Sweden 119,367; Canada 75,735.

[r]Revised. NA Not available.
[1]Less than 1/2 unit.
[2]May include germanium oxides.
[3]Excludes quantities valued at $24,295,985 in 1979 and $27,067,856 in 1980.
[4]Excludes quantity of gas carbon valued at $470 in 1980.
[5]Includes bunkers.

COMMODITY REVIEW

METALS

Aluminum.—The largest of the two aluminum smelting plants, that of Péchiney Nederland NV at Vlissingen, with a capacity of 170,000 metric tons, was reportedly unprofitable in 1981, because of escalating energy costs. The electricity was supplied to the smelter by the country's largest nuclear powerplant Zeeuwse Energy Co.

Iron and Steel.—Not long after joining forces with a West German company, Hoesch AG, in 1980, the giant Netherlands steel producer Estel Hoogovens BV (former-

ly Hoogovens IJmuiden BV) experienced several problems in 1981: The general crisis in the European steel industry, the inclusion of the Netherlands in the U.S. producers' suits, and the possible breakup of the Estel partnership. In 1981, the company registered a loss for the second year. State subsidy during the year amounted to about $540 million.[2] Nevertheless, in 1981 Hoogovens was one of the most modern, most efficient, and least subsidized steel producers in Europe. Hoogovens' output in 1981 was 5.2 million tons, up slightly from 5.0 million tons in 1980, while sales improved from 4.1 million tons in 1980 to 4.5 million tons in 1981. Exports to the United States accounted for about 12% to 15% of the firm's sales in 1981.

During the year, Hoogovens planned investments at its IJmuiden plant for the second-phase reconstruction of a coke battery and the completion of the 1.4-million-ton-per-year billet mill. The firm also planned to install a vacuum ladle and to build a coal injection system for two blast furnaces.

The Netherlands' electric steelmaker, Nedstaal BV, reached an agreement in 1981 with its parent company, Thyssen AG of the Federal Republic of Germany, to keep in operation the two most efficient furnaces of its four 35-ton units. Thyssen was to provide over $70 million for the modernization of Nedstaal's scrap bay and ingot stripping operation. The Netherlands Government was to provide another $40 million for the plant's electricity requirements and for compliance with environmental regulations. Over the next several years, however, the work force was slated for reduction by over one-third.

Lead.—Contributing to the growing worldwide importance of the secondary lead industry, the Netherlands reportedly produced only secondary lead in 1981, most of which was imported and refined in the country's only secondary plant, at Arnhem, owned by Billiton International Metals BV. A new 45,000-ton-per-year plant was planned to replace the old 25,000-ton plant in 1982.

Magnesium.—In 1981, Billiton Delfstoffen BV completed the construction of its magnesia-from-brines project, at Veendam in Groningen Province. The production was aimed mostly at the manufacture of refractory products. Billiton was encouraged to invest in the project because of the availability of magnesium-bearing salts in the region. In the Netherlands, large accumulations of magnesium-bearing salts occur in rock-salt strata, which form part of the Upper Permian Zechstein Basin, extending from Poland to eastern Scotland. The 100-meter saltbeds occur at depths of 1,500 to 2,000 meters. Billiton's mining concession consisted of 7,000 acres with sufficient reserves to sustain production of 100,000 tons of magnesia annually for at least 40 years. Two companies were set up to develop the deposits: Noordelijke Zoutwinning NV was to mine the rock salt, while Magnesia International BV was to reclaim salts from seawater and to manufacture the refractory magnesia. The plant was to use the conventional seawater magnesia technology with two process stages—a wet circuit involving brine purification and magnesium hydroxide precipitation, and a dry circuit involving calcination, pelletizing, and dead burning. The plant was to differ from existing central European practice, other than using brine rather than seawater feed, in that dead burning would be performed in high-temperature shaft kilns, which in 1981 were more energy efficient than the conventional rotary kilns. Harbison-Walker Refractories Co. of the United States supplied the technology for the process. The kilns were to be gas fired, using natural gas from local gasfields.

Zinc.—Billiton International Metals BV, in a joint venture with Australian Mining & Smelting, Ltd., expanded its zinc production capacity to 182,000 metric tons in 1981 from 150,000 tons in 1980. The approximate cost of the expansion of the zinc electrolysis plant was about $15 million, and the plant was to become operational in 1982.

NONMETALS

Lime.—The Netherlands does not possess sufficiently high-quality indigenous limestone for the production of quicklime or hydrated lime. Indigenous limestone and dolomite were used mainly in fertilizer, cattle feed, and aggregate applications. Only one company, CV Nekami Kalk, was actively engaged in the production and marketing of its own burnt lime in 1981. This company also sold and distributed up to 35,000 tons of various imported limestone and dolomite products in the Netherlands for special applications. Through a subsidiary, BV Nekami-Gouda, the company produced almost 90,000 tons of hydrated lime and other derived products at its plant in Gouda. All of the lime feedstock was imported from Belgium, where Nekami had another subsidiary, Chaux-Brison, S.A., based in Seilles, which quarried a high-quality 97% to 98% $CaCO_3$ Devonian limestone in

the Meuse Valley.

Salt.—Akzo Zout Chemie BV was the Netherland's largest and Europe's tenth largest chemical concern in 1981. Akzo Zout was the sole producer of salt, with mines at Hengelo, Heiligerlee, and Zuidwending. The company also sold soda ash and sodium sulfate, which it produced at its Delfzijl plant. In addition to the mine at Hengelo, Akzo Zout operated a processing plant there, which produced table salt, industrial salt, ice control salt, salt for water softening, salt licks, chlorine, and caustic soda.

In addition to the mines, there were three salt plants operating at Delfzijl in 1981, using brine from Winschoten near Groningen as raw material. The combined production from the three plants was 2 million tons annually.

MINERAL FUELS

The energy requirements of the Netherlands were heavily dependent on domestic natural gas and imported oil in 1981, as in previous years. Production of oil and gas from the North Sea in 1981, although modest, was running at a record level, and reportedly more than 300 drilling operations were planned to begin in 1982. In 1981, 29 exploratory wells were drilled onshore and 32 wells offshore — a record high to date of 61 wells. Four new gasfields and three new oilfields were discovered during the year. Drilling platforms and other U.S. equipment were used in the Netherlands in 1981, and U.S. suppliers based there and in the United States were looking toward a $1.2 billion potential opportunity in equipment sales in 1982.

The Netherlands continued to import all of its coal requirements in 1981, and in the near future coal was expected to furnish some 20% of the country's total energy needs. About 40% of electrical power will then be generated by coal, and some 20% by gas and oil. In 1981, oil and gas accounted for almost 70% in the generation of electrical power.

The Netherlands also operated several nuclear power stations, the Zeeuwse Energy Co. in Middleburg being the largest.

Coal.—Lacking domestic production, coal continued to be imported by the Netherlands in 1981, primarily from the Federal Republic of Germany. Other large foreign suppliers were the United States, Australia, Poland and the Republic of South Africa. For political reasons, coal was no longer to be imported from the Republic of South Africa in the near future. As a result of sharp increases in the price of oil and gas, the use of imported coal increased 10% in 1981. The iron and steel industry used almost 90% of it.

Coal imports for the generation of electricity are expected to rise from over 2.5 million tons to 26 million tons by the turn of the century. Substantial expansion of coal use was to be based on secure supplies through long-term contracts. In view of that, the Government in 1981 was promoting participation in overseas coal production in order to contribute to the security of supply. In this respect, a 10-year contract with Poland for the supply of 600,000 tons of steam coal annually was concluded in 1977. However, in view of the economic crisis in Poland, the supply from Poland dropped almost 50% in 1981.

Even though the last coal mine in the Netherlands ceased operation in 1974, estimated potential reserves amounted to some 2 billion tons. This low-grade coal, however, would be too expensive to recover.

A number of coal gasification pilot projects were investigated in 1981, and when implemented could increase coal imports by about 1.5 million tons annually through 1990. The demonstration stage was to be followed by the construction of three gasification units, each with an intake capacity of 2 million tons of coal annually. In 1981, Esso Nederland BV was building a $500 million gasification pilot plant in Rotterdam. It was due to be operational in 1985 and would convert 90 tons of coal daily into substitute natural gas.

The Ministry of Economic Affairs of the Netherlands updated domestic coal consumption projections as shown in the following table in thousand metric tons:

Use	1981	1990	2000
Steam coal:			
Electric power	4,400	10,000	15,000
Industry	500	4,000	13,000
Coking coal	3,200	5,000	6,000
Total	8,100	19,000	34,000

The leading coal trader in the Netherlands, the Anker Kolen Maatschappij, and the largest iron and steel company, Hoogovens, both had financial interests in U.S. coal companies. In addition, Royal Dutch/Shell had also invested up to $680 million in U.S. coal mines. At least six other Netherlands companies were interested in investments in U.S. mines and coal purchases in 1981.

Natural Gas.—Production of and exploration for natural gas in the Netherlands continued at a rapid pace in 1981. Official estimates of proven and probable natural gas reserves were revised at yearend 1980 to 77,200 billion cubic feet. Since 1975, exploration has been constant, with 6 to 8 gas wells drilled per year onshore and 17 to 18 wells per year offshore. Of the 31 exploration wells drilled in 1980, for example, 14 were successful, compared with 11 in 1979.

The Groningen onshore field, with total estimated reserves of 62,000 billion cubic feet, was the largest gasfield in the Netherlands and was capable of meeting strategic needs not only for the Netherlands but also for other European countries.

The national gas policy continued to be aimed at decreasing domestic production and supplementing it eventually with imported liquefied natural gas or pipeline gas. In addition to existing contracts with Norway, a new 20-year contract with Nigeria was under discussion. Negotiations with the U.S.S.R. for a total of 1,413 billion cubic feet annually for Western Europe were underway, of which some 177 billion cubic feet annually could be directed to the Netherlands by 1990.

Petroleum.—Traditionally an onshore gas producer, the Netherlands was beginning development of its offshore oilfields. Offshore exploration efforts increased sharply in 1981. Seven drilling rigs were operating, with almost twice as many planned for 1982. The bulk of the drilling was around the existing developments and finds that have not yet gone into production.

In 1981, Union Oil Co. of the Netherlands was developing the production of oil from its two offshore tracts in Block Q1, the Helm and Helder Fields.

The Nederlandse Aardolie Maatschappij BV, operated by Shell Nederland BV and Esso Nederland BV, also began to develop its F3 onshore tract in 1981. A pipeline was planned to carry the oil across the Wadden Zee nature preserve.

The Continental Netherland Oil Co., a unit of Conoco Inc. of the United States, was seeking permission to develop the K18 field located close to the Helm and Helder offshore areas. Agip Nederland BV continued reappraisal of its 1971 oil discovery close to NAM's F3 field, while Pennzoil Nederland Co. was planning extended production tests on an oil field in Block K10. Amoco Netherlands Petroleum Co. was drilling its P15-3 offshore well some 28 miles northwest of The Hague.

The Netherlands operated eight oil refineries in 1981, with a combined crude throughput of 1,148,000 barrels per calendar day.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Netherlands guilders (f) to U.S. dollars at the rate of f2.5=US$1.00, the average rate in 1981.

The Mineral Industry of New Zealand

By Charlie Wyche[1]

New Zealand's mineral industry showed no significant change during 1981, a year when demand for its mineral products was weak in the export market. Construction materials (limestone, gravel, sand, aggregates, and clays) and aluminum were the most valuable minerals produced. This situation is changing as production of iron sands for export and the output of gas and condensate from the onshore Kapuni Field increase. This change in value will also be further enhanced as output from the offshore Maui Gasfield increases over the next few years.

Although no new mines were brought onstream in New Zealand in 1981, a major coal mine is planned at Ohinewai, near Huntly. The deposit contains about 25 million metric tons of coal and will require about 4 years to develop. A production rate of about 1 million metric tons annually is planned.

The long-projected expansion of Glenbrook steelworks, which produces steel from New Zealand's iron sand deposits, was approved and was undergoing preliminary engineering studies.

The Minister of Energy announced plans for energy development based on the country's large reserves of natural gas. The plan includes a comprehensive analysis of past and future energy supply and demand status. The plan entails a total expenditure of some $6 billion[2] over 15 years. Of this total, some $3.2 billion will be directed to powerstation development, $1.9 billion toward liquid fuels, $0.62 billion for gasfield development, and $0.30 billion for coal mine construction and expansion. New Zealand is rich in energy resources, and Government policy and development programs were being pursued as a top economic priority to ensure optimum and balanced exploitation.

The Government was actively encouraging foreign investment in the country. The Department of Trade and Industry has an investment unit that provides potential overseas investors with information on investment in New Zealand, as well as lists of New Zealand firms seeking foreign investment or joint-venture partners. U.S. firms had investments totaling $579 million in 1980; this total will be greatly increased because Mobil Oil Corp. has a 25% share in a synthetic gasoline project.

The New Zealand Government approved the construction of the world's first natural gas-to-gasoline plant using a catalytic process developed by Mobil. The contract between Mobil and the New Zealand Government was signed, and the project was scheduled for completion in 1985. The natural gas, which will be supplied by the Maui Gasfield, will enable New Zealand to produce one-half of its currently imported motor fuels.

The only export commodities of any importance were titaniferous iron sands, aluminum and aluminum alloys, and small quantities of steel products. Crude oil and refinery products were the principal commodities imported, supplying about one-third of the national energy demand. Planned development of coal, natural gas, hydroelectric power, and geothermal power was expected to reduce petroleum imports to 20% to 25% of the total energy requirement by 1990.

PRODUCTION

The value of New Zealand mine and quarry output for 1981 (metals and nonmetals) was estimated at $162 million compared with $160.2 million in 1980. Principal commodities produced in 1980 (in thousand dollars) were as follows: sand and gravel ($60,300); coal ($53,700); iron sand concentrate ($34,400); limestone for agriculture, roads, cement, and other industries ($15,400); clays for brick, tile, and pottery ($2,100); and gold ($3,800).

Natural gas production, with associated condensates, was playing an increasingly important role in New Zealand's energy program. Natural gas and some condensate were produced at the offshore Kapuni Field, and the gas was supplied to Auckland, Wellington, and the New Plymouth and Stratford power stations.

Table 1.—New Zealand: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum metal, smelter	145,100	151,100	154,100	154,740	[2]156,600
Copper ore and concentrate	154	38	(3)	(3)	--
Gold, mine output, metal content troy ounces	7,168	7,011	[r]6,998	6,419	6,300
Iron and steel:					
Iron ore, gross weight	200	170	127	72	75
Iron sand, gross weight[4]	2,954,400	3,946,400	3,527,348	3,638,377	[2]1,952,992
Sponge iron thousand tons	12	28	27	134	120
Crude steel do	225	226	[e]200	223	225
Silver, mine output, metal content troy ounces	7,572	2,006	1,639	767	800
Tungsten, mine output, metal content	6	9	15	18	15
Zinc ore and concentrate	132	[e]140	[e]140	[e]150	140
NONMETALS					
Cement, hydraulic thousand tons	910	798	756	750	750
Clays:					
Bentonite	2,600	9,800	4,954	3,000	3,500
Fire clay	173,008	118,734	110,021	130,719	130,000
Kaolin including china clay	94,742	33,741	25,590	46,112	45,000
Diatomite	1,113	[e]1,000	[e]1,000	[e]1,000	1,000
Magnesite	600	840	[e]850	[e]870	870
Perlite	1,000	558	2,209	999	1,000
Pumice	28,550	39,468	25,781	13,463	20,000
Salt	53,000	65,000	55,000	5,500	NA
Sand and gravel:					
Glass sand	146,486	127,998	136,657	139,899	140,000
Common sand and gravel[5] thousand tons	21,477	20,306	17,841	17,846	18,100
Stone:					
Dolomite	23,070	[e]24,000	25,760	25,726	26,000
Greenstone	3	10	4	3	4
Limestone and marl:					
For agriculture thousand tons	1,732	1,615	1,613	1,581	1,700
For roads do	308	250	289	229	230
For industry except cement do	170	159	289	172	175
For cement do	1,590	1,366	1,268	1,389	1,400
Serpentine do	89	116	112	81	85
Unspecified:					
Dimension	16,828	[r]26,600	27,158	16,350	17,000
Rock for harbor work thousand tons	3,300	[r]2,288	2,428	2,246	2,500
Sulfur[e]	1,000	1,000	[r]650	700	1,000
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous thousand tons	389	364	383	480	490
Subbituminous do	1,817	1,669	1,355	1,473	1,550
Lignite do	162	151	209	209	225
Total do	2,368	2,184	1,947	[2]2,162	2,265
Coke, gashouse do	93	[e]100	100	110	115
Fuel briquets do	13	[e]15	15	11	12
Gas, natural:[6]					
Gross million cubic feet	[r]55,910	[r]55,215	45,633	36,049	[2]43,866
Marketed do	49,426	47,466	33,493	35,177	[2]43,124

See footnotes at end of table.

Table 1.—New Zealand: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Natural gas liquids thousand 42-gallon barrels	100	[r]148	174	216	[2]265
Petroleum:					
Crude[7] do	5,391	4,555	3,000	2,635	[2]3,260
Refinery products:					
Gasoline do	10,846	10,057	10,888	10,294	[2]10,727
Distillate fuel oil do	4,894	4,692	4,864	4,879	[2]5,058
Residual fuel oil do	7,093	5,668	5,854	4,982	[2]3,743
Other do	780	600	[e]650	[e]500	560
Refinery fuel and losses do	939	695	[e]700	[e]580	610
Total do	24,552	21,712	22,956	21,235	20,698

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through Aug. 30, 1982.
[2]Reported figure.
[3]Revised to zero.
[4]Average 57% Fe.
[5]Includes crushed rock for building aggregate, roads, and ballast.
[6]Excludes carbon dioxide component of natural gas, which is reported separately.
[7]Includes field condensate.

TRADE

According to the Department of Statistics at Wellington, principal mineral exports during fiscal year (FY) 1981 (year ending June 30, 1981) were aluminum and aluminum alloys ($220.0 million) and iron ore and concentrates ($27.6 million).

Crude petroleum, partly refined petroleum, and petroleum refinery products dominated mineral imports and were valued at $934 million in FY 1981. Iran remained the principal import source, but Kuwait and Saudi Arabia were also significant suppliers. Imports of iron and steel, mainly semimanufactures, totaled $217.8 million. Phosphate rock from Nauru, sulfur from the United States, and alumina from Australia were also imported by New Zealand during FY 1981.

The Government continued to prepare to export approximately 250,000 tons of coal annually from the Buller Coalfield located in northwest Southland. The trade, estimated at $10 million annually, would constitute the first major coal export of recent times. Probable customers are Japan, the Republic of Korea, Taiwan, Hong Kong, and Singapore.

Table 2.—New Zealand: Exports and reexports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Destinations, 1979-80	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	1,583	2,573	--	Japan 2,489; Italy 45; Australia 39.
Unwrought	143,258	119,557	--	Japan 98,530; Hong Kong 8,739.
Semimanufactures	2,000	5,353	6	Australia 2,193; Singapore 977; Indonesia 402.
Arsenic oxides and acid	--	60	--	Australia 51; Papua New Guinea 9.
Copper metal including alloys:				
Scrap	1,797	1,155	--	Australia 873; Netherlands 234; United Kingdom 33.
Semimanufactures	2,114	1,752	134	Singapore 580; Australia 392; Malaysia 258.
Gold metal including alloys, unwrought and partly wrought troy ounces	2,034	4,586	4	United Kingdom 2,481; Australia 2,101.
Iron and steel:				
Ore and concentrate thousand tons	3,002	3,499	--	Japan 3,352; Republic of Korea 137; Australia 8.

See footnotes at end of table.

Table 2.—New Zealand: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Destinations, 1979-80	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal:				
Scrap	1,519	2,159	--	Japan 1,768; Netherlands 216.
Pig iron, spiegeleisen, sponge iron, ferroalloys	8	4	--	Australia 3; Fiji 1.
Steel, primary forms	4,924	24,497	(2)	Ecuador 10,120; Hong Kong 9,836; Fiji 4,532.
Semimanufactures:				
Bars, rods, angles, shapes, sections	36,460	54,762	--	China 27,973; Egypt 8,479; Hong Kong 7,608.
Universals, plates, sheets	58,151	38,975	23,836	Fiji 3,885; Papua New Guinea 2,959.
Hoop and strip	45	393	3	Australia 316; Singapore 25.
Rails and accessories	18	17	--	Mainly to Fiji.
Wire	6,114	7,006	2,778	Hong Kong 1,228; Australia 1,165.
Tubes, pipes, fittings	12,058	3,597	1,149	Australia 619; Papua New Guinea 540; West Germany 168.
Castings and forgings, rough	134	182	2	Australia 160; Fiji 15.
Lead metal including alloys:				
Scrap	1,454	1,524	--	Japan 581; Taiwan 484; Australia 271.
Unwrought	39	29	--	Australia 28.
Semimanufactures	82	65	2	Fiji 42; Malaysia 9.
Magnesium metal including alloys, all forms	--	8	8	
Mercury, value	$124	$12,627	--	All to United Kingdom.
Molybdenum metal including alloys, unwrought, do.	--	$662	--	All to Australia.
Nickel metal including alloys:				
Scrap	20	20	6	Australia 10; United Kingdom 4.
Semimanufactures, kilograms	253	1,741	1,300	Australia 379; United Kingdom 62.
Platinum-group metals including alloys, unwrought and partly wrought, troy ounces	r142	25	--	Australia 20; West Germany 5.
Silver:				
Waste and scrap[3], value	r$1,509	$36,539	$27,891	Australia $7,005; United Kingdom $1,183.
Metal including alloys, unwrought and partly wrought, troy ounces	80	30,410	1,029	Australia 25,936; United Kingdom 3,213.
Tantalum metal including alloys, unwrought, value	--	$3,281	--	All to Australia.
Titanium oxides	4	16	--	Do.
Tungsten ore and concentrate	--	1	--	All to Netherlands.
Zinc metal including alloys:				
Blue powder, kilograms	54	--	--	
Scrap	570	656	--	Japan 171; Australia 126; France 105; Taiwan 98.
Unwrought	899	239	--	Australia 136; Taiwan 103.
Semimanufactures	2	133	4	Australia 124.
Other:				
Ores and concentrates	--	7	--	All to Belgium.
Ash and residue containing nonferrous metals	395	492	13	Australia 172; Japan 134; Taiwan 77.
Oxides, hydroxides, peroxides, value	r$11,396	$934	--	Fiji $494; Australia $375.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	r49	33	--	Australia 11; Fiji 10; Hong Kong 10.
Grinding and polishing wheels and stones, value	$111,967	$183,212	$321	Australia $86,427; Papua New Guinea $33,633; Fiji $32,774.
Barite and witherite	11	11	--	Fiji 9; Australia 2.
Cement	1,420	57,202	--	Papua New Guinea 21,942; French Polynesia 16,220.
Chalk	79	128	--	Fiji 118; New Caledonia 10.
Clays and clay products:				
Crude	6,637	3,705	--	Japan 2,907; Taiwan 383; Australia 198.
Products:				
Refractory including nonclay brick, value	$87,333	$324,054	--	Australia $218,729; Fiji $84,874.
Nonrefractory, do.	$627,618	$144,266	$582	Singapore $41,618; Fiji $22,603.
Diamond:				
Gem, not set or strung, do.	$908,226	$713,944	$13,032	Australia $605,692; United Kingdom $59,015.
Industrial, do.	--	$5,152	--	All to United Kingdom.
Diatomite and other infusorial earth	38	44	--	Malaysia 42; Fiji 2.

See footnotes at end of table.

Table 2.—New Zealand: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Destinations, 1979-80	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials:				
Crude:				
Phosphatic	2	--		
Other including mixed	242	166	--	Australia 115; Malaysia 34.
Manufactured:				
Nitrogenous	257	183	--	Australia 63; Papua New Guinea 40; Fiji 28.
Phosphatic	6,448	12,404	--	Fiji 12,311; Papua New Guinea 88.
Potassic	2,281	3,699	--	Fiji 3,000; Western Samoa 449.
Other including mixed	1,916	1,626	1	Western Samoa 957; Fiji 313.
Ammonia	2	2	--	Mainly to Fiji.
Lime	36	446	--	Papua New Guinea 353; French Polynesia 40.
Mica, worked including agglomerated splittings value	--	$2,954	--	Singapore $2,451; Fiji $503.
Pigments, mineral: Iron oxides, processed	4	16	--	Australia 7; Fiji 7.
Precious and semiprecious stones except diamond, natural and synthetic value	r$654,392	$616,192	$87,910	Australia $469,195; United Kingdom $31,476.
Salt and brine	3,020	3,036	--	Australia 2,476; Fiji 228; Tonga 89.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	3	2	--	Mainly to Fiji.
Caustic soda	(2)	5	--	Fiji 4.
Soda ash	1	1	--	Mainly to Tonga.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3	74	--	Australia 33; Fiji 24; Japan 17.
Worked value	$40,501	$60,035	--	Western Samoa $31,465; Fiji $11,949.
Gravel and crushed rock	182	4,247	--	Australia 4,232; New Caledonia 5.
Limestone excluding dimension	73	82	--	Fiji 29; Australia 26; Singapore 12.
Sand excluding metal-bearing	350	271	1	Australia 119; Fiji 84; Republic of South Africa 40.
Sulfur: Sulfuric acid	135	193	--	Fiji 90; Papua New Guinea 63; New Caledonia 17.
Talc, steatite, soapstone, pyrophyllite	9	9	--	Fiji 5; New Caledonia 4.
Other:				
Crude	1,413	1,747	--	Australia 1,429; Papua New Guinea 250.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals value, thousands	$2,500	$5,021	--	Australia $3,085; Papua New Guinea $1,121; Fiji $372.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	--	2	--	Mainly to Australia.
Coal, all grades including briquets	1	10,530	--	Japan 10,527.
Coke and semicoke	15,401	4,135	--	Australia 4,134.
Hydrogen, helium, rare gases	28	10	--	Tonga 7; Nauru 1.
Peat including litter and briquets	1,932	1,125	--	Australia 918; Bahrain 56; Oman 45.
Petroleum refinery products:				
Gasoline 42-gallon barrels	5,676	126	--	Gilbert Islands 71; Pitcairn Island 34.
Kerosine do	24	55	--	Pitcairn Island 36; Norfolk Island 5.
Jet fuel do	1,182,363	1,346,568	--	Bunkers 1,346,484.
Distillate fuel oil do	r929,563	928,098	--	Bunkers 754,299; Taiwan 171,019; Gilbert Islands 2,237.
Residual fuel oil do	1,375,976	1,801,361	--	Bunkers 1,518,389; Australia 282,972.
Lubricants do	9,807	10,637	(2)	Fiji 5,106; bunkers 4,343; Malaysia 876.
Other:				
Liquefied petroleum gas value	$1,098	$772	--	Fiji $388; Western Samoa $384.
Mineral jelly and wax 42-gallon barrels	242	129	--	Fiji 81; Papua New Guinea 26; Australia 10.
Bituminous mixtures do	r14,585	10,851	42	Barbados 3,133; Western Samoa 2,831; Fiji 1,803.
White spirit do	175	627	--	Fiji 526; Australia 54; New Hebrides 26.
Nonlubricating oils do	185	191	--	Australia 111; Fiji 32.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals value	$9,927	$61,999	--	Fiji $50,348; Australia $10,422.

rRevised.
[1]Data are for fiscal year ending June 30 of that stated.
[2]Less than 1/2 unit.
[3]Includes an undetermined amount of waste and scrap of other precious metals.

Table 3.—New Zealand: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Sources, 1979-80	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	153	564	--	Guyana 314; China 180; Italy 70.
Oxides and hydroxides	320,599	259,201	6	Australia 258,658; West Germany 229; United Kingdom 188.
Metal including alloys:				
Scrap	21	50	--	French Polynesia 35; Fiji 8.
Unwrought	263	390	19	Australia 322; United Kingdom 39; Netherlands 10.
Semimanufactures	3,723	3,728	206	Australia 2,236; Japan 653; United Kingdom 245.
Antimony metal including alloys, unwrought, value, thousands	$174	$183	--	China $167; Australia $12.
Arsenic: Trioxide, pentoxide, acid	2,070	1,888	2	United Kingdom 1,346; China 245; France 184.
Beryllium metal including alloys, scrap and unwrought, value	$2,790	$52	--	All from Australia.
Chromium:				
Ore and concentrate	36	36	--	All from Republic of South Africa.
Oxides and hydroxides	161	172	51	West Germany 76; United Kingdom 28; Australia 12.
Cobalt oxides and hydroxides	17	13	5	Belgium 7.
Copper:				
Ore and concentrate, value	$124	$1,057	--	All from Zaire.
Matte and speiss, kilograms	--	2	--	All from Australia.
Metal including alloys:				
Scrap	9	(2)	--	Do.
Unwrought	2,454	3,068	216	Australia 1,899; West Germany 865; United Kingdom 18.
Semimanufactures	[3]11,712	9,609	26	Australia 8,520; United Kingdom 567; Japan 276.
Gold metal including alloys, unwrought and partly wrought, troy ounces	5,397	6,095	87	Australia 4,827; United Kingdom 612; Canada 369.
Iron and steel:				
Ore and concentrate	260	128	--	Australia 127.
Metal:				
Scrap	1,475	938	--	Fiji 925; Australia 13.
Pig iron, ferroalloys, powder, shot	5,770	6,350	179	Republic of South Africa 2,900; Australia 2,273.
Steel, primary forms	8,817	4,307	(4)	Australia 4,291; United Kingdom 13.
Semimanufactures:				
Bars, rods, angles, shapes, sections	77,600	73,722	416	Australia 38,847; Japan 27,900; United Kingdom 2,897.
Universals, plates, sheets	358,910	340,928	530	Japan 251,740; Australia 71,372.
Hoop and strip	23,787	14,359	356	Australia 8,291; Japan 3,937; United Kingdom 881.
Rails and accessories	17,292	21,021	(4)	Australia 16,119; Japan 4,123; United Kingdom 736.
Wire	15,009	19,534	56	Australia 9,258; Japan 5,523; United Kingdom 3,027.
Tubes, pipes, fittings	23,287	20,158	389	Japan 11,978; Australia 4,452; United Kingdom 1,531.
Castings and forgings, rough	566	462	--	United Kingdom 367; Australia 80; Italy 14.
Lead:				
Oxides and hydroxides	309	169	23	Australia 140; United Kingdom 5.
Metal including alloys:				
Scrap	290	501	--	All from Australia.
Unwrought	[r]7,522	6,758	--	Australia 6,719; Belgium 22; United Kingdom 16.
Semimanufactures	152	8	(4)	Australia 3; United Kingdom 3; Japan 2.
Magnesium metal including alloys, unwrought	240	292	100	Norway 192.
Manganese:				
Ore and concentrate	104	440	--	Singapore 184; Ghana 173; Australia 65.
Oxides and hydroxides	903	893	55	Japan 442; Australia 385; Republic of South Africa 10.
Mercury, value	$10,961	$8,860	$500	United Kingdom $4,235; Australia $4,125.
Molybdenum metal including alloys, unwrought, do.	$18,500	$144	$144	
Nickel:				
Matte and speiss	--	51	(4)	Canada 50.

See footnotes at end of table.

Table 3.—New Zealand: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Sources, 1979-80	
			United States	Other (principal)
METALS —Continued				
Nickel —Continued				
Metal including alloys:				
Scrap	(4)	1	--	All from Australia.
Unwrought	38	56	--	Canada 49; Australia 4; Republic of South Africa 2.
Semimanufactures	206	255	109	Canada 66; Australia 64; West Germany 4.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	r3,043	1,817	77	Australia 984; United Kingdom 389; Switzerland 206.
Silver:				
Waste and sweepings[5] value, thousands	$525	$659	--	Australia $657; United Kingdom $2.
Metals including alloys, unwrought and partly wrought thousand troy ounces	r1,757	1,544	17	Australia 1,481; United Kingdom 29; West Germany 17.
Tin:				
Ore and concentrate value	$4,156	--		
Oxides and hydroxides	12	6	(4)	Australia 2; Norway 2; West Germany 1.
Metal including alloys:				
Scrap	6	7	--	All from Australia.
Unwrought	236	263	(4)	Australia 211; Malaysia 26; China 24.
Semimanufactures	24	17	(4)	Australia 13; West Germany 2.
Titanium oxides and hydroxides	2,752	2,518	415	Australia 1,141; West Germany 342; Finland 312.
Tungsten metal including alloys, all forms value	$9,153	$27,788	$12,539	Australia $6,266; United Kingdom $5,764; Canada $1,762.
Zinc:				
Ore and concentrate	--	1	--	All from United Kingdom.
Oxides and hydroxides	36	77	(4)	Australia 43; Canada 18; West Germany 12.
Metal including alloys:				
Scrap	62	121	18	Canada 91; Australia 12.
Unwrought	20,255	22,594	411	Australia 18,663; Canada 3,516.
Blue powder	25	1	--	Mainly from Australia.
Semimanufactures	r1,309	425	5	Canada 324; Australia 59; West Germany 19.
Other:				
Ores and concentrates	r635	626	13	Japan 397; Australia 137; China 59.
Oxides, hydroxides, peroxides	221	392	191	Norway 56; Japan 54; United Kingdom 21.
Metalloids	422	614	20	Republic of South Africa 510; Australia 24; West Germany 18; Netherlands 18.
Alkali, alkaline-earth, rare-earth metals value, thousands	$10	$14	$9	Australia $2; United Kingdom $2.
Metals including alloys, all forms do.	$96	$162	$4	Australia $82; Belgium $27; United Kingdom $21.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	155	259	216	Australia 11; Canada 10; India 8.
Artificial: Corundum	103	71	68	United Kingdom 3.
Dust and powder of precious and semi-precious stones value, thousands	$84	$106	$50	Ireland $20; Australia $17; United Kingdom $13.
Grinding and polishing wheels and stones[6]	165	124	6	United Kingdom 44; Australia 27; Japan 21.
Asbestos, crude	9,818	4,952	244	Canada 3,900; Republic of South Africa 806.
Barite and witherite	1,582	1,332	(4)	Australia 683; China 575; West Germany 54.
Boron materials:				
Crude natural borates value	$8,156	$20,915	$19,500	United Kingdom $1,190; Netherlands Antilles $224.
Oxide and acid	840	467	465	Japan 1.
Cement	3,820	3,568	233	Japan 1,659; United Kingdom 656; Denmark 465.
Chalk	658	603	3	United Kingdom 390; France 193; West Germany 9.

See footnotes at end of table.

Table 3.—New Zealand: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Sources, 1979-80	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products:				
Crude	7,170	9,076	4,449	Australia 2,687; United Kingdom 1,389.
Products:				
Nonrefractory value, thousands	$853	$1,620	$17	Japan $498; Philippines $138; Italy $137.
Refractory including nonclay brick do.	$6,796	$9,420	$790	United Kingdom $3,267; Australia $3,200; Japan $514.
Cryolite and chiolite	20	24	--	Denmark 23; Australia 1.
Diamond:				
Gem, not set or strung value, thousands	$3,137	$2,495	$7	India $1,055; Israel $425; Republic of South Africa $229.
Industrial do.	$156	$61	$8	Australia $42; United Kingdom $10; Sweden $1.
Diatomite and other infusorial earth	700	1,224	786	Japan 420; Australia 15.
Feldspar, fluorspar, nepheline syenite	997	1,020	141	Norway 372; Canada 355; Australia 78.
Fertilizer materials:				
Crude:				
Nitrogenous value	$2	--		
Phosphatic thousand tons	1,349	1,209	53	Christmas Island 592; Nauru 472; Gilbert Islands 92.
Potassic	5,227	--		
Other including mixed	13	--		
Manufactured:				
Nitrogenous	85,803	93,047	11,981	Japan 33,304; Indonesia 14,500; Italy 11,975.
Phosphatic	10,721	14,334	13,517	United Kingdom 504; Australia 115; Belgium 108.
Potassic	221,733	151,698	125,458	Canada 25,023; Belgium 618; West Germany 580.
Other including mixed[7]	40,296	18,052	16,398	West Germany 1,326; United Kingdom 121; Japan 94.
Ammonia	499	720	33	Australia 686.
Graphite, natural	68	133	11	United Kingdom 98; Norway 14; Australia 5.
Gypsum and plasters	98,970	93,162	33	Australia 92,468; West Germany 472; United Kingdom 182.
Lime	39	21	--	All from United Kingdom.
Magnesite	4,617	6,190	83	China 4,637; Australia 1,425; India 32.
Mica:				
Crude including splittings and waste value, thousands	$153	$105	$33	Australia $19; India $16; United Kingdom $15.
Worked including agglomerated splittings do.	$346	$275	$4	United Kingdom $142; Australia $73; Switzerland $29; West Germany $15.
Pigments, mineral:				
Natural, crude	292	311	22	Austria 186; Republic of South Africa 40; West Germany 22.
Iron oxides, processed	1,006	1,281	23	West Germany 984; Spain 171; Australia 73.
Precious and semiprecious stones, other than diamond:				
Natural value, thousands	$1,904	$1,954	$29	Australia $877; Thailand $541; West Germany $164.
Synthetic do.	$52	$59	$4	West Germany $39; France $6; Switzerland $4.
Pyrites, unroasted kilograms	2,133	847	--	Japan 840; Australia 7.
Salt and brine	32,610	62,761	29	Netherlands Antilles 62,429; West Germany 255.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	r382	454	16	United Kingdom 281; West Germany 61; France 37.
Caustic soda	19,820	31,503	3,804	United Kingdom 21,747; Norway 4,312; Italy 793.
Soda ash	24,792	26,609	24,270	United Kingdom 1,894; Japan 352; West Germany 54.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	865	1,062	--	Republic of South Africa 695; Italy 143; China 96.
Worked value, thousands	$295	$316	$9	Italy $155; France $81; U.S.S.R. $15.
Dolomite, chiefly refractory-grade	92	2	--	All from United Kingdom.

See footnotes at end of table.

Table 3.—New Zealand: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978-79	1979-80	Sources, 1979-80	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Gravel and crushed rock	100	122	36	United Kingdom 36; Australia 15; China 10.
Limestone, other than dimension	1	--		
Quartz and quartzite	69	74	14	Sweden 43; Australia 10; United Kingdom 6.
Sand, not metal-bearing	371	457	(4)	Australia 405; Sweden 36.
Sulfur:				
Elemental:				
Other than colloidal	257,986	249,187	80	Canada 249,094; Australia 11.
Colloidal	276	325	99	Australia 226.
Sulfuric acid	15	24	8	United Kingdom 10; Australia 5.
Talc, steatite, soapstone, pyrophyllite	3,181	3,161	36	Australia 2,996; China 70; United Kingdom 44.
Other:				
Crude value, thousands	$137	$132	$21	Republic of South Africa $64; China $27; Australia $10.
Slag and dross, not metal-bearing	119	72	1	Australia 70; United Kingdom 1.
Halogens	12	29	21	Japan 7.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	965	2,263	103	Australia 2,032; West Germany 97; Japan 27.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals, n.e.s value, thousands	$183	$266	$119	United Kingdom $94; Australia $50; Greece $3.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	40	28	22	Australia 4; United Kingdom 2.
Carbon:				
Carbon black	7,923	7,691	107	Australia 7,285; Canada 166; Japan 107.
Retort carbon	216	468	390	Australia 78.
Coal, all grades including briquets	1,010	1,230	1,046	Australia 184.
Coke and semicoke	1,871	1,343	1	Australia 1,342.
Hydrogen, helium, rare gases	699	691	48	Australia 643.
Peat including briquets and litter	47	--		
Petroleum:				
Crude and partly refined:				
Crude thousand 42-gallon barrels	13,517	14,848	--	Saudi Arabia 8,173; Kuwait 2,628; Indonesia 1,443.
Partly refined do.	5,814	4,564	--	Singapore 1,723; Australia 714; Kuwait 659.
Refinery products:				
Gasoline do.	3,988	4,358	10	Singapore 2,264; Bahrain 1,006; Australia 829.
Kerosine and jet fuel do.	2,449	2,774	3	Singapore 1,740; Australia 950; Netherlands 56.
Distillate fuel oil do.	3,074	3,377	--	Singapore 1,523; Australia 993; Bahrain 648.
Residual fuel oil do.	(4)	--		
Lubricants[8] do.	426	454	16	Australia 286; Singapore 126; Netherlands Antilles 12.
Other:				
Liquefied petroleum gas value	$78,819	$174,236	$16,501	France $83,296; Australia $62,474; Netherlands $9,755.
Mineral jelly and wax 42-gallon barrels	30,703	38,596	5,634	China 13,379; United Kingdom 6,733; Japan 5,690.
Nonlubricating oils do.	2,211	2,165	2,164	West Germany 1.
Petroleum coke do.	463,711	265,028	265,028	
Pitch and pitch coke do.	r95,568	112,984	31	Australia 112,873; United Kingdom 80.
Bituminous mixtures do.	5,864	2,067	143	Australia 1,594; Netherlands 230; West Germany 53.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals value, thousands	$2,314	$3,477	$546	Japan $2,581; Netherlands $169; Australia $146.

rRevised.
[1]Data are for fiscal year ending June 30 of that stated.
[2]Unreported quantity valued at $2,909,754.
[3]Excludes unreported quantity valued at $2,364,522.
[4]Less than 1/2 unit.
[5]May include other precious metals.
[6]Excludes unreported quantities valued at $582,665 in 1978-79 and $1,012,486 in 1979-80.
[7]Excludes unreported quantities valued at $112,004 in 1978-79 and $69,656 in 1979-80.
[8]Excludes unreported quantities valued at $341,975 in 1978-79 and $254,778 in 1979-80.

COMMODITY REVIEW

METALS

Aluminum.—New Zealand Aluminium Smelters Ltd. (NZAS), New Zealand's only aluminum smelting operation, continued work on an expansion project that would boost its annual production capacity by 57% over the present 150,000 tons. The expansion was scheduled for completion in 1983. Comalco Ltd. of Australia, in which the U.S. firm Kaiser Aluminum & Chemical Corp. has a major interest, owned 50% of NZAS, and two Japanese firms owned the remainder. Although the smelter was the subject of some criticisms by environmentalists, NZAS had considerable support from a large majority of the residents in Southland, where the plant is located.

The New Zealand Government approved the construction of a smelter on South Island by CSR Ltd. The total cost of the smelter was estimated by CSR and partners (Swiss Aluminium Ltd. and Fletchers Holdings Ltd.) at $650 million. The plant will reportedly be one of the most modern and sophisticated smelters ever built. The first potline, which will have a capacity of 100,000 tons annually, was scheduled to come onstream in 1984 and will produce primary aluminum ingots. The second potline, which will have a similar level of output, will produce either sheet or coil aluminum alloy in continuous-strip casting. Production from the second potline should start early in 1986. NZAS output accounted for over 1% of the total world production of aluminum metal in 1981. The completion of the current expansion project and the new construction project scheduled would increase New Zealand's share of world aluminum production to about 3%.

Approximately 80% of NZAS output of 150,000 tons of aluminum was exported, and the remaining 20% was used by New Zealand fabricators to produce a wide range of aluminum products for domestic needs. Aluminum exports went primarily to Japan and Southeast Asia. Under the terms of the agreement with the New Zealand Government, the Japanese partners exported their combined 50% share.

Gold.—New Zealand's gold production continued the downward trend that began in 1977. Output by Kanieri Gold Dredging Ltd., New Zealand's principal gold producer, was 2% lower than that of 1980. The decline was attributed to the exhaustion of both the more accessible alluvial gold deposits and the ore from the zones of enrichment. Annual production was mainly confined to one dredge operating in the Taramakau River, near Kumaru, South Island. The alluvial gold mined was among the lowest grades in the world. The alluvial sands also contained 3% uranite, and tests were underway to see if the uranite could be sold as a byproduct.

The Kanieri operation is a wholly owned subsidiary of Amoil New Zealand Ltd. All gold from the Kanieri operation was purchased by the Government. Because of the high gold prices in 1981, interest in possible gold-bearing areas remained high during the past year. This has led to large-scale dredging operations being proposed for the west coast of South Island.

Mineral Resources (New Zealand) Ltd. continued exploration throughout 1981 at the Marthu Mine, North Island. Mine dumps at Union Hill were being worked, and bulk samples were evaluated. Blackwater Gold Ltd. and Carpentaria Exploration Co. Pty. Ltd. continued testing ore extensions at a former property of Blackwater Mines. Amoco Minerals New Zealand Ltd. continued prospecting in the Monowai gold area.

Iron Sands.—The mining of titanomagnetite (iron sands) was by far New Zealand's largest metallic mineral industry and was second only to sand and gravel in both tonnage and value of output. In 1980, in terms of value, iron sands accounted for 20% of all nonfuel mineral output and over 84% of all metallic ore production. Output of iron sand concentrate by the two producing companies (New Zealand Steel Mining Ltd., a wholly owned subsidiary of New Zealand Steel Ltd., and Waipipi Ironsands Ltd.) declined from the 1980 level. The decline was attributed to the cutback in steel production by the Japanese steel industry, New Zealand's principal customer. Although these two companies were the sole source of iron ore for New Zealand's iron and steel industry, about 90% of the iron sands was exported.

The iron sand deposits consist of extensive horizontal beds on or near the western coast of North Island. They range in thickness from 5 to 20 meters and contain concentrations of up to 17% titanomagnetite sand grains. The grains originated from nearby andesite volcanic formations and

were sorted and concentrated by wind, stream, and wave action. The three sand deposits that were worked commercially were at Waverley, Taharoa, and north Waikato. The Waverley deposit was being mined by Waipipi Ironsands, and the other two, by New Zealand Steel, which also owns the Glenbrook steelworks, New Zealand's only steel plant.

Steel.—New Zealand Steel produced iron sands at its Waikato North Head deposit for use in its direct-reduction steelmaking plant at Glenbrook. Taharoa provided production for export to Japanese and Republic of Korea steel mills, which used the iron sands as an additive to sinter feed material for ironmaking. The plant capacity at Waikato North Head was expanded to 250,000 tons of concentrate annually. Some 223,000 tons of raw steel was produced during 1980, and about 225,000 tons in 1981. This figure is expected to increase to about 750,000 tons annually within 10 years. A cold-rolling mill and coat line for plain and galvanized sheet were being considered. Long-range plans included a new melt shop, continuous slab facilities, and more direct-reduction kilns.

Other Metals.—The Department of Scientific and Industrial Research (DSIR) continued its investigation of black, heavy-metal beach sand deposits on the west coast of South Island. These sands contain ilmenite, monazite, zircon, and gold.

Amoco Minerals conducted airborne magnetometry on the Ceromandel Peninsula, North Island, for base metals. Otter Minerals Exploration Ltd., in partnership with Gold Mines of New Zealand Ltd., continued exploration in Nelson Province and the drilling operation on D'Urville Island. Gold Mines of New Zealand, a partnership of Australian Anglo American Corp. Ltd. and Amoil, remained active in the Raukumara, East Cape, and Kaikoura regions. Exploration in 1981, however, failed to locate an economic deposit.

NONMETALS

Asbestos.—Chrysotile asbestos, mainly associated with serpentines, occurs at a number of locations on South Island. The most significant deposits were those of the northwest Otago (Pyke River) area, but further work is required to determine the limits of mineralization. Tests of the fiber indicate that it is of favorable economic quality, but no production was reported in 1981.

Phosphates.—The most promising source of phosphate was thought to be the nodules occurring on the sea floor on the eastern half of the Chatham Rise (west of Chatham Island). Research carried out by the New Zealand Oceanographic Institute in 1979 indicated the presence of phosphorite nodules ranging from 10 to 150 millimeters. Most of these deposits were found in water from 400 to 500 meters deep, and none were found at depths less than 200 meters. The P_2O_5 values for the phosphorites generally range from 18% to 24%, with a recorded high of 27.7%. Evaluation is still continuing.

Sulfur.—In 1981, development work by Fletcher Mining Co. Ltd. on a deposit of sulfur at Rotokawa in the Taupo area, North Island, remained inactive. The deposit, with reserves estimated at 6 million tons, was mixed with pumice, and research on a separation process was not completed. The Frasch process cannot be applied here owing to the porosity of the overlying beds. Further development will await the conclusion of research and financing possibilities.

Other Nonmetals.—In 1981, serpentine was mined at Piopio (near Te Kuiti) and North Cape on North Island, and Lee Valley, Collins Valley, and Mossburn on South Island. At Lake Grassmere, in Marlborough (South Island), salt was produced by solar evaporation of seawater, and perlite was produced in the Rotorua-Taupo area.

An analysis by DSIR of beach sands on the west coast of South Island indicated reserves of over 50 million tons of ilmenite-bearing sands. DSIR was conducting extensive laboratory tests aimed at producing a synthetic rutile from the low-grade (46% TiO_2) ilmenites.

MINERAL FUELS

Coal.—New Zealand produced slightly over 2.0 million tons of coal in 1981, from some 70 mines in various fields on both the North and South Islands. Nearly 70% of the production was from open pit mines. Development work on three new coal mines was on schedule, and a major new open pit mine was planned at Ohinewai, near Huntly. Prospecting for new deposits, the Mines Div. of the Department of Energy discovered large deposits of coal on both the North and South Islands. Total recoverable coal in all categories is 3.9 billion tons, including the lignite deposits rated 50% recoverable. Of this quantity, bituminous coal totals 0.2 million metric tons; subbituminous, 0.8 mil-

lion tons; and lignite, 2.9 million tons.

In 1981, state coal mines accounted for about 65% of New Zealand output. Private production accounted for 35% of New Zealand's total mine production, primarily from small mines. However, production by the private sector is expected to drop to 15% in the 1990's as the state mines expand output. Most mine expansion plans were in the state sector, but the Government planned to fund a private joint-venture partner to develop the Greymouth Stream coal deposit on South Island. This has a potential of 2 million metric tons annually, largely for export. There are no shiploading facilities on the west coast of South Island, and development is expected to be costly.

Because the coal-exploration program over recent years has greatly increased the known reserves of coal, it was decided in late 1979 that limited amounts of coal should be exported. Coal exports totaled approximately 16,000 tons during 1980. During 1981, state coal mines intend to export a total of 250,000 metric tons. The Buller Field, South Island, will supply about 85% of the total output, principally to Japan, the Republic of Korea, and Fiji. Total exports are expected to reach 500,000 metric tons annually by 1986. There were no uses in New Zealand for high-quality coking coal, and the exports will not significantly deplete the known reserves.

Natural Gas.—The New Zealand Government approved the construction of a $1.0 billion synthetic fuels project by Mobil for the conversion of natural gas into gasoline, via the intermediate product, methanol. This would provide about 30% of New Zealand's gasoline needs by 1987. Meanwhile, the distribution network for Maui and Kapuni gas is under full-scale development. Major future users include the ammonia-urea plant at Kapuni, the methanol plant at Waitara, and the synthetic gasoline plant at Motonui.

The Government was encouraging increased exploration by foreign companies by liberalizing its handling of taxes and by allowing more writeoffs, such as exploration and development, against other operations in New Zealand. Field development costs can be written off at a rate of 20% per year, beginning in the year of the first commercial production.

Petroleum.—The Government's comprehensive petroleum-exploration policy is now in effect. In instances where the Government accepts a company's petroleum-exploration proposal, it would retain the right to acquire a 51% interest in the discovery in exchange for a 40% contribution to the exploration costs. By decreasing its contribution to the exploration costs, the Government would accept a lower share of the venture. Should either party to such an agreement decide not to contribute to the costs of a particular well, the remaining parties could proceed on a sole-risk basis. In the event of a discovery, the parties contributing to the cost of drilling would be permitted to recover 600% of their expenditures as a prior charge against first production. Royalties to be paid to the Government on oil found were set at 12.5% of the sale value. The price of indigenous oil was raised to that of world crude.

New Zealand's only known major oil resources were in the Maui and Kapuni natural gasfields. Production by Shell-BP-Todd Oil Services (in equal partnership with the Government) continues to increase over that of each previous year.

The Government approved an expansion of New Zealand's only oil refinery at Marsden Point near Whangarei. The new expanded plant will be able to handle heavier types of crude oil, allowing New Zealand to import oil from a wider range of suppliers and reduce dependency on the Middle East. It will also allow the production in New Zealand of fuels, such as aviation gasoline, that are currently imported.

Production of liquefied petroleum gas at Kapuni was maintained at a high level, but market demand still exceeded supply. An extraction plant being constructed to strip liquefied petroleum gas from the Maui gas stream was expected to be fully operational in 1982. Proposals from distributors to import liquefied petroleum gas from Australia were under consideration by the Government, but no decision was made during the year.

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[1]Physical scientist, Division of Foreign Data.

[2]Where appropriate, values have been converted from New Zealand dollars ($NZ) to U.S. dollars at the rate of $NZ1.00=US$0.98, the average exchange rate for the year ending Mar. 31, 1981.

The Mineral Industry of Nigeria

By George A. Morgan[1]

The mineral industry continued to perform poorly in 1981. The nonfuel minerals sector was small, and output of cassiterite and columbite concentrates, the principal mineral products, was down because of poor market conditions, organizational problems, and mining difficulties. Crude oil output was also reduced mainly because of low demand and Government policy.

Plans to fund numerous projects, including infrastructure development, were dependent upon petroleum revenues. Foreign exchange earnings were being depleted after 2 consecutive years of surplus, and a deficit of $7 billion was predicted for 1982.[2] Borrowing was the method proposed to fund the deficit, but a number of projects were being postponed, and trade restrictions were to be put into effect. State governments were dependent upon Federal Government revenues for nearly all their funding needs. High levels of borrowing by Federal and State Governments limited funds to private borrowers. A 25% increase in the national minimum wage was enacted and was expected to add $3 billion to total expenditures. Any organization employing 50 or more people had to comply with provisions of the law.

Government Policies and Programs.—The Federal Government completed its goal of acquiring a controlling interest in foreign-owned companies. It continued to create new public companies to act as coordinating agencies for the mining industry, with private firms acting in the role of subsidiaries. The fourth national development plan covering 1981-85 had a provision for the investment of about $10 billion in the mining and quarrying sector.

All mineral rights were exercised through the Ministry of Mines and Power. The Geological Survey Department and the Mineral Resource Division constituted the two divisions of the Ministry.

The Government established three corporations, the Nigerian Coal Corp. (NCC), the Nigerian Mining Corp. (NMC), and the Associated Ores Mining Co. (AOMC). The NCC had the exclusive right to explore for and mine coal. The NMC had responsibility for all solid minerals except coal and iron. Its duties included research in processing technology and marketing of output. It was to compete with the private sector and could set up projects with the participation of state governments and private concerns.

The AOMC was responsible for exploration and development of iron ore. The Nigerian Steel Development Authority was dissolved, and separate steel companies were established in addition to the AOMC. All were under the Steel Department of the Executive Office of the President, which had a cabinet-level minister.

A Mines Reclamation Unit in the Ministry of Agriculture was responsible for rehabilitation of mining sites.

PRODUCTION AND TRADE

Production of metals again declined while output of nonmetallic mineral commodities, heavily dependent upon local consumption, remained stable. Emphasis was placed on obtaining foreign exchange through sales of oil and establishing local industry to in-

crease employment. The industry was estimated to employ about 60,000 workers. Eight quarrying operations were set up, seven of which were in the production stage. Three of seven clay-brick plants were in operation in Jos, Kano, and Maiduguri.

Imports were estimated to be valued at about $30 billion in 1981. Subsidies were available for exports of products from the manufacturing sector and for industries targeted for development. The Société Generale de Surveillance continued to oversee product standardization for trade. The level of imports was effectively controlled by the Government by limiting the number of import licenses. The number available for issuance was based on the level of foreign exchange.

An agreement made with the German Democratic Republic provided for the exchange of equipment for minerals and oil from Nigeria.

Port expansion continued, with Lagos, Tin Can Island, and Port Harcourt having the heaviest trade volume. The ports of Warri and Calabar were underutilized.

Table 1.—Nigeria: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS					
Columbium and tantalum concentrates, gross weight:					
Columbite	861	666	567	554	377
Tantalite	1	1	1	1	2
Iron and steel: Crude steel	15,000	15,000	15,000	15,000	15,000
Lead:					
Mine output, metal content[e]	70	50	70	70	204
Metal, refined, secondary	--	--	1,500	2,000	2,000
Tin:					
Mine output, cassiterite concentrate:					
Gross weight	4,630	4,011	3,824	3,543	3,172
Sn content	3,267	2,935	2,750	2,527	2,300
Metal, smelter	3,315	2,984	2,858	2,678	2,486
Zinc ore and concentrate, metal content	--	--	--	--	[e]100
NONMETALS					
Cement, hydraulic thousand tons	1,440	1,536	1,740	2,000	2,000
Clays:					
Kaolin	[r]650	[r]650	[r]670	671	635
Unspecified	NA	NA	NA	56,973	NA
Feldspar[e]	5,000	5,000	5,000	5,000	5,000
Stone:					
Limestone thousand tons	1,243	[e]1,200	2,006	2,336	1,509
Marble	6,065	[e]6,000	1,031	368	374
Shale thousand tons	[e]165	NA	149	158	140
MINERAL FUELS AND RELATED MATERIALS					
Coal do.	238	264	172	193	190
Gas, natural:					
Gross million cubic feet	757,320	721,405	[e]820,000	[e]750,000	700,000
Marketed do.	17,657	13,420	[e]18,100	[e]19,000	19,000
Petroleum:					
Crude thousand 42-gallon barrels	761,025	697,150	841,325	753,980	750,000
Refinery products:					
Gasoline do.	6,169	17,749	8,395	[e]10,600	NA
Jet fuel do.	964	6,784	160	[e]200	
Kerosine do.	1,445	--	4,585	[e]5,800	
Distillate fuel oil do.	4,891	12,817	8,760	[e]11,000	
Residual fuel oil do.	3,687	8,427	10,220	[e]12,800	
Other, unspecified do.	438	9,220	730	[e]900	
Refinery fuel and losses do.	528	1,650	1,460	[e]1,800	
Total do.	18,122	56,647	34,310	[e]43,100	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Includes data available through July 19, 1982.

Table 2.—Nigeria: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate value, thousands	$5	$2	--	All to West Germany.
Metal including alloys, semimanufactures	1	3	--	France 2; United Kingdom 1.
Copper ore and concentrate value, thousands	$383	$343	--	Belgium-Luxembourg $244; West Germany $67; United Kingdom $20; Spain $12.
Iron and steel:				
Scrap	--	198	--	Denmark 115; West Germany 3.
Steel, primary forms	9	--		
Semimanufactures:				
Universals, plates, sheets	--	423	--	All to Japan.
Tubes, pipes, fittings value, thousands	$87	$137	$137	
Lead:				
Ore and concentrate	82	24	12	United Kingdom 12.
Metal including alloys, semimanufactures	110	--		
Tin:				
Ore and concentrate value, thousands	--	$4,026	--	All to United Kingdom.
Metal including alloys:				
Unwrought do	$27,887	$12,151	--	United Kingdom $9,167; Switzerland $2,377; Netherlands $607.
Semimanufactures	--	210	--	All to United Kingdom.
Zinc:				
Ore and concentrate	280	100	--	All to West Germany.
Metal including alloys, semimanufactures	44	--		
Other:				
Ores and concentrates value, thousands	$3,172	$8,839	$2,364	United Kingdom $4,588; Netherlands $1,565; Canada $166.
Metals including alloys, scrap do	$622	$223	--	United Kingdom $153; West Germany $44; Netherlands $18.
NONMETALS				
Asbestos, crude	50	--		
Cement	--	6	--	All to Ghana.
Fertilizer materials: Manufactured	--	8	--	All to Switzerland.
Lime	116	12	--	All to Ghana.
Salt and brine	--	20	--	All to Benin.
Sodium and potassium compounds, n.e.s.:				
Caustic potash value, thousands	--	$2	--	Do.
Soda ash	--	28	--	All to United Kingdom.
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	2	--		
Worked value, thousands	$16	--		
Other: Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	--	770	--	Italy 591; Poland 166; Romania 12.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	6,555	6,395	--	Niger 3,855; Benin 988; United Kingdom 620.
Coal: Anthracite and bituminous coal excluding briquets	3,600	--		
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	712,420	786,171	389,455	Netherlands 97,316; France 63,259; West Germany 54,478; Bermuda 47,031.
Refinery products:				
Gasoline do	75	281	--	Niger 237; Netherlands Antilles 8.
Kerosine and jet fuel do	(1)	77	--	Niger 14; United Kingdom 1.
Distillate fuel oil do	798	121	--	Niger 41; United Kingdom 3; Benin 2.
Residual fuel oil do	(2)	44	--	France 24; Netherlands 20.
Lubricants value, thousands	$80	$36,428	$36,401	Netherlands $24.
Other:				
Liquefied petroleum gas do	$19	--		
Mineral jelly and wax do	$4	$5	--	NA.
Bitumen and other residues do	$148	$946		Niger $669; Benin $80.

NA Not available.
[1]Unreported quantity valued at $4,787,000.
[2]Unreported quantity valued at $18,807,000.

Table 3.—Nigeria: Imports of mineral commodities

(Thousand dollars unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Unwrought	6,195	7,471	25	Canada 4,137; Norway 1,852; Belgium-Luxembourg 504.
Semimanufactures	60,164	55,273	1,159	United Kingdom 25,037; Switzerland 8,790; West Germany 5,721.
Copper metal including alloys:				
Unwrought	272	897	--	West Germany 412; Canada 269; Belgium-Luxembourg 169.
Semimanufactures	18,821	17,838	685	West Germany 4,669; Japan 3,686; United Kingdom 3,648.
Iron and steel:				
Ore and concentrate	341	271	--	Norway 225; West Germany 30; United Kingdom 16.
Metal:				
Scrap	54	9	NA	United Kingdom 7.
Pig iron, spiegeleisen, powder, shot	638	515	2	Italy 427; United Kingdom 43; West Germany 37.
Ferroalloys	159	571	--	Norway 115; Spain 115; China 95.
Steel, primary forms	26,046	53,055	4,833	West Germany 27,163; Italy 4,118; Poland 2,737.
Semimanufactures:				
Bars, rods, angles, shapes, sections	181,208	151,904	1,528	West Germany 35,698; United Kingdom 29,733; Brazil 22,421.
Universals, plates, sheets	244,625	217,774	638	Japan 149,753; West Germany 22,146; United Kingdom 12,259.
Hoop and strip	22,672	14,800	13	West Germany 8,471; United Kingdom 2,950; Belgium-Luxembourg 867.
Rails and accessories	2,305	1,492	290	United Kingdom 683; U.S.S.R. 274; West Germany 145.
Wire	23,041	17,586	87	Belgium-Luxembourg 5,203; United Kingdom 3,984; West Germany 3,071.
Tubes, pipes, fittings	205,077	125,642	27,405	Japan 21,668; West Germany 20,809; United Kingdom 16,253.
Castings and forgings, rough	3,710	2,306	49	United Kingdom 804; Italy 529; Spain 245.
Lead metal including alloys:				
Unwrought	998	509	--	United Kingdom 254; Japan 123; Netherlands 98.
Semimanufactures	350	1,117	81	Italy 233; Japan 201; United Kingdom 195.
Nickel metal including alloys:				
Unwrought	35	41	--	All from United Kingdom.
Semimanufactures	1,622	1,646	729	United Kingdom 340; West Germany 210; Hong Kong 128.
Platinum-group metals including alloys, unwrought and partly wrought	362	211	12	United Kingdom 176; Belgium-Luxembourg 16.
Silver:				
Ore and concentrate[1]	8	5	--	All from West Germany.
Metal including alloys, unwrought and partly wrought	274	103	7	United Kingdom 57; Brazil 29; Switzerland 7.
Tin metal including alloys, all forms	68	293	--	France 253; United Kingdom 25.
Uranium and thorium:				
Ore and concentrate	5	50	--	France 48; Sweden 2.
Alloys	--	29	--	All from United Kingdom.
Zinc metal including alloys:				
Unwrought	10,723	11,130	221	Belgium-Luxembourg 5,536; United Kingdom 2,272; West Germany 869.
Semimanufactures	1,464	1,037	2	Belgium-Luxembourg 527; West Germany 170; France 154.
Other:				
Ores and concentrates	216	656	--	West Germany 276; France 239; United Kingdom 62.
Oxides and hydroxides, metric tons	6,411	--		
Metals including alloys:				
Scrap	7,050	--		
Unwrought and semimanufactures	211	817	10	Japan 454; United Kingdom 216; Belgium-Luxembourg 81.

See footnotes at end of table.

Table 3.—Nigeria: Imports of mineral commodities —Continued

(Thousand dollars unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	249	753	182	United Kingdom 571.
Grinding and polishing wheels and stones	2,442	1,693	41	United Kingdom 561; West Germany 342; Italy 306.
Asbestos, crude	13,849	13,263	272	Canada 5,722; West Germany 4,766; Italy 1,153.
Cement	289,071	269,589	3,318	Spain 62,184; Poland 45,318; West Germany 44,535; Greece 37,320.
Clay products:				
Nonrefractory	20,217	4,383	8	Italy 1,551; West Germany 685; Spain 671.
Refractory including nonclay brick	44,640	16,222	--	United Kingdom 5,063; West Germany 3,362; France 1,853.
Diamond: Industrial	69	--		
Fertilizer materials:				
Crude	18,851	14,884	--	West Germany 5,793; Yugoslavia 3,293; Netherlands 2,277.
Manufactured:				
Nitrogenous	2,129	6,173	--	West Germany 2,367; Romania 1,954; Yugoslavia 1,624.
Phosphatic	4,246	3,721	102	West Germany 1,704; Israel 1,247; Togo 453.
Potassic	2,129	1,159	--	West Germany 1,070; United Kingdom 72.
Other including mixed	356	40,986	--	West Germany 27,195; Netherlands 5,677; Denmark 3,080.
Ammonia	814	955	1	Netherlands 318; West Germany 270; United Kingdom 227.
Lime	5,866	5,591	20	Greece 2,211; Spain 1,566; United Kingdom 1,393.
Mica: Worked including agglomerated splittings	445	354	16	Italy 283; West Germany 28.
Salt and brine	47,625	72,061	247	United Kingdom 42,187; West Germany 10,407; Poland 7,640; Brazil 5,242.
Sodium and potassium compounds, n.e.s.:				
Caustic potash including sodic and potassic peroxides	5,301	9,482	122	United Kingdom 3,787; West Germany 2,136; Netherlands 1,679.
Caustic soda	8,435	10,291	6	West Germany 4,098; Netherlands 4,008; United Kingdom 1,097.
Soda ash metric tons	11,517	--		
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	3,605	4,736	55	Morocco 1,503; Italy 1,023; Greece 836.
Worked	1,295	178	9	Morocco 54; Austria 43; France 16.
Sulfur: Elemental, crude	318	1,123	--	Poland 431; West Germany 421; France 143.
Other: Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	47,952	22,454	155	Italy 6,758; West Germany 3,564; Spain 3,411; France 1,695.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	21,164	27,276	154	Spain 8,483; United Kingdom 6,397; Morocco 2,531.
Coal and briquets:				
Anthracite and bituminous coal	9	461	--	All from United Kingdom.
Briquets of anthracite and bituminous coal	124	183	43	Netherlands Antilles 81; Netherlands 38.
Coke and semicoke	230	251	1	West Germany 126; United Kingdom 53; Belgium-Luxembourg 35.
Petroleum and refinery products:				
Crude and partly refined	759	26,078	24,148	Romania 1,906; West Germany 15.
Refinery products:				
Gasoline	38,514	71,388	25,002	Netherlands 44,613; France 475.
Kerosine and jet fuel	8,225	16,502	526	United Kingdom 9,644; Netherlands 4,394.

See footnotes at end of table.

Table 3.—Nigeria: Imports of mineral commodities —Continued

(Thousand dollars unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products —Continued				
Refinery products —Continued				
Distillate fuel oil	21,046	3,356	1,262	Netherlands 1,477; West Germany 440.
Residual fuel oil	60	140	21	United Kingdom 76; West Germany 43.
Lubricants	87,419	61,163	7,509	France 8,805; Italy 8,096; United Kingdom 7,394.
Other:				
Liquefied petroleum gas	1,542	5,039	3	United Kingdom 2,090; Netherlands 905.
Mineral jelly and wax	20,617	13,254	473	United Kingdom 7,914; West Germany 2,560.
Bitumen and other residues	67,210	37,105	166	Netherlands 21,257; Spain 7,117.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	3,312	1,187	298	United Kingdom 627; Italy 161; Netherlands 51.

NA Not available.
[1]May include platinum-group metals.

COMMODITY REVIEW

METALS

A preliminary study of all known gold occurrences was completed. Further evaluation was underway for targeting sites for future exploration. The Geological Survey Department reported the discovery of both copper and columbite mineralization in Bauchi State.

Columbium-Tantalum.—Columbite concentrate production by Amalgamated Tin Mines of Nigeria Ltd. (ATMN) for the 9-month period ending December 31, 1980 was 153 tons. According to the company's annual report, about 89% of the total was produced as a byproduct of cassiterite production; the remainder was from one plant working solely for columbite. In addition, 11 tons of columbite was obtained from the Odegi Mine dumps. A contract with Vestis Tin Mines Ltd., which provided for treatment and marketing of columbite from the dumps, was terminated in February 1981, owing to economic reasons.

ATMN also had an agreement with Makeri Smelting Co. Ltd. in which it sought to obtain a higher value for tantalum recovered as a byproduct.

Iron Ore.—Development of the Itape iron ore deposit continued to lag behind the planned startup of the Ajaokuta steel plant. Reserves at the banded iron ore deposit were 200 million tons, grading 35% iron. However, only $15.7 million was allocated to the Associated Ores Mining Co. to develop the deposit.

About 108,000 tons of concentrate was imported from Liberia between May and August and stockpiled for use at the Aladja steel plant. Negotiations were completed for importing concentrate from the Miferguí-Nimba deposit in Guinea. A Liberian company was contracted to transport the concentrate from Guinea to Nigeria. The concentrate would be pellitized at the Aladja plant using a Lurgi pellitizer.

Iron and Steel.—The Aladja steel plant near Warri, operated by the Government-owned Delta Steel Co., was commissioned in November. Construction was by an Austrian and West German consortium with the assistance of Metallurgical and Engineering Consultants Ltd. of India at a total cost of $1.9 billion. Steel production capacity of four electric arc furnaces was 1 million tons per year. Charge to the furnaces in-

cluded 800,000 tons per year of sponge iron from two Midrex direct-reduction units and 200,000 tons per year of scrap. About two-thirds of production would be shipped to rolling mills at Jos, Oshogbo, and Katsina. The remainder would be rolled at a light section mill nearby. Access from the plant to the harbor at Warri was via a 6.5-kilometer-long, manmade channel. Port capacity was 4 million tons per year, and it could accommodate 25,000-deadweight-ton vessels. Electricity for the plant was supplied from the Sapele power station. About 70 million cubic feet per day of natural gas will be consumed at the plant. The supply of gas was from the Warri Oilfields, where associated gas was previously flared. Iron ore concentrate requirements of 1.5 million tons per year were to be met by imports from Liberia and Guinea. Total employment was 5,400 people.

The Katsina rolling mill, one of three mills under construction in Nigeria, underwent trial rolling tests in December. Capacity of the mill was 210,000 tons per year, and the mill was to be supplied with steel billets delivered by road from the Aladja steel plant. The Jos and Oshogbo mills would also have an initial capacity of 210,000 tons per year each. Production would be 57,000 tons of coils, and the remainder, bars. Despite a work stoppage at the Jos steel mill, about 85% of the plant was completed by Julius Berger Nigeria Ltd.

Work continued on the Ajaokuta steel plant that was being built by the U.S.S.R. Blast-furnace technology would be employed, and the plant was designed to consume 200 million cubic feet per day of natural gas. Planned capacity was in excess of 1 million tons.

Despite the high cost of domestic production, the Government intended to make Nigeria self-sufficient in production of basic steel products and to protect the new industry from low-priced imports. Cost of production of 1 ton of steel billets was $880 compared with an import price of $314 per ton. Both the quantity and type of steel imported were to be limited. Domestic demand of about 3.5 million tons per year was supplied almost entirely by imports of finished and semifinished products. Four minimills produced about 90,000 tons per year of steel products.

Tin.—Output from the labor-intensive tin sector continued to decline. The Government, through the NMC, acquired a controlling interest in all major operating tin companies. The principal firms and their percentage share controlled by NMC were ATMN, 58%; Ex-lands Nigeria Ltd., 54%; Bisichi-Jantar Nigeria Ltd., 60%; and Kaduna Prospecting Nigeria Ltd., 51%.

The Government also intended to acquire a controlling interest in Makeri Smelting Co. Ltd., which received all tin concentrates for smelting. Average capacity utilization was only 20% because of the unavailability of concentrate feed. Throughput was 3,622 tons in 1980, of which 7 tons was from Niger.

The Ririwai deposit in Kano State had demonstrated reserves of 2,581,000 tons, containing 0.82% tin and 1.7% zinc, and 2.5 million tons of indicated reserves. Initial output as an underground mine commenced in 1981 at 1,000 tons per day. The operation was a joint venture between NMC and Gold and Base Metal Mines of Nigeria Ltd.

ATMN employed about 1,600 workers and reported production of 1,155 tons of concentrate in the 9-month period ending December 31, 1980. Ground instability and low recovery from the Dorowa dredge were cited as reasons for the shortfall from a predicted output of 1,269 tons. Of the total cassiterite produced by ATMN, 70% was from contract plants, 19% was from the NG8 Mine, 6% was from the dredge, and 5%, from hand-mining contractors. The poor financial condition of the company caused curtailment of prospecting and the suspension of drilling in the N'Gell basalt. Two minimum wage increases during the year adversely affected mining costs. Amalgamated Tin Mines of Nigeria (Holdings) Ltd., in its annual report, listed its share of ATMN losses at $456,000 for the year ended March 31, 1981, compared with a profit of $160,000 in the year ended March 31, 1980. The company was reappraising its continued participation in the Nigerian mining sector.

NONMETALS

Cement.—The Benue Cement Co. at Yandev was set to start up a second production line. Capacity would be raised from 1,240 to 3,010 tons per day. The plant was built by Cementia Engineering and Consulting Ltd. of Switzerland. Equipment included two 64-meter-long rotary kilns with a four-stage Humboldt preheater. Startup was dependent upon the commissioning of a new power station under construction.

Limestone.—A number of limestone deposits were evaluated for use as flux in the iron and steel industry. The Jakura deposit was worked for production of marble, and both the Ubo and Ukpilla deposits supplied limestone to the cement industry. Lime plants were reportedly planned for several deposits. The Federal Government revoked the license of the Oyo State government to operate the Igbetti marble deposit. No reason for the revocation was given.

Salt.—Two salt refineries, one at Ijoko in Ogun State and one at Oyhereki, near Sapele, in Bendel State, were under construction. Total combined capacity of the two plants was 200,000 tons per year of salt.

MINERAL FUELS

Coal.—The Government announced that it intended to establish subsidiary mining companies at all future coal-producing areas. Soviet technicians were examining the extraction of coking coal at Lafia, in Plateau State, for possible use at the Ajaokuta steel plant under construction by the U.S.S.R.

Current output has been from two underground mines and one opencast mine at Enugu in Anambra State. Recently equipped and modernized with longwall mining equipment, production at the underground mines was 91,977 tons at Onyeama Mine and 60,222 tons at Okpara Mine. Output from the Okola opencast mine was 41,025 tons. The Nigerian Cement Co. consumed 108,715 tons; the Nigerian Electric Power Authority, 11,759 tons; the Nigerian Railways, 1,779 tons; and local users, 2,883 tons. About 5,000 tons was exported to Ghana.

Natural Gas.—Natural gas production associated with crude oil output was about 2 billion cubic feet per day, most of which was flared. An agreement made with a number of European companies to guarantee purchase of gas was terminated, once again canceling plans for a natural gas liquefaction plant. Gas reserves of 75,000 billion cubic feet were considered underestimated.

Petroleum.—Sales of crude oil made up 90% of the value of exports, 80% of Government revenue, and 25% of the gross domestic product. About $24 billion was earned from oil sales in 1980.

In 1981, declining oil prices and low production levels substantially reduced revenues. In the 9-month period ending September 30, actual revenue from the sale of oil was about $6 billion below the expected level, equivalent to one-third of the 1981 budget.

The Port Harcourt refinery operated at its rated capacity of 60,000 barrels per day. The Warri and Kaduna oil refineries, each with 100,000 barrels per day capacity, actually had a combined throughput of 134,000 barrels per day.

From the inception of oil exploration in the 1960's until early 1981, 229 oilfields had been discovered. Of that number, 140 were in production, 6 had exhausted their reserves, 71 awaited integration into a gathering system, and 12 were newly discovered. Reserves were 19 billion barrels.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Nigerian naira (N) to U.S. dollars at the rate of N1.00=US$1.84 for 1980 and N1.00=US$1.57 for 1981.

The Mineral Industry of Norway

By Joseph B. Huvos[1]

In 1981, Norway's industrial production, capital investment, and trade, including the production of offshore petroleum, were all below 1980 levels and the gross national product (GNP) increased only 0.7% in real terms to about $59 billion.[2] Oil exports contributed about 14% to the GNP.

Unemployment edged slightly upward to 1.3% in 1981. Although exports of petroleum, the leading export item, declined, unit export prices were higher, compensating in part for the decline. The country's mineral industry, consisting mainly of oil and gas, hydropower-based aluminum, ferroalloys, copper, and zinc, remained sluggish.

The Norwegian Government was preparing a new law for regulating exploration and exploitation of petroleum and other mineral deposits on Norway's Continental Shelf, which was to be presented to the Storting (Parliament) for consideration in 1982.

Important events in Norway's mineral industry in 1981 included stagnation in the country's petroleum output, Government approval of a gas grid in the North Sea, merger talks between the country's two largest steel firms, Government rescue of the iron mining company AS Sydvaranger, departure of Tinfos—a ferroalloy maker—from the Fesil Group, and a decision of Norsk Hydro AS to construct a nitric acid plant.

PRODUCTION

There was no important change in the production pattern of Norway's mineral industry in 1981. The production index of some selected items in the metal and mineral industry in 1980 and 1981 are shown in table 1.

Table 1.—Production indexes, metal and mineral industry

(1975=100)

	1980	1981
Oil, mining, energy	132	132
Oil production and mining	382	374
Coal	78	87
Crude oil and natural gas	458	447
Ore mining	101	104
Oil refining	83	81
Ceramics and glass	104	97
Mineral products	95	89
Iron, steel, ferroalloys	92	84
Nonferrous metals	115	114

Source: Monthly Bulletin of Statistics. Central Bureau of Statistics of Norway, v. 100, No. 3, 1982.

Production of major mineral commodities in 1977 through 1981 is shown in table 2.

Table 2.—Norway: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS					
Aluminum metal:					
Primary ingot	622,730	638,559	r663,916	653,337	632,783
Secondary ingot	9,474	6,634	r3,500	4,500	4,400
Superpure	4,700	4,700	NA	NA	NA
Cadmium metal, smelter	97	120	115	130	117
Cobalt metal	705	522	953	1,275	1,444
Copper:					
Mine output, metal content of concentrate	29,053	29,073	28,016	28,869	28,238
Metal:					
Smelter, primary only	26,575	20,061	r27,339	33,690	31,952
Refined:					
Primary	21,237	15,674	20,964	25,785	26,077
Secondary	1,294	5,578	6,000	e6,000	e6,000
Total	22,531	21,252	26,964	31,785	32,077
Iron and steel:					
Iron ore and concentrate thousand tons	3,635	3,773	r4,066	3,884	4,064
Roasted pyrites do	147	158	e110	e110	e110
Pig iron do	512	554	r650	612	568
Ferroalloys:					
Ferrochrome do	22	15	12	11	12
Ferrochromium silicon do	(2)	1	1	(2)	1
Ferromanganese do	244	273	338	287	225
Ferrosilicon (75% basis) do	223	266	349	307	274
Silicon metal do	60	58	e70	85	--
Ferrosilicomanganese do	127	134	184	163	198
Other do	31	30	29	7	12
Total do	707	777	983	860	722
Steel, crude do	711	812	r923	854	848
Semimanufactures:					
Rolled do	500	644	741	e750	e740
Finished castings do	10	4	6	e10	e6
Lead:					
Mine output, metal content	3,265	3,561	3,596	2,600	3,600
Smelter, secondary only	911	917	400	e400	--
Magnesium metal, primary	38,165	39,160	44,177	44,352	47,602
Nickel:					
Concentrate, metal content	543	536	500	e500	e500
Metal, primary	38,222	23,739	r30,686	37,123	37,095
Platinum-group metals[3] troy ounces	39,867	33,630	37,327	NA	NA
Titanium: Ilmenite concentrate	828,503	766,990	r819,815	827,814	657,625
Vanadium, mine output, metal content[e]	540	460	570	540	570
Zinc:					
Mine output, metal content	31,277	29,592	29,592	28,670	29,800
Metal, primary	69,790	71,628	r77,763	79,416	80,279
NONMETALS					
Cement, hydraulic thousand tons	2,314	2,232	2,197	2,093	1,789
Feldspar, lump[4]	70,799	59,522	87,888	67,559	e70,000
Graphite	9,097	11,151	11,892	10,406	8,665
Lime, hydrated, and quicklime	102,268	126,364	e130,000	130,000	e130,000
Mica[3]	2,818	2,688	2,915	2,900	e2,900
Nitrogen: N content of ammonia	504,521	526,458	544,532	515,078	544,793
Olivine sand	350,635	606,087	791,988	1,102,739	e1,100,000
Pyrites and pyrrhotite, gross weight	308,338	293,289	r240,553	421,367	412,578
Sodium and potassium compounds, n.e.s.:					
Caustic soda	74,058	101,686	176,019	183,554	184,481
Sodium carbonate[e]	25,000	26,000	27,000	27,000	27,000
Stone:					
Dimension stone: Slate	58,941	51,813	NA	NA	NA
Crushed and broken:					
Dolomite:					
Ground	66,175	80,322	97,111	--	NA
Not further described	512,040	510,681	513,350	559,117	NA
Limestone thousand tons	4,607	4,390	5,254	4,146	NA
Nepheline syenite	209,689	231,273	241,131	231,339	223,152
Quartz and quartzite	600,676	672,744	639,487	843,762	NA
Sulfur:					
Pyrites, S content thousand tons	154	150	119	193	e190
Byproduct of:					
Metallurgy do	38	36	40	e40	e40
Petroleum do	7	7	6	e6	e6
Total do	199	193	165	239	236

See footnotes at end of table.

Table 2.—Norway: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Sulfur —Continued					
Sulfuric acid (100%)	383	381	386	359	NA
Talc, soapstone, steatite:					
Unground	33,564	35,754	34,294	35,270	[e]33,000
Other	64,523	60,962	53,191	52,365	[e]52,000
Total	98,087	96,716	87,485	87,635	85,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades	436,784	402,084	[r]280,280	288,412	312,754
Coke, all grades	320,715	320,205	336,541	343,941	340,817
Gas:					
Manufactured ——million cubic feet	729	579	563	458	410
Natural:					
Gross[e] ——do	160,000	550,000	790,000	960,000	958,000
Marketed ——do	110,855	525,865	759,482	922,065	919,859
Peat:[e]					
For agricultural use	60,000	60,000	[r]60,000	[r]60,000	60,000
For fuel use	1,100	1,100	[r]1,200	[r]1,200	1,200
Petroleum:					
Crude ——thousand 42-gallon barrels	101,887	127,163	140,111	181,692	175,361
Refinery products:					
Gasoline, motor ——do	10,030	7,490	10,318	9,941	NA
Jet fuel ——do	2,446	1,762	1,956	1,321	NA
Kerosine ——do	2,219	2,807	3,663	3,548	NA
Distillate fuel oil ——do	20,657	23,728	27,534	25,966	NA
Residual fuel oil ——do	17,023	11,674	14,601	11,876	NA
Lubricants ——do	287	33	30	31	NA
Other ——do	5,361	1,721	6,381	6,545	NA
Refinery fuel and losses ——do	4,215	5,981	5,013	3,342	NA
Total ——do	62,238	55,196	69,496	62,570	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 9, 1982.

[2]Less than 1/2 unit.

[3]Data represent exports, presented in lieu of actual production data, which are reported in official sources as not available for publication. A part of these exports may be derived from imported materials.

[4]Excludes nepheline syenite, which is included under "Stone."

TRADE

In 1981, Norway's foreign trade balance showed an increasing surplus. Although North Sea oil prices dropped from $41 to $36 per barrel, the strengthening of the dollar compensated for some of the loss. Norway's mineral commodity trade in 1979 and 1980 is shown in tables 3 and 4.

Table 3.—Norway: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	--	1,847	--	All to Sweden.
Oxides and hydroxides	20	35	--	Sweden 32.
Metal including alloys:				
Scrap	23,841	18,591	--	West Germany 8,202; Italy 2,976; Sweden 2,338.
Unwrought	565,304	521,183	1,747	West Germany 184,330; United Kingdom 95,822; Netherlands 75,023.
Semimanufactures	65,196	66,044	875	United Kingdom 13,309; Sweden 8,618; West Germany 7,684.

See footnotes at end of table.

Table 3.—Norway: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Beryllium metal including alloys, all forms value	--	$1,000	--	All to Sweden.
Cadmium metal including alloys, all forms	156	NA		
Chromium: Oxides and hydroxides	1	1	--	Do.
Cobalt, metal including alloys, all forms	885	NA		
Copper:				
Ore and concentrate	98,797	89,498	--	West Germany 68,857; Sweden 20,466.
Oxides and hydroxides	2,892	NA		
Metal including alloys:				
Scrap	4,569	4,166	--	West Germany 1,908; Sweden 928; Belgium-Luxembourg 483.
Unwrought:				
Unrefined	6,192	7,388	--	All to West Germany.
Refined	21,652	27,494	455	West Germany 8,172; France 5,904; United Kingdom 4,969.
Semimanufactures	2,935	3,410	--	Sweden 1,403; West Germany 1,315.
Gold metal including alloys, unwrought and partly wrought troy ounces	4,405	NA		
Iron and steel:				
Ore and concentrate, except roasted pyrites thousand tons	3,409	2,722	--	West Germany 1,485; France 358; Poland 324.
Roasted pyrites	27,684	53,609	--	West Germany 43,070; Denmark 6,053; United Kingdom 2,086.
Metal:				
Scrap	38,025	38,491	2	West Germany 21,623; Sweden 10,815; Denmark 3,451.
Pig iron including cast iron, powder, shot	140,198	104,329	--	United Kingdom 50,958; West Germany 26,997; Netherlands 6,517.
Ferroalloys:				
Ferromanganese	245,588	245,505	18,739	West Germany 45,500; Belgium-Luxembourg 29,170.
Other	562,824	463,694	25,368	West Germany 162,777; United Kingdom 65,648; Sweden 39,018.
Steel, primary forms	239,469	211,617	--	Netherlands 114,959; Denmark 32,794; Argentina 21,988.
Semimanufactures:				
Bars, rods, angles, shapes, sections	245,318	246,547	--	Sweden 61,309; United Kingdom 53,481; West Germany 42,572.
Universals, plates, sheets	134,899	141,699	--	Sweden 39,349; United Kingdom 39,208; Denmark 28,099.
Hoop and strip	7,162	7,582	NA	Sweden 5,655; United Kingdom 1,228.
Rails and accessories	2,787	437	--	Sweden 431.
Wire	7,967	7,184	1,679	United Kingdom 1,737; Iraq 967; Finland 451.
Tubes, pipes, fittings	40,051	40,515	1,015	Sweden 17,716; United Kingdom 10,036; Denmark 3,418.
Castings and forgings, rough	11,354	12,783	2	Sweden 8,309; Denmark 2,606; Liberia 1,073.
Lead:				
Ore and concentrate	6,293	3,754	--	All to West Germany.
Oxides and hydroxides	29	11	--	Sweden 5; Thailand 4; Ghana 2.
Metal including alloys:				
Scrap	7,598	8,753	--	Denmark 4,286; West Germany 1,720; Sweden 1,695.
Unwrought	254	125	--	Sweden 71; Denmark 33.
Semimanufactures	1	2	--	All to Netherlands.
Magnesium metal including alloys:				
Scrap	20	2	--	All to West Germany.
Unwrought value, thousands	$90,224	$97,389	NA	NA.
Semimanufactures	173	207	NA	West Germany 169.
Manganese ore and concentrate	1,287	1,955	--	United Kingdom 1,100; West Germany 850.
Mercury 76-pound flasks	1,363	2,842	--	France 2,233; Czechoslovakia 609.
Nickel:				
Ore and concentrate	12,692	13,773	--	All to Finland.
Metal including alloys:				
Scrap	994	391	34	Austria 203; United Kingdom 147.
Unwrought	33,088	31,250	16,097	West Germany 3,848; United Kingdom 2,509; Netherlands 1,527.
Semimanufactures	12	78	--	Liberia 67.

See footnotes at end of table.

Table 3.—Norway: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$9,992	$11,152	$6,854	Netherlands $3,718.
Rare-earth metals: Oxides	19	--		
Silicon, elemental	56,165	(1)		
Silver:				
Waste and sweepings value, thousands	$847	$1,340	--	United Kingdom $884; West Germany $309.
Metals including alloys, unwrought and partly wrought do	$6,906	$16,339	$293	Sweden $7,666; West Germany $3,692; United Kingdom $1,954.
Tin metal including alloys:				
Scrap	35	52	--	Denmark 29; West Germany 16.
Unwrought	21	7	--	Sweden 4; Finland 2.
Semimanufactures	1	4	--	Mainly to West Germany.
Titanium:				
Ore and concentrate	741,430	779,741	--	West Germany 346,752; U.S.S.R. 97,025; Poland 84,136.
Oxides and hydroxides	1,227	1,137	--	Sweden 927; Denmark 205.
Tungsten metal including alloys, all forms value	$13,428	$7,000	--	Denmark $6,000.
Uranium and thorium metal including alloys, all forms do	--	$5,000	$5,000	
Zinc:				
Ore and concentrate	13,241	6,395	--	West Germany 4,365; Poland 2,030.
Oxides and hydroxides	671	669	--	Sweden 340; Denmark 299.
Metal including alloys:				
Scrap	1,089	1,332	--	West Germany 919; Sweden 211; Netherlands 112.
Blue powder	4,443	NA	NA	NA.
Unwrought	61,933	65,739	--	West Germany 17,806; Sweden 17,088; East Germany 9,247.
Semimanufactures	4,847	5,412	40	West Germany 1,099; Denmark 1,078; Sweden 785.
Other:				
Ash and residue containing nonferrous metals	117,431	119,065	--	West Germany 86,379; United Kingdom 12,701; Denmark 8,435.
Metalloids	7	60,586	1,853	U.S.S.R. 19,992; West Germany 13,943; United Kingdom 9,213.
Oxides, hydroxides, peroxides	2,911	3,028	NA	NA.
Base metals including alloys, all forms	1,184	1,287	NA	NA.
NONMETALS				
Abrasives, n.e.s.:				
Artificial: Corundum	1	10	--	Republic of South Africa 7.
Grinding and polishing wheels and stones	867	767	10	Sweden 209; Finland 148; Turkey 54.
Asbestos, crude	NA	--		
Barite and witherite	1,627	271	--	Denmark 150; United Kingdom 80.
Cement thousand tons	694	525	NA	NA.
Chalk	7	40	--	Denmark 31; Finland 9.
Clays and clay products:				
Crude	286	21	--	Denmark 15; Libya 5.
Products:				
Nonrefractory value, thousands	$2,391	$2,872	$1	West Germany $2,344; France $451.
Refractory including nonclay brick	4,576	6,576	8	West Germany 2,682; Sweden 1,646; Bahrain 923.
Cryolite and chiolite, natural	--	10	--	All to Iceland.
Diamond, gem, not set or strung value, thousands	$334	$307	$35	Belgium-Luxembourg $96; Finland $49; West Germany $44.
Diatomite and other infusorial earth	34	11	--	Sweden 10.
Feldspar and fluorspar	327,434	310,662	18	Netherlands 80,413; United Kingdom 62,395; West Germany 60,328.
Fertilizer materials:				
Manufactured:				
Nitrogenous value, thousands	$82,006	$99,995	NA	NA.
Phosphatic	1	100	--	All to Sweden.
Potassic	30	3,138	--	Thailand 3,131.
Other including mixed value, thousands	$122,690	$152,804	NA	NA.
Ammonia do	$2,625	$1,197	NA	NA.

See footnotes at end of table.

Table 3.—Norway: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Graphite, natural	11,178	10,675	NA	NA.
Gypsum and plasters	9	8,878	--	Ghana 4,506; Liberia 4,362.
Lime	2,405	15,300	--	Liberia 13,399; Sweden 1,599.
Magnesite	--	17,120	--	Sweden 6,179; Austria 4,332; Yugoslavia 2,666.
Mica: Crude including splittings and waste	2,915	2,113	--	Netherlands 770; Portugal 201; United Kingdom 176.
Pigments, mineral: Iron oxides, processed	36	--		
Precious and semiprecious stones except diamond value, thousands	$51	$58	--	West Germany $39; United Kingdom $9; Sweden $8.
Pyrites, unroasted	27,256	190,107	--	Sweden 61,297; Italy 51,278; Romania 47,790.
Salt and brine	1,594	1,576	--	Sweden 942; Denmark 630.
Sodium and potassium compounds, n.e.s. value, thousands	$6,881	$13,911	--	Spain $3,655; Denmark $3,387; Guinea $2,940.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Marble and other calcareous	1,232	1,704	--	Italy 1,073; Sweden 257; Japan 189.
Slate	39,897	21,852	--	Netherlands 13,963; West Germany 4,226; Belgium-Luxembourg 1,460.
Other	84,765	101,113	335	France 43,996; Italy 24,437; West Germany 18,710.
Worked, all types	312	13,106	--	Netherlands 9,795; West Germany 1,700; Belgium-Luxembourg 451.
Dolomite, chiefly refractory-grade	111,728	126,073	--	NA.
Gravel and crushed rock thousand tons	2,182	2,164	--	West Germany 1,301; France 256; United Kingdom 173.
Limestone except dimension	45,193	38,719	--	Denmark 22,239; Sweden 10,884.
Quartz and quartzite	42,357	62,496	5	Iceland 60,527; West Germany 944; Denmark 642.
Sand excluding metal-bearing	4,308	2,158	--	Sweden 1,172; Kuwait 350; United Kingdom 292.
Sulfur:				
Elemental, all forms	3,283	1,842	--	Sweden 525; Netherlands 500; United Kingdom 500.
Sulfuric acid value, thousands	$2,562	$5,191	NA	NA.
Talc, steatite, soapstone, pyrophyllite	52,007	55,728	--	United Kingdom 13,689; Netherlands 10,787; Sweden 8,730.
Other:				
Crude	NA	2	1	NA.
Slag, dross, similar waste, not metal-bearing	14,174	9,258	--	Sweden 7,803; United Kingdom 1,262.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	951	7,525	--	Sweden 3,659; Finland 3,123.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	9	1,024	--	Denmark 962; France 20.
Carbon black	17	15	--	Iceland 7; Malaysia 3; Singapore 2.
Coal and briquets: Anthracite and bituminous coal	63,577	(2)		
Coke and semicoke	55,145	35,640	--	West Germany 13,494; Iceland 12,435; Sweden 9,411.
Gas, hydrocarbon, natural million cubic feet	734,102	(3)		
Peat, including briquets and litter	14	16	--	Faroe Islands 15.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	139,283	173,266	--	United Kingdom 164,885; Netherlands 3,224.
Refinery products:				
Gasoline including natural do	5,450	4,523	--	United Kingdom 1,431; Netherlands 1,190; Sweden 787.
Kerosine and jet fuel do	121	7	--	Sweden 5.
Distillate fuel oil do	5,870	5,731	--	Denmark 1,764; Sweden 1,501; Netherlands 1,279.

See footnotes at end of table.

Table 3.—Norway: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products —Continued				
Refinery products —Continued				
Residual fuel oil thousand 42-gallon barrels	4,515	4,860	--	Netherlands 1,175; United Kingdom 1,169; Sweden 1,118.
Lubricants do	3	25	(4)	Sweden 16; Denmark 2.
Other:				
Mineral jelly and wax do	11	16	--	Sweden 15.
Liquefied petroleum gas do	530	NA		
Petroleum coke do	1,037	496	--	Netherlands 147; Hungary 83; Yugoslavia 83.
Nonlubricating oils, n.e.s. do	9	--		
Unspecified do	(4)	39	--	Italy 31; Kenya 6.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	49,703	47,087	--	Netherlands 29,709; Denmark 12,329; Belgium-Luxembourg 4,468.

NA Not available.
[1]Included with "Other: Metalloids."
[2]Unreported quantity valued at $4,396,000.
[3]Unreported quantity valued at $2,616,661,000, of which $1,653,401,000 went to West Germany, $956,796,000 to the United Kingdom, and $5,753,000 to the United States.
[4]Less than 1/2 unit.

Table 4.—Norway: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	20,641	6,894	--	All from Greece.
Oxides and hydroxides thousand tons	1,206	1,479	57	Jamaica 400; Australia 344; Suriname 334.
Metal including alloys:				
Scrap	124	2,503	473	West Germany 1,106; United Kingdom 852.
Unwrought	8,901	16,399	1,959	Sweden 4,704; United Kingdom 4,275; Spain 2,307.
Semimanufactures	36,244	45,552	1,460	West Germany 22,578; Sweden 7,248; Belgium-Luxembourg 4,011.
Antimony: Elemental	28	--		
Chromium:				
Chromite	36,357	293	--	Republic of South Africa 253.
Oxides and hydroxides	299	208	--	U.S.S.R. 102; West Germany 57; Italy 40.
Cobalt:				
Oxides and hydroxides	9	6	--	Mainly from Belgium-Luxembourg.
Metal including alloys, all forms	18	NA		
Copper:				
Matte	42	3	NA	Denmark 2.
Oxides and hydroxides	390	NA		
Sulfate	1,304	NA		
Metal including alloys:				
Scrap	228	331	223	Sweden 66.
Unwrought	2,633	2,259	2	Sweden 816; United Kingdom 790; Belgium-Luxembourg 415.
Semimanufactures	27,012	27,844	103	West Germany 9,673; Sweden 9,065; Belgium-Luxembourg 2,604.
Gold metal including alloys, unwrought and partly wrought troy ounces	39,063	NA		
Iron and steel:				
Ore and concentrate	312,434	87,101	--	Sweden 87,094.

See footnotes at end of table.

Table 4.—Norway: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal:				
Scrap	6,418	52,925	14	United Kingdom 31,867; Netherlands 6,110; Denmark 5,178.
Pig iron, ferroalloys, similar materials	15,220	17,121	20	West Germany 5,373; Sweden 3,166; Netherlands 2,670.
Steel, primary forms	136,560	195,494	NA	Netherlands 126,607; West Germany 28,888; Spain 9,765.
Semimanufactures:				
Bars, rods, angles, shapes, sections	263,136	309,631	86	Sweden 77,479; West Germany 76,996; France 41,802.
Universals, plates, sheets	430,828	584,862	608	West Germany 123,258; Sweden 118,639; Belgium-Luxembourg 71,743.
Hoop and strip	32,945	38,893	15	West Germany 10,508; Finland 8,341; Sweden 5,674.
Rails and accessories	23,640	29,410	--	Sweden 23,043; West Germany 3,135.
Wire	15,582	16,759	175	Belgium-Luxembourg 7,982; Sweden 4,074; West Germany 1,190.
Tubes, pipes, fittings	144,151	177,895	1,931	West Germany 72,728; France 19,219; United Kingdom 17,742.
Castings and forgings, rough	3,182	5,396	19	Denmark 2,725; Sweden 1,695.
Lead:				
Oxides and hydroxides	738	1,032	14	West Germany 578; United Kingdom 369.
Metal including alloys:				
Scrap	3	87	--	Denmark 57; Sweden 27.
Unwrought	12,102	13,608	1,421	United Kingdom 4,240; Denmark 4,078; Sweden 3,275.
Semimanufactures	1,069	1,415	1	Netherlands 803; West Germany 197; Sweden 139.
Magnesium metal including alloys:				
Unwrought	386	366	364	West Germany 1; United Kingdom 1.
Semimanufactures	26	24	3	Switzerland 10; Netherlands 5.
Manganese:				
Ore and concentrate	815,148	807,700	244	Gabon 259,024; Brazil 132,217; Australia 114,375.
Oxides and hydroxides	411	815	NA	Netherlands 700; Belgium-Luxembourg 65.
Metal including alloys, all forms	1,173	NA		
Mercury 76-pound flasks	29	29	--	Mainly from U.S.S.R.
Molybdenum metal including alloys, all forms	3	2	NA	Mainly from Austria.
Nickel:				
Matte, speiss, similar materials	78,897	89,855	--	Canada 76,483; United Kingdom 4,732.
Metal including alloys:				
Scrap	(1)	7	7	
Unwrought	86	80	45	United Kingdom 13; Canada 12.
Semimanufactures	197	274	14	West Germany 112; United Kingdom 70; Sweden 41.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$2,362	$2,119	$1	United Kingdom $782; West Germany $756; Switzerland $403.
Silver:				
Waste and sweepings troy ounces	361,181	444,001	--	Sweden 320,414; Denmark 58,739; Finland 43,854.
Metal including alloys, unwrought and partly wrought value, thousands	$21,061	$23,988	$286	United Kingdom $10,439; West Germany $7,324; Switzerland $4,423.
Tin metal including alloys:				
Scrap	8	7	--	Sweden 5; Denmark 2.
Unwrought	583	614	--	United Kingdom 470; Netherlands 62.
Semimanufactures	280	335	NA	United Kingdom 196; Denmark 53; West Germany 48.
Titanium:				
Ore and concentrate	228	NA		
Oxide and hydroxides	1,300	491	--	West Germany 480.
Tungsten metal including alloys, all forms	3	5	NA	West Germany 2; Sweden 2.
Uranium and thorium: Oxides including rare-earth oxides	72	NA		
Zinc:				
Ore and concentrate	73,102	81,839	--	All from Sweden.
Oxides and pentoxides	2,564	2,217	--	West Germany 1,763; United Kingdom 250.
Metal including alloys:				
Scrap	2,629	2,414	--	Sweden 1,587; Denmark 822.
Blue powder, dust, flake	3	NA		

See footnotes at end of table.

Table 4.—Norway: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc —Continued				
Metal including alloys —Continued				
Unwrought	884	1,051	--	United Kingdom 504; Poland 490.
Semimanufactures	781	651	NA	France 279; Netherlands 108; West Germany 103.
Other:				
Ores and concentrates	530	652	--	Australia 416; Netherlands 225.
Ash and residue containing nonferrous metals	21,226	24,098	--	Sweden 22,709; Denmark 1,377.
Oxides, hydroxides, peroxides	517	235	30	United Kingdom 117; China 30.
Metals:				
Metalloids	8	84	--	Sweden 78.
Alkali, alkaline earth, rare-earth metals	267	202	50	West Germany 76; Sweden 26.
Base metals including alloys, all forms	1,466	964	310	Republic of South Africa 440; Sweden 53.
NONMETALS				
Abrasives, n.e.s.:				
Pumice, emery, natural corundum	6,972	20,492	56	Portugal 12,964; United Kingdom 2,524; Netherlands 2,447.
Artificial: Corundum	1,365	1,558	70	West Germany 1,065; Netherlands 240.
Dust and powder of natural or synthetic precious or semiprecious stones except diamond—kilograms	75	[2]		
Grinding and polishing wheels and stones	948	1,060	131	Austria 252; Sweden 194; West Germany 189.
Asbestos, crude	490	103	35	West Germany 68.
Barite and witherite	102,981	111,392	911	Morocco 62,744; Netherlands 26,893.
Boron materials:				
Crude natural borates	7,275	8,392	6,741	Turkey 1,650.
Oxide and acid	380	370	159	France 156.
Cement	8,055	5,639	1	United Kingdom 1,693; Denmark 1,529; Finland 1,343.
Chalk	9,121	9,067	22	Denmark 4,572; Sweden 3,503.
Clays and clay products:				
Crude:				
Fuller's earth, Dinas, chamotte	112	NA		
Kaolin	83,765	NA		
Other	1,127	[3]154,558	3,525	United Kingdom 87,922; Greece 21,385.
Products:				
Nonrefractory—value, thousands	$12,015	$13,769	--	West Germany $3,629; Netherlands $3,049; Sweden $2,129.
Refractory	19,397	33,733	71	Sweden 9,851; United Kingdom 9,118; West Germany 5,389.
Cryolite and chiolite	5,746	6,240	--	All from Denmark.
Diamond:				
Gem, not set or strung—thousand carats	65	[4]		
Industrial—value	$5,000	$81,000	$1,000	West Germany $40,000; Sweden $33,000.
Diatomite and other infusorial earth	1,968	1,939	631	Iceland 654; Sweden 221.
Feldspar	22	[5]		
Fertilizer materials:				
Crude:				
Nitrogenous	217	221	--	All from West Germany.
Phosphatic	427,397	477,212	108,595	Israel 152,772; U.S.S.R. 73,756; Togo 59,150.
Manufactured:				
Nitrogenous	1,109	1,531	--	East Germany 900; Czechoslovakia 350; Netherlands 111.
Phosphatic	5,772	5,808	--	Sweden 5,166; Netherlands 629.
Potassic	302,590	319,473	2,750	West Germany 83,041; France 74,390; Spain 61,370.
Other including mixed	7,349	6,883	15	Sweden 5,205; Netherlands 1,428.
Ammonia	84,097	94,756	--	U.S.S.R. 66,651; France 20,137.
Fluorspar	46,941	[6]48,843	--	Morocco 14,370; United Kingdom 12,004; East Germany 10,900.
Graphite:				
Natural	784	757	NA	United Kingdom 380; Sweden 341.
Artificial	2,565	2,525	3	Sweden 1,407; United Kingdom 986.
Gypsum and plasters	177,962	168,465	--	France 91,281; Spain 36,195.
Lime	7,966	12,886	3	Sweden 7,509; Denmark 5,058.
Magnesite	6,030	4,508	--	China 1,833; Austria 1,787; Spain 591.
Mica, all forms	2,160	2,244	40	India 2,020.
Pigment, mineral: Iron oxides, processed	2,861	2,540	--	West Germany 2,520.

See footnotes at end of table.

Table 4.—Norway: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Precious and semiprecious stones, except diamond, including synthetic stones kilograms	14,170	(7)		
Salt and brine	455,230	453,609	4	Netherlands 298,907; Spain 59,223; West Germany 24,852.
Sodium and potassium compounds, n.e.s.:				
Caustic potash, sodic and potassic peroxides	1,710	1,450	NA	Sweden 1,222.
Caustic soda	6,064	9,645	NA	Netherlands 2,939; Sweden 2,704; Belgium-Luxembourg 2,267.
Soda ash	46,505	56,693	--	Netherlands 29,066; West Germany 7,036; France 6,486.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Calcareous	812	--		
Slate	2,574	3,182	--	Sweden 2,757; Italy 316.
Other	12,155	4,760	--	West Germany 1,616; Sweden 1,318; Finland 704.
Worked, all types	3,665	5,978	9	Portugal 3,179; Sweden 1,108; Poland 1,004.
Dolomite, chiefly refractory-grade	5,082	8,313	8	United Kingdom 7,389.
Gravel and crushed rock	r75,593	79,722	2	Sweden 77,629.
Limestone other than dimension	202,649	198,067	--	United Kingdom 187,411.
Quartz and quartzite	399,052	402,658	NA	Spain 291,363; Sweden 97,963.
Sand excluding metal-bearing	208,684	212,341	264	Belgium-Luxembourg 136,723; Sweden 62,937.
Sulfur:				
Elemental, all forms	2,607	2,870	--	Sweden 2,516.
Sulfuric acid	1,604	155	NA	Denmark 107; Netherlands 22.
Talc, steatite, soapstone, pyrophyllite	6,654	6,878	--	Finland 3,140; India 2,492.
Other:				
Crude	100,503	81,998	243	West Germany 79,121; Sweden 2,125.
Slag, dross, similar waste, not metal-bearing	58,709	61,492	--	Sweden 24,815; Netherlands 14,901; West Germany 10,462.
Oxides and hydroxides of magnesium, strontium, barium	316	166	1	France 70; West Germany 58.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	5,113	3,803	21	Denmark 1,256; Sweden 1,151; West Germany 378.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	110	51	49	Sweden 2.
Carbon black	4,590	5,121	110	Sweden 3,050; West Germany 1,564.
Coal, all grades, including briquets	672,375	740,349	345,452	Poland 235,615; United Kingdom 60,524; France 41,430.
Coke and semicoke	629,782	531,005	--	United Kingdom 311,807; France 97,240; West Germany 69,450.
Peat, including briquets and litter	12,469	12,098	--	Sweden 10,860.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	55,699	46,797	--	United Kingdom 26,179; Saudi Arabia 8,441; Oman 4,816.
Refinery products:				
Gasoline, including natural do.	5,072	5,098	53	Sweden 1,283; Belgium-Luxembourg 1,136; West Germany 891.
Kerosine and jet fuel do.	3,232	2,262	(1)	Belgium-Luxembourg 607; Netherlands 581; United Kingdom 569.
Distillate fuel oil do.	8,043	9,560	--	Belgium-Luxembourg 2,284; Sweden 2,027; Venezuela 1,244.
Residual fuel oil do.	3,196	5,291	143	West Germany 1,315; United Kingdom 792; Sweden 615.
Lubricants do.	517	673	26	Sweden 207; United Kingdom 204; Denmark 101.
Other:				
Liquefied petroleum gas do.	8,306	9,397	NA	NA.
Mineral jelly and wax do.	120	98	(1)	West Germany 66; United Kingdom 17; Hungary 4.

See footnotes at end of table.

Table 4.—Norway: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products —Continued				
Refinery products —Continued				
Other —Continued				
Bitumen and other residues thousand 42-gallon barrels	98	868	(1)	Netherlands 425; Belgium-Luxembourg 186; Sweden 99.
Bituminous mixtures ---do---	886	27	1	Belgium-Luxembourg 8; Sweden 7; United Kingdom 4.
Petroleum coke ---do---	15	1,647	1,592	United Kingdom 54.
Nonlubricating oil, n.e.s. do---	576	NA		
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r132,766	130,618	--	United Kingdom 59,350; West Germany 47,221.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]Unreported quantity valued at $11,000.
[3]Includes all types crude clays.
[4]Unreported quantity valued at $5,453,000.
[5]Included with fluorspar.
[6]May include some feldspar.
[7]Unreported quantity valued at $417,000.

COMMODITY REVIEW

METALS

Aluminum.—A November storm cut the power supply at Norsk Hydro's Karmöy smelter near Haugesund for 5 days causing the aluminum to freeze in the pots. This event and a very weak market caused a loss of about $10 million to the company.

Long-range plans for Norway's aluminum industry would have increased aluminum production from 700,000 to 1 million tons per year. A merger was under discussion between Aardal og Sunndal Verk AS (ASV), with its 320,000-ton-per-year plant, and DNN Aluminium AS (DNN), bringing the total capacity of the two near 500,000 tons per year.

By April 1982, a new $116 million, 80-furnace potline of 47,000 tons per year came online at ASV's aluminum smelter located on the Sogne Fjord at Höyanger. ASV's other plant at Höyanger was also producing metal from an older 20,000-ton-per-year potline, which was to be closed down for conversion to Sumimoto technology after the new potline was operating satisfactorily.

The severe slump in the primary aluminum market prompted ASV to halt preparation for a $120 million hydroelectric development on its property at Aardal. The project was to have supplied 400 million kilowatt-hours by the mid-1980's for the Aardal smelter and was to replace expensive power now bought from the Government. The company cited failure to secure adequate financing and a forecast of a mere 1% growth in the Federal Republic of Germany, ASV's most important market.

The Norwegian Government stopped preparations for modernization of the State-owned DNN aluminum plant on the Sörfjord at Odda as a result of low demand for primary aluminum. In May 1981, $10 million had been appropriated to begin a $300 million modernization of the plant. Originally planned at 90,000 tons per year, the plant's planned capacity was reduced to 60,000 tons per year owing to a lack of electric power that itself was caused by successful environmental opposition to hydroelectric development over the last 10 years. The Government wanted to gain time to reconsider the primary aluminum expansion. Meanwhile, a contractor already had started dismantling the old works, leaving only 8,000 tons per year capacity.

ASV and Elkem Spigerverket have delayed participation in the $650 million expansion of the Aluminum Company of America's Jamaican bauxite refinery. Norsk Hydro was still interested in the deal with the Jamaican Government and Alcoa.

According to original plans, Jamaica's bauxite capacity of 550,000 tons per year would have been doubled. ASV was in the meantime ready to participate in the Hunters Valley smelter project in Australia.

In 1981, Norway's aluminum industry of five companies operating eight plants had a total capacity of about 712,000 tons. The largest producer was Aardal og Sunndal Verk with plants at Aardal, Sunndalsöra, and Höyanger and a total annual capacity of 329,000 tons. Second was Mösal Aluminium AS, a subsidiary of Elkem, with plants at Mosjöen, Lista, and Farsund and a total annual capacity of 177,000 tons. Norsk Hydro's Karmöy plant with 110,000 tons per year was third, followed by Sör-Norge Aluminium AS at Husnes with 72,000 tons per year, and Det Norske Nitrid AS at Tyssedal with 24,000 tons per year.

Copper, Lead, and Zinc.—In 1981, Norway operated nine complex sulfide ore mines; among them were four copper-zinc mines: Skorovas Gruber, Skorovatn; Grong Gruber, Limingen; AS Killingdal Grubeselskap, Trondheim; and Orkla Industrier AS, Lökken Verk. There were also three copper-lead-pyrite mines: Fosdalens Bergverks AS, Malm; AS Sulitjelma Gruber, Sulitjelma; and Folldal Verk AS, Tverfjellet, Hjerkinn. There were, furthermore, two lead-copper-zinc mines: Bergverkselskapet Nord-Norge AS, Mo; and Bleikvassli Gruber, Bleikvasslia. There was also a small copper smelter at AS Sulitjelma Gruber's Sulitjelma plant.

Folldal Verk AS, a subsidiary of Borregard AS, agreed with the Amoco Minerals Co. to conduct a joint $9 million exploration program for 6 years to investigate deposits in the area of Folldal's copper-zinc mines. Tungsten and molybdenum deposits were also to be investigated.

Iron, Steel, and Ferroalloys.—The Norwegian Government established a steel commission to study the competitiveness of the country's steel industry. Based on the committee's report, merger talks continued between the country's two major steelmakers, private sector Elkem and state-owned AS Norsk Jernverk. Elkem, said to be profitable, was making rebars from local scrap near its market. Norsk Jernwerk was comparable to the best steelworks of Europe but had a cost disadvantage owing mainly to its small size of 900,000 tons per year raw steel and its ironmaking process, which consisted of electric pig iron furnaces. The company's Mo i Rana plant was in the middle of an improvement and modernization program.

The Norwegian Government agreed to rescue the state-owned mining concern Sydvaranger from the threat of bankruptcy. The company was to be released from payment of interest and amortization to the Government for 1982 and 1983. The Government was to take over credit guarantees of about $20 million and advance another $20 million to the company for modernization purposes.

Sydvaranger's Kirkenes concentrator completed major modifications to increase its capacity and to enable it to produce concentrates suitable for delivery to the direct reduction plant in Emden, Federal Republic of Germany, in which the company had a 74.9% interest. The new equipment installed at the concentrator in 1981 included a 6.5-meter-diameter ball mill and a flotation plant for upgrading magnetite concentrates.

Norway's largest iron ore mines remained as follows: Government-owned Sydvaranger's Sör Varanger Mine near Kirkenes (2.3 million tons of concentrate per year), Norsk Jernnerk's Rana Mine near Mo (1.2 million tons), and Fosdalens Bergverks AS's Verran Mine in Nord-Tröndelag (510,000 tons). Smaller mines included the privately owned AS Rödsand Mine near the west coast (150,000 tons), Elkem's Nesset Mine also on the west coast, both producing iron ore as a byproduct of vanadium, and Titania AS's Sokndal Mine in South Norway, also a byproduct iron ore producer besides ilmenite.

Union Carbide Co.'s ferromanganese plant at Sauda was acquired at midyear by Elkem, raising the latter's share in the smelter to 91%.

Associated Metals and Minerals Corp. has agreed to invest $39 million in Orkla's ferrosilicon operation at Thamshavn, which has a capacity of 60,000 tons per year of 75% ferrosilicon, although its furnaces are working, at present, below that figure.

Tinfos, a ferroalloy manufacturer, decided to leave the Fesil Group by July 1, 1982, to market independently its ferrosilicon product, together with its manganese alloys. Tinfos had a capacity of 70,000 tons per year of 75% ferrosilicon, leaving Fesil with a 200,000-ton-per-year capacity. This made Elkem Norway's largest producer with a ferrosilicon capacity of 230,000 to 245,000 tons per year. Elkem had left Fesil in 1980, in order to better control its overseas sales, after having increased its foreign

holdings. The Fesil Group was to comprise, after July 1, 1982, the Björlvefossen, Hafslund, and Ila og Lilleby companies with plants at Aalvik near Hardangerfjord, Sarpsborg near Ostfold, Trondheim and Holla on the west coast, and Finnsness near Tromsö. Tinfos meanwhile was to market its own ferrosilicon, up to 100,000 tons per year of silicomanganese, and up to 80,000 tons per year of high-carbon ferromanganese.

Magnesium.—In 1981, Norsk Hydro operated the country's only magnesium smelter at Porksgrunn, south of Oslo. Although in 1979 and 1980, production problems at the plant had led to a reduction of output below target levels, the problems were solved in 1981, resulting in about a 7% increase in output. The company reported a considerable buildup of inventories because of the generally poor economic climate.

A major modernization of the smelter, planned for 1982, was expected to result in a substantial improvement in productivity. Small old electrolytic cells were to be replaced by new larger cells, based on modern company technology, resulting in considerable energy savings.

The company's Federal Republic of Germany subsidiary, Norsk Hydro Magnesiumgesellschaft GmbH was a maker of magnesium anodes for corrosion protection. Some of the caustic magnesia produced at Porksgrunn for conversion into magnesium was sold in the free market for the processing of paper and as a cattle feed additive.

Nickel, Cobalt, Platinum-Group Metals.—In 1981, the Kristiansand, south coast, refinery of Falconbridge Nikkelverk AS, a subsidiary of Falconbridge Nickel Mines Ltd. of Canada, continued to process imported Canadian nickel matte containing cobalt and platinum.

Titania AS's Sokndal Mine on the south coast produced a nickel concentrate byproduct with 3.9% nickel, which was shipped for processing at Outokumpu Oy's Harjavalta works on the west coast of Finland.

Rare-Earth Metals.—Further investigations of the recently discovered rare-earth metals deposit at Ulefos in Telemark County were undertaken. Most of the deposits are located on land owned by the S.D. Cappelen Co., over an area of 450 acres.

Vanadium.—In 1981, the Rödsand Mine, a subsidiary of Elkem, located at Rausand, west of Molde on the Sunndalsfjord, continued to mine a titanium-magnetite deposit with a vanadium content of about 1%. The magnetite concentrate was processed at Elkem's Bremanger smelter near Svelgen into 45% to 50% ferrovanadium; capacity of the operation was about 800 tons per year of ferrovanadium. Vantite, a vanadium-titanium pig iron, was also produced.

The Rödsand iron mine had not been profitable for some years, and it was decided to remedy this by building a plant for recovering vanadium pentoxide from the ore according to the Otanmäki process, at a cost of $600,000. The magnetite concentrate produced would be sold separately.

NONMETALS

Ammonia.—In 1981, Norsk Hydro's ammonia capacity was 2.145 million tons, including capacity in the Netherlands and Qatar, to be expanded by 500,000 tons in the Netherlands in 1984. The company was also planning to build for the late 1980's another ammonia plant either in Norway, the Netherlands, or the United Kingdom.

Apatite.—Norsk Hydro acquired mining rights to the apatite deposits west of Oslofjord at Kodal, estimated to contain 70 million tons of ore graded at 17% P_2O_5 and 40% Fe_2O_3. Feasibility studies were being prepared for the deposit, said to be able to support production of 300,000 tons of concentrate per year, sufficient to cover 70% to 80% of Norsk Hydro's Norwegian fertilizer production for up to 50 years.

Cement.—Norcem, Norway's only cement manufacturer, with three cement plants and a total capacity of 3.2 million tons of cement per year, signed, through intermediaries, a contract with Ashland Coal International Ltd. of the United States for the delivery of 350,000 tons of West Virginia steam coal.

Industrial Minerals.—In 1981, Norway continued to produce significant quantities of various industrial minerals, the most important ones being limestone, olivine, ilmenite, quartz, dolomite, nepheline syenite, and feldspar. A detailed description of industrial minerals of Norway in 1981 appeared in the technical literature.[3]

Nitrogen.—Norsk Hydro has decided to invest $22 million in replacing a 40-year-old 140,000-ton-per-year nitric acid plant at Rjukan, Hordaland, which was part of an ammonia and ammonium nitrate complex. Davy McKee Co. Ltd. has been awarded a turnkey contract for their own process.

Sulfur.—Borregard AS of Sarpsborg, south of Oslo, decided to build a pyrite-

based 180,000-ton-per-year sulfuric acid plant (monohydrate) at its Sharpsborg site, where at present the company had a Dorr Oliver Inc. type 300,000-ton-per-year plant.

MINERAL FUELS

In 1981, Norway remained a net exporter of oil and gas, producing about one-quarter of Western Europe's oil output.

Electric power allocations were announced by the Government amounting to 1.4 billion kilowatt-hours until 1985, another 2 billion kilowatt-hours by 1990, but allocation of a further 4.2 million kilowatt-hours was postponed. Of a total of 3.4 billion kilowatt-hours allocated at present, 2 billion went to the aluminum industry, and 600 million kilowatt-hours, to the ferroalloy industry. Norsk Hydro's magnesium production was allotted 350 million kilowatt-hours. Total industrial energy consumption was about 30 billion kilowatt-hours per year. Industry was requesting a 75% increase of electric power allotments. Tax on electric power was increased again to a total of $120 million, which was about one-third of the total cost of power paid by industry.

Coal.—Coal production on Svalbard Island by the Government-owned Store Norske Spitsbergen Kullkompani increased slightly from the three operating mines. Two of the mines, called No. 3 and No. 7, were located at Longyearbyen. Although the coal was less than 1 meter thick in the No. 3 mine and little mechanization was possible, in the latter it was about 1.4 meters thick, allowing for some mechanization. The third mine was located at Svea where only test mining took place. Full mining was to begin in 5 to 6 years at this location, at which time Svalbard output would double to over 70,000 tons per year from reserves of about 15 million tons. In the meantime, Norcem, Norway's cement operator, planned to convert to coal and use 400,000 tons of Svalbard coal per year.

Petroleum and Natural Gas.—In 1981, oil and gas production in the Norwegian sector of the North Sea decreased temporarily by 1.4% to an oil equivalent of 48.8 million tons. This was caused by an unexpected drop in the production of the Ekofisk Field and by strikes in the industry. According to existing programs, production by 1986 is to be about 60 million tons of oil equivalent per year, but decisions to develop fields in block 30/6 and some other smaller fields could raise production to 80 million or even 90 million tons of oil equivalent per year. These development decisions would stimulate offshore capital expenditures in the range of $2 billion to $3 billion throughout the 1980's.

In 1981, the Norwegian parliament gave its backing to the construction of an 843-kilometer gas gathering pipeline that was to land Norwegian-Sector natural gas at Emden, in the Federal Republic of Germany. In a first step, the gas from the new Statvik Field in block 34/10 was to be landed in Norway at Kaarstö through a 285-kilometer 30-inch pipeline. After separation of the natural gas liquids, the dry gas was to flow from Kaarstö through a 196-kilometer 26-inch pipeline to a riser platform, to which the Heimdal Field was to be connected via a 150-kilometer 36-inch pipeline. From there the gas was to flow via a 203-kilometer 36-inch line to the Ekofisk area, from whence the gas was to flow via the existing Norpipe pipeline to Emden.

Capacity of this link to Ekofisk was to be 600 billion cubic feet per year. Cost of the project was estimated at $2.2 billion, which made it look economical in view of an annual throughput worth $1.5 billion. Snamprogetti was to be responsible for the planning, while M. W. Kellogg would handle the Kaarstö facilities. The state was to take a 60% share in the Statpipe Co. being built, Elf took 10%, Norsk Hydro 8%, Mobile 7%, Esso 5%, Shell 5%, Total 3%, and Saga 2%. Development cost of the reserves of the Statvik Field was put at $3.1 billion.

In 1981, there were seven oilfields in production on the Norwegian Continental Shelf (Ekofisk, West Ekofisk, Edda, Cod, Tor, Albuskjell, and Statfjord). The Ekofisk complex included 17 steel platforms and a concrete pumping and processing center and produced about 385,000 barrels per day, although the peak was 618,000 barrels per day. The Statfjord Field comprised two concrete platforms but a third may be added at a later date. The Statfjord Field produced 75,000 barrels per day.

There were also two oilfields under development, Valhall and Ula. The first stage of Valhall involved three steel platforms linked to the Ekofisk center and having a capacity of 95,000 barrels per day. Ula had a planned capacity of 60,000 barrels per day.

North of the 62° parallel two areas were under exploration, one west of Trondheim, Central Norway, called the Haltenbanken area, the other facing northern Norway, called the Tromsö Field. Oil and gas explo-

ration in these areas was very successful; four of the five wells drilled in the area struck oil or gas. The oil companies were pressing for extending the drilling season from the present 5 months per year to a year-round season, making more efficient operation possible. Statoil, the Norwegian state oil company, found gas in one field in the Tromsö area estimated to contain 100 billion to 200 billion cubic meters. Norsk Hydro also found gas in the same area but had not proved it to be commercial. Seismic surveys showed also similar structures in the Barents Sea, but an unresolved ownership dispute with the Soviet Union has held Norway back from exploiting it.

The Norwegian companies were considering alternate plans for the gas in the north of the country. It may be liquefied and shipped in special tankers, or be sent by pipeline through Sweden to supply the continental markets of Europe.

In 1981, two companies, AS Norske Esso and AS Norske Shell, operated four petroleum refineries, the first company at Slagen and Valloy in the Oslo Fjord with 110,000 and 4,000 barrels per day capacity, respectively, and the second at Sola and Mongstad (Stavanger and Bergen areas) having 60,000 and 90,000 barrels per day capacity, respectively.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values in Norwegian kroner (NKr) have been converted to U.S. dollars at the average rate of NKr5.50=US$1.00 for 1981.

[3]Industrial Minerals (London). December 1981, p. 34.

The Mineral Industry of Pakistan

By Suzann C. Ambrosio[1]

Pakistan's economy, particularly the mineral and industrial sectors, exhibited positive growth signs during 1980-81.[2] Real gross domestic product (GDP in constant 1960 prices) increased nearly 6% for the fourth consecutive year, and nominal gross national product (GNP) increased 20% to $28 billion during the year.[3] Despite significant gains in the production of fertilizers, cement, and other nonmetallic materials, the mineral industry continued to comprise less than 1% of the GNP. Pakistani mineral products having the highest unit value during 1981 included hydrocarbons and gem stones. The reported market value of these commodities was approximately $300 million.

The $5.8 billion Government budget was expected to increase 14% to $6.7 billion in 1981-82. Over one-half of the current expenditures were allocated to defense and debt servicing. The debt-service ratio decreased for the third consecutive year in 1981. Budget financing was expected to be divided between internal sources (65%) and external assistance (35%).

The balance of payments (BOP) improved during 1981. Exports increased in value by 26% to $2.9 billion, and imports grew 13% to $5.5 billion. The U.S. share in Pakistani trade was only 5% of exports and 11% of imports. Major Pakistani import categories continued to be petroleum, capital goods, and fertilizers.

The Arab nations continued to provide BOP support through the OPEC fund and other bilateral arrangements. Saudi Arabia was the largest contributor in 1981, followed by Japan and the Federal Republic of Germany. The multilateral aid organizations targeted aid programs toward more specific areas: The International Bank for Reconstruction and Development (World Bank)—$120 million for the development of Pakistani energy resources; United Nations—a $50 million grant to construct and equip a national training development institute in Islamabad; and the International Development Association (IDA) of the World Bank—a $25 million loan to train skilled workers. The Western industrialized countries were expected to grant a total of $1.2 billion in Afghan refugee assistance. The United States proposed a $3 billion aid package for combined military and economic assistance during 1982.

Pakistan's economic policy objectives, to promote the development of import-substitution industries and to increase exports, were complemented by demand management programs of restrained monetary supply growth and tightened credit. Inflation continued to rise, however, to approximately 11%, owing primarily to higher import prices and increased levels of worker remittances. The 1981 current account deficit of approximately $1 billion improved because of the 22% increase in worker remittances to nearly $2.2 billion. The shortfall was financed primarily through foreign capital inflows and drawdowns on the International Monetary Fund (IMF). The IMF Extended Fund Facility was to provide $1.7 billion over a period of 3 years from 1980-83. Despite general improvement trends, Pakistan's economy continued to be plagued by an investment-savings gap and growing dependence on worker remittances and foreign energy supplies.

Policies were implemented to encourage private investment and boost domestic industries. In addition to streamlining and

accelerating the investment process, the Government reduced the maximum corporate income tax rate by 5% to approximately 61% of profits. The rate of initial depreciation on plant equipment and machinery was raised from 25% to 40%.

The total gross fixed capital investment increased 12% during 1981. Public sector investment increased 11% overall, and private sector investment increased 14%, driven by a 27% increase in industrial investment. The Government continued to dominate the mineral sector, although Government investments in minerals declined 7% to $9.6 million in 1981. Conversely, private sector investment in the mineral industry increased 20% over this same period, primarily for coal and marble. Despite the fact that 85% of the coal mining properties were leased to the private sector, the public sector accounted for approximately 17% of total production during 1981.

Private industrial development was expected to be assisted by a $30 million credit approved by the IDA to finance 80 industrial projects. Although joint ventures between the Government and private companies have increased in the fertilizer and cement industries, more recently, private sector involvement has been encouraged in the hydrocarbon and gem stone sectors. In December 1981, Pakistan held an international exhibition and gem stone auction. The Gemstone Corp. of Pakistan was allowed to make direct sales to Indian gem merchants and started opening the market to other foreign and domestic private sector gem merchants.

According to the Government, major constraints in developing indigenous mineral resources were lack of exploratory equipment, insufficient geologic mapping at appropriate scale, shortage of trained and experienced personnel, and inadequate financial resources, particularly the lack of available risk capital. The United Nations Technical Cooperation Div. approved a program to strengthen the technical resources needed to explore and evaluate Pakistani mineral deposits. The $672,000 program was expected to be completed in 1983 and concentrate on copper-molybdenum deposits in Chagai and lead-zinc-barite resources in Lasbela-Khuzdar, both within the Baluchistan region. Other exploration efforts were expected to focus on hydrocarbons, chromite, iron ore, gem stones, phosphate, granite, and marble.

PRODUCTION AND TRADE

Mineral production continued to be geared toward import substitution and supplying raw materials for existing and proposed development projects. Increased output was reported for iron ore, antimony, bauxite, fertilizers, cement, barite, dolomite, limestone, fire clay, kaolin, natural gas, and refinery products. There was a decline in output of crude oil, coal, chromite, manganese, and sulfur.

Owing to the increased production efficiencies of various Government-owned plants, fertilizer production increased by 36% to approximately 600,000 nutrient tons. The Mirpur Mathelo plant, commissioned during 1980, increased urea and ammonia unit output. The Exxon Chemicals (Pakistan) Ltd. facility achieved 130% of its designed capacity. The Hazara and Fauji fertilizer plants were expected to come onstream in the near future. When completed, approximately 200,000 nutrient tons of capacity, or the equivalent of two-thirds of domestic demand, was expected to be added. Pakistan continued to import to satisfy its fertilizer deficiencies, especially urea, phosphate, and potash, from Arab countries in the Middle East.

Large increases in output were expected in the cement and iron and steel industries. Thirteen new cement plants were sanctioned by the Government. Production of iron and steel was expected to increase over the next 2 years through the commissioning of the new Pipri integrated steelworks blast furnaces Nos. 2 and 3 and billet mills. Initial output of blast furnace No. 1 in 1981 resulted in 21,000 tons of pig iron exports. All of the pig iron went to India, and negotiations were underway to sell India 50,000 tons in 1982. When the two coke oven batteries come online, approximately 215,000 tons of surplus coking coal will be available for export. Discussions about potential coke exports were being held with India, Bangladesh, Romania, and Iran.

Natural gas and other petroleum product output increased during the year. Crude oil output declined slightly, owing to declining production of the Khaur, Dhullian, Meyal, and Balkassar Oilfields. This was compensated in part by increased output of the Joya Mair, Toot, and Adhi Oilfields. There was a slight decline in total refinery product exports, mostly naphtha and furnace oil, which were sent primarily to India and

Turkey.

Despite a 13% decrease in the volume of oil imports between 1980-81, prices increased 42%, and the total oil import bill reached approximately $1.5 billion. High-quality coal imports increased 60% over that of the previous year because of expanded use for thermal power generation.

Declining production was reported for chromite and sulfur, the latter attendant with decreased oil production. Information was scarce as to why the Muslim Bagh chromite mines were not fully operable during the year. High transport costs from the mountainous area near the Afghan border to the Port of Karachi were likely a factor. Approximately 7,500 tons of chromite was exported, and 2,000 tons was sold in the local market during 1980. Development of the other known chromite deposits continued to be hampered by the economics involved in processing the relatively low-grade ores having a high alumina content.

Pakistan's mineral trade deficit was largely due to iron ore, manganese, coking coal, and crude oil imports. Until the domestic iron resources are fully developed, imports will continue to be shipped from Australia, Brazil, Canada, India, and Liberia. Mount Newman (Australia) signed a 5-year contract to supply approximately 20% of Pakistan's current iron ore needs and 40% of the lump ore requirements. The suppliers of manganese and coke imports were unknown in 1981, although most of the 1979-80 coke was imported from European countries. Kuwait and other Arab countries supplied Pakistan's crude oil requirements, plus refinery products, especially middle distillates.

The volume of mineral and mineral-related trade between Pakistan and the Middle East and the United States was expected to continue increasing. A Pakistani delegation visited various Arab countries during 1981 and was expected to develop market analyses primarily for nonmetal and construction materials exports. The United States-Pakistan Economic Council was created to promote trade between the two countries. Pakistan's trade deficit with the United States stood at $412 million in July 1981. Trade consisted primarily of manufactured products and machinery, although the potential existed to develop increased mineral trade in fertilizers, chemicals, and refined petroleum products.

Table 1.—Pakistan: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum: Bauxite, gross weight	151	1,621	1,640	1,618	[2]2,087
Antimony ore:					
Gross weight	94	104	31	40	[2]40
Metal content[e]	19	21	6	10	[2]20
Chromium: Chromite, gross weight	8,400	11,000	2,638	3,115	[2]1,427
Iron and steel: Mild steel products thousand tons	277	349	365	400	500
Manganese ore, gross weight	53	288	110	186	[2]96
NONMETALS					
Abrasives, natural: Emery	657	887	1,133	1,395	550
Barite	17,718	19,194	34,200	14,054	[2]23,929
Cement, hydraulic thousand tons	3,165	3,103	3,418	3,336	3,500
Chalk	1,105	1,091	1,595	3,426	[2]1,311
Clays:					
Bentonite	1,089	906	1,441	1,500	[2]1,130
Fire clay	53,100	50,000	56,168	55,139	[2]59,633
Fuller's earth	18,000	18,000	40,331	24,463	[2]20,558
Kaolin (china clay)	566	13,758	15,114	27,162	[2]38,527
Other	65,000	76,000	[e]70,000	66,000	[2]86,000
Feldspar	3,699	14,305	14,851	10,898	[2]10,494
Fluorspar	--	[r]450	791	592	5
Gypsum, crude	283,000	253,000	343,000	568,000	[2]393,000
Magnesite, crude	1,567	2,672	2,748	1,525	[2]1,551
Nitrogen: N content of ammonia	315,300	309,200	385,600	350,000	636,000
Pigments, mineral, natural: Ocher	14,310	4,672	1,028	326	[2]438
Salt:					
Rock thousand tons	385	413	512	506	[2]562
Marine do	114	227	348	369	[2]495
Total do	499	640	860	875	1,057

See footnotes at end of table.

Table 1.—Pakistan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Sand and gravel:					
Gravel	40,000	96,000	83,000	125,000	130,000
Sand:					
Bajri and common	14,131	20,836	18,086	46,908	[2]60,494
Glass	66,088	69,656	91,000	94,000	[2]82,000
Sodium compounds, n.e.s.:					
Caustic soda	25,914	34,605	37,831	39,181	[2]38,963
Soda ash, manufactured	60,579	74,019	75,258	87,911	[2]101,158
Stone:					
Aragonite and marble	34,000	39,000	102,000	114,000	[2]100,000
Dolomite	2,723	11,426	13,904	21,062	[2]32,284
Limestone thousand tons	3,895	2,887	3,297	2,984	[2]3,192
Crushed do.	693	172	1,445	1,500	[2]799
Strontium minerals: Celestite	365	217	620	500	[2]288
Sulfur:					
Native	1,160	1,083	729	800	[2]480
Byproduct, all sources[e]	12,000	14,000	14,000	14,000	14,500
Total	13,160	15,083	14,729	14,800	14,980
Talc and related materials: Soapstone	9,179	25,290	27,200	30,000	[2]24,997
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades thousand tons	1,154	1,036	1,329	1,695	[2]1,524
Gas, natural (sales) million cubic feet	180,324	195,784	240,033	287,213	[2]316,360
Natural gas liquids[e] thousand 42-gallon barrels	32	36	38	40	40
Petroleum:					
Crude do.	3,720	3,491	3,823	3,629	[2]3,474
Refinery products:					
Gasoline do.	4,015	3,735	4,015	4,000	4,000
Jet fuel do.	3,221	3,893	4,015	4,000	4,500
Kerosine do.	1,840	1,749	1,460	1,500	1,700
Distillate fuel oil do.	5,120	7,619	8,030	8,000	9,000
Residual fuel oil do.	6,057	7,734	8,030	7,000	8,000
Lubricants do.	609	616	365	500	600
Other do.	926	9,392	2,190	5,500	6,200
Refinery fuel and losses do.	2,057	2,000	2,190	2,500	3,000
Total do.	23,845	36,738	30,295	33,000	37,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 12, 1982.
[2]Reported figure.

Table 2.—Pakistan: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Iron and steel:				
Ore and concentrate	31	--		
Metal:				
Scrap	201	72	--	All to Japan.
Semimanufactures: Bars, rods, angles, shapes, sections	715	1,042	--	India 600; Afghanistan 408; Saudi Arabia 34.
Lead: Ore and concentrate	--	100	--	All to Japan.
Manganese: Ore and concentrate	--	1,000	--	All to Republic of Korea.
Silver: Ore and concentrate[1]				
value, thousands	$1,243	--		
Tin: Ore and concentrate	--	1	--	All to Afghanistan.
Other:				
Oxides, hydroxides, peroxides	3	--		
Metals including alloys, scrap	29	--		
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	910	46	--	Japan 38; Saudi Arabia 5; Bangladesh 3.
Cement	49	--		
Clays and clay products:				
Crude	199	118	--	Bangladesh 64; Afghanistan 35; United Arab Emirates 14.

See footnotes at end of table.

Table 2.—Pakistan: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products —Continued				
Products:				
Nonrefractory	--	13	--	All to Kuwait.
Refractory including nonclay brick	14	264	--	Saudi Arabia 206; United Arab Emirates 58.
Fertilizer materials:				
Crude:				
Phosphatic	897	110	--	United Kingdom 100; Kuwait 10.
Other including mixed	r39,578	76,929	231	United Arab Emirates 34,431; Qatar 27,000; Japan 6,101.
Manufactured: Phosphatic	--	300	--	All to Austria.
Precious and semiprecious stone except diamond:				
Natural value, thousands	$188	$1,581	$51	Hong Kong $565; France $334; West Germany $290; Switzerland $254.
Synthetic do.	$504	$73	--	France $49; Japan $24.
Salt and brines	11,027	24,851	--	Afghanistan 10,855; India 9,145; Tanzania 2,546.
Sodium and potassium compounds, n.e.s.:				
Soda ash	8	--		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	28,006	11,598	43	Italy 6,961; Singapore 1,073; Japan 1,021.
Worked value, thousands	[2]$949	$3,129	$101	Japan $749; Italy $444; Saudi Arabia $288.
Gravel and crushed rock	1,496	2,831	--	Kuwait 1,434; Singapore 545; Saudi Arabia 361.
Limestone excluding dimension	935	227	--	United Arab Emirates 176; Greece 23; Bangladesh 20.
Sand excluding metal-bearing	460	--		
Other:				
Crude	3,903	4,158	--	Republic of Korea 2,550; West Germany 1,550; Afghanistan 58.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	1,634	--		
MINERAL FUELS AND RELATED MATERIALS				
Coal, all grades, excluding briquets	280	184	--	All to United Arab Emirates.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	2,310	1,316	--	Bermuda 395; People's Democratic Republic of Yemen 395; India 263.
Refinery products:				
Residual fuel oil do.	5,090	5,155	--	India 2,225; United Arab Emirates 1,198; Sri Lanka 566; Turkey 566.
Lubricants 42-gallon barrels	14	--		
Liquefied petroleum gas do.	278	545	--	All to Afghanistan.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	20	--		

rRevised.
[1]May contain ore and concentrate of platinum-group metals.
[2]Quantity reported at 3,596 metric tons.

Table 3.—Pakistan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	1,123	NA		
Metal including alloys:				
Waste and scrap	12,545	NA		
Unwrought	3,800	2,084	697	Bahrain 500; West Germany 500; France 176.
Semimanufactures	4,790	8,788	3,973	Canada 1,246; Bahrain 865; Japan 432.
Arsenic: Oxides and acid	28	NA		
Cobalt: Oxides and hydroxides	8	NA		
Copper:				
Ore and concentrate	39	55	--	China 48; Australia 7.
Oxides and hydroxides	18	NA		

See footnotes at end of table.

Table 3.—Pakistan: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Copper —Continued				
Metal including alloys:				
Waste and scrap	933	NA		
Unwrought	593	384	(1)	Canada 322; Belgium-Luxembourg 59.
Semimanufactures	3,653	5,535	33	Canada 2,175; West Germany 1,328; Poland 719.
Iron and steel:				
Ore and concentrate	120	33,794	--	India 33,541; China 223.
Metal:				
Scrap	139,225	333,841	32,824	United Arab Emirates 75,082; Kuwait 64,488; United Kingdom 43,816.
Pig iron, cast iron, spiegeleisen	53,248	43,404	--	China 17,851; Brazil 12,100; Poland 10,500.
Ferroalloys:				
Ferromanganese	5,247	2,883	--	Japan 1,430; Norway 498; China 315.
Other	3,131	17,438	6	Spain 14,059; Norway 1,654; China 563.
Steel, primary forms	187,003	125,079	22,439	Argentina 59,053; Japan 28,534; Australia 4,232.
Semimanufactures:				
Bars, rods, angles, shapes, sections	43,111	32,282	71	Japan 20,723; Czechoslovakia 4,565; United Kingdom 1,248.
Universals, plates, sheets	396,403	333,032	108,594	Japan 77,628; Australia 30,795; West Germany 28,439.
Hoop and strip	5,380	4,328	14	Japan 2,998; West Germany 917; United Kingdom 214.
Rails and accessories	38,474	9,414	92	United Kingdom 6,474; Japan 2,220; Portugal 224.
Wire	13,654	11,447	185	Japan 3,329; China 2,918; Poland 1,617.
Tubes, pipes, fittings	24,718	37,896	5,711	Japan 17,891; West Germany 6,189; Italy 2,971.
Castings and forgings, rough	1,887	1,116	63	Italy 254; Japan 177; Turkey 148.
Lead:				
Ore and concentrate	115	300	--	Japan 125; Morocco 119; West Germany 26.
Oxides and hydroxides	6	NA		
Metal including alloys:				
Unwrought	1,580	2,175	(1)	Canada 1,658; Tanzania 500.
Semimanufactures	4	5	--	Japan 3; West Germany 2.
Manganese:				
Ore and concentrate	285	150	--	All from China.
Oxides and hydroxides	746	NA		
Mercury 76-pound flasks	773	NA		
Nickel:				
Ore and concentrate	(2)	1,782	--	United Kingdom 1,778; Netherlands 4.
Metal including alloys:				
Waste and scrap	2	NA		
Unwrought	61	52	--	Netherlands 24; United Kingdom 9; Canada 6.
Semimanufactures	224	128	(1)	Canada 43; United Kingdom 38; Netherlands 17.
Silicon, elemental	40	NA		
Silver: Ore and concentrate including those of platinum-group metals value, thousands	$3	--		
Tin metal including alloys:				
Waste and scrap	192	NA		
Unwrought	365	150	--	Malaysia 146; Denmark 4.
Semimanufactures	28	17	--	United Kingdom 9; West Germany 8.
Titanium: Oxides and hydroxides	1,135	NA		
Zinc:				
Ore and concentrate value, thousands	--	$30	--	Hong Kong $15; Australia $10; United Kingdom $4.
Oxides and hydroxides	527	NA		
Metal including alloys:				
Unwrought	5,534	9,749	27	Republic of Korea 2,330; Canada 2,099; Spain 2,000.
Blue powder	109	NA		
Semimanufactures	151	173	3	Belgium-Luxembourg 156; China 6; United Kingdom 4.
Other:				
Ores and concentrates	86	16,097		All from Australia.
Ash and residue containing nonferrous metals	34			
Oxides and hydroxides	5,388	6,213	45	China 3,225; West Germany 975; Australia 395.

See footnotes at end of table.

Table 3.—Pakistan: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Other —Continued				
Metals including alloys:				
Waste and scrap	2,027	58,164	1,669	United Arab Emirates 45,902; Kuwait 3,758; Singapore 1,397.
Unwrought and semimanufactures value, thousands	$356	$255	--	China $79; Netherlands $47; West Germany $38; United Kingdom $37.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc. value, thousands	$373	$351	$86	Netherlands $215; Iran $28; United Kingdom $20.
Grinding and polishing wheels and stones	316	520	1	China 189; West Germany 114; East Germany 65.
Asbestos, crude	14,963	3,564	--	Australia 1,857; Japan 902; Republic of South Africa 805.
Boron materials:				
Acid	79	NA		
Oxide	55	NA		
Cement	685,849	436,292	7	Romania 173,600; Poland 99,999; Republic of Korea 89,479.
Clays and clay products:				
Crude: China clay	5,934	22,613	79	United Kingdom 16,610; China 2,772; Republic of Korea 646.
Products:				
Nonrefractory	1,009	2,056	78	United Kingdom 616; China 600; Italy 214.
Refractory including nonclay brick	7,368	8,227	8	West Germany 2,416; Japan 1,062; Canada 902.
Diamond: Industrial value, thousands	$10	$2	--	All from Switzerland.
Diatomite and other infusorial earth	93	NA		
Fertilizer materials:				
Crude:				
Phosphatic	86,008	135,964	--	Jordan 101,694; Kuwait 12,900; Oman 12,000.
Other including mixed	63	2	1	West Germany 1.
Manufactured:				
Nitrogenous	865,481	945,215	10,160	Iraq 289,638; Netherlands 161,740; France 67,327.
Phosphatic	451,287	506,120	452,404	United Kingdom 24,466; France 10,000; West Germany 10,000.
Potassic	29,088	5,000	--	All from West Germany.
Other including mixed	1,450	252	--	All from Australia.
Ammonia	49	--		
Graphite, natural	612	NA		
Mica: Worked including agglomerated splittings	1	2	(1)	Mainly from Japan.
Pigments, mineral: Iron oxides, processed	19	NA		
Precious and semiprecious stones except diamond:				
Natural value, thousands	$6	--		
Synthetic do.	$31	$9	--	Austria $6; France $3.
Salt and brines do.	--	$2	--	All from United Kingdom.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	72	NA		
Caustic soda	3,727	NA		
Soda ash	1,003	NA		
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	--	17	--	Italy 9; Switzerland 7.
Worked	7,513	71	--	Afghanistan 68; Japan 3.
Sulfur:				
Elemental, other than colloidal	15,504	22,443	--	Kuwait 18,632; Turkey 3,000; Iraq 650.
Dioxide kilograms	354	NA		
Sulfuric acid, oleum	12	--		
Other:				
Crude:				
Quartz, mica, feldspar	26	75	--	China 43; United Kingdom 32.
Unspecified value, thousands	$1,489	$2,085	$54	Belgium-Luxembourg $930; Ireland $331; Thailand $176.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	3,064	3,766	(1)	Japan 3,500; Italy 114; France 51.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	289	165	100	China 48; United Kingdom 17.
Carbon black	2,114	NA		
Coal, all grades, including briquets	317	92,628	23,910	Australia 24,559; Canada 24,408; Poland 18,562.
Coke and semicoke	41,995	249,222	--	Iran 219,200; China 30,022.

See footnotes at end of table.

Table 3.—Pakistan: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	22,114	37,543	--	Saudi Arabia 20,607; United Arab Emirates 13,251; Iraq 3,680.
Refinery products:				
Gasoline do	675	908	--	Bahrain 525; Kuwait 274; Italy 86.
Kerosine and jet fuel do	5,330	3,672	(1)	Kuwait 3,579; Singapore 92.
Distillate fuel oil do	7,192	7,871	--	Kuwait 7,681; Singapore 108.
Residual fuel oil do	127	43	3	Kuwait 27; United Kingdom 2.
Lubricants do	364	256	2	Singapore 183; France 38; West Germany 13.
Mineral jelly and wax do	73	374	(1)	West Germany 162; China 150; Hungary 45.
Unspecified do	3	3	2	United Kingdom 1.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	4,121	429	33	United Kingdom 326; China 58.

NA Not available.
[1]Less than 1/2 unit.
[2]Unreported quantity valued at $182,000.

COMMODITY REVIEW

METALS

Bauxite.—The Geological Survey of Pakistan estimated lateritic bauxite resources in excess of 70 million tons. Pakistan's Export Processing Zones Authority (EPZA), in joint participation with Saudi Arabia, was expected to finance the construction of an aluminum extrusion plant. The plantsite was located in Lhandi, near Karachi, where 200 acres was set aside for an export zone. Details on plant capacity and cost were unavailable, but the aluminum plant was expected to be the largest EPZA project, with approximately 30% of investment and profits nonrepatriable.

Chromite.—Chromite was the only commercial metallic mineral produced and exported in Pakistan during 1981. Resources were estimated at 5 million tons, with the largest known deposits located at Muslim Bagh (Baluchistan), and smaller deposits were found in Malakand, Northwest Frontier Province (NWFP), and Rash Koh, Chagai, and the Lasbela districts of Baluchistan. The Pakistan Mineral Development Corp. explored the Malakand deposits and confirmed 580,000 tons of chromite reserves. Pilot tests carried out by the Pakistan Council of Scientific and Industrial Research (PCSIR) upgraded the Malakand ores to 45% Cr_2O_3. However, tests were not successful in reducing the alumina content to the permissible limit of 10%.

The Muslim Bagh chromite mines in the Khob Valley were not fully commissioned in 1981. Investigations were underway to determine the feasibility of developing the approximately 4-million-ton deposit in conjunction with a 15,000-ton-per-year ferrochrome smelter. The Muslim Bagh ores contain a chromium-iron ratio of 3:1 to 3.6:1. The Baluchistan Development Authority reportedly initiated mining of chromite in the Lasbela area, but no other details were available.

Copper.—The Bankable Document and detailed feasibility studies were completed for the Saindak copper project in May 1980. Mountain States Mineral Enterprises of the United States submitted the final feasibility study after becoming involved in the project as consultant to Seltrust Engineering Ltd. (United Kingdom) during the preinvestment study phase. Recommendations were made to develop the south ore body at a mining rate of 12,000 tons per day. Reserves of the three adjoining Saindak copper ore bodies were estimated at 412 million tons with an average grade of 0.37%. The south ore body comprised approximately 17% of total reserves. Annual production projections were revised to 17,857 tons of blister copper, 338 tons of molybdenum concentrate, 225,220 tons of sulfuric acid, 52,337

troy ounces of gold, and 79,935 troy ounces of silver.[4]

The total cost of the project was estimated at $400 million, including a foreign exchange component of 60%. The Baluchistan Mineral Resources Development Corp. was asked by the Pakistani Ministry of Finance to prepare terms and conditions for joint venture schemes. Several international companies expressed interest, including a Canadian-French-Yugoslavian consortium and United States, British, Swedish, and Romanian firms, but no information was available on contracts and construction schedules. Tenders were offered to construct an open pit mine at the south ore body, estimated to cost $200 million. Joint venture proposals were under consideration with a projected startup in 1984-85.

The exact location of the proposed mine, mill, smelter, and steel mill was undecided by yearend 1981. A total of approximately 3,000 people were expected to be employed, and various infrastructure requirements were expected to be addressed. Investigations determined that adequate water resources were available and a 35-megawatt power station would initially facilitate the integrated mining project. A main railway line passes 20 kilometers south of Saindak, with the nearest railway station located at Koh-e-Toftan, 35 kilometers from the deposit site. In addition, a major highway parallels the main Quetta-Zahidan railroad line.

The Geological Survey of Pakistan located additional copper deposits at Dasht-i-Kain within the Chagai district and at Ann-Dhoro and Soap-Dhoro in the Lasbela district of Baluchistan. Evaluation of these new deposits were expected to occur over the next few years, with an emphasis on deposits in the Chagai district.

Iron Ore.—Pakistani iron ore reserves were estimated to exceed 400 million tons, with main deposits located in Kalabagh-Makerwal, Punjab; Langrial, Hazara district, and Chitral of NWFP; and Khuzdar, Ziarat, Chilgazi, and Nou Kundi of Baluchistan.

The Pakistan Industrial Development Corp. (PIDC) continued to explore for iron ore in the Baluchistan region in order to meet domestic steel production requirements. Approximately 18 million tons of good-quality iron ore was proved in Naukundi and Pachinkoh. The PCSIR successfully produced iron ore concentrate from indigenous resources in Pachinkoh and Chigendik. PIDC and U.S. consultants were involved in evaluating the suitability of the Naukundi iron ore for the Pakistan Steel Mills Corp. (PASMIC).

Beneficiation studies of the Chichali iron deposits in Kalabagh, Punjab region, revealed that the ore could be upgraded from 32.5% to 58% iron. The feasibility limit for commercialization and use in steel production was determined to be 62% iron metal content.

Iron and Steel.—PASMIC recently initiated the first stage of the Pipri steelworks, which are also known as the Karachi steelworks, located 40 kilometers east of Karachi at Bin Qasim. Commissioning of the two blast furnaces and billet mills was running 2 years behind schedule and exhausted the original $1.3 billion budget allocation. A $2 million loan was secured from France to import machinery for additional construction. The Soviet Union assisted the Pakistani Government with the original financing, design, and construction of the 1.1-million-ton-per-year-capacity (Linz-Donawitz process) plant.

Technical problems with the seawater pumping equipment delayed startup of the first blast furnace for 8 months, until August 1981. A fire damaged the slag production unit soon after the steelworks opened, and damages were estimated at $1 million. Despite all the problems, approximately 60,000 tons of pig iron was produced during the year. The second blast furnace was scheduled for operation in June 1982, when pig iron production was expected to more than double.

In April 1981, the steel mill's first turbogenerator was placed in service in the thermal powerplant. Rated at 55 megawatts capacity, this unit was joined, in the same month, by startup of coke oven battery No. 1, a 485,000-ton-per-year-capacity portion of the coke oven and byproduct plant. Assuming two batteries and two blast furnaces were operating, approximately 970,000 tons of coke was expected to be partially consumed, 680,000 tons by the blast furnace and 75,000 tons by the sintering plant. The balance of 215,000 tons would be available for export and domestic markets.

The 800-millimeter billet mill was scheduled for startup in March 1982, and steelmaking was expected to commence in September 1982. Phase 2 of the Pipri integrated steelworks, including production of hot sheets, cold sheets, galvanized sheets, and formed sections, was expected to be operational by 1985.

Steel projects made headway in other areas of Pakistan. A continuous caster plant was recently installed in Lahore, Punjab region. The one-strand curved mold caster was expected to produce billets from 75 by 75 millimeters to 125 by 125 millimeters. The Pakistan Industrial Credit and Investment Corp. was considering financing nearly 40% of the total cost of a steel galvanizing and iron pipe plant. The plant-site was located at the Kot Lakhpat industrial estate, near Lahore. Loans from the Industrial Development Bank of Pakistan at Peshawar were expected to facilitate construction of a steel, wire, and metal rods manufacturing unit in Lasbela.

Pakistani People's Steel Mills, the Government-owned specialty steelmaker, was shut down in 1979 because of its mounting debt of $54 million. Japanese steel experts evaluated the mills and steel stocks and suggested that the plant would not be viable without state subsidies and/or debt rescheduling. Interest was expressed by the private sector, but the Government did not make any decisions on selling or bailing out the specialty steel mills by yearend 1981.

NONMETALS

Cement.—Nine publicly operated cement plants had an installed capacity of 3.75 million tons per year in 1981. Annual consumption demand was estimated at 5 million tons and was projected to increase to 6 million tons by 1983. Expansion of the Mustehkam cement plant was expected to increase capacity to 4 million tons by yearend 1982. Three additional public sector cement projects were scheduled for completion in 1982-83, raising annual capacity by approximately 1 million tons.

The Pakistani Central Investment Promotion Committee approved private sector participation in the construction of eight new cement projects. The projects were expected to add 2.4 million tons to capacity over the next few years. Project implementation was expected to be slow because of large increased foreign exchange requirements for imported plant equipment and machinery.

Only one private sector project initiated construction by yearend 1981. The foundation was laid at the Cheerat cement factory, located 19 kilometers south of Peshawar in the NWFP. Initially, 325,000 tons was expected to be produced annually, with expansion plans set at 1 million tons. Financing was arranged through a private entrepreneur in collaboration with a French machinery and equipment firm. The Pakistani Banker's Equity was also expected to share in financing the project. Similar instances of Government participation through direct allocation of funds were expected for the Naseer Shaikh and Co. cement factory and the Fecto Ltd. cement plant, with proposed locations near Jhelum and Rawalpindi in the northern Punjab region, respectively. Each of these three projects was designed to produce approximately 300,000 tons per year of portland gray cement.

Other privately sponsored cement project proposals included Pak Land Cement located at Dhabeji, near the Port of Karachi; Dadabhoy Cement at Dadu; and Fakir Cement at Jhill Hill, Karachi, all within the Sind region. Each plant was expected to have a 300,000 ton annual capacity. Two other cement plants were to be sponsored by Arab entrepreneurs, Galadari Cement (Gulf) Ltd. at Lasbela, Baluchistan, and the Fharah cement plant at Hub Chowki, Baluchistan. Both plants had planned capacities of 600,000 tons per year.[5]

Asbestos Cement Industries Ltd. operated two plants at Karachi and Hyderabad, Sind region. Total production was rated at only 50% of installed capacity of 40,000 tons per year. Production was projected to expand through improved plant efficiencies and construction of a new asbestos cement facility, recently sanctioned by the Government for the Punjab region.

Clays.—*Kaolin.*—During 1981, the only commercially exploited deposits of kaolin (china clay) were located at Shah Dheri in Swat, NWFP. Total reserves were estimated at 4.5 million tons within the NWFP and 3.5 million tons in Nagar Paker, Sind. Recently discovered deposits in Lahore, Punjab, were evaluated by the PCSIR and the London Institute of Geological Sciences. Initial investigations proved extremely favorable and detailed feasibility studies were undertaken with technical assistance provided by the United Kingdom.

Fuller's Earth.—The Punjab Mineral Development Corp. was in the process of conducting a feasibility study to develop a fuller's earth plant. The facility was projected to cost $7 million. Operations were expected to commence by 1985 at the proposed site, Dera Ghazi Khan.

Fertilizer Materials.—In concurrence with recent successful strides to narrow the

gap between demand and domestic production, fertilizer material production increased for the fourth consecutive year and consumption declined by approximately 6% during 1981. Total production capacity achieved in 1981 was approximately 730,000 tons of nitrogenous fertilizer and 90 tons of phosphatic fertilizer.

Implementation plans continued to be made to increase the efficiency of operating plants and to expand domestic output of both nitrogenous and phosphatic fertilizers. Exxon Chemicals (Pakistan) Ltd. attained a production efficiency peak at 130% design capacity, resulting in production of 225,700 tons of fertilizer materials in 1981. Various steps implemented during the year were responsible for the increased efficiency: Ammonia converter basket and gas turbine rotor replacement, urea reactor inspections, replacement of five catalysts, and increased maintenance of the critical heat exchangers.

Progress was made on the proposed Hazara fertilizer complex. British experts were evaluating the extent and quality of phosphate deposits in the Hazara region, NWFP. The pentoxide content (P_2O_5) was estimated at 25% to 28%. The British team was expected to ascertain if the content could be raised to 30%. Preliminary reports were due in July 1981, and the final report was expected to be complete by 1983. No other detailed information on the deposits was available at yearend 1981. The National Fertilizer Corp. had the responsibility for setting up the Hazara fertilizer complex, and the Sarhad Development Authority was responsible for setting up the two mining operations near Abbattabad and Hazara.

An agreement was signed between the Fauji Fertilizer Co., Ltd., and the Kuwait Fund for Arab Economic Development in May 1981. The agreement called for a 20-year loan to assist in the execution and operation of the fertilizer project. Snamprogetti (Italy) was contracted to construct the 900-ton-per-day ammonia unit and 15,000-ton-per-day urea unit at Goth Machhi, Sind.[6]

Gypsum.—Total gypsum reserves were estimated to exceed 350 million tons. Large deposits occur in Mian Wali, Jhelum, and D. G. Khan districts in Punjab; Quetta and Sibi districts in Baluchistan; and Kohat district in NWFP. A new gypsum quarry was developed in Mian Wali with rated production capacity of 100,000 tons per year. The Government planned to triple gypsum output over a 5-year period to facilitate cement and chemical fertilizer industry expansions. The Asian Development Bank granted technical assistance to support Pakistani gypsum production goals.

Salt.—Large salt reserves located in the Punjab and NWFP were estimated to exceed 100 million tons. Salt continued to be produced from six major mines and quarries at an approximate rate of 500,000 tons per year. Three additional salt mines were expected to be opened to meet the estimated annual demand increases of 10%. Potential salt minesites were identified at Khewra, Warcha, and Kalabag, with an estimated total cost of $2 million.

The development of a 300,000-ton-per-year solution mine was under consideration. A feasibility study was near completion, and if the mine was commissioned, the salt was expected to be utilized by a nearby soda ash factory.

MINERAL FUELS

Coal.—Pakistan had approximately 480 million tons of known coal reserves in 1981, with nearly one-half of the reserves located at Lakhra, Sind. Most of Pakistani coal resources were classified as high-volatile lignitic to subbituminous, with relatively high ash and sulfur content. Proven commercial deposits were confined to the southeast foothills of the central mountain ranges. The only coal in the country possessing medium coking characteristics was located in the Sharigh Coalfield. After washing and blending with imported high-grade coking coal, the Sharigh coal was found suitable for the manufacture of metallurgical coke.

New coal deposits were discovered within the Sind and Punjab regions. The Geological Survey of Pakistan identified large quantities of good-quality coal approximately 400 kilometers northeast of Karachi at Thatta, Sind. The Thatta-Sadha Coalfield, covering over 750 square kilometers and straddling the Indus River, was expected to be inventoried by 1983. Another deposit was discovered near the border between the Jhelum and the Mian Wali districts of Punjab. The feasibility of developing a 15,000-ton-per-year mine by 1982, with an expansion potential to 50,000 tons per year, was being considered. The Provincial government allocated $3 million for additional exploration in the area. The Punjab government has also earmarked approximately $1.4 million to establish a modern mining

training institute to facilitate improvement of local coal mining practices.

The current 5-year plan (1978-83), which set the coal production target at 3 million tons, would require an approximate 50% increase in 1981 production levels. To meet the goals of the plan, objectives were set to increase production of coal to 1.7 million tons through the expansion and modernization of existing mines and development of new coalfields in the Punjab and Sind Provinces. More specifically, the plan called for expanding annual capacity at the Sharigh collieries from 50,000 to 100,000 tons by yearend 1982, construction of a 75,000-ton-per-year coal washing plant at Sharigh, expansion of the Makerwal collieries from 120,000 to 300,000 tons per year capacity, and development of the Jhimpir-Meting Coalfield within the Sind region.

The Government was also encouraging higher value uses of indigenous coal, used almost exclusively in brickkilns. Higher grade coal was imported primarily for use in thermal power generation. The Japanese International Cooperation Agency provided technical expertise in the preparation of a feasibility report for an integrated Lakhra coal mining thermal power station. The projected cost of the project, if completed in 1987, was estimated at $1.2 billion, with a foreign exchange component of $612 million. Approximately 36 million tons of reserves were proven to be of sufficient quality to feed a 200-megawatt thermal powerplant. The Pakistani Water and Power Development Authority envisioned Lakhra stage 2 in 1990 expanding capacity by 300 megawatts. The facility was designed to accommodate capacity up to 1,000 megawatts. The project continued to be delayed because of the large financial requirement and technical problems associated with the higher sulfur coals.

Natural Gas.—Recoverable reserves from dry gasfields and associated gases from the oilfields were estimated at 16 trillion cubic feet. The Oil and Gas Development Corp. recently estimated offshore resources at 8.4 billion cubic feet. At yearend 1981, the remaining marketable reserves were estimated at 13.3 trillion cubic feet, and the gas was projected to last approximately 50 years at the current production rate. Consumption during 1980-81 was 265 billion cubic feet. Natural gas supplied 35% of the total energy needs of Pakistan during 1980 and was estimated to have supplied 42% of total energy needs in 1981.

The Sui Gasfields met 80% of the total gas demand, with roughly 90% of the gas consumed by the industrial sector. Thermal power stations, fertilizer factories, and cement facilities were the three largest industrial consumers of natural gas. Large increases were reported to be consumed by the thermal-power-generation industry, owing primarily to the commissioning of the third 210-megawatt unit of the Gudu power station.

A 2-year appraisal program was launched at the Dhodak and Pirkoh Gasfields, located within the Punjab and Baluchistan regions, respectively. Objectives were set to evaluate the size of the fields and estimate the volume of gas and condensate reserves at Dhodak and the volume of gas reserves at Pirkoh. Preliminary estimates have revealed 1 trillion cubic feet of gas at Pirkoh, and six development wells were expected to be completed in the area by 1983. Pakistan signed a $55 million loan with the Asian Development Bank to develop the Pirkoh Gasfield and lay a pipeline. An 18-inch-diameter, 120-million-cubic-foot-per-day pipeline was envisioned to transport gas from Pirkoh to the Sui Field and transmission network. The initial phase of the Pirkoh gas project was expected to supply 72 million cubic feet per day by 1984.

There were five gas processing plants in Pakistan as of July 1981, with total throughput capacity of 720 million cubic feet per day. Pakistan Oilfields Ltd. initiated two refrigerated absorption plants during the year, utilizing associated gas from the Dhulian and Meyal Oilfields.

Pakistan's gas distribution network was estimated to cover 14,500 kilometers by yearend 1981. Construction work was initiated in July 1981 to lay a 12-inch-diameter, 350-kilometer pipeline from Sui Indus Right Bank pipeline to Quetta and other towns en route within Baluchistan. The Quetta gas pipeline project was estimated to cost approximately $670 million with a 51% foreign exchange component. The foreign exchange component was expected to be provided by the Kuwait Fund for Economic Assistance.

The gas transmission capacity of the Indus Right Bank pipeline was expected to be expanded from 135 million cubic feet per day. The expansion project involved the installation of mainline compressor stations at Shikarpus and Dadu and a booster station at the Sari-Hundi Gasfields.

The Hydrocarbon Development Institute of Pakistan was in the process of commis-

sioning two compressed natural gas (CNG) pilot projects. The objective was to replace gasoline and imported diesel fuel with CNG at stations in Karachi and Islamabad.

Oil.—The Pakistani Government continued to place a high priority on oil exploration and development, which was reflected in the 17% increase in the 1981-82 budget of $1.8 million. The Oil and Gas Development Corp. (OGDC), the largest Government hydrocarbon agency, was allocated 55% of the budget. OGDC drilled 7 of the 33 wells and operated 5 rigs during 1981. Other drilling was carried out by approximately 11 other public and private sector companies. A total Government investment of $2.8 million was envisioned to finance the drilling of eight exploratory wells, four development wells, and one appraisal well in 1982.

Oil was found for the first time in the lower Indus Basin, about 22 kilometers northwest of Badin, within the Sind region. The Khaskeli No. 1 well was spudded on May 14 by Union Texas Co. (United States), reaching a total depth of 2,559 meters on June 16, 1981. Union Texas, the operator for Cities Service Co. (United States) and OGDC, was expected to proceed with development drilling in 1982. The group held an 18,000-square-kilometer concession in the Thatta district of the lower Sind region. By yearend 1981, Khaskeli No. 2 was also reporting a show of oil. Union Texas planned to drill three more wells in the area.

OGDC and Pakistan Shell Petroleum Development BV agreed on a supplemental petroleum concession of 11,000 square kilometers. Under the agreement, a 4-year license was granted for the additional area. Shell was already committed to survey and drill a deep well at Pabbi Hills, NWFP.

A memorandum of understanding was signed between the Government and a group that included Occidental Petroleum Corp. for a 640-square-kilometer exploration concession in the north Potwar area of NWFP. The private sector group planned to spend $19 million in the concession for 4 years. Seismic surveys were planned, and two wildcat wells were expected to be drilled during 1982-83.

OGDC, with assistance from the Canadian International Development Agency, drilled two more wells at Dakhni and Tut within the Attock district, NWFP. Production testing was carried out at Tut No. 2, while Tut Nos. 12 and 13 were nearing their target depths by yearend 1981.

Pakistan Petroleum Ltd. (PPL) drilled six development wells during 1981. PPL, in joint participation with OGDC, conducted seismic surveys of the recently discovered (1979) Adhi Oilfield structure. Adhi No. 7 was drilled below 2,300 meters, and Adhi No. 8 was spudded on December 14, 1981, by contract drillers, Deutag Ltd. (Federal Republic of Germany). PPL agreed to transfer a concession held in the east Potwar area to OGDC. The agreement called for AMOCO Pakistan Exploration Co. and OGDC to carry out joint exploration, which included drilling three wells in the area.

Pakistan's refinery capacity was 46.8 million barrels per year in 1981, divided among Pakistan Refinery Ltd.—18.3 million barrels, National Refinery Ltd.—15.3 million barrels, and Attock Refinery Ltd.—13.2 million barrels. The Pakistan Refinery Ltd., located at Karachi, contracted with Lumus Co. Ltd. (United States) to expand annual capacity. The revamping was expected to consist of installing a vacuum distillation unit, a deasphalting unit, and a lube refinery by 1984.

An oil-product pipeline extending 865 kilometers from Karachi to Gujrat near Multan was commissioned. Oil-marketing companies obtained the products at the Gujrat Depot. An oil terminal located at Gujrat was recently constructed by the Pak-Arab Refinery Co. Operations were reported to have commenced in May 1981.

The Government commitment towards enhancing the effectiveness of the hydrocarbon sector was reflected in the establishment of a petroleum testing center in September 1981. The sponsor, Hydrocarbon Development Institute, located the center at Lahore, Punjab. In addition, the Government was expected to conduct a detailed feasibility study on the market and demand for petrochemicals.

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[1]Physical scientist, Division of Foreign Data.

[2]Pakistan's fiscal year runs from July 1 through June 30. Textual material reported in fiscal years unless otherwise specified.

[3]Where necessary, values have been converted from Pakistani rupees (PRs) to U.S. dollars at the rate of PRs9.90=US$1.00.

[4]Mining Annual Review—1981 (London). P. 451.

[5]Pakistan Economist (Karachi). V. 21, No. 26, June 27, 1981, pp. 37-38.

[6]———. The Fertilizer Fix. V. 21, No. 52, Dec. 26, 1981, pp. 24-25.

The Mineral Industry of Peru

By Doris M. Hyde[1]

In 1981, the Peruvian economy registered a gross domestic product (GDP) of $20 billion.[2] The real growth rate of 3.9% compared favorably with the 3.1% rate achieved in 1980 but was less than that projected early in 1981. The average rate of inflation for 1981 was about 73%, but the official rate of currency devaluation was held to 45%.

The minerals sector accounted for slightly less than 9% of the GDP in 1981. The value of nonfuel mineral exports reached $1.5 billion and represented 43% of total export earnings, a decrease from its 47% contribution in 1980. There was a 20% drop in the 1981 nonfuel mineral export value from that of 1980, which was unusual for Peru but was in accord with generally depressed world metal prices and the domestic circumstances that reduced copper production.

The $684 million value of 1981 petroleum exports represented a 12% decrease from that of 1980. Nevertheless, petroleum easily maintained its newly acquired position as Peru's leading mineral foreign exchange earner because of the poor performance from the copper industry. Petroleum contributed almost 22% of the $3.2 billion value of total exports.

For the most part, all mining sectors were affected by a combination of adverse events. These included natural disasters that disrupted the transportation of minerals, supplies, and fuel, both to and from the central mining region; labor unrest; postponements of expansion plans; and cash-flow problems intensified by generally depressed market prices for metals.

The medium- and small-sized mining sectors were particularly affected by low prices for their products. To assist these companies through this critical period, the Banco Minero del Peru increased its short- and medium-term loans by almost 79%. The small-sized mining sector obtained 45% of these loans, and the medium-sized sector, 40%. Other forms of transitory credit were also made available to assist the miners with working capital.

The bank began the construction of 20 new concentrators to be situated throughout the country. These concentrators were to be rented to small operations for a maximum period of 5 years. The concentrator capacities ranged from 20 to 200 tons per day, depending on the particular needs of each region. The first of these concentrators, a 40-ton-per-day flotation plant, was inaugurated in September in the Department of Cuzco. The remainder was expected to be installed by the end of 1982.

The large-sized mining sector was also affected by adverse circumstances. Owing to labor problems at all three of its operations, Southern Peru Copper Corp. (SPCC) experienced a 15% drop in blister copper production. The work stoppage of almost 60 days was the longest in the company's history. SPCC was frustrated in its attempt to refinance the Cuajone operation. The company indefinitely postponed plans to expand production from both of its mines.

Refined copper output at the La Oroya metallurgical complex of Empresa Minera del Centro del Perú (CENTROMÍN PERÚ) was down slightly because of transportation problems caused by the aftermath of adverse weather. Copper production from the Ilo refinery of Empresa Minera del Perú (MINERO PERÚ) was reduced 11% in 1981 when the SPCC strikes curtailed blister deliveries. MINERO PERÚ also endured a short strike at its refinery. Pessimistic copper price projections were largely responsible for delaying the Ilo refinery's expansion plans.

The number of strikes in the mining sector decreased from 123 in 1980 to 37 in

1981, but the total effect was more harmful in 1981. The value of strike-lost production in 1980 was estimated at $75 million, but in 1981, with 70% fewer strikes, the lost production was valued at $100 million. Lost copper production due to the strike at SPCC was valued at $65 million.

Government Policies and Programs.—In 1981, the Government completed a series of legislative actions to reform mining and tax laws in an effort to encourage foreign investment.

The mineral marketing monopoly of Minero Perú Commercial (MINPECO) was eliminated through Legislative Decree No. 44, issued February 27, 1981. As a result, trading companies opened or reopened offices in anticipation of competing for mining sales contracts once agreements with MINPECO expire. Legally, MINPECO retained the right to market production from the three wholly state-owned enterprises. The decree established MINPECO as a limited liability company subject to the Law of Mercantile Companies.

Legislative Decree No. 35, issued February 27, 1981, modified the General Mining Law, Decree Law No. 18880. This decree altered the structure of MINERO PERÚ so that it could be operated as a limited liability company. All special mineral rights of the state were transferred to MINERO PERÚ. MINERO PERÚ may form joint ventures with private foreign and local companies to develop large mining projects as Empresas Mineras Especiales. MINERO PERÚ would retain a minimum 25% equity in these special mining companies.

Legislative Decree No. 33 exempted the mining and petroleum companies from payment of certain taxes created by Decree Laws 21528 and 21529 of 1976, including the 17.5% tax on exports and domestic sales. The decree allowed for a gradual phasing out of the export tax on a quarterly basis, with applicable taxes varying for individual mining sectors until June 30, 1983. By that date, the tax rate for the large-sized mining sector and petroleum and petroleum derivative producers was scheduled to have been reduced to 5%. Producers of silver would have had their tax reduced finally to 2%, and all other mining companies would have had their tax reduced to 3.5%.

The export tax had generated 10% of the Government's total tax revenue. To cushion the fiscal impact of the export tax reduction, a new 5% sales tax was imposed on each sale and/or export transaction of products whose prices are subject to international quotations. This new sales tax was allowed to be credited as an advance income tax payment. Small producers, gold and heavy sand-mining companies, Empresa Minera de Hierro del Perú (HIERRO PERÚ), and the Cerro Verde I operation of MINERO PERÚ were exempted from the sales tax payments.

In June, Legislative Decree No. 154 provided for a 50% reduction in the sales tax due on minerals whenever the daily international prices fell within specified ranges during 1 calendar month. The ranges were set at $9.00 to $9.50 per ounce (Handy & Harman) for silver, $0.83 to $0.88 per pound on the London Metal Exchange (LME) for copper, $0.30 to $0.33 per pound (LME) for lead, and $0.37 to $0.40 per pound (LME) for zinc. No sales tax would be paid when daily prices fell below these prices for any period exceeding 1 month.

Legislative Decree No. 109 of June 12, 1981, was the new General Mining Law, which became effective September 1, 1981. The law redefined small-sized mining, with attendant special tax benefits, by increasing the production limits from 200 to 350 tons of ore per day for metals and up to 500 tons per day for coal or nonmetals other than construction materials. As originally set forth in Legislative Decree No. 44, it eliminated the state's monopoly on the marketing of minerals and in the installation of refineries and smelters. This allowed a number of small lead-zinc smelter companies to open up operations. The new mining law also reaffirmed the special position of gold mining, redefined the role of the state-owned companies in the mining sector, redesigned the system for registering mining claims, and provided a variety of tax benefits and investment incentives. Some of the tax and investment incentives had been enacted earlier as modifications to the old mining law.

Implementing regulations for the December 1980 Petroleum Law, Decree Law 23231, were issued on March 20, 1981, as Supreme Decree No. 005-81-EM-DGH. The regulations concerned the criteria for extensive reinvestment tax credits and were generally thought to encourage increased exploration and foreign investment.

PRODUCTION

Overall, Peru's mineral production had a mixed performance in 1981. Labor problems at the SPCC Cuajone and Toquepala Mines in southern Peru was the primary reason for decreased copper production. Problems stemming from adverse weather conditions and depressed world market prices affected mineral output from producers elsewhere in Peru. CENTROMÍN PERÚ continued to produce the widest range of minerals and metals.

In 1981, CENTROMÍN PERÚ's seven mining units accounted for 8% of total mined copper production, 43% of zinc, 41% of lead, and 24% of mined silver production. CENTROMÍN PERÚ production at the La Oroya metallurgical complex is shown in table 2. Peru's refined zinc production doubled in 1981 as a result of the completion of the MINERO PERÚ Cajamarquilla zinc refinery.

The gold boom continued, and gold represented Peru's most active mineral sector. A small new gold rush occurred along the coast north of Lima near Chimbote. The Madre de Dios area in the eastern jungles, east of Cuzco and north of Puno, continued to attract mining interest.

In 1981, the average petroleum production of about 193,000 barrels per day not only failed to meet the targeted goal of 225,000 barrels but dropped slightly below the 1980 production level of 195,000 barrels. One reason for this was the failure of the consortium of Occidental Petroleum Corp.-Bridas Exploraciones y Producción of Argentina to significantly increase production from its secondary recovery program in the Talara north coastal area. In addition, production from the jungle areas was restrained from reaching its potential by problems related to transportation. The targeted production rate for 1982 was set at 230,000 barrels per day, based on anticipated improvements in the above areas.

Table 1.—Peru: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Antimony:					
Mine output, metal content	819	745	r546	344	640
Metal	504	489	477	427	478
Arsenic, white	1,367	1,257	3,222	3,205	2,676
Bismuth:					
Mine output, metal content	644	611	527	497	639
Metal	516	611	527	497	639
Cadmium:					
Mine output, metal content	380	e350	424	490	511
Metal	182	169	190	172	302
Copper:					
Mine output, metal content	r338,110	r366,753	r390,720	366,800	327,614
Copper sulfate (Cu content)	1,311	1,228	1,395	4,665	5,595
Metal:					
Smelter	307,425	318,900	371,385	321,021	253,438
Refined	187,183	182,754	230,835	226,299	209,100
Gold:					
Mine output, metal content, troy ounces	104,393	r112,656	r124,434	132,139	156,895
Metal, do.	r53,242	r48,258	r56,858	57,196	55,781
Indium, kilograms	3,734	3,302	3,484	3,675	3,489
Iron and steel:					
Ore and concentrate:					
Gross weight, thousand tons	6,284	4,921	5,444	5,705	6,069
Iron content, do.	4,064	3,199	3,622	3,765	4,007
Metal:					
Pig iron, do.	244	244	265	261	235
Ferroalloys	e500	e1,800	e1,800	e1,800	1,800
Steel ingots and castings, thousand tons	379	374	436	471	332
Lead:					
Mine output, metal content	175,708	182,704	174,000	176,955	186,735
Metal	79,258	74,269	85,706	79,939	79,236
Molybdenum, mine output, metal content	456	729	r1,196	2,688	2,488
Selenium metal, refined, kilograms	15,936	12,927	18,320	22,920	22,478
Silver:					
Mine output, metal content, thousand troy ounces	r39,731	r37,022	r39,248	42,989	46,940
Metal, do.	22,379	r20,897	r25,488	23,797	23,853
Tellurium metal, kilograms	18,370	r15,417	r21,233	20,920	21,310
Tin, mine output, metal content	r329	r458	r870	1,077	1,519
Tungsten, mine output, metal content	526	582	r564	549	521

See footnotes at end of table.

Table 1.—Peru: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS —Continued					
Zinc:					
Mine output, metal content	[r]405,250	[r]402,600	432,000	487,596	496,707
Metal	66,949	[r]62,852	68,195	63,829	125,000
NONMETALS					
Barite	[r]434,500	[r]395,500	[r]444,500	414,600	409,100
Boron materials, crude (borates)	[e]5,000	[e]6,000	[e]12,000	[e]21,000	16,644
Cement, hydraulic thousand tons	1,929	2,020	[e]2,500	[e]3,000	3,080
Chalk	362,798	269,755	361,800	485,174	500,000
Clays:					
Bentonite	31,200	18,805	--	--	30,500
Fire clay	9,682	13,037	13,250	13,325	8,520
Kaolin	2,698	3,752	4,052	5,500	6,000
Common clay	272,193	252,948	399,090	309,800	754,256
Diatomite	8,474	4,923	(2)	--	--
Feldspar	2,184	2,461	2,176	15,600	21,600
Graphite	(2)	(2)	(2)	--	--
Gypsum, crude	142,751	168,936	217,490	280,000	350,000
Mica	150	100	[e]50	[e]60	574
Nitrogen: N content of ammonia	83,000	81,000	[e]80,000	61,700	97,500
Phosphates, crude: Guano	--	--	5,000	13,900	12,000
Salt, all types	317,857	348,056	398,820	456,987	500,000
Stone, sand and gravel:					
Dimension stone:					
Marble	2,461	7,067	14,535	NA	3,072
Slate	30,300	25,300	NA	NA	NA
Crushed and broken stone:					
Dolomite	7,535	5,510	--	--	--
Limestone	2,764	3,371	2,810	3,175	3,800
Quartz and quartzite	2,250	2,170	NA	NA	NA
Silica thousand tons	174	80	NA	NA	18
Sand and gravel do.	3,291	2,887	2,577	3,596	2,538
Sulfur:					
Elemental:					
Native	109	102	98	--	--
Byproduct of metallurgy	20,000	18,000	[e]20,000	[e]20,000	20,000
Sulfuric acid, gross weight	50,983	47,292	[r]53,762	51,801	170,801
Talc and related materials:					
Talc	721	231	2,700	[e]2,700	2,700
Pyrophyllite	10,714	8,678	13,270	[e]12,000	12,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	5,698	5,661	3,182	[e]3,500	3,500
Coal:					
Anthracite	27,847	41,235	45,892	89,471	157,000
Bituminous[e]	(3)	(3)	(3)	(3)	(3)
Coke, all types[e]	10,000	10,000	10,000	10,000	10,000
Gas, natural:					
Gross million cubic feet	72,763	68,970	73,118	[e]67,500	67,000
Marketed do.	[e]32,900	31,877	21,053	[e]21,000	21,000
Natural gas liquids:					
Natural gasoline and other[4] thousand 42-gallon barrels	493	521	464	353	350
Propane do.	74	60	47	75	75
Butane do.	8	7	9	9	9
Total do.	575	588	520	437	434
Petroleum:					
Crude do.	33,276	55,079	69,952	71,369	70,100
Refinery products:					
Gasoline:					
Aviation do.	(3)	(3)	1	(3)	(3)
Motor do.	11,981	11,102	13,088	12,810	12,500
Jet fuel do.	1,325	1,812	2,657	3,220	3,200
Kerosine do.	5,017	5,538	6,156	6,741	6,500
Distillate fuel oil do.	7,304	9,746	11,949	12,339	12,500
Residual fuel oil do.	15,448	14,523	15,462	16,622	16,500
Lubricants do.	63	70	141	85	100
Liquefied petroleum gas do.	1,220	1,274	1,237	1,145	1,100
Asphalt do.	246	212	181	181	180
Unspecified do.	217	122	104	159	160
Refinery fuel and losses do.	505		193	254	260
Total do.	43,326	44,399	51,169	53,556	53,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 19, 1982.

[2]Revised to zero.

[3]Less than 1/2 unit.

[4]Includes hexane.

Table 2.—Peru: Smelter and refinery production of CENTROMÍN PERÚ

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981
Refined metals:					
Copper	55,022	51,897	54,291	54,104	50,026
Lead	79,243	74,255	85,112	81,976	79,236
Zinc	66,949	62,852	68,196	63,829	67,966
Silver troy ounces	21,572,344	20,896,528	25,488,117	23,970,564	23,853,133
Gold do	36,369	32,220	42,937	42,455	42,425
Bismuth	516	611	523	498	639
Cadmium	182	170	190	172	182
Indium kilograms	3,734	3,302	3,845	3,610	3,489
Selenium do	15,936	12,941	18,320	22,908	22,478
Tellurium do	18,370	15,418	21,233	20,920	21,310
Metals in blister copper for export:					
Copper content	1,486	--	1,340	1,859	--
Silver content troy ounces	303,524	--	292,849	383,555	--
Gold content do	569	--	629	981	--
Subproducts:					
Antimony, crude	528	488	477	427	478
Antimonial lead	102	9	95	15	--
Arsenic trioxide	1,405	1,322	1,415	r2,475	2,164
Copper sulfate	5,625	5,271	5,987	6,038	5,729
Zinc sulfate	2,039	1,826	2,003	2,283	2,144
Sulfuric acid	50,983	47,292	53,762	51,802	46,990

rRevised.

Source: CENTROMÍN PERÚ annual reports for 1977-81.

TRADE

The Central Reserve Bank preliminary statistics on nonfuel mineral exports in 1981 indicated a total value of about $1.5 billion, a 20% decrease from the $1.8 billion record set in 1980. This substantial drop in mineral export value resulted from generally depressed world market prices for metals and a decrease in Peru's copper production.

The United States was the leading recipient of MINPECO mineral exports, importing 79% of the silver, 31% of the lead, 22% of the copper, and 19% of the zinc. Western European countries imported 31% of the copper, 27% of the lead, and 42% of the zinc exports. The Republic of Korea and Japan received about 80% of the iron ore exports.

Petroleum exports in 1981 were estimated at 54,541 barrels per day, valued at slightly under $700 million for the year. Peru expected 1982 crude oil exports to reach 85,000 barrels per day and to contribute over $1 billion to foreign exchange earnings. This export goal for 1982 remained subject to continued production increases from secondary recovery operations, the improvement of pipeline transport from the northern jungle fields, and conservative increases in domestic consumption. Domestic consumption of petroleum continued to rise at a rate of about 2% per year and in 1981 reached 138,300 barrels per day.

Through legislation enacted in 1981, MINPECO lost its monopoly in the marketing of minerals. Henceforward, MINPECO only acts on behalf of the state-owned companies plus any private companies that request its services. The change in MINPECO's status had no major affect in 1981 since all of the 1981 production had been sold prior to the legislative action.

Preliminary figures on 1981 mineral exports through MINPECO are shown in table 3.

Table 3.—Peru: Mineral exports, 1981 preliminary data

(Thousand fine metric tons unless otherwise specified and thousand dollars)

Product	Quantity	Value
Copper:		
Refined	217	374,000
Refined rods	4	8,000
Blister	105	165,000
Concentrates	25	36,000
Total	351	583,000
Lead:		
Refined	87	62,000
Concentrates	58	154,000
Ores	1	2,000
Total	146	218,000
Refined silver metric tons	895	320,000
Zinc:		
Refined	104	87,000
Concentrates	376	166,000
Ferrites	10	4,000
Total	490	257,000
Other metals	NA	50,000
Iron ore	5,803	106,000
Grand total	XX	1,534,000

NA Not available. XX Not applicable.

Source: U.S. Embassy, Lima, Peru. State Department Airgram A-17, May 28, 1982.

Table 4.—Peru: Exports of mineral commodities[1]

(Metric tons)

Commodity	1979	1980
Antimony:		
Ore	738	378
Metal	102	--
Arsenic trioxide	1,519	351
Bismuth, refined	362	554
Cadmium, refined	210	179
Copper:		
Ore and concentrate	113,441	69,811
Blister	139,613	129,985
Cement	1,784	--
Refined cathode	175,145	180,054
Refined wirebars	31,406	26,042
Wire	5,547	3,202
Indium, refined	4	3
Iron ore	5,529,934	5,500,328
Lead:		
Ore and concentrate	140,823	156,721
Refined	85,531	74,227
Molybdenum concentrate	2,141	2,995
Selenium, refined	13	3
Silver, refined	772	495
Tellurium, refined	12	5
Tin concentrate	2,365	2,214
Tungsten concentrate	1,129	996
Zinc:		
Concentrate	693,639	754,348
Refined	57,292	37,813
Powder	--	50
Sulfate	20	--

[1]Table includes partial export data; information on destinations of exports was not available.

Source: La Minera En El Peru, 1980, Editores Tecnicos Asociados, S.A., Pueblo Libre, Peru, 1981, p. E27.

COMMODITY REVIEW

METALS

Copper.—The 11% downturn in 1981 copper production was primarily due to labor problems and other factors related to adverse weather. Table 5 shows the principal producers of copper ores and concentrates.

Labor problems beset SPCC at all three of its operations. The Toquepala Mine was closed 56 days owing to strike activity, the Cuajone Mine lost 49 days of production owing to work stoppages, and the Ilo smelter underwent 54 days of strike activity. Labor, fuel, and maintenance costs rose significantly during the year, while the average refined copper price during 1981 was almost 77 cents per pound compared with 96 cents in 1980. In 1981, SPCC net earnings fell $65 million below the $85 million reported for 1980.

During 1981, SPCC conducted studies on all economic, technical, and legal aspects of expanding production at its two mining and concentrator operations. As a result of these studies, the company decided to delay the projects until market conditions and the financial climate improved.

SPCC continued to use the marketing services of MINPECO on a joint basis. The company planned to use MINPECO services in 1982 while continuing to establish itself as both a producer and marketer of copper.

CENTROMÍN PERÚ's Cobriza Mine copper production decreased because of labor unrest and an 18-day work stoppage caused by fuel transportation problems. The expansion work on the mine, initiated in 1977, was almost complete by the end of 1981. The new concentrator, located at Pampa de Coris on the Mantaro River, was expected to be completed by mid-1982, followed by the completion of the mine expansion project in September. This $261 million project was designed to more than triple Cobriza's annual production capacity to 205,000 tons of concentrate containing 25.4% copper. In addition, about 6 ounces of silver per ton of concentrate would be obtained. Cobriza's proven ore reserves were determined to be about 30 million tons, averaging 2.16% copper and 0.55 ounce of silver per ton. This was considered sufficient for a 10-year mine life providing additional reserves are not identified.

MINERO PERÚ maintained a normal production level at its Cerro Verde I copper mine, located 24 kilometers southwest of Arequipa in southern Peru. The company began substituting sulfuric acid produced at its new Cajamarquilla zinc refinery instead of using imported acid for leaching purposes. In 1981, the Cerro Verde project produced about 33,300 tons of copper cathodes, plus 2,450 tons of concentrate, grading 47.5% copper, from the sulfides pilot plant.

The 60 million tons of Cerro Verde I copper oxide ore reserves are underlain by 1.2 billion tons of copper sulfide ore, which MINERO PERÚ has called Cerro Verde II. Negotiations with various companies during the past 4 years to develop the Cerro Verde II project were not successful. In 1981, MINERO PERÚ decided to develop the project through engineering consultants. Accordingly, in November, Kaiser Engineers International Inc. was selected to manage the first phase of construction and development of Cerro Verde II.

The Cerro Verde II project requires expanding the Cerro Verde I Mine, the construction of a concentrating plant to treat 20,000 tons per day of copper sulfide ore, and arrangements for tailings disposal. In addition, the project entails the construction or expansion of facilities for transporting concentrate to the Port of Matarani, additional port facilities, and increased water and electrical power supplies.

The cost of Cerro Verde II was estimated at $300 million. MINERO PERÚ was negotiating for loans from Japanese sources. Construction was to start in 1982 and reach completion by the second half of 1984. Meanwhile, MINERO PERÚ began limited preparatory work to develop the mine and to prepare locations for the platforms to stockpile mined ore, the water tank, and the crushing plant.

The labor problems at SPCC operations also affected the production of refined copper at MINERO PERÚ's Ilo refinery. The lack of SPCC blister copper from August 17 to October 3 and separate strike actions by the Ilo refinery workers from October 20 to November 5 reduced output 11%, from 141,630 tons in 1980 to 125,534 tons in 1981.

At CENTROMÍN PERÚ's refinery at La Oroya, total refined copper production fell by 8%. The decrease would have been more severe except for a substantial increase in copper cathode production. The metallurgical complex encountered fuel supply and transportation problems caused by heavy rains that resulted in flooding and landslides. In 1981, CENTROMÍN PERÚ invited engineering companies to submit prequali-

fication bids for modernizing the La Oroya copper circuit. In 1981, about 45% of the copper concentrates treated at La Oroya were purchased by CENTROMÍN PERÚ from small- and medium-size mines in the region.

During 1981, progress continued on various copper projects throughout the country. Kaiser and Consultores Minero Metalúrgicos S.A. completed a feasibility study on CENTROMÍN PERÚ's Toromocho polymetallic deposit. Proven ore reserves were 354 million tons, assaying 0.75% copper and 0.36 ounce of silver per ton, plus other byproducts such as molybdenum, tungsten, zinc, and bismuth. Additional reserves of lower grade leachable ore have also been identified. The Toromocho deposit is located in the Morococha district, 142 kilometers east of Lima, and has been considered one of the more important deposits in Peru. At full production, the planned concentrator would produce 61,000 tons of copper and more than 2 million troy ounces of silver per year. The required capital investment over a 4-year construction period was estimated at $707 million. Financing arrangements have not been announced.

CENTROMÍN PERÚ was also owner of Compañia Minera Los Montes S.A., created to develop the Monterrosas copper deposit located 20 kilometers northwest of Ica in southern Peru. By the end of 1981, construction work on the mine and concentrator was nearing completion, and the project was expected to go onstream in March 1982. Initial plant capacity was 750 tons per day, with expansion capability to 1,000 tons per day. Production was estimated at 16,000 tons of copper concentrate per year, containing 25% copper and 0.26 ounce of gold per ton of concentrate. A small volume of concentrate, averaging 53% molybdenum was also programed for recovery.

The cost of the Monterrosas project was estimated at $14.2 million. Financing was obtained from the Crocker National Bank, $5 million; Corporación Financiera de Desarrollo (COFIDE), $3.6 million; the Capital Fund, $1 million; and local sources. About 80% of the investment for Monterrosas was made in local currency.

Empresa Estatal Minera Asociada Tintaya S.A. (EMATINSA), owned by MINERO PERÚ (45%), CENTROMÍN PERÚ (45%), and COFIDE (10%), obtained a total of $215 million in loans from the Export Development Corp. of Canada and a group of international banks. Construction work had been initiated in 1980, and EMATINSA expected the project to be onstream in 1984. The Canadian firm Surveyer, Nenninger and Chenevert was awarded the management services contract for this project.

The other large copper development company, Empresa Minera Especial Asociada Antamina S.R.L., was dissolved by mutual agreement of the partners in December after failing to obtain financing. The company was jointly owned by MINERO PERÚ, 51%, and Geomin of Romania, 49%. Full ownership reverted to MINERO PERÚ, although Geomin was to be reimbursed for its contributions at their nominal value. The cancellation agreement gave Geomin the option to purchase, at market prices, up to 15% of concentrate production for 15 years, whenever production begins. The future development of the Antamina copper-zinc deposit was uncertain at yearend. MINERO PERÚ was expected to create another mixed company with foreign interests. First-stage costs were estimated at $326 million for a production of 10,000 tons of copper concentrates per day.

Table 5.—Peru: Principal producers of copper ores and concentrates

(Metric tons of copper)

Company	1979	1980	1981	Change, percent (1980-81)
Southern Peru Copper Corp.:				
Cuajone Mine	183,521	150,829	133,100	-12
Toquepala Mine	107,552	108,491	92,055	-15
MINERO PERÚ	33,100	r33,231	32,700	-2
CENTROMÍN PERÚ	27,669	26,978	25,284	-6
Cía. Minera Pativilca, S.A	4,920	r4,643	4,801	+3
Corp. Minera Nor Peru S.A	r3,719	r3,357	3,175	-5
Cía. Minera Condoroma, S.A	3,585	r3,294	3,525	+7
Minas Aguila S.A	5,410	r5,282	3,325	-37
Minas de Cobre de Chapi, S.A	2,300	r2,358	2,605	+10
Cía. Minera del Madrigal	2,595	r2,801	2,600	-7

rRevised.

Amax Exploration, Inc., decided to withdraw from the Pashpap copper-molybdenum project. The Government, however, was expected to promote the development of the 60 million tons of ore reserves, which average 0.8% copper and 0.053% molybdenum. The Pashpap reserves are located 380 kilometers north of Lima in Ancash Department.

Gold.—Almost 60% of Peru's gold production resulted from placer mining, largely centered in the southeastern part of the country. CENTROMÍN PERÚ produced 42,425 troy ounces of refined gold at its La Oroya metallurgical complex. This output easily establishes it as Peru's single largest gold producer, although a substantial quantity of the ore processed at La Oroya was purchased from other mining companies. Minas Ocoña S.A. was the largest private gold producer with a 1981 output of 11,253 troy ounces from its underground lode mine in the district of Andaray, Department of Arequipa.

Estimated recoverable gold production by source is shown, in troy ounces, in the following table:

	1980	1981	Change, percent
In ores and concentrates	4,983	9,517	+91
Refined and in blister	57,196	55,781	-3
In placer gravels	69,960	91,597	+31
Total	132,139	156,895	+19

Source: As reported by Banco Minero del Perú.

The Banco Minero purchased 104,747 ounces of gold in 1981. The bank sold about 1,100 troy ounces domestically, a 94% decrease from that sold in 1980. Gold exports, on the other hand, reached 175,858 troy ounces, a 172% increase over that of 1980. The average price for gold in 1981 was $460 per troy ounce, a 25% decrease from the average price in 1980.

Despite the price decline, there was continued foreign and domestic interest in developing gold deposits. Some former lode gold mines were scheduled to be reopened, and many new gold-exploration claims were filed. Among the larger foreign firms reported to be planning on opening offices in Peru were Anaconda Minerals Co.; Utah International, Inc.; and Consolidated Gold Fields.

The Arias Group reopened the Salpo Mine near Quiruvilca, Department of La Libertad. The mine capacity was 100 tons per day, but a water shortage limited ore treatment to 70 tons per day, averaging 200 to 250 ounces of silver and 1.8 to 2.5 ounces of gold per ton. Development continued on the Poderosa deposit owned by an Arias Group subsidiary, Cía. Minera Poderosa S.A. This underground mine in Pataz Province, La Libertad Department, was scheduled to open in 1982. About 115,000 tons of reserves averaging 0.32 ounce of gold per ton has been identified. Another Arias Group subsidiary, Unidad Minera, completed expansion of the Farallón Mine treatment plant from 80 to 180 tons per day. Farallón ore reserves were estimated at 250,000 tons, averaging 4.2% zinc, 3.5% lead, 0.76% copper, and 0.048 ounce of gold and 4.3 ounces of silver per ton.

Compañia Aurifera Utupara S.A. resumed exploration at Utupara, Antabamba Province, Apurimac Department. Abandoned in 1960 because of difficult access and the low price of gold, construction of the new Antabamba Road and higher market prices have enhanced the mine's economic viability. The company was proceeding with infrastructural development and additional exploration. Proven and probable reserves were placed at 80,000 tons, averaging 0.5 ounce of gold and 1.5 ounces of silver per ton. Inferred reserves were estimated at 300,000 tons. Production was expected to start in 1982.

The jungle area of southeastern Peru continued to attract both Peruvian and foreign investors. Access to the various placer mines has typically required travel by air, road, water, and trail. Mines are operated under arduous working conditions.

CENTROMÍN PERÚ had the largest placer operation with claims on two blocks of 15,000 hectares each. At the Bijahual claim on the Madre de Dios River, 80 kilometers west of Puerto Maldonado, 1 million cubic meters of auriferous material has been blocked out with an average grade of 0.011 ounce of gold per cubic meter. In December 1981, a pilot plant capable of treating 12 cubic meters of material per hour was installed at CENTROMÍN PERÚ's second claim, 110 kilometers west of Puerto Maldonado on the Inambari River, where 9.8 million cubic meters of auriferous gravels have been identified with an average gold content of 0.009 ounce of gold per cubic meter. Exploration to block out additional gold reserves was continuing.

Aurifera Sur Oriente S.A. (AUSORSA) had the most successful company operation in the Madre de Dios area. In 1981, the

company had active operations in 16 concessions totaling more than 15,000 hectares in the Huepetue and Pukibe region, Manú Province. In this region, between the Huepetue River and the junction of the Colorado and Madre de Dios Rivers, AUSORSA also controlled a group of companies owning concessions covering about 36,000 hectares, of which 24,000 hectares was under a development contract with Rio Holding Co. and Rio Tinto Finance and Exploration (RIOFINEX), both subsidiaries of Rio Tinto Zinc Corp. RIOFINEX had extensive exploration efforts underway.

AUSORSA installed portable pilot plants for use at the Tigre and Choque sites of their active Huepetue region concessions. The plants consisted of simple riffles and sluices, suitable for both the region and the relatively unskilled operators. They were designed to handle 500 cubic meters of material per 24-hour feed of the black sand in which the gold is disseminated. After the washing process, mercury was added to amalgamate the gold particles and remove residual sand. The gold-mercury amalgams were burnt by a blowtorch to oxidize the mercury, leaving rough clots of gold. The concentrated gold was sent to Lima to be smelted and formed into bars. In 1981, AUSORSA produced about 2,100 ounces of gold.

The Banco Minero had established offices in the Madre de Dios area at Puerto Maldonado, Colorado, Mazuko, Huaypetue, and Laberinto to purchase gold from thousands of individual miners. These miners mostly employed the mercury and blowtorch technique for recovering the gold. They worked along the riverbanks and sandbars because land-based operations require expensive exploration and machinery for mining. A blowtorch was again used by the bank prior to weighing for purchase. The Banco Minero based its purchasing price on a weekly average of international gold prices but deducted about $58 per ounce for various expenses involved in refining, assaying, and other operating costs.

At its San Antonio de Poto gold placer deposit, Department of Puno, MINERO PERÚ planned to group hundreds of independent gold panners into cooperatives to which the miners would pay royalties. Two royalty contracts were in the final phase of preparation with the Cooperativa Aurifera de Producción Santiago de Ananea, which would transfer about 80 hectares to the cooperative. Another contract with Cooperativa Minera Ancocala was in preparation. MINERO PERÚ has divided the San Antonio deposit into four work areas where private companies may initiate operations: Arequipa Pampa, Ancocala, Huachani, and Pampa Blanca. MINERO PERÚ had been operating on a small scale at Pampa Blanca. In midyear, a small gold-washing plant was installed with a capacity of producing between 2,700 and 4,200 ounces of gold per year. This washing plant, purported to be the largest operating in Peru, encountered some problems and was modified. However, by the end of the year, the plant had operated 122 days and produced less than 129 ounces of gold.

In the latter half of 1981, a new gold boom began on the Pacific coast, about 10 kilometers north of Chimbote in the delta area of the Santa River. These deposits had been quietly worked on a small scale since their discovery in 1978. Inevitably, the location became widely known, and by midyear, the region was inundated by over 1,000 gold panners, especially around Guadalupito Beach. By the end of the year, most miners were departing as the easily reached surface sands became well worked over. A more orderly mining plan was emerging as concessions were granted, limiting the haphazard or random pattern of gold-rush-style panning.

After a short preliminary examination by geologists, the Santa River delta was thought to contain concentrations of gold, titanium, zirconium, and platinum. Gold was reportedly found throughout the land area going eastward from the coastline for about 5 kilometers to the Pan-American Highway and for about 25 kilometers in a northern direction from the mouth of the river. The depth of the gold-bearing material had not been determined, and drilling programs were planned. In November, newspaper accounts of mining activity stated that individual miners were panning between 5 and 6 ounces of gold per week using elemental panning and sluicing devices.

Iron Ore.—The possibility of recovering cobalt, copper, and nickel from HIERRO PERÚ's San Nicolás plant tailings had been under study. This potential recovery program aroused some interest in mining circles, and HIERRO PERÚ installed an experimental pilot plant. The company planned, at first, to recover only the copper, retaining the tailings for possible later extraction of cobalt and nickel. In 1981, copper concentrate recovery from the pilot plant amounted to 1,467 tons, averaging 22%

copper, of which 1,404 tons was sold to CENTROMÍN PERÚ for $331,500. Further metallurgical studies were underway.

In 1981, the beneficiation plants at San Nicolás operated at 75% of capacity because of weak market demand. HIERRO PERÚ's 1980-81 production by category is shown in the following table, in thousand metric tons:

	1980	1981	Projected 1982
Pellets	1,564	1,504	1,890
Low-silica pellets	--	193	240
High-grade sinter feed	2,800	3,359	3,460
Pellet feed in slurry form	265	202	--
Pellet feed in cake form	1,076	811	810
Total	5,705	6,069	6,400

Beneficiated iron ore exports in 1981 amounted to 5.2 million tons valued at almost $94 million.[3] The Republic of Korea purchased the major portion, 43%, overtaking Japan, which dropped to second place with 37%, while Yugoslavia purchased 18%. Smaller amounts were shipped to the United States and Argentina. Peru did not export iron ore to Romania and Czechoslovakia in 1981.

A feasibility study was underway for the construction of a plant to produce enriched iron for export using anthracite instead of coke. At a cost of $400 million, the 800,000-ton-per-year plant would enrich Marcona iron ore from 65% to 95% iron content. The project, if viable, would stimulate Peru's coal industry. The primary sources of coal for the new plant would be from mines in the Santa Valley near Chimbote. Preliminary reports indicated the plant might be located near Acari, south of San Nicolás.

Iron and Steel.—Empresa Siderúrgica del Perú (SIDERPERÚ) had a troubled year in 1981. Contracts were signed in 1980 with West German, Austrian, and Spanish firms for the installation of facilities to modernize and expand steelmaking capacity from 440,000 to 720,000 tons per year at a cost of $300 million. The contracts had not gone into effect pending the signing of relevant financing contracts. Improvements included the installation of a coal-based direct-reduction plant, an electric arc furnace, a continuous slab casting plant, and a 50-megawatt thermal powerplant.

All expansion plans were postponed after a World Bank-sponsored study that revised SIDERPERÚ's earlier feasibility study. Instead, it was recommended that the company consider a 3-year rehabilitation plan involving the repair and replacement of equipment that had been deteriorating for several years. The recommendation was to first achieve full use of present capacity, and after the modernization has been completed, steel capacity could be expected to reach 520,000 tons per year. This scaled-down program was estimated to cost $130 million, of which $87 million would be fixed investment.

The modernization program included a reorganization of the company to make it more efficient managerially and technically. A decision whether to reactivate the original expansion plan or proceed with the more modest modernization program was expected early in 1982. SIDERPERÚ has never been profitable, and losses in 1981 were estimated at $26 million. Recent losses were blamed on competition from imported steel after import duties were reduced on construction steel from 41% to 5% in mid-1980. Domestic annual steel demand was projected to reach 700,000 tons by 1985, and without the major expansion program planned earlier, major steel imports would be needed.

In 1981, by Legislative Decree No. 216, SIDERPERÚ was converted into an autonomous state company, with all shares owned by the Government. COFIDE was to control financial matters.

Lead and Zinc.—CENTROMÍN PERÚ continued to be the primary producer of lead and zinc. Its mining units contributed 41% of total lead production and 43% of total zinc. In 1981, about 20% of the lead concentrate treated at La Oroya was purchased from small- and medium-size mines. In the private sector, some producers were affected by various labor and mechanical problems.

The substantial jump in Peru's refined zinc production signaled the March 1981 startup of MINERO PERÚ's Cajamarquilla zinc refinery. By August, plant deficiencies had been corrected, and the production rate was nearing its 102,000-ton-per-year capacity. The plant also produced an estimated 125 tons of metallic cadmium and 124,000 tons of sulfuric acid. Over 84,000 tons of the sulfuric acid was shipped to MINERO PERÚ's Cerro Verde copper mine for leaching purposes. Studies were continuing to determine the best process to extract silver and lead from the residues as additional byproducts.

The major lead and zinc producers are shown in table 6, with recoverable metallic output as estimated by the Peruvian Min-

ing Society.

Cía. Minera San Ignacio de Morococha continued as the largest zinc producer in the private sector. It operated the San Vincente Mine at San Ramón, approximately 400 kilometers west of Lima. An expansion program has been underway and was scheduled for completion late in 1982. Cía. Minera Atacocha S.A., Peru's second largest lead producer, conducted geological studies to accelerate exploration opportunities. At the end of 1981, ore reserves were estimated at 3.5 million tons averaging about 4% lead, 5% zinc, and 3.3 ounces of silver and 0.01 ounce of gold per ton. MINERO PERÚ's Antamina copper-zinc project has been discussed under the section on copper.

Volcán Compañia Minera, S.A., encountered mechanical problems in 1981 that delayed completion of the Carahuacra flotation plant expansion until mid-1982. Cía. Minera Huarón, S.A., one of the oldest mining companies in Peru, also encountered mechanical difficulties at the concentrator during 1981. In addition, Huarón had transportation and shipping problems. Huarón's mines are in the central district of Huayllay, Pasco Department. Mine expansion and new exploration have been underway to increase present mine ore reserves and to allow the company to expand to other areas. This geographic expansion of activities was the basis for Huarón's 1981 decision to become a 33.3% shareholder in Extracciones y Tratamiento de Minerales, S.A. (EXTRAMIN). The other partner in EXTRAMIN was the Société Minière et Metallurgique de Penarroya, a French company. EXTRAMIN planned to process 90,000 tons of ore per year from small miners. A 300-ton-per-day portable plant was purchased for installation next year at Catac, Recuay Province, Ancash Department. The plant was expected to yield about 10,000 tons of lead-zinc-copper-silver bulk concentrate annually.

Table 6.—Peru: Mine output of principal lead and zinc producers

(Metric tons of recoverable metal content)

Company	Lead			Zinc		
	1980	1981	Change, percent	1980	1981	Change, percent
CENTROMÍN PERÚ	69,670	72,000	+3	175,467	180,480	+3
Cía. de Minas Buenaventura, S.A	4,345	5,600	+29	4,136	5,000	+21
Cía. Minera Alianza S.A	7,675	8,000	+4	NA	NA	--
Cía. Minera Atacocha S.A	13,505	13,700	+1	15,685	16,900	+8
Cía. Minera del Madrigal	6,030	5,800	-4	11,405	11,300	-1
Cía. Minera Huarón, S.A	6,875	6,200	-10	14,440	12,864	-11
Cía. Minera Milpo, S.A	11,725	11,276	-4	21,905	23,340	+7
Cía. Minera Raura, S.A	8,290	6,170	-26	12,511	NA	--
Cía. Minera San Ignacio de Morococha	NA	NA	--	34,625	35,925	+4
Cía. Minera Santa Luisa	7,525	6,660	-12	16,325	15,760	-3
Cía. Minerales Santander, Inc	NA	NA	--	22,260	20,200	-9
Minas de Gran Bretaña	NA	NA	--	12,460	12,770	+3
Volcán Compañia Minera, S.A	NA	1,178	--	14,670	18,000	+23

NA Not available.

Source: U.S. Embassy, Lima, Peru. State Department Airgram A-17, May 28, 1982.

Molybdenum.—SPCC was the sole producer of molybdenum in 1982. The two smaller producers, Compañia Minera Turmalina in northern Peru and Compañia Minera San Diego in the Department of Apurimac, southeast of Lima, ceased molybdenum production because of low prices and poor long-term expectations. Taminsa S.A. continued exploration work on its Aries molybdenum deposit in Huari, Ancash Department. Although the depressed world prices for this metal has slowed exploration to some extent, Taminsa planned to apply for a $3 million loan from the Banco Minero. Taminsa expected to continue its studies using diamond drilling.

Silver.—Most of the major silver producers increased their output during 1981. Production gains were offset by a continuation of silver's downward price spiral. During 1981, the price dropped from about $16.50 per troy ounce in January to about $8.50 per troy ounce in December.

In spite of some labor unrest and adverse weather conditions, CENTROMÍN PERÚ's La Oroya refinery produced about the same quantity of refined silver as in 1980. About 52% of the silver concentrate treated at La Oroya came from small- and medium-size private producers.

Table 7 shows estimated recoverable silver from Peru's principal producers. This

table was adapted from data provided by the Peruvian Mining Society and may not conform to information obtained elsewhere.

Cía. de Minas Buenaventura, S.A., experienced some labor and weather problems during 1981, but the company still managed to increase total silver production. Buenaventura's concentrate production also contained lead, zinc, copper, bismuth, cadmium, and gold. However, about 84% of the total value of its 1981 mineral production was attributed to silver. Buenaventura's expansion of the Uchucchacua mining unit, 120 kilometers northeast of Lima, was credited as the principal reason for the increased silver production. Buenaventura continued development work at its other three mining units. At the end of 1981, ownership of the Huachocolpa unit, Huancavelica Department, was transferred to Compañia de Minas Recuperada S.A., owned 99% by Buenaventura.

At Minas de Arcata S.A., owned 51% by the Hochschild Group, plant expansion from 450 to 600 tons per day was almost completed. Arcata's 3.8-megawatt hydroelectric powerplant was expected to go onstream in mid-1982. Total ore reserves at the end of 1981 amounted to 1.8 million tons, averaging 15 ounces of silver per ton. Another Hochschild-managed company, Cía. Minera Caylloma, S.A., operated the San Cristóbal silver mine in Arequipa Department. Cía. Minera Castrovirreyna, S.A., continued development and exploration work at its three silver mining units, San Genero, Astohuaracan, and El Palomo. All of the mines are located in the Province of Castrovirreyna, Department of Huancavelica.

After a favorable study was completed by its subsidiary Consultores Minero Metalúrgicos S.A., CENTROMÍN PERÚ announced it would separate the Andaychagua Mine from its San Cristóbal production unit and develop it as an independent mining unit. Andaychagua produced silver, lead, and zinc. It is located about 10 kilometers east of San Cristóbal and 170 kilometers east of Lima. The proposed expansion project was estimated to cost $42 million. By the end of 1981, a $14 million direct loan was approved by the Inter-American Development Bank, and additional loans were expected from other sources. Proved and probable reserves at Andaychagua were placed at 1.5 million tons, averaging 1% lead, 5.7% zinc, and 5.7 ounces of silver per ton. A 1,000-ton-per-day concentrator was planned that would produce 1.5 million ounces of silver per year contained in 5,200 tons of lead concentrate and 25,400 tons of zinc concentrate. The project was scheduled for completion in 1984.

Table 7.—Peru: Principal producers of silver in ores and concentrates

(Thousand troy ounces of recoverable content)

Company	1979	1980	1981	Change, percent (1980-81)
CENTROMÍN PERÚ	10,978	10,707	11,574	+8
Cía. de Minas Buenaventura, S.A	4,350	3,856	4,192	+9
Minas de Arcata S.A	1,807	2,156	2,529	+17
Cía. Minera Alianza S.A	1,580	1,750	1,940	+11
Cía. Minera Huarón, S.A	1,545	1,544	1,688	+9
Cía. Minera Milpo, S.A	1,643	1,668	1,672	(1)
Cía. Minera Castrovirreyna, S.A	1,382	1,463	1,599	+9
Corp. Minera Nor Peru S.A	1,184	1,219	1,196	-2
Cía. Minera Caylloma, S.A	606	659	1,157	+76
Cía. Minera Atacocha S.A	1,039	1,132	1,127	(1)
Cía. Minera Millotingo, S.A	1,033	1,138	1,075	-6

[1]Less than 1/2 unit.

Tungsten.—Production of tungsten from CENTROMÍN PERÚ's Mahr Tunnel plant at the San Cristóbal Mine continued to plummet, dropping from highest producer in 1979 to third in 1981.

At the Pasto Bueno Mine of Fermin Malaga Santolalla e Hijos Negoc. Minera, an agressive exploration and expansion program continued. By the end of 1981, the company had blocked out over 1 million tons of ore reserves, averaging 0.44% WO_3. In addition, several new exploration claims were filed for tungsten and copper ores in Pallasca Province, Ancash Department. An expansion of the copper sulfide plant from 576 to 720 tons per year was also scheduled.

Minera Regina, S.A., mining the Palca XI deposit northeast of Juliaca, Department of Puno, planned to complete its mill expansion program by the end of 1982. When

completed, capacity was expected to reach 500 tons of concentrate, averaging 70% WO_3.

Sociedad Minera Puquio Cocha S.A. used a pilot plant to recover tungsten concentrate from 50 tons per day of tailings supplied by its copper flotation plant in central Peru. The company expected to bring a 500-ton-per-day processing plant onstream in 1982.

Tungsten production by company was as follows, in metric tons of WO_3 content:

	1979	1980	1981	Change, percent (1980-81)
Malaga Santolalla	192	296	358	+21
Minera Regina, S.A.	102	145	200	+38
CENTROMÍN PERÚ	403	209	130	-38
Small producers	58	50	50	--
Total	755	700	738	+5

NONMETALS

Phosphate.—The U.S. firm Jacobs Engineering Co. proceeded with a feasibility study on the development of the Bayóvar phosphate deposit near Piura in northern Peru. The study was undertaken for Empresa Promotora Bayóvar, owned by MINERO PERÚ (60%), COFIDE (20%), and Empresa Nacional de Comercialización de Insumos (10%).

Bayóvar reserves were estimated as equivalent to 550 million tons of phosphate concentrate containing 30.5% phosphorus pentoxide and 450 million tons of brine containing 1% potassium chloride and 22% sodium chloride.

At MINERO PERÚ's Bayóvar beneficiation plant, capacity was increased to 36,000 tons per year. In 1981, actual concentrate production was about one-third of the new capacity. About 86% of production was exported to New Zealand, where it reportedly performed better than industrial superphosphates in the acid soil. New Zealand found that the Bayóvar concentrate could be used directly as a fertilizer without further treatment. In view of this finding, New Zealand has expressed an interest in participating in investments to expand present production.

MINERAL FUELS

Coal.—In 1981, the Government created a national coal company, Empresa Promotora del Carbón S.A. (PROCARBON), to promote the development and use of Peru's coal resources. PROCARBON is equally owned by four state agencies, CENTROMÍN PERÚ, MINERO PERÚ, COFIDE, and Electricidad del Peru (ELECTROPERÚ). The new company had applied for a $5 million loan from the Inter-American Development Bank. Most of the loan money was to be used for additional exploration at CENTROMÍN PERÚ's Jatunhuasi prospect, with the balance for other coal-exploration studies.

CENTROMÍN PERÚ's Jatunhuasi coal-exploration efforts have increased estimated reserves. About 300,000 tons of semibituminous coking coal has been identified. Potential reserves were still estimated at 10 to 12 million tons, averaging 30% volatile matter, 52% fixed carbon, 20% ash, and 3% sulfur. Calorific value was calculated at 11,000 British thermal units per pound. This deposit has been targeted as a priority project by PROCARBON.

The future development of MINERO PERÚ's Alto Chicama coal project remained uncertain. Financing was not obtained in 1981. Samples were gathered for combustion tests required by ELECTROPERÚ. Both ELECTROPERÚ and MINERO PERÚ planned extended feasibility studies.

The Instituto Geologico Minero y Metalúrgico was in the final phase of completing an inventory of Peru's coal resources.

Petroleum and Natural Gas.—In March 1981, Peru signed the first oil-exploration contract with a foreign company since the Belco Petroleum Corp. contract in 1973. Following lengthy negotiations, Superior Oil Co. and Petrolera General S.A., a subsidiary of Phoenix Canada Oil Co., Ltd., were awarded a 1-million-hectare concession in Block 2 in the northeastern jungle region. Block 2 is located immediately south of productive Block 1A of Occidental and east of the Santiago River. The Block 2 dimensions were altered somewhat so that an area previously explored by Petróleos del Perú (PETROPERÚ) was still reserved exclusively for its possible future exploitation. Superior holds a 90% interest in the venture, and Phoenix Canada Oil, 10%. The contract was similar to PETROPERÚ's renegotiated contract with Occidental. Superior planned a $20 million investment during the next 2 years, including the drilling of at least two wells. The first Superior Block 2 exploration well was spudded in November in the Maranon River basin.

The long-awaited final contract between PETROPERÚ and Royal Dutch/Shell was

signed in July 1981. Shell was committed to spend at least $100 million over the next 4 years in a two-stage exploration program in the southeastern jungle region. The allotted area included Lots 38 and 42, totaling 20,000 square kilometers at the southwestern corner of Loreto Department. At the end of 1981, Shell was involved in seismic exploration and was not expected to drill until 1982 or 1983.

PETROPERÚ and Belco Petroleum Corp. signed a draft agreement to explore an area off the northwestern coast. A formal contract was expected early in 1982. The new area, Block Z28, includes 3,995 square kilometers and lies immediately to the west of Belco's existing acreage in Blocks Z1 and Z2.

PETROPERÚ announced that in 1981 new discoveries had increased proven oil reserves to 840 million barrels, of which 57% was in the northeastern and central jungle areas, 30% in the northwestern coastal fields, and 13% was in Belco's Continental Shelf area. These reserves were not thought to be sufficient to ward off the prospect of Peru's becoming an importer of crude oil within the next 5 years. This prospective dependency on oil imports was the overriding basis for Peru's renewed efforts to attract foreign and national investment for oil exploration.

PETROPERÚ announced the wildcat discovery of a new field, the San Juan, in Block 8 in the northeastern jungle. This followed the late 1980 discovery of the Nueva Esperanza Field. The Nueva Esperanza well tested about 7,680 barrels per day of 45° API gravity crude oil at a depth of 10,270 feet. PETROPERÚ estimated that this field could have 20 million barrels of reserves and produce 10,000 barrels of oil per day. The San Juan well had a poor initial flow, but a confirmation well was planned for 1982.

Occidental also announced oil discoveries from two structures in the northern jungle. The more important of these was the Ceci, near the Corrientes River and close to the boundary between Blocks 1A and 1B. The Ceci No. 1 flowed 44° and 42° API gravity crude oil from two zones at a combined rate of 1,700 barrels per day from a depth of about 11,600 feet. The site is less than 8 miles from Occidental's nearest producing field. Potential reserves were not estimated pending delineation of the field. The second discovery was the Jivarito No. 1, drilled south of the Shiviyacu Field in Block 1B. The well tested at 1,200 barrels per day of 14° API gravity crude oil from a depth of about 9,600 feet. Occidental planned to drill again 6 miles south of the Jivarito discovery and to conduct additional seismic surveys.

Crude oil production failed to meet expectations in 1981. This was attributed to less-than-anticipated progress from secondary recovery projects on the northwestern coast and to oil transport problems from jungle operations. The inadequate pipeline network from the northern jungle fields inhibited production from that area. PETROPERÚ planned to initiate construction of necessary feeder lines in the near future.

The largest share of natural gas production, 36%, came from Belco's offshore operations, followed by PETROPERÚ from its northwest coastal fields.

Uranium.—No contracts for uranium exploration were issued by the Instituto Peruano de Energía Nuclear (IPEN) during 1981. Decree Law 23112, of July 9, 1980, authorized IPEN to enter into agreements with national and foreign companies for the purpose of uranium exploration and exploitation. A number of foreign companies have applied, and IPEN was expected to announce its decision in 1982. Meanwhile, the Government has reserved for itself about 400,000 hectares around Macusani and Carabaya in the Department of Puno. IPEN had initiated prospecting work in the area.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Peruvian soles (S) to U.S. dollars at the 1981 average exchange rate of S426.59=US$1.00. In January 1981, the sol averaged S341.17=US$1.00, and in December 1981, the sol averaged S506.17=US$1.00.

[3]Empresa Minera de Hierro del Perú. Annual Report 1981. Export data does not agree with that shown in the tabulation of 1981 mineral exports through MINPECO in table 3 of this chapter.

The Mineral Industry of the Philippines

By John C. Wu[1]

In 1981, the Philippines economy grew at a slower pace than in 1980. According to the Philippines National Economic Development Authority, the development target of real growth in gross national product (GNP) in 1981 was 6.5% under the 5-year Philippines development plan (1978-82). However, the real growth in the Philippines GNP in 1981 was 4.9% compared with 5.4% (revised) in 1980, and ranked fifth among the five members of the Association of Southeast Asian Nations. The Philippines GNP in 1972 constant dollars was $12.9 billion in 1981 compared with $12.3 billion in 1980.[2]

The slower growth in the Philippines economy in 1981 was caused by weakened exports, depreciated currency, mounting foreign debts, and a deteriorated balance-of-payments deficit. In 1981, despite increases in exports of coconut products and nontraditional manufactures, exports of sugar, timber, and minerals decreased because of the cutback in imports by the Philippines major trade partners—the United States and Japan. As a result, the Philippines export earnings dropped 4.3% from $4.7 billion in 1980 to $4.5 billion in 1981, while the import bills rose 9.5% from $6.38 billion in 1980 to $6.99 billion mainly because of the higher oil import bills. The Philippines external debts increased 24.7% from $12.7 billion in 1980 to $15.84 billion in 1981, while the overall balance-of-payments deficit was $560 million in 1981 compared with $381 million in 1980. However, the rate of inflation, as measured by the consumer price index, dropped to 12.5% in 1981 from 17.8% in 1980.[3]

In 1981, the mining and quarrying sector had the lowest growth rate of the major sectors in the Philippines gross domestic product (GDP). By sector, the growth rates during 1980-81 were as follows, in percent:

Sector	Growth rates	
	1980	1981
Agriculture, fishery, forestry	4.9	4.3
Mining and quarrying	4.8	1.7
Manufacturing	5.9	5.1
Construction	9.7	5.8
Electricity, gas, water	8.5	7.8
Transportation, communication, storage	4.6	4.1
Commerce	5.5	5.0
Services	5.5	4.8

The sluggish performance of the Philippines mining and quarrying industry was a result of the general downswing in metal prices caused by deepening of the worldwide economic recession and the slow growth in advanced industrial nations that cut their import demand for the Philippines mineral commodities. However, the mining industry continued to be an important sector of the Philippines economy. Its value contributed about 2.8% to the country's GDP in 1981.[4]

In 1981, the Philippines remained among the top 10 world producers of cobalt, copper, and gold. Other important metallic minerals produced by the Philippines included chromium, nickel, and silver. According to the Philippines Ministry of Natural Resources, the future development of nontraditional mineral products (nonmetallics), such as dolomite and silica, will become important in the Philippines mining sector. Under the 5-year development plan, the nonmetallic sector is to contribute at least 25% of the total mineral output value.[5]

Of the five industrial projects related to the mining sector, all except the aluminum smelter project were moving smoothly during 1981. The $373.2 million copper smelter project was proceeding smoothly and was scheduled for completion in April 1983. The $1.5 billion integrated steel mill project was

scaled down to $765 million. Instead of setting up a new steel mill complex, the Government of the Philippines has decided to modernize and expand the existing facilities of the National Steel Corp. in Iligan City on Mindanao Island. Bids on the iron-making plant have been received by the Philippines from four consortia. The rationalization and expansion of the cement industry was also proceeding on schedule. Polysius Ltd., a British subsidiary of Krupp Polysius AG Beckum of the Federal Republic of Germany, has received an order from the Philippines Cement Industry Authority to deliver nine coal-grinding plants valued at about $38.3 million. The Philippines first phosphatic fertilizer facility was moving toward actual construction work. A consortium led by Coppee-Rust of Belgium has won the contract. The plant was scheduled to come onstream in 1985, and was expected to reach full capacity in 1987. The aluminum smelter project, however, never got off the ground in 1981 because of the disagreement over pricing of the hydroelectric power between the Philippines and Reynolds Metals Aluminum Co. of the United States.

In November 1981, the Philippines Bureau of Mines and Geosciences reported that substantial heavy mineral deposits were discovered in many beach and offshore areas after aeromagnetic surveys, regional gravity surveys, sea-bottom samplings, and multispectral photography were made and studied. The important findings are as follows: (1) Heavy concentrations of detrital magnetite, chromite, gold, and ilmenite were found along the coastlines of Bascarra-Paoay, San Ildefonso-Vigau, Bauang-Santo Tomas, Carlatan-Bacnotan, and San Fabian-Dagupan; (2) placer gold deposits were discovered along the Jose Panganiban-Paracale coastline of the Bicol region; (3) silica sand deposits were found along the northern coast of Rapu-Rapu Island in the Visayas; (4) concentrations of magnetite were discovered in the Tanauan-Abuyig and Barugo-Capoocan coastal area of northern Leyte and in the San Jose-Pawig coastline of northeastern Leyte.[6]

In December 1981, the President of the Philippines ordered the establishment of a special stabilization fund to assist mining companies during periods of depressed metal prices in world markets. A $625 million industrial fund was being set aside for the exclusive use of the distressed mining industry during the 1981-83 period. About $187.5 million was to be released annually starting in 1981. Based on the proposed mechanism of disbursement, a mining company can withdraw funds whenever the prices of its mineral products fall below the trigger level. The withdrawn funds are to be repaid when prices rise.[7]

The Government of the Philippines, in an effort to encourage mineral development, announced that mining companies with large and/or newly discovered ore reserves will also be granted tax exemption. Section 53 of Presidential Decree No. 463, Executive Order No. 660, which was announced on March 4, 1980, entitled mining companies that are expanding their operations to tax exemption. The tax exemption privileges granted to new and old mines under Section 53 of Presidential Decree 463 included customs duties on imported equipment and royalties. The tax exemption privilege would be limited to 2 years from the first day of operation.[8]

The first nuclear powerplant in the Philippines resumed construction on September 15, 1980, after construction was halted for redesigning to meet additional safety requirements. The construction work was proceeding smoothly in Bagac (Borong), Bataan, about 80 kilometers west of Manila. Because of the additional safety equipment, the total cost of the project was estimated at $1.9 billion, about $800 million more than the original cost estimate. The 620-megawatt nuclear powerplant was expected to be completed by December 1983 or January 1984. Australia is reportedly expected to supply about 840 tons of U_3O_8 for the fuel requirements of the nuclear powerplant between 1985 and 1990.

PRODUCTION

The Philippines total mineral production for the first 9 months in 1981 dropped 7.8% to $1,127 million from that of the same period in 1980 as a result of the general downswing in metal prices. The output of all metallic minerals except gold and zinc declined for the first 9 months in 1981 from that of the same period in 1980.

Despite a significant drop in the output value of copper, the copper industry remained the most important sector of the Philippines mining industry. Copper pro-

ducers contributed not only copper (about 30% of the total mineral production value), but also a very significant amount of gold as a byproduct to the country's total mineral output value. Because of the lower prices and weakened demand for metals, the mine production of chromium, cobalt, copper, nickel, manganese, lead, and molybdenum were all at lower levels in 1981 than in 1980. However, mine production of gold increased significantly because of mining expansions by Benguet Corp., Atlas Consolidated Mining and Development Corp., and Apex Mining Co., Inc.

In the mineral fuels sector, the output of coal jumped by 15% in 1981 from that of 1980. It is expected that coal output will continue to increase in 1982 with the expansion of mining operations by Semirara Coal Corp. and Coalfields Mining and Industrial Corp. The Philippines crude oil production from Nido Oilfield continued to decline during 1981. However, the country's second oilfield, Cadlao, operated by Amoco Philippines Petroleum Co., started commercial operation in September 1981. By yearend, the output of two wells at Cadlao Oilfield was about 9,000 barrels per day. The third oilfield, Matinloc, operated by Cities Service Inc., is expected to start its commercial operation with an initial rate of 12,000 barrels per day in June or July 1982.

Table 1.—Philippines: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Chromium: Chromite, gross weight:					
Metallurgical-grade	136,173	141,048	167,785	160,961	[3]156,325
Refractory-grade	402,376	398,850	388,325	335,099	[3]186,442
Total	538,549	539,898	556,110	496,060	[3]342,767
Cobalt, mine output, metal content	1,084	1,192	1,370	1,331	[3]1,093
Copper, mine output, metal content	272,792	263,590	298,300	304,504	[3]305,262
Gold—troy ounces	558,554	586,531	535,166	643,806	[3]756,217
Iron and steel:					
Iron ore and concentrate—thousand tons	--	2	6	--	[3]6
Ferroalloys: Electric-furnace ferrosilicon[e]	15,000	14,000	18,000	20,000	20,000
Crude steel—thousand tons	364	276	397	420	400
Lead, mine output, metal content	3,695	1,448	1,949	1,812	[3]1,346
Manganese ore and concentrate, gross weight	20,599	3,911	3,769	2,556	[3]10,737
Molybdenum, mine output, metal content	--	55	141	91	[3]93
Nickel:					
Mine output, metal content	36,781	29,528	33,287	47,114	[3]30,797
Metal, smelter	21,873	18,737	21,478	25,381	[3]23,928
Silver, mine output, metal content—thousand troy ounces	1,621	1,640	1,838	1,952	[3]2,023
Zinc, mine output, metal content	12,442	9,468	9,670	6,845	[3]5,828
NONMETALS					
Asbestos	--	159	--	6	10
Barite	5,393	5,548	6,667	5,355	5,000
Cement, hydraulic—thousand tons	4,197	4,340	3,950	4,482	[3]4,207
Clays:					
Bentonite	2,279	1,569	3,123	5,053	5,000
Red	18,737	12,271	24,126	31,561	30,000
White	11,854	7,040	402,241	14,310	15,000
Rock	913	373	1,393	1,039	1,000
Other	411,568	502,241	428,639	453,494	450,000
Feldspar	16,073	18,073	19,064	15,925	16,000
Gypsum and anhydrite:					
Natural	1,710	[e]1,700	--	--	--
Synthetic[e]	110,000	110,000	110,000	110,000	110,000
Lime	28,184	33,317	53,887	87,363	90,000
Nitrogen: N content of ammonia	[e]40,000	[e]40,000	[e]40,400	39,100	40,000
Phosphate:					
Guano	162	821	3,158	24,836	25,000
Phosphate rock	10,323	1,074	2,495	16,794	17,000
Perlite	1,864	3,168	3,806	7,973	8,000
Pyrite and pyrrhotite (including cuprous), gross weight	108,523	110,774	87,408	115,231	120,000
Salt, marine	200,000	225,650	322,131	346,387	[3]355,289
Sand and gravel:					
Alumina sand	18,040	31,414	26,547	25,723	26,000
Silica sand—thousand tons	311	419	407	477	[3]484
Other[4]—thousand cubic meters	7,347	9,964	11,132	13,310	[3]16,227

See footnotes at end of table.

Table 1.—Philippines: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Stone:					
Andesite	420,000	8,461	276,221	231,872	230,000
Basalt ---- cubic meters	--	--	421	--	--
Coral ---- do	14	40	--	--	--
Dacite	20,224	18,841	18,136	10,636	11,000
Diorite	97,841	90,128	112,319	86,800	100,000
Dolomite	7,442	7,600	10,375	11,318	12,000
Limestone[5] ---- thousand tons	6,393	[r]9,232	10,156	10,100	10,000
Marble (dimension), unfinished cubic meters	5,750	8,692	5,966	9,273	9,000
Volcanic cinder ---- do	NA	346,235	827	2,379	2,000
Sandstone	67,612	91,337	47,006	57,467	60,000
Serpentine	NA	2,571	7,579	23,571	20,000
Tuff	58,574	90,493	106,327	132,721	120,000
Quartz	8,917	28,190	39,298	60,007	70,000
Crushed, broken, other[6] thousand cubic meters	1,572	4,066	1,908	1,687	1,500
Sulfur, S content of pyrite	50,463	51,510	40,645	53,583	50,000
Talc	1,200	4,061	3,570	863	900
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades	284,554	255,054	263,132	325,008	[3]373,000
Petroleum:					
Crude ---- thousand 42-gallon barrels	--	--	8,570	3,620	[3]4,380
Refinery products:					
Gasoline ---- do	15,234	14,423	14,632	11,751	NA
Jet fuel ---- do	2,665	2,684	2,174	2,270	NA
Kerosine ---- do	3,110	3,516	4,055	3,620	NA
Distillate fuel oil ---- do	15,021	14,966	16,532	17,204	NA
Residual fuel oil ---- do	27,244	29,500	29,278	27,333	NA
Other ---- do	2,959	2,542	3,002	3,421	NA
Refinery fuel and losses ---- do	3,639	4,195	3,536	3,203	NA
Total ---- do	69,872	71,826	73,209	68,802	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through July 9, 1982.

[2]In addition to the commodities listed, the Philippines produces platinum-group metals as byproducts of other metals, but output is not reported quantitatively and no basis is available to make reliable estimates of output levels.

[3]Reported figure.

[4]Includes "pebbles" and "soil," not further described.

[5]Excludes limestone for road construction, reported in cubic meters, which totaled 9,687 cubic meters in 1978 and 2,932 cubic meters in 1979 (other years not available).

[6]Includes materials described as: rock, crushed or broken; stones, cobbles, and boulders; rock aggregates; and broken adobe.

TRADE

In 1981, the Philippines total export earnings were estimated at $4.45 billion, a 4.3% drop from $4.65 billion registered in 1980, because of the lower world market prices of the country's export commodities. The total imports were estimated at almost $7 billion, a 9.5% jump from $6.38 billion, mainly owing to higher oil import prices. As a result, the Philippines trade deficit was pushed up by 46.2% from $1.73 billion in 1980 to $2.53 billion in 1981.

According to the latest report of the Philippines Central Bank, during the first 10 months of 1981 total mineral exports declined 25% to $756.75 million from the same period of 1980. For the same period, export earnings of copper declined 21% to $463.07 million, gold declined 31% to $135.11 million, nickel declined 32% to $90.46 million, and other metals declined 29% to $68.11 million. Among the top export-earning commodities, copper and nickel ranked third and sixth, respectively, in 1981. Other major export commodities were sugar, crude coconut oil, garments, electrical equipment (integrated circuits),

bananas, lumber, and wood products. The Philippines principal imports in 1981 were mineral fuels, nonelectrical machinery, transport equipment, base metals, electrical machinery, and appliances.

During 1981, the principal exporting partners of the Philippines were Japan, the United States, the Netherlands, the Federal Republic of Germany, and the Republic of Korea. The principal importing partners were Japan, the United States, Saudi Arabia, Kuwait, and the Federal Republic of Germany.

Table 2.—Philippines: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Unwrought	1,050	38	--	Hong Kong 37.
Semimanufactures	924	2,925	--	Hong Kong 2,548.
Chromium ore and concentrate	496,770	484,109	163,032	Japan 190,436; China 24,905; Canada 22,116.
Copper:				
Ore and concentrate thousand tons	1,048	1,149	36	Japan 849; Republic of Korea 125; U.S.S.R. 30.
Matte	10	6,703	--	All to Japan.
Metal including alloys:				
Scrap	792	1,730	30	Japan 779; India 115; other Asia, n.e.s. 783.
Unwrought and semimanufactures	1	60	--	All to other Asia, n.e.s.
Gold metal in copper ore and concentrates troy ounces	367,211	NA	NA	NA.
Iron and steel:				
Ore and concentrate thousand tons	4,100	4,264	--	Japan 4,228.
Pyrite, roasted	33,079	59,535	--	Other Asia, n.e.s. 53,415.
Metal including alloys:				
Scrap	2,530	2,170	--	Japan 601; other Asia, n.e.s. 1,559.
Pig iron and similar materials	23	26	--	All to Japan.
Ferroalloys:				
Ferrosilicon	10,117	NA	NA	NA.
Other	1,021	[1]18,001	--	Japan 16,779.
Semimanufactures:				
Bars, rods, angles, shapes, sections	283	1,286	--	Singapore 1,157.
Universals, plates, sheets	78,195	120,162	793	Thailand 33,060; Iran 26,342; Indonesia 13,211.
Hoop and strip	2,950	9	--	All to Australia.
Wire	25	--		
Tubes, pipes, fittings	2,808	1,800	--	Australia 759; France 671; Singapore 306.
Castings and forgings, rough	905	851	508	Australia 264.
Lead:				
Ore and concentrate	5,574	3,232	--	All to Japan.
Metal including alloys, all forms	--	894	--	Do.
Manganese ore and concentrate	7,383	1,000	--	All to other Asia, n.e.s.
Molybdenum ore and concentrate	210	NA	NA	NA.
Nickel:				
Ore and concentrate	704,299	608,824	--	Japan 608,118.
Metal including alloys:				
Scrap	--	125	--	All to Japan.
Unwrought	14,791	18,823	8,904	Netherlands 6,716; Japan 1,264; Romania 625.
Semimanufactures	2,416	4,135	2,555	Netherlands 1,580.
Silver:				
Ore and concentrate[2] value, thousands	$103,280	$239,149	$16,325	Japan $175,508; Republic of Korea $13,816.
Metal including alloys, unwrought and partly wrought do	$532	$76	--	All to Hong Kong.
Tin metal including alloys, waste, scrap	403	34	34	
Tungsten metal including alloys, waste, scrap kilograms	393	--		
Zinc:				
Ore and concentrate	22,295	14,859	--	All to Japan.
Metal including alloys:				
Scrap	305	184	--	Japan 100; other Asia, n.e.s. 84.
Semimanufactures	15	100	--	Malaysia 64; Hong Kong 36.
Other:				
Ores and concentrates of niobium, tantalum, vanadium	210	180	77	West Germany 92.
Ash and residue containing nonferrous metals	1,949	1,767	--	Japan 1,109.

See footnotes at end of table.

Table 2.—Philippines: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Other —Continued				
Base metals including alloys, all forms	4	165	8	Japan 99; Hong Kong 15.
NONMETALS				
Abrasives: Grinding and polishing wheels and stones, value, thousands	NA	$10	--	All to other Asia, n.e.s.
Cement	291,580	767,170	--	Bangladesh 214,588; Hong Kong 177,910; India 73,242.
Chalk, kilograms	160	--		
Clays and clay products:				
Crude	23	241	--	Thailand 34; other Asia, n.e.s. 198.
Products:				
Nonrefractory, value, thousands	$4,748	$8,422	$556	Hong Kong $2,816; Singapore $1,748; West Germany $1,055.
Refractory, do	r$2	$203	--	Japan $153; Indonesia $28; Hong Kong $22.
Fertilizer materials:				
Manufactured:				
Nitrogenous	--	550	--	Kampuchea 500; Hong Kong 50.
Other including mixed	(3)	1,000	--	All to Kampuchea.
Ammonia	11	2	--	All to Hong Kong.
Pyrite	6,732	--		
Salt, kilograms	544	--		
Sodium and potassium compounds: Caustic potash	(3)	1	1	
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	574	319	27	Japan 230; Hong Kong 62.
Worked	1,533	3,799	706	Japan 1,353; Singapore 732; Hong Kong 727.
Gravel and crushed stone	1,383	2,936	5	Japan 2,026; Hong Kong 659.
Limestone except dimension	71,622	120,595	--	All to Australia.
Sand	1,182	1,539	174	Japan 494; Hong Kong 450; United Kingdom 136.
Sulfur: Sulfuric acid, oleum	147	54	--	Guam 35; Hong Kong 19.
Other:				
Crude	3,868	3,791	--	Hong Kong 789; other Asia, n.e.s. 2,788.
Slag, dross, similar waste, not metal-bearing	27	153	--	West Germany 86; other Asia, n.e.s. 65.
Halogens, chlorine, kilograms	400	--		
Activated mineral products, natural	2,273	--		
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	--	784	--	All to Hong Kong.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	2,145	756	--	Thailand 703.
Coal, briquets	44	--		
Petroleum refinery products:[4]				
Gasoline:				
Aviation, 42-gallon barrels	13,202	NA	NA	NA.
Motor, do	90,972	[5]716,448	--	Thailand 358,343; Burmuda 226,610.
Kerosine and jet fuel, do	8,704	NA	NA	NA.
Distillate fuel oil, do	183,926	7,162	--	All to Pacific Islands.
Residual fuel oil, do	93,355	26,360	--	All to Thailand.
Lubricants, do	21,006	12,229	--	Thailand 3,801; Singapore 2,352; Republic of Korea 1,918.
Other:				
Liquefied petroleum gas, do	13,050	46,539	--	Japan 29,139; Bahamas 17,400.
Mineral wax, do	2	--		
Bitumen and other residues, do	22	24	--	All to Hong Kong.
Total, do	424,239	808,762		

rRevised. NA Not available.
[1]Includes all ferroalloys.
[2]May include some platinum-group ore and concentrate.
[3]Less than 1/2 unit.
[4]Excludes bunker loadings.
[5]May include aviation gasoline.

Table 3.—Philippines: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	9,909	8,219	14	Malaysia 8,005.
Oxides and hydroxides	2,743	1,202	102	Japan 743; China 110; West Germany 94.
Metal including alloys:				
Scrap	38	68	31	West Germany 32.
Unwrought	28,412	17,651	3,883	Australia 7,824; Japan 2,458; France 1,473.
Semimanufactures	6,948	5,426	383	Japan 2,198; Sweden 624; West Germany 524.
Arsenic trioxide, pentoxide, acids	246	NA	NA	NA.
Chromium:				
Ore and concentrate—kilograms	500	--		
Oxides and hydroxides	85	70	30	Italy 18; West Germany 12; Japan 10.
Cobalt oxides and hydroxides	r1	2	--	Japan 1.
Copper:				
Copper sulfate	185	NA	NA	NA.
Metal including alloys:				
Scrap	--	272	--	Singapore 109; Japan 100.
Unwrought	5,273	4,961	159	Japan 3,966; Canada 244.
Semimanufactures	4,994	4,824	634	Japan 3,030; Australia 385.
Gold metal including alloys:				
Unwrought or semimanufactures—troy ounces	165	NA	NA	NA.
Rolled-on base metal or silver—do	2,967	NA	NA	NA.
Iron and steel:				
Ore and concentrate—thousand tons	3,363	4,651	--	Australia 2,186; Brazil 1,971; Canada 494.
Metal including alloys:				
Scrap	95,465	8,966	5,465	Japan 2,051.
Pig iron, cast iron, powder, shot	45,567	20,563	61	Sweden 17,468; Republic of Korea 1,864.
Ferroalloys:				
Ferromanganese	5,537	3,214	--	Japan 2,011.
Ferrosilicon	177	--		
Others	1,309	1,666	88	Other Asia, n.e.s. 660; India 521.
Steel, primary forms	669,195	479,630	9,019	Japan 211,115; Australia 92,261; Republic of Korea 64,962.
Semimanufactures:				
Bars, rods, angles, shapes, sections	78,554	70,114	339	Japan 52,405; Australia 6,817.
Universals, plates, sheets	371,824	279,013	1,563	Japan 256,768.
Hoop and strip	11,539	20,220	246	Australia 11,260; Japan 7,931.
Rails and accessories	10,059	6,001	147	Japan 3,552; Hong Kong 763; West Germany 617.
Wire	16,924	13,332	138	Japan 7,896; Republic of Korea 3,017.
Tubes, pipes, fittings	40,019	39,382	5,316	Japan 29,608; Singapore 1,992.
Castings and forgings, rough	21	--		
Lead:				
Oxides	494	60	17	Australia 39.
Metal including alloys:				
Scrap	929	655	124	Australia 515.
Unwrought	7,648	5,422	153	Australia 4,865.
Semimanufactures	369	357	30	West Germany 88; Japan 84; Belgium-Luxembourg 59.
Magnesium metal including alloys, all forms	35	6	5	NA.
Manganese:				
Ore and concentrate	3,456	6,626	--	Singapore 6,322.
Oxides	1,445	1,365	26	Japan 846; India 350.
Mercury—value, thousands	$52	$6	$1	Netherlands $5.
Molybdenum metal including alloys, all forms	71	17	3	Netherlands 10.
Nickel metal including alloys, all forms	164	190	39	Canada 43; Japan 37; Australia 29.
Platinum and platinum-group metals, unwrought and partly wrought—value, thousands	$22	$56	$7	West Germany $48.
Silver metal including alloys, unwrought and partly wrought—do	$77	$45	$2	West Germany $24; Japan $19.
Tin:				
Oxide—kilograms	1,130	--		
Metal including alloys, all forms	488	553	11	Malaysia 156; Thailand 150; Japan 128.
Titanium:				
Ores (rutile and ilmenite)	493	NA	NA	NA.
Oxides and hydroxides	2,585	1,322	66	West Germany 396; Japan 330; Australia 279.
Tungsten metal including alloys, all forms	1	96	53	Japan 40.
Zinc:				
Oxides and peroxides	1,090	792	47	Other Asia, n.e.s. 398; India 108; Australia 57.
Metal including alloys:				
Scrap	15	20	--	All from Australia.
Unwrought	26,550	16,174	108	Japan 6,028; Australia 4,948; Canada 3,131.
Semimanufactures	578	653	234	Japan 380.
Zirconium ore and concentrate	383	NA	NA	NA.

See footnotes at end of table.

Table 3.—Philippines: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates of niobium, tantalum, vanadium	876	1,080	--	Australia 975; Japan 105.
Other ores and concentrates	120	1	--	All from Japan.
Ash and residue containing nonferrous metals	68,658	38,366	--	Japan 38,358.
Oxides, hydroxides, peroxides	446	295	103	Republic of Korea 51; Hong Kong 38; Japan 38.
Metalloids	28	17	--	Japan 14.
Alkali, alkaline-earths, rare-earth metals	8	8	2	Australia 3; United Kingdom 2.
Base metals including alloys, all forms	78	654	9	Papua New Guinea 521; Hong Kong 71.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	1,187	485	80	Spain 132; Greece 87; China 80.
Artificial corundum	125	131	1	Italy 87; Japan 43.
Dust and powder of precious and semi-precious stones, value, thousands	$85	$197	--	Belgium-Luxembourg $195.
Grinding and polishing wheels and stones	1,160	1,094	70	Japan 204; Brazil 193; West Germany 156.
Asbestos	6,570	4,467	282	Canada 2,174; Australia 1,296.
Barite and witherite	1,054	1,893	--	Singapore 1,833.
Boron materials, oxides and acids	696	839	764	France 72.
Cement	21,027	28,773	2,853	Japan 20,229.
Chalk	20	215	--	Japan 164; China 50.
Clays and clay products:				
Crude, n.e.s.:				
Bentonite and fuller's earth	10,258	NA	NA	NA.
Fire clay	1,366	NA	NA	NA.
Kaolin (china clay)	9,441	NA	NA	NA.
Other	15,458	[1]31,227	13,494	Singapore 8,912; Japan 4,293; United Kingdom 2,238.
Products:				
Refractory including nonclay bricks value, thousands	$9,966	$14,902	$2,504	Japan $6,841; United Kingdom $1,608; West Germany $865.
Nonrefractory do	$513	$370	$13	Italy $263.
Diamond, industrial do	$480	$439	--	Australia $328; Belgium-Luxembourg $86.
Diatomite and other infusorial earth	1,451	1,609	849	Japan 716.
Feldspar and fluorspar	3,354	3,022	65	India 1,033; Japan 471; Italy 448.
Fertilizer materials:				
Crude:				
Nitrogenous	30	100	--	All from Chile.
Phosphatic	96,632	30,011	4,371	Jordan 25,500.
Manufactured:				
Nitrogenous	503,237	631,219	50,402	Republic of Korea 253,098; U.S.S.R. 115,261; Indonesia 79,297.
Phosphatic	77,952	88,828	74,578	Republic of Korea 14,250.
Potassic	107,491	135,475	6,651	Canada 74,578; East Germany 31,765; U.S.S.R. 10,745.
Other including mixed	38,366	16,731	7	Japan 9,102; Republic of Korea 7,150.
Ammonia	200,193	188,578	8	Japan 187,852.
Graphite, natural	291	184	18	Italy 87; Austria 34; Hong Kong 25.
Gypsum and plasters	63,274	65,671	131	Japan 42,576; Australia 12,516.
Lime	306	758	545	West Germany 120.
Magnesite	3,913	6,856	--	Japan 5,816; China 650.
Mica:				
Crude including splittings and waste	61	109	20	India 78.
Worked including agglomerated splittings	22	33	4	India 18; Japan 6.
Pigments, mineral:				
Natural, crude	3,586	--		
Iron oxides, processed	1,615	668	30	West Germany 430; Spain 106.
Precious and semiprecious stones:				
Natural value, thousands	$22	$12	--	Australia $5; Republic of South Africa $4.
Synthetic do	$24	$106	$7	Belgium-Luxembourg $87; Brazil $7.
Salt	63,989	60,022	198	Australia 56,338.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	27,567	15,137	5,537	Republic of Korea 2,358; West Germany 1,191; Poland 850.
Caustic potash	860	953	96	Japan 671; Italy 56; China 52.
Soda ash	81,554	89,715	42,071	Kenya 23,000; Japan 16,055; West Germany 6,556.
Stone, sand and gravel:				
Dimension stone, crude and partly worked	1,025	279	74	Hong Kong 190.
Dolomite	9,867	5,305	--	Japan 2,609; West Germany 620; Austria 618.
Gravel and crushed stone	242	268	--	France 126; Japan 87; Belgium-Luxembourg 54.
Limestone, except dimension	960	459	--	Japan 345; West Germany 60.
Quartz and quartzite	317	181	--	Republic of Korea 150.
Sand:				
Natural (river and sea)	18	NA	NA	NA.

See footnotes at end of table.

Table 3.—Philippines: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Sand —Continued				
Silica	17,066	NA	NA	NA.
Other	2,328	[2]16,878	137	Malaysia 15,300.
Sulfur:				
Elemental, all forms	18,141	28,628	159	Canada 19,962; Japan 7,175.
Sulfur dioxide	58	NA	NA	NA.
Sulfuric acid, oleum	87,963	70,827	21	Japan 70,791.
Talc, steatite	7,148	8,097	735	Republic of Korea 5,950; China 991.
Other:				
Crude	279	3,336	90	India 1,765; United Kingdom 734; Australia 268.
Slag, dross, and similar waste, not metal-bearing	88,790	50,638	--	Japan 50,475.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	3,173	813	155	Japan 300; Australia 238.
Bromine, iodine, fluorine, chlorine	42	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	941	1,020	20	Republic of Korea 850; China 150.
Carbon black	1,240	1,132	325	Japan 422; Australia 281.
Coal and briquets:				
Anthracite and bituminous coal	1,388	2,422	283	Japan 2,088.
Briquets of anthracite and bituminous coal	68	--		
Lignite and lignite briquets	366	--		
Coke and semicoke	267,695	333,775	67,602	Japan 202,062; Australia 63,861.
Hydrogen and rare gases	198	353	153	Japan 141.
Peat and peat briquets	3	17	--	All from Finland.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	67,100	62,012	--	Saudi Arabia 28,966; Kuwait 8,704; Iraq 6,784; China 6,453.
Refinery products:				
Gasoline:				
Aviation do	193	NA	--	NA.
Motor do	523	322	[3]	China 177; Bahrain 65; Italy 49.
Kerosine and jet fuel do	57	39	--	All from Bahrain.
Distillate fuel oil do	11,375	13,271	--	Kuwait 6,335; Bahrain 4,659; Singapore 1,308.
Lubricants do	55	113	66	Netherlands 17; Netherlands Antilles 11.
Other:				
Liquefied petroleum gas do	646	633	[3]	Australia 299; Saudi Arabia 210.
Naphtha do	1,487	NA	--	NA.
Mineral jelly and wax do	100	56	6	China 27; Japan 10; Hong Kong 7.
Bitumen and other residues do	2	1	[3]	NA.
Petroleum coke do	[3]	[3]	[3]	NA.
Bituminous mixtures, n.e.s do	2	3	1	Japan 1.
Nonlubricating oils, n.e.s do	15	--		
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	6,311	5,399	598	Australia 1,166; Japan 910; France 560.

[r]Revised. NA Not available.
[1]Includes all types of clays.
[2]Includes all types of sands.
[3]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—In 1981, the proposed $773 million aluminum smelter did not get off the ground. Despite the assurance of Reynolds Aluminum Co. of the United States to finance and build the smelter, National Development Co., the investment arm of the Philippines Government, was reportedly discussing with Biliton International of the Royal Dutch/Shell Group the possibility of Biliton's partnership in the project. Because

of the cutback in new aluminum projects worldwide, caused by the reduced world demand for aluminum, both Reynolds and Biliton have not done anything other than express interest in the project.[9]

Exploration work of the bauxite deposits on Samar Island was not going well because of the deteriorated civil conditions in areas of Gandara, Matuginao, and San Jose de Bauan. However, the survey of the bauxite deposits in areas of Salcedo, Mercedes, Guian, and Concord, as well as on Batag Island, was completed by the Philippines Bureau of Mines and Geosciences in 1981. Based on the survey, the bauxite deposits in these areas were estimated at 120 million tons.

Chromium.—Mine production of both refractory and metallurgical chromite ores declined in 1981. Consolidated Mines, Inc. (the property owner), under an operating contract with Benguet Corp. (the operator), remained the single most important producer of refractory chromite ore in the Philippines, accounting for over 95% of the total refractory chromite output. In 1981, other major refractory chromite ore producers were Capital Mineral Resources and Development Co., Inc.; Pulsar Mineral Resources, Inc.; and Philchrome Mining Corp. Production of metallurgical chromite ore and concentrate was by Acoje Mining Co.; Trident Mining and Industrial Corp., which produced both ore and concentrate; and by more than eight other small ore producers led by Velore Mining Corp. and Malayan Wood Products Corp.

Consolidated Mines, Inc. (CMI), produced about 340,000 tons per year of refractory chromite concentrate from its chromite property at Coto, Masinloc, in Zambales Province under an operating contract with Benguet Corp. Under the old contract, which expired in December 1980, CMI retained 75% of the output as the property owner, while Benguet shared the remaining 25% as the mine operator.

In early 1981, a new operating contract was signed between the two companies. CMI reportedly agreed to cut its output share from 75% to only 30%, while Benguet was to retain 70%. Under the new 25-year contract, Benguet agreed to invest about $10 million to open up new reserves for a new underground chromite mining and milling operation to augment production from the existing but dwindling chromite reserves available for open pit mining. Under the new contract, the mine would expand its production capacity in 3 to 4 years. The Masinloc refractory chromite mine is the single largest and the most important source of low-silica refractory chromite in the world. In 1980, about 340,000 tons of refractory chromite concentrates were produced from the mine, of which 275,000 tons were exported mainly to the United States, Japan, and Canada.[10]

Philchrome Mining Corp., a new chromite producer, began commercial operation from its large chrome sand deposits in the southern part of Palawan Island. AMAX Inc. of the United States and Kawasaki Steel Corp. of Japan were reportedly to acquire 15% interest each in Philchrome Mining Corp. The planned output capacity was to reach 20,000 tons per year of refractory chromite for export to the United States and Japan.

Triden Mining and Industrial Corp., the second largest metallurgical chromite concentrate producer in the Philippines, completed its expansion program in early 1981, and planned to install additional equipment in two mills in Palawan to increase chromium metal recovery. The company operated two chromite concentration plants at Narra, Palawan, with an annual capacity of 96,000 tons of chromite concentrates containing about 53% chromium. Most of the output was exported under long-term contracts to Japan (imported by Mitsui and Co., Ltd.), the Federal Republic of Germany (by A. G. Metallgesellschaft), and other European countries. China was, reportedly, also an important buyer of the company's chromite concentrate.

Cobalt.—The Philippines remained one of the top six world cobalt producers in 1981; however, cobalt production of Marinduque Mining and Industrial Corp. (MMIC) declined in 1981. The reduction in cobalt output in the form of nickel-cobalt mixed sulfide was affected largely by a cutback in the output of nickel concentrate and refining operations on Nonoc Island owing to the weakened nickel prices in the world market.

For the past year, Marinduque's nickel-cobalt sulfide was shipped to Sumitomo Metal Mining Co. of Japan for refining under a long-term tolling contract. In late 1981, MMIC was reportedly negotiating with Sumitomo to amend the tolling contract, which would not expire for several years. MMIC was planning to build its own cobalt refinery, which could be completed in 1 to 2 years; however, MMIC suffered losses

of $36 million in 1980 and about $85 million in 1981 under a heavy interest repayment burden largely because of the $331 million debt financing on the Surigao nickel refinery on Nonoc Island.[11]

Copper.—The Philippines remained the world's ninth largest copper producer during the 1980-81 period. In 1980, the Philippines production of copper metal surpassed the 300,000-ton level. In 1981, because of a substantial drop in the world copper prices and increased costs of production, 7 of the 12 primary copper producers reported a decrease in output. As a result, the Philippines copper production dropped by about 5%, and total value of the copper production shrank 18% to $356 million for the first 9 months of 1981 from $435 million for the same period of 1980.

The Philippines copper production of the top 10 primary producers, during the 1980-81 period, was as follows, in thousand tons of copper metal:[12]

Company	1980	9 months	
		1980	1981
Atlas Consolidated Mining and Development Corp.	126.0	100.2	106.2
Marcopper Mining and Industrial Corp.	34.5	26.1	27.8
Benguet Corp	25.2	18.9	21.0
Marinduque Mining and Industrial Corp.	19.5	14.2	19.1
Philex Mining Corp	22.1	16.1	17.1
Lepanto Consolidated Mining Co.	15.2	12.2	11.3
CDCP Mining Corp	20.4	14.9	8.1
Western Minolco Corp	13.9	11.4	7.8
Baguio Gold Mining Co	6.1	4.6	3.9
Acoje Mining Co	3.1	2.9	1.9
Other primary and secondary producers.	19.7	17.1	2.3
Total	305.7	238.6	226.5

Other primary copper producers that reported a substantial drop in copper output were Black Mountain, Inc., and Sabena Mining Corp. In May 1981, Sabena temporarily suspended operations at its Camanlangan copper mine in New Bataan, Darao del Norte, because of lower copper prices. Two secondary producers, Zambales Base Metal, Inc., and Benguet Exploration, Inc., also reported a decline in their copper output in 1981.

In 1981, two expansion projects were completed. CDCP Mining Corp. (CDCP) has expanded its milling capacity from 15,000 to 25,000 tons of ore per day at Basay in Negros Oriental. Marinduque Mining and Industrial Corp. also completed its expansion program at Sipalay in Negros Occidental to increase milling capacity from 18,000 to 30,000 tons of ore per day. Under a joint exploration agreement, Marubeni Corp. of Japan was to invest $12.6 million in CDCP to increase its equity holding from 10.84% to 35.29%. This new capital was to be used mainly for the expansion program at Basay and underground development work. As of January 1, 1981, CDCP copper reserves at Basay were estimated at 240.7 million tons, averaging about 0.4% copper.[13]

In 1981, the Bully Bueno Mine, a new copper mine operated by Hercules Minerals and Oils, Inc., at Cacapain, Marcos, Ilocos Norte, started commercial operations. The annual output was expected to exceed 30,000 tons of 24% copper concentrate. The mine made its first shipment of copper concentrate to Japan in November. Ore reserves in the area were estimated at 13.5 million tons averaging 0.82% copper, 0.5 gram of gold, and 7.382 grams of silver per ton of ore. The mine life is expected to be 12 years at the projected milling capacity of 3,000 tons of ore per day.

The Amacan project of North Davao Mining Corp. in Masara, North Davao, was previously scheduled to start copper production in July 1981. Because of a flash flood that killed 127 people (construction crew), commercial operation was rescheduled to begin in April 1982. The milling capacity at Amacan would be 25,000 tons per day or 140,000 tons per year of 25% copper concentrate, which contains 8 to 15 grams of gold and 70 to 140 grams of silver per ton of concentrate. Ore reserves at the Amacan area were estimated at 87 million tons averaging 0.4% copper.

During 1981, several copper projects were either suspended or shelved, mostly because of the depressed world copper market. Sabena Mining Corp. suspended copper operations as well as its expansion plan at New Bataan. Marcopper suspended its San Antonio copper project near Tapian. Benguet shelved its Batangas project because of low-grade ore deposits and the high cost of land acquisition. Acoje Mining Co. closed its Barlo copper mines in Dasol, Pangasinan, at the end of 1981. The Barlo flotation mill was reportedly being sold by Acoje because of the depressed copper prices, which made it impossible to continue the commercial operations of the remaining low-grade deposits.

In late 1981, Atlas announced that it was

expanding its Lutopan underground mine at Toledo in Cebu. The $50 million expansion project would increase the output of the existing underground mine from 25,000 to 32,000 tons of ore per day by July 1984. The $50 million capital was to be financed from both external sources as well as internally generated funds.

Gold.—Despite the low price of gold in the world markets, the Philippines gold production increased in 1981. Increased gold production was largely due to extra alluvial mining operations of Atlas in Aroroy on Masbate Island, and the expanded gold mining and milling capacity of Apex in Masara, Davao del Norte. In 1981, the Philippines remained 1 of the top 10 world gold producers. Its share in the world total gold production was about 2% in 1980-81.

The Philippines gold output rose by 14.5% for the first 9 months of 1981 compared with output of the same period of 1980. Of the total output, 35% was by 7 primary gold producers and 65% was by 12 copper producers, which recovered gold as a byproduct of their copper operations. According to the Philippines Chamber of Mines, the Philippines gold production of the top 10 producers during the 1980-81 period, was as follows, in thousand troy ounces:

Company	1980	9 months	
		1980	1981
Benguet Corp. (primary and byproduct).	183.0	138.0	153.1
Atlas Consolidated Mining and Development Corp. (primary and byproduct).	150.3	110.9	145.3
Philex Mining Corp. (byproduct).	116.5	86.1	91.5
Lepanto Consolidated Mining Co. (byproduct).	58.2	46.3	46.5
Marcopper Mining Corp. (byproduct).	26.0	18.9	23.4
Apex Mining Co. Inc. (primary).	24.8	16.2	28.6
Western Minolco Corp. (byproduct).	23.4	18.9	14.6
Benguet Exploration, Inc. (primary).	11.9	8.6	8.9
Baguio Gold Mining Co. (byproduct).	11.7	8.9	7.6
Itogon-Suyoc Mines, Inc	8.9	6.5	8.0
Other primary and byproduct producers.	32.7	29.5	32.1
Total	647.4	488.8	559.6

Other gold producers were Vulcan Industrial & Mining Corp. (primary), Manila Mining Corp. (primary), Sabena Mining Corp. (byproduct, suspended operation in May 1981), Consolidated Mines, Inc. (byproduct, suspended operation in August 1980), Marinduque Mining and Industrial Corp. (byproduct), CDCP (byproduct), and Black Mountain, Inc. (byproduct).

The $29 million gold project of Philippines Eagle Mines, Inc., originally scheduled to come onstream in early 1981, was still building the processing plant at the mine site in Longos, Paracale, Camarines Norte. The plant is expected to be completed in 1982. The plant was expected to produce 44,000 ounces of gold and about 35,000 ounces of silver as a byproduct. Ore reserves were estimated at 1.56 million tons, with ore grade ranging from 0.45 to 0.55 ounce of gold per ton of ore.

In late 1981, Baguio Gold Mining Co. closed down its Santo Nino Mine in Mountain Province because of financial problems and withdrawal of Philex Mining Corp. as the company manager of the Santo Nino gold project. The project suffered from high operating costs caused by rising costs of energy and capital expenditures as well as high government royalty taxes.[14]

Iron and Steel.—San Pio Guinto Mining Corp., the only mining company engaged in the production of lump iron ore in the Philippines, produced only 4,376 tons of iron ore during the first half of 1981. The mining of magnetite sand was still restricted by the Government in 1981. Most of the Philippines iron ore requirements were imported from Australia, Brazil, and Canada.

A $7.5 million modernization project of Armco-Marsteel Alloy Corp. at its Taguig steelworks (annual capacity 70,000 tons) was started in late 1981. The project involved installation of high-technology continuous bloom-casting equipment and other support facilities. The equipment will be supplied by Concast AG of Switzerland. The project was scheduled for completion by the end of 1982. The company is a joint venture of Armco, Inc., of the United States; and Marsteel Consolidated and the Philex Mining Corp. of the Philippines. The major products of the company included specialty steel grinding balls and rods used by the domestic mining and cement industries and galvanized metal pipes consumed by the construction industry.

The plan for the development of an integrated steel mill in Misamis Oriental on Mindanao island was revised several times because of difficulties in finding the necessary financing for the project. In late 1981, the Government of the Philippines decided

to expand the existing facilities of the National Steel Corp. in Iligan City, Mindanao, in three phases. The latest proposal for the first phase called for building of a coal-based, direct-reduction, ironmaking plant; the second phase called for a steelmaking plant; and the third phase called for a rolling mill. The total cost of the project was scaled down from $1.5 billion to $765 million. Vöest Alpine AG of Austria, Kawasaki Heavy Industries of Japan with Krupp of the Federal Republic of Germany, and Davy McKee Direct Reduction Co. of the United States were reportedly the three bidders for the first phase.[15]

Nickel.—The mine output of nickel declined in 1981 because of the sluggish demand for nickel in the world market. The nickel output of MMIC dropped to 16,423 tons of refined nickel for the first 9 months of 1981 from 16,725 tons for the same period of 1980. In addition, production of mixed sulfides containing about 2,000 tons of nickel and slightly over 1,000 tons of cobalt for the first 9 months of 1980 also declined to almost 1,750 tons of nickel and nearly 825 tons of cobalt for the same period of 1981.

MMIC, in an effort to reduce operating costs, was converting from oil to coal for its nickel-refining operations on Nonoc Island in Surigao del Norte. The $123 million conversion project will reduce oil consumption of the refinery by 75% or save annually up to $50 million in energy cost upon completion of the conversion in late 1982 or early 1983.

In 1981, Rio Tuba Nickel Mining Corp., the other nickel producer in the Philippines, also reported a decline in its ore production at Bataraza in Palawan Island. Most of its nickel ore was exported to Japan.

Other Metals.—In 1981, production of manganese, lead, and molybdenum in the Philippines was at a much lower level than in 1980. MMIC and Black Mountain were the only two molybdenum producers, with MMIC accounting for over 80% of the total output. Production of lead was by Zambales Base Metals, Inc. In 1981, a new secondary lead smelter and refinery was being built in Meycawayan, Luzon. The 13,000-ton-per-year capacity lead smelter owned by the Philippines Lead Smelter Corp. was scheduled for operation in 1983. The output of unwashed manganese ore was mainly by the Associated Mining Corp. Zinc production in 1981 increased slightly from that of 1980, with Zambales Base accounting for 57% of the total, while Benguet Exploration, Inc., accounted for 43%.

Maria Cristina Chemical Corp. (MCCI), a ferroalloy producer in the Philippines, reportedly sold part of its equity holding in a new silicochromium plant at Iligan City to Nippon Kokan Kabushiki Kaisha (NKK) of Japan. In exchange, NKK was to receive about 10,000 tons of silicochromium (the total plant output) from MCCI annually. Silicochromium was shipped to the Toyama plant of NKK for processing into low-carbon chromium.

NONMETALS

Barite.—Mine Production of barite was by Falcon Minerals, Inc., the Philippines only producer of barite. The company operated its mine and milling plant in Mansalay, Oriental Mindoro. Mine output of barite declined in 1981, however, the production of barite for drilling fluid (oil well drilling mud) was being maintained at the 500-ton-per-month level. In 1980, Falcon Minerals obtained an $825,000 loan from the Private Development Corp. of the Philippines to finance the expansion program in Mansalay from 10,000 to 15,000 tons per year capacity. It is expected that production of commercial grades of varying mesh sizes and color will increase substantially for use by local paint, brake, explosive, and fiberglass industries in the coming years.

The barite ore reserves, as of December 1979, were estimated at almost 104,500 tons plus slightly over 31,000 tons of probable ore reserves.[16]

Cement.—In 1981, the Philippines cement industry consisted of 18 cement plants with 31 kilns. Although the country's total annual output capacity was 7.2 million tons, the actual cement production was about 4.2 million tons. High energy cost, outmoded equipment, and inefficient plant size were cited by the industry sources as the reasons for this low-capacity utilization. The Philippines consumed about 3.6 million tons of cement and exported about 800,000 tons to neighboring Southeast Asian countries annually.

According to the Philippines cement industry sources, the fuel cost alone accounted for 75% of the total production cost. In an effort to cut the fuel cost, the Government of the Philippines had created the National Coal Authority (NCA) to manage the so-called coal logistic system to supply

the fuel (coal) needs of cement plants as well as mines in shifting from bunker oil to coal-power generation.

The coal logistic system would include distribution of domestically produced coal through mine out-loading ports, vessels for efficient maritime movement and transportation of coal, installation of infrastructures that includes receiving, blending, and distribution terminals—six coal depots, importation of coal to be upgraded and supplement the domestic coal supply and inland transport to the end users by truck or rail. The total cost of this coal logistic system was estimated by NCA at $122 million, which includes $45 million for establishing 8 coal terminals, $8 million for 5 coal mine outloading ports, and $68 million for 12 marine vessels. The Philippines National Oil Co., (PNOC), reportedly will finance part of the cost, while NCA probably would approach the World Bank (International Bank for Reconstruction and Development) to finance the project. The whole project was expected to be completed by 1984 or 1985.

In late 1981, the Philippines Board of Investment approved two pioneer projects for coal conversion. Both Floro Cement Corp. and Iligan Cement Corp. will receive a loan from the Development Bank of the Philippines to finance their projects to convert operations from bunker to coal-fired kilns. The project of the Floro plant at Lugait, Misamis Oriental (440,000-ton-per-year capacity), was estimated at $5.8 million, while the project of the Iligan plant at Kiwalan, Iligan City (300,000-ton-per-year capacity), was at $6.6 million.

Fertilizers.—In mid-1981, the Philippines Phosphate Fertilizer Corp. (Philphos) awarded a $336 million turnkey fertilizer contract to a consortium led by Coppee-Rust of Belgium. The phosphate-fertilizer complex, to be built at Isabel City on Leyte Island, includes two units for the production of complex fertilizer (monoammonium phosphate, diammonium phosphate, and nitrogen, phosphorous, and potassium), each with a daily capacity of 1,500 tons; two phosphoric acid plants, each with a daily capacity of 600 tons; and a 550-ton-per-day sulfuric acid plant. The planned annual capacity is 350,000 tons of phosphates and 153,000 tons of ammonium sulfate. The construction work is expected to be completed by the end of 1984, but the plant operations are scheduled to come onstream in 1985.

The consortium is composed of Coppee-Rust of Belgium, which will undertake construction work on the phosphoric acid plants using the Prayon process; they will also coordinate the project. Mitsubishi Heavy Industries Ltd. of Japan will build the sulfuric acid plant using a Lurgi process using local pyrite. Dragados y Construcciones of Spain will construct the fertilizer plants, and the local contractor will be the Construction and Development Corp. of the Philippines.

Philphos, a joint-venture company, is owned 60% by the Philippines Government's National Development Corp. and 40% by Nauru Phosphate Corp. (NPC), a state-owned company of Nauru (an island nation in the Pacific). NPC has agreed to supply 300,000 tons of phosphate rock to the fertilizer plant annually. The plant requires about 1.1 million tons of phosphate ore annually. The remaining requirements of phosphate ore (800,000 tons) are expected to be supplied by Morocco and Jordan, and the anhydrous ammonia by Indonesia.[17]

MINERAL FUELS

Coal.—The Philippines coal production continued to increase in 1981. The output level reached over 373,000 tons, about 15% over that of 1980. During 1981, there were 50 coal service contractors, of which 28 were developing and producing coal, while 22 were in exploration. The major companies involved in coal development were CDCP, Marinduque Mining and Industrial Corp., and Burnett and Hallamshire of the United Kingdom.

The Philippines largest coal producer, Semirara Coal Corp. (a subsidiary of Vulcan Industrial and Mining Corp.), started a $100 million coal expansion project on Semirara Island in 1981. Vöest-Alpine AG of Austria, reportedly was to provide financing and install all mining equipment (including four bucket-wheel excavators) and facilities by 1983. The initial coal mining operation would be at the Unong Mine, one of the three mines owned and managed by Vulcan. The initial output was projected at 1,000 tons per day in 1983. By 1984, the total output of Unong Mine was expected to reach 1 million tons per year at full capacity. The Unong Mine, along with Panian and Himalian Mines, have total reserves of 105 million tons of coal. Under a long-term contract, Vulcan was to deliver annually 360,000 tons of coal to Atlas and 960,000 tons to the National Power Corp.

Coalfields Mining and Industrial Corp., a joint-venture company 50% owned by Atrium Capital Corp. (an affiliated company of the Herdis Group Co.) and 50% by J. J. Mining and Exploration Corp., was to start a $15 million coal mining and development project in Albay on Bataan Island off Legazpi. Coalfields plans to produce about 300,000 tons of coal per year by 1982 and to 500,000 tons per year by 1984. The coal reserves on Bataan Island were estimated by the NEWCO Engineering & Coal Development Co., Inc., of the United States, at about 46 million tons. Under a 10-year contract, Coalfields was to supply Atlas about 150,000 tons annually of coal beginning in April 1982.

Petroleum and Natural Gas.—During 1981, the Philippines crude oil production from Nido Oilfields declined from 3,000 barrels per day in January to about 2,600 barrels per day in October. Cities Service, the operator of Nido Oilfields, predicted that the well will be producing only about 1,700 barrels per day by December 1982. Cities Service has indicated that it probably will discontinue its operation at Nido by the end of 1982 and will focus on development at the Matinloc Field and further exploration at the Galoc Field.

In September 1981, the Philippines second offshore oilfield went into production. Cadlao Oilfields, operated by Amoco Philippines Petroleum Co. (a subsidiary of Standard Oil Co. of Indiana), started production at about 1,000 barrels per day because of bad weather and damage to some equipment. By yearend, the output of two wells at Cadlao reached 9,000 barrels per day. According to Amoco, the Cadlao Oilfields have recoverable oil reserves of about 10 million barrels with an API rating of 47°.

The Philippines third offshore oilfield, Matinloc Oilfield originally scheduled to start production in late 1981, was rescheduled by Cities Service to begin in the second quarter of 1982 at an initial production rate of 12,000 to 15,000 barrels per day. The Matinloc Oilfield with estimated oil reserves of 10 million barrels, is about 33 miles northeast of Nido Oilfields.

In August 1981, the Philippines Cities Service discovered oil at the North Galoc-1 well. The Galoc-1 well is the Philippines first oil discovery in a sandstone reservoir. The well has a yield of about 1,200 barrels of oil per day. The quality of the crude oil is between 31° to 32° API. According to Cities Service, another well called the South Galoc-1 was also discovered in a sandstone reservoir in November 1981. The South Galoc-1, about 8 miles south of the Galoc-1, contains no oil but has gas. The well tested 3.7 million cubic feet per day of natural gas and 280 barrels per day of gas condensate from two zones of a sandstone reservoir.[18]

In May 1981, Cities Service also discovered a new oil well called Tara-1, near other wells in the Matinloc, Pandau, and Libro Fields. The estimated flow rate from Tara-1 was 3,375 barrels per day. It was reported that Cities Service would concentrate on the development of the Matinloc, Pandau, and Libro Fields, and PNOC was taking over the development work on Tara-1.

The Philippines will spend $213.2 million for the development and production of oil wells in 1982. These expenditures are to be spent mainly on the Matinloc Oilfields, and about 20 oil wells scheduled for drilling in 1982.

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[1]Economist, Division of Foreign Data.

[2]Where appropriate, values have been converted from the Philippines peso (P) to U.S. dollars at the rate of P8.00=US$1.00.

[3]Business Times (Kuala Lumpur). Jan. 19, 1982, p. 24; Feb. 13, 1982, p. 9.

[4]The Economic Monitor (Manila). Sept. 7, 1981, p. 24.

[5]Business Day (Manila). Nov. 10, 1981, p. 20.

[6]———. Nov. 3, 1981, p. 20.

[7]The Financial Time (Manila). Dec. 21, 1981, p. 1.

[8]Bulletin Today (Manila). Mar. 24, 1981, p. 22.

[9]Far Eastern Economic Review (Hong Kong). Aug. 14, 1981, p. 6.

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[10]Industrial Minerals (London). No. 162, March 1981, pp. 10, 12.

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[11]Metal Bulletin (London). No. 6636, Nov. 3, 1981, p. 17.

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[12]Chamber of Mines of the Philippines. Newsletter. V. 6, No. 1, January 1981, p. 3.

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[13]Engineering and Mining Journal. V. 182, No. 7, July 1981, p. 154, v. 182, No. 11, November 1981, p. 326.

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[14]The Financial Time (Manila). Nov. 18, 1981, pp. 1, 6.

[15]Standard Chartered Review (London). February 1982, p. 29.

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[16]The Philippines Mining Yearbook (Quezon City, Philippines). 1981, p. 40.

[17]The British Sulphur Corp. Ltd. Phosphorous and Potassium. No. 113, May and June 1981, p. 14; No. 115, September and October 1981, p. 15.

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The Mineral Industry of Poland

By Tatiana Karpinsky[1]

In 1981, a deep social and economic crisis continued to affect Poland, marked by an unbalanced market, a deep negative balance of payments, shortages in materials and technical services, a decline in industrial production, low labor productivity, and a host of unsolved social problems. By the end of 1981, the sociopolitical situation of the country had deteriorated further. A wave of tension, conflicts, and strikes were again sweeping the country. Economic difficulties grew, and strikes affected almost all industries.

On December 13, 1981, by a decree of the Council of State, martial law was introduced throughout the country, and Prime Minister Jaruzelski announced that a so-called Military Council of National Salvation (Wojskowa Rada Ocalenia Norodnogo) had been established. The Government announced that 150 enterprises had been "militarized," meaning that employees were subject to military discipline.

A decree was issued militarizing all petroleum industry centers, including all refineries and oil-processing plants and hard coal and lignite mines; powerplants and other power industry units serving these plants were also militarized.

Poland entered the crisis stage in 1979, as expressed in the decline of national income and most of the economic indicators. According to Polish sources, national income decreased 15% in 1981, compared with that of 1980, or significantly more than in the previous 2 years when the drop amounted to only a few percent. Gross industrial production decreased by 12.6% in 1981.[2]

In 1981, the shortage of coal was particularly acute and was a major handicap in other subsectors of industry. The Polish national economy was based on coal, which accounted for 70% of domestic energy.

In 1981, a shortage of electric power resulted in a decrease in output, especially of such products as electric arc furnace steel, rolled products, aluminum, soda, ammonia, lead, zinc, and cement.

In 1981, capital investment in Poland's economy decreased 15.6% compared with the 1980 level and amounted to 460 billion Polish zlotys (Z).[3] Investment in the iron and steel industry dropped sharply to only about a third of the volume of 1980, but priority in investment was given to the copper-silver industry, because foreign exchange earnings in this sector are much higher than those of the steel industry. According to the Government decision, 15 large capital projects in the steel and nonferrous sectors valued at Z133 billion were frozen and about 7 projects were trimmed back.

By decision of the Government, in November 1980, the construction of the second stage of the Katowice steel plant was discontinued, except for two tasks: The construction of the coking plant, with one-half of the original targets to be completed; and the construction of the rail heat-treatment department.[4]

In 1981, the electrical and manufacturing industries contributed 27.7% to Poland's total industrial output. The fuel industry contributed 8.8%, a decrease from 12% in 1976; the metallurgical industry, 8.7% (down from 11.5%); the chemical industry, 9.1%, and the mineral industry, 3.1%.[5]

The total number of industrial workers and employees in state enterprises in Poland was 4,744,000 in 1981. The number of workers and employees in state mineral and energy enterprises by branch for 1980 is given in table 1.[6]

Table 1.—Poland: Industrial workers and employees in 1980

Branch	Workers and employees (thousands)	Percent of total employment in all industry
Coal	412	8.7
Other fuel	50	1.0
Power	87	1.8
Ferrous metals	186	3.9
Nonferrous metals	74	1.6
Building materials	181	3.8

The mining industry's labor shortage was estimated at 19,000. During the year, 6,800 workers were trained as laborers to work in the enterprises of the Ministry of Mining.

Under the contract signed by Poland with the U.S.S.R., Polish enterprises participated in the construction of three nuclear power stations in the Soviet Union. In return, the Soviet Union is to provide Poland with 1.2 billion kilowatt-hours of electrical energy in 1984 and 2.4 billion kilowatt-hours in 1985. The total amount of electrical energy supplied to Poland under the terms of the contract is to be more than 100 billion kilowatt-hours.[7]

Poland continued to take part in the expansion of Soviet ore extraction facilities, and in return, Poland was assured additional supplies of raw materials in the 1981-85 period.[8]

Government Policies and Programs.—On January 24, 1982, the Polish Planning Commission published the first quarter revised economic plan for 1982. In comparison with the first quarter of 1981, the production in the first quarter of 1982 was planned to increase as follows: Bituminous coal, 7.4% to 44.3 million tons; sulfur, 1.1% to 1.1 million tons; and cement, 4.8% to 3.5 million tons. A decrease in output was expected for the following mineral commodities: Coke, 3.8% to 4.4 million tons; crude oil, 20.8% to 2.8 million tons; rolled steel products, 27.2% to 2.3 million tons; and copper, 5.4% to 80,000 tons.[9]

PRODUCTION

Of major importance to the development of Polish industrial production are domestic reserves of bituminous coal and lignite, copper, silver, zinc, lead, sulfur, salt, and many other minerals.

Poland has shortages of crude oil, natural gas, phosphates, potassium, salts, and metals used in alloying steel.

On December 3, 1980, the Central Committee put the Government under obligation to develop, within the framework of the preliminary 5-year plan, a 3-year plan for economic stabilization of the country. The plan for 1981 was the first stage of the 3-year program of economic stabilization. The Polish economic plan for 1981 was modest. The Government Planning Commission expected the level of industrial output in 1981 to be close to that of 1980. However, the annual report on the fulfillment of the 1981 economic plan, released early in 1982 by the main Statistical Office, showed declines in mineral production.

Table 2.—Poland: Fulfillment of 1981 economic plan

Commodity	Production (thousand metric tons)	Plan fulfillment (percent)
Bituminous coal	163,200	84.5
Natural gas	[1]6,172	97.5
Refined petroleum	13,600	84.2
Steel (crude)	15,719	80.7
Steel rolled products	11,064	81.6
Copper (refined)	327	91.6
Aluminum	66	69.4
Lead	69	84.1
Zinc	167	76.8

[1]Million cubic meters.

Table 3.—Poland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum metal, primary	104,000	100,000	96,600	95,100	[3]66,000
Cadmium metal, primary	754	761	773	698	630
Copper:					
Mine output, metal content, recoverable	289,300	321,000	325,000	346,125	315,250
Metal:					
Smelter, including secondary	311,000	337,000	341,000	363,500	330,770
Refined, including secondary	306,600	332,200	335,800	357,300	[3]327,210
Iron and steel:					
Iron ore and concentrate, gross weight thousand tons	659	529	249	104	100
Pig iron do	9,517	11,109	10,966	11,600	11,000
Ferroalloys:					
Blast furnace do	134	126	138	126	126
Electric furnace do	175	169	176	170	170
Steel:					
Crude do	17,841	19,251	19,218	19,485	[3]15,719
Semimanufactures:					
Rolled, excluding pipe do	11,950	13,566	13,577	13,551	[3]11,064
Pipe do	1,183	1,164	1,161	1,132	[3]1,043
Lead:					
Mine output, metal content, recoverable	63,000	63,900	61,900	60,040	50,434
Metal, refined, including secondary	85,400	86,700	84,200	82,000	[3]69,000
Nickel:[e]					
Mine output, metal content, recoverable	2,400	2,400	2,100	2,100	2,100
Metal, smelter	2,400	2,400	2,100	2,100	2,100
Silver, mine output, metal content, recoverable[e] thousand troy ounces	10,708	21,900	22,600	24,665	22,690
Zinc:					
Mine output, metal content	188,000	194,000	182,700	187,800	146,484
Metal, refined, including secondary	228,000	222,000	209,000	215,300	[3]167,100
NONMETALS					
Barite	88,700	90,300	96,000	96,300	90,000
Cement, hydraulic thousand tons	21,300	21,700	19,176	18,443	[3]14,226
Clays and clay products:					
Crude:					
Bentonite[e] do	50	50	50	50	50
Fire clay do	1,352	1,292	1,251	1,200	1,200
Kaolin do	91	66	49	51	50
Products do	785	768	687	600	600
Feldspar[e] do	40	40	40	40	40
Gypsum and anhydrite, crude[e 4] do	1,340	1,350	1,360	1,300	1,300
Lime, hydrated and quicklime do	8,638	9,135	7,652	7,500	7,500
Magnesite, crude	25,400	[r]23,700	20,000	19,600	19,000
Nitrogen: N content of ammonia thousand tons	1,665	1,611	1,525	1,543	1,500
Salt:					
Rock do	1,562	1,435	1,458	1,465	1,100
Other do	2,795	2,958	2,971	3,069	2,300
Sodium and potassium compounds, n.e.s.:					
Sodium carbonate (soda ash) do	671	663	684	762	[3]701
Caustic soda (96% NaOH) do	450	489	454	433	[3]417
Stone:					
Dolomite do	2,685	3,118	3,296	3,437	3,200
Limestone do	NA	NA	NA	NA	NA
Quartzite do	261	NA	NA	NA	NA
Other do	17,254	17,476	17,610	16,000	16,000
Sulfur:					
Native:					
Frasch[e] do	4,321	4,546	4,310	4,667	4,250
Other than Frasch[e] do	450	505	[r]520	518	472
Total do	4,771	5,051	4,830	5,185	4,722
Byproduct:[e]					
From metallurgy do	314	315	310	300	300
From petroleum do	35	35	35	30	30
Total do	349	350	345	330	330
From gypsum[e] do	30	20	20	20	20
Total sulfur do	5,150	5,421	5,195	5,535	5,072
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous do	186,200	192,622	201,004	193,121	[3]163,022
Lignite and brown do	40,800	41,005	38,083	36,866	[3]35,538
Total do	227,000	233,627	239,087	229,987	[3]198,560
Coke:					
Coke oven do	19,055	20,356	20,037	19,850	[3]17,918

See footnotes at end of table.

Table 3.—Poland: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Coke —Continued					
Gashouse ---------- thousand tons	945	950	950	940	930
Total ---------- do	20,000	21,306	20,987	20,790	18,848
Fuel briquets, all grades ---------- do	1,697	1,752	1,800	1,700	1,200
Gas:					
Manufactured:					
Town gas ---------- million cubic feet	17,377	16,282	14,233	14,000	14,000
Coke oven gas ---------- do	258,507	265,359	261,015	250,000	250,000
Natural, marketed ---------- do	257,695	282,242	259,072	223,501	[3]217,952
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	[e]85	[e]85	[e]85	80	80
Propane and butane ---------- do	[e]58	[e]58	[e]58	53	53
Peat: Fuel and agricultural ----------	[r]200,000	[r]200,000	200,000	202,700	202,700
Petroleum:					
Crude:					
As reported ---------- thousand tons	364	363	331	329	329
Converted ---- thousand 42-gallon barrels	2,701	2,693	2,456	2,441	2,441
Refinery products:					
Gasoline ---------- do	28,518	29,325	28,720	28,330	27,044
Kerosine (presumably including jet fuel) do	1,194	1,240	1,105	1,744	1,615
Distillate fuel oil ---------- do	38,031	39,240	38,663	37,994	36,227
Residual fuel oil ---------- do	29,131	29,970	29,826	26,180	24,925
Lubricating oil and grease ---------- do	3,276	3,430	3,314	[e]3,150	3,027
Paraffin ---------- do	189	197	--	--	NA
Liquefied petroleum gas ---------- do	2,285	2,320	2,209	[e]2,100	2,018
Bitumen ---------- do	7,017	7,090	6,628	[e]6,300	6,054
Total[5] ---------- do	109,641	112,812	110,465	105,798	100,910

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through June 23, 1982.

[2]In addition to the commodities listed, antimony, cobalt, germanium, gold, a variety of crude nonmetallic construction materials, and carbon black are also produced, but available information is inadequate to make reliable estimates of output levels. Poland may also produce alumina in small quantities, but details of such an operation, if it exists, are not available.

[3]Reported figure.

[4]Includes building gypsum, as well as an estimate for gypsum used in production of cement.

[5]Total of listed commodities only; excludes products not reported individually as well as refinery fuel and losses.

Particularly disastrous was the drop in coal production by over 30 million tons, resulting in cutbacks to industry by over 10% and by nearly 7% to the private consumer. Production decreased by about 600,000 tons owing to strikes in the mines following the imposition of martial law, chiefly at the Piast and Zeimowit Mines, where production decreases were estimated at 150,000 tons and 250,000 tons, respectively.

In 1981, the country's powerplants generated 115 billion kilowatt-hours of electrical energy, a decrease of 5.7% compared with 1980.

The first nuclear powerplant in Poland is being constructed at Zarnowice, Gdansk Province, with total designed capacity of 1,880 megawatts. The first unit of the plant is planned to start operation in 1988.

TRADE

The value of Polish exports in 1981 decreased 14.6% compared with that of 1980 and was estimated at $13.2 billion. Exports to the centrally planned economy countries decreased by 10%; exports to the market economy countries decreased by 21.3% to $5.8 billion.[10]

In 1981, the imports from the centrally planned economy countries increased 2%, compared with 1980, while imports from the market economy countries decreased by about 30%. The deficit of trade with market economy countries amounted to $78.2 million in 1981 and the deficit in trade with the centrally planned economy countries increased to $1.95 billion.

In 1981, exports by the electrical and manufacturing industries contributed about

47% of Poland's total export value; fuel and electric power, 10%; ferrous and nonferrous industry, 8%; chemical industry, 9.5%; and products of other industries, 25.5%. The share, by value, of total Polish coal exports decreased from 14% in 1980 to 10% in 1981. The import value of manufacturing and electrical industries accounted for 32%; fuel and electrical power, 20%; ferrous and nonferrous industry, 9.5%; chemical industry, 11%; and products of other industries, about 27.5%.[11]

In 11 months of 1981, in comparison with the same period of 1980, exports dropped as follows: Bituminous coal, 48%; lignite, 8%; coke, 22%; petroleum products, 49%; steel rolled products, 15%; copper, 5%; and zinc and zinc products, 52%.

In 11 months of 1981, imports of many minerals were also lower than in the same period of 1980: Crude oil, 21%; natural gas, 0.9%; petroleum products, 10%; iron ore and concentrate, 19%; pig iron, 2.2%; and steel rolled products, 0.8%.

In 1981, the Polish-Soviet trade turnover accounted for about 8.5 billion Soviet rubles (R) as compared with R8 billion in 1980. In 1981, imports from the Soviet Union increased 13.6% compared with 1980. The Soviet Union covered about 40% of import needs for raw materials, including 100% of natural gas and 75% each of crude oil and iron ore. In 1981, deliveries from the Soviet Union included 13.1 million tons of crude oil, 3 million tons of petroleum products, 5.3 billion cubic meters of natural gas, 9 million tons of iron ore, 69,000 tons of asbestos, and 53,000 tons of aluminum. The value of deliveries within the framework of participation in common capital investments in 1981 stood about R400 million, which constituted about 13% of raw material imports from the Soviet Union. These deliveries included 1 million tons of crude oil, 2.8 million cubic meters of gas, 2.5 million tons of steel-related raw materials, 42,500 tons of asbestos, and about 62,800 tons of ferroalloys. A trade agreement between the Polish and Soviet Governments for 1982 was signed in January 6, 1982, in accordance with which turnover in 1982 is to reach R8.4 billion. Deliveries of Soviet fuels and raw materials will continue to constitute not only a major, but in many cases the sole source of import supplies for the Polish economy in 1982.

Polish exports to the U.S.S.R. are to amount to R3.6 billion. In the field of raw materials the planned level of deliveries to the Soviet Union was to remain at the level of 1981, which means that they will also be considerably lower than the quantities supplied in the second half of the seventies. With regard to the negative balance of turnover in 1981, the Soviet Union granted Poland long-term credit amounting to R2.7 billion.

In 1981, Poland had an external hard currency debt of approximately $26 billion; of this amount, Government and Government-guaranteed debt was some $17 billion; private unguaranteed debt was some $9 billion. Of the $26 billion, about $20 billion was due to 16 Western countries. Polish debt to the United States totals some $3.15 billion, which is 12% of the total. Governments of 16 Western countries including the United States, the United Kingdom, France, the Federal Republic of Germany, Japan, Canada, Switzerland, and the Netherlands signed a multilateral agreement in April 1981 to reschedule 90% of the principal and interest falling due from May 1981 to December 1981. The U.S. share of this was $380 million. The official rescheduling totals $2.4 billion.

Table 4.—Poland: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	1	51	--	Sweden 45; Thailand 6.
Metal including alloys:				
Scrap	13,362	7,489	--	Austria 5,420; West Germany 1,482; France 220.
Unwrought	22,332	17,095	--	Hungary 15,900; West Germany 505; Sweden 284.
Semimanufactures	232	143	--	Italy 106; Denmark 18; Sweden 12.
Chromium oxides and hydroxides	596	487	--	Brazil 150; France 61; Finland 60.
Copper metal including alloys:				
Scrap	184	511	--	France 269; West Germany 214.
Unwrought[2]	133,720	144,754	--	West Germany 79,401; United Kingdom 18,440; Italy 11,013.
Semimanufactures[2]	39,471	50,056	2,983	Czechoslovakia 17,522; U.S.S.R. 6,005; Romania 5,088.
Iron and steel:				
Ore and concentrate	77,669	--		
Pyrite, roasted	8,201	11,481	--	All to Hungary.
Metal:				
Scrap	11,408	14,944	--	Netherlands 6,780; West Germany 5,645; Italy 1,727.
Pig iron	3,190	10,589	--	Pakistan 10,500; Italy 74.
Ferroalloys	--	101	--	Italy 100.
Steel, primary forms thousand tons	[3]379	215	(4)	Yugoslavia 93; Austria 31; United Kingdom 31.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	[3]911	[3]1,053	15	West Germany 131; Yugoslavia 25; Finland 23.
Universals, plates and sheets do	[3]423	[3]386	55	West Germany 66; Norway 38; Sweden 33.
Hoop and strip do	[3]147	[3]168	--	Yugoslavia 35; Sweden 19.
Rails and accessories do	[3]36	[3]133	--	Singapore 15; Italy 14.
Wire do	[3]44	[3]52	2	West Germany 6; Yugoslavia 4; Hungary 3.
Tubes, pipes, fittings do	[3]110	[3]115	[5]9	East Germany 34;[2] Saudi Arabia 13; France 7.
Castings and forgings, rough do	[r]7,691	11,314	[5]286	West Germany 3,720; Sweden 2,129; Ireland 549.
Lead:				
Oxides and hydroxides	260	40	--	All to Yugoslavia.
Metal including alloys:				
Scrap	17	--		
Unwrought	[2]7,098	--		
Semimanufactures	11	--		
Molybdenum metal including alloys, all forms	5	4	--	All to Sweden.
Nickel metal including alloys:				
Scrap	11	18	--	All to Finland.
Semimanufactures kilograms	[r]345	1,390	--	France 1,000; Yugoslavia 390.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$3,565	$1,428	--	United Kingdom $1,281; West Germany $139.
Silver:				
Waste and sweepings do	$408	$450	--	Switzerland $448.
Metal including alloys, unwrought and partly wrought[2]	347	516	46	Switzerland 158; United Kingdom 113; West Germany 109.
Tantalum metal, including alloys, all forms	--	3	--	All to West Germany.
Tin metal including alloys, scrap	36	36	--	All to United Kingdom.
Tungsten metal including alloys, all forms	12	6	--	All to Yugoslavia.
Zinc metal including alloys:				
Scrap	24	--		
Unwrought[2]	33,162	41,408	--	United Kingdom 18,664; U.S.S.R. 9,351; Hungary 8,924.
Semimanufactures[2]	4,782	4,699	[5]41	U.S.S.R. 2,955; West Germany 801; Czechoslovakia 283.
Other:				
Ash and residue containing nonferrous metal	16,362	13,493	--	Austria 8,093; West Germany 4,034; Netherlands 77.
Oxides, hydroxides, peroxides	58	11	--	Pakistan 6; Jamaica 5.
Metals:				
Metalloids	1	--		
Nonferrous alloys[2]	2,984	4,000	--	All to U.S.S.R.
Metal powder[2]	2,091	887	--	All to Czechoslovakia.

See footnotes at end of table.

Table 4.—Poland: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Other —Continued				
Metals —Continued				
Base metals including alloys, all forms	--	1	--	All to Morocco.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	2	--		
Corundum, artificial	3,073	3,291	--	West Germany 1,389; Italy 915; Austria 868.
Grinding and polishing wheels and stones	270	[6]178	--	Yugoslavia 49; Thailand 40; Austria 25.
Cement[2] thousand tons	2,044	1,890	--	West Germany 660; Spain 209; Austria 197; Ivory Coast 162.
Chalk	--	15	--	All to Jordan.
Clays and clay products:				
Crude:				
Fire clay[2]	24,333	21,631	--	Hungary 15,029; Austria 4,354.
Chamotte[2]	1,629	10,203	--	Yugoslavia 6,119; Italy 1,710; Hungary 931.
Other	8,139	496	--	Italy 203; Spain 148; West Germany 100.
Products:				
Nonrefractory	3,473	4,463	--	Sweden 3,127; West Germany 841; Finland 340.
Refractory including nonclay brick[2]	18,216	17,790	[5]9	Finland 5,375; Belgium-Luxembourg 3,424; Czechoslovakia 2,287.
Diamond:				
Gem, not set or strung value, thousands	$2	--		
Industrial do	$734	$593	--	Belgium-Luxembourg $590.
Fertilizer materials:				
Crude, nitrogenous	27	--		
Manufactured:				
Nitrogenous[2] thousand tons	365	271	--	India 60; West Germany 46; France 38; Japan 21.
Phosphatic	--	110	--	Indonesia 85; Netherlands 25.
Potassic[2]	6,762	14,000	--	All to Romania.
Other including mixed	7,476	39,707	--	Yugoslavia 24,966; Denmark 8,002; West Germany 6,316.
Ammonia	NA	12,063	--	Italy 11,993; Kenya 70.
Gypsum and plasters	161	87	--	Finland 66; Sweden 20.
Iodine	11	2	--	All to Yugoslavia.
Lime[2]	11,942	12,212	--	Hungary 10,028.
Magnesite	--	41	--	France 40.
Pigment, mineral, including processed iron oxides	102	20	--	All to Italy.
Precious and semiprecious stones value, thousands	$15	$14	$13	West Germany $1.
Salt and brine[2]	253,056	296,711	--	Sweden 183,417; Finland 62,831; France 29,038.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	20	1	--	All to United Kingdom.
Caustic soda[2]	71,870	43,017	--	West Germany 11,685; Yugoslavia 5,853; Netherlands 4,448.
Soda ash[2]	123,011	141,481	--	West Germany 49,050; U.S.S.R. 26,646; Czechoslovakia 24,407.
Stone, sand and gravel:				
Dimension stone[2]	33,719	38,088	--	Netherlands 11,265; West Germany 9,714; Belgium-Luxembourg 8,666.
Dolomite, chiefly refractory-grade	--	11	--	All to West Germany.
Gravel and crushed rock[2]	457,194	291,543	--	West Germany 244,798; Finland 30,147; United Kingdom 6,888.
Limestone and dolomite	[2]9,021	3,275	--	All to West Germany.
Sand excluding metal-bearing	231,394	196,422	--	Do.
Sulfur:				
Elemental:				
Other than colloidal[2] thousand tons	3,892	3,903	--	U.S.S.R. 742; France 447; Czechoslovakia 440.
Colloidal	72	799	--	Sweden 520; Singapore 115; Sri Lanka 100.
Sulfuric acid, oleum[2]	88,310	211,729	--	U.S.S.R. 92,166; Sweden 89,437; Japan 14,308.
Other:				
Crude	6,563	[7]36	--	Denmark 22; United Kingdom 14.
Slag, dross, and similar waste, not metal-bearing	410	1,907	--	West Germany 1,203; Austria 704.
Halogens	62,611	1	--	All to Sweden.

See footnotes at end of table.

Table 4.—Poland: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	22	192	--	United Kingdom 182.
Coal and briquets:				
Anthracite and bituminous[2] thousand tons	41,498	31,048	235	U.S.S.R. 6,041; France 3,243; Denmark 3,205.
Briquets of anthracite and bituminous	--	238	--	Austria 184; Malta 54.
Lignite including briquets[2] thousand tons	2,974	1,569	--	East Germany 1,562.
Coke and semicoke[2] do	2,075	1,770	--	U.S.S.R. 500; East Germany 424; Austria 246.
Peat including briquets and litter[2]	21,007	17,394	--	West Germany 7,031; Austria 3,159; Italy 2,960.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	358	757	--	Switzerland 332; Denmark 211; Sweden 76.
Kerosine do	9	15	--	Hungary 14; Italy 1.
Distillate fuel oil do	2,643	4,870	--	Denmark 1,763; West Germany 1,635; Sweden 776.
Residual fuel oil do	1,737	1,183	(4)	Sweden 542; Denmark 356; Austria 218.
Lubricants do	82	r57	--	Yugoslavia 28; Austria 26.
Other:				
Liquefied petroleum gas do	197	551	--	Yugoslavia 395; Denmark 86; Austria 26.
Mineral jelly and wax do	1	3	--	All to Netherlands.
Bituminous mixtures do	(4)	(4)	--	All to Finland.
Unspecified[2] do	6,101	4,424	--	Bermuda 1,905; Switzerland 1,521; Netherlands 527.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	55,895	63,437	--	West Germany 28,142; France 14,391; Finland 13,309.

rRevised. NA-Not available.

[1]Owing to a lack of official trade data published by Poland, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from various sources which include United Nations information, data published by the partner trade countries, and partial official trade sources of Poland.

[2]Official Trade Statistics of Poland.

[3]Source: Quarterly Bulletin of Steel Statisics for Europe, United Nations, New York.

[4]Less than 1/2 unit.

[5]Source: Official Trade Statistics of the United States.

[6]Excludes Hungarian import valued at $7,000.

[7]Excludes Japanese import valued at $2,000.

[8]Excludes Japanese import valued at $1,000.

Table 5.—Poland: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite[2]	95,074	83,146	--	Hungary 70,185; Australia 12,961.
Oxides and hydroxides[2]	283,038	287,206	15,139	Hungary 127,986; Yugoslavia 74,889; Guinea 24,907.
Metal including alloys:				
Unwrought	23,743	19,825	3	Hungary 18,965; Norway 299; Iceland 247.
Semimanufactures[2]	33,496	25,600	[3]4	U.S.S.R. 8,364; Czechoslovakia 4,367; East Germany 2,586.
Bismuth metal including alloys, all forms	5	34	--	All from Japan.
Chromium:				
Chromite[2]	211,248	197,975	--	U.S.S.R. 123,540; Albania 40,870; Iran 11,778.
Oxides and hydroxides	4	9	--	All from United Kingdom.
Metal including alloys, all forms	21	--		

See footnotes at end of table.

Table 5.—Poland: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Cobalt:				
Oxides and hydroxides	9	--		
Metal including alloys, all forms	24	16	3	Netherlands 13.
Copper metal including alloys:				
Scrap	--	19	19	
Unwrought	[4]100	15	--	Belgium-Luxembourg 12.
Semimanufactures[2]	2,836	1,873	[3]35	West Germany 678; Czechoslovakia 378; France 196.
Iron and steel:				
Ore and concentrate[2] thousand tons	18,872	20,150	--	U.S.S.R. 15,749; Brazil 2,766; Sweden 1,281.
Metal:				
Scrap[5] do	6	227	--	NA.
Pig iron do	[5]1,463	[6]1,430	--	U.S.S.R. 1,333;[6] West Germany 90.
Ferroalloys	[2]99,102	[5]71,000	52	U.S.S.R. 44,000;[6] Norway 13,927; Yugoslavia 4,494.
Steel, primary forms[5]	17,000	12,000	--	Yugoslavia 10,445; Sweden 466.
Semimanufactures:[5]				
Bars, rods, angles, shapes, sections thousand tons	593	447	(7)	West Germany 34; Hungary 18.
Universals, plates, sheets do	830	846	(7)	Czechoslovakia 166;[2] West Germany 97; East Germany 51.[2]
Hoop and strip do	96	61	(7)	West Germany 36; Italy 6; France 6.
Rails and accessories do	39	9	--	Japan 1; Spain 1.
Wire do	49	44	--	West Germany 3; Sweden 3.
Tube, pipe, fittings do	337	258	(7)	Romania 61;[2] West Germany 42;[2] East Germany 29.[2]
Castings and forgings, rough do	39	33	--	Czechoslovakia 16;[2] East Germany 10.[2]
Lead:				
Oxides and hydroxides	421	787	--	France 661; West Germany 89.
Metal including alloys:				
Unwrought[2]	9,805	6,654	--	U.S.S.R. 3,995; United Kingdom 1,905; North Korea 748.
Semimanufactures	1	1	--	All from Yugoslavia.
Magnesium metal including alloys:				
Unwrought[2]	1,370	1,127	689	Austria 226; Yugoslavia 142.
Semimanufactures	1	160	--	Canada 139; Yugoslavia 20.
Manganese:				
Ore and concentrate[2]	739,889	664,187	--	U.S.S.R. 489,833; Brazil 76,563; France 68,887.
Oxides	1,417	1,015	--	Ireland 500; Greece 455.
Metal including alloys, all forms	--	65	--	All from France.
Mercury 76-pound flasks	957	--		
Molybdenum:				
Ore and concentrate	90	83	--	All from Netherlands.
Nickel metal including alloys:				
Unwrought	99	89	--	West Germany 74; United Kingdom 12.
Semimanufactures	[r]88	47	1	Sweden 12; West Germany 11; France 6.
Niobium metal including alloys, all forms kilograms	198	321	321	
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$4,704	$695	--	United Kingdom $671; West Germany $14.
Silver metal including alloys, unwrought and partly wrought do	$1,454	$2,068	--	France $1,683; West Germany $334.
Tantalum metal including alloys, all forms kilograms	1,466	89	89	
Tin:				
Oxides and hydroxides	--	18	--	All from Austria.
Metal including alloys:				
Unwrought[2]	3,879	3,318	--	United Kingdom 2,192; Malaysia 501; Indonesia 350.
Semimanufactures	1	2	1	West Germany 1.
Titanium:				
Oxides and hydroxides	1,174	723	--	West Germany 542.
Metal including alloys, all forms kilograms	970	678	644	Japan 34.
Tungsten:				
Ore and concentrate[2]	2,898	1,662	--	United Kingdom 875; China 662; Switzerland 125.
Metal including alloys, all forms kilograms	2,579	4,167	1,733	Netherlands 1,000; Japan 914.

See footnotes at end of table.

Table 5.—Poland: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate[2]	27,979	27,053	--	Sweden 12,789; West Germany 11,848; Norway 2,416.
Oxides and peroxides	22	5	--	France 3; Switzerland 1; United Kingdom 1.
Metal including alloys:				
Unwrought[2]	2,627	2,398	--	U.S.S.R. 2,164; Norway 125; Czechoslovakia 109.
Semimanufactures	229	266	1	Norway 131; Yugoslavia 130.
Other:				
Ores and concentrates	153	[8]84,237	2	Norway 84,136; Netherlands 83.
Ash and residue containing nonferrous metals	10	9	--	All from United Kingdom.
Oxides, hydroxides, peroxides of metals	146	324	--	West Germany 251; Austria 18.
Metals:				
Metalloids	18,269	22,018	5	France 19,146; Yugoslavia 1,568; Norway 920.
Alkali, alkali-earth, rare-earth metals	NA	61	--	United Kingdom 31; Austria 30.
Metal powder[2]	644	777	--	All from East Germany.
Nonferrous alloys[2]	[r]2,167	3,114	--	U.S.S.R. 1,628; Hungary 1,286; East Germany 200.
Base metals including alloys, all forms	88	116	3	West Germany 77; United Kingdom 20.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	675	767	48	Italy 708; Greece 10.
Artificial: Corundum	4,145	1,810	23	Yugoslavia 916; Japan 592; West Germany 231.
Dust and powder of precious and semiprecious stones				
value, thousands	$686	$230	--	All from Belgium-Luxembourg.
Grinding and polishing wheels and stones	2,064	[9]1,673	([7])	Austria 726; United Kingdom 302; Yugoslavia 286.
Asbestos, crude[2]	103,372	83,272	[3]443	U.S.S.R. 66,898; West Germany 6,066; United Kingdom 5,339.
Barite and witherite	1,125	4,088	--	All from Morocco.
Boron materials:				
Crude natural borates	19,707	200	--	All from Netherlands.
Oxides and acids	1,801	605	--	France 600.
Cement[2]	42,318	134,970	--	U.S.S.R. 63,871; Czechoslovakia 44,351; Hungary 26,747.
Chalk	--	40	--	All from France.
Clay and clay products:				
Crude:				
Bentonite	4,053	4,591	92	Hungary 4,499.
Fire clay[2]	[r]48,404	11,380	--	U.S.S.R. 8,231; East Germany 1,580.
Chamotte[2]	[r]63,299	81,089	--	U.S.S.R. 26,092; France 19,665; Spain 19,173.
Kaolin[2]	218,032	151,252	[3]203	Czechoslovakia 63,146; United Kingdom 47,529; U.S.S.R. 13,210.
Other	1,781	1,145	--	Italy 1,115; France 20.
Products:				
Nonrefractory	7,394	15,186	--	Spain 12,321; Italy 1,060; Portugal 970.
Refractory including nonclay brick[2]	52,432	34,771	[3]152	Czechoslovakia 7,473; Austria 6,604; Ireland 5,215.
Diamond:				
Gem, not set or strung				
value, thousands	$375	NA		
Industrial do	$7,260	$3,579	--	Belgium-Luxembourg $3,158; Switzerland $402.
Diatomite and other infusorial earth	703	3,480	3,171	Denmark 220; France 88.
Feldspar and fluorspar[2]	62,553	55,328	--	Mexico 31,802; East Germany 13,370; North Korea 7,899.
Fertilizer materials:				
Crude, phosphatic[2] thousand tons	3,327	3,242	900	Morocco 954; U.S.S.R. 741; Jordan 293.
Manufactured:				
Nitrogenous[2] do	207	123	--	U.S.S.R. 119; Austria 2.
Phosphatic do	3	--		
Potassic[2] do	1,789	2,428	--	U.S.S.R. 1,758; East Germany 640; West Germany 24.
Other including mixed	330	--		
Ammonia[2]	80,647	33,705	--	Hungary 11,473; U.S.S.R. 10,076; Austria 7,058.
Graphite, natural[2]	13,828	11,386	--	Austria 9,055; U.S.S.R. 1,990.
Gypsum and plasters	8,864	6,324	98	West Germany 6,183; United Kingdom 20.
Lime	10	42	--	Austria 27; France 15.
Magnesite[2]	319,921	317,120	--	North Korea 141,641; Czechoslovakia 58,428; Brazil 48,030.

See footnotes at end of table.

Table 5.—Poland: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Mica:				
Crude including splittings and waste[2]	1,756	1,844	--	India 1,793.
Worked including agglomerated splittings	32	56	--	Austria 24; Switzerland 23.
Pigments, mineral:				
Natural crude	19	--		
Iron oxides, processed	3,031	2,419	3	West Germany 1,875; United Kingdom 239; Canada 224.
Precious and semiprecious stones excluding diamond:				
Natural value, thousands	$379	$65	$12	Switzerland $28; West Germany $25.
Synthetic do.	$185	$81	--	West Germany $59; Austria $15.
Pyrite	59	20	--	All from Italy.
Salt and brine	--	7	--	West Germany 5; Sweden 2.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	15	[2]4,289	--	Czechoslovakia 2,030;[2] West Germany 1,959.[2]
Soda ash[10]	16,300	200	--	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked[2]	4,627	4,842	--	Bulgaria 2,280; Albania 1,616; U.S.S.R. 834.
Worked	38	1,748	--	Italy 1,721; West Germany 25.
Dolomite, chiefly refractory-grade	201	110	--	All from West Germany.
Gravel and crushed rock[2]	16,725	13,786	--	Norway 10,860; Finland 2,906.
Limestone excluding dimension	[2]14,267	NA		
Quartz and quartzite	6,518	5,543	--	West Germany 4,234; Brazil 800; Finland 469.
Sand excluding metal-bearing	98	132	--	United Kingdom 65; Finland 22; Sweden 19.
Sulfur:				
Elemental, other than colloidal	26	25	--	All from West Germany.
Sulfuric acid, oleum	961	13	--	All from Italy.
Talc, steatite, soapstone, pyrophyllite[2]	26,043	23,180	--	North Korea 11,672; Czechoslovakia 6,580; Finland 4,652.
Other:				
Crude	19,043	15,351	--	Hungary 12,540; West Germany 2,769.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	--	10,504	--	Japan 10,502.
Halogens	267	94	--	All from Japan.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	47	153	--	West Germany 140; Sweden 9.
Carbon black	15,029	[2]33,656	[3]740	Austria 7,380;[2] West Germany 6,877;[2] Romania 6,683.[2]
Coal, anthracite and bituminous including briquets[2] thousand tons	971	1,042	--	U.S.S.R. 742; East Germany 300.
Coke and semicoke	14,494	450	--	All from Italy.
Gas, natural[2] million cubic feet	140,658	187,591	--	All from U.S.S.R.
Petroleum and refinery products:[2]				
Crude thousand 42-gallon barrels	122,368	120,382	--	U.S.S.R. 96,285; Iraq 12,305; Nigeria 4,691.
Refinery products do.	29,299	33,168	([3])([7])	U.S.S.R. 22,492; Romania 603; Czechoslovakia 475.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	1,481	2,395	([11])	West Germany 2,265; United Kingdom 117.

[r]Revised. NA Not available.

[1]Owing to a lack of official trade data published by Poland, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from various sources which include United Nations information, data published by the partner trade countries, and partial official trade sources of Poland.

[2]Official Trade Statistics of Poland.

[3]Source: Official Trade Statistics of the United States.

[4]Source: World Metal Statistics, published by World Bureau of Metal Statistics, London, United Kingdom.

[5]Source for total imports only, not principal sources: Quarterly Bulletin of Steel Statistics for Europe, United Nations, New York.

[6]Calculated quantity from Polish and other sources.

[7]Less than 1/2 unit.

[8]Excludes export from Australia valued at $788,000.

[9]Excludes export from Hungary valued at $41,000.

[10]Source: Statistical Yearbook of members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R..

[11]U.S. reported 42 barrels of tar exports to Poland.

COMMODITY REVIEW

METALS

Aluminum.—Production of aluminum in Poland is based on alumina imported from Hungary (70%) and from Western countries (30%). Aluminum output fell in 1981, as cutbacks ordered at the Skawina smelter were enforced. Krakow's mayor ordered the 50,000-ton-per-year smelter to idle half its pots in order to reduce hydrogen fluoride emissions. The smelter was constructed in 1952 in the valley of the Vistula River, some 14 kilometers southwest of Krakow.[12]

Copper.—In 1981, development of the copper industry continued in the Legnica-Glogow region, the sole producing area. However, in September 1981, social unrest led to a fall in production. To improve the situation an extraordinary session of the Voivodship Council was held and market supplies were slightly improved. Work discipline was a problem in the copper industry, and unauthorized absences increased by 65% from August 1, 1980, to the end of 1981. The original economic plan provided for 425,000 tons of electrolytic copper to be produced in 1980, but the output was actually 357,000 tons. The revised plan for 1981 provided for 340,000 tons of electrolytic copper to be produced, but production fell short by 13,000 tons. Production of 330,000 tons was planned for 1982, and this figure was to reach 396,000 tons in 1985, and 445,000 tons in 1990.

In 1981, Poland exported 47% of its total copper production exclusively in the form of electrolytic copper. About 52% of copper exports went to the Federal Republic of Germany as a payment for money invested in the Lubin Copper Basin, about 5% went to Belgium, 5% to France, 8% to Romania, 7% to Czechoslovakia, 6% to the United Kingdom, and smaller amounts to Sweden, Finland, Austria, Switzerland, and Iran. In 1982, exports of 165,000 tons of electrolytic copper are planned, including 145,000 tons to the market economy countries.

In 1981, the copper industry was a "priority customer" for supplies of coal, and there were no fuel shortages in the industry. The entire copper industry in the Lubin area had about 40,000 employees, 10,000 of which were underground miners. At the end of December, under martial law, the mines worked 6 days a week. In 1981, copper ore was extracted mainly from three underground mines: Rudna, Polkowice, and Lubin. A fourth mine, the Sieroszowice Mine, continued under development, although it already was producing some ore in 1981. The development of ventilation shafts at the mine was 3 months behind schedule. The largest mine, Rudna, produced about 8.5 million tons of copper ore in the same year, and the target for 1984 was 11 million tons. The Rudna Mine itself had 5,700 employees, of which 3,500 were miners. In addition to the above, an old copper mine, Konrad, produced about 1.5 million tons of ore in 1981.

In 1981, production of copper ore decreased mainly because of the introduction of work-free Saturdays and Sundays. Copper ore output in Poland planned for the 10 years (1980-90) is shown in table 6.

Table 6.—Poland: Copper ore output planned for 1980-90

(Million tons)

Mine	1980	1985	1990
Lubin	7.5	7.5	7.5
Polkowice	7.5	7.5	7.5
Rudna	11.0	11.0	12.0
Konrad	1.5	1.5	--
Sieroszowice I	1.5	5.5	5.5
Sieroszowice II	--	3.4	9.5
Total	29.0	36.4	42.0

In 1981, mining was done at a depth of 900 to 1,000 meters and was planned to go down to 1,500 meters by 1983; the average copper content was about 1.5%, and overall bed thickness ranged from 0.4 to 5.5 meters. Reserves of more than 1% copper amounted to about 1,500 million tons of copper ore. The ore-bearing deposits in the Lubin-Glogow region are in sandstone and dolomites. The main ore minerals present are sulfides, such as bornite, chalcocite, chalcopyrite, and some galena and sphalerite. Associated with copper are silver, lead, cobalt, vanadium, and various other elements. The copper deposits lie below heavy water-bearing Tertiary formations.

In 1981, smelter capacities were sufficient to reach the target of the originally planned amount of 425,000 tons of electrolytic copper per year. Smelter capacities were as follows: Legnica 60,000 tons; Glogow I 160,000 tons (two production lines); the new Glogow II 150,000 tons; and others (Trzebina, Hutnem, Szopience) about 55,000 to

60,000 tons. The Glogow II copper smelter plant was put into operation in 1978 at an estimated cost of $35 million. In 1980, it produced only 60,000 tons instead of the planned 150,000 tons.

Iron and Steel.—In 1981, steel output was planned for 17.5 million tons, but the goal was not reached. The output of rolled products was expected to decrease 0.5 million tons to about 13 million tons. This production plan was not fulfilled. In comparison with the first quarter of 1981, the production of rolled steel in the first quarter of 1982 is to decrease 27.2% to 2.3 million tons.

In 1981, consumption of steel was estimated at 15.5 million tons, reflecting a decrease of 3.7 million tons compared with the 1975 level. Slackening trends in investment activity and decline of production, both in steel sectors of the manufacturing industry, can be classified as the most significant factors working toward slowing down the growth of steel demand. Investment in the iron and steel industry decreased from Z35.8 billion in 1976 to Z20.9 billion in 1979 and to an estimated Z8.6 billion in 1981.

Poland is deficient in iron ore. During the first 11 months of 1981, imports of iron ore amounted to 14.8 million tons, a decrease of 3.5 million tons from that of the same period in 1980. About 75% of the iron ore[13] was imported from the U.S.S.R., and about 13% from Sweden and others. Norway, Brazil, and Venezuela accounted for 12%. The domestic output of low-grade siderite decreased from 529,000 tons in 1978 to 104,000 tons in 1980. Production of iron ore in 1981 was estimated at a lower level than in 1980. Imports of pig iron were about 1.4 million tons in 1981.

In 1981, there were 27 steel plants in operation, most of them located in the Upper Silesian industrial district. The largest iron and steel manufacturing plants included the Lenin steel complex in Krakow, the Katowice steel complex, and the Warsaw metal plant.

In 1981, there were 21 blast furnaces in operation with an average capacity of about 980 cubic meters. The largest units (3,200 cubic meters) operated at the Katowice steel complex. The average capacity of 16 blast furnaces of the old metal plants amounted to 539 cubic meters. The coke consumption per ton of pig iron was about 600 kilograms on the average. Poland's plans for the steel industry were to reduce open-hearth production and to increase the oxygen converter output as shown in percentages in table 7.

Table 7.—Poland: Steel production by process

(Percent)

	1976	1977	1978	1979	1980
Open-hearth	64.1	56.3	49.5	47.1	46.7
Electric	14.4	14.2	13.7	13.8	14.0
Oxygen converter	21.5	29.5	36.8	39.1	39.3

In 1980, there were 79 open-hearth furnaces in operation; 8 had a production capacity of 370 tons each, 15 had a production capacity of 100 to 200 tons, and the remainder had a production capacity of 30 to 90 tons.[14] There also were 28 electric furnaces with different capacities as shown in table 8.

Table 8.—Poland: Capacities of electric furnaces

Capacity in tons	Number of electric furnaces
5-10	6
20	4
25-30	4
50	7
140	7
Total	28

In 1981, the limited funds of the iron and steel industry were invested mainly in the completion of processing facilities including plate mills at the Beirut steel plant, small rolling mills at the Nowotko steel plant, and a cold-rolling mill at the Lenin steel plant. In 1981, planned production of crude steel at the Lenin steel complex was 6 million tons, but in view of fuel shortages, reduced shipments of iron ore, and strikes, production reached only 5 million tons. Work on the Katowice foundry was halted following an investment freeze imposed because of Poland's economic crisis. Two giant furnaces at Katowice were producing about 5 million tons of steel per year.

Lead and Zinc.—In 1981, production of zinc and lead decreased by 23% and 16%, respectively, mainly because of the reduction of the workweek to 5 days. Zinc and lead ores were mined mainly in the Olkusz district. Production of zinc and lead came from the mining and metallurgical complex in Bukowno, the Szopienice nonferrous metallurgical plant, and the Miasteczco Slaskie plant.

Poland exported an estimated 12,000 tons of zinc metal in 1981. Imports of lead metal were estimated at 4,000 tons. Hard currency shortages prevented the import of zinc and lead concentrates. On April 1, 1981, a new plant for processing battery scrap was put in operation at the Orzel Bialy mining and metallurgical combine at Pickary Slasky. About 70,000 tons of scrap is to be processed at this plant annually.

Silver.—In 1981, production of silver, a byproduct of copper production, continued to be one of Poland's major hard currency earners. Value of silver exports amounted to Z328 million in 1979 and increased in 1980 largely because of doubling of the silver price.[15]

Tin.—Further prospecting of the tin deposits near Krobica and Gierczyn (Lower Silesia), discovered in 1979, proved the ore grade of 0.2% to 0.4% tin to be economic for mining. Up to 1981, production of tin in Poland was based on imported tin ores, mainly from the United Kingdom and Indonesia.

NONMETALS

Cement.—In 1981, production of cement decreased considerably because of shortages of coal and heavy fuel oil. Following a decision of the Central Anti-Crisis Commission, production of cement was halted at two of the three plants at the Chelm cement complex, and monthly production at the complex fell from 260,000 to 270,000 tons to 40,000 tons. According to the Cement, Lime, and Gypsum Industrial Association of Opole, the cement plant there was closed because of the drastic cuts in coal supplies. The plan for the supply of coal means that it most likely will remain closed until the middle of 1982.

In 1981, only 71% of the total capacity of cement plants was used. Underutilization of productive capacity in the existing cement plants and a fuel shortage led to the new plan, with a special emphasis on modernizing existing plant facilities to reduce fuel consumption. The first stage of modernization includes reconstruction of Warta II and Kujawy cement plants, where heat consumption for the firing of clinker is to decrease from 1,800 to 1,100 kilocalories per kilogram.[16] Reconstruction is planned at the Wejherowo and Strzelce Opolskie cement plants.

Fertilizers.—During the first 11 months of 1981, in comparison with the same period of 1980, nitrogenous fertilizer production dropped 3% to 1.17 million tons (in terms of nutrient content), but production of phosphoric fertilizer increased about 2% to 796,000 tons (in terms of P_2O_5).

Fertilizer production for 1982 was planned to reach about 3.14 million tons. In 1980, export of nitrogenous fertilizers fell to 271,000 tons from 365,000 tons in 1979. This was a large reduction, compared with the 981,000 tons that was exported in 1976. Exports of nitrogenous fertilizers for 1982 are planned to reach 560,000 tons.

In 1981, about 120,000 tons of ammonia was imported from the U.S.S.R. In 1981, total imports of fertilizers increased about 20% over that of 1980. Imports of phosphate rock were supplied mainly by Morocco, the United States, and the U.S.S.R. The Soviet Union is the biggest supplier of potassic fertilizers to Poland. The 1981 shipments were estimated to be over 1.7 million tons in terms of K_2O content.

The Port of Swinoujscie was recently expanded with the introduction of a new loading base in Swinoport, III. The new facility is to handle imports of chemical raw materials for the Police chemical complex. An estimated 2 million tons of chemicals are expected to be handled by the base. The country's economic crisis and lack of raw materials caused further delays in work on the fertilizer complex at Police. The Police II plant is to produce 500,000 tons of ammonia, 400,000 tons of urea, and 823,000 tons of other fertilizers per year.

In 1981, the construction of a 250-mile gas pipeline to link the Orenburg gasline with the Police fertilizer complex was underway.[17]

The 407,000-ton-per-year ammonia plant at Wroclawek, constructed in 1972, was to undergo renovation to reach projected ammonia capacity.

Salt.—In 1981, the production of salt came from the Klodawa and Inowroclaw regions in central Poland where the deposits occur in the form of salt domes, which have cross sections of several square kilometers and reach a depth of more than 1,000 meters. Production of salt in the form of natural brine came also from rock deposits occurring along the Carpathian foreland in seams several meters thick at a depth of more than 500 meters. More than 60% of the total rock salt reserves are located in Inowroclaw and Klodawa.

In 1981, a new mine was under development at Przyma near Mogilno in the

Kujawy region because the mine at Inowroclaw, which is 50 years old, is expected to be closed in the next few years. The new mine will produce salt by solution mining by about 1986.

In 1981, the first shaft of 50 meters was put into operation at the salt mine at Siedlec near Bochnia in Tarnov Province. Brine from the new mine is to be used in the chemical industry and in production of salt. Several recently discovered deposits of salt are located in the region of Raciborz, Przemysl, and Rzeszow.

Sulfur.—In October and November 1981, sulfur production from the Grzybow, Jezierko, and Machow Mines was badly affected by strikes in the Tarnobrzeg mining region. Grzybow and Jezierko, which are Frasch mines, contributed about 90% of the total sulfur production in 1981, and Machow,which is an open pit, produced the remainder. The experimental Bazina Mine in the Preusl region produced 30,000 tons of sulfur. Domestic consumption of sulfur amounted to over 1 million tons.

Total exports of sulfur in the first 9 months of 1981 increased 5% over the level achieved during the same period in 1980 and reached 2.97 million tons. Of this total, 1.47 million tons was taken by market economy countries, a similar figure to that of 1980; Western Europe's imports of Polish sulfur fell by 22% to 968,000 tons. With the exception of Finland, all regular importers of Polish sulfur reduced their deliveries. An 84% rise in exports to Africa throughout the 9 months was achieved, with Morocco taking 213,000 tons compared with 145,000 tons in 1980, and Tunisia importing 138,000 tons compared with 46,000 tons in 1980. The high level of exports to Morocco was to cover the additional requirements of the recently completed fourth 1,500-ton-per-day sulfuric acid line of the Maroc Phosphate I plant, as well as to accumulate stocks for the startup of Maroc Phosphate II.

Exports of sulfur from Poland to centrally planned economy countries for the first 9 months of 1981 increased 9% to 1.49 million tons. Sulfur delivered to the U.S.S.R. increased from 556,000 tons in the first 9 months of 1980 to 668,000 tons over the same period in 1981.[18]

Exports of sulfur to the Soviet Union increased because large-capacity brimstone-based sulfuric acid plants, built by Polish enterprises, were brought onstream in the Soviet Union. The strong demand for Polish sulfur in the Soviet Union in 1981 also limited the extent to which Poland's Foreign Trade Enterprise Siarkopol could meet the growing sulfur demand in East Europe. Plans were to invest about Z16,500 million in the sulfur industry in the 1981-85 period. Of this Z16,500 million, about Z6,500 million is to be spent on development of a new 1-million-ton-per-year mine, Scopanie, to replace the Grzybow Mine, where output is expected to decrease from 1.4 million tons in 1981 to 250,000 tons per year in the near future. Development of the Scopanie Mine is planned to start in 1982.

MINERAL FUELS

In 1981, total primary energy production was 184.9 million tons in standard coal equivalent (SCE). This represents a decrease in total primary energy production by 14.5%, compared with the 1980 level. Coal (lignite and bituminous) contributed 93.8%; crude oil, 0.3%; natural gas, 4.4%; and others (peat, wood, and hydropower), 1.5%. Total consumption of all types of primary energy reached 200.2 tons SCE, with coal providing 78.9%; petroleum, 12.1%; natural gas, 7.6%; and others, about 1.4%. In 1981, the total apparent consumption of primary energy decreased 8.8% compared with consumption of 1980; exports decreased by 49.6%. The energy balance for 1981 and 1980 is shown in table 9.

Table 9.—Poland: Total primary energy balance[1]

(Million tons of standard coal equivalent)

	Total primary energy	Coal (lignite, bituminous) and coke	Crude oil and petroleum products	Natural gas	Others
1980:					
Production	216.3	204.2	0.5	8.4	3.2
Imports	38.8	1.0	30.7	7.1	--
Exports	35.5	33.1	2.4	--	--
Apparent consumption	219.6	172.1	28.8	15.5	3.2
1981:[e]					
Production	184.9	173.5	.5	8.1	2.8
Imports	33.2	1.0	25.1	7.1	--
Exports	17.9	16.6	1.3	--	--
Apparent consumption	200.2	157.9	24.3	15.2	2.8

[e]Estimated.

[1]One ton of standard coal equivalent (SCE)=7,000,000 kilocalories. Conversion factors used are from the United Nations as follows: Hard coal, 1.0; brown coal, 0.3; coke, 0.9; crude oil, 1.47; petroleum products, 1.54; natural gas (1,000 cubic meters), 1.33.

Source: Biuletyn Statystyczny (Statistical Bulletin), Warsaw, No. 12, 1981, pp. 14, 32, and 34.

Coal.—In 1981, coal output fell 12 million tons short of the planned target of 175 million tons and was 38 million tons less than in 1979 and 30 million tons less than in 1980, because miners worked only a 5-day week, involving work-free Sundays and only voluntary work on Saturdays.[19] Prior to December 13, strikes and work stoppages in mines resulted in shortfalls of some 600,000 tons of coal. Large production decreases were also noted in the last few weeks of 1981, when work was halted at the Ziemovit and Piast Mines. Export of bituminous coal amounted to 15.1 million tons in 1981, about 16 million tons less than in 1980. This entailed a loss of hard currency revenue of $1,100 million. Of the total exports, 7.2 million tons was exported to centrally planned economy countries and 7.9 million tons to developed market economy countries.[20] It was estimated that about 18 million tons of bituminous coal would be exported in 1982.

The December 13 declaration of martial law established a maximum 6-day workweek during the period of martial law. On December 31, all hard coal mines were working normally, although only on two shifts.

In 1981, there were 66 mines in operation, mainly situated in Upper Silesia. The average mining depth was estimated at about 560 meters. About 89% of the total hard coal production was obtained from mines using the longwall system of mining. The development and renovation of some hard coal mines that were started in previous years continued in 1981 (Suszec, K-1, Kaczyce, Czeczot, and Budryk Mines).

In 1981, two mines were under development in the Lublin coal basin. Work on one, however, had been suspended and work on the other was delayed because of flooding in 1980.[21]

Extraction and exports of lignite in 1981 were lower than in 1980. Exports of lignite were 1.6 million tons in 1980 compared with 3.0 million tons in 1979. In 1981, Turow opencast mine lignite output accounted for about 60% of the total lignite production. Work continued on the Turow Mine to expand its capacity and on the Konin opencast mine to develop the new Lubstow lignite deposits. A total of Z1,720 million was to be spent on the project in the near future. A new mine at Lubstow is expected to produce about 500,000 tons of lignite by yearend 1982.

The opencast brown coal mining and energy project at Belchatow continued in 1981, some 2 years behind schedule. According to M. Glanovsky, Deputy Minister of Mining and Power, the geological prospecting has proven reserves of about 1.7 billion tons of lignite. The annual output of the mine under development is to amount to about 38 million tons of lignite, which will supply the Belchatow power station with a designed capacity of 4,320 megawatts. More than 202 million cubic meters of overburden was removed at the mine and production of lignite started in 1981; final preparations were made there to put the first 360-megawatt unit into service. It is expected that in 1990, lignite production will total 140 million tons compared with

about 35 million in 1981, while the share of lignite-based energy will grow to 40%.

In 1981, about 20% of the total amount of electrical energy produced was based on the use of lignite. In 1982, lignite extraction is to increase by 1.5 million tons as a result of the commissioning of the Belchatow Basin.

Natural Gas.—Most domestic natural gas consumed was extracted from the Lubaszow Fields, but extraction of gas slightly declined compared with the level of 1980. Imports from the U.S.S.R. totaled 5.3 billion cubic meters. In 1981, new gas deposits were discovered near Nowa Sola, at a depth of about 1,000 meters. Prospecting in the region is to continue. The country purchased drilling equipment from Romania, and it was expected to drill to a depth of 6,000 to 8,000 meters. In 1980, considerable deposits of gas and oil were discovered in Karlino, Kasolin region, northwest Poland. In 1981, production of gas in the Karlino well increased from 12,000 cubic meters per day to 32,000 cubic meters per day. According to Polish sources, proved, probable, and possible gas reserves are estimated at about 200 billion cubic meters.

Petroleum.—In 1981, production of crude oil was insignificant. Petroleum supplies came from the U.S.S.R. and amounted to 13.2 million tons, including 1.1 million tons of crude oil as payment for Polish participation in the Soviet Union oil industry. Imports of petroleum products were estimated at 2.9 million tons. The Polish petroleum industry is to receive a similar amount of oil for processing in 1982. Oil imports from the Organization of Petroleum Exporting Countries were almost discontinued because of the difficult balance of payments situation.

In 1981, large crude oil deposits were discovered in the area of the Polish shelf, north of Rozewa, by the drilling platform of a joint enterprise belonging to Poland, the German Democratic Republic, and the U.S.S.R. The size of the deposits can be confirmed only by further drilling.[22]

In 1981, the Karlino oil well in the Kosalin region increased its crude oil production from 110 tons per day to 180 to 190 tons per day. If the production of oil continues at this level, the Karlino well will produce about 70,000 tons of crude oil in 1982. Some production of crude oil also came from the Krasno region in the Carpathian Mountains where new oil wells were drilled. However, workers of the Krasno oil industry went on strike in November 1981, and the production of oil considerably decreased.

In 1981, a new oil well was put into operation in the Platy region and another at Karsk near Novograd, Czczecin Province. This Province produced half of the domestic crude oil in 1981.

In 1981, the Plock refinery, together with several smaller plants, processed 13.6 million tons of crude oil. In June 1981, the Gdansk refinery resumed operations after a break of more than 1 month. The refinery processed about 2 million tons of oil in 1981. Reportedly, the prices of oil deliveries from the Soviet Union under the Intra-Comecon Agreement were raised in 1981 by 30%, but they were still about 40% below comparable world market quotations.

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[1]Foreign mineral specialist, Division of Foreign Data.
[2]Tribuna Ludu (Warsaw). Jan. 29, 1982, p. 5.
[3]Depending upon the purpose of the exchange, the value of zloty may vary considerably. Where necessary, values have been converted from Polish zloty (Z) to U.S. dollars at the official exchange rate of Z34.46=US$1.00 (September 1981). U.S.S.R. rubles 1.00=US$1.50 approximately.
[4]Tribuna Robotnicza (Worker's Tribune) (Katowice). Apr. 24-26, 1981, pp. 1, 4.
[5]Biuletyn Statystyczny (Statistical Bulletin) (Warsaw). No. 8, September 1981, p. 13.
[6]Maly Rocznik Statystyczny (Concise Statistical Yearbook of Poland) (Warsaw). 1981, p. 110.
[7]Polish Foreign Trade (Warsaw). March-April, 1981, p. 40.
[8]———. January-February, 1981, p. 7.
[9]Zycie Gospodarcze (Economic Life) (Warsaw). Jan. 24, 1982.
[10]Work cited in footnote 2.
[11]Biuletyn Statystyczny (Statistical Bulletin) (Warsaw). No. 12, December 1981, p. 31.
[12]Tribuna Ludu (Warsaw), Nov. 22-23, 1980.
[13]Page 32 of work cited in footnote 11.
[14]Wiadomosci Hutnicze (Metallurgical News) (Warsaw). No. 5, May 1979, pp. 170-176.
[15]Rocznik Statyczny Handlu Zagranicznego (Polish Trade Book) (Warsaw). 1981, p. 71.
[16]Materialy Budowland (Building Materials) (Warsaw). No. 8, Apr. 16-30, 1981, pp. 4-5.
[17]Phosphorous & Potassium (London). No. 12, March-April 1981, p. 13.
[18]Sulfur (London). No. 156, September-October 1981.
[19]Tribuna Ludu (Warsaw). Sept. 15, 1981, p. 2.
[20]———. Jan. 7, 1982, p. 2.
[21]Polish Economic Survey (Warsaw). Feb. 16-28, 1981, No. 4, p. 12.
[22]Tribuna Ludu (Warsaw). May 6, 1981, p. 3.

The Mineral Industry of Portugal

By Roman V. Sondermayer[1]

The mineral industry of Portugal remained modest by world standards. During 1981, however, the Government started to implement its plans aimed at development of the country's neglected mineral resources, hoping thereby to decrease imports of minerals and increase employment in the country. Because of budgetary restraints, however, the pace of the development would be slower than originally anticipated.

The industrial policy in the 1981-84 economic plan was intended to pave the way for entry into the European Communities and to set the framework for modernization of Portuguese industry, including mines and smelters, and for the building of a modest number of new mineral-related installations. Portugal's relative political stability, its favorable incentives, and reasonable labor rates made investing in the country an attractive opportunity.

During 1981, the extractive sector of the industry accounted for about 1% of the gross domestic product of approximately $23.9 billion.[2] The significance of the Portuguese mineral industry for the mineral supply of the world was modest, and only output of tungsten, approximately 4% of the world total, was important in the international market. The industry was also hampered by one of the most severe droughts in the past 120 years, which caused shortages of hydroelectric power and water.

Expansion of the Aljustrel pyrite mine, development of the Neves-Corvo deposit of complex sulfide ores, and development of the Moncorvo iron ore deposit were the most important events during the year in the mineral industry.

PRODUCTION

Table 1 shows trends in the production of minerals in Portugal. Most of the major mineral-producing enterprises were owned by the Government. The private sector was mostly involved in production of nonmetals. Mineral-producing facilities were outdated by world standards, but modernization and expansion of large existing installations and development of new modern ones were under study.

Table 1.—Portugal: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Arsenic, white	222	253	[e]345	[e]200	[2]257
Beryl concentrate, gross weight	--	([3])	5	19	[2]17
Columbite and tantalite concentrates, gross weight	3	8	4	4	[2]12
Copper:					
Mine output, metal content	3,216	3,617	3,600	5,200	[2]4,800
Metal:					
Smelter, primary and secondary[e]	3,300	3,000	5,500	6,600	[2]4,800
Refined, primary	3,392	2,997	3,373	4,600	[2]4,800

See footnotes at end of table.

Table 1.—Portugal: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS —Continued					
Gold, mine output, metal content—troy ounces	8,841	9,131	[e]12,400	8,855	[2]10,924
Iron and steel:					
Ore and concentrate:					
Gross weight:					
Hematite and magnetite	22,384	19,761	22,119	14,773	--
Manganiferous	30,250	34,760	37,440	41,850	37,000
Total	52,634	54,521	59,559	56,623	37,000
Iron content:					
Hematite and magnetite	15,078	13,437	15,040	10,046	--
Manganiferous	11,767	12,757	13,740	15,359	13,000
Total	26,845	26,194	28,780	25,405	13,000
Metal:					
Pig iron—thousand tons	357	353	366	300	300
Ferroalloys:					
Ferromanganese[e]	55,000	78,000	75,000	74,000	65,000
Silicomanganese[e]	5,000	15,000	15,000	17,000	18,000
Ferrosilicon[e]	24,000	30,000	25,000	25,000	24,000
Silicon metal[e]	13,200	20,000	32,000	33,000	32,000
Ferrotungsten	166	163	[e]200	[e]200	200
Other[e]	([4])	([4])	([4])	--	--
Total[e]	97,366	143,163	147,200	149,200	139,200
Crude steel—thousand tons	537	577	649	653	[2]551
Semimanufactures—do	561	643	640	650	NA
Lead:					
Primary	123	118	--	--	--
Refined, secondary	400	286	31	1,000	[2]1,200
Silver, mine output, metal content—troy ounces	25,753	22,602	[e]30,700	18,800	[2]38,493
Tin:					
Mine output, metal content	267	282	225	274	[2]351
Metal, primary and secondary	1,016	854	1,121	938	1,000
Titanium: Ilmenite concentrate, gross weight	229	325	268	234	[2]334
Tungsten, mine output, metal content	1,005	1,104	1,377	1,467	[2]1,381
Uranium concentrate: U content	111	102	134	95	[2]120
Zinc: Smelter, primary	--	--	--	[e]2,000	11,000
NONMETALS					
Barite	590	620	704	1,300	[2]1,350
Cement, hydraulic—thousand tons	4,296	5,120	5,138	5,748	5,800
Clays:					
Kaolin	72,860	73,555	[e]54,000	49,274	52,846
Refractory	105,686	181,717	[e]100,000	[e]100,000	110,000
Diatomite	3,390	2,700	3,400	2,310	[2]3,090
Feldspar	15,246	21,582	33,808	40,802	[2]42,435
Gypsum and anhydrite	175,961	208,701	[e]200,000	205,000	200,000
Lime, hydrated and quicklime—thousand tons	227	260	261	270	260
Lithium minerals: Lepidolite	1,200	1,200	1,000	1,000	1,000
Nitrogen: N content of ammonia—thousand tons	185	252	222	200	200
Pigments, mineral, natural: Iron oxides	62	[e]65	[e]60	65	60
Pyrites and pyrrhotite (including cuprous), gross weight—thousand tons	360	314	349	350	[2]287
Salt:					
Rock—do	351	326	408	401	[2]408
Marine—do	148	150	[e]140	130	120
Total—do	499	476	548	531	528
Sand and gravel:					
Sand—do	6,882	5,294	NA	NA	NA
Gravel—do	153	464	NA	NA	NA
Sodium compounds, n.e.s.:					
Sodium carbonate	129,724	131,452	182,770	175,000	170,000
Sodium sulfate	46,479	51,344	44,831	52,200	50,000
Stone:					
Basalt—thousand tons	121	71	NA	NA	NA
Calcareous:					
Dolomite—do	93	93	NA	NA	NA
Limestone, marl, calcite—do	7,390	8,932	10,541	NA	NA
Marble—do	267	303	324	NA	NA
Diorite—do	4,222	620	NA	NA	NA
Gabbro—do	10	--	NA	NA	NA
Granite—do	3,625	6,796	4,796	NA	NA
Graywacke—do	20	38	NA	NA	NA

See footnotes at end of table.

Table 1.—Portugal: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Stone —Continued					
Ophite thousand tons	74	65	NA	NA	NA
Porphyry do	85	--	NA	NA	NA
Quartz do	116	122	125	125	116
Quartzite do	299	316	NA	NA	NA
Schist do	125	275	NA	NA	NA
Serpentine do	1	--	NA	NA	NA
Slate do	50	59	NA	NA	NA
Syenite do	9	9	NA	NA	NA
Sulfur:					
Content of pyrites do	156	136	151	155	135
Byproduct, all sources do	2	1	1	2	2
Total do	158	137	152	157	137
Talc	1,610	1,709	2,727	2,598	[2]6,363
MINERAL FUELS AND RELATED MATERIALS					
Coal, anthracite thousand tons	195	180	179	177	[2]184
Coke, metallurgical do	206	203	179	140	NA
Fuel briquets, all grades	381	290	247	200	NA
Gas, manufactured million cubic feet	4,819	4,965	4,900	5,000	NA
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	5,983	6,589	8,700	7,140	NA
Jet fuel do	3,076	2,827	3,696	3,000	NA
Kerosine do	464	640	947	900	NA
Distillate fuel oil do	9,296	9,647	22,402	18,500	NA
Residual fuel oil do	17,100	16,826	25,669	32,581	NA
Lubricants do	677	469	449	500	NA
Other:					
Liquefied petroleum gas do	1,662	1,495	2,045	2,000	NA
Asphalt do	315	348	547	2,000	NA
Unspecified do	2,559	1,664	3,600	4,000	NA
Refinery fuel and losses do	3,577	4,004	[e]5,100	5,000	NA
Total do	44,709	44,509	73,155	75,621	NA

[e]Estimated. [p]Preliminary. NA Not available.
[1]Table includes data available through Aug. 4, 1982.
[2]Reported figure.
[3]Less than 1/2 unit.
[4]Revised to zero.

TRADE

Foreign trade in minerals is shown in tables 2 and 3. Imports of fuels heavily burdened the trade balance of the country.

Table 2.—Portugal: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	9,812	7,511	--	Spain 3,134; India 2,436; France 1,129.
Beryllium metal including alloys all forms	NA	40	40	NA.
Chromium: Oxides and hydroxides	1	2	--	All to Guinea-Bissau.
Copper:				
Ore and concentrate including matte	1,004	1,052	--	Finland 550; United Kingdom 502.
Sulfate, value	$41	NA		
Metal including alloys, all forms	5,046	3,059	736	France 776; Spain 262; Netherlands 240.
Gold: Waste and sweepings, value	$30,660	NA		
Iron and steel:				
Roasted pyrites	27,514	20,531	--	All to West Germany.
Metal:				
Scrap	4,796	4,515	7	Spain 2,285; Netherlands 1,775; Belgium-Luxembourg 338.
Pig iron, ferroalloys, similar materials	92,773	85,244	21,550	Italy 12,423; West Germany 8,219; Greece 7,769; Turkey 6,997.
Semimanufactures:				
Bars, rods, angles, shapes, sections	69,387	43,791	2	Syria 9,987; Switzerland 7,050; West Germany 7,042.
Universals, plates, sheets	35,833	22,717	--	Switzerland 9,095; Romania 9,057; Spain 1,440.
Hoop and strip	1,018	379	--	Angola 285; Nigeria 69; United Kingdom 13.
Rails and accessories	320	400	--	Pakistan 390; Cape Verde 10.
Wire	155	3,500	--	Tunisia 2,500; West Germany 369; Egypt 215.
Tubes, pipes, fittings	5,408	5,106	--	Italy 879; Spain 684; France 568; Lebanon 564.
Castings and forgings, rough	12,562	8,171	1,658	United Kingdom 3,810; Sweden 953; France 920.
Lead:				
Ore and concentrate	1,635	1,420	--	All to Belgium-Luxembourg.
Oxides and hydroxides	113	104	--	Belgium-Luxembourg 99; Angola 5.
Metal including alloys, all forms	100	20	--	Angola 16; United Kingdom 3.
Magnesium metal including alloys, waste and scrap	8	NA		
Manganese:				
Ore and concentrate	2,050	650	--	All to France.
Oxides and hydroxides	(1)	36	--	All to Mozambique.
Molybdenum metal including alloys, all forms, value	$470	NA		
Nickel metal including alloys, all forms	84	22	--	All to United Kingdom.
Platinum-group metals including alloys, unwrought and partly wrought, troy ounces	3,312	(2)		
Silver metal including alloys, unwrought and partly wrought, do.	488,878	(3)		
Tin metal including alloys, all forms	9	11	--	Angola 6; Saudi Arabia 3.
Tungsten:				
Ore and concentrate	1,704	2,091	432	United Kingdom 698; Japan 430; West Germany 281.
Metal including alloys, all forms, kilograms	--	12	10	Mozambique 1; Switzerland 1.
Zinc:				
Oxides and hydroxides	2,087	2,108	--	West Germany 905; United Kingdom 600; Italy 364.
Metal including alloys, all forms	129	23	--	Spain 22; Guinea-Bissau 1.
Other:				
Ores and concentrates	315	6	--	All to Japan.
Ash and residue containing nonferrous metals	11,339	6,667	--	West Germany 4,194; Spain 2,260.
Oxides, hydroxides, peroxides	4	NA		
Metals:				
Metalloids	21,066	19,573	--	U.S.S.R. 8,000; Japan 6,000; West Germany 2,003.
Waste and sweepings of precious metals, value, thousands	$320	$522	--	France $265; Belgium-Luxembourg $150; West Germany $44.
Base metals including alloys, all forms	6	1	--	Mainly to Mozambique.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	85,646	74,118	--	United Kingdom 57,597; Norway 11,056; Netherlands 5,457.
Artificial corundum	6	NA		
Grinding and polishing wheels and stones	69	62	25	United Kingdom 11; Angola 7; Iran 5.

See footnotes at end of table.

Table 2.—Portugal: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Barite and witherite	283	NA		
Boron materials: Oxides and acids	2	NA		
Cement	13,288	9,193	--	Gibraltar 5,305; Guinea-Bissau 2,845; United Kingdom 708.
Chalk	22	11	--	Angola 4; Guinea-Bissau 2.
Clays and clay products:				
Crude	906	119	--	Spain 59; Angola 28; Brazil 3; Mozambique 3.
Products:				
Nonrefractory	16,873	38,849	605	Spain 8,803; France 8,105; West Germany 6,945.
Refractory including nonclay brick	429	1,136	--	Guinea-Bissau 508; Angola 355; Gibraltar 113.
Diamond:				
Gem, not set or strung thousand carats	6,081	NA		
Industrial do	29,602	(e)		
Diatomite and other infusorial earth	16	44	--	Sao Tome and Principe 17; Venezuela 15.
Feldspar, leucite, nepheline	9,099	11,278	--	West Germany 4,782; France 3,987; East Germany 1,550.
Fertilizer materials:				
Manufactured:				
Nitrogenous	181,894	111,723	--	West Germany 61,425; Netherlands 24,190; Italy 7,048.
Phosphatic	108,968	61,595	--	Brazil 14,586; United Kingdom 10,835; Spain 5,900; U.S.S.R. 5,080.
Potassic	100	1,394	--	Mozambique 1,294; Cyprus 100.
Other including mixed	89,220	70,214	--	Belgium-Luxembourg 36,760; Libya 14,226; West Germany 12,160.
Ammonia	8,648	7,308	--	Morocco 4,306; Tunisia 3,000.
Graphite, natural	106	97	--	All to Spain.
Gypsum and plasters	145	103	--	Mozambique 80; Cape Verde 11; Guinea-Bissau 10.
Lime	66	456	--	Mozambique 275; Cape Verde 81; Guinea-Bissau 59.
Mica: Crude including splittings and waste	232	NA	NA	
Pigments, mineral:				
Natural, crude	23	NA	NA	
Iron oxides, processed	21	25	--	Guinea-Bissau 13; Cape Verde 10; Sao Tome and Principe 1.
Pyrites, unroasted	133	NA	NA	
Salt and brine	15,024	1,524	10	Zaire 1,485; West Germany 20.
Sodium and potassium compounds, n.e.s.:				
Caustic potash kilograms	300	NA	NA	
Caustic soda	105	32	--	Guinea-Bissau 24; Angola 6.
Soda ash	4,837	11,575	--	Algeria 7,500; Italy 3,000; Spain 974.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Marble and other calcareous	108,444	115,363	50	Italy 44,554; Spain 30,018; West Germany 11,327.
Slate	3,634	2,000	--	West Germany 801; Denmark 797; Belgium-Luxembourg 255.
Granite and other	23,660	28,491	425	Japan 17,005; Italy 10,301.
Worked:				
Slate	8,690	10,524	--	West Germany 4,020; Belgium-Luxembourg 2,944; Netherlands 2,346.
Paving and flagstone	138,230	157,671	--	West Germany 119,038; Denmark 11,475; United Kingdom 9,395.
Marble and other	46,593	53,918	2,068	West Germany 20,382; France 7,366; Saudi Arabia 6,822.
Dolomite, chiefly refractory-grade	3	--		
Gravel and crushed rock	4,660	1,603	--	Italy 1,196; Spain 313.
Limestone, except dimension	215	131	--	Mozambique 66; Cape Verde 49.
Quartz and quartzite	3,812	1,472	--	United Kingdom 698; West Germany 395; Ireland 200.
Sand excluding metal-bearing	14,112	12,455	--	Gibraltar 11,660; Spain 700; Angola 59.
Sulfur:				
Elemental, all forms	205	83	--	Spain 40; Mozambique 22; Angola 14.
Sulfuric acid and oleum	28,649	23,895	--	Algeria 12,709; Spain 6,374; Turkey 4,618.
Talc, steatite, soapstone, pyrophyllite	18	33	--	Angola 24; Mozambique 7.
Other:				
Crude	111	159	--	Spain 113; Guinea-Bissau 24.

See footnotes at end of table.

Table 2.—Portugal: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other —Continued				
Slag, dross, similar waste, not metal-bearing:				
From iron and steel manufacture	1,226	NA		
Unspecified kilograms	200	NA		
Oxides, hydroxides, peroxides of barium, magnesium, strontium value	$20	NA		
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	1,742	1,867	--	Guinea-Bissau 675; Cape Verde 521; France 398.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	(1)	22	--	All to Guinea-Bissau.
Carbon black	(1)	11	--	Angola 7; Guinea-Bissau 3; Mozambique 1.
Coal, all grades including briquets	11	19	--	Angola 16.
Coke and semicoke	15	20	--	All to Angola.
Hydrogen, helium, rare gases kilograms	100	NA		
Petroleum refinery products:				
Bunker deliveries:				
Gasoline, aviation thousand 42-gallon barrels	(1)	85		
Kerosine do	(1)	NA		
Jet fuel do	1,121	1,529		
Distillate fuel oil do	27	357		
Residual fuel oil do	1,136	537		
Lubricants do	142	24		
Unspecified do	405	10		
Nonbunker deliveries:				
Gasoline do	768	1,948	572	Netherlands 522; West Germany 274; France 179.
Kerosine and jet fuel do	167	100	91	Cape Verde 9.
Distillate fuel oil do	--	1,226	614	Netherlands 374; Belgium-Luxembourg 170.
Residual fuel oil do	510	2,061	607	Spain 923; Netherlands 265; United Kingdom 265.
Lubricants do	36	72	--	Spain 28; Cuba 21; United Kingdom 7.
Other:				
Liquefied petroleum gas do	11	13	--	Cape Verde 12.
Mineral jelly and wax do	15	3	--	Nigeria 1.
Unspecified do	1,599	207	--	Sweden 203; Guinea-Bissau 2.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	31	621	4	Sao Tome and Principe 580; Angola 22.

NA Not available.

[1]Less than 1/2 unit.

[2]Value only reported at $1,365,000, of which $628,000 to France, $409,000 to United Kingdom, and $200,000 to United States.

[3]Value only reported at $5,341,000, of which $3,635,000 to West Germany, $1,648,000 to Belgium-Luxembourg, $37,000 to Angola, and $1,000 to United States.

[4]Value only reported at $107,454,000, all to Switzerland.

Table 3.—Portugal: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate	550	2,578	--	Suriname 1,100; Spain 763; West Germany 715.
Oxides and hydroxides	6,285	4,576	102	United Kingdom 2,459; France 1,109; Spain 27.
Metal including alloys:				
Scrap	503	103	--	Spain 65; West Germany 20; France 7.
Unwrought	21,803	27,403	1,223	Canada 11,733; Spain 6,596; France 3,724.
Semimanufactures	14,177	15,532	167	Spain 3,436; Belgium-Luxembourg 3,101; France 1,693.
Beryllium: Ore and concentrate	762	NA		
Chromium:				
Chromite	733	410	--	Republic of South Africa 216; Finland 140; Spain 24.
Oxides and hydroxides	254	198	1	West Germany 169; United Kingdom 15; Spain 11.
Cobalt: Oxides and hydroxides	9	4	--	Belgium-Luxembourg 2; Canada 1.
Columbium and tantalum: Tantalum metal including alloys, all forms, value	$818	NA		
Copper:				
Ore and concentrate	62	10	--	All from Australia.
Matte and speiss	1	1,797	--	All from Chile.
Oxides and hydroxides	296	NA		
Sulfate solution	10	NA		
Metal including alloys:				
Scrap	269	244	2	United Kingdom 80; Senegal 20.
Unwrought	12,921	12,463	20	Belgium-Luxembourg 3,899; Canada 2,450; France 2,382.
Semimanufactures	12,556	14,711	152	United Kingdom 2,810; Italy 2,229; Spain 2,203.
Gold:				
Ore and concentrate, value	$143	NA		
Metal including alloys, unwrought and partly wrought, troy ounces	8,982	NA		
Iron and steel:				
Ore and concentrate	619,650	494,918	--	Mauritania 130,190; Venezuela 120,580; Canada 91,172.
Roasted pyrites	37	2	2	
Metal:				
Scrap	145,809	149,205	68,701	United Kingdom 33,645; Netherlands 22,843; U.S.S.R. 19,548.
Pig iron, ferroalloys, similar materials	58,204	43,009	2	Spain 30,923; Republic of South Africa 4,854; Brazil 4,045.
Steel, primary forms	147,824	254,203	44,304	West Germany 63,127; Japan 41,453; Netherlands 31,010.
Semimanufactures:				
Bars, rods, angles, shapes, sections	105,048	125,399	218	West Germany 32,727; Spain 29,547; Netherlands 12,576.
Universals, plates, sheets	178,020	272,603	2,786	West Germany 86,119; Belgium-Luxembourg 24,884; Denmark 24,511.
Hoop and strip	65,225	54,072	35	West Germany 39,912; France 5,813; Belgium-Luxembourg 3,562.
Rails and accessories	3,847	1,682	--	Belgium-Luxembourg 762; West Germany 739; France 124.
Wire	17,184	22,071	57	Spain 8,764; West Germany 2,754; United Kingdom 2,674.
Tubes, pipes, fittings	26,077	25,855	252	West Germany 10,079; France 2,879; Japan 2,517.
Castings and forgings, rough	728	708	9	United Kingdom 322; West Germany 104; Italy 85.
Lead:				
Ore and concentrate	NA	100	--	All from Suriname.
Oxides and hydroxides	60	81	--	West Germany 40; United Kingdom 40; Italy 1.
Metal including alloys:				
Scrap	91	1,050	3	Saudi Arabia 512; Spain 240; United Kingdom 140.
Unwrought	28,044	16,469	3,378	United Kingdom 9,947; Mexico 1,045; Canada 517.
Semimanufactures	5	18	1	West Germany 10; Belgium-Luxembourg 6.
Magnesium metal including alloys, all forms	33	11	5	Norway 2; Netherlands 1; Spain 1.
Manganese:				
Ore and concentrate	235,709	173,823	--	Republic of South Africa 93,826; Brazil 50,234; Gabon 29,738.
Oxides and hydroxides	846	1,206	(1)	Ireland 470; United Kingdom 360; Republic of South Africa 120.
Mercury, 76-pound flasks	815	928	(1)	Spain 638; Mexico 174; U.S.S.R. 87.

See footnotes at end of table.

Table 3.—Portugal: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Molybdenum metal including alloys, all forms	2	2	(1)	Italy 1.
Nickel:				
Matte and speiss	104	34	--	Finland 12; Norway 7; West Germany 5.
Metal including alloys:				
Scrap	18	35	--	West Germany 24.
Unwrought	206	888	60	West Germany 658; France 98; Republic of South Africa 21.
Semimanufactures	452	433	1	West Germany 105; Canada 95; Finland 65.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	8,753	(2)		
Rare-earth metals, oxides	18	NA		
Silver metal including alloys, unwrought and partly worked thousand troy ounces	1,422	(3)		
Tin:				
Ore and concentrate	256	308	--	Thailand 224; Singapore 36; Malaysia 31.
Oxides and hydroxides	61	NA		
Metal including alloys:				
Scrap	20	25	24	NA.
Unwrought	529	571	--	Malaysia 260; Thailand 190; Australia 60.
Semimanufactures	52	37	(1)	United Kingdom 21; Netherlands 8; Spain 4.
Titanium oxides and hydroxides	8,231	8,749	4	Spain 2,377; West Germany 2,027; Belgium-Luxembourg 1,218.
Tungsten:				
Ore concentrate including residues	100	NA		
Metals including alloys, all forms	1	1	(1)	NA.
Zinc:				
Ore and concentrate	22	--		
Oxides and hydroxides	166	173	(1)	West Germany 69; Denmark 40; United Kingdom 31.
Metal including alloys:				
Scrap	781	1,138	--	Canada 534; Nicaragua 455; Belgium-Luxembourg 60.
Blue powder	815	NA		
Unwrought	14,524	16,722	19	Canada 5,170; France 3,290; Spain 2,302.
Semimanufactures	2,094	1,528	27	United Kingdom 467; Belgium-Luxembourg 405; West Germany 393.
Other:				
Ores and concentrates:				
Of titanium, vanadium, zirconium	1,126	1,892	--	Spain 1,188; Australia 329; Republic of South Africa 223.
Of base metals	386	924	--	Spain 268; Suriname 200; Australia 194.
Ash and slag containing nonferrous metals	95	490	--	All from Australia.
Oxides, hydroxides, peroxides	1,703	NA		
Metals:				
Metalloids	258	10	--	United Kingdom 4; West Germany 3; Sweden 1.
Alkali, alkaline earth, rare-earth metals	r4	NA		
Pyrophoric alloys	45	NA		
Base metals including alloys, all forms	115	83	3	Spain 30; West Germany 18; United Kingdom 17.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	300	523	18	Italy 173; Netherlands 122; Greece 68.
Artificial corundum	1,753	1,439	2	West Germany 945; France 233; Brazil 126.
Dust and powder of precious and semiprecious stones, including diamond value, thousands	$448	$676	--	Ireland $367; West Germany $170; United Kingdom $119.
Grinding and polishing wheels and stones	530	618	20	Italy 229; Spain 119; United Kingdom 98.
Asbestos crude	11,213	19,708	15	Canada 8,976; Republic of South Africa 8,971; Australia 861.

See footnotes at end of table.

Table 3.—Portugal: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS—Continued				
Barite and witherite	645	1,980	--	Morocco 1,050; West Germany 598; France 238.
Boron materials:				
Crude natural borates	4,570	5,965	160	Turkey 5,231; Netherlands 466; Belgium-Luxembourg 106.
Oxide and acid	553	612	47	France 544; Spain 20.
Borates and perborates	3,924	3,245	2,419	France 683; Switzerland 60; Turkey 60.
Cement	95,800	220,939	47	Spain 220,340; Belgium-Luxembourg 271.
Chalk	10,319	11,190	106	Spain 4,397; France 4,223; United Kingdom 1,565.
Clays and clay products:				
Crude	42,928	41,485	676	Spain 24,967; United Kingdom 10,637; France 3,374.
Products:				
Nonrefractory	482	565	(1)	Spain 197; Finland 174; Italy 170.
Refractory including nonclay brick	10,282	13,670	111	West Germany 4,660; Austria 2,784; France 2,357.
Cryolite and chiolite	55	100	--	Denmark 60; Netherlands 20; Spain 20.
Diamond, except powder and dust:				
Gem, not set or strung value, thousands	$106	NA		
Industrial do	$123	NA		
Unclassified do	$56,574	$109,890	$1	Switzerland $93,666; United Kingdom $5,981.
Diatomite and other infusorial earth	4,058	4,284	541	Spain 2,966; France 632; West Germany 130.
Feldspar, leucite, nepheline	2,209	2,022	--	France 1,601; United Kingdom 205; Spain 133.
Fertilizer materials:				
Crude:				
Nitrogenous	1,197	514	--	Chile 496; West Germany 18.
Phosphatic	389,794	452,105	19,971	Morocco 408,593; Mozambique 17,806.
Manufactured:				
Nitrogenous	31,097	29,767	--	U.S.S.R. 22,032; United Kingdom 5,343; France 1,893.
Phosphatic	1,242	1,678	--	All from France.
Potassic	90,984	86,125	--	Spain 63,120; East Germany 17,510; U.S.S.R. 5,490.
Other including mixed	11,584	4,514	3,384	West Germany 648; Belgium-Luxembourg 306.
Ammonia	6,023	27,525	4,452	Iran 12,500; Ireland 6,058; West Germany 4,513.
Graphite, natural	184	388	--	United Kingdom 286; Norway 46; West Germany 21.
Gypsum and plasters	35,502	35,118	2	Spain 27,998; Morocco 6,800.
Iodine	11	NA		
Lime	530	768	--	Spain 761; France 7.
Magnesite	3,096	5,317	13	United Kingdom 3,192; Austria 840; Netherlands 571.
Mica:				
Crude including splittings and waste	469	336	(1)	Norway 201; United Kingdom 74; France 53.
Worked including agglomerated splittings	27	19	2	Switzerland 6; West Germany 3; Spain 3.
Pigments, mineral:				
Natural, crude	91	NA		
Iron oxides, processed	1,976	1,982	(1)	West Germany 1,377; Spain 424; Netherlands 79.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$186	$135	$8	Belgium-Luxembourg $77; France $19; West Germany $10.
Manufactured do	$48	$30	--	Austria $11; Switzerland $10; France $5.
Pyrites, unroasted	6	NA		
Salt and brine	48,800	91,072	--	Italy 60,581; Spain 30,400.
Sodium and potassium compounds, n.e.s.:				
Caustic potash including sodic and potassic peroxides	382	396	--	Italy 263; Spain 68; France 44.
Caustic soda	17,511	20,877	--	Spain 12,556; Belgium-Luxembourg 4,342; West Germany 3,940.
Soda ash	1,518	1	--	All from West Germany.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1	73	--	All from France.
Worked	113	99	(1)	Italy 52; Spain 23; Belgium-Luxembourg 19.

See footnotes at end of table.

Table 3.—Portugal: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Dolomite, chiefly refractory-grade	6,527	5,936	--	Spain 1,742; Italy 1,738; Norway 1,194; France 1,088.
Gravel and crushed rock	67	44	1	France 20; Italy 11; Netherlands 5.
Limestone other than dimension	2,402	1,500	--	All from France.
Quartz and quartzite	160	205	--	Belgium-Luxembourg 102; Finland 44; Sweden 29.
Sand, excluding metal-bearing	7,985	8,782	--	Spain 6,768; Belgium-Luxembourg 1,626.
Sulfur:				
Elemental:				
Other than colloidal	90,443	92,978	--	France 65,641; Poland 25,784; U.S.S.R. 1,552.
Colloidal	1	1	(1)	Mainly from Switzerland.
Sulfuric acid and oleum	40,336	3,157	--	United Kingdom 3,047; Spain 46; France 24.
Talc, steatite, soapstone, pyrophyllite	3,336	3,638	146	France 2,177; Austria 586; Norway 299.
Other:				
Crude	318	660	--	China 200; Spain 171; Republic of South Africa 156.
Slag, dross, similar waste, not metal-bearing:				
From iron and steel manufacture	29,407	58,465	--	France 58,015; United Kingdom 450.
Unspecified	2	--		
Oxides, hydroxides, peroxides of barium, magnesium, strontium	22	42	2	France 30; Italy 6; Spain 2.
Halogens excluding iodine	2	56	--	Spain 45; Japan 10.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	245	562	--	France 356; Sweden 89; Spain 34.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,649	1,177	67	West Germany 1,103; France 6.
Carbon black	10,162	10,722	69	Spain 6,567; France 2,911; West Germany 783.
Coal, all grades including briquets	376,858	313,483	166,538	Poland 116,879; Belgium-Luxembourg 11,817.
Coke and semicoke	98,907	117,208	2,430	United Kingdom 43,760; Netherlands 33,890; Italy 18,815.
Hydrogen, helium, rare gases	[4]46	NA		
Peat including briquets and litter	908	1,183	--	West Germany 362; Finland 328; Sweden 210.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	56,925	58,767	--	Iraq 25,031; United Arab Emirates 9,353; Saudi Arabia 9,033.
Refinery products:				
Gasoline ---do---	42	251	(1)	Bulgaria 243; Italy 4.
Kerosine and jet fuel ---do---	323	149	2	France 40; Canada 31; United Kingdom 12.
Distillate fuel oil ---do---	1,408	1,171	48	Canada 392; France 157; Yugoslavia 144.
Residual fuel oil ---do---	1,657	2,676	--	United Kingdom 459; Sweden 454; France 378; Belgium-Luxembourg 358.
Lubricants ---do---	207	308	15	United Kingdom 82; France 59; Belgium-Luxembourg 45.
Other:				
Liquefied petroleum gas ---do---	3,927	3,132	(1)	United Kingdom 1,465; France 468; Netherlands 280.
Mineral jelly and wax ---do---	15	14	(1)	West Germany 4; Spain 4; Netherlands 2.
White spirit ---do---	2	NA		
Petroleum coke ---do---	12	46	25	Netherlands 12; Spain 9.
Bitumen and other residues ---do---	243	246	--	Spain 186; Netherlands Antilles 45; Netherlands 12.
Bituminous mixtures ---do---	56	50	(1)	Spain 34; West Germany 5; United Kingdom 2.
Unspecified ---do---	75	--		
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	15,829	13,181	1	Netherlands 5,472; Spain 3,468; Italy 1,845.

[r]Revised. NA Not available.

[1]Less than 1/2 unit.

[2]Value only reported at $3,168,000, of which $1,299,000 from France, $888,000 from United Kingdom, $435,000 from United States, and $378,000 from West Germany.

[3]Value only reported at $3,048,000, of which $2,429,000 from West Germany, $243,000 from France, $174,000 from United Kingdom, and $51,000 from United States.

[4]Excludes unreported quantity value at $319,496.

COMMODITY REVIEW

METALS

Copper.—In 1981, exploration continued and two new ore bodies, Graca and Zambujal, were delineated in the complex Neves-Corvo copper-lead-zinc deposit near Castro Verde, some 50 kilometers south-southwest of Beja and 40 kilometers southeast of Aljustrel in the Baixo Alentejo, southern Portugal. The Neves-Corvo ore bodies were located near the southeast end of the Estacao de Ourique anticlinorium and lay on the northeastern flank of the structure, dipping 10° to 30° to the northeast.

Total reserves of sulfide ores at Neves-Corvo were reported to range from 70 million tons to 100 million tons, containing 1.7 million tons of copper, 1.9 million tons of zinc, and 0.1 million tons of lead. In addition, the pyrite in the deposit contains another 0.38% copper, 0.40% zinc, and 0.31 ounce (10 grams) of silver per ton.

In addition to the massive sulfide mineralization present as stockwork in the footwall, the area of the Neves-Corvo deposit contained two types of mineralization never before identified in the Iberic Pyritic Belt. The first was layered chalcopyrite that overlaid the massive sulfides, sometimes in contact with them, but most of the time interbedded in graywackes and slates. The second was a breccia composed of chalcopyrite and pyrite in a stockwork pattern. In general, the large ore bodies at Neves-Corvo showed a core of zinc-bearing minerals with a halo of copper minerals. In certain areas, a zinc ore body was surrounded by a lead halo. A detailed description of the Neves-Corvo deposit was published.[3]

Iron and Steel.—The Moncorvo project continued in the preparatory phase during the year. Final approval from the Government was being sought and details for financing were being worked out, mostly with the World Bank. Public invitations for prequalification of companies interested in equipment supply were published by Ferromina, the operating company. The project was scheduled for startup in 1984, at an initial production of about 2 million tons of iron pellets annually.

Work on expanding capacity of the Seixal steelwork continued. Construction started at sites designated for the new blast furnace and the new steel shop. Plans call for new capacities at Seixal as follows: 1 million tons of steel, 800,000 tons of rolled products, and 1.5 million tons of iron pellets.

Pyrites.—The work on implementation of the National Plan for Utilization of Pyrites (Programa de Aproveitamento Integrado das Pirites—PAIP), continued during 1981. Aljustrel and Neves-Corvo Mines and the Sines metallurgical complex project remained the major component of the PAIP. The following completion dates for PAIP projects were targeted: The first phase of Aljustrel and Sines, 1983-84; production of copper concentrate from Neves-Corvo, 1985; startup of a copper plant at Sines, 1985-86; and the second phase of Aljustrel and Sines, 1987-88.

Tantalum.—Geomines of Belgium concluded an agreement with the Societe Nortenha of Portugal to prospect the Visiros tin-tantalite deposit. Details of the agreement were not known.

Tungsten.—The Panasqueira and Borralha Mines, situated in the central part of Portugal, remained principal producers of tungsten in Portugal. The mineralization was associated with granites related to tectonic movements of the Westphalian (Upper Carboniferous) or with granite of posttectonic effusions.

Production of the Borralha Mine declined in 1981, when compared with the output in previous years, mostly as a result of lower ore grades and labor problems. At Panasqueira, increased production was achieved by a combination of higher output resulting from mine mechanization, richer ore, and better rates of recovery in the Panasqueira mill. Geomines continued to develop the new tin and tungsten mine at Miguel Vacas.

Zinc.—The 11,000-ton-per-year zinc electrolytic plant located near the town of Barreiro, southeast of Lisbon, owned and operated by the Government-owned Quimigal-Quimica de Portugal, started normal production during 1981 although trial production had started in 1980. Only pyrite cinders were used as raw materials at Barreiro, producing zinc by the modified Zincex process. Two different types of leach liquors were obtained from roasting the pyrite by separate processes. About 60% of zinc feed was produced by using the German DHK nonvolatizing chloride roasting process. The rest of the feed was treated by the Japanese Kowa Seiko volatizing chloride roasting process. Electrowinning, melt-

ing and casting, and cationic solvent regeneration steps are the same for both circuits. Roughly 6,500 tons of zinc per year was produced from the feed of the DHK line and 4,500 tons per year of zinc was produced by the Kowa Seiko line. The detailed description of the Zincex process was published.[4]

NONMETALS

Cement.—During 1981, there were 10 plants in operation in Portugal with a total annual capacity of 6 million tons. The largest plant, with an annual capacity of 1.65 million tons, was at Outao near Setubal, and this plant was operated by the Companhia Geral de Cal e Cimento S.A.R.L.-Secil.

Other Nonmetals.—Table 1 shows production of nonmetals in Portugal during 1977-81. During 1981, no major events, by world standards, were registered.

MINERAL FUELS

The energy supply of Portugal remained almost completely dependent on imported hydrocarbons during 1981, as it was in the past. Modest quantities of anthracite were produced in northern Portugal, at the Pajao Mine, also known as the Germude Mine, by the Empresa Carbonifera do Douro S.A.R.L. In 1981, as in the past, Portugal did not produce crude oil and natural gas in its national territory. Imports of crude oil and some liquefied gas were essential to meet the country's demand.

Uranium was the only primary energy source in Portugal of economic significance. Portugal's national uranium company, Empresa National di Uranio S.A.R.L., made a decision to increase production of yellow cake U_3O_8 from 120 to 500 tons per year. During the year of review, Portugal exported all of its uranium production as yellow cake. Reports indicated stocks of about 935 tons of yellow cake were held at the end of 1981.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Portuguese escudos (Esc) to U.S. dollars at the rate of Esc61.5=US$1.00.

[3]Albouy, L., L. N. Conde, F. Fogliesini, X. Leca, and A. Modikis. Le Gisement de Sulfures Massifs Polymetalliques de Neves-Corvo (Baix Alentejo, Sud Portugal). (The massive mixed sulfide deposit at Neves Corvo, Baixo Alentejo, Southern Portugal.) Chron. Rech. Minière, No. 460, 1981, p. 5.

[4]Noqueira, E. D., J. M. Regife, and P. M. Blythe. Zincex—the Development of a Secondary Zinc Process. Chem. and Ind. (London), No. 2, Jan. 19, 1980, p. 63.

The Mineral Industry of Romania

By Walter G. Steblez[1]

In 1981, Romania's centrally planned economy further displayed the declining trends that marked its performance in 1980. The planned targets for the major economic indicators, with a few minor exceptions, were not met, and in some cases, output dropped below the level of the preceding year.

The net material product (gross national product minus services) was reported to have increased by only 2.1% in 1981 in comparison with that of 1980 and fell short of planned goals by about 5%. Also, net and marketable industrial production failed to reach their respective planned targets by wide margins, achieving reported growth of 4.0% versus 8.1% planned and 2.6% versus 7% planned over the 1980 level. The relative share of the fuel and metallurgical industries, including ore mining, amounted to 14.7% of the gross output of industry, and the industrial production labor force in these sectors was about 10% of the total.

Romania mined a number of ferrous, nonferrous, and nonmetallic commodities, but in many cases, domestic production was insufficient to meet the country's industrial demands, creating an import reliance for most ferrous and nonferrous metals. Although well endowed with energy resources and a developed petroleum refining industry, the country reported increasing import trends for energy raw materials owing to production shortfalls in 1981 and the preceding years. Refineries were also reported to have been operating below capacity.

Government Policies and Programs.—The inability of the Romanian economy to meet annual industrial plan objectives in 1980 and 1981 made the final outcome of the 1981-85 5-year plan, which had set high growth objectives for the period, highly uncertain. National income was planned to increase at an average annual rate of 6.1% per year, and net industrial production was planned to grow 7.1% per year. Capital investment and the foreign trade turnover were to increase 5.2% and 11.9%, respectively, each year.

A planned average 6% annual growth rate was set for the mining and extractive branches of industry, and a 7.7% annual growth rate was designated for the country's metallurgical industries.

In 1981, greater emphasis than in the past was placed on increasing reliance on domestic raw material and energy resources. Success of the entire 1981-85 5-year plan would depend upon domestic reliance of up to 82% for primary energy, 90% to 98% for coal and metallurgical coke, 100% for aluminum, and 80% to 90% for lead and zinc.

Romania's planned 1985 output of key material and energy resources is presented in table 1.[2]

Table 1.—Romania: 1980 production and 1985 production goals for key resources[1]

Commodity		1980 production	1985 goals
Bituminous shale	million tons	--	10.0
Cement	do	15.6	16.5
Chemical fertilizers (100% active substance)	thousand tons	2,455.0	4,050.0
Coal, net	million tons	35.2	85.6
Electric energy	billion kilowatts	67.5	82.5
Natural gas	billion cubic meters	28.2	31.0
Petroleum	million tons	11.5	12.5
Steel	do	13.2	18.2

[1]Scinteia (Bucharest). July 2, 1981, pp. 3-4.

Romania's river ore cargo handling and carrying capacities were also to be modernized and expanded, according to the 5-year plan. The Galati ore carrier harbor, servicing the Galati iron and steel complex, was reported to be undergoing a third development stage, which would increase its export handling capacity to 2 million tons per year.

Increased development of the mining, metallurgical, and fuel extraction industries was a key theme in the 1982 Romanian national economic plan. Measures aimed at rectifying the poor 1981 performance were to include substantial increases in geological survey work to locate new sources of fossil fuels and production increases of ferrous, nonferrous, and nonmetallic ores.

PRODUCTION

Production shortfalls in the mining, energy, and metallurgical industries were reportedly chief reasons the Romanian economy was unable to meet the 1981 planned overall output goals. Economic dislocations caused by the shortfalls were apparently severe enough to have caused censure and demotion of the Minister of Mines, Petroleum, and Geology. The Ministry was subsequently reorganized into three discrete ministerial bodies.

Among the causes of the shortfalls were mismanagement, insufficient production of mining equipment and spare parts, and the delivery of often faulty equipment. Other problems included the inefficient use of raw materials and distorted reporting of these situations to the central authorities.[3] Steel production was the only major branch of industry that recorded significant growth in 1981, although the planned target was not met by a significant margin.

Table 2.—Romania: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum:					
Bauxite, gross weight	702,000	707,767	708,000	[e]710,000	712,000
Alumina, calcined, gross weight	442,000	449,000	502,000	534,000	540,000
Ingot including alloys:					
Primary	209,000	213,000	217,000	241,000	251,000
Secondary	17,000	18,000	19,000	18,000	18,000
Total	226,000	231,000	236,000	259,000	269,000
Bismuth, mine output, metal content[e]	80	80	80	80	80
Cadmium metal, smelter[e]	90	90	90	85	85
Copper:					
Mine output, metal content[e]	27,000	27,000	29,000	28,000	27,000

See footnotes at end of table.

Table 2.—Romania: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS —Continued					
Copper —Continued					
Metal:					
Smelter:					
Primary	41,429	38,880	41,120	40,675	40,500
Secondary[e]	4,000	4,000	4,000	4,000	4,000
Total	45,429	42,880	45,120	44,675	44,500
Refined, primary and secondary[e]	40,000	40,488	42,000	42,000	42,000
Gold, mine output, metal content[e] troy ounces	65,000	65,000	65,000	65,000	65,000
Iron and steel:					
Iron ore thousand tons	2,467	2,511	2,523	2,333	2,400
Metal:					
Pig iron do	7,784	8,155	8,879	9,012	9,400
Crude steel do	11,457	11,779	12,909	13,175	[3]13,000
Semimanufactures:					
Castings and forgings, finished do	1,028	1,097	1,176	1,220	1,200
Pipes and tubes do	1,320	1,419	1,500	1,464	1,500
Rolled products do	8,392	8,958	9,482	9,319	[3]9,600
Lead:					
Mine output, metal content	35,000	33,300	33,300	33,500	33,500
Metal, smelter, primary and secondary	41,702	42,815	40,900	40,991	41,000
Manganese:[e]					
Ore:					
Gross weight	80,000	80,000	80,000	80,000	80,000
Metal content	17,000	17,000	17,000	17,000	17,000
Concentrate, gross weight	28,000	28,000	28,000	28,000	28,000
Silver, mine output, metal content thousand troy ounces	1,125	1,030	965	900	850
Zinc:					
Mine output, metal content	62,000	60,000	60,000	60,000	55,000
Metal, smelter, primary and secondary	51,860	49,790	46,486	45,906	40,000
NONMETALS					
Barite	[e]85,000	87,300	88,000	88,000	88,500
Cement, hydraulic thousand tons	13,875	14,688	15,598	15,611	14,750
Clays:					
Bentonite	63,000	65,000	65,000	65,000	65,000
Kaolin	90,000	90,000	90,000	90,000	90,000
Diatomite[e]	40,000	40,000	40,000	40,000	40,000
Feldspar[e]	60,000	60,000	60,000	60,000	60,000
Fluorspar[e]	20,000	20,000	20,000	20,000	20,000
Graphite[e]	6,000	6,000	6,000	6,000	6,000
Lime thousand tons	3,446	3,657	3,829	3,813	3,800
Nitrogen: N content of ammonia do	1,792	2,257	2,335	2,248	2,200
Pyrites, gross weight[e] do	915	930	930	930	930
Salt:					
Rock salt do	NA	1,657	1,650	1,770	1,700
Other do	NA	3,082	3,070	3,286	3,300
Total do	4,535	4,739	4,720	5,056	5,000
Sand[e] do	NA	1,367	1,400	1,400	1,400
Sodium compounds, n.e.s.:					
Caustic soda do	735	725	704	723	725
Sodium carbonate, manufactured, 100% Na_2CO_3 basis do	861	899	893	937	970
Sulfur:					
S content of pyrites[e] do	395	400	400	400	400
Byproduct, all sources[e] do	110	120	130	140	150
Total[e] do	505	520	530	540	550
Sulfuric acid do	1,523	1,655	1,750	1,850	1,950
Talc[e]	60,000	66,000	60,000	60,000	60,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	100,433	108,964	95,122	101,849	102,000
Coal:					
Run-of-mine:					
Anthracite and bituminous thousand tons	8,637	8,794	9,299	9,686	9,700
Brown do	635	641	633	680	700
Lignite do	19,872	22,019	24,956	27,448	27,000
Total do	29,144	31,454	34,888	37,814	37,400
Washed (produced from above):					
Anthracite and bituminous:					
For coke and semicoke production do	2,154	2,450	2,205	2,337	2,300

See footnotes at end of table.

Table 2.—Romania: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Coal —Continued					
Washed (produced from above) —Continued					
Anthracite and bituminous —Continued					
For other uses ____ thousand tons__	4,993	4,968	5,903	5,723	5,700
Brown ____ do____	603	606	601	648	600
Lignite ____ do____	19,028	21,239	24,055	26,456	26,000
Total ____ do____	26,778	29,263	32,764	35,164	34,600
Coke:					
Metallurgical ____ do____	3,148	3,458	3,066	3,033	3,000
Other ____ do____	396	384	385	470	450
Total ____ do____	3,544	3,842	3,451	3,503	3,450
Fuel briquets (from brown coal) ____ do____	NA	711	720	730	730
Gas:					
Manufactured: Coke oven million cubic feet__	NA	NA	NA	NA	NA
Natural:					
Gross:					
Associated ____ do____	230,462	232,016	242,540	247,732	250,000
Nonassociated ____ do____	1,015,468	1,023,167	960,166	994,427	995,000
Total ____ do____	1,245,930	1,255,183	1,202,706	1,242,159	1,245,000
Marketed ____ do____	1,203,526	1,211,697	1,161,100	1,198,683	1,200,000
Natural gas liquids thousand 42-gallon barrels__	3,740	NA	NA	NA	NA
Petroleum:					
Crude:					
As reported ____ thousand tons__	14,650	13,794	12,323	11,511	11,600
Converted _ thousand 42-gallon barrels__	109,186	102,806	91,843	85,791	86,455
Refinery products:[4]					
Gasoline ____ do____	37,961	42,440	41,514	40,502	40,500
Jet fuel and kerosine ____ do____	8,029	7,789	7,463	6,727	6,700
Distillate fuel oil ____ do____	48,356	52,324	54,301	55,764	55,500
Residual fuel oil ____ do____	50,989	60,912	67,393	68,138	68,000
Lubricants ____ do____	4,242	4,669	5,103	4,648	4,500
Other:					
Liquefied petroleum gas ____ do____	3,144	2,802	2,285	2,575	2,500
Asphalt ____ do____	4,357	4,400	4,218	4,066	4,000
Total ____ do____	157,078	175,336	182,277	182,420	181,700

[e]Estimated. [p]Preliminary. NA Not available.

[1]Includes data available through Aug. 3, 1982.

[2]In addition to the commodities listed, antimony, asbestos, gypsum, and a variety of crude construction materials are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Romanian sources do not indicate whether refinery fuel is reported as a part of the listed product yields. Moreover, additional minor products may be produced but are not listed in official sources.

TRADE

In 1981, Romania reported a 332.4 billion lei[4] foreign trade turnover, which was aided by a broad range of commercial agreements. Apart from Romania's trade with the CMEA[5] and other socialist countries, which constituted about 41% of the total trade, 33% of the total was accounted for by trade with developed Western countries, and a substantial 26% of the total was with the developing states of Latin America, Africa, and Asia. Romania's commercial and cooperative agreements with developing countries were extensive and were particularly aimed at mining and petroleum development.

Faced with the mounting difficulties of servicing a $9.8 billion debt owed to Western banks, Romania decreased its convertible currency imports in 1981 in an effort to improve its trade balance. This resulted in a reported $300 million convertible currency surplus for the period. Total imports in 1981 decreased 7.4% while exports reportedly rose 11.3%.

Romania's main exports included petrochemicals and consumer and producer durables. The country has been a net importer of raw materials, which in 1981 included some 12.9 million tons of oil, 15 million tons of iron ore, and 3.3 million tons of metallurgical coke.

In view of its precarious balance-of-payments status, Romania's permanent representative at CMEA, Nicolai Constantin, underscored the need to effectively implement the program for inter-CMEA cooperation and economic integration that was adopted at the 25th session of CMEA 10 years previously. He particularly noted that over the 10-year period, the CMEA contribution toward fulfilling Romania's requirements for mineral raw materials, metals, and fuels declined from about 47% to 21%, necessitating purchases of these commodities with convertible rather than soft currency.

In 1981, Romania's imports of essential commodities from CMEA remained on a declining trend, and negotiations for CMEA exports of fuel and electric power to Romania were reportedly not concluded by the third quarter of 1981.

Nonferrous metals, which Romania must import owing to insufficient domestic output, were obtained in a number of buy-back arrangements with developing countries in exchange for Romanian development assistance to their respective mining enterprises. Some commodities, however, had to be purchased with hard currency.

Metals that Romania does not produce, such as nickel and cobalt, were obtained from Cuba as sinter and concentrate. In exchange, Romania, in concert with other CMEA countries, was active in upgrading Cuba's nickel-cobalt mining facilities.

Countries with which Romania conducted commercial and cooperative agreements in 1981 in mining and petroleum extraction were Chile, Peru, and Venezuela in Latin America; Angola, Mozambique, Burundi, Morocco, and Zambia in Africa; and China and Indonesia in Asia. Romania also reported negotiations conducted on cooperative mining ventures with Algeria, Egypt, Syria, Libya, Iran, and the Yemen Arab Republic.

Table 3.—Romania: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	8,295	NA		
Oxides and hydroxides	--	5	--	All to France.
Metal including alloys:				
Scrap	2,016	4,645	--	Italy 2,436; Belgium-Luxembourg 818; Austria 699.
Unwrought	[2]65,000	[3]93,800	--	Japan 11,323; Italy 5,698; France 4,062; undetermined 64,203.
Semimanufactures	[r]28,951	19,650	759	Japan 9,705; Poland 2,157; Hungary 1,626.
Arsenic: Trioxide, pentoxide, acid	150	NA		
Chromium: Oxides and hydroxides	199	105	--	United Kingdom 85; France 10.
Copper:				
Sulfate	20	NA		
Metal including alloys:				
Scrap	844	688	--	Italy 561; West Germany 71; France 49.
Unwrought	5,350	1,425	--	Austria 597; Italy 398; Turkey 300.
Semimanufactures	245	73	--	West Germany 52; Italy 16.
Iron and steel:				
Pyrites, roasted	125,853	137,899	--	Hungary 137,850.
Metal:				
Scrap	1,142	260	--	Yugoslavia 257.
Pig iron, cast iron, powder, shot	50,625	10,342	--	Austria 6,511; West Germany 3,527.
Ferroalloys	19,524	5,224	--	West Germany 1,891; Switzerland 1,015; Netherlands 590.
Steel, primary forms	[3]541,000	293,720	--	Yugoslavia 101,905; Italy 62,216; West Germany 39,337.
Semimanufactures:[4]				
Bars, rods, angles, shapes, sections	[3]295,000	[3]664,000	--	West Germany 68,589; Egypt 23,226; Yugoslavia 18,303; undetermined 517,388.

See footnotes at end of table.

Table 3.—Romania: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures[4] —Continued				
Universals, plates, sheets	[3]575,000	[3]708,000	33,562	West Germany 58,978; undetermined 545,034.
Hoop and strip	309	1,107	7	Saudi Arabia 1,037; Yugoslavia 33; West Germany 27.
Rails and accessories	--	15	--	All to Jordan.
Wire	[3]147,000	[3]166,000	--	West Germany 16,432; Israel 7,105; Kenya 7,095; undetermined 128,842.
Tubes, pipes, fittings	[2]388,700	[2]443,600	19,099	Poland 61,052; West Germany 23,524; undetermined 294,756.
Castings and forgings, rough	3,436	5,753	--	West Germany 4,212; Switzerland 1,309.
Lead:				
Oxides and hydroxides	3	NA		
Metal including alloys:				
Unwrought	--	425	--	All to Italy.
Semimanufactures	41	3	--	All to Saudi Arabia.
Manganese ore and concentrate	--	1,000	--	All to Italy.
Nickel metal including alloys, scrap	2	NA		
Platinum-group metals including alloys:				
Waste and sweepings value, thousands	--	$148	--	All to West Germany.
Unwrought and partly wrought do	--	$58	--	France $57.
Silver:				
Ore and concentrate do	--	[5]$3,232	--	All to United Kingdom.
Metal including alloys, unwrought and partly wrought do	$4	$1,692	--	West Germany $1,396; Switzerland $154; Italy $103.
Tungsten metal including alloys, all forms	11	NA		
Zinc metal including alloys:				
Unwrought	[6]100	NA		
Semimanufactures	21	2	--	All to Morocco.
Other metals, n.e.s.:				
Ash and residues containing nonferrous metals	542	1,658	--	Italy 1,278; West Germany 342.
Oxides, hydroxides, peroxides	2,667	420	--	Pakistan 392; Canada 27.
Nonferrous metals including alloys:[2]				
Unwrought	439	6,375	--	NA.
Semimanufactures	--	21,172	--	NA.
NONMETALS				
Abrasives, n.e.s.:				
Dust and powder of precious and semiprecious stones value, thousands	--	$90	--	All to West Germany.
Grinding and polishing wheels and stones	12	11	--	West Germany 6; Italy 4.
Asbestos, crude	20	179	--	All to France.
Barite and witherite	2,478	770	--	Do.
Boron oxide and acid	370	180	60	Italy 120.
Cement thousand tons	[2]2,738	[2]2,791	--	Egypt 993; Pakistan 174; Czechoslovakia 104.
Clays and clay products:				
Crude	3	50	--	All to West Germany.
Products:				
Nonrefractory:				
Quantity	6,339	1,790	--	Saudi Arabia 781; Cameroon 754.
Value thousands	NA	$249	--	Israel $195; Cyprus $45.
Refractory	1,476	62	--	West Germany 32; Italy 20.
Diamond, industrial value, thousands	$1,050	$410	--	United Kingdom $277; Switzerland $106.
Fertilizer materials:				
Crude, nitrogenous	5,044	NA		
Manufactured:				
Nitrogenous, urea thousand tons	[2]1,023	[2]1,263	30	Turkey 143; Egypt 96; Algeria 83; undetermined 564.
Phosphatic	148,340	31,756	--	Algeria 10,500; Turkey 9,145; Hungary 7,675.
Potassic	6,350	NA		
Other including mixed thousand tons	[2]1,315	[2]1,766	--	Thailand 105; Turkey 73; Yugoslavia 31; undetermined 1,546.
Ammonia do	35,466	25,518	--	Yugoslavia 14,187; Greece 9,920.
Gypsum and plasters	28,051	28,502	--	All to Hungary.
Lime	11,146	7,692	--	Do.

See footnotes at end of table.

Table 3.—Romania: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Pigments, mineral:				
Crude, earth colors	6	NA		
Iron oxides and hydroxides, processed	53	NA		
Precious and semiprecious stones, natural value, thousands	$3	$4	--	Italy $3; Switzerland $1.
Salt and brine thousand tons	[2]841	[2]1,025	--	Hungary 538; Yugoslavia 194; Greece 22.
Sodium and potassium compounds:				
Caustic potash	740	1,893	--	Italy 1,049; Austria 342; West Germany 202.
Caustic soda	[2]238,600	[2]248,800	--	Hungary 47,535; Yugoslavia 30,167; Egypt 19,964; undetermined 137,750.
Soda ash	[2]457,400	[2]513,000	--	Czechoslovakia 51,000; Hungary 41,230; Tunisia 30,160; undetermined 322,483.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	547	269	--	Japan 222; Austria 47.
Worked	23,351	[7]21,686	--	West Germany 17,082; Austria 2,461; Switzerland 1,402.
Gravel and crushed rock	121,428	4,457	--	All to Hungary.
Limestone excluding dimension	932	1,230	--	All to West Germany.
Sand excluding metal-bearing	20	16	--	All to Jordan.
Sulfuric acid and oleum	5,322	294	--	All to Yugoslavia.
Talc, steatite	88	145	--	All to Israel.
Other nonmetals, n.e.s.:				
Crude	1,896	1,011	--	Hungary 601; West Germany 314.
Slag, dross, similar waste, not metal-bearing	119,199	13,580	--	All to Yugoslavia.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	996	NA		
Carbon black	[2]30,200	[2]29,300	--	Poland 6,683; Sri Lanka 718; Thailand 667; undetermined 20,789.
Gas, natural million cubic feet	[2]7,063	[2]7,084	--	All to Hungary.
Peat including briquets	2,006	1,835	--	Austria 1,296; Italy 516.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	--	811	--	All to Spain.
Refinery products:				
Gasoline do	[2]20,226	[2]22,886	843	Netherlands 4,381; West Germany 3,500; France 1,686.
Kerosine and jet fuel do	([8])	21	--	Hungary 14; West Germany 7.
Distillate fuel oil do	[2]15,092	[2]19,700	--	Italy 3,739; Turkey 2,480; West Germany 2,087.
Residual fuel oil do	[2]17,005	[2]22,768	353	Italy 6,199; France 2,502; Netherlands 1,862.
Lubricants and nonlubricating oils do	[2]2,615	[2]2,164	--	Brazil 262; Italy 138; Austria 70; undetermined 1,494.
Other:				
Mineral jelly and wax do	[2]31	[2]14	--	Thailand 2; Turkey 2; Madagascar 1.
Petroleum coke do	[2]295	[2]585	--	Italy 82; undetermined 501.
Bitumen and other residues do	[2]38	[2]24	--	Austria 19.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	[2]68,700	[2]57,800	([9])	Italy 17,323; France 14,931.

[p]Preliminary. [r]Revised.. NA Not available.

[1]Owing to the lack of official trade statistics published by Romania, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information, data published by the partner trade countries, and partial official trade sources of Romania.

[2]Official Trade Statistics of Romania.

[3]Quarterly Bulletin of Steel Statistics for Europe, United Nations, New York.

[4]Destinations of steel semimanufactures exclude imports by Israel valued at $1,317,000, and Malta, valued at $413,000.

[5]May include waste and sweepings of silver.

[6]World Metal Statistics, World Bureau of Metal Statistics, London, United Kingdom.

[7]Excludes imports by Israel valued at $19,000.

[8]Less than 1/2 unit.

[9]The United States imported 851,683 barrels of naphtha.

Table 4.—Romania: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite thousand tons	669	1,051	--	Greece 974; Yugoslavia 77.
Oxides and hydroxides	13,730	22,276	--	Austria 12,263; Netherlands 6,205; Hungary 2,281.
Metal including alloys:				
Unwrought	2,115	1,501	--	Hungary 1,500.
Semimanufactures	5,868	5,091	--	West Germany 1,950; Hungary 1,495; France 488.
Bismuth metal including alloys, all forms	3	10	--	All from Japan.
Cadmium metal including alloys, all forms	--	55	--	Finland 30; Japan 25.
Chromium:				
Chromite	2,924	2,160	--	Finland 1,270; West Germany 890.
Metal including alloys, all forms	17	13	--	All from West Germany.
Cobalt:				
Oxides and hydroxides	--	2	--	All from France.
Metal including alloys, all forms	11	9	(2)	Do.
Copper:				
Ore and concentrate	1,840	37,169	9,837	Canada 21,483; Italy 2,862; Morocco 2,000.
Metal including alloys:				
Scrap	50	40	--	All from Belgium-Luxembourg.
Unwrought	20,934	[3]25,018	--	Belgium-Luxembourg 7,008; Poland 7,007; Chile 6,000.[4]
Semimanufactures	11,803	13,873	--	Poland 5,088; Belgium-Luxembourg 3,517; West Germany 2,048.
Germanium metal including alloys, all forms kilograms	500	NA		
Iron and steel:				
Ore and concentrate thousand tons	[5]15,065	[5]15,984	--	U.S.S.R. 7,386; Brazil 2,225; Spain 475.
Pyrites, roasted	10,001	NA		
Metal:				
Scrap thousand tons	[6]10	[6]56	31	NA.
Pig iron, cast iron, powder, shot do	[5]573	[5]634	--	Brazil 198; West Germany 54; Yugoslavia 24; undetermined 345.
Ferroalloys do	[5]190	[5]145	--	NA.
Steel, primary forms do	[6]596	[6]201	--	West Germany 12; undetermined 187.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	[6]546	[6]521	--	Poland 83; West Germany 59; Czechoslovakia 57.
Universals, plates, sheets do	[6]262	[6]261	17	Bulgaria 53; United Kingdom 43; West Germany 30.
Hoop and strip do	[6]37	[6]28	--	West Germany 23.
Rails and accessories do	[6]61	[6]50	--	West Germany 5; undetermined 42.
Wire do	[6]59	[6]70	--	West Germany 13; Belgium-Luxembourg 3; undetermined 48.
Tubes, pipes, fittings do	[5]112	[5]126	(2)	West Germany 27; Czechoslovakia 13; Japan 9; undetermined 63.
Castings and forgings do	[6]4	[6]3	--	Hungary 1.
Lead:				
Ore and concentrate	30,326	6,320	--	Spain 2,720; Italy 2,000.
Oxides and hydroxides	2,861	3,554	--	France 3,552.
Metal including alloys:				
Unwrought	15,066	10,411	--	All from Morocco.
Semimanufactures	5	1	--	All from United Kingdom.
Magnesium metal including alloys:				
Unwrought	406	[7]199	199	
Semimanufactures	57	261	248	West Germany 13.
Manganese:				
Ore and concentrate thousand tons	[6]113	[6]216	--	Brazil 61; undetermined 155.
Oxides and hydroxides	784	665	14	Greece 230; Ireland 220; Spain 200.
Mercury 76-pound flasks	8,961	3,829	--	Spain 2,495; Netherlands 638; Turkey 493.
Molybdenum metal including alloys, all forms kilograms	4,511	4,827	387	Switzerland 2,540; West Germany 1,900.
Nickel metal including alloys:				
Unwrought	2,103	1,474	--	Philippines 625; Finland 348; France 261.
Semimanufactures	516	529	13	West Germany 457; Italy 16; France 14.

See footnotes at end of table.

Table 4.—Romania: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$3,298	$5,223	--	France $2,440; United Kingdom $2,118; Austria $289.
Silver:				
Ore and concentrate do	--	$445	--	All from Canada.
Metal including alloys, unwrought and partly wrought do	$367	$597	--	France $267; West Germany $228; United Kingdom $90.
Tin:				
Ore and concentrate	--	24,900	--	All from Greece.
Metal including alloys:				
Unwrought	80	NA		
Semimanufactures kilograms	--	377	--	All from Switzerland.
Titanium:				
Oxides	1,119	1,816	--	Spain 980; West Germany 835.
Metal including alloys, all forms kilograms	4,624	1,480	--	West Germany 1,400.
Tungsten metal including alloys, all forms	10	19	2	France 15; Netherlands 2.
Zinc:				
Ore and concentrate	11,607	579	--	All from Yugoslavia.
Oxides and hydroxides	5,405	5,709	--	France 5,037; Italy 496; Yugoslavia 175.
Metal including alloys:				
Dust, blue powder	2,300	NA		
Unwrought	3,506	3,998	--	Spain 2,999; Finland 999.
Semimanufactures	101	2,649	--	West Germany 1,496; Belgium-Luxembourg 1,134.
Zirconium:				
Ore and concentrate	45	165	--	All from West Germany.
Metal including alloys, all forms kilograms	800	232	232	
Other metals, n.e.s.:				
Ores and concentrates	830,094	[8]122,093	--	Algeria 121,883; West Germany 165; Austria 45.
Ash and residues containing nonferrous metals	36	NA		
Oxides, hydroxides, peroxides	80	316	12	Sweden 153; Finland 57; Netherlands 36.
Metalloids	4,216	3,517	1	Norway 1,253; France 893; Yugoslavia 810.
Alkali, alkaline-earth, rare-earth metals	--	22	--	Israel 14; Finland 7.
Base metals including alloys, all forms	104	194	1	Japan 151; Belgium-Luxembourg 18; United Kingdom 13.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	1,653	2,983	--	Turkey 2,850; Italy 133.
Artificial: Corundum	7,690	7,800	--	Yugoslavia 6,741; Hungary 1,040.
Dust and powder of precious and semiprecious stones value, thousands	$751	$359	$355	Belgium-Luxembourg $4.
Grinding and polishing wheels and stones:				
Quantity	3,647	3,305	11	Yugoslavia 1,200; Austria 843; France 309.
Value thousands	NA	$1,122	--	Hungary $1,084; Canada $38.
Asbestos, crude	10,759	4,287	2,048	Canada 1,869; Yugoslavia 136; Italy 125.
Barite and witherite	17,290	20,481	--	Turkey 8,650; West Germany 7,130; Thailand 4,701.
Boron materials:				
Crude, natural borates	12,501	23,600	--	All from Turkey.
Oxide and acid	--	801	--	Turkey 500; France 300.
Cement	97	2,219	--	Kenya 2,200; France 17.
Clays and clay products:				
Crude:				
Kaolin	1,953	10,125	108	Czechoslovakia 7,000; Spain 3,017.
Other, unspecified	12,661	20,921	--	United Kingdom 10,479; Greece 4,963; Turkey 3,790.
Products:				
Nonrefractory	818	539	--	Yugoslavia 278; Spain 193.
Refractory	[5]114,000	[5]151,100	136	Yugoslavia 23,872; West Germany 23,455; U.S.S.R. 21,999.
Diamond:				
Gem, not set or strung value, thousands	--	$21	--	All from Belgium-Luxembourg.

See footnotes at end of table.

Table 4.—Romania: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Diamond —Continued				
Industrial ____ value, thousands__	$4,503	$6,200	--	Belgium-Luxembourg $3,575; United Kingdom $2,620.
Diatomite and other infusorial earth ___	787	1,032	124	France 861; West Germany 45.
Feldspar, fluorspar, etc _____	500	6,886	--	Italy 6,561; West Germany 300.
Fertilizer materials:				
Crude, phosphatic _____	[5]2,338	[5]2,276	382	Morocco 867; Jordan 388; Israel 99.
Manufactured:				
Nitrogenous _____	50	28	--	All from West Germany.
Phosphatic _____	--	1,072	--	All from Israel.
Potassic____ thousand tons__	[5]179	150	--	East Germany 78.
Other including mixed _____	75	NA		
Graphite, natural _____	114	70	--	All from France.
Gypsum and plasters _____	10	NA		
Lime _____	8	6	--	Do.
Magnesite _____	41,154	39,138	--	Czechoslovakia 37,000; Greece 1,000; Yugoslavia 999.
Mica:				
Crude including splittings and waste _	12	41	--	Belgium-Luxembourg 40.
Worked including agglomerated splittings _____	23	18	--	Switzerland 15; France 2.
Pigments, mineral: Iron oxides and hydroxides, processed _____	617	827	--	West Germany 525; Japan 271; France 30.
Precious and semiprecious stones:				
Natural ____ value, thousands__	$1	$35	--	All from Switzerland.
Synthetic _____do____	$21	$6	--	West Germany $4; Austria $2.
Pyrites, unroasted _____	75,844	144,247	--	Sweden 84,382; Norway 47,790.
Salt and brine _____	3	10	--	Sweden 8; United Kingdom 2.
Sodium and potassium compounds:				
Caustic potash _____	542	153	--	Yugoslavia 128; France 25.
Caustic soda _____	19	24	16	West Germany 6.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked ____	105	19	--	All from Italy.
Worked _____	26	121	--	Switzerland 92; Italy 21.
Dolomite, chiefly refractory-grade __	--	12	--	All from West Germany.
Gravel and crushed rock _____	508	2,082	--	France 1,424; Austria 428.
Quartz and quartzite _____	1,111	1,290	--	Finland 710; West Germany 534.
Sand excluding metal-bearing ____	3,339	731	--	West Germany 496; Belgium-Luxembourg 174.
Sulfur:				
Elemental:				
Other than colloidal _____	223,315	81,433	58,608	Canada 21,810.
Colloidal _____	1,330	122	--	France 100; Japan 20.
Dioxide _____	--	1,051	--	All from West Germany.
Sulfuric acid and oleum _____	4,400	4,956	--	Hungary 4,902; Bulgaria 50.
Talc, steatite _____	435	753	--	Italy 408; West Germany 219; Belgium-Luxembourg 105.
Other nonmetals, n.e.s.:				
Crude _____	2,020	2,819	--	Italy 1,217; Greece 900; West Germany 444.
Halogens _____	18	38	--	Japan 23; United Kingdom 5; Switzerland 4.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural _____	41	34	--	Italy 32.
Carbon black _____	93	8,183	--	Egypt 7,700; West Germany 443.
Coal and briquets:				
Anthracite and bituminous coal thousand tons__	1,801	3,163	1,267	Poland 401; Czechoslovakia 340; Australia 317.
Lignite including briquets __do____	148	260	34	Turkey 197; Yugoslavia 28.
Unspecified _____do____	[9]1,896	[9]526	--	NA.
Total _____do____	[5]3,845	[5]3,949		
Coke and semicoke _____do____	[5]2,896	[5]3,133	154	Japan 415; Belgium-Luxembourg 348; Italy 337.
Peat including briquets _____	--	21	--	Ireland 12; Italy 9.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels__	[5]104,375	[5]116,515	--	NA.
Refinery products:				
Gasoline ___42-gallon barrels__	33,320	27,761	--	West Germany 15,530; Greece 8,254; Italy 3,970.
Kerosine and jet fuel ___do____	5,828	2,720	--	Hungary 2,410; Yugoslavia 310.

See footnotes at end of table.

Table 4.—Romania: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products — Continued				
Refinery products —Continued				
Distillate fuel oil				
42-gallon barrels	3,044	13,495	--	Greece 12,645; West Germany 679.
Residual fuel oil ------do----	6,527	167,666	--	Hungary 163,856; Greece 3,450.
Lubricants ----------do----	30,590	[10]24,591	147	Greece 9,688; West Germany 6,335; Belgium-Luxembourg 1,484.
Other:				
Liquefied petroleum gas do----	167,597	123,958	--	Italy 40,368; Hungary 39,011; West Germany 30,788.
Mineral jelly and wax do----	1,668	1,472	--	West Germany 1,322; France 55.
Bitumen and other residues do----	--	4,272	--	All from Italy.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals ----	11,380	13,019	--	U.S.S.R. 11,900; West Germany 622.

[p]Preliminary. NA Not available.

[1]Owing to the lack of official trade statistics published by Romania, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information, data published by the partner trade countries, and partial official trade sources of Romania.

[2]Less than 1/2 unit.

[3]Excludes exports from Israel valued at $6,000.

[4]Metallgesellschaft Aktiengesellschaft (Metallstatistik), Frankfurt am Main, West Germany.

[5]Official trade statistics of Romania.

[6]Quarterly Bulletin of Steel Statistics for Europe, United Nations, New York.

[7]Excludes exports from Norway valued at $112,000.

[8]Excludes exports from Australia valued at $1,483,000.

[9]Presumably largely bituminous; of total officially reported coal imports in 1979, 2,840,000 tons was described as washed pit coal for coke manufacture, and 1,005,000 tons was not further described. For 1980, 2,557,000 tons was described as washed pit coal and 1,395,000 tons was unspecified.

[10]Excludes portion of Japanese exports valued at $248,000.

COMMODITY REVIEW

METALS

In 1981, the Romanian steel industry employed over 119,000 production workers; nonferrous metallurgical and mining enterprises employed over 72,300 production workers. Estimated capital investment in iron mining and steel production exceeded 13 billion lei, and in the nonferrous sector, it exceeded 2.5 billion lei.

To improve the performance of the country's nonferrous mining and smelting industry, a state decree was issued establishing, on October 1, 1981, The Industrial Center for Nonferrous and Rare Metals (CIMNR). Established under the Ministry of Chemical Industry, the objectives of CIMNR were to extract aluminum, heavy metals, and rare metals from scrap and concentrate and to manufacture anodes, sulfuric acid, and other products. The following units were transferred to CIMNR:

(1) The Baia Mare, Copsa Mica, and Zlatna Metallurgical Enterprises for Nonferrous Metals as well as the Industrial School No. 3, including the Professional School for Metallurgy, were transferred from the Baia Mare Center for Ores and Nonferrous Metallurgy.

(2) The Slatina Aluminum and the Oradea Alumina Enterprises as well as the Neferal Metallurgical Enterprise, Bucharest, were transferred from the Slatina Center for Nonferrous and Rare Metals.

(3) The Tulcea Alumina Enterprise was transferred from the Tulcea Metallurgical Complex.

(4) The Moldova Noua Metallurgical Enterprise for Nonferrous Metals was transferred from the Deva Ore Center.

Aluminum.—Romania's aluminum industry was located in Slatina in Olt County. The industry's annual capacity was in excess of 250,000 metric tons, and apart from organizational changes described above, industry plans in 1981 were to maintain capacities that were already built and concentrate on increasing production efficiency as well as on the improvement and diversification of aluminum products. Reportedly, new rolling mill capacities were planned to grow by 20% to 25% in the 5-year period.

Also, a new 20,000-ton-per-year initial capacity cast components and motorcar pistons manufacturing enterprise was planned. Liquid aluminum alloys would largely be supplied from the Slatina aluminum complex.

Copper.—The main copper-producing area was in southern Banat region, in west-central Romania. The chief deposits were located along three major trends: the west Banat, the east side of the Resita geosyncline, and the Rudaria lineament.

The development of a new copper mine in the Baia de Arama area of Mehedinti County was reported. A flotation plant was begun, and initial concentrate production was scheduled for the end of 1982. The recovery of about 60,000 tons of copper from secondary sources in 1981 was also reported.

Romania was active during 1981 in a variety of international joint copper mining and mine development ventures with the major aim of assuring sources of imported copper. Among these was work conducted until the end of December on the Antamina copper-zinc deposit in Peru by the joint Romanian-Peruvian Antamina company; studies were conducted to determine whether ore production from the deposit at a rate of 10,000 to 20,000 tons per day was feasible. However, on December 13, partnership was officially dissolved owing to the venture's inability to provide necessary scheduled financing. The ownership of the mine reverted to Empresa Minera del Perú with Romania receiving nominal value compensation for its investment. Geomin of Romania will also have the option to purchase 15% of the concentrate for 15 years after production startup. The proven ore reserves at the deposit are 166 million tons, assaying 1.3% copper, 1.1% zinc, 0.48 ounce of silver per ton, and 0.04% molybdenum.

A copper exploration agreement was undertaken by the joint Romanian-Chilean company, Coemin, and other similar arrangements were reported with Mozambique and Zambia.

Gold.—Gold has been mined in Romania since antiquity. Auriferous ores were found in the country's polymetallic deposits as well as in placer beds. Romanian geologists in 1981 discovered new gold deposits that were said to have favorably increased the country's reserves of this metal. Research was planned toward extending known deposits as well as developing new regions, especially in the Apuseni Mountains, in the Banat region, and in the eastern Carpathians. During the 1981-85 5-year period, the Banat and the Fagaras Mountains would be evaluated for precious metal potential by studies of old crystalline formations and associated alluvial deposits.

Romania became a consistent exporter of gold beginning in May 1981, and in 1981 was reported to have sold 20.3 tons of gold on the Swiss market.

Iron and Steel.—A number of new installations in the iron and steel industry came onstream. A third ferrochromium furnace was put into operation at Tulcea with a 52,000-ton-per-year capacity; two additional furnaces were planned for startup in 1981 for the production of ferrosilicon. The Iasi heavy engineering complex also put into operation its first 50-ton electric-furnace shop. The shop was to be equipped with 10-, 20-, 50-, and 100-ton furnaces that would produce ingots ranging from 5 to 400 tons.

The first 350,000-ton-per-year medium sheet rolling mill was put into operation at the Calarasi iron and steel complex, completing its first stage of development. Also the construction of the No. 6 2,500-cubic-meter blast furnace was completed at the Galati iron and steel complex in 1980, and the first production of pig iron was scheduled for the second half of 1981. At the Calan metallurgical plant in Hunedoara, the first domestically produced 330,000-ton-per-year metallurgical coke battery was put into operation.

Romania's steel production, by process, was approximately 44% oxygen, 19% electric, and 37% open hearth. In 1981, about 6.4 million tons of steel was produced from recycled scrap.

In 1981, Romania had extensive trade and cooperative agreements in the iron and steel area; however, alleged dumping charges and suits were leveled against Romania by several European nations as well as the United States. The charges alleged that Romanian steel plates and pipes were sold abroad below manufacturing costs.

Lead and Zinc.—Romania continued to mine the major portion of its lead-zinc ores at the Baia Mare mining complex. The concentrate was smelted at the Copsa Mica smelting facilities in the central part of the country.

From all indications, Romania's ambitious planned production increases of 13.9% for lead and 8.9% for zinc over the 1980 level were not met, and after the installation of the electrolytic lead facilities at Copsa Mica, no new capacities were

announced for the year. Romania did, however, report a production of 11,400 tons of zinc from recycled secondary raw materials.

Silver.—Increased exploration of argentiferous ores in the Apuseni Mountains and the eastern Carpathians was undertaken by the Ministry of Geology in 1981. In Romania, silver, as well as gold, was produced in association with copper, lead, and zinc ores.

NONMETALS

Cement.—In 1981, the output of cement by the country's 12 plants actually dropped to just over the 1978 output level. Few details were provided on the industry during the year, and most of the activities within the industry were conducted abroad with the cement plants reported under construction in North Korea, Iraq, and Turkey with Romanian participation.

Clays.—Romania produced a variety of clays but was apparently unable to fully meet domestic needs for this mineral. Although the country did not publish production statistics, various foreign trade sources indicated past Romanian purchases of this commodity.

To fully meet domestic requirements, Romania's Ministry of Geology, in 1981, was directed to increase efforts aimed at finding new clay deposits, as well as other nonmetallic minerals such as talc, sands, limestones, and ornamental rocks. Refractory clays were found in the Alun region of the Padurea Craiului Mountains, as well as kaolin-bearing rocks at Stejera.

Fertilizers.—Romania's chemical industry produced a variety of simple and complex fertilizers. With an abundance of methane gas, the country has become a substantial producer of nitrogenous fertilizers. Apart from centrally planned domestic needs, nitrogenous fertilizer was exported, which in large measure helped offset the import cost of potash and phosphate rock.

Romania's agricultural and soil conditions required an average nitrogen, phosphorus, and potassium nutrients ratio (N:P:K) of 1.9:1.0:0.4. Chemical fertilizer complexes at Fagaras, Craiova, Turnu Magurele, Arad, Slobozia, Bacau, etc., were well distributed throughout agricultural regions of the country. Romania's weighted output of both simple and complex fertilizers by 1981 was as follows:

Type	Percent
Simple fertilizers:	
Superphosphate	3.4
Triple superphosphate	5.4
Carbamide	33.3
Ammonium nitrate (including nitrocalcite)	20.3
Ammonium sulfate	2.0
Total	64.4
Complex fertilizers:	
Nitrophosphates	32.6
Diammoniac phosphate	3.0
Total	35.6
Grand total	100.0

In 1981, Romania reported the startup of a 197,000-ton-per-year urea plant at Bacau in the eastern part of the country. The plant was based on Stamicarbon technology and was constructed with know-how and engineering input from Coppee-Rust.

Sulfur.—Romania's domestic production of sulfur came primarily from pyrites, although the most significant development in 1981 was the continued development at the Calimani sulfur project at Suceava. The Suceava deposit was reported to be the largest native sulfur deposit ever found in Romania. A 20-kilometer access road was under construction, and some 1,200 workers in addition to mining complex personnel were employed in the removal of rock overburden. The project called for more than 200 dump trucks, over 20 excavators, and over 30 bulldozers. The project was to come onstream late in 1981 after the removal of about 1 million cubic meters of overburden and the initial exposure of 100,000 tons of sulfur.

MINERAL FUELS

In 1981, Romania was able to meet planned objectives only for the production of methane gas. Crude petroleum output showed some gain over that of the preceding year but did not meet planned goals. Net coal production fell short of planned output requirements by over 13 million tons.

Table 5.—Romania: Primary energy balance

(Million tons of standard coal equivalent)[1]

	Total primary energy	Coal (lignite, anthracite, bituminous coke)	Crude oil and petroleum products	Natural and associated gas	Hydro-power
1980:					
Production[2]	82.3	17.0	16.9	46.9	1.5
Exports	11.7	--	11.0	.3	.4
Imports	31.9	6.2	23.5	2.0	.2
Apparent consumption	102.5	23.2	29.4	48.6	1.3
1981:					
Production[2]	82.3	16.7	17.2	46.9	e1.5
Exports	12.7	--	12.0	.3	.4
Imports	28.2	6.0	22.0	--	.2
Apparent consumption	97.8	22.7	27.2	46.6	1.3

eEstimated.

[1]1 ton of standard coal equivalent (SCE)=7,000,000 kilocalories. Conversion factors used are hard coal, 1.0; lignite and brown coal, 0.33; coke, 0.9; crude oil, 1.47; natural gas, 1.33 (per 1,000 cubic meters); and hydroelectric power, 0.123 (per thousand kilowatt-hours).

[2]Production from production table and from Anuarul Statistic Republicii Socialiste Romania, 1981, Bucharest, 1981.

Coal.—Faced with serious production shortfalls in 1981, Romania planned substantial production increases in 1982 that would set output at about 44 million tons of lignite and pit coal. By 1985, an estimated annual 96-million-ton production level was set. The Jiu Valley in Oltenia County remained the country's principal coal mining area; located in the southern Carpathian region, the Jiu Valley, with a commercial reserve base of 1 billion tons, produced 90% of Romania's lignite and about 25% of its bituminous and anthracite coal.

During the year, worker unrest was alleged at the Jiu Valley coal mining area owing to food shortages, which may have, in part, contributed to the industry's dislocations during the year.

In 1981, Romania reported the reopening of three coal mines in the Trotus Valley; the renewed operation at these mines was said to have led to discoveries of new seams that could be exploited for an estimated 15 years. It was also reported that facilities were expanded at the Leurda lignite mine in the Motru Valley that would raise output by 5,000 tons per day.

Nuclear Power.—Romania reported construction progress on the country's first nuclear powerplant at Cerna Voda. The excavation of the foundation for the Canadian-built Candu reactor was completed, and the first reactor block was scheduled for startup in 1985. Romania is the only CMEA country to have initiated its nuclear power development without resorting to Soviet technology.

Petroleum and Natural Gas.—Romania's production plan for 1982 called for the production of 12.5 million tons of crude oil and 33,000 million cubic meters of natural gas. In 1981, the industry reported a significant offshore oil discovery. The Gloria location in the Black Sea, some 30 miles offshore, was reported to contain light crude and gas in 150 feet of water. Romanian authorities expressed interest in obtaining the cooperation of U.S. oil companies to help develop the deposit, and preliminary discussions were held with Standard Oil of Indiana and Occidental Petroleum, among others.

Shale (Bituminous).—Romania's principal shale deposits, with a calorific content of 980 to 1,200 kilocalories per kilogram, were located in the southwest in Caras-Severin County. Doman and Anina, the two main deposits, were reported to contain substantial reserves, and it was planned to mine them by open pit methods; the mined product would be supplied to a planned thermoelectric power station. Shale output by 1985 was estimated at 10 million tons per year.

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[1]Foreign mineral specialist, Division of Foreign Data.

[2]Scinteia (Bucharest). July 2, 1981, pp. 3-4.

[3]Revista Economica (Bucharest). No. 41, Oct. 9, 1981, p. 62.

Romania Libera (Bucharest). Feb. 18, 1982, pp. 1, 5.

[4]The Romanian lei is a nonconvertible currency, whose relation to the U.S. dollar is based upon the fluctuation of the dollar-lei ratio. The rate of dollars to lei is US$1.00=Lei4.47 (official commercial rate, July 8, 1981). The conversion of Romanian national income and foreign exchange accounts into U.S. dollars was not done, owing to different criteria used in determining value in centrally planned economies as opposed to those used in market economies.

[5]Council for Mutual Economic Assistance (CMEA). Its membership includes Bulgaria, Cuba, Czechoslovakia, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, the U.S.S.R., and Vietnam. Yugoslavia obtained permanent observer status in 1965.

The Mineral Industry of Saudi Arabia

By Peter J. Clarke[1]

Revenues from petroleum exports, in excess of $100 billion, continued to fuel the rapid development of the Saudi economy in 1981. Production of crude oil averaged 9.945 million barrels per day during the year, up only 0.18% from the 1980 level. Petroleum revenues reached $101.2 billion[2] for 1981, up from $85 billion the year before. These revenues were the mainstay of the Saudi economy, generating 60% of the 1981 gross domestic product (GDP) of approximately $130 billion, 90% of Government revenues, and 88% of the Kingdom's total exports, valued at $115 billion in 1981. Major Saudi exports, in order of decreasing value, were crude oil, refined petroleum products, and natural gas liquids (NGL).

Economic and social development in Saudi Arabia was implemented under the guidelines of 5-year economic development programs, the third of which began in 1981. In the second 5-year plan, over 50% of the Kingdom's resources were allocated for infrastructure development to remove bottlenecks and increase the country's capacity to absorb large industrial investments. Under the first two plans, GDP has tripled, gross fixed capital formation has increased about 45% per year, and per capita income has more than doubled to the current level of about $15,000. Along with these economic developments, over 20,000 kilometers of roads, five major seaports, and three international airports were built. Electricity, telecommunications, and water distribution networks were extended to even the most remote villages. The third development plan, 1981-85, was intended to build upon these achievements, while gradually shifting the emphasis away from basic infrastructure to productive investments, such as heavy industry, agriculture, and mining. Total Government expenditures during the plan period were estimated at $236 billion, excluding military expenditures.

The largest of these investments was in the oil sector, where development of downstream processing industries was rapidly taking place. The Saudi Government has concentrated its efforts at two major industrial centers, Jubail on the East coast and Yanbu on the Red Sea. Jubail was to be the site for 2 major export-oriented oil refineries, 6 major petrochemical plants, a fertilizer plant, an iron and steel mill, secondary support industries, and a residential community for 300,000 people. Yanbu made its first step in becoming a major crude oil and NGL export terminal in 1981, with the completion of Petroline, the two parallel crude oil and NGL transpeninsular pipelines. A major crude oil and NGL loading terminal at Yanbu gave Saudi Arabia its first oil outlet on the Red Sea, thus avoiding the Persian Gulf and vulnerable Strait of Hormuz. Yanbu was also to house a NGL processing plant, an export and lube oil refinery, and a petrochemical plant. Also nearing completion was the Saudi gas system, to collect, process, and transport over 3 billion cubic feet per day of associated gas that will provide feedstock for petrochemical production, fuel for industry, power generation, and desalinization of seawater. The system was 75% complete at the end of the year. Total contracts awarded for the two industrial areas were valued at $7.8 billion in mid-1981.

The nonoil sector of the economy was also receiving considerable attention under the third 5-year plan, as part of a concerted effort by the Government to diversify the economy away from oil dependence. Growth rate of the nonoil GDP was 12% in 1981,

double the rate envisioned by the plan and about the same as in 1980. Growth in nonoil GDP was primarily a result of Government expenditures for infrastructure and basic services for Saudi Arabia's booming construction industry. The private nonoil economy also expanded rapidly in 1981, at a rate of 13%. Advances in the private sector were generated mainly by the trade and services sector, as a result of the high level of imports required by an expanding economy.

As part of its intention to develop the nonoil resources of the Kingdom, the Saudi Arabian Government issued, along with the economic plan, a 5-year mineral development plan. Development of nonfuel minerals in Saudi Arabia was under the direction of the Directorate General of Mineral Resources (DGMR). Petroleum and hydrocarbon exploitation was controlled by the General Petroleum and Mineral Organization (Petromin). Both the DGMR and Petromin were agencies of the Saudi Arabian Government. To induce foreign and domestic companies to invest in mineral development, the Kingdom offered a liberal mining code, well-established precedents for joint-venture arrangements with Petromin, interest-free loans of 50% of the capital investment with a Saudi partner, and a 5-year tax holiday. Eight mineral exploration permits were issued during the year to private companies, mostly for metallic minerals in the Arabian Shield. In addition to these companies, geologic mapping and mineral exploration was being conducted by the U.S. Geological Survey (USGS), the French Bureau de Recherches Géologiques et Minières (BRGM), Hunting Survey's Ltd. (United Kingdom), Shell Minerals Exploration-Saudi Arabia, and British Steel Corp. Two mineral projects were also nearing implementation in 1981. Consolidated Gold Fields and Petromin were going ahead with plans to develop the Mahd Adh Dhahab gold deposit in the Arabian Shield, and Saudi Arabia and Sudan were operating a pilot plant to extract several metallic minerals from the floor of the Red Sea.

The amount of revenues realized from oil exports and other sources that was not spent under the budget, or used for other purposes, constituted Saudi Arabia's petrodollar surplus. The surplus for 1981 was estimated at about $20 billion. The Saudi Arabian Monetary Agency (SAMA) was responsible for investing these surpluses to receive a maximum return. SAMA total assets at the end of 1980 were estimated at nearly $100 billion. Saudi investment income from these assets was estimated at about $5 billion in 1981. SAMA investments were mostly in Government guaranteed bonds and in blue-chip corporate securities. Estimates placed about 80% of SAMA investments in dollar-denominated securities, but with less than 50% in the United States itself.

Overall, 1981 was a year of tremendous achievement for Saudi Arabia. Its status in international financial markets was recognized in May 1981, when an agreement with the International Monetary Fund (IMF) was signed, allowing the latter to borrow up to $4.7 billion from SAMA over a period of 6 years. This effectively doubled the SAMA contribution and was considered a substantial achievement in the effort to recycle petrodollars, strengthen the IMF, and the international monetary system.

The Saudi prevailed on the Organization of Petroleum Exporting Countries (OPEC) pricing issue, for which they had fought for over a year. In October 1981 at the Geneva OPEC conference, Saudi pressure led to the unification of the OPEC pricing structure around the benchmark Arabian Light (34° API) at $34 per barrel. The Saudi had produced over 10 million barrels of oil per day and flooded world markets for most of the year to force price retrenchment by other OPEC member states. Their ability to influence the world oil market and gain acceptance of their pricing policy was a major step in the Saudi plan to become a leader of the moderate Arab world and allow OPEC to speak with a unified voice.

PRODUCTION

Production of crude oil in Saudi Arabia increased slightly in 1981, to 3.63 billion barrels. This production reflects an average daily output of nearly 10 million barrels per day. Production was raised in October 1980 from 9.5 to 10.5 million barrels per day to help supply countries left short by the loss of supplies from Iran and Iraq. Production was maintained at this level through the first 5 months of 1981, creating an oversupply situation in the world market. The Saudi used their output to prevent another round of price increases in the wake of the Iran-Iraq war, and to keep a downward

pressure on spot, or noncontract, crude oil prices. The price of Arabian Light stood at $32 per barrel from November 1980 to October 1981, when it was raised to $34 per barrel, where it remained for the rest of the year. Spot prices fluctuated slightly below the official level and reached a low of $29 per barrel by the end of the year. In October, following the OPEC conference, Saudi Arabia cut its production to 8.5 million barrels per day, where it remained through yearend.

Production of refined products continued to increase, mainly owing to the large-scale expansion program underway in the Saudi refining industry. Output of refined products averaged about 950,000 barrels per day in 1981, up 3.6% from the 1980 level. New refinery capacity was added at Riyadh, and another addition was expected in 1982 at Jeddah. Three major export refineries, at Jubail, Yanbu, and Rabigh, were to come onstream by 1985, as well as two domestic refineries and six lubrication oil refineries. With all this new capacity onstream, Saudi Arabia was to be capable of exporting over 400 million barrels per year of refined products by the mid-1980's.

The other major oil-related development in Saudi production capacity was the implementation of the massive master gas system (MGS), capable of processing 3 billion cubic feet per day of associated gas and turning it into feedstock for one of the largest petrochemical projects in the world. Saudi Arabia produced about 140 million barrels of NGL in 1981, nearly all of which was exported. When all phases of the MGS are completed, output of NGL was to more than double. Downstream processing facilities were to transform methane into ethane for use in developing the Saudi petrochemical industry.

In addition to refined products and NGL, petrochemicals represented the long-term future of the Saudi downstream processing industry. Eight petrochemical projects were to be constructed in Jubail and Yanbu by 1985, producing primary petrochemicals for the world market. The Saudi stated goal was to capture 5% of the world chemical market by 1990. To bring these projects to reality, several of the world's largest oil and chemical companies were participating as joint-venture partners. The first of these plants was due onstream in 1983.

Nonfuel mineral production in Saudi Arabia was also expanding in 1981. Production of nitrogenous fertilizer increased 4% in 1981 from the 1980 level and is scheduled to undergo large-scale expansion when the Jubail Fertilizer Co. plant comes onstream in 1983. The plant is to produce 580,000 tons per year of urea fertilizer, mainly for export. Sulfur production is also expected to increase dramatically as a byproduct of petroleum refining. Sulfur production capacity was to increase to 1.6 million tons per year by the middle of the decade.

Construction materials, mainly iron, steel, and cement, were in great demand in Saudi Arabia. To satisfy domestic requirements, the Saudi Iron and Steel Co. was constructing an 800,000-ton-per-year, direct-reduction steelworks at Jubail, to be completed by 1983. Output from the Jeddah steel rolling mill was also expanded, from 80,000 to 140,000 tons per year, in 1981. The cement industry was also given a considerable boost in 1981 through the addition of 3.8 million tons per year of new capacity. Current capacity of the cement industry was 5.2 million tons per year, but was to expand to 13 million tons per year by 1985 through the addition of four new plants. Saudi Arabia expected to be self-sufficient in iron, steel, and cement production by the mid-1980's and still have a moderate surplus for export. Total mineral production in Saudi Arabia is shown in table 1.

Table 1.—Saudi Arabia: Production of mineral commodities[1]

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Iron and steel: Crude steel thousand metric tons	5	5	45	50	72
NONMETALS					
Cement, hydraulic[2] do	1,267	1,800	2,200	3,500	5,000
Gypsum do	20	210	300	300	350
Lime[e] do	20	30	150	150	175
Nitrogen: N content of ammonia do	125	140	155	167	170
Sulfur:					
Native metric tons	1,160	1,083	1,100	1,000	NA
Byproduct, all sources do	12,000	14,000	125,000	460,000	480,000
Total do	13,160	15,083	126,100	461,000	480,000
MINERAL FUELS AND RELATED MATERIALS[3]					
Gas, natural:					
Gross million cubic feet	1,719,816	1,544,960	1,700,000	1,913,695	1,920,000
Marketed[e] do	158,915	334,927	400,000	450,000	500,000
Natural gas liquids:					
Propane and butane thousand 42-gallon barrels	NA	NA	NA	NA	NA
Natural gasoline and other do	NA	NA	NA	NA	NA
Total do	70,000	91,009	100,000	105,000	140,000
Petroleum:					
Crude do	3,357,955	3,029,901	3,479,389	3,623,541	3,630,000
Refinery products:					
Gasoline do	12,334	19,716	21,316	26,043	29,000
Jet fuel do	2,054	202	248	355	360
Kerosine do	8,569	9,854	9,913	12,526	12,526
Distillate fuel oil do	32,116	37,486	34,991	44,696	46,000
Residual fuel oil do	96,887	95,423	97,997	89,048	90,000
Liquefied petroleum gas do	57,571	65,326	79,523	97,339	100,000
Naphtha do	49,010	48,285	51,250	45,560	47,000
Asphalt do	7,063	6,178	7,937	8,268	8,300
Unspecified do	--	1,085	1,560	1,600	1,700
Refinery fuel and losses do	9,608	[e]10,200	[e]10,200	10,200	10,500
Total do	275,212	293,755	314,935	335,635	345,386

[e]Estimated. [p]Preliminary. NA Not available.
[1]Table includes data available through July 23, 1982.
[2]Data are for the Hejira calendar year, which corresponds closely to the Gregorian calendar year.
[3]Includes Saudi 1/2 share of production in the Kuwait-Saudi Arabia Partitioned Zone.

TRADE

Saudi balance-of-payments surplus continued to grow in 1981, led by a rise of almost 20% in the value of oil and gas exports. The merchandise trade balance showed a surplus of $76.5 billion in 1981, up 7% from the 1980 level. Oil exports, including NGL, rose by 11% in 1981 over the 1980 level. Of the total oil exports, refined products accounted for 5%; bunker fuel, 1%; and crude oil, the remaining 94%. Nonoil exports were negligible in 1981 but were to increase significantly when the petrochemical projects come onstream.

Total imports by Saudi Arabia reached $40 billion in 1981, up 22% from the 1980 level. Real growth in imports, after inflation and exchange rate adjustments, was estimated at 15%. Imports by the private sector rose 20% to $34.5 billion, representing 86% of total imports. About 80% of Saudi imports originated in 14 major industrial countries.

Table 2.—Saudi Arabia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	--	9	--	All to Yemen Arab Republic.
Metal including alloys:				
Scrap	1,479	2,026	--	Kuwait 1,276; Lebanon 140; Jordan 48.
Unwrought	64	447	--	Kuwait 211; Lebanon 95; Netherlands 25.
Semimanufactures	380	419	--	Bahrain 220; Kuwait 95; Yemen Arab Republic 44.
Cobalt: Oxides and hydroxides	--	20	--	All to Qatar.
Copper:				
Matte and speiss	1,333	802	--	Kuwait 583; Jordan 84; Lebanon 71.
Metal including alloys:				
Scrap	876	3,269	--	Kuwait 1,207; India 605; West Germany 578.
Unwrought	88	259	--	Spain 109; India 60; Belgium-Luxembourg 54.
Semimanufactures	5,215	745	--	Kuwait 275; India 150; Belgium-Luxembourg 99.
Iron and steel:				
Ore and concentrate	5	1	--	All to Yemen Arab Republic.
Metal:				
Scrap	730	15,931	8	Italy 10,086; Pakistan 2,460; Jordan 775.
Pig iron, ferroalloys, powder, shot	1,203	3,011	18	Lebanon 1,013; Pakistan 1,000; Jordan 443.
Steel, primary forms	99	147	2	Yemen Arab Republic 99; Somalia 22.
Semimanufactures:				
Bars, rods, angles, shapes, sections	7,083	3,473	--	Pakistan 1,300; Kuwait 1,179; Yemen Arab Republic 473.
Universals, plates, sheets	702	2,432	2	Yemen Arab Republic 2,231; Somalia 120.
Hoop and strip	2	28	--	Kuwait 24; Yemen Arab Republic 4.
Rails and accessories	15	330	5	United Arab Emirates 307; Lebanon 12.
Wire	14	64	--	Yemen Arab Republic 29; Bahrain 15; Lebanon 15.
Tubes, pipes, fittings	2,035	3,763	120	Kuwait 629; United Kingdom 580; United Arab Emirates 461.
Castings and forgings, rough	1,138	514	10	United Arab Emirates 111; Jordan 104; Yemen Arab Republic 73.
Lead:				
Ore and concentrate	1	--		
Oxides and hydroxides	--	3	--	United Arab Emirates 2; Bahrain 1.
Metal:				
Scrap	85	290	--	Kuwait 183; Portugal 46; Lebanon 33.
Unwrought and semimanufactures	8	90	--	West Germany 36; Kuwait 33.
Nickel:				
Matte and speiss	--	23	--	All to Kuwait.
Metal including alloys: Semimanufactures	(1)	20	--	All to Qatar.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	--	$1	--	All to Sudan.
Silver:				
Waste and sweepings ---do---	--	$3	--	All to United Kingdom.
Metal including alloys, unwrought and partly wrought ---do---	$37,304	$56,003	--	United Kingdom $24,479; France $21,102; Switzerland $6,675.
Tin metal including alloys, unwrought and semimanufactures	--	1	--	All to Yemen Arab Republic.
Tungsten metal including alloys, all forms	4	10	NA	Kuwait 4.
Zinc:				
Oxides and hydroxides	14	20	--	Bahrain 15; Somalia 5.
Metal including alloys:				
Scrap	--	48	--	Kuwait 37; Somalia 5; Yemen Arab Republic 5.
Unwrought	47	102	--	Somalia 90; Yemen Arab Republic 6.
Semimanufactures	239	980	--	Lebanon 328; Somalia 231; Syria 111.
Other:				
Ores and concentrates	--	62	--	Kuwait 34; Jordan 27; Yemen Arab Republic 1.
Alkali, alkaline-earth, rare-earth metals	87	7	--	All to Qatar.
Metalloids	99	215	--	Lebanon 150; Jordan 64.

See footnotes at end of table.

Table 2.—Saudi Arabia: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	5	51	--	Kuwait 33; Yemen Arab Republic 18.
Grinding and polishing wheels and stones	41	16	--	Yemen Arab Republic 13; Bahrain 2; People's Democratic Republic of Yemen 1.
Asbestos, crude	83	11	--	All to Yemen Arab Republic.
Boron materials: Crude natural borates	--	3	--	Do.
Cement	4,775	27,409	--	Spain 16,200; Yemen Arab Republic 10,268; Somalia 528.
Chalk	(1)	2	--	All to Yemen Arab Republic.
Clays and clay products:				
Crude	412	226	--	Kuwait 120; United Arab Emirates 100.
Products:				
Nonrefractory	134	374	--	Yemen Arab Republic 254; Somalia 56; Bahrain 27.
Refractory including nonclay brick	109	756	--	United Arab Emirates 608; Kuwait 113; Lebanon 23.
Diatomite and other infusorial earth	771	1,284	--	Kuwait 942; Burma 140; Jordan 140.
Fertilizer materials:				
Crude:				
Nitrogenous	14,138	10,023	--	China 10,000; Yemen Arab Republic 16.
Other including mixed	156	111	--	Kuwait 60; Yemen Arab Republic 32; Netherlands 19.
Manufactured:				
Nitrogenous	94,072	170,908	4,000	Pakistan 51,617; Bangladesh 43,913; India 34,150.
Phosphatic	5,269	41,518	--	China 10,000; India 8,500; United Kingdom 6,700.
Other including mixed	115	10,001	--	Bangladesh 10,000; Yemen Arab Republic 1.
Ammonia	364	61	--	Qatar 41; Syria 12; Kuwait 8.
Gypsum and plasters	7,566	6,127	--	Kuwait 5,694; Qatar 195; Bahrain 184.
Lime	2,600	2,311	--	Yemen Arab Republic 2,018; Kuwait 92; Jordan 90.
Mica: Worked including agglomerated splittings	--	148	--	United Arab Emirates 133; Jordan 14.
Pigments, mineral: Iron oxides, processed	--	7	--	All to Kuwait.
Salt and brine	1,980	3,440	--	Kuwait 2,843; Jordan 320; Yemen Arab Republic 236.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	932	135	--	Kuwait 125; United Arab Emirates 10.
Soda ash	--	3	--	All to Yemen Arab Republic.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	54	120	--	Yemen Arab Republic 83; United Arab Emirates 34.
Worked	257	1,406	--	Yemen Arab Republic 592; United Arab Emirates 359; Greece 226.
Gravel and crushed rock	133	553	--	Kuwait 488; Jordan 40; Yemen Arab Republic 14.
Sand excluding metal-bearing	142	164	--	United Arab Emirates 122; Qatar 36.
Sulfur:				
Elemental, all forms	76	126	--	Yemen Arab Republic 97; Qatar 17; Somalia 12.
Sulfuric acid, oleum	--	522	--	Qatar 515; Yemen Arab Republic 7.
Other:				
Crude	25	272	--	Kuwait 188; Yemen Arab Republic 44; Somalia 24.
Slag, dross, similar waste, not metal-bearing	--	26	--	NA.
Halogens	10	24	--	All to Kuwait.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	117	--		
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	886	714	--	United Arab Emirates 407; Oman 185; Somalia 24.

See footnotes at end of table.

Table 2.—Saudi Arabia: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	5	15	--	All to Yemen Arab Republic.
Carbon black	--	18	--	Do.
Coal:				
Anthracite and bituminous coal	1	4,301	--	Yemen Arab Republic 4,287; Lebanon 8; United Arab Emirates 6.
Lignite including briquets	--	38	--	All to Yemen Arab Republic.
Hydrogen, helium, rare gases	19	86	--	Lebanon 64; Kuwait 6.
Peat including briquets and litter	--	1	--	All to Yemen Arab Republic.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	3,218,497	3,353,796	543,232	France 320,040; Netherlands 228,711; Italy 212,171.
Refinery products:				
Gasoline do	NA	45,245	3,623	Japan 18,428; Netherlands 4,007; Italy 3,942.
Kerosine and jet fuel do	84	164	--	Yemen Arab Republic 35; India 34; France 31; Netherlands 31.
Distillate fuel oil do	NA	4,023	--	Oman 479; United Arab Emirates 479; Brazil 361.
Residual fuel oil do	NA	38,968	--	Japan 4,327; Republic of Korea 2,022; Singapore 1,711.
Lubricants do	65	118	--	France 52; Iran 30; Somalia 27.
Other:				
Liquefied petroleum gas do	NA	90,637	1,533	Japan 63,482; Netherlands 7,381; Spain 6,868.
Mineral jelly and wax do	--	(1)	--	Mainly to Yemen Arab Republic.
Bitumen and other residues do	1	25	--	Yemen Arab Republic 24.
Total refinery products including bunkers do	177,792	179,180		
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	7,029	9,341	--	India 5,000; Iran 4,250.

NA Not available.
[1]Less than 1/2 unit.

Table 3.—Saudi Arabia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	31	--		
Oxides and hydroxides	9	1,269	43	Netherlands 1,215; Italy 8.
Metal including alloys:				
Scrap	1,456	1,518	202	Canada 634; Bahrain 398; Norway 196.
Unwrought	1,373	7,382	268	Bahrain 4,425; Canada 1,983; France 280.
Semimanufactures	30,045	41,312	3,197	Greece 7,232; Egypt 3,993; Bahrain 3,776.
Beryllium, elemental	8	2	(1)	Mainly from Canada.
Chromium:				
Ore and concentrate	7	--		
Oxides and hydroxides	1	19	(1)	West Germany 13; Netherlands 2; Republic of Korea 2.
Cobalt: Oxides and hydroxides	71	51	1	United Kingdom 34; West Germany 12; India 3.

See footnotes at end of table.

Table 3.—Saudi Arabia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Copper:				
Ore and concentrate	(1)	40	--	All from West Germany.
Matte and speiss	26	9	(1)	India 8.
Metal including alloys:				
Scrap	2,013	20	--	Australia 15; Japan 4.
Unwrought	87	73	13	France 38; West Germany 17.
Semimanufactures	11,222	16,633	3,896	Australia 6,054; Japan 2,951; United Kingdom 1,049.
Iron and steel:				
Ore and concentrate including roasted pyrite	115	49,128	--	India 49,127.
Metal:				
Scrap	38,471	1,198	220	Japan 317; Lebanon 61; Belgium-Luxembourg 55.
Pig iron, ferroalloys, powder, shot	52,738	57,460	418	Netherlands 14,263; Qatar 11,649; India 9,529.
Steel, primary forms	294,548	91,401	376	Japan 48,357; Republic of Korea 12,611; West Germany 4,130.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	1,781	1,805	15	Japan 806; Republic of Korea 295; North Korea 90.
Universals, plates, sheets	360,765	337,379	15,758	Japan 239,237; West Germany 17,555; Greece 14,109.
Hoop and strip	8,807	9,698	268	Japan 5,136; Romania 1,037; West Germany 638.
Rails and accessories	19,112	11,492	954	West Germany 3,586; Spain 2,536; Republic of Korea 1,025.
Wire	17,752	32,060	269	West Germany 9,822; China 4,823; Republic of Korea 4,118.
Tubes, pipes, fittings	466,512	610,352	64,223	Japan 219,605; West Germany 43,538; Republic of Korea 38,990.
Castings and forgings, rough	106,979	117,776	22,010	Japan 17,485; Italy 17,438; West Germany 14,932.
Lead:				
Ore and concentrate	38	153	--	Morocco 91; Belgium-Luxembourg 44; Italy 18.
Oxides and hydroxides	43	97	(1)	West Germany 60; United Kingdom 36.
Metal including alloys:				
Scrap	374	967	459	United Kingdom 95; Kuwait 87; Lebanon 69.
Unwrought	616	1,504	31	United Kingdom 413; Kuwait 412; Lebanon 189.
Semimanufactures	2,707	3,626	151	Lebanon 1,067; West Germany 1,042; Sweden 189.
Magnesium metal including alloys:				
Scrap value, thousands	--	$3	--	All from Belgium-Luxembourg.
Unwrought and semimanufactures	90	19	10	United Kingdom 4; Bahrain 1.
Manganese:				
Ore and concentrate	2,133	--	--	
Oxides and hydroxides	73	44	--	Belgium-Luxembourg 43; West Germany 1.
Mercury 76-pound flasks	6,237	48,850	14	West Germany 38,523; United Kingdom 5,889; Italy 2,785.
Molybdenum metal including alloys, all forms	19	28	21	Italy 6.
Nickel:				
Ore and concentrate	29	36	--	All from Italy.
Matte and speiss value, thousands	$1	--		
Metal including alloys: Semimanufactures	106	200	7	Japan 138; Italy 34; West Germany 10.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$57	$40	$13	West Germany $18; Afghanistan $5; Morocco $4.
Silver:				
Ore and concentrate[2] do	$1	--		
Waste and sweepings[2] do	$52	$59	$5	Italy $48; Czechoslovakia $5.
Metal including alloys, unwrought and partly wrought do	$1,085	$10,215	$5	Netherlands $5,410; Switzerland $1,807; Lebanon $1,663.

See footnotes at end of table.

Table 3.—Saudi Arabia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Tantalum metal including alloys, all forms	15	--		
Tin:				
Ore and concentrate	--	35	--	France 26; Belgium-Luxembourg 9.
Metal including alloys:				
Scrap	7	9	(1)	Singapore 5; West Germany 3.
Unwrought	27	104	18	Singapore 31; United Kingdom 30; Spain 18.
Semimanufactures	513	999	53	Hong Kong 747; United Kingdom 99; West Germany 32.
Titanium: Oxides and hydroxides	1,480	1,948	35	Belgium-Luxembourg 753; United Kingdom 458; West Germany 207.
Tungsten metal including alloys, all forms	93	149	5	Belgium-Luxembourg 100; Finland 28; Japan 10.
Uranium and thorium metal including alloys, all forms _ value, thousands	--	$28	$2	Japan $23; Denmark $2; Italy $1.
Zinc:				
Ore and concentrate	16	1,017	--	West Germany 893; Belgium-Luxembourg 22.
Oxides and hydroxides	1,851	1,877	332	Czechoslovakia 478; West Germany 446; Belgium-Luxembourg 307.
Metal including alloys:				
Scrap	58	19	--	West Germany 12; Egypt 3; Lebanon 2.
Unwrought	2,029	250	--	West Germany 140; Republic of Korea 7.
Semimanufactures	10,242	9,831	277	Japan 6,623; West Germany 1,398; Belgium-Luxembourg 216.
Other:				
Ores and concentrates	199	730	39	Czechoslovakia 300; West Germany 243; Spain 33.
Metals:				
Alkali, alkaline-earth, rare-earth metals	384	1,916	248	Netherlands 509; Italy 498; West Germany 299.
Metalloids	202	248	11	France 87; West Germany 67; United Kingdom 24.
Base metals including alloys:				
Scrap	26	2,221	--	West Germany 2,219; Denmark 2.
Unwrought and semimanufactures	159	122	17	Japan 37; Italy 24; Switzerland 12.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	1,696	1,055	3	Belgium-Luxembourg 394; West Germany 118; Lebanon 82.
Artificial: Corundum	3	--		
Dust and powder of precious and semiprecious stones value, thousands	$62	$5	--	All from India.
Grinding and polishing wheels and stones	1,944	3,385	61	Italy 1,574; Spain 522; West Germany 363.
Asbestos, crude	24,169	52,225	244	Canada 30,181; Spain 15,080; Cyprus 960.
Barite and witherite	553	41,268	22,122	Australia 19,010; West Germany 41.
Boron materials:				
Crude natural borates	53	52	10	West Germany 42.
Oxide and acid	60	41	4	Belgium-Luxembourg 36.
Cement thousand tons	6,433	10,579	45	Spain 3,931; Greece 2,321; Japan 2,177.
Chalk	4,005	3,566	38	Belgium-Luxembourg 504; United Kingdom 601; Switzerland 406.
Clays and clay products:				
Crude	8,970	6,798	2,567	United Kingdom 939; Cyprus 840; Greece 700.
Products:				
Nonrefractory	237,700	438,183	8,071	Italy 287,251; Spain 55,642; Lebanon 11,726.
Refractory including nonclay brick	66,119	78,333	9,591	West Germany 19,108; Japan 11,644; Italy 9,845.
Cryolite and chiolite	148	227	--	West Germany 92; United Kingdom 66; Norway 36.

See footnotes at end of table.

Table 3.—Saudi Arabia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Diamond:				
Gem, not set or strung value, thousands	$1,997	$3,380	$3	India $1,150; Singapore $687; Switzerland $489.
Industrial do	$607	$412	$7	India $390; France $5; Italy $5.
Diatomite and other infusorial earth	5,327	15,760	14,012	Thailand 712; West Germany 394; United Kingdom 274.
Feldspar, fluorspar, nepheline	463	445	--	West Germany 192; Italy 103; Japan 101.
Fertilizer materials:				
Crude:				
Nitrogenous	5,992	4,193	58	West Germany 2,000; France 1,719; Lebanon 240.
Phosphatic	316	54	--	France 48; United Kingdom 5.
Potassic	63	42	--	Finland 15; United Kingdom 14; Republic of Korea 11.
Other including mixed	--	6,285	812	France 2,392; West Germany 1,790; Italy 383.
Manufactured:				
Nitrogenous	11,482	10,462	76	France 5,444; Netherlands 4,157; Italy 204.
Phosphatic	9,391	27,152	170	France 8,673; Lebanon 8,122; Netherlands 5,061.
Potassic	1,575	3,780	9	West Germany 1,964; Belgium-Luxembourg 1,399; France 191.
Other including mixed	1,833	7,759	44	Netherlands 3,382; West Germany 1,764; Canada 1,031.
Ammonia	663	610	122	Kuwait 287; United Kingdom 85; Japan 48.
Graphite, natural	43	14	1	Albania 7; India 5.
Gypsum and plasters	23,777	26,085	5,002	West Germany 3,389; France 3,090; United Arab Emirates 2,776.
Lime	107,116	30,927	1,828	Lebanon 25,968; United Kingdom 670; West Germany 454.
Magnesite	177	95	--	Belgium-Luxembourg 50; West Germany 44.
Mica:				
Crude including splittings and waste	769	1,038	--	India 991; United Kingdom 37.
Worked including agglomerated splittings	116	32	2	France 27; Japan 2; West Germany 1.
Pigments, minerals: Iron oxides, processed	393	2,018	329	Qatar 690; United Kingdom 332; Finland 278.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$1,817	$993	--	India $283; Italy $247; Lebanon $196.
Synthetic do	$2,779	$2,050	$6	Switzerland $939; India $440; Belgium-Luxembourg $328.
Pyrite, unroasted	311	375	--	Italy 174; Lebanon 144; West Germany 25.
Salt and brine	7,369	8,829	6,534	West Germany 526; Netherlands 426; United Kingdom 350.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	5,671	11,186	356	West Germany 7,900; United Kingdom 664; Spain 494.
Soda ash	8,462	7,456	4	West Germany 5,202; France 1,503; Kenya 332.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	62,907	92,743	1,297	Italy 65,835; United Arab Emirates 7,210; Lebanon 4,225.
Worked thousand tons	2,468	451	3	Italy 319; Greece 25; Spain 23.
Dolomite, chiefly refractory-grade	3,651	2,465	--	Sweden 1,054; France 680; West Germany 368.
Gravel and crushed rock	45,011	63,372	1,119	Italy 44,067; Iran 5,156; Syria 2,637.
Limestone, other than dimension	432	408	44	Pakistan 204; Lebanon 70; United Kingdom 35.
Quartz and quartzite	631	2,741	5	Italy 2,449; Lebanon 86.
Sand excluding metal-bearing	4,269	1,822	316	Netherlands 705; West Germany 218; Italy 187.
Sulfur:				
Elemental:				
Other than colloidal	579	1,003	11	Kuwait 675; U.S.S.R. 181; China 52.
Colloidal	306	573	17	Lebanon 529; Italy 10; Egypt 9.
Sulfuric acid, oleum	4,716	4,579	124	Netherlands 1,079; Kuwait 1,010; Lebanon 850.

See footnotes at end of table.

Table 3.—Saudi Arabia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Talc, steatite, soapstone, pyrophyllite	4,866	732	18	Italy 332; Finland 131; Norway 103.
Other:				
Crude	3,215	69,607	21,754	Republic of Korea 16,226; Indonesia 14,616; Greece 10,330.
Slag, ash, similar material, not metal-bearing	6	17,401	--	India 17,326; New Zealand 35; Turkey 35.
Halogens	80	100	30	Finland 52; United Kingdom 18.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	105	369	11	Netherlands 266; Belgium-Luxembourg 40; France 26.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	180,126	94,931	9,319	Belgium-Luxembourg 15,490; West Germany 10,806; Italy 8,385.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,752	2,794	1,412	United Kingdom 342; Netherlands 223; Japan 171.
Carbon black and gas carbon	77	65	--	West Germany 8; Netherlands 3; France 2.
Coal, all grades including briquets	585	1,562	301	Italy 898; Netherlands 139.
Coke and semicoke	3,565	193	38	Italy 62; United Kingdom 47; Syria 19.
Hydrogen, helium, rare gases	155	306	103	Japan 86; United Kingdom 35; United Arab Emirates 18.
Peat including briquets and litter	1,044	1,217	2	West Germany 428; United Kingdom 425; Belgium-Luxembourg 167.
Petroleum and refinery products:				
Crude and partly refined 42-gallon barrels	1,350	1,869	723	Belgium-Luxembourg 526; United Kingdom 460.
Refinery products:				
Gasoline do	14,263	4,029	1,674	France 875; United Kingdom 858.
Kerosine and jet fuel do	138,368	167,423	54,405	United Arab Emirates 56,908; United Kingdom 20,173.
Distillate fuel oil do	123,635	80,061	48,072	United Arab Emirates 20,351; Belgium-Luxembourg 5,864.
Residual fuel oil do	27,726	8,452	919	Netherlands 2,824; Hong Kong 1,658; Republic of Korea 826.
Lubricants do	995,533	937,580	323,568	Singapore 331,926; Netherlands 85,379; United Kingdom 61,369.
Other:				
Liquefied petroleum gas do	928	2,517	383	Greece 615; Spain 406; United Kingdom 267.
Mineral jelly and wax do	913	1,055	79	West Germany 197; Japan 142; United Kingdom 126.
Bitumen, other residues, and bituminous mixtures do	43,390	68,193	27,488	United Kingdom 19,216; France 5,884; West Germany 3,109.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	1,322	2,842	214	West Germany 1,064; Netherlands 391; United Kingdom 264.

[1]Less than 1/2 unit.
[2]May include platinum-group metals.

COMMODITY REVIEW

METALS

Exploration and development work was being carried out in Saudi Arabia on several metallic minerals in 1981. Prospecting for metals focused primarily on two areas, base metals in the Arabian Shield in northwest Saudi Arabia and metalliferous muds on the floor of the Red Sea. In the Arabian Shield, nearly 100 prospects were identified by various organizations, including the USGS, BRGM, Rio Tinto Finance and Exploration Ltd. (Riofinex), and DGMR.

The Shield itself has evolved from a complex geologic history, the evidence for which is a rapid lateral facies variation from the Red Sea coast eastward. Mineralization in the Shield reflects the complexity of changes in the Pre-Cambrian geological environment from oceanic, to volcanic, to continental in nature. The early stages near the Red Sea contain podiform chromite deposits at the base of ophiolite complexes such as at Al Ays. In the volcanic stage further to the east, the rocks contain gold at Mahd Adh Dhahab, copper at Jebal Sayid, and iron at Wadi Sawawin. Later mineralization reflects the continental environment, with formation of alkaline granites and concentrations of rare-earth elements. The most promising prospects in the Shield, the ones that the Saudi Government planned to develop, were gold at Mahd Adh Dhahab, copper at Al Masani and the Ad-Dawadimi-Jebal Sakhen Basin, and iron ore at Wadi Sawawin.

Development work on the metalliferous muds of the Red Sea progressed during 1981, with a positive recommendation from a feasibility study carried out by Preussag (Federal Republic of Germany). Completion of the study cleared the way for construction of a pilot project to process samples brought to the surface. The project was under the direction of the Saudi-Sudanese Authority for the Exploitation of Red Sea Resources. The deposits being considered were metal-rich muds in deep brine pools of the Atlantis II Deep Basin along the center of the Red Sea floor. The muds consist of layers of sulfide minerals, mainly sphalerite and chalcopyrite, alternating with oxides and silicates. Eighteen brine pools have been identified, containing a total of 17 minerals. The minerals thought to be commercially exploitable were lead, zinc, copper, silver, platinum, and cadmium. The most promising single pool contains an estimated 2.5 million tons of zinc, 500,000 tons of copper, and 9,000 tons of silver.

Sudan and Saudi Arabia reached agreement on joint ownership of the deposits. Sudan was unable to finance any of the exploration or development costs, however, so Saudi Arabia was covering the $28 million cost of the feasibility study and the $166 million for the pilot project to mine the deposit. The project was to be implemented in four stages, the first two of which were completed in 1981. The first stage included geophysical and oceanographic surveys of the Atlantis II Basin. The second stage involved comprehensive environmental studies, development of mining and processing technology, prepilot mining tests, and training of personnel. The third stage, scheduled to start in 1982, was the pilot mining and processing stage. The mining process, developed by Orenstein and Koppel AG of the Federal Republic of Germany, was to suction pump the brine-mud mixture from the sea floor to a processing ship, most likely a refitted ore carrier. The mixture was to be processed onboard into a concentrate containing about 5% copper, 32% zinc, and 0.07% silver. The concentrate was then to be shipped by barge to a smelting-refining complex, possibly located at Yanbu. Residual slurry was to be pumped back into the sea and allowed to settle. The fourth and final stage was commercial production, scheduled to start in 1988. The estimated value of ores in the basin was over $3.5 billion, and with almost all the legal, technical, economic, and environmental studies yielding positive results, the project appeared closer than ever to realization.

Aluminum.—Saudi activity in the aluminum industry in the Middle East has been confined to participation in two major projects, both outside the Kingdom, while developing its own extrusion and fabricating facilities. The significant downturn in the metals market in 1980 led to the cancellation of plans to build a 200,000-ton-per-year aluminum smelter in the Jubail industrial zone. In 1980, Bahrain decided to expand the capacity of its aluminum smelter from 126,000 to 170,000 tons per year, and Dubai commissioned the gulf's second smelter, with a capacity of 135,000 tons per year. Saudi Arabia had acquired a 20% interest in Aluminum Bahrain (Alba) in 1978.

In February 1981, Saudi Arabia and five other Persian Gulf nations signed a joint-venture agreement to establish the Gulf Aluminum Rolling Mill Co. at a cost of about $100 million. The plant, to be located in Bahrain, was to produce 40,000 tons per year of semifabricated aluminum products to be sold mainly in the gulf area. The mill was to use primary aluminum from the Alba smelter. Equity holders in the venture were Saudi Arabia, Bahrain, Kuwait, and Iraq, 20% each, and Oman and Qatar, 10% each. Kaiser Engineering won a consulting contract for the mill late in the year, and tenders for construction of the plant were to be invited before the end of 1982.

A single aluminum extrusion plant was operating in Saudi Arabia during the year at Dammam. Aluminum Products Co. brought the 5,000-ton-per-year plant into operation in 1978. There were approximately 45 other aluminum fabricating plants operating in the Kingdom in 1981, with a combined capacity of 40,000 tons per year, most of which produced aluminum doors, windows, and household manufactures for the local market.

Copper.—Exploration work was continuing on a copper deposit in the Al-Masani area, 200 kilometers northeast of Jeddah. The Arabian Shield Development Co., a joint venture of Watts, Griffis and McQuat Ltd. (Canada) and the Saudi Arabian National Mining Co., was conducting drilling tests in the area, financed by an $11 million interest-free loan from the Saudi Ministry of Finance. The deposit contained copper, lead, zinc, silver, and gold, in a north-south trending shear zone 30 meters wide and over 5 kilometers long. Petromin indicated that exploitation of the deposit could begin by 1984.

The main Saudi consumer of copper was the Saudi Cable Co., the Kingdom's first and only electrical wire and cable manufacturing company. In 1981, NKF Groep S.V., a wholly owned subsidiary of Phillips of Holland, signed an agreement making NKF a technical partner in the company. Capacity of the plant, located in Jeddah's industrial estate, was to increase from 16,500 to 27,500 tons per year of metal wire equivalent or about 50,000 tons per year of cable. The plant manufactured building wires, low-tension power cable, bare copper wire, aluminum conductors, polyvinyl chloride-insulated copper conductors, steel tape armor, and four conductor cables. Under the expansion project, the company was to begin producing medium- and high-tension wires, insulated copper and aluminum conductors, and other products. The company's products were specially designed for Saudi Arabia's high-temperature conditions. Since opening in 1978, the company's sales have risen from $4 million in 1978 to $76 million in 1981.

Gold.—After completing the initial feasibility study, Consolidated Gold Fields (United Kingdom), in conjunction with Petromin, decided to go ahead with plans to exploit the gold deposit located at Mahd Adh Dhahab, 280 kilometers northeast of Jeddah. Consolidated Gold Fields began exploration work in the Arabian Shield in 1976, and following the discovery of gold, Petromin took a 50% share in the operation in 1979. Further exploration of the deposit revealed evidence of an open pit mine that dated back to before 1,000 B.C. Location of the ancient works led to speculation that the mine may have been King Solomon's legendary Mines of Ophir. A similar gold deposit, 1 kilometer away, had been exploited by a joint United States-Saudi partnership between 1937 and 1954. The deposit at Mahd Adh Dhahab contained an estimated 1.2 million tons of ore, containing about 1 ounce of gold per ton, 4.3 ounces of silver per ton, and 0.8% copper. The joint venture to mine the deposit appeared likely to begin development work within a year. Commercial production was scheduled to start in 1983. Output was to be 3 tons of gold and 10 tons of silver per year. The mine was expected to remain productive for 10 years. Production costs for gold were estimated at $298 per ounce.

Iron and Steel.—A full-scale feasibility study was underway during the year to determine the economic potential of the Wadi Sawawin iron ore deposit, located in northwest Saudi Arabia near the Gulf of Aqaba. The deposit has been under investigation by the British Steel Corp. (BSC) since 1978, when BSC was awarded a $15 million contract to determine the tonnage and grade of the deposit. Initial estimates indicated the presence of 250 million tons of ore containing about 42% iron, with generally high levels of silica and phosphorus. The reserves appeared sufficient to establish a large-scale mining operation, but the ore was of insufficient grade to serve as feed for a direct-reduction process. The BSC was investigating the possibility of concentrating the ore for use in developing the Saudi steel industry. The DGMR proposed to mine

25,000 tons per year of ore and beneficiate it to a 65% iron concentrate at a plant to be built near Sawawin on the Red Sea coast. Pending development of the deposit, Saudi Arabia agreed to import 1 million tons of iron ore pellets from Brazil for the planned iron and steel complex.

One of the most ambitious Saudi nonoil development projects was the construction of an 800,000-ton-per-year steelworks, to be located at the eastern industrial complex at Jubail. The project was a joint venture of the Saudi Arabian Basic Industries Corp. (SABIC), 80%, and Korf Stahl of the Federal Republic of Germany, 20%. The Saudi Iron and Steel Co. (Hadeed) was to consist of two natural gas-based Midrex direct-reduction modules, three 120-ton electric arc furnaces, three six-strand billet casters, a bar mill, and a rod mill. The Midrex direct-reduction units were to be supplied by Lurgi Chemie and Huettentechnik (Federal Republic of Germany) at a cost of $210 million. Vöest-Alpine AG (Austria) was to supply the arc furnaces and billet casters at a cost of $237 million, and a consortium consisting of Mannesmann-Damag (Federal Republic of Germany) as consortium leader, Schloemann-Siemag (Federal Republic of Germany), Redec-Daelim Saudi Arabia, and Compagnie d'Enterprises Metalliques (France) was awarded a $225 million contract to supply the two rolling mills, along with ancillary facilities and related services. The first mill was to produce 6- to 32-millimeter reinforcing bars; the other, 6- to 12-millimeter wire rod coils. The combined output of the mills, 800,000 tons per year, was to be sold mostly on the domestic market, with any surplus being exported. Hadeed was to import 1 million tons of iron ore pellets, at a cost of $50 million, from Companhia Vale de Rio Doce (Brazil) under a 5-year supply agreement. The entire complex was scheduled to begin operation in 1983.

The Jeddah steel rolling mill recommenced production of reinforcing bars after undergoing a modernization, automation, and expansion project in 1979-80. Capacity of the plant, another joint venture of SABIC and Korf-Stahl, was upgraded from 80,000 to 140,000 tons per year of steel reinforcing bars. The plant reopened in September 1981 and produced about 50,000 tons of rebars by the end of the year, and 46,000 tons of this output was sold to the domestic construction industry. Steel ingots to supply the plant were imported from Europe, pending the availability of ingots from the Jubail steel complex.

The Saudi Steel Pipe Co., a joint venture of Rabiah and Nasser Co. (Ranco), Fahd Saja Saudi Arabia, and the Korean Steel Pipe Co., brought its 70,000-ton-per-year pipe plant onstream in November 1981. The plant, located in Dammam, was built at a cost of $30.7 million and was to begin producing spiral welded pipe at full capacity in February 1982. Most of the output was to be marketed in Saudi Arabia, with the remainder on order by Iraq.

The Industrial Co. for Castings and Sanitary Fittings in Riyadh, which began operating in 1976, was increasing its capacity in 1981. The company produced mainly manhole covers and frames in gray iron. Because of increasing demand, the company ordered a 20-ton hydraulic rotary furnace for its iron foundry from Monometer. The company already operated a 5-ton rotary furnace, also obtained from Monometer.

NONMETALS

Cement.—The Saudi cement industry was expanding rapidly in 1981, with two new plants providing 3.8 million tons per year of additional capacity. The Yanbu Cement Co. brought onstream a 2-million-ton-per-year cement plant early in the year. The plant, located at Ra's Baridi, 65 kilometers north of Yanbu, was the largest cement plant in the Kingdom to date. The plant was built by KHD Industrialagen AG (Federal Republic of Germany), at a cost of $100 million. The second plant to come onstream in 1981 was the Saudi Bahraini Cement Co.'s plant at Ain-Dar. The facility, built by Ishikawajima Harima Heavy Industries Co. (Japan), was approaching full capacity by the end of the year. Also nearing completion at the end of the year was the Southern Province Cement Co.'s facility at Gizan. Fuller Co. (United States) was providing two gyratory crushers, two raw ball mills, two finish ball mills, two rotary kilns, two clinker coolers, and SF preheaters with flash calciners. The plant was to be capable of producing 1 million tons per year of cement when it comes onstream sometime in 1982. Saudi planned and operating cement plants are shown in the following table.

Table 4.—The Saudi Arabian cement industry

Operating company	Location	Current capacity (thousand metric tons per year)	Planned capacity (thousand metric tons per year)	Year commissioned
Saudi Cement Corp	Hoffuf	1,000	XX	1978
Arab Cement Co	Jeddah	600	XX	1972
Yamama Saudi Cement	Riyadh	1,000	XX	1979
Yanbu Cement Co	Ras-Baridi	2,000	XX	1981
Quasim Cement	Buraydah	600	XX	1980
Saudi Bahraini Cement Co	Ain Dar	XX	1,800	1981
Saudi-Kuwait Cement Manufacturing Co	Khursaniyah	XX	2,500	1985
Southern Province Cement Co	Gizan	XX	1,000	1982
Arab Cement Co	Rabigh	XX	1,500	1983
Total		5,200	6,800	

XX Not applicable.

Source: Saudi Arabian Monetary Agency, Annual Report 1980, p. 99.

Two large cement plants were both in the planning stage in 1981. The Arab Cement Co. and Kloeks Homelth of the Federal Republic of Germany signed a $264 million contract to establish a new cement plant in Rabigh. The plant was to be capable of producing 1.5 million tons per year of cement. Part of the financing for the facility came from a $120 million loan from the Saudi Industrial Development Fund. The plant was scheduled for completion in 1983. Saudi Arabia and Kuwait signed an agreement in December 1981 to establish the largest cement project in the Middle East. The plant was to produce 2.5 million tons per year of clinker, for the production of portland cement. Krupp Polysius AG (Federal Republic of Germany) won the $235 million construction contract. The project was to make both Saudi Arabia, which owns 55% of the project, and Kuwait, which owns the other 45%, self-sufficient in cement. Work on the plant, to be located at Khursaniyah, 100 kilometers north of Dammam on the Dammam-Kuwait road, was to begin in 1983.

Fertilizer Materials.—The Saudi Arabian Fertilizer Co. (SAFCO) produced a record 342,000 tons of urea fertilizer in 1981, a 4% increase over the 1980 level. About 46,000 tons was consumed in the local market, and another 16,000 tons was exported to neighboring gulf nations. The bulk of production, 272,000 tons, was exported, mainly to China, India, and Bangladesh, with smaller quantities sold to Zambia, Sudan, and Kenya. The remaining 8,000 tons was held as inventory. In February 1980, SAFCO opened a 300-ton-per-day sulfuric acid plant in Dammam to supply the local market. The plant, built by Sim Chem of the Republic of Korea at a cost of $10 million, operated at about 50% of capacity during 1981. SAFCO was owned by Petromin (45%) and other private Saudi shareholders.

Production of nitrogenous fertilizers was to more than double in Saudi Arabia when the Jubail Fertilizer Co. (SAMAD) comes onstream in January 1983. SAMAD was a joint venture of SABIC and the Taiwan Fertilizer Co. At the end of 1981, construction work on the $350 million complex was more than 50% complete, and 150 Saudi Arabian technicians were in Taiwan training to operate the complex. The Jubail fertilizer facility was to consist of a 1,000-ton-per-day ammonia plant and a 1,600-ton-per-day urea plant utilizing natural gas feedstock. Taiwan Fertilizer Co. agreed to purchase 60% of the plant's output for use in Taiwan and for marketing to other Southeast Asian countries. The remainder of the output was to be exported, either in bulk or bags, to other foreign markets. When SAMAD comes fully onstream in 1984-85, Saudi Arabia was expected to have an exportable surplus of about 300,000 tons per year of nitrogen in fertilizer.

Sulfur.—Saudi Arabia was preparing to produce another important fertilizer component, sulfur, on a large scale in 1981. With the progressive implementation of the Kingdom's huge gas-gathering scheme and the commissioning of three major export refineries, Saudi Arabia was to have the capacity to produce over 1.6 million tons of sulfur per year. Three major sour gas treatment plants were to provide the bulk of the material. The first plant, at the Berri Oilfield, was brought onstream in 1979. Approximately 300,000 tons of sulfur was recovered from associated gas at Berri in 1980, and 1981 output averaged 1,000 tons per day. Sulfur from Berri was utilized in the SAFCO acid plant at Dammam. No contract had been signed at the end of the year for international marketing of the plants' output.

A second sour gas plant was commissioned at Shedgum in March 1980. The plant

provided NGL to a fractionation plant at Ju'Aymah and had a sulfur recovery capacity of 1,200 to 1,400 tons per day. The Saudi Sulfur Co., a joint venture of the Shobokshi Group of Jeddah, Sheikh Saleh Kamel, Sheikh Adnan Samman, and Devco Overseas of the United States, signed a $300 million contract to process and market sulfur recovered from Shedgum. The operation was to recover and pelletize the sulfur and truck the pellets to Jubail, where three full-time berths were leased from the Saudi Port Authority. Sulfur was to be exported from Jubail and marketed to large fertilizer-importing countries, mainly India, Jordan, Tunisia, Italy, Pakistan, Greece, Morocco, and Thailand. Exports from Shedgum were scheduled to begin in 1982 at the rate of 650,000 to 700,000 tons per year, rising to 900,000 tons per year toward the middle of the decade.

The third major sour gas plant was completed in 1981, at Uthmaniyah. Sulfur recovery from this plant was to average 1,100 tons per day. The basic treatment facilities at Uthmaniyah were already complete, but sulfur recovery has been delayed awaiting construction of a pipeline to transport sweetened gas from Uthmaniyah to Yanbu for fractionation and liquefaction.

In addition to sulfur recovery at the sour gas plants, sulfur was to be recovered from three export refineries, all currently under construction. The joint-venture Petromin-Petrola (Greece), 325,000-barrel-per-day refinery at Rabigh was to recover 122 tons of sulfur daily by 1984. The Petromin-Shell, 250,000-barrel-per-day refinery at Jubail was to add another 300 tons per day of sulfur, and the Petromin-Mobil, 250,000-barrel-per-day refinery at Yanbu was to add still another 300 tons per day. The Mobil and Shell refineries were due onstream in 1984 and 1985, respectively.

The production and export of sulfur in Saudi Arabia was expected to rank closely behind oil, gas, and petrochemicals as the Kingdom's main source of foreign currency in the late 1980's and 1990's. Saudi Arabia was preparing to take full advantage of production and export problems in Iran, Iraq, and Poland and planned to capture a significant share of the world markets and to become a world-scale producer by 1985.

Stone (Industrial-Ornamental).—The DGMR, Petromin, and the French BRGM renewed their agreement to locate, study, and develop the mineral resources of Saudi Arabia. The joint geological venture has led to the discovery of several large deposits of limestone, clay, basalt, dolomite, and glass sand. The DGMR opened a model quarry in 1980 to demonstrate quarrying techniques and commissioned a stone cutting and polishing plant in Jeddah.

In 1981, the Saudi Consulting House conducted an economic feasibility study for the exploitation of limestone near the Jubail region. The study examined the feasibility of mining and calcining limestone and using it as a flux in the furnaces of the Jubail iron and steel complex. The limestone deposits had a thickness of up to 20 meters in certain areas, and reserves were estimated to last more than 100 years at a proposed mining rate of 100,000 tons per year. The study also included cost estimates for production and transport of limestone blocks from the quarry to the iron and steel complex at Jubail.

A joint venture was established during the year between the Retser Engineering Agency of China (40%) and Bin Ladin Organization (60%) of Saudi Arabia to develop a marble mining and processing industry in the Kingdom. The companies invested $7.6 million to set up a factory to process marble stones from a quarry 180 kilometers from Jeddah. The plant began operating in July 1981 and was capable of processing 1,000 square meters of marble per day. The company planned to expand the operation in the near future.

MINERAL FUELS

Natural Gas.—Petromin, in cooperation with Arabian-American Oil Co. (Aramco), was in the process of implementing the largest associated gas collecting and processing operation in the history of the oil industry in 1981. The project began in the early 1970's when Aramco, at the request of the Government, designed a gas treatment center to separate and utilize associated gas from the Berri Oilfield. In the midst of the Berri project, the Government decided to expand the project to other main oilfields and to collect and process over 220 billion cubic feet per year of the country's natural gas, which would have otherwise been flared. Construction and management of the scheme was awarded to Aramco, under the supervision of Petromin. During the year, the Saudi Government, which already owned 50% of the natural gas rights and gas processing facilities in the Kingdom, purchased the remaining share from Aramco for an undisclosed sum, retroactive to January 1, 1981. The sale left the Aramco part-

ners with no fixed assets in the petroleum industry in the country, except for the Trans-Arabia Pipeline (TAPline).

The MGS basically involves two stages; the first is a gas collection, desulfurization and liquefaction stage, and the second involves secondary fractionation and the production of liquefied petroleum gas (LPG). The first stage included gas collecting stations and compressing facilities at the various oilfields and pipelines to three gas-gathering stations, located at Berri, Shedgum, and Uthmaniyah. The first plant, at Berri, was designed to process 600 million cubic feet per day of associated gas from the eastern province oilfields. It went online in July 1979. Aramco awarded several units of Fluor Corp. (United States) a major contract covering engineering, procurement assistance, and construction management for a gas-collection system at Safaniya, 160 kilometers from Berri. The project was to collect previously flared gas from the Safaniya Oilfield, separate, compress, and cool the gas and pump it through a 160-kilometer pipeline to the gas-collection center at Berri. Condensate and gas receiving facilities, together with condensate stripping and product surge units, were to be added to the Berri plant. From Berri, NGL were to be transported by pipeline to a secondary treatment center at Ras Tanura where ethane and LPG were to be produced.

The second gas-gathering station, at Shedgum, began operating in March 1980. Shedgum was designed to handle 1,400 million cubic feet per day of gas from oilfields to the south of Berri in the production of sulfur and methane. Output from Shedgum was delivered to the secondary fractionation and treatment center at Ju'Aymah, where ethane and LPG were produced, while the remainder entered the transpeninsular pipeline to Yanbu. The ethane from Ju'Aymah was to serve as feedstock for the petrochemical complexes currently under construction at Jubail. Until the petrochemical projects are ready for operation, the Saudi Government planned to export NGL and to pump surplus ethane and NGL into the Qatif underground reservoir. NGL was to be pumped into the north dome of the field, and ethane, into the south dome.

The third gas-gathering station, Uthmaniyah, was completed in 1981, but had not started production at the end of the year. The plant, located southwest of Shedgum, on the western side of the Ghawar Oilfield, was designed to process 1,400 million cubic feet per day of associated gas from the Ghawar Field. NGL were then to be pipelined across the entire Arabian Peninsula along with NGL from Shedgum to the secondary fractionation and treatment center at Yanbu. Ethane and LPG output from Yanbu was to be used as feedstock for local industries and petrochemical projects at the Yanbu industrial complex. The MGS is illustrated in the following table.

Table 5.—Saudi Arabia: Master gas system

Center	Design feed capacity	Product	Volume	Startup date
Gas-gathering (million cubic feet per day):				
Berri	600	Sulfur-methane-NGL.	360,000 barrels per day NGL.	1979
Shedgum	1,400	do	NA 1,400 tons per day sulfur	1980
Uthmaniyah	1,400	do	445 million cubic feet per day methane. 325,000 barrels per day NGL.	1981
Natural gas liquid plants (thousand barrels per day):				
Ras Tanura	360 NGL	Ethane-LPG	NA	1973
Ju'Aymah	270 NGL	do	NA	1981
Yanbu	270 NGL	do	270 condensate 110 ethane 90 propane 40 butane 30 natural gasoline	1984

NA Not available.

A large portion of the LPG output from the gas project was already sold under contract up to 1985. Among the buyers of Saudi LPG were Tokyo Gas-Shell International Gas (250,000 tons per year), British Petroleum (200,000 tons per year), Mitsubishi, Mitsui, C. Itoh and Co., and Nippon Oil (250,000 tons per year each), and Dow Chemical (250,000 tons per year). Despite the number of contracts already signed, there remained some concern over the short-term surplus being generated by OPEC in LPG. Saudi Arabia, with its program still under construction, was already producing about 8 million tons per year of NGL. Another 4 million tons was to be added with the progressive implementation of MGS. Although, as of January 1, 1981, Petromin owned the entire industry, there was speculation that the Saudi Government may require the Aramco partners to purchase and market a large share of NGL and LPG. The Saudi were also having difficulty maintaining the price of LPG during the year. Prices dropped to $225 per ton for Saudi LPG from a high of $320 in 1980. Significant increases in LPG output from Shedgum and Uthmaniyah were not expected to ease the downward pressure on prices already evident in the market.

Petroleum.—*Production.*—Saudi Arabia produced approximately 3.63 billion barrels of crude oil in 1981, making it the world's second largest producer of crude oil, behind the Soviet Union, and the world's largest exporter of petroleum. Saudi crude oil output represented 21% of the market economy countries total and 68% of the Middle East total.

Aramco personnel continued to operate facilities at most oilfields and installations in Saudi Arabia, owing to the paucity of Saudi technicians. Petromin became fully responsible for administering the country's oil wealth and setting production ceilings at all oilfields. Saudi Arabia also produced oil from the offshore and onshore area of the Kuwait-Saudi Arabia Partitioned Zone, located on the southern border of Kuwait in eastern Saudi Arabia. The onshore-area oilfields in the partitioned zone were operated by Getty Oil Co. (United States) on behalf of Saudi Arabia and the Kuwait Oil Co. on behalf of Kuwait. The Arabian Oil Co., owned 60% by Saudi Arabia and 40% by Kuwait, operated the partitioned zone's offshore oilfields.

The Saudi began the year producing at their highest level ever, 10.5 million barrels per day. During the first few months of the year, the global surplus of crude oil was estimated at over 2 million barrels per day, but the Saudi maintained output at over 10 million barrels per day through June 1981. While low-priced Saudi crude was flooding the market, other OPEC producers were having difficulty maintaining customers. The Saudi share of the total Persian Gulf output was estimated at 68% in mid-1981, up from 58% in 1980.

The Saudi were in the process of expanding their crude oil output capacity from 11 to 12 million barrels per day by 1985, at a cost of about $4 to $5 billion. Although it was doubtful that this capacity would ever be used, it allowed the Saudi to alter their oil production from a minimum revenue requirement level of about 6.2 to 7 million barrels per day to a high of 12 million barrels per day. This degree of "swing capacity" was greater than most other OPEC nations' total production capacity. This put the Saudi in a position to significantly alter the world market situation, as they demonstrated thoughout most of the year. Other OPEC nations, whose production policies were determined by revenue requirements, came under strong pressure to follow the moderate lead of Saudi Arabia.

The Saudi influence within OPEC was evident in October 1981, at the OPEC ministers' conference in Geneva, Switzerland. They were able to unify the OPEC pricing structure, as had been their stated goal since the beginning of the year. The meeting brought the only price rise of the year for Arabian Light (34° API), the benchmark for OPEC, from $32 to $34 per barrel. The Saudi price rise was in return for a lowering of overpriced Gulf and North African crudes. Having achieved their objectives, the Saudi lowered production, which had drifted from July to September to about 9.6 million barrels per day, to 8.5 million barrels per day, where it remained through the end of the year.

Marketing of Saudi crude oil output was the responsibility of the producing companies, primarily Aramco and Petromin. In 1981, the major partners in Aramco exported 3.238 billion barrels of crude oil and 187 million barrels of refined products. Getty Oil Co. and the Arabian Oil Co., combined, exported 85 million barrels of crude oil and 13 million barrels of refined products. Lifting by the Aramco majors were then either resold under third-party contracts or transported into their own petroleum marketing

network. In December 1981, the Saudi Government issued an announcement stating that Petromin was the only organization authorized by the Saudi Government to carry out crude oil sales in accordance with Government policies. Petromin exported about 220 million barrels of crude oil in 1981, all of which was through direct Government deals with countries such as Turkey, Italy, Japan, Spain, Greece, Thailand, and Brazil. The remaining share of crude oil output, which belonged to Petromin, was provided as incentive crude oil for participation in the Saudi petrochemical and refining industry and as supplies to TAPline and domestic refineries.

Exploration.—By the end of 1981, Saudi crude oil reserves were estimated at 167 billion barrels, down only slightly from the 1980 figure. Of this total, proven oil reserves in Aramco concession areas were estimated at 113 billion barrels. Five new oilfields were discovered in 1980 and 1981; Jubah, Duhaynah, and Nita onshore, and Dawl and Salsal offshore. In addition, six new productive reservoirs were located in two existing fields. All of these new discoveries were located in Aramco concession areas.

In 1980, the most recent year for which exploration statistics are available, seismic surveys were conducted over a linear distance of 12,000 kilometers. Development drilling resulted in the completion of 182 wells, 114 of which were oil producing, 51 were for water or gas-liquid injection and water supply, and 18 were for observation purposes. Total footage drilled was 1,279 billion feet. In 1981, Aramco was operating 18 onshore drilling rigs and 15 onshore work-over rigs. In the offshore area, 11 drilling rigs and 1 work-over rig were in operation.

Refining.—The Saudi refining industry was undergoing a massive expansion program in 1981, which will nearly double the Kingdom's already large refining capacity by the middle of the decade. Of the five existing operating refineries in Saudi Arabia, three were owned by the independent companies; Aramco at Ras Tanura, Arabian Oil Co. at Ras-al-Khafji, and Getty Oil Co. at Mina Saud. The remaining two refineries were wholly owned by Petromin. All but 1 of the 11 new refineries were either owned completely by Petromin or were owned jointly by Petromin and various international companies. The two operating refineries owned by Petromin, at Jeddah and Riyadh, were also completing large-scale expansion projects in 1981. With all the new capacity onstream, Saudi production capacity for petroleum products was to rise from the 1981 level of 1 million barrels per day to 2.25 million barrels per day.

In 1981, Saudi Arabia produced an estimated 345 million barrels of refined products, up nearly 4% from the 1980 level. Domestic consumption averaged just under 200 million barrels, leaving the balance for export. As the new refineries come onstream within the next several years, Saudi consumption of refined products was expected to increase to nearly 500,000 barrels per day, still leaving a massive surplus for export. The Saudi, already the world's largest exporters of crude oil and close to being the world's largest exporters of refined products, were to make available to the world market another 300 million barrels per year of refined products by the mid-1980's. Saudi current and planned refining facilities are shown in table 6.

The largest Saudi refinery, Ras Tanura, processed an average of 425,000 barrels per day of crude oil and nearly 300,000 barrels per day of NGL in 1981. Production capacity at Ras Tanura, one of the world's largest refining and product loading terminals, was increased by 10,000 barrels per day through the addition of new straight-run naphtha and pentane merox extraction facilities. The new units, designed to remove organic sulfur compounds from the naphtha and pentane stream, were able to boost production of motor gasoline an average of 10,000 barrels per day in 1981.

The other major Aramco project during the year was the planned construction of the 250,000-barrel-per-day refinery at Ju'Aymah. The refinery was intended to process high-sulfur crude (27° API) from the Manifa Oilfield to supply the domestic market. Chevron Research, a subsidiary of Standard Oil Co. of California, was awarded a contract for process design of the new refinery, and Bechtel was to perform construction engineering services. Construction was to start in 1983 and be completed in 1986. Total cost of the refinery was estimated at $2.5 billion.

Table 6.—Saudi Arabia: Operating and planned oil refineries

Location	Ownership	Crude oil capacity (barrels per day)	Market	Startup date	Contractors	Cost (million dollars)
Operating refineries:						
Ras Tanura	Aramco	500,000	Domestic-export.	1945	NA	NA
Ras-al-Khafji	Arabian Oil Co	30,000	Domestic	1956	NA	NA
Mina Saud	Getty Oil Co	100,000	Domestic-export.	1958	NA	NA
Riyadh	Petromin	120,000	Domestic	1974-1981	Chiyoda-Mitsubishi	NA
Jeddah	do	98,000-240,000	do	1968-1982	NA	NA
Planned refineries:						
Ju'Aymah	Aramco	250,000	do	1986	Bechtel-Chevron Parsons International.	2,500
Jubail	Petromin-Shell	250,000	Export	1985	Chiyoda, Technip	2,000
Yanbu	Petromin-Mobil.	250,000	do	1984	Chiyoda	NA
Do	Yanbu Domestic Refining Co.	179,000	Domestic	1982	do	NA
Rabigh	Petromin-Petrola.	325,000	Export	1984	Lummus-Petrola	2,600
Lube oil refineries:						
Jubail	Petromin-Social-Texaco.	12,000	Domestic-export.	1986	Lummus	1,000
Yanbu	Petromin-Ashland.	5,000	Export	1985	NA	457
Red Sea	Petromin-Apicorp.	4,000	do	NA	NA	NA
Riyadh	Petromin-Mobil (Petrolube).	500	Domestic	1981	NA	NA
Jeddah	do	3,300	do	1981	NA	NA
Jubail	Petromin	2,800	do	NA	Caltex	NA

NA Not available.

The two operating Petromin refineries, at Riyadh and Jeddah, were both being expanded in 1981. Chiyoda Chemical Engineering and Construction Co. and Mitsubishi Corp. (Japan) completed expansion of the Riyadh refinery from 20,000 to 120,000 barrels per day in December 1981. This refinery receives its crude oil feedstock from the Khurais Oilfield, via an 88-kilometer pipeline. The Khurais-Riyadh pipeline, completed in December 1980, had a design capacity of 300,000 barrels per day. Throughput at the end of 1981 averaged 120,000 barrels per day. Also nearing completion was the expansion project at Jeddah, raising capacity from 98,000 to 240,000 barrels per day.

Yanbu Domestic Refining Co., a subsidiary of Petromin, awarded a 5-year contract for management assistance, startup, operation, and maintenance of a new 170,000-barrel-per-day refinery at Yanbu, to FW Management Operations Ltd., a subsidiary of Foster-Wheeler Corp. (United States). The refinery was to commence operating in August 1982, utilizing a portion of the throughput of the transpeninsular crude oil pipeline.

Three major export refineries were under construction in 1981, at Jubail, Yanbu, and Rabigh. At Yanbu, Petromin and Mobil Oil Corp. (United States) were building a 250,000-barrel-per-day export refinery, at a cost of nearly $1.5 billion. Chiyoda was awarded the main contract for engineering and material and equipment procurement plus field supervision services for the 50:50 joint venture. Chiyoda awarded an $80 million subcontract to CBI Industries, a subsidiary of Chicago Bridge and Iron Co., to build storage tanks and other structures at the refinery. The project was to be completed by 1984.

The second major refinery, at Rabigh on the Red Sea coast, was a joint venture of Petromin and Petrola International Saudi Arabia (Greece). Construction began on the project in October 1981. Petrola was also awarded a $2.6 billion construction contract for the refinery, and Lummus Co. Ltd.

(United Kingdom) was to provide engineering services. Product yield from the refinery was to be 140,000 barrels per day of fuel oil, 58,000 barrels per day of naphtha, 46,000 barrels per day of diesel oil, 33,370 barrels per day of jet kerosine, and 5,000 barrels per day of LPG. The first phase of the project was to be completed by 1982.

The long-awaited construction contract for the joint Petromin-Royal Dutch/Shell export refinery at Jubail was awarded in August 1981 to a consortium of five companies composed of Ralph M. Parsons International (United States), Technip of France, and Chiyoda Chemical Engineering and Construction Co. (Japan), together with the latter two companies' Saudi subsidiaries, Technip Saudi Arabia and Chiyoda Petrostar. The $1 billion contract, to be shared equally by the three companies, involved engineering, procurement, and construction of the refinery, including a hydrocracker and benzene manufacturing facility. Badger Co. and Fluor Corp. (United States) were also providing basic engineering and process design services for the project, the total cost of which was estimated at about $2 billion. The refinery was to produce 94,000 barrels per day of naphtha, 92,000 barrels per day of gas oil, 67,000 barrels per day of high-sulfur fuel oil, and 5,000 barrels per day of benzene. Output was to be marketed jointly by Petromin and Shell. As a bonus for participating in the project, Shell was to receive "incentive" crude oil supplies beginning in 1981 at a rate of 12,000 barrels per day and rising to nearly 60,000 barrels per day by 1985. Financing for the project was to come from Petromin, 15%; Shell, 15%; commercial borrowing, 10%; and the Saudi Public Investment Fund, 60%. Commercial production was scheduled to begin in 1985.

Two major agreements involving lube oil refineries in Saudi Arabia were finalized in 1981. Arabian Chevron Overseas Ltd., a subsidiary of Standard Oil Co. of California, and Texaco Inc. joined with Petromin to build the world's largest single-train, grassroots lubrication oil refinery at Jubail. The facility, owned 50% by Petromin and 25% each by the foreign partners, was to produce 12,000 barrels per day of premium lubricating base stocks and 10,000 barrels per day of asphalt. The company was to export six different types of base oil products. Bids for design, procurement, and construction contracts were to be requested early in 1982, and the project was scheduled for completion in 1986.

The second agreement involved construction of a 5,000-barrel-per-day lubrication oil complex at Yanbu, as a 50:50 joint venture of Petromin and Ashland Oil, Inc. The plant was to utilize feedstock derived from the nearby 170,000-barrel-per-day Petromin-Yanbu refinery. Most of the plant's output was to be exported. Having signed the agreement for the refinery, Ashland became entitled to 32,000 barrels per day of incentive crude oil supplies over a 15-year period, based on its equity investment in the project.

Two other lube oil refineries in Riyadh and Jeddah were providing lubricating oils for domestic consumption in 1981. Both plants were owned by Petrolube, a joint venture of Petromin, 70%, and Mobil, 30%. In Riyadh, a 175,000-barrel-per-year lube oil blending plant was commissioned in October 1981. The plant was built by Chiyoda Petrostar, under a contract awarded in 1979. Capacity of the plant was to rise to 500,000 barrels per year in 1984. Capacity at Petrolube's refinery in Jeddah was raised from 850,000 barrels per year to 1.2 million barrels per year. The refinery produced various types of lubricants for gasoline, diesel and light turbine engines.

Petrochemicals.—The Saudi petrochemical industry was the core of one of the largest and most rapid industrialization schemes in the history of the Middle East. The Saudi were in the process of investing over $20 billion into projects that, they say, will capture 5% of the world's petrochemical market by the latter half of the decade. With other projects still far off in the planning stage, that share could increase to 15% by the year 2000. To accomplish this ambitious development program, the Saudi have attracted some of the world's largest petroleum and chemical companies to two major industrial cities, Jubail and Yanbu, through substantial incentive offers to participate with equity shares and technical know-how in the projects.

SABIC, a Government-owned industrial enterprise, was the Saudi Government's arm in implementing the plan. For each project, SABIC approached a foreign partner or consortium meeting certain criteria to form a 50:50 joint-venture company to undertake the project. In each case, financing was provided at low interest rates by the Saudi Public Investment Fund of the Ministry of Finance. The Public Investment Fund provided 60% of the cost of the project, 10% was secured from commercial bank loans,

and the remaining 30% share was provided equally by SABIC and the foreign partner. In addition to these favorable financing arrangements, the foreign partners were entitled to lift "incentive" supplies of crude oil, based on the formula of 500 barrels per day of entitlement crude oil supply per $1 million invested by the foreign partner. In the case of the SABIC-Shell Oil Co. (United States) venture, Shell was entitled to 1.3 billion barrels of oil over a 19-year period for its participation in the complex. For their part, the foreign companies were required to provide technical expertise in the chemical industry, a good record of operation, willingness to train Saudi personnel, and the capability to market most of the plants' output. Marketing was a key for SABIC to make the ventures economically viable. The foreign partner was to market, through its own channels, not less than 75% of the plant's output.

Feedstock for the plants was to be provided by the huge MGS, utilizing vast quantities of associated gas that had previously been flared. Ethane feedstock for the Jubail plants was to come from the secondary gas-fractionation centers at Ras Tanura and Ju'Aymah. Natural gas for the complex at Yanbu was to be piped from the eastern gas-gathering center at Shedgum through the recently completed transpeninsular NGL pipeline. Ethane was to then be produced at the Yanbu gas treatment facility and from there supplied to the petrochemical plant. This low-cost feedstock was a critical factor in making the plants profitable.

According to recent estimates, the Saudi plants were to be capable of producing ethylene at about 14 cents per pound and still turn a profit. In contrast, ethylene in the United States was selling, unprofitably, at about 20 to 25 cents per pound, and the United States was considered one of the world's most efficient producers. Saudi entrance into the market was coming at a time when there was already over capacity in world petrochemicals, as was demonstrated by plant closures in the United States and Europe. In some cases, as with Exxon, the foreign partner has agreed to close their obsolete plants elsewhere and use Saudi production to fill marketing channels. With so much world capacity existing on the threshold of profitability, Saudi expansion held the potential to take a significant share of the world market by forcing plant closings elsewhere and perhaps to shift the geographical center of chemical production out of the West and into the Middle East. The Saudi petrochemical industry is shown in table 7.

These major plants, all conducted on a 50:50 joint-venture basis, were essentially export-oriented operations, designed to produce primary petrochemicals for world markets. They were also to form the core of second-phase petrochemical ventures intended to serve primarily local and regional requirements. SABIC was already in the process of planning this next phase in 1981. The basic objectives of the second phase were to develop local, smaller scale industry to either provide service facilities to the large plants or to further process their output. Foreign participation in the next phase was to be limited to 20%, as opposed to 50% for the large ventures, in an attempt to establish small-scale Saudi industry.

The major developments in the petrochemical industry in 1981 mostly involved contract awards and agreement finalization. Late in 1981, construction began on the world's largest petrochemical plant in Jubail, the joint venture of SABIC and Shell Oil Co. Construction also began on the SABIC-Exxon Corp. complex at Jubail. A Japanese consortium, composed of Ishikawajima-Harima Heavy Industries and Nippon Kokan won a $193 million contract from Fluor Corp. to manufacture and assemble modules for chemical production, to be assembled at the Jubail SABIC-Shell complex. The modules were to form the basic ethylene, styrene, and crude ethanol production units at the plant. At the Eastern Petrochemical Co. (Sharq) at Jubail, Chiyoda Chemical Engineering and Construction Co. (Japan) was awarded a several-hundred-million-dollar contract to provide engineering and construction services for the $1.5 billion joint venture of SABIC and the Saudi Petrochemicals Development Corp. (SPDC), a 59-company consortium led by Mitsubishi Corp. (Japan). The Sharq project was being set up in association with another plant, Petrokemya, owned by SABIC and Dow Chemical Co. (United States). The final agreements for construction of both of these projects were signed in 1981. In December 1980, SABIC, Dow, and SPDC signed an agreement under which the two foreign companies would jointly own and share the output from the two plants. Sharq was to produce low-density polyethylene and ethylene glycol utilizing ethylene feedstock provided by Petrokemya. In return, Sharq was to supply Petrokemya with ethylene glycols.

Table 7.—Saudi Arabia: Petrochemical industry

Project	Location	Ownership	Feedstock	Products	Capacity (metric tons per year)	Startup	Cost (million)
Saudi Petrochemical Co. (SADAF)	Jubail	SABIC-Shell	Ethane	Ethylene	656,000	1985	$3,000
				Ethanol	281,000		
				Styrene	295,000		
				Ethylene dichloride.	454,000		
				Caustic soda	255,000		
				Low-density polyethylene.	260,000		
				Ethylene glycols	220,000		
Jubail Petrochemical Co. (Kemya)	do	SABIC-Exxon	Ethylene	Low-density polyethylene.	260,000	1985	1,080
Arabian Petrochemical Co. (Petrokemya)	do	SABIC-Dow	Ethane	Ethylene	500,000	1985	1,500
				Ethylene glycols	300,000		
				Polyethylene	310,000		
Eastern Petrochemical Co. (Sharq)	do	SABIC-SPDC	do	Ethylene glycols	330,000	1985	1,500
				Linear low-density polyethylene.	145,000		
Saudi-Yanbu Petrochemical Co. (Yanpet)	Yanbu	SABIC-Mobil	do	Ethylene	450,000	1985	2,400
				Ethylene glycols	200,000		
				Low-density polyethylene.	205,000		
				High-density polyethylene.	91,000		
National Methanol Co	Jubail	SABIC-Celanese-Texas-Eastern.	Methane	Chemical-grade methanol.	650,000	1985	400
Saudi Methanol Co	do	SABIC-Japanese consortium.	do	do	600,000	1983	200
Jubail Fertilizer Co	do	SABIC-Taiwan	do	Ammonia	365,000	1983	350
				Urea	580,000		

Pipelines.—The two parallel legs of the transpeninsular East-West pipeline were completed ahead of schedule in 1981. The crude oil line, built at a cost of $1.6 billion over 4 1/2 years, was currently capable of transporting 1.85 million barrels per day from the eastern oilfields at Abqaiq and Ghawar to Yanbu on the Red Sea coast. Mobil Overseas Pipeline Co., a subsidiary of Mobil Oil Corp. (United States), provided design, engineering and management services and was also assisting in operating the pipeline. The crude line, 1,200 kilometers long and 48 inches in diameter, had 11 pumping stations across the Arabian Peninsula. Oil was delivered to a specially designed oil port at Yanbu, which included eleven 1-million barrel storage tanks and three operational berths, capable of handling tankers between 80,000 and 500,000 tons, with simultaneous loading facilities. The first shipment of crude to be exported from Yanbu was loaded July 1, 1981. Arabian light crude oil was priced at $34.60 per barrel from Yanbu, which included 60 cents per barrel for transportation cost basically equivalent to the cost of tanker shipping the oil around the Arabian Peninsula. The Saudi Government was delaying the plan to expand the crude oil line to handle 3.7 million barrels per day. The terminal at Yanbu was the first Saudi loading facility on the Red Sea and the only outlet for crude oil that did not have to pass through the volatile Persian Gulf and the Strait of Hormuz. Most Saudi oil was still exported from the huge loading facility at Ras Tanura in the Persian Gulf. Besides providing an alternative outlet for oil exports, the pipeline was to provide crude oil supplies to the planned refineries at Yanbu and Rabigh.

Parallel to the crude oil line was the 1,700-kilometer East-West NGL pipeline, running from the Shedgum gas-gathering center in eastern Saudi Arabia to the secondary gas-fractionation center at Yanbu. The pipeline, built by Aramco at a cost of nearly $2 billion, was capable of delivering 270,000 barrels of NGL per day to Yanbu. The gas was to be used to fuel powerplants at the Yanbu industrial complex, as fuel for the pump stations positioned along the East-West pipeline, and at the NGL plant at Yanbu to provide feedstock for the petrochemical industry. The pipeline testing procedure was completed in April 1981, but the line was awaiting completion of the Yanbu NGL center before starting full-scale deliveries.

Also completed during the year was the 140-kilometer pipeline linking the Riyadh refinery to the Khurais Oilfield. The $51 million pipeline, built by Niigata Engineering Co. (Japan), was capable of delivering 300,000 barrels per day of crude oil to Riyadh. The Riyadh refinery was expanded during the year to process 120,000 barrels per day of crude oil; output of the Khurais Field was also being expanded from 50,000 to 165,000 barrels per day to supply the refinery.

A detailed engineering study for the construction of a system of refined product pipelines was completed at the end of 1981. Petromin had commissioned a group of international consulting firms to study the feasibility of building a 2,600-kilometer pipeline network to deliver refined products to a number of small towns in Saudi Arabia. According to Petromin, the study was completed and implementation of the project was awaiting allocation of appropriate funds. The system was to carry products to Riyadh, al-Qasim, al-Kharj, Najran, Diba, Tobuk, Ras Tanura, al-Hoffuf, Jubail, Jeddah, Merra, Taif, and Khamis Mushayt.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Saudi riyals (SRls) to U.S. dollars at the rate of SRls3.38=US$1.00.

The Mineral Industry of Sierra Leone

By Ben A. Kornhauser[1]

Sierra Leone suffered economically in 1981 from various internal and external problems, many of which required considerable assistance from outside sources for their resolution. As with most developing countries, the lack of, or limited, foreign exchange prevented the purchase of supplies and goods necessary to maintain existing enterprises and precluded embarking on new ventures to improve the industrial, commercial, and transport infrastructure required to support greater economic growth.[2] Huge Government deficits amounting to about one-quarter of all expenditures planned for 1981-82 resulted from factors such as the high cost of imports (particularly oil), balance of payment deficits resulting from worldwide inflation and recession, declining export earnings, and subsidization of health care and electrical power to varying extents. Inflation during fiscal year 1981 was estimated to be 15%. As a result of these deficits, Sierra Leone applied for assistance from the International Monetary Fund (IMF), which approved a 3-year program valued at Special Drawing Rights (SDR) of $185 million, against which drawings started in April 1981. This amount was to be raised eventually to $211.5 million, equal to 400% of Sierra Leone's SDR quota of $52.9 million, once IMF confirmed additional resource commitments.[3]

The main points of the IMF stabilization program included restricted credit expansion, overall budget deficit containment, tax system reform, intensified efforts to maximize the surrender of foreign exchange receipts and to liberalize import licensing, and the continuation and expansion of production and investment programs in agriculture, mining, energy, and transportation. Among the principal investment projects in the IMF program was intensified rice production. Continuation of the World Bank's International Development Association supported agricultural projects and final negotiations for commencing the kimberlite diamond mining and the Bumbuna hydroelectric projects. The success of the 3-year program depended on maintaining exports in the face of declining output and falling prices for diamonds (the main export), as well as containing imports—that is, maintaining a slightly positive balance of payments.

Further exploitation of natural resources was the expected major benefit of the hoped-for simultaneous development of two major hydroelectric projects. These projects were the Bumbuna hydroelectric project and the Mano River Union Basin development program. The Bumbuna project was to supply power solely for Sierra Leone use and was located at Bumbuna Falls in the north-central section of the country on the Seli River. Phase one of the project was estimated to cost $376 million and was hoped to start by yearend 1981. The Mano River project, located on the Mano River bordering Sierra Leone and Liberia, was to supply power to both countries and was the largest venture attempted by the Mano River Union (MRU). Estimated cost was $277 million. The MRU was composed of Liberia, Sierra Leone, and Guinea, which joined in 1981. Funding for both projects depended primarily on receiving money from foreign countries. The electric power from these projects was to reduce oil imports and improve the profitability of present major mining operations. Bumbuna power also was to produce alumina from a recently discovered bauxite deposit in the

Port Loko area and to exploit the rich Tonkolili iron deposits, which required pelletizing to agglomerate the fines produced in separating the iron from other minerals in the deposit.[4]

The development of the road network, which attracted international aid, including a recent $10 million World Bank loan, was expected to benefit rural areas.

PRODUCTION AND TRADE

In fiscal year 1981, ending June 30, 1981, the acute shortage of foreign exchange was aggravated by the decrease in overseas earnings from diamonds and coffee, which together accounted for more than one-half of Sierra Leone's foreign exchange. The drop in prices of these products also accounted for 45% of the shortfall in fiscal export income. The value of cocoa, another major agricultural export, also declined with respect to its fiscal 1980 earnings, contributing to the shortage of foreign exchange. Although rutile production rose an estimated 50%, its increased value equaled less than 20% of the value of the diamond exports.[5] Exports of bauxite in fiscal 1981 dropped with respect to fiscal 1980, although actual production was about the same. The unreported bauxite was stockpiled until the market improves.[6] Most of Sierra Leone's bauxite production was shipped to the Federal Republic of Germany with only minor quantities to the United States.

The United States was a major receiver of Sierra Leone's diamonds, rutile, coffee, and cocoa, purchasing about 35% of that country's total exports. During 1981, the growth of U.S. exports was deterred, primarily by the strength of the U.S. dollar and the hesitancy of U.S. suppliers to ship to Sierra Leone without confirmed letters of credit.

Table 1.—Sierra Leone: Production of mineral commodities[1]

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
Aluminum: Bauxite, gross weight thousand metric tons	745	716	672	766	610
Diamond:					
Gem thousand carats	423	353	419	317	208
Industrial do	538	426	436	275	97
Total do	961	779	855	592	305
Gold troy ounces	NA	NA	NA	407	3,435
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	331	394	421	375	343
Jet fuel do	101	102	277	306	131
Kerosine do	199	213	105	99	213
Distillate fuel oil do	464	501	586	533	548
Residual fuel oil do	824	412	434	420	383
Liquefied petroleum gas do	10	10	7	7	9
Other do	--	--	2	2	NA
Refinery fuel and losses do	6	43	55	173	88
Total do	1,935	1,675	1,887	1,915	1,715
Salt thousand metric tons	180	180	200	200	200
Titanium: Rutile ore and concentrate, gross weight metric tons	--	--	10,000	47,497	50,795

[e]Estimated. [p]Preliminary. NA Not available.
[1]Table includes data available through Aug. 30, 1982.
[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) is produced, but output is not reported and available general information is inadequate to make reliable estimates of output levels. Sierra Leone annually refines 4,000 to 10,000 metric tons of salt from imported crude marine salt, but this is not included in the body of the table because it would represent double counting of materials credited to the country where the salt was originally collected. This output would be in addition to that reported in this table.

COMMODITY REVIEW

METALS

Bauxite.—In 1981, production of washed bauxite ore was estimated at the 1980 rate. Annual production in 1982 and thereafter was projected at 1 million tons. This increase was expected upon completion of the expansion of the Sierra Leone Ore & Metal Co. (SIEROMCO), wholly owned by Swiss Aluminium Ltd. The expanded production was to result from the completion of a new washing plant that was to reduce costs, was to have a capacity of 1 million tons per year, and was located 13 miles south of the Mokanji Hills near Moyamba in southwestern Sierra Leone. A drying plant at the port

of Nitti was expected to improve the bauxite's marketability. The planned expanded production resulted from a renegotiated agreement between SIEROMCO and the Government of Sierra Leone that increased the tax and royalty payments to the Government for the period 1978-88, but excluded Government participation in the venture.

Gold.—In August 1981, the Government made the Bank of Sierra Leone the sole purchaser and exporter of alluvial gold. By imposing few regulations on deep mining, it was hoped that investments would be encouraged in such operations that required greater capital outlays for development. The law was enacted to centralize gold export and to enable the Government to obtain the greatest amount of foreign exchange possible from alluvial mining. For the law to be effective, the gold prospector had to be offered at least the internationally established gold price and paid part of the price in a foreign exchange.[7 8]

Eurocan Ventures Ltd. (EVL) of Canada entered into a joint gold-diamond venture with Diamond Distributors Exploration Inc. (DDX) of the United States. EVL had a 60% interest in a 25.9-square-kilometer diamond-gold concession, for an initial investment of $2 million. The cost of development was to be prorated, with DDX maintaining the diamond rights. EVL completed eight drill holes and a large open pit in the Nimini Hills area in eastern Sierra Leone. The holes were drilled to varying depths, with a planned depth of 305 meters for a ninth hole then underway. Two holes had been assayed. One hole, drilled to 87 meters, had average values (including gold-bearing areas) that were of a minable open pit grade. Another hole, drilled to a depth of 57 meters, showed promising assays at three different intervals. Mineralization of the core samples from the ninth hole also showed open pit potential. A sample taken from a surface pit about 122 meters south along the strike of the two holes had a gold content of 0.3 troy ounce per ton across a 20-meter exposed span.[9]

Iron Ore.—The Marampa iron mines, which had been closed since 1975, were reopened in 1980 by the Marampa Iron Ore Mining Co. Ltd., wholly owned by the Government of Sierra Leone, which took it over from the defunct Sierra Leone Development Co. The Marampa property was operated by Austromineral KG, a subsidiary of the Austrian state-owned firm of Austro Minerals Voest Alpine AG. Funding for the operation was supplied by an Austrian Government-sponsored loan of $16 million and Government of Sierra Leone equity capital of $6 million. One-half million tons of iron ore concentrate was expected to be shipped in 1982. The mines, when operating at capacity, were expected to export 1 million tons of concentrate annually.

The Marampa Iron Ore Mining Co. Ltd. Agreements Ratification Act, 1981, delegated an exclusive managing and marketing contract to the Austromineral KG subsidiary. Under the act, the contract was to be in effect for 14 years, until December 1995. The company also was given a mining concession covering 259 square kilometers. The company's goal was the annual production of 1 million tons of salable iron ore concentrate for export.[10]

Titanium.—Rutile production in 1981 was reported at 50,795 tons, placing Sierra Leone behind Australia, the world's largest producer. The processing plant's yearly production capacity was 75,000 tons of rutile concentrate. Rutile was mined by Sierra Rutile Ltd. (SRL), which was owned by the Bethlehem Steel Corp. (85%) and Nord Resources Corp. of Ohio (15%) and began production in mid-1979. The leased area was near Gbangbima in the Moyamba and Benthe districts and was worked by Sherbo Minerals Ltd. from 1966 to 1971. The rutile was recovered by dredging alluvial sands at Mogbwembo, about 270 kilometers by road southeast of Freetown. Rutile grades averaged 2.5% TiO_2 in the topsoil and up to 3.5% TiO_2 in the basal sands and gravel, with the stratified column averaging 2.2% TiO_2 as rutile. Ilmenite, an iron titanate ($FeTiO_3$), also was produced as a byproduct of the beneficiation of the rutile. The unreported ilmenite was set aside until SRL considers it salable as is or after reprocessing.[11]

Natural rutile was used to make titanium sponge metal and was preferred for welding rod coatings. The principal use of rutile was to make titania pigment by the chloride process, which had many advantages over the sulfate process, which used ilmenite, leucoxene (another titanium mineral), and titaniferous slags. About 95% of the titanium produced was used in pigment manufacturing with the balance as titanium metal sponge, welding rod coatings, carbides for cutting tools, and in ceramics and glass. Considerable TiO_2 pigment was used in paper coating or fillers and in compounding

materials such as plastics and rubbers. The majority of the titanium metal alloys was used in aerospace systems because of their high strength-weight ratio, their strength at more elevated operating temperatures, and their excellent corrosion resistance.

NONMETALS

Cement.—A cement factory, scheduled to open in 1982, was expected to have sufficient capacity to supply the country's annual requirements of 70,000 tons and exports of 50,000 tons.[12]

Clays.—The Sierra Brick and Ceramics Factory, situated in Wellington, was still operating and reclaiming waste heat from kilns for use in dryers. An objective of the company was to produce high-quality brick at the lowest price as a means of earning foreign exchange.[13]

Diamond.—Production of alluvial diamonds by the National Diamond Mining Co. (DIMINCO) was estimated to be at 1980 levels. However, the severe drop in diamond prices greatly decreased Sierra Leone's principal source of foreign exchange. DIMINCO was owned by the Sierra Leone Government (51%) and the Sierra Leone Selection Trust (SLST), now a subsidiary of British Petroleum Ltd. (49%). Negotiations were still underway between the Government and SLST regarding the underground mining of the diamond-bearing kimberlite deposits in Kono and Tongo. An agreement was hoped for by early 1982, with exploitation starting that year. By 1984, the decline in diamond production resulting from the depletion of alluvial diamonds was expected to be reversed, but production was not expected to reach former levels. Recovery of diamonds in the kimberlite project would be more expensive. Funding of about $100 million was sought from Kuwait, the European Investment Bank, and others. The Government believed that mining in the reserve areas of the kimberlite pipes and dykes would diminish the illicit mining and diamond smuggling now prevalent in the Yengema and Tongo nonreserve areas. Resumption of the kimberlite mining would make jobs available in the Kono district.

MINERAL FUELS

Petroleum.—The *T. W. Nelson*, Mobil Oil Corp.'s sophisticated geophysical ship, returned at yearend 1981 to insure pinpointing the location for drilling offshore Turner's Peninsula in the Bonthe District for a consortium of U.S. oil companies. The consortium was searching for oil in a 73,000-square-kilometer concession belonging to Aracca Petroleum, Oxoco Petroleum, and Sundance Petroleum, with Mobil as the operating partner. The group turned over 85% of its interest to Mobil, which was bearing the entire cost of the exploration work. The test well drilling had been delayed until 1982.

The Government of Sierra Leone had been negotiating a 100% takeover of the Sierra Leone Petroleum Refining Co. (SLPRC), which was owned by the Government (50%), with remaining shares equally divided between British Petroleum, Shell Oil Co., Mobil, and Texaco Inc. If the Government became the sole owner of SLPRC, the companies were freed of an obligation to supply crude oil and platformate to the refinery in proportion to their share of the Sierra Leone market. The Government of Sierra Leone then probably had to negotiate government-to-government agreements for continuing the supply of the refinery's imported oil needs.

In December 1981, the Government acquired a 60% share in British Petroleum Co. (Sierra Leone) Ltd. which, in addition to its traditional oil business, was involved in other industrial activities.[14]

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[1]Metallurgist, Division of Foreign Data.
[2]Where necessary, values have been converted from leones (Le) to U.S. dollars at the rate of Le1 = US$0.83.
[3]Where necessary, values have been converted from Special Drawing Rights (SDR) to U.S. dollars at the rate of SDR1 = US$1.14.
[4]U.S. Embassy, Freetown, Sierra Leone. State Department Airgram Freetown-19, Sept. 24, 1981.
[5]Work cited in footnote 4.
[6]Work cited in footnote 4.
[7]Freetown Daily Mail. Aug. 26, 1981, pp. 1, 16.
[8]Work cited in footnote 4.
[9]Commonwealth Geological Liaison Office Newsletter. London, May 1981.
[10]Freetown Daily Mail. Dec. 9. 1981, p. 1.
[11]U.S. Embassy, Freetown, Sierra Leone. State Department Airgram Freetown A-6, May 4, 1982.
[12]Work cited in footnote 11.
[13]Freetown Daily Mail. June 10, 1981, pp. 1, 8.
[14]Freetown Daily Mail. Dec. 19, 1981, p. 1.

The Mineral Industry of the Republic of South Africa

By Miller W. Ellis[1]

The mineral industry continued to dominate the economy of the Republic of South Africa and mineral products accounted for more than one-half the value of the country's exports, and for 16% of its gross domestic product (GDP). In terms of U.S. dollars, the total value of mineral sales was $15.8 billion out of a GDP of $81.8 billion.[2] During 1981, the GDP grew 4.7% in real terms, about one-half the rate of increase in 1980. The gradual decline in the value of the South African rand throughout 1981 tended to neutralize the worldwide decline in the price of certain mineral commodities in terms of local currency, and thus maintained a moderately prosperous status for the country's mineral industry.

The Government-owned Industrial Development Corp. of South Africa Ltd. indirectly controlled such companies as the Phosphate Development Corp. Ltd. (Foskor), which mined and processed phosphate rock at the Palabora carbonatite deposit in eastern Transvaal Province, and the state-run Alluvial Diamond Diggings of Alexander Bay at the mouth of the Orange River. The state-controlled South African Iron and Steel Industrial Corp. Ltd. (Iscor) continued to operate its colliery, iron mines, tin mine, zinc mine, and dolomite quarries, in addition to three major production complexes. The state's exclusive control and ownership of the South African Coal, Oil and Gas Corp. Ltd. (Sasol), the country's oil-from-coal operation, ended in 1979 when the sale of shares to the public commenced, but the Government continued to play a major role during 1981 when the Sasol II plant was operational and the Sasol III unit was nearing completion.

Consolidated Gold Fields Ltd. of the United Kingdom, affiliated with Gold Fields of South Africa Ltd. (GFSA), continued to increase its shareholding in Newmont Mining Corp. of the United States which has worldwide mining interests including the Tsumeb Corp. Ltd. mines in Namibia (South-West Africa) and the O'okiep Copper Co. Ltd. and Palabora Mining Co. Ltd. mines in the Republic of South Africa.

PRODUCTION AND TRADE

The Republic of South Africa continued to lead the world in production of chromite, gem diamonds, gold, platinum, and vanadium, and was one of the three leading producers of antimony, asbestos, industrial diamond, manganese, uranium, fluorspar, and vermiculite.

Both the volume and value of gold production declined as the world gold price continued to drop. The value of the country's gold sales at $9.8 billion indicated an average price of $465 per troy ounce, nearly 25% below the record price of 1980. The value of marketed diamonds decreased, but diamond production increased nearly 12%. Coal production and exports increased substantially in both volume and value with total sales of 130 million tons worth $2.43 billion, including exports of nearly 30 million tons worth $1.12 billion. Iron ore production increased 7.6% in 1981, and the value of iron ore exported increased 14% in terms of local currency. Production and sales of both manganese ore and chromite diminished as did those of asbestos, fluorspar, and phosphate rock. Mineral products

from the Republic of South Africa were major sources of raw materials for the manufacturing industries of the United States, Western Europe, Japan, and, in some cases, Eastern Europe. Despite the generally increasing prices for many imported industrial commodities and the additional markup caused by diminished value of the local currency, the country's balance of trade had only a $1.88 billion trade deficit in 1981 in contrast to the $6.5 billion credit balance of 1980. Similarly, the increased value of exported commodities in terms of local currency stimulated trade to a substantial degree.

Despite the additional production of synthetic crude oil (syncrude) from expanded Sasol facilities, crude oil continued to be a major import commodity as did alumina, imported from Australia to supply the country's growing aluminum industry. Exports of mineral commodities from, and their imports to, the Republic of South Africa are listed in tables 2-3. Export values compared with those of domestic sales during 1979-81 are shown in table 4.

Table 1.—Republic of South Africa: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum metal	78,000	81,100	86,300	86,600	87,000
Antimony concentrate:					
Gross weight	20,053	16,395	20,086	22,372	16,599
Metal content	11,535	9,094	r11,657	13,067	9,810
Beryl concentrate (11% to 12% BeO)	3	4	1	(2)	122
Chromite, gross weight:					
More than 48% Cr_2O_3 thousand tons	53	33	33	20	36
44% to 48% Cr_2O_3 do.	1,607	1,524	1,633	1,989	1,561
Less than 44% Cr_2O_3 do.	1,399	1,588	1,631	1,405	1,273
Total do.	3,059	3,145	3,297	3,414	2,870
Columbium-tantalum concentrate kilograms	--	143	765	1,912	3,615
Copper:					
Mine output, metal content	208,287	205,745	190,591	200,683	208,700
Metal:					
Smelter	188,400	191,400	178,000	180,819	199,424
Refined	145,900	149,100	150,757	140,887	144,100
Gold, primary thousand troy ounces	22,502	22,649	22,617	21,669	21,121
Iron and steel:					
Ore and concentrate:					
Gross weight thousand tons	26,481	24,206	31,565	26,312	28,319
Iron content do.	16,948	15,492	20,202	16,840	18,124
Metal:					
Pig iron do.	6,114	5,910	7,031	7,515	NA
Ferroalloys, blast furnace and electric furnace:					
Ferrochromium[e] do.	350	660	780	800	NA
Ferromanganese[e] do.	310	330	560	520	
Ferrosilicon[e] do.	75	75	149	162	
Ferrosilicomanganese[e] do.	22	22	45	70	
Ferrosilicochrome[e] do.	23	23	28	38	
Ferrovanadium[e] do.	(2)	(2)	(2)	(2)	
Total do.	780	1,110	r1,562	1,590	NA
Crude steel:					
Ingots do.	7,175	7,735	8,667	8,863	NA
Castings do.	201	167	201	205	
Total do.	7,376	7,902	8,868	9,068	NA
Semimanufactures:					
For immediate sale do.	538	152	e550	e550	NA
Hot-rolled products do.	4,844	5,634	e6,500	e6,600	
Iron castings do.	1,351	1,382	433	480	
Steel castings and forgings do.	133	134	148	e140	
Total do.	6,866	7,302	7,631	7,770	NA

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS —Continued					
Lead:					
Mine output, metal content	--	--	--	86,059	98,901
Smelter	24,000	23,600	23,300	35,400	NA
Manganese ore and concentrate, gross weight:					
Metallurgical:					
Over 48% Mn thousand tons	263	262	296	290	368
45% to 48% Mn do	1,198	1,131	998	942	1,226
40% to 45% Mn do	577	430	763	997	676
30% to 40% Mn do	2,839	2,357	2,897	3,099	2,429
Total do	4,877	4,180	4,954	5,328	4,699
Chemical:					
Over 65% MnO_2 do	[2]	--	[2]	[2]	[2]
35% to 65% MnO_2 do	171	118	153	166	45
Less than 35% MnO_2 do	--	19	76	201	296
Total do	171	137	229	367	341
Grand total do	5,048	4,317	5,183	5,695	5,040
Manganiferous iron ore (15% to 30% Mn, 20% to 35% Fe)	242,155	95,699	--	--	NA
Nickel:					
Mine output, metal content	22,760	28,700	30,290	25,700	26,400
Metal, electrolytic	21,955	22,500	8,040	18,100	17,960
Platinum-group metals, metal content of concentrate, matte, and refinery products[e 3] thousand troy ounces	2,870	2,860	3,017	3,100	3,110
Silver:					
Mine output, metal content[e] do	3,135	3,110	3,240	5,500	NA
Primary do	3,130	3,104	3,236	3,125	7,568
Tin:					
Concentrate:					
Gross weight	6,139	6,120	5,706	[e]6,160	6,950
Metal content	2,864	2,886	2,697	2,913	2,811
Metal, primary	582	[4]637	819	1,100	[5]2,056
Titanium:					
Rutile concentrate	4,500	18,100	41,740	[e]48,000	49,900
Slag	--	90,700	286,700	[e]344,000	370,000
Uranium oxide (U_3O_8)	3,962	4,672	5,637	7,295	7,234
Vanadium:					
Vanadiferous slag, gross weight	53,969	54,381	55,000	[e]60,000	62,000
V content:					
Of vanadiferous slag[e]	7,556	7,600	8,400	8,620	8,980
Of V_2O_5 and vanadate products[e]	3,682	3,650	3,900	4,080	3,820
Total	11,238	[e]11,250	[e]12,300	12,700	12,800
Zinc:					
Concentrate:					
Gross weight	139,262	130,318	107,646	158,137	174,377
Metal content	69,631	65,159	53,823	79,068	87,172
Metal, smelter	76,000	79,100	75,400	81,400	87,200
Zirconium concentrate (baddeleyite)	16,825	[e]36,000	[e]82,000	[e]80,000	80,000
NONMETALS					
Asbestos:					
Amosite	66,983	40,526	39,058	51,646	56,834
Anthophyllite	550	--	--	--	--
Chrysotile	111,575	79,511	91,828	106,940	76,772
Crocidolite	201,056	137,288	118,301	118,148	102,337
Total	380,164	257,325	249,187	276,734	235,943
Barite	2,500	2,355	2,494	2,635	2,247
Cement, hydraulic thousand tons	6,573	6,824	6,900	7,200	7,000
Clays:					
Attapulgite	--	2,773	[e]3,000	--	5,221
Bentonite	37,221	34,519	46,394	49,815	44,372
Fire clay	167,835	223,413	310,670	154,967	282,645
Flint clay	193,229	167,285	180,070	190,488	171,500
Fuller's earth	--	258	919	720	434
Kaolin	88,619	122,024	148,740	107,563	150,003
Montmorillonite	--	1,299	1,267	1,115	354
Corundum, natural	138	18	74	141	91

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Diamond:					
Gem[e] thousand carats	3,099	3,078	3,539	3,403	3,429
Industrial[e] do	4,544	4,649	4,845	5,117	6,097
Total do	7,643	7,727	8,384	8,520	9,526
Diatomite	666	930	1,059	584	615
Feldspar	51,230	52,545	47,416	52,247	56,006
Fluorspar:					
Acid-grade	234,649	297,591	387,305	[e]448,783	451,614
Ceramic-grade	65,660	14,907	8,477	[e]9,823	6,118
Metallurgical-grade	50,370	80,778	55,330	[e]64,112	38,789
Total	350,679	393,276	451,112	522,718	496,521
Gem stones, semiprecious:					
Emerald crystals kilograms	2,076	1,047	1,781	432	502
Tiger's-eye do	339,557	346,102	212,947	163,157	220,034
Graphite	911	583	394		
Gypsum, crude	439,688	388,734	377,467	452,490	554,827
Kyanite-related materials:					
Andalusite	113,076	112,040	134,177	196,516	181,272
Sillimanite	15,455	9,540	19,574	[5]16,194	15,504
Lime[5] thousand tons	1,504	1,875	1,721	2,184	2,251
Magnesite, crude	49,219	37,407	65,336	59,975	56,557
Mica:					
Sheet kilograms	45	74	64	252	
Waste	3,142	2,542	3,617	5,046	2,395
Nitrogen: N content of ammonia thousand tons	508	563	563	549	552
Phosphate rock, gross weight do	2,403	2,699	3,221	3,185	2,617
Pigments, mineral, natural:					
Ochers	1,561	1,244	1,244	710	742
Oxides	609	943	917	660	555
Total	2,170	2,187	2,161	1,370	1,297
Pyrites, gross weight	829,509	765,130	910,723	1,450,000	1,475,000
Quartz, quartzite, glass sand (silica) thousand tons	1,017	1,013	1,376	1,617	1,387
Salt	242,254	489,925	538,735	567,270	537,278
Silcrete	4,340	5,434	5,783	5,430	9,243
Stone, n.e.s.:					
Dimension:					
Granite:[5]					
Sawn slabs	24,084	9,341	20,471	28,910	23,535
Rough blocks	388,719	203,983	193,563	181,250	182,770
Marble	8,523	[r]6,444	7,562	5,965	6,327
Crushed and broken:					
Limestone thousand tons	13,076	14,112	17,406	19,869	21,107
Shale do	267	376	425	604	600
Sulfur:					
S content of pyrites do	332	219	319	493	503
Byproduct:					
Of metallurgy do	105	[e]100	[e]100	[e]100	127
Of petroleum do	28	[e]25	[e]25	[e]25	
Total do	465	344	444	618	630
Talc and related materials:					
Talc	8,095	7,487	9,451	9,466	9,464
Pyrophyllite (wonderstone)	5,109	5,159	5,795	4,900	5,662
Vermiculite	165,419	209,093	191,573	185,699	190,601
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e]	45,000	40,000	45,000	45,000	45,000
Coal:					
Anthracite thousand tons	2,559	2,150	3,309	3,895	4,017
Bituminous do	82,852	88,208	100,459	111,225	126,362
Total do	85,411	90,358	103,768	115,120	130,379
Coke:					
Coke oven and beehive do	5,201	4,869	4,951	5,377	5,500
Gashouse, low- and medium-temperature do	[e]110	[e]110	[e]110	94	100

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	30,083	30,090	30,660	NA	NA
Jet fuel do	2,349	2,440	2,555		
Kerosine do	3,338	3,333	3,285		
Distillate fuel oil do	31,918	32,973	33,580		
Residual fuel oil do	22,036	22,178	22,630		
Lubricants do	2,262	2,240	2,555		
Other do	8,607	7,372	6,205		
Refinery fuel and losses do	5,624	5,700	4,015		
Total do	106,217	106,326	105,485	110,000	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through Sept. 15, 1982.
[2]Less than 1/2 unit.
[3]Includes osmiridium from gold ores, estimated at 2,500 troy ounces per year.
[4]Sales.
[5]Domestic sales plus exports. Production not reported.

Table 2.—Republic of South Africa: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	127	180	--	Finland 100; West Germany 69.
Oxides and hydroxides	106	244	--	All to Sweden.
Metal including alloys:				
Scrap	60	90	--	All to West Germany.
Unwrought	29,557	7,817	--	Taiwan 3,741; Japan 1,424; Thailand 599.
Semimanufactures	2,527	2,672	([2])	Japan 1,296; France 617; Brazil 410.
Antimony:				
Ore and concentrate, metal content	6,897	1,937	629	West Germany 458; Japan 446; France 355.
Oxides and hydroxides	--	6,393	6,393	
Beryllium: Ore and concentrate	34	24	24	
Chromium:				
Ore and concentrate thousand tons	[3]1,269	1,376	367	Japan 407; West Germany 224; France 87.
Oxides and hydroxides	1	2	--	All to United Kingdom.
Cobalt:				
Oxides and hydroxides	4	8	--	Spain 7; Netherlands 1.
Metal including alloys, all forms	759	35	35	
Columbium and tantalum: Concentrate kilograms	[3]4,414	[3]4,920	4,920	
Copper:				
Ore and concentrate	72,001	84,909	--	West Germany 78,323; Japan 6,586.
Matte and speiss	214	88	--	All to West Germany.
Sulfate	342	--		
Metal including alloys:				
Scrap	1,088	1,068	1	West Germany 482; Belgium-Luxembourg 252; Spain 119.
Unwrought	181,601	180,423	2,207	West Germany 62,548; Belgium-Luxembourg 43,147; Japan 32,524.
Semimanufactures	6,859	[4]2,519	1,387	United Kingdom 194; Hong Kong 182; Taiwan 171.
Iron and steel:				
Ore and concentrate thousand tons	17,079	14,286	6	Japan 6,833; West Germany 4,410; France 1,093.
Pyrites, roasted	337	--		
Metal:				
Scrap	3,296	5,974	--	Italy 1,890; Japan 1,122; Netherlands 998.
Pig iron, cast iron, powder, shot	102,208	[5]92,088	17,133	Spain 23,113; Japan 13,405; West Germany 10,899.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys:				
Ferrochromium	599,308	691,394	184,903	Japan 201,955; West Germany 173,025; Spain 21,265.
Ferromanganese	444,989	288,193	203,316	Italy 26,518; United Kingdom 19,140; West Germany 14,622.
Ferrosilicon	27,556	22,778	4,776	Japan 14,909; West Germany 3,043.
Ferrosilicomanganese	33,399	56,269	21,785	West Germany 21,375; Italy 5,509.
Ferrosilicochromium	33,983	16,433	345	Japan 9,796; West Germany 2,287.
Unspecified	105,145	42,032	10	United Kingdom 26,147; Japan 10,841.
Steel, primary forms	173,193	203,840	15,541	Italy 51,376; Sri Lanka 40,294; United Kingdom 26,938.
Semimanufactures:				
Bars, rods, angles, shapes, sections	500,350	486,986	120,280	Hong Kong 148,068; Canada 48,742; United Kingdom 43,549.
Universals, plates, sheets	484,411	524,660	210,284	Taiwan 92,141; Israel 58,231; Hong Kong 31,002.
Hoop and strip	822	1,885	--	Hong Kong 635; Greece 519; Taiwan 447.
Rails and accessories	283	7,702	--	Taiwan 7,548; France 154.
Wire	15,802	17,396	7,295	Israel 3,650; Portugal 2,520; Sri Lanka 2,056.
Tubes, pipes, fittings	72,241	68,849	51,399	Hong Kong 7,462; United Kingdom 5,749; Sri Lanka 1,220.
Castings and forgings, rough	248	115	--	United Kingdom 46; Canada 40; France 19.
Unspecified and mixed value, thousands	NA	$28,023	--	Israel $19,333; Australia $4,883; Uruguay $3,600.
Lead:				
Ore and concentrate	206	84,512	6,802	Canada 18,728; France 16,522; West Germany 12,843.
Oxides and hydroxides	56	88	--	Canada 60; Australia 21.
Metal including alloys:				
Scrap	249	735	--	West Germany 668; Netherlands 49.
Unwrought	23,122	24,360	--	Italy 19,388; Japan 4,835; Portugal 102.
Semimanufactures	185	58	--	All to Hong Kong.
Magnesium metal including alloys:				
Scrap	318	281	145	Brazil 136.
Unwrought	17	1	--	All to United Kingdom.
Manganese:				
Ore and concentrate thousand tons	3,055	3,428	190	Japan 1,438; France 485; West Germany 326.
Oxides and hydroxides	69	500	--	France 227; Portugal 120; Finland 66.
Metal including alloys, all forms	19,282	21,797	7,072	Canada 6,412; West Germany 2,651; Netherlands 2,298.
Molybdenum: Ore and concentrate	6	--		
Nickel:				
Ore and concentrate	41,432	48,319	48,319	
Matte and speiss	3,910	3,998	--	Norway 3,794; Italy 119; Belgium-Luxembourg 36.
Metal including alloys:				
Scrap	1,092	1,648	12	Canada 1,453; United Kingdom 64; France 44.
Unwrought	26,591	21,815	3,462	Italy 4,081; West Germany 3,589; Netherlands 2,347.
Semimanufactures	1,058	1,081	716	Brazil 171; Sweden 153; Portugal 29.
Niobium: Ore and concentrate	--	1	1	
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$792,737	$1,099,629	$678,465	Japan $320,456; France $27,243; West Germany $23,578.
Silver:				
Ore and concentrate[6] do	$168	$36,600	$170	Canada $13,799; Spain $5,736; Israel $702.
Waste and sweepings[6] do	$4,130	$275,079	$1,431	United Kingdom $266,167; France $6,416; West Germany $481.
Metal including alloys, unwrought and partly wrought do	$26,772	$53,470	$131	United Kingdom $48,309; West Germany $3,095; Austria $1,200.
Tin:				
Ore and concentrate	3,727	2,757	179	United Kingdom 1,735; Netherlands 447; Spain 389.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Tin —Continued				
Metal including alloys:				
Scrap	114	(7)	--	All to Israel.
Unwrought	1,108	1,250	472	United Kingdom 360; Italy 187; France 96.
Semimanufactures	37	30	--	All to Sri Lanka.
Titanium:				
Ore and concentrate	42,845	54,367	17,152	France 20,386; Netherlands 10,406; Italy 2,672.
Slag and dross containing titanium	27,144	--		
Oxides	892	1,142	1,007	Reunion 135.
Metal including alloys, all forms	155	9	9	
Tungsten: Ore and concentrate	80	24	--	West Germany 17; Sweden 7.
Vanadium: Oxides and hydroxides	r4,406	3,949	484	Japan 3,066; France 399.
Zinc:				
Ore and concentrate	3 37,367	52,846	--	West Germany 49,414; France 2,184.
Oxides and hydroxides	38	365	--	All to Sri Lanka.
Metal including alloys:				
Scrap	17	--		
Unwrought	33	100	--	All to United Kingdom.
Semimanufactures	98	49	11	Portugal 34; United Kingdom 4.
Zirconium: Ore and concentrate	48,108	83,258	13,348	Japan 25,127; West Germany 18,511; France 6,055.
Other:				
Ores and concentrates	10,905	15,636	32	Switzerland 5,239; Greece 3,982; Canada 2,254.
Ash and residue containing nonferrous metals	70,784	202,771	54,836	Italy 76,874; France 60,288; Austria 7,332.
Oxides and hydroxides	r5,535	5,649	--	Austria 2,745; Canada 1,287; West Germany 934.
Metalloids	17,442	25,321	468	Japan 9,086; West Germany 6,004; Australia 3,960.
Alkali, alkaline-earth, rare-earth metals	--	351	351	
Base metals including alloys, all forms	17,434	12,662	395	Canada 5,494; Japan 2,498; United Kingdom 2,140.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	4,570	531	399	Australia 130.
Dust and powder of precious and semiprecious stones value, thousands	$14,678	$10,019	$6,035	France $3,187; West Germany $388; Sweden $258.
Grinding and polishing wheels and stones	138	76	NA	Australia 61; Hong Kong 13.
Asbestos, crude	389,470	330,730	10,260	Japan 92,685; Italy 37,389; West Germany 27,611.
Barite and witherite	25	500	--	All to Venezuela.
Boron materials: Crude, natural borates	24	--		
Cement	19,457	115,135	22	Reunion 114,546; Central African Republic 564.
Clays and clay products:				
Crude:				
Andalusite, kyanite, sillimanite	3 89,482	3 121,317	--	West Germany 49,484; Japan 15,287; Italy 14,523.
Bentonite	3 1,067	3 1,630	NA	Taiwan 68.
Chamotte earth	NA	2,868	--	All to West Germany.
Kaolin	3 1,263	3 1,798	NA	NA.
Unspecified	3 108,316	128,378	--	Japan 45,428; United Kingdom 31,484; West Germany 17,943.
Products:				
Nonrefractory	2,077	10,059	9,298	Belgium-Luxembourg 402; United Kingdom 127.
Refractory including nonclay brick	3,717	30,164	1,046	Australia 11,736; Italy 7,539; Brazil 6,185.
Cryolite and chiolite	--	351	351	
Diamond:				
Gem, not set or strung value, thousands	$981,453	$1,362,800	$730,712	Belgium-Luxembourg $111,349; Hong Kong $92,428; Japan $22,427.
Industrial do	$68,610	$74,404	$52,652	West Germany $7,386; Japan $5,827; United Kingdom $3,070.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Feldspar, fluorspar, similar material	474,764	498,446	220,035	Japan 131,990; West Germany 44,369; Canada 27,507.
Fertilizer materials:				
Crude:				
Nitrogenous	15	18	--	All to Italy.
Phosphatic	65,511	108,346	--	Venezuela 89,000; United Kingdom 18,865.
Manufactured:				
Nitrogenous	71,072	20	--	All to United Kingdom.
Phosphatic	18,811	15,593	--	Sri Lanka 10,200; West Germany 5,089.
Potassic	1,929	--		
Other including mixed	6,526	14,777	--	Sri Lanka 13,761; West Germany 1,014.
Ammonia	--	1	--	All to Reunion.
Graphite, natural	359	967	378	United Kingdom 519; France 70.
Gypsum and plasters	[3]3,237	[3]1,092	NA	Japan 4.
Lime	[3]77,071	[3]78,599	NA	NA.
Magnesite	13	458	--	Austria 230; Brazil 228.
Mica: Crude including splittings and waste	2,414	1,601	3	United Kingdom 789; West Germany 463; Japan 201.
Pigments, mineral:				
Crude, natural	[3]657	[3]814	NA	Belgium-Luxembourg 297.
Iron oxides, processed	r [3]39	[3]18	--	All to Portugal.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$29,424	$13,691	$4,506	West Germany $2,713; Switzerland $2,572; Hong Kong $927.
Synthetic do	$48	$69	$9	Hong Kong $43; Canada $7; United Kingdom $7.
Pyrites, unroasted (sulfur content)	[3]2,463	[3]47,181	NA	NA.
Salt and brine	[3]53,612	[3]53,745	NA	Reunion 404; Central African Republic 400.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	21	18	--	All to Canada.
Caustic soda	102	1	--	All to Reunion.
Soda ash	1,949	NA	NA	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	[3]12	1,099	786	Italy 75; France 71; Japan 65.
Worked	[3]10,172	[3] [8]11,337	NA	United Kingdom 1,718; Netherlands 1,082.
Gravel and crushed rock	1,225	5,701	35	United Kingdom 5,638; Republic of Korea 20.
Limestone other than dimension	[3]11,681	NA	NA	NA.
Quartz and quartzite	[3]1,540	3,648	1	West Germany 2,591; Netherlands 881; United Kingdom 69.
Sand other than metal-bearing	33,110	11,540	34	Belgium-Luxembourg 10,742; Netherlands 288; West Germany 271.
Sulfur:				
Elemental:				
Crude	NA	138	--	All to Taiwan.
Refined	361	NA	NA	NA.
Sulfuric acid	NA	5	--	All to Sri Lanka.
Talc and related materials:				
Pyrophyllite (wonderstone)	[3]6,353	NA	NA	NA.
Talc	--	[3]500	NA	NA.
Vermiculite	[3]171,991	[3]156,072	NA	France 15,756; Canada 7,756.
Other: Slag, dross, and similar waste, not metal-bearing	71,244	118,725	44,923	Japan 63,412; United Kingdom 9,938.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	2,329	1,019	--	All to United Kingdom.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	[3]23,341	[3]29,150	698	France 9,260; Japan 3,288; Italy 3,058.
Briquets of anthracite and bituminous coal	106,515	174	--	Sri Lanka 122; France 52.
Lignite and lignite briquets	25,591	99	77	West Germany 22.
Coke and semicoke	NA	194	--	Sri Lanka 150; Japan 44.
Peat including briquets and litter	15	39	39	

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Gasoline				
thousand 42-gallon barrels	840	(2)	--	All to Reunion.
Kerosine and jet fuel do	147	NA	NA	NA.
Distillate fuel oil do	503	206	--	Mainly to New Zealand.
Residual fuel oil do	253	1,038	--	Hong Kong 318; Spain 283; Belgium-Luxembourg 233.
Lubricants do	55	197	(2)	Austria 191; Reunion 5.
Other:				
Liquefied petroleum gas do	373	9	--	All to Reunion.
Mineral jelly and wax do	245	186	84	West Germany 45; Italy 14; France 12.
Petroleum coke do	1	NA	NA	NA.
Bitumen and other residues do	61	57	2	Reunion 54.
Bituminous mixtures do	1	NA	NA	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	5,926	7,284	--	United Kingdom 5,112; West Germany 1,717; Brazil 400.

[r]Revised. NA Not available.

[1]Because official South African trade statistics provide data only on the value of total exports of each commodity class (with no data on destinations) and not on quantity of material exported, this table has been compiled from a variety of sources including the quarterly publication "Minerals" issued by the Department of Mines (issues for 1979 and 1980) as well as official trade returns of trading partner countries. Data from "Minerals" is footnoted; other figures are compiled from a variety of sources with specifics on destination obtained from the import statistics of the countries listed.

[2]Less than 1/2 unit.

[3]Source: "Minerals" quarterly of the South African Department of Mines. Figures are shipments by producers for export and are not necessarily actual exports.

[4]Total excludes unreported quantities valued at $48,000 to Israel and $15,000 to Uruguay.

[5]Total excludes unreported quantities valued at $58,000 to Uruguay and $16,000 to Israel.

[6]May include platinum-group metals.

[7]Unreported quantity valued at $20,000.

[8]Excludes unreported quantity valued at $1,249,000 of which $1,028,000 went to the United States, $71,000 to Israel, and $64,000 to Canada.

Table 3.—Republic of South Africa: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	23,699	24,742	NA	Australia 14,544; Hong Kong 4,578; Denmark 4,401.
Oxides and hydroxides	174,109	164,725	852	Australia 152,024; United Kingdom 6,317; Japan 2,894.
Metal including alloys:				
Scrap	405	1,809	787	West Germany 380; Israel 244.
Unwrought	620	282	39	United Kingdom 204; West Germany 26.
Semimanufactures	7,166	12,668	4,066	West Germany 4,276; Japan 1,225.
Arsenic:				
Trioxide, pentoxide, acid	36	1	NA	NA.
Elemental	10	12	4	Sweden 8.
Chromium:				
Chromite	845	7,430	NA	NA.
Oxides and hydroxides	445	470	132	West Germany 314; United Kingdom 20.
Cobalt:				
Oxides and hydroxides	8	12	NA	France 2; Australia 1; Belgium 1; Canada 1.
Metal including alloys, all forms	64	100	1	Belgium 32; Japan 10; Canada 6.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Copper:				
Ore and concentrate	(1)	2,972	NA	Australia 2,969.
Metal including alloys:				
Scrap	55	286	73	Israel 57; United Kingdom 24.
Unwrought	2,127	9,013	4	United Kingdom 1,056; Belgium 350.
Semimanufactures	2,528	5,600	276	West Germany 1,777; United Kingdom 1,280; Belgium 688.
Gold:				
Waste and sweepings ____ value	$25,183	$697,320	$16,538	United Kingdom $671,778.
Metal, including alloys, unwrought and partly wrought troy ounces	r6,388	6,151	NA	United Kingdom 3,642; France 946.
Iron and steel:				
Ore and concentrate	79	(2)	NA	NA.
Metal:				
Scrap	7,910	27,922	23,476	Australia 164.
Pig iron, ferroalloys, similar materials	38,456	42,184	881	Sweden 2,151; Belgium 1,071; Brazil 1,016.
Steel, primary forms	5,839	6,836	21	West Germany 624; Austria 266; United Kingdom 228.
Semimanufactures:				
Bars, rods, angles, shapes, sections	23,729	35,410	1,588	United Kingdom 8,438; Japan 2,759; West Germany 2,309.
Universals, plates, sheets	39,436	56,626	1,033	Japan 29,563; West Germany 15,509; Italy 4,577.
Hoop and strip	10,094	14,489	457	Japan 5,967; West Germany 1,969; Belgium 1,524.
Rails and accessories	1,049	1,947	NA	United Kingdom 49; West Germany 39.
Wire	20,187	25,510	289	Belgium 2,002; France 1,233; United Kingdom 1,205.
Tubes, pipes, fittings	43,804	82,380	2,190	Japan 40,955; West Germany 10,595; Spain 6,256.
Castings and forgings, rough	437	537	4	West Germany 104; Belgium 50.
Lead:				
Ore and concentrate	--	950	--	All from Spain.
Oxides and hydroxides	25	35	NA	West Germany 19; United Kingdom 3.
Metal including alloys:				
Scrap	31,517	6,212	3,494	United Kingdom 824; Australia 429.
Unwrought	3,365	9,303	1,151	United Kingdom 2,649; Brazil 1,197.
Semimanufactures	32	33	NA	United Kingdom 24; West Germany 7.
Magnesium metal including alloys, all forms	919	727	615	France 58.
Manganese:				
Ore and concentrate	r29,842	3,972	NA	United Kingdom 3,271; Belgium 140.
Oxides and hydroxides	3,486	4,560	5	Belgium 3,545; United Kingdom 387; Greece 332.
Mercury ____ 76-pound flasks	1,532	2,988	78	Spain 1,091; United Kingdom 644; Hong Kong 548.
Molybdenum:				
Oxides and hydroxides	144	312	20	Chile 93; Switzerland 68; West Germany 47.
Metal including alloys, all forms	32	19	10	Austria 7; United Kingdom 2.
Nickel metal including alloys, all forms	1,729	1,481	182	Japan 215; West Germany 202; United Kingdom 197.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	r27,440	22,977	1,250	United Kingdom 9,319; West Germany 7,636.
Silicon, elemental	111	16	5	United Kingdom 11.
Silver:				
Ore and concentrate[3] value, thousands	$39,509	$88,671	--	Norway $88,665.
Waste and sweepings[3] ____ value	r$623,557	$715,446	NA	Italy $587,880; United Kingdom $115,007.
Metal including alloys, unwrought and partly wrought troy ounces	745,822	776,060	9,089	United Kingdom 388,990; West Germany 317,996.
Tantalum metal including alloys, all forms ____ kilograms	1,200	1,100	1,100	
Tin metal including alloys:				
Scrap	611	149	NA	NA.
Unwrought	386	225	NA	Netherlands 10; United Kingdom 8.
Semimanufactures	9	20	NA	United Kingdom 4; West Germany 2.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Titanium:				
Ore and concentrate	14	50	NA	West Germany 45.
Oxides and hydroxides	356	1,529	246	United Kingdom 751; West Germany 365; Spain 108.
Tungsten:				
Ore and concentrate	333	2,504	NA	Hong Kong 2,082; Brazil 119; Australia 90.
Metal including alloys, all forms	201	176	14	Ireland 40; West Germany 26; Netherlands 20.
Zinc:				
Ore and concentrate	2	(4)	NA	NA.
Oxides, hydroxides, peroxides	360	391	--	West Germany 190; United Kingdom 97; Belgium 82.
Metal including alloys:				
Scrap	218	132	NA	Israel 59.
Unwrought	(1)	1,825	NA	NA.
Semimanufactures	15	1,522	95	United Kingdom 480; France 203; West Germany 180.
Zirconium: Ore and concentrate	33	49	NA	Australia 47.
Other:				
Ores and concentrates:				
Of molybdenum, tantalum, vanadium	144	207	96	Netherlands 66; Chile 45.
Unspecified	37	35	NA	NA.
Ash and residue containing nonferrous metals	5,652	3,092	1,033	Israel 440; West Germany 319; United Kingdom 293.
Oxides, hydroxides, peroxides	r638	697	141	United Kingdom 260; West Germany 67; Hong Kong 50.
Metals:				
Metalloids:				
Boron ---- kilograms	20,300	100	NA	NA.
Phosphorus	24	50	NA	United Kingdom 32; West Germany 14.
Selenium	5	1	--	Mainly from United Kingdom.
Tellurium	1	3	NA	Japan 1.
Alkali, alkaline-earth, rare-earth metals	69	29	NA	United Kingdom 19; West Germany 8.
Pyrophoric alloys	6	17	10	West Germany 3; Japan 2.
Base metals including alloys, all forms	r406	528	35	United Kingdom 204; Hong Kong 100; Japan 28.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	r7,917	11,110	146	West Germany 30.
Artificial, corundum	4,940	6,146	1,593	West Germany 1,665; United Kingdom 1,501; France 519.
Dust and powder of precious and semiprecious stones ---- value	$305,818	$369,008	NA	United Kingdom $282,751; Belgium $67,577; Israel $13,942.
Grinding and polishing wheels and stones	398	658	62	West Germany 188; United Kingdom 126; Netherlands 50.
Asbestos, crude	18,203	19,518	29	Canada 786.
Barite and witherite	19,168	6,931	NA	Spain 3,016; United Kingdom 869; West Germany 242.
Boron materials:				
Crude natural borates	2,298	1,716	1,156	Netherlands 319; United Kingdom 106.
Oxide and acid	548	1,179	84	France 1,074.
Bromine	55	76	--	All from Israel.
Cement	91,053	95,503	238	France 16,728; United Kingdom 2,498; West Germany 1,563.
Chalk	4,851	7,016	NA	France 4,170; Sweden 2,299.
Clays and clay products:				
Crude	33,706	29,627	22,798	United Kingdom 5,060; West Germany 497.
Products:				
Nonrefractory[5]	5,319	34,407	NA	Italy 8,819.
Refractory including nonclay brick	r30,208	25,675	1,802	West Germany 8,594; United Kingdom 5,818.
Cryolite and chiolite	111	171	--	Denmark 125; West Germany 46.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Diamond:				
Gem, not set or strung thousand carats	107	159	3	Belgium 61; United Kingdom 44; Switzerland 27.
Industrial do	1,691	2,344	26	United Kingdom 1,312; Ireland 694.
Diatomite and other infusorial earth	5,900	6,465	5,829	West Germany 38.
Feldspar and fluorspar	89	80	NA	NA.
Fertilizer materials:				
Crude:				
Phosphatic	7	29	NA	NA.
Potassic	42,901	98,949	--	Canada 35,626; Israel 26,348; West Germany 15,602.
Other including mixed	209	963	NA	NA.
Manufactured:				
Nitrogenous	31,048	149,875	27,624	Italy 51,970; Netherlands 20,705.
Phosphatic	111	9,006	8,844	Israel 162.
Potassic	158,467	145,624	--	Israel 81,345; West Germany 37,599; Canada 18,480.
Other including mixed	1,277	34,084	33,255	United Kingdom 630; Netherlands 133.
Ammonia	21,026	72,191	47,258	Switzerland 157.
Graphite, natural	938	1,132	NA	Norway 421; United Kingdom 11.
Gypsum and plasters	5,939	7,283	18	West Germany 5,092; United Kingdom 1,208; Spain 960.
Lime	4,008	4,954	NA	France 4,708.
Lithium minerals, crude	4,452	5,327	NA	NA.
Magnesite	124,827	98,384	244	Italy 14,573; Japan 10,085; United Kingdom 8,833.
Mica:				
Crude including splittings and waste	685	1,187	172	Australia 162; United Kingdom 17.
Worked including agglomerated splittings	65	83	32	United Kingdom 20; Belgium 12; Switzerland 9.
Pigments, mineral:				
Natural, crude	r500	227	NA	Austria 123; United Kingdom 54.
Iron oxides, processed	7,692	7,891	16	West Germany 5,689; United Kingdom 817.
Precious and semiprecious stones excluding diamond:				
Natural value, thousands	$1,178	$1,247	$49	West Germany $174; Hong Kong $158; United Kingdom $83.
Manufactured do	$1,744	$3,888	$199	Ireland $1,187; Taiwan $259; Switzerland $100.
Pyrites, unroasted	904	10,772	46	West Germany 38; France 29.
Salt and brine	23,413	20,502	32	Brazil 17,653; West Germany 1,727.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	1,814	1,753	19	France 881; Spain 391.
Caustic soda	r629	5,604	4	Italy 2,313; West Germany 1,582; Netherlands 995.
Soda ash	176,007	255,439	156,150	United Kingdom 63,382; Belgium 6,577.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	535	1,727	NA	Italy 1,612; Portugal 52.
Worked	608	1,027	NA	Italy 744; Portugal 220.
Dolomite, chiefly refractory-grade	1	33	NA	NA.
Gravel and crushed rock	2,153	11,698	NA	United Kingdom 67.
Limestone excluding dimension	55	139	NA	NA.
Quartz and quartzite	669	405	NA	NA.
Sand excluding metal-bearing	367	263	17	West Germany 32; United Kingdom 21.
Sulfur:				
Elemental:				
Other than colloidal	811,730	913,609	64,091	Canada 823,126; United Kingdom 10,902.
Colloidal	1,308	2,431	2,353	West Germany 40; United Kingdom 37.
Sulfuric acid	146,703	222,362	43,244	Japan 64,235; United Kingdom 60,688.
Talc, steatite, soapstone	1,819	2,412	299	Republic of Korea 1,177; Italy 302; Norway 276.
Other:				
Crude	r6,183	5,820	43	Greece 5,449; Australia 146.
Slag, dross, and similar waste, not metal-bearing:				
From iron and steel manufacture	37	18	NA	NA.
Unspecified	2,543	3,644	219	France 396; West Germany 359.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other —Continued				
Oxides and hydroxides:				
Of barium	84	130	--	Italy 69; West Germany 35; Spain 26.
Of magnesium	698	157	10	Israel 70; United Kingdom 58.
Of strontium	6	9	8	NA.
Iodine and fluorine	23	9	--	Japan 7; West Germany 1.
Building materials of asphalt, asbestos and fiber cements, unfired non-metals	1,057	1,756	423	Austria 832; United Kingdom 145; Italy 125.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	946	790	323	Belgium 165.
Carbon black	3,183	4,309	917	France 1,166; Canada 1,062; West Germany 622.
Coal, all grades including briquets	175,887	199,471	19,908	NA.
Coke and semicoke	8	21	NA	United Kingdom 18.
Hydrogen, helium, rare gases	39	45	15	Japan 18; Belgium 7.
Peat including briquets and litter	342	498	NA	Ireland 154; Canada 134; West Germany 121.
Petroleum refinery products:				
Lubricants—42-gallon barrels	9,300	11,080	3,205	United Kingdom 4,217; West Germany 2,294.
Liquefied petroleum gas —do—	363	374	102	France 236.
Mineral jelly and wax —do—	388,315	407,985	64,364	Japan 177,516; West Germany 66,483.
Pitch and pitch coke —do—	r6,450	997	NA	United Kingdom 924.
Petroleum coke —do—	311,583	448,181	334,712	United Kingdom 113,467.
Bitumen and other residues —do—	1,594	1,595	730	Netherlands 333.
Bituminous mixtures —do—	2,211	2,595	1,314	United Kingdom 893.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	18	29	NA	NA.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]Unreported quantity valued at $1,068.
[3]May include platinum-group metals.
[4]Unreported quantity valued at $117.
[5]Totals exclude unreported quantities valued at $2,130,000 in 1979 and $11,390,000 in 1980.

Table 4.—Republic of South Africa: Value of domestic sales and exports of major mineral commodities

(Thousand U.S. dollars)

Commodity	Domestic sales			Exports		
	1979	1980	1981	1979	1980	1981
METALS						
Aluminum	NA	NA	NA	54,120	NA	NA
Antimony	11,601	13,534	10,490	14,146	4,119	7,158
Chromite	44,181	51,717	38,357	61,957	65,095	60,807
Copper	123,328	193,877	165,705	227,097	191,235	153,262
Gold[1]	--	--	--	6,951,983	13,329,098	9,831,548
Iron ore	86,662	136,668	166,437	262,995	243,992	248,538
Lead concentrate	--	--	--	--	41,493	72,396
Manganese	54,124	46,983	55,625	153,715	140,025	134,701
Nickel	11,265	14,949	12,084	39,234	68,981	66,194
Silver[1]	--	--	4,080	35,548	65,720	76,514
Tin	10,958	26,712	10,490	23,983	22,678	16,042
Titanium	3,844	5,739	5,276	8,359	11,973	13,117
Uranium[1]	NA	NA	NA	303,057	e415,000	e300,000
Vanadium	47	e50	e50	77,369	e80,000	e65,000
Zinc	14,076	18,180	25,911	5,768	3,747	6,973
NONMETALS						
Andalusite	6,492	8,872	11,555	7,953	13,888	7,100
Asbestos	6,861	11,718	9,999	120,526	119,582	123,330
Cement	257,814	e280,000	e280,000	33,796	e35,000	e35,000
Flint clay	2,683	4,911	4,902	5,295	5,991	4,684
Other clays	7,994	10,916	9,789	50	84	77

See footnotes at end of table.

Table 4.—Republic of South Africa: Value of domestic sales and exports of major mineral commodities —Continued

(Thousand U.S. dollars)

Commodity	Domestic sales			Exports		
	1979	1980	1981	1979	1980	1981
NONMETALS — Continued						
Diamond[1]	--	--	--	651,373	710,882	390,562
Feldspar	2,078	3,017	3,551	321	289	279
Fluorspar	2,559	3,284	3,207	33,402	43,855	52,029
Granite	1,387	1,850	2,300	18,617	22,201	21,662
Gypsum	2,655	4,048	5,376	26	12	34
Lime products	62,456	106,112	93,763	2,357	2,697	NA
Limestone	46,209	43,531	64,584	165	690	2,917
Magnesite	3,122	3,204	2,154	--	--	28
Mica	227	384	306	416	568	495
Phosphate rock	74,574	88,760	73,009	--	106	764
Pyrites-sulfur	10,044	29,897	38,994	98	2,072	2,523
Salt	13,938	16,123	17,766	1,825	1,928	1,850
Silica, sand	14,873	21,362	20,173	188	393	348
Sillimanite	808	826	784	2,537	2,989	2,251
Slate	1,137	2,003	2,599	1,890	2,918	2,656
Other stone	713	1,227	1,567	808	561	539
Vermiculite	222	287	407	8,229	9,993	14,319
Wonderstone	323	243	195	1,536	654	1,090
Miscellaneous	1,319	1,927	2,312	1,723	1,663	2,851
MINERAL FUELS						
Anthracite	23,599	29,664	31,691	93,736	129,343	194,137
Bituminous coal	731,202	1,007,560	1,273,053	512,077	755,126	928,419
Total	r1,635,375	r2,190,135	2,448,541	r9,718,275	r16,546,641	12,842,194

eEstimated. rRevised. NA Not available.
[1]Value, if any, is included under "Exports."

Sources: Republic of South Africa Department of Mines, Quarterly Information Circular, Minerals, October-December 1980, Commodity Summaries for Monthly and Annual Periods, 1981. U.S. Consulate General Johannesburg, Republic of South Africa. State Department Airgram A-47, July 15, 1980, Appendix C.

COMMODITY REVIEW

METALS

Antimony.—Late in 1980, Consolidated Murchison Ltd. (CML), the country's only antimony producer, announced a reduction in its milling rate in view of the generally depressed world antimony market. The result was a drop of 25% in antimony produced in 1981, most in the form of concentrate which remained stockpiled on CML property at yearend. The company reported discouraging results from its program of local exploration and discontinued its exploration project in Spain, where it has decided not to exercise its options.

Approximately 388,950 tons of crude ore at a grade of 2.81% antimony was milled in 1981 to produce 16,300 tons of concentrate to which was added 300 tons of high-grade cobbed ore containing 69% antimony. The average antimony content of this mixture was 59%. Government figures indicate that the antimony contained in the concentrate was 9,810 tons, 25% less than the antimony content of the larger 1980 concentrate.

Chromite.—The nation's chromite industry suffered more from the worldwide recession than any of the country's other mining industries except diamond. Production of chromite was down 16% to less than 2.9 million tons, and exports declined 5.5% to less than 1.2 million tons. Domestic sales, largely to ferrochromium producers, were down nearly 21% to barely 1 million tons. A number of mines were shut down including three sections of the large Winterveld Mine near Steelpoort, operated by the Barlow Rand Ltd.'s subsidiary, Transvaal Consolidated Land and Exploration Co. Ltd. (TCL). The General Mining Union Corp. Group (Gencor) closed two of its mines in the Rustenburg area. Shipments of chromite through the Mozambique port of Matala near Maputo were delayed both during rail transit and at the harbor.

Western Platinum Ltd. expected to start a new 60,000-ton-per-month concentrator in early 1982 that was to treat chromite-rich platinum ore from the UG2 reef of the Bushveld Igneous Complex. The mill was slated to produce about 35,000 tons per month of 35% chromite rejects that would be stockpiled and ultimately upgraded to 42%.

Copper.—Copper production declined slightly during 1981 to just under 200,000 tons. Total sales value declined by 11% in terms of local currency, but export sales value declined 25% to $153.2 million. Palabora, a subsidiary of Rio Tinto-Zinc Corp. Ltd., remained the country's, and one of the world's, largest and most efficient copper producers. Palabora produced nearly 121,000 tons of refined copper from 100.7 million tons of its own ore, and refined 6,359 tons of copper for other producers. Byproducts included nearly 120,000 tons of magnetite, 234.2 tons of U_3O_8 concentrate, 4,941 tons of the zirconium oxide mineral (baddeleyite), and 15.5 tons of precious metal (mostly silver) in refinery tankhouse slimes. The vermiculite division recovered 175,125 tons of vermiculite byproduct from 2.1 million tons of ore. On October 1, 1981, the first stage of Palabora's electrified trolley-assist project became operational with the equipping of the 150-ton truck fleet to utilize electrical energy from lines above the steep 2.7-kilometer north ramp of the open pit. The net saving of diesel fuel from the trolley-assist system during the last quarter of 1981 was estimated at approximately $1 million. Early in 1981 the forged steel balls in one-half of the conventional ball mill circuit were replaced with high chromium steel balls. As a result, the consumption of steel balls decreased from 190 to 60 grams per ton of ore milled, and produced a grinding-cost saving of 30% despite the higher price of chromium steel balls.

At the Messina-Transvaal Development Co. Ltd. operations near the Zimbabwe border north of Palabora, 600,000 tons of 1.3% copper ore was mined and treated yielding 7,489 tons of copper in concentrate. Smelter feed included 45,000 tons of low-grade material in addition to the concentrate. Smelter output totaled 8,590 tons of copper ingot, partly from concentrate stockpiled in 1980. Copper sales of 9,427 tons realized an average of $1,644 per ton, while production cost rose to $1,742 per ton. Development work continued at the Railway lode and the Campbell shaft was extended. O'okiep, managed and 57.5% owned by Newmont Mining Corp. of the United States, also operated at a loss during 1981. O'okiep produced 1.7 million tons of 1.45% copper ore from which 68,000 tons of 32% copper concentrate was extracted. The smelter produced 22,334 tons of blister copper from O'okiep concentrate and 16,460 tons from toll concentrates. The average sales price was $1,908 per ton including about $166 for the contained gold and silver. Sinking of the shaft to develop the Carolusberg Deep ore continued to a depth of 1,615 meters, of the planned 1,690 meters. Production from the project was expected to commence before mid-1983. The proven reserves of this ore body were revised during 1981 to 15.6 million tons containing 1.99% copper. O'okiep's Carolusberg Mine became the first mine in the southern Africa region to use vertical crater retreat stoping which results in maximum safety and ore recovery in this high stress area. The cement-rockfill system in use at the nearby Hoits Mine may also be extended to the Carolusberg section in 1982.

The Prieska Copper Mines (Pty.) Ltd. (PCM), jointly owned by Anglo-Transvaal Consolidated Investment Co. Ltd. (Anglovaal) and the United States Steel Corp., mined and milled 2.76 million tons of ore from which 103,424 tons of copper (as well as zinc, lead, and iron pyrite) concentrate was recovered and smelted by O'okiep. PCM reported that 1981 profits, at $9.35 million, were less than one-half those of 1980. The Black Mountain Mineral Development Co. (Pty.) Ltd. lead-copper-zinc-silver mine, near Aggeneys in northwest Cape Province, treated 1.15 million tons of ore to recover 4,571 tons of copper in argentiferous concentrate. Black Mountain was managed by GFSA and partly owned by the Phelps Dodge Corp. of the United States.

Gold.—With the world price of gold declining well below 1980 levels throughout the year, and the rand's devaluation accentuating the rise in working costs, the Republic's gold industry continued to dominate the country's economy. Most of the gold production was managed by six large corporations: Anglo-American Corp. of South Africa Ltd. (AAC), Anglovaal, Barlow Rand Ltd., Gencor, GFSA, and Johannesburg Consolidated Investment Co. Ltd. (JCI). These six houses operated 35 gold mines and at least 2 tailings retreatment facilities. The major mines treated nearly 92 million tons of gold ore at an average grade of 0.223 troy ounce per ton, and recovered more than 20.4 million troy ounces (635 tons) of gold. Tailings treatment, small producers, and base metal mines recovered nearly 700,000 troy ounces. Production and developed ore figures for the major mines for 1979-81 are shown in table 5.

Table 5.—Republic of South Africa: Gold production and ore reserves, by producer

Producer	Production (troy ounces)			Developed ore	
	1979	1980	1981	(Thousand tons)	(Troy ounces per ton)
Anglo-American Joint Metallurgical Scheme	62,800	73,824	112,405	NA	NA
Barberton	48,496	49,998	38,098	NA	NA
Blyvooruitzicht	605,363	580,302	604,254	5,338	0.672
Bracken	139,235	112,849	112,064	2,900	.170
Buffelsfontein	836,183	854,554	904,506	11,626	.340
Deelkraal	--	101,731	171,530	1,676	.181
Doornfontein	388,285	391,972	382,256	4,875	.350
Driefontein Consolidated					
East Driefontein	1,555,816	1,263,556	1,168,557	12,959	.527
West Driefontein	1,679,992	1,407,952	1,275,333	7,786	.570
Durban Deep	243,683	233,984	265,173	6,117	.170
East Rand Gold and Uranium Ltd. (Ergo)	166,219	220,908	202,453	NA	NA
East Rand Proprietary Mine	345,373	378,491	373,984	7,724	.235
Elandsrand	94,240	168,804	167,322	854	.247
Free State Geduld	1,210,180	1,035,964	883,833	8,744	.437
Free State Saaiplaas	140,772	154,053	(1)	--	--
Grootvlei	216,837	204,337	210,372	8,700	.117
Harmony	1,037.697	1,004,646	1,027,087	30,607	.199
Hartebeestfontein	1,023,213	1,032,679	981,661	14,508	.383
Kinross	309,599	293,205	310,399	7,700	.206
Kloof	1,008,334	972,390	957,034	4,653	.606
Leslie	129,066	118,035	128,429	3,500	.157
Libanon	400,431	347,161	325,597	10,779	.231
Loraine	197,714	171,743	211,445	6,218	.260
Marievale	58,926	43,989	39,124	400	.147
President Brand	985,719	955,469	859,379	9,092	.386
President Steyn	835,476	837,758	787,747	14,490	.326
Randfontein	755,079	669,272	761,297	6,188	.330
St. Helena	552,520	533,988	500,555	11,700	.317
Stilfontein	532,265	559,034	478,766	7,061	.282
Unisel	38,591	184,240	235,681	3,500	.230
Vaal Reefs	2,163,153	2,246,565	2,363,314	29,817	.389
Venterspost	199,611	190,554	181,291	8,657	.181
Welkom	393,538	365,004	(1)	--	--
Western Areas	742,971	628,676	569,261	10,486	.177
Western Deep Levels	1,539,689	1,466,743	1,254,293	5,971	.581
Western Holdings	997,101	918,074	1,339,969	18,559	.315
West Rand Consolidated	75,037	86,402	90,957	4,305	.229
Winkelhaak	489,501	456,949	447,933	11,400	.228
Witwatersrand Nigel	37,137	33,112	36,156	976	.196
Other Producers	380,811	320,501	361,622	NA	NA
Total or average	22,616,656	21,669,468	21,121,137	299,866	.316

NA Not available.
[1]Free State Saaiplaas and Welkom production reported with Western Holdings after merger during 1981.

Sources: Chamber of Mines of South Africa. Quarterly Analysis of Working Results, October-December 1979-81. U.S. Consulate General. Johannesburg, Republic of South Africa. State Department Airgram A-47, July 15, 1980, pp. 45-48. Supplement to the Mining Journal, London, Jan. 29, 1982, p. 15.

Each of the country's major mines continued to produce gold bullion containing 88% gold, 10% silver, and 2% base metal impurities in 26-kilogram ingots. The ingots were delivered to Rand Refining Ltd., at Germiston, where they were precisely assayed and purchased on behalf of the Reserve Bank of the Republic of South Africa. More than 100 tons of the annual gold production was minted into coins at the South African Mint in Pretoria, and sold on the world market by the International Gold Corp. (Intergold) on behalf of the Chamber of Mines of South Africa. During 1981, Intergold reported sales of 3,128,727 of the 1-ounce Krugerrand coins, 178,014 of the 1/2-ounce coins, 726,428 of the 1/4-ounce coins, 1,321,022 of the 1/10-ounce coins, as well as 18,538 2-Rand and 19,274 1-Rand coins. The total weight of gold in South African coins sold was 3.54 million troy ounces.

The average production cost per ton of ore produced and milled increased to $49.13, an increase of 18% above the 1980 figure in terms of local currency. This was equivalent to approximately $204 per troy ounce of gold recovered, while the revenue averaged about $466 per troy ounce during 1981, leaving an average profit of $262 per troy ounce. Some of the country's larger mines continued with expansion projects that were planned when the price of gold was higher. AAC merged its Free State Saaiplaas, Welkom, and Western Holdings properties in the Orange Free State, to encompass ore underlying the Erfdeel and Dank-

baarheid farms, and was contemplating the expenditure of $622 million, chiefly tax savings, for expanding the operation by the early 1990's. AAC also extended its retreatment techniques to include the old waste dumps at the Simmer and Jack property where rehabilitation work was in progress and the mine was scheduled to reopen in 1983.

GFSA arranged for its two largest and lowest cost gold producers, the East Driefontein and West Driefontein Mines to merge as Driefontein Consolidated Ltd., and to include the undeveloped North Driefontein property held by Gold Fields Mining and Development Ltd., as well as 54 hectares of neighboring ground held by Texasgulf Inc. of the United States. Texasgulf was to receive nearly 300,000 shares in the new company, but would not qualify for dividends until the operation was expanded. Early extraction of the old intermine boundary pillars was expected to produce 900,000 troy ounces of gold. The new company appeared to qualify as the world's largest and richest gold mine after recovering 2.44 million troy ounces of gold from more than 5.5 million tons of ore during 1981. The average recovery grade was 0.441 troy ounce per ton, substantially below the reserve grade of 0.543 troy ounce per ton.

Five of the country's major mines applied for state assistance because of the declining gold price during 1981. They included GFSA's Venterspost Mine, Gencor's East Rand Proprietary Mine, Anglovaal's Loraine Mine, and the independent Witwatersrand Nigel operation. These mines produced nearly 894,000 troy ounces of gold worth about $416 million and collected nearly $31 million in state assistance.

Iron Ore and Concentrate.—Production of hematitic iron ore, chiefly from Iscor's Sishen Mine in northern Cape Province, increased 9% to more than 24 million tons in 1981 while the output of magnetite ore remained constant at nearly 4.25 million tons. The value of hematite sold locally increased nearly 36% to $155 million while the value of hematite exports increased nearly 14%, in terms of local currency, to nearly $249 million. Iscor's Thabazimbi Mine in the Transvaal Province produced 2.1 million tons of the 9.4 million tons of hematite treated in Iscor's three steel mills. Of the country's 4.24 million tons of magnetite ore, 1.9 million tons was the vanadium-bearing, titaniferous magnetite from the Mapochs Mine operated by Highland Steel and Vanadium Corp. Ltd. in the Transvaal Province. Highland's 10th prereduction kiln was commissioned in June of 1981 and 3 more similar 250,000-ton-per-year kilns were to be installed before 1985. Magnetite ore continued to account for about 15% of the total iron ore production in 1981 and was chiefly used for domestic consumption. Palabora produced 120,000 tons of finished magnetite concentrate during the year.

Iron and Steel.—Iscor consumed slightly more crude ore in 1981 than in 1980, but consumption of dolomite increased by about 5%. Steel production of 6.86 million tons, was down nearly 4% from that of 1980 and consisted of 52% ingots and 48% continuously cast blooms and slabs, most of which supplied the construction and other local industries. The total net sales value was $2.26 billion, an increase of more than 3% in terms of local currency, and the net pretax profit was more than $72 million, a drop of nearly 20% in terms of local currency. Iscor's Vanderbijlpark facility accounted for about 3.5 million tons of the steel output while its Pretoria works and Newcastle works produced, 1.5 and 2.0 million tons, respectively. The quality of Iscor's railroad steel was improved during the year by the addition of a degassing plant at Pretoria. Iscor has awarded a contract to Lurgi Chemie und Huttentechnik GmbH of the Federal Republic of Germany for the construction of a four-kiln, 600,000-ton-per-year direct-reduction plant at Vanderbijlpark by 1984. A 75,000-ton-per-year plant incorporating a process developed by Direct Reduction Corp. of New York was also under construction at Germiston, by Davy McKee Ltd. of the United Kingdom, on behalf of Scaw Metals Ltd.

The corrosion-resistant 3CR12 alloy developed by the Southern Cross Steel Co. (Pty.) Ltd. of Middelburg has proven to be popular for ore chute liners, agitation leach tanks, and other installations requiring resistance to wet abrasion and corrosion and an amenability to fabrication by welding even in thicknesses as great as 20 millimeters. During 1981, a new plant was commissioned at Middelburg to increase the capacity of the meltshop from 20,000 to 200,000 tons per year and to provide additional continuous casting, as well as hot- and cold-rolling facilities.

Lead and Silver.—The country's only major lead producer, the Black Mountain Mineral Development Co. (Pty.) Ltd., managed

and 51% owned by GFSA, and 49% owned by Phelps Dodge Corp. of the United States, continued its new operation near Aggeneys in the northwestern Cape Province. Although hard hit by generally depressed nonferrous metal and silver prices, the underground operation produced and milled 1.15 million tons of complex lead-silver-copper-zinc ore during its first full year of operations. Lead concentrate containing nearly 100,000 tons of lead and more than 3 million troy ounces of silver, and copper concentrate with 4,570 tons of copper and nearly 1 million troy ounces of silver, were trucked to a shipping point on the Sishen-Saldanha Railroad and thence to Saladanha Bay for export. Zinc concentrate, with nearly 21,000 tons of zinc and about 45,000 troy ounces of silver, was shipped to the Zinc Corp. of South Africa Ltd. (ZINCOR) refinery at Springs in the Transvaal Province. ZINCOR is also a subsidiary of GFSA.

Manganese.—The worldwide slump in the steel industry was responsible for nearly a 12% drop in manganese ore production to barely over 5 million tons, with most of the decrease in the lower grade metallurgical ores. The country's largest producer continued to be the 45% state-owned South African Manganese Amcor Ltd. with its Wessels, Mamatwan, and Lohathla Mines in northern Cape Province. The other major producer, the Associated Manganese Mines of South Africa Ltd. (AMMOSAL), operated the Black Rock, N'Chwaning, and Gloria Mines, and AAC continued to manage its deep underground Middelplaats Mine, also in northern Cape Province. The Gopane Mine, the country's only source of battery-grade ore, was entirely within the Bophuthatswana Homeland. AMMOSAL was completing a major expansion program to provide additional mining capacity at its ferromanganese facilities in Transvaal Province. The country's manganese mining capacity was estimated to exceed 9 million tons per year and its ore reserves were sufficient to last for several hundreds of years. It retained its position as the world's foremost exporter of ferromanganese and electrolytic manganese metal, and as a major supplier of metallurgical ore and manganese chemicals.

Nickel and Platinum-Group Metals.—All statistics concerning the volume of these metals were classified by the Government of the Republic of South Africa. Virtually all were produced by three major companies operating a number of mines exploiting the Merensky Reef in the Bushveld Igneous Complex in Transvaal Province. Local sales of nickel were down a little more than 10% in terms of local currency with a value equivalent to slightly more than $2 million while export sales were worth nearly $66.2 million, an increase of 15% over the 1980 revenue.

Rustenburg Platinum Holdings Ltd., with its associated Matthey Rustenburg Refiners (Pty.) Ltd., continued to be the world's largest producer of platinum metal. A new base metal refinery with a capacity of 19,000 tons per year of electrolytic nickel was commissioned in October 1981. Rustenburg's precious metal refinery at Wadesville, owned jointly with Johnson Matthey and Co. of the United Kingdom, had an estimated output of 1.3 million troy ounces of platinum-group metal in 1981. Portions of Rustenburg's four mines were in the Bophuthatswana Homeland. Total production of nickel was estimated at 18,000 tons, part of which came from the new base metal refinery commissioned by Rustenburg's associate, Matthey Nickel Ltd., in October 1981.

Impala Platinum Mines (Pty.) Ltd., the country's second largest platinum-group metal producer, had an estimated production of 945,000 troy ounces of platinum-group metal. Impala's mines and most of its concentrating and smelting plants were in the Bophuthatswana Homeland. Its base and precious metal refineries were at Springs in Transvaal Province. Portions of the Impala operations were also in Bophuthatswana which reportedly mined more than 30% of the total world production of platinum.[3]

Western Platinum Ltd. (Wesplat) was building a new 60,000-ton-per-month concentrator, at a cost of $15.9 million expended in 1981, to treat platinum-chromium ore from the UG2 reef in the Bushveld Igneous Complex. The plant was expected to produce a platinum-group metals concentrate containing minor chromite, a chromite-rich (35%) reject that would be stockpiled, and tailings. The new plant was to be commissioned by mid-1982. Meanwhile Wesplat was mining nearly 122,000 tons of ore per month from the Bushveld's Merensky Reef, and milling about 110,000 tons per month to produce a sulfide concentrate with platinum-group metals and nickel. About 12,000 tons per month of the Merensky Reef ore was being stockpiled for use as a sweetener in the UG2 ore to be treated in the new

concentrator. Wesplat's Merensky Reef ore contains 6.5 grams per ton of platinum-group metal and its UG2 ore contained 4.8 grams per ton of platinum-group metal. Wesplat's production for 1981 was 132,000 troy ounces of platinum-group metal.

Tin.—World tin prices fluctuated considerably but were generally low during the first half of 1981, and rose to a record high of nearly $8.30 per pound in November. Production was somewhat lower than that of 1980, and the quantities and values of both local and export sales were substantially below those of 1980. The country's leading producer, GFSA's Rooiberg Minerals Development Co. Ltd., increased its production of tin-in-concentrate to a record 2,386 tons by retreating old tailings through the recently commissioned flotation plant at its "C" Mine. Union Tin Mines Ltd., also managed by GFSA, saw production levels decline despite retreatment of old tailings. Zaaiplaats Mining Co. Ltd., controlled by the AAC managerial subsidiary Zimro (Pty.) Ltd., was replacing old equipment in a general rehabilitation program. New tube mills replaced the old stamp battery in an attempt to increase throughput and exploit large bodies of low-grade mineralization.

Titanium, Vanadium, and Zirconium.—Ancient beach sand dunes north of Richards Bay continued to be mined by Tisand (Pty.) Ltd., and Richards Bay Iron and Titanium Ltd. smelted the ilmenite sand recovered by Tisand's floating dredges into pig iron and titanium slag. Substantial quantities of rutile, zircon, and monazite concentrates were also recovered by a land-based electromagnetic-electrostatic plant 8 kilometers from the dredging operations. The zirconium mineral, baddeleyite, was also recovered as a byproduct of phosphate and copper mining at Palabora.

The world's largest deposit of titaniferous magnetite with exploitable amounts of vanadium was mined at the Mapochs Mine operated by AAC's Highveld Steel and Vanadium Corp. Ltd. in the Steelpoort-Roossenekal area of Transvaal Province. The ores were from the Bushveld Igneous Complex and were treated in one of Highveld's eight roasting units at Witbank. Union Carbide Corp. of the United States reported reduced operations of its vanadium production facilities at Brits and Bon Accord.

Zinc.—Anglovaal's Prieska Mine continued to be the Republic's chief zinc producer from its four-product (copper, zinc, lead, and pyrite) mine at Copperton, 65 kilometers southwest of Prieska. The mine produced 125,579 tons of zinc concentrate that was transported by rail to GFSA's ZINCOR smelter-refinery near Springs in Transvaal Province. GFSA's Black Mountain operation near Aggeneys in northwesten Cape Province produced and shipped about 42,000 tons of zinc concentrate containing 20,750 tons of zinc to the Springs refinery. Iscor reported the production of 47,200 tons of zinc concentrate that was shipped from its Rosh Pinah Mine in Namibia to its Vanderbijlpark complex southwest of Pretoria for smelting and the manufacture of galvanized sheet iron and wire.

NONMETALS

Andalusite and Related Minerals.—The Republic of South Africa continued to be the world's largest producer and exporter of andalusite and sillimanite through 1981. Output of the two minerals declined 8% and 4%, respectively, during the year and export volumes and values declined 44% and 43%, respectively, for andalusite and 38% and 15%, respectively, for sillimanite. Local sale of andalusite increased 24% in volume and 46% in local currency value, while domestic sales of sillimanite declined 29% in volume, but the value in local currency increased 6%.

Weedon's Minerals (Pty.) Ltd., operating near Thabazimbi, continued as the country's largest producer of andalusite, and Pella Refractory Ores S.A. (Pty.) Ltd. and R.G. Niemoller, with mines near Aggeneys in the Namaqualand area of northwestern Cape Province, were the chief producers of sillimanite. The Hudson andalusite mine near Penge, and the Lager andalusite mine, both in the Lebowa homeland between Pietersburg and Sandton in the Transvaal Province, were sold to the Rand London Corp. during the year. The Hoogenoeg andalusite mine near Roodepoort in the Transvaal Province was acquired by a French company, Denin-Anzin Mineraux, which was improving the facilities for increased production.

Asbestos.—Production of chrysotile asbestos declined 28% as a reflection of the worldwide trend against the use of this industrial mineral. Output of the more flexible crocidolite, "blue," asbestos also decreased by 14% but output of amosite

asbestos, unique to the Republic of South Africa, increased 10% to 56,834 tons. Barlow Rand's TCL continued to acquire asbestos mines from the Swiss Eternit AG's Zimbabwean and South African subsidiary, Everite Ltd., following the acquisition of a number of crocidolite mines from Cape Industries Ltd. By midyear TCL owned 75% of the South African and world crocidolite potential. Most of the remaining crocidolite producers were held by Griqualand Exploration Ltd., a Gencor subsidiary. In the latter part of 1981, Gencor purchased all of TCL's asbestos interests for $50 million in cash and shares. Crocidolite asbestos from the Wandrag Asbestos (Pty.) Ltd., held by Duiker Exploration Ltd., a subsidiary of the Lonrho Group was marketed by Gencor's Griqualand, which thus had a monopoly on crocidolite by yearend and was able to supply the softening demand by streamlining the more profitable and closing the less profitable mines.

Gencor also owned the Msauli crysotile asbestos mine, in the Barberton district of Transvaal Province, which was plagued by production troubles throughout the year. All of the country's amosite asbestos came from the Penge Mine, operated by Egnep (Pty.) Ltd., which was included in the Cape package acquired successively by TCL and Gencor. Most of Penge's output was exported and had a value of $24 million.

Diamond.—The Republic's diamond industry[4] was the hardest hit of its diverse mineral industries with a drop of 42% to $1.86 billion in sales by the Central Selling Organization (CSO) of De Beers Consolidated Mines Ltd. This reflected a drop of 48% to $390 million in the CSO purchase price of the country's 8.1 million carats of diamonds, down 4% in quantity sold despite a 12% increase in the number of carats produced. Table 6 shows the details of marketed diamonds from various sources in the Republic of South Africa and the average sales value per carat for 1981 compared with that of 1979-80.

The Finsch Mine, 150 kilometers northwest of Kimberley in northern Cape Province, continued to be De Beers' largest producer in the Republic of South Africa since 1979, and was its second largest producer in the world, surpassed only by the Orapa Mine in neighboring Botswana. Although underground mining had started and development was continuing, most of Finsch's 4.8 million tons of ore was recovered from the 160- to 200-meter levels of the open pit, and overburden stripping of the 112- to 172-meter benches continued. Diamond recovery was greatly improved during the first full year of operation of the new treatment plant that recovered 4,463,944 carats for an average yield of 92.13 carats per 100 tons of ore, an increase of more than 50% over the 1980 recovery. On August 19, 1981, the Finsch Mine's 736-meter shaft was completed. It was the first vertical shaft sunk in the Republic of South Africa using a six-boom jumbo drill rig in place of about 40 handheld air drills, reducing the labor force on the shaft bottom by 50%. Since startup in February 1980, 52,800 cubic meters of rock has been excavated from the 9-meter-diameter shaft, and an additional 19,800 cubic meters were excavated from six hoisting stations at various levels.

Of the four kimberlite mines near the town of Kimberley in Cape Province, only the Bultfontein underground mine increased production by barely 1% over that of 1980. Bultfontein produced 663,200 tons of ore containing 40.41 carats per 100 tons from the 580- and 700-meter levels. A rim-loading section at the south of the 570-meter level was completed in December 1981. Water tunnels around the Bultfontein pipe were completed in August, and drainage holes were being drilled from the tunnels at yearend. The Bultfontein dumps yielded 367,510 carats of diamond from 1,131,400 tons of ore with a grade of 32.48 carats per 100 tons. Substantial tonnages have been added to reserves as a result of continued sampling of old dumps near Bultfontein. The Wesselton Mine production continued to be the largest of the mines near Kimberley, with 1,377,200 tons of ore which yielded 274,399 carats at a grade of 19.92 carats per 100 tons, a drop of 17% below that of 1980. Part of the drop was due to waste rock dilution from the 785-meter block cave area which accounted for 857,000 tons of ore. The mining of higher level remnants produced 520,000 tons of ore and, following additional mine development, the practice was to be extended to remnants of ore above the 713-meter level. The 920-meter haulageway was fully equipped, and development of the 920-meter sublevel cave section was continued.

At the original De Beers Mine, 127,989 carats were produced from 663,300 tons of ore at a grade of 19.30 carats per 100 tons. The ore was drawn nearly equally from the 745-meter level block cave section and from sublevel caving on the 620-meter level

where ground pressure problems were apparently obviated by orienting the development drives in an east-west direction instead of a north-south direction. Development for mining the area above the 745-meter east block cave was extended to the 585-meter level.

Table 6.—Republic of South Africa: Marketed diamond output, by Province

Province	1979		1980		1981	
	Output (carats)	Price per carat	Output (carats)	Price per carat	Output (carats)	Price per carat
Mine diamond:						
Transvaal	2,033,993	$39.60	2,342,715	$39.92	1,871,107	$28.08
Cape Province	3,680,787	45.58	3,902,256	52.04	4,693,074	27.12
Orange Free State	441,050	117.34	531,708	167.92	353,082	98.07
Total	6,155,830	48.75	6,776,679	56.94	6,917,263	31.00
Alluvial diamond:						
Transvaal	22,268	325.21	26,882	506.93	23,902	282.00
Cape Province	1,995,046	172.45	1,645,920	189.12	1,171,100	144.59
Orange Free State	7	261.80	764	115.13	127	544.64
Total	2,017,321	174.13	1,673,566	194.19	1,195,129	147.38
Grand total	8,173,151	79.70	8,450,245	84.13	8,112,392	48.14

Source: Republic of South Africa Department of Mineral and Energy Affairs, Quarterly Information Circular, Minerals, October-December 1981, p. 2. 1 Rand = US$1.149 for 1981.

The 586,000 tons of ore from the Dutoitspan Mine came from the 760-meter block cave area and yielded 98,758 carats of diamond at a grade of 16.83 carats per 100 tons. The water tunnels around the pipe were completed in July and drainage-hole drilling from the tunnels was nearly complete. The headgear and the return airways to the new ventilation shaft were completed early in the year. The shaft was to the 580-meter level by yearend and commissioning was nearly complete. Drilling and sampling of the Kamfersdam kimberlite, 5-kilometers to the north, has continued with disappointing results.

Ore production at the Premier Mine, 10 kilometers north of Pretoria in Transvaal Province, declined 16% from that of 1980 to 6.8 million tons. Ore from the underground mine, at 5.2 million tons, was slightly less than that mined in 1980, the grade was substantially lower at 28.81 carats per 100 tons, and diamond output declined nearly 3% to 1,501,157 carats. The throughput of the retreatment plant was reduced to 1.6 million tons by the fine-grained material handled, but the grade of the dump ore increased nearly 60% to 33.64 carats per 100 tons, and production of diamonds increased to 538,654 carats from this source, to achieve Premier's total of 2,039,811 carats in 1981, greater by 625 carats than that of 1980. The heavy media separation plant for fines was an improvement on the old jig plant, but harder ore has adversely affected the release and recovery of small diamonds. The No. 3 ventilation shaft was completed by June, but the underground crusher was not commissioned until December because of poor ground conditions in the crusher chamber.

The Koffiefontein Mine, 80 kilometers southeast of Kimberley in the Orange Free State, recorded a 10% drop in ore production and a 25% drop in diamond production with 3.3 million tons of ore yielding 322,635 carats of diamonds at a grade of 9.89 carats per 100 tons. Opencast mining stopped in August and underground mining failed to reach the target rate because of large boulders of hard kimberlite left in the underground haulageways from open pit haulage roads blasted in the last stages of conversion to undergroung mining.

De Beers' Namaqualand Div. recovered virtually all of the company's alluvial diamonds but production was down 15% after closure of the new Tweepad facility in June because of declining prices and demand for gem diamonds. In the Koingnass area, 1.4 million tons of ore was treated with 288,900 tons of washed gravels from the Mitchells Bay screening and washing plant, to produce 550,119 carats of diamond at an average grade of 32.81 carats per 100 tons. The decline of 13% from that of 1980 was slightly more than was envisaged when the target production was reduced by 10% in

June. Similarly, the 19% reduction in the 4.5 million tons of terrace gravel from the Buffels complex was accompanied by a 17% decrease in recovery to 622,486 carats at a grade of 13.72 carats per 100 tons. The Langhoogte Mine treated 323,500 tons of ore and recovered 41,472 carats of diamonds, 9% less than that of 1980. Overburden stripping was completed at Langhoogte. Sand removal continued in the Tweepad-Annex Kleinzee area where erection of a new 46-cubic-meter-capacity dragline for overburden stripping was nearing completion.

De Beers was continuing to evaluate diamond-bearing terrace gravels in Namaqualand and kimberlites near Venetia in northern Transvaal Province.

The Messina (Transvaal) Development Co. Ltd. paid $1.15 million on March 1, 1981, for a 72% interest in the Bobbejaan kimberlite fissure mine owned by Guniting and Mining Enterprise (Pty.) Ltd., 60 kilometers west of Warrenton in northern Cape Province. The remaining 28% interest was acquired in October. Treatment of tailings and the ore extracted during underground mine development yielded diamonds at an average rate of 13 carats per 100 tons. Production was not declared, but 3,800 carats of diamonds were sold during the year at an average price of nearly $150 per carat.

Brazil Diamante Beperk erected a new recovery plant on the farm Hondeklip south of Kleinzee on the Namaqualand coast, and two other companies, Buffels Bank Diamante Beperk and Namex (Pty.) Ltd. commissioned new plants in Namaqualand's Richtersveld area.

The Alexander Bay State Alluvial Diamond Diggings produced 125,405 carats of diamonds in 1981, 10% less than that of 1980. The sales price averaged $245 per carat and the average size stone was 0.35 carat. The cumulative weight of the larger diamonds increased 19% to 2,245.7 carats, ranging in size from 9.8 to 109.6 carats. The increase was due to the greater recovery of diamonds from the seabed where the average size was 0.70 carat. Seabed production involved 348.8 cubic meters of gravel containing 9,477.3 carats of diamonds, more than twice the quantities involved in 1980. A substantial program of plant and infrastructure rehabilitation involved the expenditures of $1.3 million for new staff housing and almost $4 million for rehabilitation of the plant during 1981.

Fluorspar.—The country's position as the world's second largest fluorspar producer was maintained in 1981 despite a 5% decline in production to 496,521 tons. Gencor's Buffalo Mine continued to be the world's largest fluorspar mine with a capacity of 240,000 tons per year. The Rand Mines Ltd. Marico operation had the capacity to produce 180,000 tons per year of acidspar, and the nearby Ottoshoop Mine, operated by Chemspar Ltd. a subsidiary of Phelps Dodge Mining Ltd., had a capacity of almost 100,000 tons per year. The Vergenoeg Mining Co. Ltd., owned by Bayer A.G., continued operation of its 115,000-ton-per-year facility at Pienaarsriver. Early in 1981, it was announced that Armco Bronne, the exploration and development subsidiary of the U.S. company, Armco Inc., would spend $27 million to develop and mine a 20-million-ton fluorite deposit near Zeerust and export 200,000 tons of fluorite per year for the U.S. steel industry. It was later announced that the project had been discontinued. Most of the country's ceramic and metallurgical grades of fluorspar were sold for consumption by the domestic refractory and steel industries. Most of the acid-grade fluorspar was exported chiefly to the United States, Japan, and the Federal Republic of Germany. Total exports declined 13% to 405,958 tons but the value increased 25% from that of 1980 to $52 million.

Phosphate.—Most of the Republic's supply of phosphate fertilizer came from the Foskor operation at the Palabora carbonatite deposit in northeastern Transvaal Province. Apatite-bearing carbonatite containing 8% to 9% phosphorus pentoxide (P_2O_5) was mined and milled to a concentrate containing in excess of 30% P_2O_5. Most of the concentrate was sold to Federale Kunsmis Ltd. and Triomf Fertilizer (Pty.) Ltd., which manufactured phosphoric acid for export. Crude phosphate rock production was down 11% to 17.7 million tons, and concentrate production dropped 18% to 2.6 million tons in 1981 from that of 1980, largely because of Foskor cutbacks following weak demand for exports of phosphoric acid, largely to Brazil. Foskor continued to receive apatite-rich overburden stripped by Palabora to facilitate mining its copper ore and the coarse, apatite-rich tailings from the Palabora concentrator which were pumped directly into the Foskor mill. Like Palabora, Foskor instituted savings of diesel fuel by installing electric trolley lines over haul roads out of its open pit. In addition to the country's phosphoric acid production,

which amounted to 229,601 tons exported in 1981, about 825,000 tons of phosphatic fertilizers, and 1,880,000 tons of various artificially mixed fertilizer blends incorporating some phosphate, were manufactured in the Republic of South Africa.

MINERAL FUELS

Coal.—The value of the Republic's coal output set a new record of more than $2.4 billion in 1981, when production of bituminous coal increased 36% to 126.36 million tons and anthractie output rose 3% to 4.02 million tons. Total coal exports increased to nearly 30 million tons worth $1.12 billion, and local sales of nearly 98 million tons had a value of $1.30 billion. More than 60% of the coal sold locally was used for coal-fired power-generating stations which supply 93% of the country's electricity. A large part of the stations was operated by the state-managed Electricty Supply Commission (Escom). Sasol's Bossjesspruit coal mine, the source of raw material for the Sasol II and III plants, achieved a production of 1 million tons of coal during July, believed to be the world's largest monthly output from an underground mine. Bossjesspruit used two 2,000-ton-per-hour belt conveyors in the haulage drift to its 11-meter-diameter service shaft. Sasol II operated at 80% of its planned capacity in January 1981.

Other coal mining achievements during the year were: A continuous drum-type miner at Escom's Matla Colliery produced 118,794 tons of coal in May; a conventional mechanized section at AAC's Kriel Colliery produced 207,393 tons of coal during August; and a longwall section at Sasol I's Sigma Colliery had an output of 210,000 tons of coal during October.

Iscor's Grootegeluk's coal mine near Ellisras in northern Transvaal Province was officially opened in April 1981 and produced just over 700,000 tons of coking coal during the remainder of the year. Grootegeluk installed in-pit crushers and conveyor systems to expedite overburden removal, and an electric trolley system over the haulage roads out of the pit to conserve diesel fuel. Grootegeluk commenced the storage of 20 million tons of middlings coal to be used by Escom in 1986. The fine coal was spread into dumps by scoop-trams, leveled, and compacted to exclude air. A number of thermocouples were buried in the dump which was covered and monitored monthly with infrared photography to reveal areas of heat buildup. The first 1-million-ton dump was completed and a 4-million-ton unit was in progress at yearend.

Iscor's Durnacol Mine produced 1.3 million tons and the company purchased 4.3 million tons of coking coal from the private sector. The AAC's subsidiary, Anglo-American Coal Corp. Ltd., was the source of 28% of the country's coal output during 1981, and by yearend was contemplating the expenditure of more than $1.5 billion to develop and equip four new mines for supplying thermoelectric power stations and for export. The Kleinkopje opencast mine of AAC's South Africa Land and Exploration Co. Ltd. was increasing production to the scheduled 4.8 million tons per year. The plan was to supply 2.5 million tons for the export market, 1.6 million tons for the Transvaal Coal Owners Association, and 700,000 tons of low-ash, metallurgical coal to Iscor during 1982. The Reitspruit Colliery, jointly owned by Barlow Rand's TCL and Shell South Africa Ltd., a subsidiary of Royal Dutch/Shell, was establishing its place as one of the largest and most mechanized of the nation's opencast collieries.

The Minister of Mineral and Energy Affairs announced that after the 44-million-ton-per-year coal export target has been achieved, probably by the mid-1980's, an export ceiling of 80 million tons per year would apply. The country's coal reserves were restated as 110,000 million tons of which 51,000 million tons was extractable.

Petroleum.—The state-owned Southern Oil Exploration Corp. (Pty.) Ltd. spent $75 million chiefly on offshore drilling of 13 drillholes with an aggregate depth of 43,988 meters plus 1 hole abandoned at 533.4 meters because of adverse water currents. Two of 4 west coast drillholes warranted drill-stem-tests as did 6 of the 10 holes drilled off Mossel Bay and the south coast. The better results were encountered 90 kilometers south of Mossel Bay where hole F-A4 cut three sandstone zones with a total permeable thickness of 14 meters, which yielded 24 million cubic feet of gas and 46 cubic meters of natural gas liquids (NGL) per day. Hole F-A5 had one 6.5-meter zone permeable with 4.4 million cubic feet of gas and 18 cubic meters of NGL, and F-A6 had 10 meters permeable in two zones with 13 million cubic feet of gas and 25 cubic meters of NGL per day. The combined fractions contained 83% methane, 6% ethane, 3% propane, and 8% of higher hydrocarbons.

Sasol II's plant was completed in 1981 and production has intermittantly exceeded 80% of its designed capacity. Sasol III was judged 90% complete by December 1, 1981, and some front-end units had been started. Production was scheduled for the second quarter of 1982. Sasol's research and development department was building a pilot plant of an improved synthesis reactor at Sasolburg, and was discussing the erection of a coal gasifer with Westinghouse Electric Corp. of the United States, as an addition to the Lurgi-Sasol gasifiers presently employed.

Uranium.—Production of uranium oxide (U_3O_8) declined less than 1% during 1981 largely due to reduced production at Gencor's West Rand Consolidated Mine, 51%; JCI's Randfontein mine, 9%; and several small producers. Increased production was recorded at AAC's Joint Metallurgical Scheme in the Orange Free State, 12%; the Ergo tailings treatment plant in the Transvaal Province, 5%; Barlow Rand's Harmony Mine, 18%; and Rio Tinto-Zinc Corp.'s Palabora Copper Mine, 62%. Production records from 1978 through 1981 are shown in table 7. West Rand Consolidated announced in July its intention to cease operating its uranium section and to concentrate on gold recovery. In August 1981, Gencor announced that its $200 million Beisa uranium mine, held and developed by Union Corp. Ltd. since 1938 and due to come onstream early in 1982, would be acquired by St. Helena Gold Mines Ltd. so that the capital outlay could be deducted from the latter's taxes. Reimbursement to Beisa was to be in preference shares issued by St. Helena that entitled the holders to 85% of Beisa's net profit after payment of royalties, taxes, capital expenditures, etc. Royalty of 15% of Beisa's gross income was payable to an AAC subsidiary and to Gencor as the most recent owners of the Beisa property.[5]

[1]Physical scientist, Division of Foreign Data.
[2]Where necessary, values have been converted from South African rand (R) to U.S. dollars at the rate of R1=US$1.2854 for 1980 and R1=US$1.149 for 1981, as shown in the International Financial Statistics, v. 35, No. 7, July 1982, p. 366.
[3]U.S. Embassy, Pretoria. State Department Airgram A-43, June 8, 1982, p. 2, para. 3.
[4]Sources: De Beers Consolidated Mines Ltd. Annual Report 1981; Republic of South Africa Department of Mines and Energy Affairs, Annual Report 1981.
[5] Mining Magazine. Beisa Mine. June 1982, pp. 448-457.

Table 7.—Republic of South Africa: Production of U_3O_8, by producer

(Kilograms)

Producer	1978	1979	1980	1981
AAC Joint Metallurgical Scheme[1]	653,059	676,262	977,116	1,093,416
Blyvooruitzicht	292,212	285,710	324,482	315,502
Buffelsfontein	620,000	620,400	603,800	631,750
East Rand Gold and Uranium Ltd. (Ergo)	117,828	238,734	295,314	302,194
Harmony	534,839	540,925	490,822	580,428
Hartebeestfontein	365,889	394,210	435,242	478,663
Palabora Copper	140,860	121,252	140,000	234,206
Randfontein	96,081	412,959	646,452	591,774
Vaal Reefs	1,059,851	1,273,415	1,758,386	1,693,569
West Driefontein	295,119	288,274	251,656	242,327
West Rand Consolidated	312,914	367,512	385,924	190,258
Western Deep Levels	183,365	199,002	212,562	212,484
Miscellaneous	--	218,345	773,619	667,856
Total	4,672,017	5,637,000	7,295,375	7,234,427

[1]Includes recovery of U_3O_8 from concentrates and tailings produced by the Free State Geduld, Free State Saaiplaas, President Brand, President Steyn, Welkom, and Western Holdings Mines, all subsidiaries of Anglo-American Corp. in the Orange Free State Province.

Source: Chamber of Mines of South Africa. Quarterly Analysis of Working Results, October-December 1978-81; Republic of South Africa, Department of Mineral and Energy Affairs, Quarterly Statistical and Other Data on Minerals, October-December 1981; Annual Reports, Palabora Mining Co. Ltd. 1978-81, and East Rand Gold and Uranium Co. Ltd., 1978-81.

The Mineral Industry of Spain

By Roman V. Sondermayer[1]

During 1981, Spain remained mineral-poor relative to its industrial demand. Imports of mineral commodities into Spain were approximately 70% of the value of minerals, including fuels, that Spain consumed during 1981. To alleviate this dependence on foreign sources of raw materials and relieve pressure on the trade balance, the Government of Spain continued to make efforts to increase domestic production of minerals available in the country and to encourage export of these minerals.

However, Spain was an important producer and processor of certain minerals during 1981. The minerals produced in Spain with global significance were mercury, with a 24% share of world production; pyrites, with 11%; fluorspar, with 6%; and potash, with 2%. Activities of the mineral sector varied from commodity to commodity; growth was strongest in coal production, reflecting the switch to coal consumption in the country.

Activities in sectors producing and processing nonenergy minerals were partly affected by recession. Stagnation and reduced demand were characteristic of the nonfuel sector during 1981. Mineral commodities whose prices declined on world markets had the lowest level of activity.

Some commodities, such as aluminum, lead, and zinc, however, showed some improvement in their operations during 1981. These improvements resulted from efforts of the Government to foster the Plan National de Abastecimiento de Materias Primas Minerales (National Mineral Raw Materials Supply Plan).

During 1981, the economy of Spain suffered severe losses in agriculture owing to an unprecedented drought. Large imports of food put an additional burden on the trade balance. Industrial output was at the same level as that of the previous year. Unemployment was between 13% and 14% of the labor force while inflation was at 14%. The mineral industry's share in the gross national product was between 11% and 12%, including metal refining, petroleum refining, and the processing of nonmetals; however, the extractive sector's share alone was less than 1%. The mineral industry, including processing, employed about 500,000 persons during 1981.

Principal events in the mineral industry of Spain during 1981 included closing of the Aznalcóllar copper mine, development of the Sotiel copper mine, exploration of a lead and zinc deposit at La Troya, and the beginning of production at four new coal mines.

Table 1.—Spain: Principal mineral industry companies and locations, by commodity

Commodity	Major companies	Location of principal facilities
Alumina	Alúmina de España S.A	Plant at San Ciprián.
Aluminum	Aluminio Español S.A	Do.
Do	Endasa S.A	Plant at Aviles and Valladolid.
Do	Aluminio de Galicia S.A	Plant at La Coruña and Sabiñánigo.
Bituminous coal	Hunosa S.A	Mines in Asturias.
Cement	Asland S.A	5 plants.
Copper ore	Rio Tinto Minero S.A	Mines at Rio Tinto.
Copper, refined	do	Refinery at Huelva.
Ferroalloys	Soc. Espanola de Carburos Metálicos S.A	Plant at Berga.
	Hidro Nitro Espanolas S.A	Plant at Monzón.
	Ferroaleaciones Espanolas S.A	Plant at Medina del Campo.
Iron ore	Cía. Andalusa de Minas S.A	Mine at Marquesado.
Lead ores	Sociedad Minera y Metallúrgica de Peñarroya de Espana.	Mines at Mantas de los Azules, Unión.
Lead smelter	do	Smelter at Santa Lucía.
Mercury	Cousejo de Administration de Minas de Almadén.	Mines and smelter at Almadén.
Petroleum, refined	Empresa Nacional del Petróleo S.A	Refineries at Valle de Escombreras, Puertolano, and Tarragona.
Do	Cía. Esp. de Petróleos S.A	Refineries at St. Cruz de Tenerife, Algeciras.
Potash	Potasas de Navarra S.A	Mine near Pamplona.
Do	Minas de Potasas se Suria S.A	Mine near Suria.
Do	Unión Explosivos Rio Tinto S.A	Mines at Balsarney-Sallent and Cardona.
Pyrite	Tharsis Sulfur and Copper Co. Ltd	Mines at Tharsis and La Zarza.
Steel	Empresa Nacional Siderurgica S.A	Works at Aviles, Felguera, Gijón-Moreda, and Gijón-Verina.
Do	Altos Hornos de Vizcaya S.A	Work at Baracaldo-Sestao.
Zinc ore	Real Cía. Asturiana de Minas S.A	Mines at Reocín and Rubiales.
Zinc, smelter	do	Electrolytic zinc plant at San Juan de Nieva.

PRODUCTION

Latest trends in production for 1977-81 are shown in table 2.

Table 2.—Spain: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum:					
Bauxite	9,614	9,274	16,845	7,899	9,000
Metal:					
Primary	211,167	212,100	259,511	386,492	[2]396,600
Secondary	40,000	39,100	42,000	43,000	40,000
Antimony, mine output, metal content	331	442	501	625	600
Arsenic, white[e]	10	10	--	--	--
Cadmium metal	303	253	222	309	310
Copper:					
Mine output, metal content	[r]35,962	[r]33,948	25,644	42,483	51,400
Metal:					
Blister:					
Primary	99,500	95,500	90,300	[r e]85,100	128,100
Secondary	18,000	17,000	18,000	[r e]18,000	20,000
Total	117,500	112,500	108,300	103,100	[2]148,100
Refined:					
Primary	130,000	117,000	119,400	127,700	122,400
Secondary	29,000	30,000	25,000	30,000	30,000
Total	159,000	147,000	144,400	157,700	[2]152,400
Gold, mine output, metal content—troy ounces	117,800	102,882	91,404	108,154	105,000
Iron and steel:					
Ore and concentrate including byproduct concentrate:					
Gross weight—thousand tons	8,327	8,580	8,827	9,227	8,565
Iron content—do	4,122	3,906	3,994	4,372	4,218
Metal:					
Pig iron—do	[r]6,622	[r]6,243	6,454	6,720	[2]6,423
Electric-furnace ferroalloys—do	[r]305	[r]375	434	374	283

See footnotes at end of table.

Table 2.—Spain: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS —Continued					
Iron and steel —Continued					
Metal —Continued					
Steel:					
Crude ---------- thousand tons	10,921	r e11,044	r e12,058	12,333	12,662
Castings and forgings------do	181	r e225	r e246	253	250
Total ----------do	11,102	r11,269	12,304	12,586	212,912
Semimanufactures----------do	12,164	10,801	9,202	9,472	NA
Lead:					
Mine output, metal content ----------	65,540	71,341	72,262	87,105	83,000
Metal:					
Primary ----------	89,177	83,400	87,200	84,300	77,000
Secondary ----------	29,400	38,800	39,800	37,400	39,600
Mercury:					
Mine output, metal content					
76-pound flasks--	26,850	29,588	33,275	49,198	50,000
Metal ----------do	27,031	31,037	32,375	48,038	49,000
Silver: Mine output, metal content					
thousand troy ounces--	2,966	2,924	3,168	4,526	4,800
Tantalum minerals (tin byproduct):					
Gross weight ---------- kilograms--	NA	NA	NA	50,700	NA
Tantalum content ----------	NA	NA	NA	9,338	NA
Tin:					
Mine output, metal content ----------	641	711	496	437	475
Metal, primary----------	5,343	4,575	4,412	4,100	3,400
Titanium dioxide ----------	39,478	39,336	e40,000	e40,000	40,000
Tungsten, mine output, metal content--------	307	358	394	446	340
Uranium, mine output, U_3O_8 content --------	254	284	349	394	290
Zinc:					
Mine output, metal content ----------	98,316	146,844	142,745	183,120	180,000
Metal, primary and secondary----------	156,600	177,000	182,700	151,800	184,000
NONMETALS					
Barite ----------	84,280	71,457	74,700	59,827	65,000
Bromine[e] ----------	r400	r400	400	400	400
Cement, hydraulic, other than natural					
thousand tons--	27,995	30,233	27,912	28,460	28,600
Clays:					
Attapulgite ----------	335,812	39,230	62,423	48,020	NA
Bentonite ----------	114,600	108,318	120,678	97,705	110,000
Kaolin, marketable:					
Crude----------	66,490	57,961	72,425	46,066	50,000
Washed----------	232,145	193,136	204,106	181,116	NA
Refractory, not further described----------	352,519	294,799	427,817	NA	460,114
Other ----------thousand cubic meters--	9,165	8,984	8,590	r e7,838	NA
Diatomite and tripoli ----------	28,281	21,370	27,196	23,460	23,500
Feldspar----------	93,222	116,283	115,685	103,365	105,000
Fluorspar:					
Gross weight:					
Acid-grade----------	211,825	201,505	155,278	204,596	272,500
Metallurgical-grade ----------	98,636	99,790	37,620	40,153	40,200
Total ----------	310,461	301,295	192,898	244,749	312,700
CaF_2 content:					
Acid-grade----------	205,905	195,994	150,327	198,152	259,500
Metallurgical-grade ----------	75,960	76,893	28,600	29,631	31,500
Total ----------	281,865	272,887	178,927	227,783	291,000
Gypsum and anhydrite, crude-- thousand tons--	5,482	5,369	5,275	5,223	5,200
Kyanite, andalusite, related materials--------	2,981	5,087	5,355	6,471	6,500
Lime, hydrated and quicklime[e] - thousand tons--	400	350	400	450	450
Magnesite:					
Calcined----------	161,869	128,627	147,761	153,933	150,000
Crude ----------	421,241	306,548	381,867	505,532	500,000
Meerschaum ----------	97,630	131,817	202,810	286,232	NA
Mica ----------	2,934	3,345	5,169	4,831	4,800
Nitrogen: N content of ammonia					
thousand tons--	965	880	820	800	800
Pigments, mineral:					
Ocher ----------	12,365	12,227	15,078	13,696	14,000
Red iron oxide ----------	36,261	e24,000	e25,000	e25,000	25,000
Potash salts, K_2O equivalent ----------	561,630	612,581	667,560	658,230	705,000
Pumice ----------	931,793	902,402	779,118	1,086,417	1,000,000
Pyrites including cuprous, gross weight					
thousand tons--	2,423	2,292	2,366	2,394	2,400
Salt:					
Rock including byproduct from potash works					
do----	1,901	2,092	2,187	2,379	2,400
Marine and other ----------do----	1,200	1,277	1,260	1,129	1,200

See footnotes at end of table.

Table 2.—Spain: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Sand and gravel: Silica sand ___ thousand tons__	[4]2,844	[4]2,438	[4]2,178	2,425	NA
Sodium compounds:					
Sodium carbonate, manufactured ___ do___	[e]320	499	[e]500	[e]505	500
Sodium sulfate:					
Natural:					
Glauberite, Na_2SO_4 content	73,705	104,492	101,780	37,735	40,000
Thenardite, Na_2SO_4 content	107,411	102,975	106,022	118,324	120,000
Manufactured	174,307	121,704	[e]175,000	[e]175,000	175,000
Stone:[5]					
Calcareous:					
Chalk ___ thousand tons__	311	276	282	278	160
Dolomite ___ do___	1,797	1,948	1,909	2,043	NA
Limestone ___ do___	95,433	89,958	85,379	81,239	NA
Marble ___ do___	769	722	823	753	NA
Marl ___ do___	6,483	6,557	7,708	7,150	NA
Basalt ___ do___	1,766	1,391	1,434	920	NA
Granite ___ do___	5,712	6,693	6,794	7,224	NA
Ofite ___ do___	1,208	1,066	1,169	458	NA
Phonolite ___ do___	325	329	466	255	NA
Porphyry ___ do___	288	490	462	396	NA
Quartz ___ do___	650	717	790	708	NA
Quartzite ___ do___	399	426	448	401	NA
Sandstone ___ do___	2,055	1,749	1,265	1,633	NA
Serpentine ___ do___	263	306	409	302	NA
Other ___ do___	29,364	29,308	29,855	29,890	NA
Strontium minerals:					
Gross weight	11,000	14,000	18,000	19,000	20,000
Sr_2O_4 content	9,680	12,320	16,560	17,480	18,500
Sulfur:					
S content of pyrites ___ thousand tons__	1,099	1,046	1,091	1,096	1,100
Byproduct:					
Of metallurgy ___ do___	129	117	120	125	135
Of petroleum ___ do___	5	10	10	12	12
Of coal (lignite) gasification ___ do___	2	3	3	3	3
Talc and steatite	60,070	61,892	71,047	73,949	75,000
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural	14,556	13,100	8,710	NA	NA
Carbon black	52,745	[e]53,000	53,000	54,000	NA
Coal (marketable):					
Anthracite ___ thousand tons__	3,761	3,831	3,796	4,077	NA
Bituminous ___ do___	8,115	7,668	8,049	9,070	NA
Lignite ___ do___	5,813	8,272	10,696	15,390	NA
Total ___ do___	17,689	19,771	22,541	28,537	NA
Coke, metallurgical ___ do___	4,276	3,886	3,897	4,000	NA
Fuel briquets:					
Briquets ___ do___	7	7	6	NA	NA
Ovoids ___ do___	69	43	40	40	NA
Gas, natural, marketed ___ million cubic feet__	152	531	363	300	NA
Peat	41,721	31,519	46,379	44,367	44,000
Petroleum:					
Crude ___ thousand 42-gallon barrels__	7,203	7,134	8,383	11,732	11,969
Refinery products:					
Gasoline, motor ___ do___	44,750	46,719	46,844	45,452	NA
Jet fuel ___ do___	16,282	19,055	17,928	17,091	NA
Kerosine ___ do___	2,264	893	473	1,061	NA
Distillate fuel oil ___ do___	96,434	78,136	83,272	80,219	NA
Residual fuel oil ___ do___	137,246	138,875	139,663	151,365	NA
Lubricants including grease ___ do___	1,791	1,706	1,657	2,386	NA
Other ___ do___	39,170	44,289	[e]44,000	47,346	NA
Refinery fuel and losses ___ do___	16,896	20,848	[e]21,000	21,700	NA
Total ___ do___	354,833	350,521	354,837	366,620	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 23, 1982.

[2]Reported figure.

[3]In previous editions, reported as "Earths, industrial, n.e.s." clay.

[4]Includes sand obtained as a byproduct of feldspar and kaolin production.

[5]Units revised.

TRADE

For the past several years, Spanish imports of minerals heavily taxed the country's balance of payments, and during 1981, this situation continued. Tables 3 and 4 show details of Spain's foreign trade in minerals, as reported by the Spanish Government.

Table 3.—Spain: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	1,106	6,173	--	West Germany 3,600; Portugal 2,573.
Oxides and hydroxides	69	82	--	Portugal 52; United Kingdom 12; Yugoslavia 12.
Metal including alloys:				
Scrap	684	204	1	West Germany 78; Italy 69; France 20.
Unwrought	42,870	106,782	--	France 20,889; Netherlands 17,202; Portugal 16,149.
Semimanufactures	21,755	19,495	993	Portugal 3,865; France 3,660; Japan 1,749.
Antimony:				
Oxides and hydroxides	44	44	--	All to France.
Elemental	593	370	--	Netherlands 200; Tunisia 38; France 35.
Bismuth metal including alloys, all forms	4	--		
Chromium:				
Chromite	4,099	6,267	--	Belgium 3,508; Sweden 2,754.
Oxides and hydroxides	72	533	--	Iran 440; West Germany 40; Israel 20.
Cobalt: Oxides and hydroxides	11	1	--	All to Saudi Arabia.
Copper:				
Ore and concentrate	98	--		
Matte	325	233	--	West Germany 215.
Oxides and hydroxides	92	76	21	Netherlands 54.
Sulfate	297	88	--	Netherlands 88.
Metal including alloys:				
Scrap	704	884	--	West Germany 441; France 210; Italy 95.
Unwrought	35,856	66,294	88	France 18,331; Belgium-Luxembourg 16,076; Italy 13,672.
Semimanufactures	20,065	22,505	512	Iran 5,026; Morocco 3,487; Italy 2,652.
Gold:				
Waste and sweepings ---- value	$20,318	$194,848	--	West Germany $121,838; Finland $53,416.
Metal including alloys, unwrought and partly wrought ---- thousand troy ounces	193,837	26,717	--	United Kingdom 10,610; West Germany 9,645; France 6,141.
Iron and steel:				
Ore and concentrate, except roasted pyrites thousand tons	1,995	2,088	--	Netherlands 800; Romania 475; West Germany 375.
Roasted pyrites	329,519	371,653	--	West Germany 348,950; France 22,227.
Metal:				
Scrap	172	869	79	Belgium-Luxembourg 429; Morocco 150; West Germany 138.
Pig iron including cast iron	81,993	31,291	1	Romania 10,180; Yugoslavia 9,455; Sweden 7,176.
Sponge iron, powder, shot	13,397	16,656	2	Italy 9,050; France 1,753; West Germany 1,529.
Ferroalloys:				
Ferromanganese	53,481	31,334	9,121	West Germany 9,128; Italy 3,502; Venezuela 2,004.
Other	120,350	90,069	8	West Germany 34,624; Japan 12,643; United Kingdom 9,805.
Steel, primary forms	248,421	544,839	6,844	Yugoslavia 66,799; Iran 50,232; France 39,546.

Table 3.—Spain: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	2,742	2,799	219	Iran 392; West Germany 225; Morocco 210; France 162.
Universals, plates, sheets	802,304	645,371	105,360	West Germany 70,411; Italy 45,183; Mexico 39,355; Norway 34,783.
Hoop and strip	27,172	29,981	21	Bulgaria 4,597; West Germany 3,906; Romania 3,682.
Rails and accessories	11,502	3,760	2	Saudi Arabia 2,638; Poland 845.
Wire	39,114	42,799	888	Portugal 9,312; Algeria 7,591; France 6,626.
Tubes, pipes, fittings	364,364	467,226	95,118	U.S.S.R. 51,478; France 48,759; West Germany 44,619.
Castings and forgings, rough	28,143	11,448	1,153	France 3,749; Belgium-Luxembourg 1,397; Canada 1,196.
Lead:				
Ore and concentrate	34	9,394	--	Romania 2,719; West Germany 2,284; Netherlands 2,257.
Oxides and hydroxides	20	1	--	Mainly to Guinea.
Metal including alloys:				
Scrap	--	240	--	All to Portugal.
Unwrought	19,644	7,633	--	U.S.S.R. 4,000; Belgium-Luxembourg 1,727; Italy 1,500.
Semimanufactures	1,293	3,286	217	U.S.S.R. 2,000; France 896.
Lithium: Oxides and hydroxides kilograms	--	16	--	All to Portugal.
Magnesium metal including alloys, all forms	--	2	--	Argentina 1; United Kingdom 1.
Manganese:				
Ore and concentrate	138	68	--	All to Portugal.
Oxides and hydroxides	3,000	3,202	--	France 1,393; Italy 779; U.S.S.R. 500.
Mercury 76-pound flasks	37,798	19,290	2,002	Belgium 2,901; Romania 2,495; France 2,002.
Molybdenum metal including alloys, all forms	724	10	--	West Germany 9.
Nickel:				
Ore and concentrate	--	5	--	All to United Kingdom.
Metal including alloys:				
Scrap	302	168	--	France 117; United Kingdom 39.
Unwrought	193	11	--	United Kingdom 8.
Semimanufactures	601	29	--	Algeria 11; Venezuela 6; Switzerland 2.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	47,615	9,999	--	Switzerland 5,337; West Germany 3,794.
Selenium, elemental	1	5	--	West Germany 5.
Silicon, elemental	16,464	13,667	--	Japan 8,495; France 1,902; U.S.S.R. 1,000.
Silver:				
Ore and concentrate[1]	10	27	--	All to Portugal.
Waste and sweepings[1] value	$839,741	$425,000	--	France $223,000; West Germany $193,000.
Metals including alloys, unwrought and partly wrought thousand troy ounces	3,344	184,002	--	Netherlands 176,327.
Tantalum:				
Ore and concentrate	25	56	27	West Germany 15; Netherlands 6.
Metal including alloys, all forms	4	5	--	West Germany 2; France 1.
Tin:				
Oxides and hydroxides	730	72	--	All to Portugal.
Metal including alloys:				
Scrap	94	65	--	United Kingdom 60.
Unwrought	567	229	--	Netherlands 95; United Kingdom 79.
Semimanufactures	58	259	--	Netherlands 95; United Kingdom 80; France 40.
Titanium oxides and hydroxides	12,894	11,494	2,269	France 2,858; West Germany 1,234; Italy 1,040.

See footnotes at end of table.

Table 3.—Spain: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Tungsten:				
Ore and concentrate	615	4,216	31	Netherlands 3,623; West Germany 386.
Metal including alloys, all forms	31	49	(2)	Netherlands 18; West Germany 14.
Uranium: Ore and concentrate	(2)	37	--	All to France.
Zinc:				
Ore and concentrate	13,891	54,796	--	Italy 19,260; Belgium-Luxembourg 15,070; U.S.S.R. 10,977.
Oxides and hydroxides	659	838	--	Denmark 420; Italy 167; Egypt 100.
Metal including alloys:				
Blue powder	954	128	--	France 105; West Germany 22.
Unwrought and semimanufactures	84,106	93,905	41,669	Netherlands 29,852.
Zirconium: Ore and concentrate	39	97	--	All to Portugal.
Other:				
Ores and concentrates	r27	14	--	All to United Kingdom.
Ash and residue containing nonferrous metals	38,402	28,068	--	Sweden 11,196; East Germany 6,427; Belgium 6,153.
Oxides, hydroxides, peroxides	r10,981	1,513	2	Algeria 1,134.
Metals:				
Alkali, alkaline-earth	57	57	--	Italy 30; Austria 18.
Pyrophoric alloys	18	32	--	Portugal 31.
Base metals including alloys, all forms	260	59	1	United Kingdom 21; West Germany 12; France 9.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	2,039	1,666	--	West Germany 934; Portugal 180; Sweden 163.
Artificial: Corundum	2,780	3,598	60	Italy 1,628; West Germany 1,089; Netherlands 313.
Dust and powder of precious and semiprecious stones value, thousands	$114	$98	$21	Italy $58.
Grinding and polishing wheels and stones	2,616	3,029	147	West Germany 1,078; France 258; Austria 204.
Asbestos, crude	41	17	--	West Germany 11; Mexico 4.
Barite and witherite	74,678	52,018	36	West Germany 31,720; Republic of South Africa 4,047; Cameroon 3,500.
Boron materials:				
Crude natural borates	367	69	--	West Germany 64.
Oxides and acids	781	412	198	Netherlands 108; Iran 50.
Cement thousand tons	9,592	10,057	300	Saudi Arabia 3,740; Nigeria 1,405; Egypt 1,175.
Chalk	23,877	32,178	--	Algeria 14,666; Libya 5,110; Sweden 2,700.
Clays and clay products:				
Crude:				
Bentonite	39,876	32,581	--	Portugal 17,680; West Germany 2,606; France 2,367.
Kaolin (china clay)	71,794	79,407	--	Poland 24,612; West Germany 15,102; Ireland 7,713.
Other	42,612	40,097	1	United Kingdom 6,030; France 5,841; Portugal 5,804.
Products:				
Nonrefractory	335,265	548,932	16,900	France 135,869; Saudi Arabia 63,574; West Germany 44,436.
Refractory including nonclay brick	23,411	29,993	450	Egypt 7,005; Cuba 5,946; France 2,938.
Cryolite and chiolite	16	--		
Diamond:				
Gem, not set or strung value	$139,978	$1,049,000	--	Belgium-Luxembourg $701,000; Switzerland $321,000.
Industrial do	$142,436	$250,000	--	Belgium-Luxembourg $146,000; Mexico $66,000; Netherlands $38,000.
Diatomite and other infusorial earth	1,453	1,673	--	Belgium 505; United Kingdom 347; Italy 326.

See footnotes at end of table.

Table 3.—Spain: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Feldspar	1,901	1,582	--	United Kingdom 1,260.
Fertilizer materials:				
Crude and manufactured:				
Nitrogenous	77,752	65,250	--	West Germany 36,648; Indonesia 10,500; Ireland 6,711.
Phosphatic	4,107	7,473	--	Ireland 4,200; United Kingdom 1,920; Cameroon 1,300.
Potassic	677,503	574,354	22,620	Portugal 79,590; Brazil 60,899; Nicaragua 58,620.
Other including mixed	176,100	262,273	--	Turkey 135,195; Venezuela 27,585; China 26,000.
Ammonia	39	15	--	Mauritania 8; Guinea 5.
Fluorspar	101,546	107,518	11,864	Italy 44,570; West Germany 18,992; U.S.S.R. 9,955.
Graphite:				
Artificial and colloidal	778	833	--	France 406; Portugal 241; Japan 99.
Natural	3	8	--	Pakistan 4; Tunisia 2.
Gypsum and plasters thousand tons	1,111	1,120	174	Denmark 263; Sweden 262; Finland 122.
Iodine	1	1	--	Mainly to West Germany.
Lime	7,776	3,889	--	Guinea 2,182; Portugal 711.
Magnesite	93,459	91,165	1,500	West Germany 33,588; United Kingdom 20,114; France 12,893.
Mica, all forms	4,173	6,283	--	United Kingdom 3,249; Nicaragua 2,780.
Pigments, mineral: Iron oxides, processed	11,246	12,044	736	United Kingdom 1,887; Venezuela 1,620; Australia 902.
Precious and semiprecious stones, except diamond:				
Natural value	$173,810	$557,000	--	Switzerland $228,000; Belgium-Luxembourg $117,000; Canada $89,000.
Manufactured do	$722,592	$556,000	$14,000	Switzerland $496,000.
Pyrites, unroasted	126,963	234,887	--	Belgium 182,163; Greece 26,146; Italy 10,248.
Salt and brine	782,353	479,733	89,989	Italy 117,256; Iceland 83,820; Norway 59,197.
Sodium compounds, n.e.s:				
Caustic potash	5,554	3,876	180	West Germany 618; Switzerland 528; Netherlands 479.
Caustic soda	115,819	92,459	--	Iraq 13,350; Portugal 12,817; Ivory Coast 5,900.
Soda ash	4,519	71,999	--	Argentina 43,754; Algeria 8,758; Italy 7,093.
Stone, sand and gravel:				
Dimension stone:				
Crude or partly worked:				
Calcareous	37,239	53,366	68	Italy 31,186; United Kingdom 11,173.
Slate	4	129	--	Andorra 79; France 50.
Other	101,901	153,266	--	Italy 129,726; France 9,934; West Germany 4,015.
Worked:				
Slate	172,093	161,490	58	France 132,619; West Germany 16,394.
Paving stone and flagstone	177	951	--	Saudi Arabia 709; Italy 174.
Other	21,864	29,753	566	West Germany 11,048; Saudi Arabia 9,098.
Dolomite, chiefly refractory-grade	105,399	75,885	--	United Kingdom 46,720; West Germany 22,000.
Gravel and crushed rock	33,992	35,658	--	Morocco 22,375; Andorra 5,519.
Limestone except dimension	99,434	5,694	--	All to Belgium.
Quartz and quartzite	333,698	357,702	--	Norway 265,884; France 59,862.
Sand excluding metal-bearing	385,786	351,491	(2)	Andorra 344,050; Portugal 7,042.
Sulfur:				
Elemental, all forms	17,733	13,257	--	Algeria 6,957; Norway 4,289; France 1,935.
Sulfuric acid	175	17,417	--	Algeria 12,736; Belgium 4,615.

See footnotes at end of table.

Table 3.—Spain: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Talc, steatite, soapstone, pyrophyllite	15,030	11,357	--	Cuba 3,400; West Germany 3,054; United Kingdom 1,840.
Other:				
Crude	535,133	563,549	752	France 180,787; Belgium 169,557; West Germany 88,571.
Slag, dross, similar waste, not metal-bearing	102,208	77,450	--	West Germany 33,131; Portugal 22,455; France 15,687.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	394	49	--	Republic of South Africa 25; Canada 18.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	38,717	41,766	217	France 20,717; Tunisia 6,236; Iceland 2,772.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	35	1	--	All to Ecuador.
Carbon black	11,577	16,221	10	Portugal 6,612; France 3,409; Morocco 2,919.
Coal and briquets:				
Anthracite and bituminous coal	14,475	17,196	--	Belgium-Luxembourg 13,725; Portugal 3,252.
Briquets of anthracite and bituminous coal	60	--		
Lignite and lignite briquets	436	28	--	All to Andorra.
Coke and semicoke	3,378	3,124	--	France 2,066; Mexico 1,000.
Gas, natural	--	21	--	Angola 14; Morocco 7.
Hydrogen, helium, rare gases	1,418	1,329	--	Belgium 979; France 123; Italy 112.
Peat including briquets and litter	163	16	--	All to Portugal.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	(2)	1,057	--	Spain 631; Libya 422.
Refinery products:				
Gasoline, aviation and motor ---do---	895	1,088	--	Italy 257; Netherlands 241; France 203.
Kerosine and jet fuel ---do---	530	560	--	Greece 165; Singapore 140; Sweden 125.
Distillate fuel oil ---do---	2,087	4,707	205	Italy 1,304; Netherlands 687; India 427.
Residual fuel oil ---do---	6,847	6,686	--	Sweden 1,052; Netherlands 789; France 274.
Lubricants ---do---	51	1,646	38	Italy 531; Mexico 224; Nigeria 202.
Other:				
Liquefied petroleum gas ---do---	29	2	--	Cape Verde 1.
Mineral jelly and wax ---do---	7	20	1	Morocco 6; Argentina 4; Portugal 2.
Petroleum coke ---do---	--	2,855	--	Italy 2,615.
Bitumen and other residues ---do---	r3,105	2,140	--	Libya 1,384; Algeria 375.
Bituminous mixtures ---do---	405	666	--	Nigeria 322; Libya 241.
Unspecified ---do---	1,294	1,572	--	All to Italy.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r180,314	207,479	26,329	Italy 62,487; Netherlands 60,890; France 42,184.

r Revised.
[1]May include platinum-group metals.
[2]Less than 1/2 unit.

Table 4.—Spain: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate	142,818	349,384	--	Guinea 187,966; Guyana 60,472.
Oxides and hydroxides	559,226	706,581	613	Guinea 273,078; Jamaica 224,528; France 94,182.
Metal including alloys:				
Scrap	4,080	5,631	1,553	Portugal 3,106; France 341.
Unwrought	7,152	3,164	511	Italy 652; Venezuela 576; West Germany 425.
Semimanufactures	14,617	16,769	3,568	West Germany 3,245; France 2,378; Belgium-Luxembourg 2,305.
Antimony:				
Ore and concentrate	664	657	--	Thailand 330; Morocco 220.
Oxides and hydroxides	242	210	--	France 105; United Kingdom 54; China 20.
Elemental	199	35	--	France 16; Czechoslovakia 12.
Arsenic: Elemental	19	18	3	Sweden 14.
Beryllium metal including alloys, all forms kilograms	10	12	--	West Germany 11.
Bismuth metal including alloys, all forms	102	72	--	Mexico 32.
Cadmium metal including alloys, all forms	(1)	10	--	All from West Germany.
Chromium:				
Chromite	117,977	84,558	--	Republic of South Africa 49,649; Turkey 17,430; Albania 9,852.
Oxides and hydroxides	135	133	1	West Germany 123; United Kingdom 9.
Metal including alloys, all forms	6	19	1	West Germany 11; United Kingdom 5.
Cobalt oxides and hydroxides	75	72	13	Belgium 28; Canada 14.
Copper:				
Ore and concentrate	191,109	204,097	--	Papua New Guinea 56,859; Mexico 43,769; Chile 43,156.
Matte	12,498	3,811	645	France 2,277; Italy 762.
Oxides and hydroxides	475	383	--	West Germany 155; Italy 87; Norway 60.
Sulfate	1,517	499	--	France 498.
Metal including alloys:				
Scrap	18,951	35,852	17,632	France 8,028; Canada 2,379; United Kingdom 1,613.
Unwrought	64,396	49,521	123	Chile 24,513; Belgium-Luxembourg 15,872.
Semimanufactures	r28,195	100,041	1,058	Austria 67,972; France 9,413; United Kingdom 4,994.
Gold:				
Ore and concentrate kilograms	350	27	NA	Republic of South Africa 11; Peru 8; Chile 6.
Waste and sweepings value, thousands	$250,768	$179,389	$6	Switzerland $120,493; United Kingdom $35,995; France $22,422.
Metal including alloys, unwrought and partly wrought thousand troy ounces	80	96	(1)	Mainly from West Germany.
Iron and steel:				
Ore and concentrate, except roasted pyrites thousand tons	5,195	4,757	--	Brazil 1,936; Venezuela 760; Liberia 654.
Roasted pyrites	--	26	--	All from France.
Metal:				
Scrap thousand tons	2,927	3,926	1,107	United Kingdom 1,861; France 393.
Pig iron including cast iron	44,312	54,163	--	Republic of South Africa 23,113; Canada 19,165; France 4,521.
Sponge iron, powder, shot	136,600	119,532	208	Canada 86,492; Venezuela 15,483; Trinidad and Tobago 10,000.
Ferroalloys	46,557	70,031	1,495	France 28,477; Republic of South Africa 22,351; Sweden 5,089.
Steel, primary forms	509,314	591,955	5	West Germany 210,764; France 185,520; Belgium-Luxembourg 69,090.
Semimanufactures:				
Bars, rods, angles, shapes, sections	172,056	201,786	352	Japan 43,929; France 33,924; West Germany 33,707.

See footnotes at end of table.

Table 4.—Spain: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures —Continued				
Universals, plates, sheets	266,890	350,537	2,575	West Germany 128,290; France 76,384; Netherlands 59,288.
Hoop and strip	66,036	84,505	108	West Germany 31,377; France 29,547; Netherlands 7,771.
Rails and accessories	2,218	2,358	--	United Kingdom 1,221; West Germany 639; Belgium-Luxembourg 345.
Wire	19,111	17,044	281	France 4,573; West Germany 4,316; Belgium-Luxembourg 3,474.
Tubes, pipes, fittings	37,561	47,329	5,196	France 13,826; West Germany 11,811; Italy 5,012.
Castings and forgings, rough	6,274	2,276	21	France 1,087; Italy 813.
Lead:				
Ore and concentrate	15,155	28,081	--	Ireland 12,063; Morocco 5,932; Denmark 5,080.
Oxides and hydroxides	109	88	--	West Germany 86.
Metal including alloys:				
Scrap	286	129	21	France 79; Guinea 20.
Unwrought	1,168	4,328	116	United Kingdom 1,307; Netherlands 1,074; West Germany 819.
Semimanufactures	69	307	110	West Germany 126; France 65.
Lithium: Oxides and hydroxides	138	127	105	Italy 15.
Magnesium metal including alloys:				
Scrap	15	30	--	Greece 17; Belgium-Luxembourg 12.
Unwrought	706	1,315	902	Norway 224; France 178.
Semimanufactures	46	39	15	West Germany 16.
Manganese:				
Ore and concentrate	487,333	432,648	3	Republic of South Africa 147,600; Australia 95,087; Gabon 82,756.
Oxides and hydroxides	1,310	637	--	Belgium 533; Ireland 100.
Metal including alloys, all forms	351	1,565	50	Portugal 1,247.
Mercury 76-pound flasks	16	26	(1)	West Germany 18; Austria 2.
Molybdenum:				
Oxides and hydroxides	--	43	9	United Kingdom 20; West Germany 14.
Metal including alloys, all forms	32	34	13	Austria 6; West Germany 6; Netherlands 6.
Nickel:				
Matte, speiss, similar materials	2,074	1,779	--	Canada 1,281; Cuba 450.
Metal including alloys:				
Scrap	32	7	7	
Unwrought	6,500	6,281	191	Canada 1,725; Cuba 1,547; Australia 771.
Semimanufactures	721	780	82	Netherlands 203; West Germany 171; France 145.
Platinum-group metals including alloys, unwrought and partly wrought thousand troy ounces	601	6,109	NA	France 4,983; United Kingdom 643; West Germany 482.
Rare-earth metals	29	46	1	Austria 22; United Kingdom 11; Brazil 10.
Selenium, elemental	42	32	--	Japan 13; United Kingdom 9; Canada 7.
Silicon, elemental	45	148	1	France 146.
Silver:				
Ore and concentrate[2]	33	71	5	Morocco 27; Chile 18; Republic of South Africa 8.
Waste and sweepings[2] value, thousands	$23,656	$86,522	$24,778	France $50,973; Switzerland $7,001.
Metals including alloys, unwrought and partly wrought thousand troy ounces	1,993	20,673	3	France 19,355; West Germany 643.

See footnotes at end of table.

Table 4.—Spain: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Tantalum:				
Ore and concentrate	168	10	--	All from West Germany.
Metal including alloys, all forms	7	6	3	West Germany 3.
Tellurium, elemental	2	1	(1)	NA.
Tin:				
Ore and concentrate	3,263	4,363	--	United Kingdom 1,334; Thailand 1,034; Indonesia 860.
Oxides and hydroxides	301	343	--	United Kingdom 113; West Germany 107; Italy 102.
Metal including alloys, all forms	167	127	2	Malaysia 40; United Kingdom 27; West Germany 21.
Titanium:				
Ore and concentrate	162,977	134,920	2,413	Australia 65,946; Norway 64,363.
Oxides and hydroxides	2,151	2,227	137	Belgium 1,042; France 342; United Kingdom 151.
Tungsten metal including alloys, all forms	21	18	1	France 6; Austria 4; United Kingdom 3.
Uranium and thorium metals including alloys, all forms kilograms	485	165	160	France 5.
Vanadium: Oxides and hydroxides	73	282	--	Finland 150; West Germany 92.
Zinc:				
Ore and concentrate	111,703	40,192	--	Peru 21,201; Ireland 13,396.
Oxides and hydroxides	650	577	(1)	West Germany 242; Italy 140; United Kingdom 112.
Metal including alloys, all forms	3,265	1,953	1	Belgium-Luxembourg 1,255; West Germany 371.
Zirconium:				
Ore and concentrate	26,526	45,230	--	Australia 34,014; Republic of South Africa 11,151.
Metal including alloys, all forms	2	1	1	
Other:				
Ores and concentrates:				
Of molybdenum, tantalum, vanadium, zirconium	4,802	4,568	556	Australia 2,019; United Kingdom 846; Republic of South Africa 368.
Unspecified	1,179	1,845	(1)	Republic of South Africa 1,052; Australia 399; Sri Lanka 374.
Ash and residue containing nonferrous metals	46,586	51,384	17,260	France 2,722; Israel 2,535; Norway 2,080.
Oxides, hydroxides, peroxides	r1,477	1,089	171	France 469; West Germany 291.
Metals:				
Alkali and alkaline-earth	307	328	1	West Germany 288; France 36.
Pyrophoric alloys	32	26	(1)	France 21.
Base metals including alloys, all forms	r350	13,055	157	France 12,738.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	2,365	337	28	Italy 201; United Kingdom 28; France 25.
Artificial: Corundum	2,888	2,967	76	West Germany 1,074; France 986; Austria 646.
Dust and powder of precious and semiprecious stones value, thousands	$3,918	$3,764	$1,883	Ireland $1,417.
Grinding and polishing wheels and stones	1,739	1,605	--	Italy 485; Austria 271; France 263.
Asbestos, crude	74,162	67,148	361	Republic of South Africa 24,230; Canada 22,140; Zimbabwe 8,344.
Barite and witherite	2,462	849	(1)	France 838.
Boron materials:				
Crude natural borates	113,522	87,209	29,585	Turkey 54,400; France 1,923.
Oxides and acids	72	84	1	France 42; Argentina 36.
Bromine	205	256	13	Israel 160; West Germany 40.
Cement	246,184	191,849	351	Poland 147,585; United Kingdom 18,987.
Chalk	10,660	10,503	18	France 9,682; Greece 750.

See footnotes at end of table.

Table 4.—Spain: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products:				
Crude:				
Bentonite	35,277	31,664	5,947	Morocco 15,489; Greece 8,955.
Kaolin (china clay)	172,423	167,278	7,107	United Kingdom 117,644; West Germany 18,139; France 15,002.
Other	76,262	80,002	4,816	United Kingdom 52,881; France 12,327; Morocco 4,678.
Products:				
Nonrefractory	75,146	64,494	--	Italy 49,416; Portugal 8,880; West Germany 2,334.
Refractory including nonclay brick	35,844	36,847	813	West Germany 10,262; Italy 7,886; Austria 6,921.
Cryolite and chiolite	9,314	4,577	--	All from Denmark.
Diamond:				
Gem, not set or strung -- value, thousands	$40,339	$22,843	$700	Belgium-Luxembourg $17,990; Israel $2,080.
Industrial -- do	$2,506	$942	--	Republic of South Africa $626; Belgium-Luxembourg $160.
Diatomite and other infusorial earth	2,998	3,094	1,499	France 1,349.
Feldspar	16,256	21,408	--	France 15,662; Norway 4,151.
Fertilizer materials:				
Crude:				
Nitrogenous	46,667	49,335	1	Chile 47,192; Norway 2,142.
Phosphatic -- thousand tons	2,932	2,607	32	Morocco 2,395.
Other including mixed	3,011	1,980	1	France 1,190.
Manufactured:				
Nitrogenous	181,394	181,692	--	Netherlands 56,841; West Germany 36,541; Norway 26,920.
Phosphatic	15,552	24,606	--	Belgium-Luxembourg 14,150; Portugal 7,900.
Potassic	3,117	3,161	--	France 1,625; Israel 1,530.
Other including mixed	121,047	202,687	186,405	Finland 5,009; West Germany 4,789; Belgium-Luxembourg 2,208.
Ammonia	337,647	480,452	25,618	Mexico 129,597; U.S.S.R. 104,479; United Kingdom 51,919.
Fluorine, elemental	9,997	29	--	West Germany 15; France 8.
Fluorspar	23	62	--	France 39; Italy 23.
Graphite:				
Artificial and colloidal	3,648	2,133	216	United Kingdom 705; France 629; West Germany 206.
Natural	1,778	2,218	--	Madagascar 1,030; West Germany 402; Norway 300.
Gypsum and plasters	6,573	5,448	17	France 4,221; Morocco 786.
Iodine	146	152	9	Japan 69; Chile 48.
Lime	87	291	--	Morocco 174; France 105.
Magnesite	53,832	72,749	97	Greece 37,829; Italy 14,247; United Kingdom 8,523.
Mica, all forms	1,189	1,610	192	Austria 443; India 389; France 266.
Pigments, mineral: Iron oxides including processed	7,350	6,586	48	West Germany 5,289; France 715.
Precious and semiprecious stones except diamond:				
Natural -- value, thousands	$8,111	$5,183	--	Thailand $2,321; India $994; Brazil $383.
Manufactured -- do	$1,536	$786	$198	Austria $328; France $106.
Pyrites, unroasted	160	139	--	Italy 89; Austria 32.
Salt and brine	1,262	1,301	--	Netherlands 615; United Kingdom 419; West Germany 161.
Sodium compounds, n.e.s.:				
Caustic potash	540	226	(1)	West Germany 80; Sweden 64.
Caustic soda	146,908	145,283	1	West Germany 33,852; Belgium-Luxembourg 33,803; France 27,005.

See footnotes at end of table.

Table 4.—Spain: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Sodium compounds, n.e.s. —Continued				
Soda ash	23,053	3,421	--	Portugal 2,143; France 625; Bulgaria 500.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Calcareous	91,780	93,817	--	Italy 59,756; Portugal 30,203.
Slate	3	(1)	--	All from West Germany.
Other	27,743	36,094	--	Finland 11,890; Republic of South Africa 10,282; Norway 6,110.
Worked:				
Slate	155	155	--	Italy 117; France 33.
Paving stone and flagstone	104	18	--	Mainly from Italy.
Other	12,783	9,719	4	Italy 6,182; Portugal 2,951.
Dolomite, chiefly refractory-grade	3,121	4,430	--	France 2,549; Norway 1,387.
Gravel and crushed rock	29,185	41,036	10	Morocco 33,321; France 7,082.
Quartz and quartzite	2,617	3,745	10	Sweden 2,392; Yugoslavia 799.
Sand excluding metal-bearing	14,692	15,530	191	Morocco 7,094; France 5,043; Belgium-Luxembourg 2,843.
Sulfur:				
Elemental:				
Other than colloidal	109,576	94,116	4,173	France 59,969; Mexico 20,909; Canada 6,925.
Colloidal	6,382	266	(1)	West Germany 242.
Sulfuric acid	251,486	71,390	6,282	France 29,164; West Germany 9,254; Poland 7,302.
Talc, steatite, soapstone, pyrophyllite	10,970	15,181	29	France 12,547; Norway 1,643.
Other:				
Crude	47,787	33,768	206	U.S.S.R. 8,836; Morocco 6,921; Greece 5,522.
Slag, dross, similar waste, not metal-bearing	6,230	14,381	--	France 11,587; Italy 1,625; West Germany 1,128.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	160	242	42	Canada 105; United Kingdom 29; West Germany 25.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	4,329	9,901	77	France 5,236; Italy 3,433.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	407	507	384	France 115.
Carbon black	18,511	14,767	1,640	France 8,836; Netherlands 1,551; West Germany 1,157.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	4,192	5,678	3,014	Poland 999; Republic of South Africa 713; Australia 636.
Briquets of anthracite and bituminous coal	31	--	--	
Lignite and lignite briquets	7,086	6,706	--	France 6,621.
Coke and semicoke	547,845	561,087	144,839	Poland 67,611; West Germany 56,367; Chile 45,965.
Gas, natural thousand tons	1,214	1,426	(1)	Algeria 801; Libya 610.
Hydrogen, helium, rare gases	74	81	46	France 20.
Peat including briquets and litter	8,798	12,333	--	West Germany 6,434; U.S.S.R. 2,457; Canada 1,396.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	360,037	365,139	--	Saudi Arabia 108,023; Iraq 48,991; Mexico 34,067.
Refinery products:				
Gasoline, motor and aviation do	3,759	2,207	3	Italy 777; Netherlands 401; Egypt 354.
Kerosine and jet fuel do	1,491	1,034	163	Netherlands 290; Belgium-Luxembourg 160; Morocco 139.
Distillate fuel oil	1,895	3,536	20	Bahamas 1,130; Iran 608; Netherlands 471.
Residual fuel oil do	3,321	6,597	(1)	U.S.S.R. 764; Portugal 703; Belgium-Luxembourg 691.
Lubricants do	213	1,209	118	Bangladesh 219; Bahamas 154; U.S.S.R. 145.

See footnotes at end of table.

Table 4.—Spain: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Other:				
Liquefied petroleum gas thousand 42-gallon barrels	14,067	19,631	(1)	Saudi Arabia 6,599; Algeria 4,219; France 3,410.
White spirit ---do---	27	10	--	France 9.
Mineral jelly and wax ---do---	30	24	4	Netherlands 5; France 4; Republic of South Africa 3.
Petroleum coke ---do---	3,002	2,745	1,995	United Kingdom 303; U.S.S.R. 265.
Bitumen and other residues ---do---	30	153	87	U.S.S.R. 55; United Kingdom 11.
Bituminous mixtures, n.e.s ---do---	6	6	(1)	United Kingdom 2; Italy 1; France 1.
Unspecified ---do---	3,283	(1)	NA	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r193,963	154,364	95,424	West Germany 36,299; Italy 5,815; United Kingdom 5,164.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]May include platinum-group metals.

COMMODITY REVIEW

METALS

Aluminum.—After startup in 1980, the alumina-aluminum complex, owned by Alúmina de España S.A. and the Aluminio Español S.A. at San Ciprián, had an uneventful year. Production of both alumina and aluminum was near design capacities of 800,000 and 180,000 tons, respectively.

The major producer of aluminum remained the Government-owned Empresa Nacional del Aluminio, S.A. (ENDASA), taking into account its 55% participation in Aluminio Español. During 1980, the latest year for which complete data were available, ENDASA employed 3,670 persons operating smelters at Aviles and Valladolid; utilization of the smelters was 94% of designed capacity.

Copper.—The area around Seville, in southern Spain, remained the principal producer of mined copper in Spain during 1981.

The Aznalcóllar Mine, owned by the Sociedad Andaluza de Piritas S.A., located near Aznalcóllar in the Province of Seville, was closed during the summer of 1981 because of water shortages. Aznalcóllar consists of an open pit mine with a capacity of 4 million tons of ore per year and a mill with a total capacity of 4 million tons, of which 2 million tons is treated in the pyrite circuit and 2 million tons in the pyroclastic ore circuit.

Development of the mine and construction of the mill continued at Sotiel, near Seville, southern Spain. The mine and mill were owned by the Minas de Almagrera S.A. (MASA). About 96% of MASA capital was subscribed by Institute Nacional de Industria (INI), the holding company of the Government of Spain. The mine and mill at Sotiel should become operational sometime in 1983-84. During 1981, most of the mining and milling equipment was ordered. Designed annual capacity of the mine was 600,000 tons of complex sulfide ore. The mill was designed to produce 40,000 tons of zinc concentrates with an average zinc content of 50%, 11,000 tons of copper concentrates with an average copper content of 20%, and 10,000 tons of lead concentrates with an average lead content of 50%. In addition, plans call for use of recovered pyrite in a 300,000-ton-per-year sulfuric acid plant located near the mine site.

At Rio Tinto Mines, near Seville, the most important activity continued to be expansion of the Cerro Colorado open pit mine, including the prestripping of the new Cerro Salomón pit.

Gold.—At the MASA La Lapilla gold and silver mine, in the Province of Huelva, exploration and laboratory tests for metals recovery from the ore were completed. Based on the results of the laboratory tests, planning started for construction of a beneficiation pilot plant. By yearend, no major decisions had been made relating to startup of production.

Iron and Steel.—The iron and steel sector of the industry in Spain had an uneventful year. Planning and examining ways to restructure and reorganize the steel sector to compensate for recent increases in energy and labor costs were the principal activities of the Government and private companies.

Altos Hornos de Vizcaya, S.A., operated the iron ore mines at Gallarta and Bodovalle, in Sestao, near Bilbao. Gallarta is an open pit mine that produced about 1 million tons of ore, and Bodovalle is an underground mine that produced 1.25 million tons of run-of-mine ore during 1981. The siderite concentrates were further processed in the sintering plant of the Sestao steel plant. At the common minesite, a new facility for high-intensity magnetic separation of ore in the size 0- to 1-millimeter went onstream.

In the steel sector, the major event was the Kawasaki Steel Corp. study for restructuring the integrated segment of the steel industry of Spain. The study was to be completed in 1982.

Lead.—During 1981, Exploración Minera International España S.A. continued to explore and plan for development of a complex sulfide deposit, with lead sulfide being the major component, at La Troya, near Ceraín, about 50 to 60 kilometers southwest of San Sabastián in northwestern Spain. In addition to lead, the ore from La Troya contained zinc, copper, and some precious metals.

Actual development of an underground mine and construction of a mill were to start in 1982-83. At yearend 1981, capacities of these installations had not been announced.

Tungsten.—At the Sultana tungsten-tin mine, Province of Orense, owned by MASA, geological studies, sampling, and general maintenance of stopes were underway during 1981, but production was not resumed.

In addition, some tests on beneficiation of the Sultana ore were conducted. Exploratory drilling in deeper parts of the mine was completed, and a survey of the central part of the deposit was near completion at yearend.

NONMETALS

Cement.—The cement industry had a quiet year during 1981. Spain had 54 plants, operated by 36 companies, with an aggregate annual capacity of about 44 million tons of cement. The largest company was Asland S.A. of Madrid, which operated five cement plants with a total capacity of about 6.6 million tons of cement. Spain's largest cement plants were two 2-million-ton-per-year plants, one located at Puerto Sagunto, Province of Valencia, and the other at Villaluenga de la Sagro, Province of Toledo. Both plants were owned by Asland.

MINERAL FUELS

As in the past, coal, uranium, and hydropower were the principal sources of primary energy produced in Spain during 1981. However, Spain remained heavily dependent on imported fuels, mostly petroleum, natural gas, and high-grade coals, to meet its energy demand.

The National Energy Plan (Plan Energetico National—PEN) was the governing document for the energy policy of Spain. In broad terms, the PEN provided (1) Conservation of energy through pricing and fiscal policy (Energy prices should reflect the real cost of supply, including the cost of investments; there should be a lowering of the purchase tax for small automobiles, and there should be a halt to licensing of new truck transportation companies.), (2) Increased domestic production of energy by large investments in coal and nuclear energy, and (3) Use of energy sources from reliable foreign suppliers through investments in foreign companies and by participating in exploration abroad.

Coal.—Four opencast mines, two in Teruel Province and two in Cordoba Province, started production during 1981. This accounted for most of the increased coal output.

Coal remained the most favored source of primary energy in the country, and the Government was encouraging industry to convert from liquid fuels to coal. Electric powerplants and cement factories were among the first to start using coal instead of fuel oil. Seven coal-fired electric plants were scheduled for completion in the next 3 to 4 years, replacing the oil-fired plants planned before the oil crisis.

The PEN called for domestic coal production to reach 38 million tons by 1985. This target appeared to be realistic in view of

production of about 28 million tons achieved during 1981.

To facilitate imports of coal from abroad, some seaports had to be adapted to handle large quantities of coal. To avoid labor problems with longshore workers, most of the new facilities were planned in smaller ports, avoiding the large ports of Barcelona and Bilbao. The ports at Tarragona, Almeria, and Algeciras were selected for building the new expanded and modernized installations.

A coal-importing and -exporting company was formed by the Government of Spain through its holding company, INI. The new company, Sociedad Española de Carbón Exterior, S.A. (Carboex), was organized to secure necessary coal imports, to participate in prospecting for coal abroad, and to invest in foreign coal operations. During 1981, representatives of Carboex were negotiating participation in coal-related activities in the United States, Colombia, Australia, and other countries.

The largest coal producer in the country remained the Empresa Nacional Hulleras del Norte S.A. (Hunosa). Hunosa produced approximately 5 million tons of marketable coal during 1981; about 4 million tons was produced in underground mines, and the rest was mined by opencast mining methods.

Nine large mining operations and five large coal washeries, with a total capacity of 10 million tons of run-of-mine coal, were operated by Hunosa during 1981.

Petroleum and Natural Gas.—Domestic output of both petroleum and natural gas remained small, and Spain was, as in the past, heavily dependent on imported crude oil and natural gas to meet its demand in 1981.

Exploration for liquid and gaseous hydrocarbons continued, even though results of previously drilled wells were negative. Evaluation of the Vizcaya Gasfield, offshore Bilbao, indicated reserves of natural gas of 700 billion cubic feet.

During 1981, the Government of Spain passed a decree setting up a state company that will group various state interests in the oil sector. The new entity, Instituto Nacional de Hydrocarburos (INH), was organized to coordinate purchases and refining of crude oil in Spain. The INH would operate under the jurisdiction of the Ministry of Industry and would exercise control of Empresa Nacional del Petróleo, S.A. (Enepetrol), Compañia Refinadora De Petroleos, S.A., Empresa Nacional de Investigation y Exploration de Petroleos, S.A., Hispanica de Petroleos, S.A., Empresa Nacional del Gas, S.A., and Butano, S.A.

The organization of INH, however, failed to satisfy the European Communities (EC) criteria on marketing monopolies, in that the Campsa marketing monopoly was not disbanded with the organization of INH, which was against the stipulations in Article 37 of the Treaty of Rome. In addition, INH was to give preference to Spanish refineries and would be obliged to use Spanish ships; these regulations had to be phased out before Spain could become a member of the EC.

During 1981, expansion of the refinery at Tarragona was completed. In several other refineries, construction of new catalytic cracking units were started.

Total petroleum refinery capacity available in Spain at the beginning of 1981 was 1.56 million barrels per day in 10 refineries. Three companies accounted for about 74% of the total capacity; Enepetrol with refineries at Escombreras (capacity 200,000 barrels per day), Puertollano (capacity 140,000 barrels), and Tarragona (capacity 260,000 barrels); Compañía Española de Petroleos S.A. with refineries at Santa Cruz de Tenerife (capacity 160,000 barrels per day) and Algeciras (160,000 barrels); and the Refinería de Petróleos del Norte, S.A., with a refinery at Somorrostro (capacity 240,000 barrels per day).

Uranium.—Geologists from Empressa Nacional del Uranio, S.A., conducted exploration for uranium in the Provinces of Salamanca, Cáceres, and Badajoz. In addition, areas near Soria, Molina de Aragón, and in the Tagus Basin were targets of geological exploration. At yearend, no discoveries of major new uranium deposits had been announced.

The Province of Salamanca remained the largest producer of uranium oxide (U_3O_8) in Spain with about 80% of the country's total reserves. Authorities were planning to build a new yellow cake plant with a capacity of about 800 tons of U_3O_8 per year by 1985.

The apparent slippages in construction of nuclear powerplants were a major concern of the authorities because delays in startup of nuclear plants would extend dependence on costly imported oil.

[1]Physical scientist, Division of Foreign Data.

The Mineral Industry of Sudan

By Ben A. Kornhauser[1]

The mineral industry continued to be of minor significance to Sudan's estimated gross domestic product (GDP) of $4,050 million.[2] The production of mineral commodities in 1981 essentially was stagnant relative to that of 1980. Their estimated contribution, excluding refined petroleum products, was about 1% of GDP. The balance-of-payments deficit in 1981 increased to $700 million from $534 million in 1980. This deficit created a greater imbalance in foreign exchange which limited growth of the mineral industries further by restricting purchase of parts, equipment, and services.

Sudan is among the 10 oil-importing developing countries in Africa with the best potential for economic oil prospects. The new oil-field discoveries in 1981 and during last few years hold promise of improving Sudan's future economic structure. However, relatively small discoveries, which require greater investments to develop production, may reduce economic stimulus.

The Sudanese Government continued the construction of its transport infrastructure to expedite mineral and industrial development and distribution of agricultural, industrial, and mineral products. Roadbuilding was emphasized since the money required for road development has been calculated to be less than the cost of rehabilitating the railroad. The Government's allocation for roads, under its 6-year development plan (1977-78 to 1982-83), is estimated to have been exceeded by the end of the plan's third year. Except for the roads already under construction within this plan, lack of funds will limit the building of much needed roads in the future. Roads under construction are: The Wad Medani-Sennar-Kosti, Sennar-Singa-Damazin, Nyala-Kas-Zalingei, Nyala-El Fasher, and White Nile.

The Wad Medani-Sennar-Kosti road provides access from the Khartoum-Wad Medani road to the Sudanese sugar region and factories. The terminus of the road is Kosti, which is Sudan's most important river harbor, the main loading point for river transport to southern Sudan, and the site selected for Sudan's second oil refinery. The financing came from the United Kingdom and the Organization of Petroleum Exporting Countries (OPEC) Special Fund.

The Sennar-Singa-Damazin road crosses the Blue Nile Province and links it to the Gezira Province in the north. The Blue Nile Province has chromite mines and is rich in agricultural and forest resources. The road to Damazin will provide access to Roseires Dam, the country's main source of hydroelectric power. Twenty-five percent of the 258-kilometer road, which had been completed by early 1981, is being checked by the contractor, an Egyptian company, since the construction is considered below specifications.

The Nyala-Kas-Zalingei 210-kilometer road is within Southern Dorfur Province and is rich in animal and forestry resources. The road, which was expected to be asphalted in 1981 and inaugurated in mid-1982, will permit goods to move to Nyala, the railroad's most westerly point.

The Nyala-El Fasher road will link the two western provincial capitals of the Dorfur region. The road will provide access to Nyala, which is served only by Sudan Railways, and to El Fasher, which only has scheduled flights to Khartoum. The Netherlands is financing the project and supplying the equipment. However, since traffic loads are projected to be light and funds appar-

ently are unavailable for a better surface, the road will be of a raised gravel construction.

The White Nile road in central Sudan will extend southward from Khartoum in two phases. Phase One was started in 1980 and includes 152 kilometers of road, a 6-kilometer spur to the White Nile, and two ferry boats linking the spur with the town of El Dueim. The road will serve many White Nile pump-irrigation projects, which supply vegetables and dairy products to Khartoum, and will ease travel to western Sudan. In phase two of road construction, the road will continue southward to Kosti, joining the Sennar-Kosti road and the railroad. The road is being financed by the International Development Association and the Federal Republic of Germany. Construction was expected to start in 1981. Many more roads are necessary but are awaiting financing.[3]

The Port Sudan operation (World Bank part 1 project), managed by the Sea Ports Corp. of the Ministry of Transportation and started about 3 years ago, was not completed on schedule in 1981 but is expected to be finished in the second half of 1982.

PRODUCTION AND TRADE

The mining industry, on a limited scale, produced mostly chromite, gypsum, and mica. Cement production, although reduced in 1981, represented a significant part of the value of minerals in the economy.

Sudan's import trade is relatively small and is with European and nearby African and Middle Eastern countries. The dominant imports are iron and steel products, cement, fertilizers, and petroleum refinery products. However, most of the steel-mill products or semifinished materials were imported from the Far Eastern countries of Japan and the Republic of Korea. No reliable data on values were available.

In its present state of development, Sudan's small quantities of exports were mainly unprocessed raw materials or concentrates and internally generated scrap materials. These exports, mostly to Western Europe, consisted of ferrous and nonferrous scrap and locally mined chromite and manganese ores and concentrates. The imposition in early 1981 of a 5% tax on a number of exported minerals and petroleum products was expected to have a detrimental effect on Sudan's major export, chromite. With transport costs and Government royalties amounting to more than 70% of chromite prices, future production may stop if expected railway tariffs are imposed.

Table 1.—Sudan: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
Cement, hydraulic ---- thousand tons	137	[r]167	182	185	122
Chromium: Chromite concentrate, gross weight	17,273	18,000	28,176	25,400	25,515
Gold, mine output, metal content[e] ---- troy ounces	300	300	300	300	300
Gypsum and anhydrite, crude	15,300	20,000	10,000	10,000	28,000
Manganese ore	457	450	454	363	400
Mica, all grades	[e]400	1,000	2,000	1,500	2,000
Petroleum refinery products:					
Gasoline ---- thousand 42-gallon barrels	1,170	1,211	1,200	1,118	1,099
Jet fuel ---- do	275	199	199	428	308
Kerosine ---- do	267	193	192		
Distillate fuel oil ---- do	2,440	3,653	3,700	2,366	2,198
Residual fuel oil ---- do	3,347	1,858	1,900	--	2,419
Other ---- do	42	52	60	55	--
Refinery fuel and losses ---- do	362	350	350	299	296
Total ---- do	7,903	7,516	7,601	4,266	6,320
Salt	91,713	72,000	81,200	80,000	64,253

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through July 19, 1982.

[2]In addition to the commodities listed, modest quantities of a variety of crude construction materials (including clays, stone, and sand and gravel) presumably were produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels. Crude oil was produced from several wells on a testing basis but was not being produced for domestic use or export through yearend 1980.

Table 2.—Sudan: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Copper metal including alloys, scrap	160	174	--	Denmark 100; West Germany 74.
Iron and steel metal including alloys, scrap	4,547	3,929	--	Pakistan 2,229; Egypt 1,700.
Lead metal including alloys, scrap	661	718	--	West Germany 468; Egypt 250.
Tin metal including alloys, scrap	--	1,000	--	All to Italy.
Zinc metal including alloys, scrap	70	52	--	All to West Germany.
Other:				
Ores and concentrates	24,376	9,754	--	All to Switzerland.
Precious metals excluding gold, scrap, waste, dust value	--	$41,600	--	All to United Kingdom.
Metals including alloys, scrap	50	2,037	--	All to Yugoslavia.
NONMETALS				
Abrasives, n.e.s.:				
Dust and powder of precious and semi-precious stones	211	--		
Grinding and polishing wheels and stones	--	72	--	All to West Germany
Clays, crude	--	100	--	All to Egypt.
Mica, crude	--	363	--	United Kingdom 314; Bahamas 49.
Salt and brines	148	157	--	Zaire 94; Ethiopia 62.
Sodium carbonate, natural	r9,826	7,430	--	All to Saudi Arabia.
Other, crude	--	9,976	--	Do.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products: Lubricants thousand 42-gallon barrels	1,421	250	--	West Germany 143; Italy 107.

rRevised.

Table 3.—Sudan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	--	5	--	All from India.
Metal including alloys, all forms	1,326	1,524	5	Hong Kong 557; China 274; United Kingdom 265.
Copper metal including alloys, all forms	58	228	6	Netherlands 115; United Kingdom 85.
Iron and steel metal:				
Pig iron, ferroalloys, similar materials	1	9	--	France 8; Netherlands 1.
Steel, primary forms	9,361	6,150	--	Netherlands 2,899; Belgium 1,750; Japan 1,491.
Semimanufactures:				
Bars, rods, angles, shapes, sections	14,722	59,305	NA	Republic of Korea 22,066; Belgium 14,588; Italy 8,328.
Universals, plates, sheets	14,208	31,251	450	Japan 13,563; Belgium 8,925; Egypt 2,266.
Hoop and strip	5,526	12,628	--	Japan 10,404; Belgium 2,036.
Rails and accessories	4	2	--	NA.
Wire	1,815	66,774	--	West Germany 65,873.
Tubes, pipes, fittings	r9,083	2,762	--	Egypt 467; Greece 429; United Kingdom 353; Japan 350.
Castings and forgings, rough	734	248	--	Hong Kong 107; Egypt 77; United Kingdom 30.
Lead metal including alloys, all forms	673	357	--	Denmark 250; United Kingdom 107.
Manganese ore and concentrate	715	1,833	--	All from Singapore.
Nickel metal including alloys, all forms	5	11	--	India 5; Kenya 3; China 2.
Tin metal including alloys, all forms	2	13	--	Denmark 12.
Zinc metal including alloys, all forms	971	1,471	--	Netherlands 463; Japan 400; West Germany 396.
Other:				
Oxides, hydroxides, peroxides:				
Of cobalt, iron, manganese, titanium	245	580	--	West Germany 231; United Kingdom 221; China 96.
Of lead and zinc	32	10	--	Belgium 9; West Germany 1.
Unspecified	168	309	--	Belgium 156; Taiwan 40; United Kingdom 34.
Metals including alloys, scrap kilograms	25	--		

See footnotes at end of table.

Table 3.—Sudan: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	--	156	--	Greece 103; West Germany 49.
Grinding and polishing wheels and stones	56	17	--	West Germany 5; Japan 4; United Kingdom 4.
Asbestos, crude ---- value	$81,162	--		
Cement	62,475	89,643	--	Romania 25,936; Greece 18,812; Yugoslavia 13,198.
Chalk	--	118	--	All from West Germany.
Clays and clay products:				
Crude	143	12,469	--	All from United Kingdom.
Products:				
Nonrefractory[2]	1,081	1,330	10	West Germany 460; Lebanon 234; Spain 225.
Refractory including nonclay brick	894	[3]708	--	United Kingdom 675; France 31.
Fertilizer materials:				
Manufactured:				
Nitrogenous	73,594	123,125	--	Kuwait 98,146; Netherlands 16,461; Japan 5,850.
Phosphatic	155	456	--	West Germany 400; Netherlands 49.
Other including mixed	4	4	--	All from United Kingdom.
Ammonia	13	47	--	Netherlands 20; West Germany 19; United Kingdom 8.
Graphite, natural	1	5	--	All from United Kingdom.
Gypsum and plasters	147	988	--	Egypt 905.
Lime	3,612	6,234	--	United Kingdom 3,033; Netherlands 2,800.
Pigments, mineral, natural, crude	3,700	13,420	--	India 10,920; United Kingdom 2,000.
Salt and brines	1	3	--	Belgium 2; Netherlands 1.
Sodium and potassium compounds, n.e.s.:				
Sodium carbonate, natural	11,660	3,000	--	All from Egypt.
Caustic soda	3,590	5,803	--	West Germany 2,917; Netherlands 798; Belgium 704.
Caustic potash, sodic and potassic hydroxides	44	202	--	United Kingdom 123; Spain 50; Netherlands 27.
Stone, sand and gravel: Dimension stone	--	6	--	All from United Kingdom.
Sulfur:				
Elemental, all forms	10	187	--	France 168; West Germany 19.
Sulfuric acid, oleum	615	474	--	West Germany 389; Belgium 50; Greece 17.
Other:				
Crude	52	13	--	Hong Kong 10; Belgium 3.
Halogens	10	3	--	All from United Kingdom.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	999	275	--	Greece 253; United Kingdom 21.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	11,514	11,759	--	United Kingdom 7,000; West Germany 3,221; Netherlands 900.
Carbon black	72	45	--	West Germany 35; Netherlands 10.
Coke and semicoke	48	500	--	All from West Germany.
Hydrogen, helium, rare gases	6	16	--	China 8; West Germany 4; France 3.
Petroleum:				
Crude ---- thousand 42-gallon barrels	--	5,068	--	Saudi Arabia 4,952; Kuwait 116.
Refinery products:				
Gasoline:				
Motor ---- do	157	1,734	--	Saudi Arabia 1,212; Kuwait 498.
Aviation ---- do	94	167	--	Kuwait 93; Iran 13; Italy 13; United Kingdom 13.
Kerosine ---- do	105	131	--	Kuwait 130.
Distillate fuel oil ---- do	112	1,377	--	Kuwait 1,349.
Residual fuel oil -- 42-gallon barrels	20	133	--	All from Kenya.
Lubricants ---- do	[r]92,189	240,726	56,930	Saudi Arabia 136,072; United Kingdom 15,250; Italy 14,913.
Other:				
Liquefied petroleum gas -- do	12	4,884	--	Italy 4,640; Kenya 151.
Mineral jelly and wax -- do	1,794	1,211	80	West Germany 1,131.
Bituminous mixtures, n.e.s -- do	82,992	23,761	24	Netherlands 10,338; Singapore 5,145.
Unspecified ---- do	[r]66	4	--	Mainly from France.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	--	525	--	All from United Kingdom.

[r]Revised. NA Not available.
[1]Excludes quantity valued at $3,062.
[2]Excludes quantities valued at $3,568 in 1979 and $324 in 1980.
[3]Excludes quantity valued at $1,080.

COMMODITY REVIEW

METALS

Chromite.—Chromite production in 1981 was estimated at 25,000 metric tons but is expected to increase within the next 5 years owing to a better transportation infrastructure. Haulage costs via the asphalt roads south to Damazin are expected to compare favorably with railroad transport. The Mitsubishi Corp. of Japan was exploring for chromite deposits in the Ingessana Hills of the Blue Nile Province. Mitsubishi is still interested in a ferrochrome production unit to supply about 20,000 tons per year instead of the 150,000 tons per year originally agreed upon with the Sudanese Government.

Copper.—The Geological and Mineral Resources Department (GMRD) and the French Bureau de Recherches Géologiques et Minières (BRGM) were still evaluating copper and tungsten prospects in the Red Sea Hills area. Saudi Arabia allocated about $11 million during 1981 to finance further prospecting by BRGM and Total Exploration, a wholly state-owned subsidiary of the French Compagnie Français des Pétroles (CFP-Total).

Gold.—A gold rush was still underway in the southeast near the borders of Kenya and Uganda. Tribespeople worked rich gold placers along the Thingaita River and bartered much of the gold for rifles from remnants of Idi Amin's army. Local and foreign companies also were exploring for gold and base-metal deposits. Minex, Inc., a subsidiary of Vam Pty. Ltd. of Australia, was prospecting for gold in the area of 36° E and the Nile. This region was considered one of Africa's most significant gold-bearing districts. By the end of 1981, Minex had discovered 30 previously unknown prospects and was examining about 50 known deposits. Mowlem-Africa Construction Co., Ltd., a joint Sudanese and British company, was evaluating the gold potential in the ancient gold mining district of Fazughli south of the Blue Nile and along the Ethiopian border. The initial assays looked promising.[4]

Metal-Rich Sediments.—According to the Saudi-Sudanese Red Sea Commission for the Exploitation of Red Sea Resources, the pilot plant for mining the metalliferous muds of the Red Sea Atlantis II Deep Basin was scheduled to be completed in 1981. By yearend 1981, the Saudi-Sudanese Red Sea Commission had spent over $300 million on the program of mining, recovering, and processing the seabed minerals identified in the sediments. Commercial production is not expected until 1988, when zinc and copper are expected to be exploited along with lead, silver, and cadmium. The mining and extractive process that was developed by Orenstein & Koppel AG of the Federal Republic of Germany, involves agitating the freed seabed muds, mixing them with seawater, and pumping the slurry to a processing ship for mineral concentration. The concentrate would be shipped by barge to a smelter-refinery, which would be constructed. The residual tailings slurry would be returned to the sea at a depth of 500 feet, where tests indicate an acceptable environmental dispersion as the residue settles onto the seabed. In 1979, the exploratory drilling ship, *Sedco*, had performed the preliminary work that led to this effort.

Radioactive Minerals.—Minex was expected to drill for radioactive minerals in its Jabal Dumbeir and Jabal Kon concessions in Kordofan. Important radioactive anomalies within syenites were discovered in the Nuba Mountains area by a West German team and a team from the University of Khartoum.

NONMETALS

Cement.—The Atbara plant of the Maspio Cement Corp. was being expanded by the addition of a 750-ton-per-day rotary kiln plus a single-stage cyclone preheater and Unax cooler. This equipment also includes a 3.2- by 9-meter raw mill and a 3.4- by 11-meter finishing mill. The modernized plant is expected to be in use in 1982.

Mica.—The Geological Survey Department of the Ministry of Energy and Mining began a pilot project in 1976 in Khartoum to produce trimmed mica. In 1978-79, as a result of this project, about 1,000 tons of scrap mica were produced along with 1 ton of hand-trimmed mica of different sizes. Owing to various contributing factors, such as poor transportation, outdated equipment, and insufficient financing, the project deteriorated and production of trimmed mica dropped significantly. In spite of this setback, it has been reported that the northern region government is interested in revitalizing the project and that some private companies are interested. By the end of 1981, 3 of the original 18 prospective sites had been worked. The Government held negotiations to sell 10,000 tons of mica at Port Sudan. The northern region government believed that an additional 4,000 tons of mica could be mined from these three sites and from new finds. Mica deposits are known to exist

on the eastern bank of the Nile in the Northern Province.[5]

MINERAL FUELS

Petroleum.—The successful discoveries of petroleum since 1979 by Chevron Oil Co. of Sudan (a subsidiary of Standard Oil Co. of California) spurred additional exploration by Chevron, Texas Eastern Corp., Union Texas Petroleum Corp. (an Allied Chemical Corp. subsidiary), Phillips Petroleum Co., and Total Exploration of France. The latter four companies were exploring the Red Sea concessions relinquished by Chevron. In 1981, Chevron increased the number of its exploratory and drilling crews in its leased areas. By the end of 1981, Chevron had completed 31 wells in its interior blocks, with a total drilled footage of 339,568. Six of these wells were new field discoveries, of which one, Tabaldi No. 1, recovered oil but was not classified as a discovery. None of the oilfields were in production. The cost of Chevron's program exceeded $300 million. This exploration pace was expected to continue in 1982. Chevron believed that Sudanese oil reserves could reach 10 billion barrels, more than the Indonesian 9.2 billion or Algerian 8.2 billion. Chevron's south fields could hold 400 million barrels, and much of the country was still to be explored. Kosti, the site of the planned Chevron refinery, also will be a large terminus for transporting products from the topping plant to the south and to oil exploration areas.

CFP-Total was exploring for oil and gas on approximately 145,000 square kilometers in the Muglad region of southern Sudan, adjoining the southeast area where Chevron made its oil discoveries at Abu Gabra, Sharaf, and Unity. CFP-Total also will explore an area offshore from Port Sudan, consisting of about 6,400 square kilometers. Texas Eastern and Union Texas, on the other hand, were exploring in northern Sudan near the Egyptian border. Texas Eastern's concession was for 26,700 square kilometers onshore and offshore from the northern Red Sea coast. Seismic work and drilling were scheduled into 1982.

Phillips Petroleum and the Government of Sudan agreed on an oil exploration contract whereby Phillips will explore 18,000 square kilometers in north-central Sudan just west of Khartoum and continuing northwesterly to a point west of Dongola. The area covers a sedimentary basin and is highly accessible all year. However, the area was considered less promising than the Red Sea or Chevron concessions. The Sudanese Government acquired a 15% equity in any production and received bonus payments exceeding $1 million for the leases.

Government negotiations were underway in 1981 regarding leases for onshore locations in the Red Sea region of northwest Sudan and for abandoned Chevron concessions in the south and west. These negotiations involved several firms including Mobil, Conoco, Sun Oil, and Trans-Pacific of Canada.

Saudi Arabia and the Federal Republic of Germany jointly planned to finance the reconstruction of the neglected Red Sea port at Sowakin at a cost of approximately $300 million to provide better service to the Shell-British Petroleum Port Sudan refinery, which will be handling Saudi-produced oil.

Refining.—A consortium, consisting of the International Finance Corp. of the World Bank, Chevron, the Sudanese Government, and the Arab Petroleum Investment Corp., established the White Nile Petroleum Co. that was arranging financing and preparing a request for a proposal package for the construction at Kosti of an oil refinery and a pipeline. The oil refinery (with a maximum capacity of 15,000 to 25,000 barrels per day) will be built on the White Nile, 275 kilometers south of Khartoum, to process the oil from Chevron's wells in the southeast areas of Abu Gabra, Sharaf, and Unity. The refinery and about 550 kilometers of 10-inch pipeline, to transport the crude from the Unity Field to the refinery, are projected to cost between $600 to $1,000 million. This project will provide products for Sudan's internal market.

The Port Sudan refinery was unable to operate at its full capacity of 1.2 million tons per year during 1981 because it was unable to obtain sufficient credit for crude from oil suppliers. To complicate matters, the oil storage at Port Sudan has a capacity of less than 50,000 tons for handling incoming deliveries.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Sudanese pounds (£Sd) to U.S. dollars at the rate of £Sd0.9=U.S.$1.00.

[3]U.S. Embassy, Khartoum, Sudan. Roads and Road Transport in the Sudan. State Department Airgram A-16, Apr. 1, 1981, pp. 5-7.

[4]Mining Annual Review (London). North Africa and Middle East, Sudan, 1981, p. 472.

[5]Industrial Minerals (London). Sudan, Mica Mining Prospects. No. 170, November 1981, p. 15.

The Mineral Industry of Sweden

By Joseph B. Huvos[1]

The recession in Sweden reached a trough in 1981, and signs of an economic upturn were visible by yearend with the stimulus to industrial production coming mainly from export demand. A 10% devaluation of the krona in September was expected to boost exports further. Sweden's gross national product in 1981 was about $123 billion,[2] a decrease in real terms of 0.8%. The balance-of-payments current-account deficit decreased in 1981 because of reduced imports. Unemployment was 2.5%, and the consumer price index rose by 12.1%.

In 1981, Sweden's mineral industry remained small but technologically advanced. The country continued to be one of the world's largest iron ore producers, and there was significant production of nonferrous metals and industrial minerals. Hydroelectric and nuclear power were abundant, but fossil fuels had to be imported.

Significant developments in Sweden's mineral industry in 1981 included commissioning of the Boliden AB Kristineberg sulfide ore mine and expansion of its Aitik copper mine, and conversion of the two Cementa AB cement plants to coal. Construction continued on the Luossavaara Kiirunavaara AB (LKAB) Viscaria copper mine and on the new Svenskst Staal AB (SSAB) ore pelletizer at Grängesberg. Government holdings in SSAB were increased, and merger talks started in the stainless steel industry. The Government's new energy bill was approved. The Stora Kopparbergs Bergslags AB (SKB) Falun open pit metal mine was closed, and plans were disclosed to close Boliden's Vassbo lead mine.

PRODUCTION

Production of mineral commodities in 1977-81 is shown in table 1.

Indices of Swedish mineral industry production in 1980-81 are shown in the following tabulation (1968=100):

Industry sector	1980	1981[p]
Iron ore mining	86	74
Nonmetallic minerals	92	81
Metal industries	118	109
Mining, quarrying, manufacturing	128	123

[p]Preliminary.

Source: Monthly Digest of Swedish Statistics, No. 5, 1982, p. 13.

Table 1.—Sweden: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
METALS					
Aluminum, unalloyed:					
Primary	82,597	82,019	81,955	81,641	82,717
Secondary	381	32,005	28,787	23,239	NA
Arsenic:					
White, refined	5,300	e5,400	e5,080	e4,080	e4,000
Metallic	700	e700	NA	NA	NA
Bismuth, mine output, metal content[e]	15	15	14	14	14
Copper:					
Mine output, metal content	44,764	47,611	45,773	42,769	51,100
Metal:					
Smelter:					
Primary	46,666	53,177	51,655	45,749	e62,800
Secondary	15,008	13,830	12,889	10,692	e11,000
Total	61,674	67,007	64,544	56,441	73,800
Refined:					
Primary	47,684	52,629	50,676	e46,713	51,900
Secondary	14,036	11,809	11,000	e9,000	10,000
Total	61,720	64,438	61,676	55,713	61,900
Gold:					
Mine output, metal content ---troy ounces	67,934	76,294	e70,000	e70,000	e70,000
Metal including alloys ---do	136,705	e140,000	149,629	129,567	e150,000
Iron and steel:					
Iron ore and concentrate, gross weight:					
Direct-shipping ore ---thousand tons	12,845	NA	15,696	14,300	e14,300
Concentrate ---do	11,994	NA	10,473	e12,884	e8,925
Total ---do	24,839	21,486	26,169	27,184	23,225
Metal:					
Pig iron and sponge iron[3] ---do	2,490	2,481	3,033	2,436	1,720
Electric-furnace ferroalloys:					
Ferrochromium	134,452	166,238	189,299	144,089	e189,000
Ferrochromium-silicon	8,456	4,181	28,825	8,335	e20,000
Ferromolybdenum	1,003	1,131	1,365	805	e1,600
Ferrosilicon	22,282	652	--	--	--
Ferrotungsten	487	440	500	423	e500
Ferrovanadium	423	616	500	348	e600
Silicon metal	12,687	8,753	r12,929	18,457	e16,000
Total	179,790	182,011	r233,418	172,457	227,700
Steel, crude ---thousand tons	3,968	4,325	4,628	4,232	3,765
Semimanufactures:					
Bars, rods, sections ---do	1,210	1,228	1,241	1,190	1,159
Plates and sheets ---do	1,345	1,401	1,046	1,202	1,139
Strip ---do	87	93	147	734	665
Rails and accessories ---do	56	62	52	49	38
Pipe and tube stock ---do	207	201	170	178	150
Other including castings and forgings ---do	349	560	675	216	82
Total ---do	3,254	3,545	r3,331	3,569	3,233
Lead:					
Mine output, metal content	88,132	81,900	81,626	72,200	84,100
Metal, refined:					
Primary	23,733	26,915	22,675	20,300	e17,600
Secondary	17,420	18,143	18,962	22,000	e1,000
Selenium, elemental, refined	80	56	r57	51	e68
Silver:					
Mine output, metal content ---thousand troy ounces	5,438	5,007	5,649	5,112	e5,100
Metal including alloys ---do	6,810	7,692	9,473	7,666	e8,000
Tungsten, mine output, metal content	199	317	r371	327	371
Uranium oxide (U_3O_8)[e]	80	80	NA	NA	NA
Zinc:					
Mine output, metal content	140,233	162,800	169,854	167,400	180,900
Clinker (70%-75% Zn)	28,200	NA	NA	NA	NA
NONMETALS					
Cement, hydraulic[4] ---thousand tons	2,615	2,351	2,387	2,523	2,320
Chalk	36,205	32,096	35,822	33,739	NA

See footnotes at end of table.

Table 1.—Sweden: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Clays:					
Kaolin	298	344	327	357	NA
Refractory thousand tons	100	NA	NA	NA	NA
Feldspar, salable, crude and ground	52,167	53,845	58,654	57,999	e50,000
Fluorspar	2,414	--	--	--	--
Gypsum, manufactured	211,100	NA	NA	NA	NA
Lime: Quicklime, hydrated lime, dead-burned dolomite thousand tons	769	748	775	e800	e800
Nitrogen: N content of ammonia do	102	96	89	86	79
Phosphates: Thomas slag, gross weight do	r50	83	r58	88	124
Pigments, mineral, natural	975	NA	NA	NA	NA
Pyrite and pyrrhotite (including cuprous), gross weight thousand tons	402	484	448	396	421
Sodium compounds:					
Sodium carbonate[e]	900	900	1,000	1,000	1,000
Sodium sulfate[e]	105,000	105,000	105,000	105,000	105,000
Stone, sand and gravel:					
Dimension stone:					
Unworked:					
Limestone and marble thousand tons	28	24	20	23	NA
Granite and gneiss do	65	65	113	92	NA
Quartz do	20	30	32	21	NA
Quartzite do	3	15	NA	--	NA
Micaceous schist do	20	17	NA	NA	NA
Sandstone do	33	34	NA	NA	NA
Other do	15	17	NA	16	NA
Worked, all types[5] do	68	NA	NA	NA	NA
Crushed and broken stone:					
Clay slate do	54	43	65	65	NA
Dolomite:					
Crude do	360	372	354	421	NA
Burnt do	25	21	NA	NA	NA
Granite and gneiss do	8,032	NA	NA	NA	NA
Limestone:					
For cement manufacture do	2,081	1,642	2,222	1,840	NA
For lime manufacture do	752	812	NA	117	NA
For other industrial uses including lime marl do	3,268	3,001	2,402	2,204	NA
Quartz do	15	15	NA	NA	NA
Quartzite do	1,531	1,286	NA	NA	NA
Sandstone do	281	212	NA	NA	NA
Other do	1,036	975	NA	NA	NA
Sulfur:					
S content of pyrite do	204	233	282	249	e249
Byproduct:					
From metallurgy[e] do	135	130	130	130	130
From other sources do	e30	18	36	e40	e40
Total do	e369	381	448	419	e419
Sulfuric acid do	NA	799	754	647	e650
Talc and steatite	21,214	21,322	17,746	3,000	4,000
Other, crude[e]	3,104	NA	NA	NA	NA
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	23,523	25,497	NA	NA	NA
Coal, all grades thousand tons	8	9	e9	e9	NA
Coke, metallurgical do	918	853	1,136	1,186	NA
Oil shale:					
For fuel production use do	12	73	68	73	NA
For other use do	6				
Peat:					
For agricultural use do	92	95	e95	e95	NA
For fuel use do	30	30	NA	NA	NA
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	21,083	21,048	20,944	23,146	NA
Jet fuel do	1,094	1,148	1,440	1,424	NA
Kerosine do	63	68	85	39	NA
Distillate fuel oil do	37,556	39,012	42,340	44,797	NA
Residual fuel oil do	39,846	43,293	48,335	51,535	NA
Lubricants do	142	214	e220	e220	NA

See footnotes at end of table.

Table 1.—Sweden: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum refinery products —Continued					
Other:					
Naphtha ____ thousand 42-gallon barrels	195	511	1,113	1,003	NA
White spirit ____ do ____	2,597	2,944	e3,000	e3,000	NA
Unspecified ____ do ____	NA	NA	NA	NA	NA
Refinery fuel and losses ____ do ____	6,771	6,925	e7,600	e8,100	NA
Total ____ do ____	109,347	115,163	125,077	133,264	NA

eEstimated. pPreliminary. rRevised. NA Not available.

[1]Includes data available through Oct. 1, 1982.

[2]In addition to the commodities listed, cobalt, nickel (as nickel sulfate), and metallic titanium are also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[3]Production of sponge iron is as follows, in thousand tons: 1977—161; 1978—117; 1979—136; 1980—not available; and 1981—not available.

[4]Includes clinker as follows, in thousand tons: 1977—43; 1978—15; 1979—not available; 1980—not available; and 1981—not available.

[5]Represents material for sale, not that produced.

[6]Includes strontium minerals, unspecified minerals, and fragments of ceramic materials.

TRADE

Exports of Swedish goods declined 0.1% in 1981, and imports declined 6.5%. Sweden's principal trading partners were the countries of Western Europe. In 1981, the United States was the second largest foreign investor in Sweden, accounting for $271 million or 20% of the total. Also in 1981, the United States was the leading target of Sweden's investments abroad, with 28% of all foreign investments.

Sweden's mineral trade in 1979-80 is shown in tables 2 and 3.

Table 2.—Sweden: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	730	27	--	All to Republic of Korea.
Oxides and hydroxides	104	569	--	West Germany 351; Denmark 103; Finland 89.
Metal including alloys:				
Scrap	1,628	2,364	18	West Germany 948; Pakistan 248; France 205.
Unwrought	19,561	17,726	--	Norway 4,459; Netherlands 3,050; West Germany 2,678.
Semimanufactures	63,087	50,940	492	Denmark 9,161; United Kingdom 7,894; Norway 7,060.
Cadmium metal including alloys, all forms	--	30	30	
Chromium:				
Chromite	--	31	--	Norway 16; United Kingdom 13.
Oxides and hydroxides	23	17	NA	Norway 12.
Metal including alloys, all forms	6	1	NA	NA.
Cobalt:				
Oxides and hydroxides	89	(1)	NA	Mainly to Norway.
Metal including alloys, all forms	216	103	--	United Kingdom 50; Japan 14; India 11.

See footnotes at end of table.

Table 2.—Sweden: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Copper:				
Ore and concentrate	27,173	6,895	--	East Germany 4,032; Finland 2,863.
Ash and residue containing copper	96	15,662	--	Belgium-Luxembourg 12,459; East Germany 1,899.
Metal including alloys:				
Scrap	668	1,837	--	Spain 949; West Germany 406; Denmark 306.
Unwrought	31,223	21,044	108	United Kingdom 9,350; Belgium-Luxembourg 5,152; Netherlands 2,930.
Semimanufactures	76,225	72,162	9,566	West Germany 10,734; Norway 9,984; Denmark 8,351.
Iron and steel:				
Ore and concentrate thousand tons	26,242	20,998	161	Belgium-Luxembourg 6,009; West Germany 5,929; France 2,722.
Pyrite, roasted	303,000	249,954	--	United Kingdom 138,984; West Germany 93,728.
Metal:				
Scrap	17,366	16,231	--	West Germany 6,994; East Germany 2,556; Denmark 2,540.
Pig iron including cast iron	150,319	179,631	12,067	Japan 52,707; Italy 43,322; Finland 26,187.
Sponge iron, powder, shot	119,144	99,950	192	West Germany 16,837; United Kingdom 11,672; Japan 11,065.
Ferroalloys:				
Ferromanganese	1,000	1,025	--	Finland 301; Hungary 140; West Germany 136.
Other	144,842	99,484	7,962	West Germany 34,279; Italy 20,447; United Kingdom 11,696.
Steel, primary forms	560,287	424,386	12,684	West Germany 97,774; Japan 85,998; United Kingdom 34,963.
Semimanufactures:				
Bars, rods, angles, shapes, sections	677,695	644,301	22,075	West Germany 126,282; Norway 69,467; Finland 67,298.
Universals, plates, sheets	655,966	625,568	26,637	West Germany 132,095; Norway 121,494; Denmark 71,996.
Hoop and strip	102,862	97,636	5,368	West Germany 17,606; Finland 11,162; Denmark 9,767.
Rails and accessories	30,315	37,427	--	Norway 22,705; Italy 7,988; West Germany 2,426.
Wire	77,693	65,406	6,232	West Germany 9,718; Finland 6,441; Denmark 5,932.
Tubes, pipes, fittings	256,669	230,902	11,214	West Germany 35,402; U.S.S.R. 22,782; Norway 20,508.
Castings and forgings, rough	2,543	2,239	10	Finland 713; Norway 598; Denmark 362.
Lead:				
Ore and concentrate	59,190	56,788	--	West Germany 38,662; Belgium-Luxembourg 13,765.
Oxides and hydroxides	129	181	NA	NA.
Metal including alloys:				
Scrap	36	65	--	West Germany 23; Norway 19; Denmark 12.
Unwrought	44,917	42,610	--	West Germany 18,078; Finland 10,735; Norway 3,168.
Semimanufactures	488	469	--	Finland 189; Norway 167; Saudi Arabia 57.
Magnesium metal including alloys:				
Scrap	239	307	17	West Germany 198; Denmark 65.
Unwrought	--	3	--	Mainly to Yugoslavia.
Semimanufactures	8	4	NA	Denmark 3.
Manganese:				
Ore and concentrate	164	7	--	All to North Korea.
Oxides and hydroxides	21	206	--	Denmark 200.
Metal including alloys, all forms	104	77	NA	Finland 73.
Mercury 76-pound flasks	551	841	--	Norway 725.
Molybdenum:				
Ore and concentrate	1,129	1,330	NA	West Germany 701; Netherlands 308; Japan 162.
Metal including alloys, all forms	12	2	1	United Kingdom 1.

See footnotes at end of table.

Table 2.—Sweden: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Nickel:				
Matte and speiss	64	--		
Metal including alloys:				
Scrap	482	503	18	Finland 171; India 171; United Kingdom 134.
Unwrought	1,516	1,906	252	Netherlands 1,311; United Kingdom 158; Spain 85.
Semimanufactures	1,406	1,347	209	France 216; West Germany 140; Italy 102.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$6,955	$7,942	$54	United Kingdom $4,063; Finland $2,135.
Silicon, elemental do	$15,300	NA	NA	NA.
Silver:				
Ore and concentrate[2] do	--	$19	--	All to Finland.
Waste and sweepings[2] do	$19,945	$53,677	$822	United Kingdom $23,456; West Germany $22,869.
Metal including alloys, unwrought and partly wrought thousand troy ounces	7,298	7,780	NA	NA.
Tin metal including alloys:				
Scrap	8	5	--	All to Norway.
Unwrought	63	58	--	Finland 55.
Semimanufactures	47	27	--	Saudi Arabia 13; Finland 9; West Germany 2.
Titanium:				
Ore and concentrate	388	23	NA	NA.
Oxides and hydroxides	38	32	NA	Norway 19.
Metal including alloys, all forms	97	278	38	United Kingdom 147; West Germany 52.
Tungsten:				
Ore and concentrate	431	330	--	West Germany 222; India 64; Netherlands 44.
Metal including alloys, all forms	54	46	--	United Kingdom 29.
Zinc:				
Ore and concentrate	347,574	351,941	--	West Germany 77,789; Finland 73,642; Norway 68,340.
Ash and residue containing zinc	30,983	21,294	--	Norway 20,291; West Germany 513; Belgium-Luxembourg 324.
Oxides and hydroxides	486	478	NA	Norway 250; Finland 160.
Metal including alloys:				
Scrap	3,347	3,325	--	Norway 1,893; West Germany 501; Belgium-Luxembourg 350.
Unwrought	249	342	--	Norway 113; West Germany 102; Belgium-Luxembourg 49.
Semimanufactures	75	71	--	Finland 45; West Germany 15.
Zirconium metal including alloys, all forms	28	13	--	Japan 10; West Germany 3.
Other:				
Ash and residues containing nonferrous metals	r2,365	1,413	--	West Germany 460; Belgium-Luxembourg 448; United Kingdom 230.
Oxides, hydroxides, peroxides	99	200	NA	West Germany 150; United Kingdom 23; East Germany 18.
Base metals including alloys, all forms	r1,539	3160	16	United Kingdom 101.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	35	30	--	Norway 21; U.S.S.R. 7.
Artificial corundum	3,855	44	23	Norway 11.
Dust and powder of precious and semiprecious stones value, thousands	$47	$126	--	Finland $95; Denmark $28.
Grinding and polishing wheels and stones	2,447	2,512	--	Finland 331; France 292; U.S.S.R. 270; United Kingdom 270.
Asbestos, crude	112	14	--	United Kingdom 9; Switzerland 5.
Boron materials: Oxides and acids	29	47	NA	Norway 46.
Cement	165,394	348,512	85,744	Nigeria 222,067; Venezuela 35,820.
Chalk	9,309	10,210	--	Norway 3,553; Republic of South Africa 2,455; Finland 2,139.

See footnotes at end of table.

Table 2.—Sweden: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products:				
Crude	2,379	3,188	--	West Germany 1,065; Norway 856; Vietnam 471.
Products:				
Refractory including nonclay brick	36,742	59,057	1,080	Finland 15,790; Norway 13,514; West Germany 10,865.
Nonrefractory	28,252	23,778	250	Norway 6,687; Finland 3,430; Belgium-Luxembourg 3,351.
Cryolite and chiolite	--	2	--	Finland 1; West Germany 1.
Diamond:				
Gem, not set or strung value, thousands	$3,363	$10,197	$402	Finland $3,144; Belgium-Luxembourg $2,738; Norway $1,858.
Industrial do.	$38	$50	--	Belgium-Luxembourg $34; United Kingdom $16.
Diatomite and other infusorial earth	142	81	--	Norway 43; Yugoslavia 13; Finland 11.
Feldspar, fluorspar, etc	35,537	30,336	38	United Kingdom 11,235; East Germany 9,476; Austria 3,227.
Fertilizer materials:				
Crude:				
Nitrogenous	2,310	5,059	--	Belgium-Luxembourg 5,057.
Phosphatic	43,816	60,675	--	Norway 48,585; West Germany 6,100.
Manufactured:				
Nitrogenous	r35,313	39,084	--	NA.
Phosphatic	6,205	32,692	--	NA.
Potassic	440	--	--	
Other including mixed	8,235	8,021	18	Norway 5,169.
Ammonia	--	84	NA	NA.
Graphite, natural	47	47	36	NA.
Gypsum and plaster	--	266	--	Denmark 203; Norway 32; Finland 30.
Lime	2,292	8,092	NA	Norway 7,467.
Magnesite	551	225	--	Norway 156; Denmark 43.
Mica:				
Crude including splittings and waste	--	11	--	West Germany 5; Netherlands 2; Switzerland 2.
Worked including agglomerated splittings	1	3	NA	NA.
Pigments, mineral: Iron oxides, processed	45	70	NA	Norway 29.
Precious and semiprecious stones excluding diamond:				
Natural value, thousands	$334	$393	$3	Switzerland $112; United Kingdom $106; Australia $48.
Synthetic do.	$10,361	$13,664	$6	Ireland $13,443.
Pyrite, unroasted	7,046	84,705	--	Romania 84,382.
Salt and brine	5,037	1,475	--	Norway 840; Denmark 328; Finland 285.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	3,619	3,692	NA	NA.
Caustic soda	3,765	11,940	NA	NA.
Soda ash	292	89	NA	Norway 82.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Calcareous	3,039	2,062	--	Denmark 1,220; Netherlands 648.
Slate	19,568	24,656	--	Belgium-Luxembourg 12,225; Denmark 4,639; Norway 3,664.
Other	200,455	111,921	16	West Germany 47,951; Italy 23,980; Denmark 21,114.
Worked	12,714	11,569	228	Denmark 8,666.
Dolomite, chiefly refractory-grade	4,347	36,446	--	Denmark 8,573; Netherlands 8,409; West Germany 7,793.
Gravel and crushed rock thousand tons	1,574	1,525	--	Denmark 846; West Germany 594.
Limestone excluding dimension do.	1,013	953	--	Finland 726; West Germany 114; Denmark 111.
Quartz and quartzite	141,397	103,092	1,560	Norway 85,291.
Sand excluding metal-bearing	67,624	72,259	(1)	Norway 62,855.

See footnotes at end of table.

Table 2.—Sweden: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental, other than colloidal	20,597	29,513	--	United Kingdom 19,631; Netherlands 6,384; West Germany 3,015.
Dioxide	24,124	14,528	NA	Finland 5,581; Norway 4,815; West Germany 3,220.
Sulfuric acid	36,757	14,760	NA	Finland 7,967; Denmark 4,010; Norway 2,422.
Talc, steatite, soapstone, pyrophyllite	3,776	5,649	--	United Kingdom 4,391.
Other:				
Crude	7,596	9,346	--	United Kingdom 3,627; Denmark 3,009; Norway 1,901.
Slag, dross, similar waste	139,153	83,342	(1)	Finland 38,588; Norway 20,550; United Kingdom 17,398.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	42	35	NA	Argentina 20.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	3,557	4,801	NA	Norway 1,641; Finland 1,396; Hungary 735.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	76	10	--	Poland 9.
Carbon black	6,296	8,650	NA	Norway 2,991; Poland 2,513; Finland 2,244.
Coal including briquets:				
Anthracite and bituminous	24,479	3,994	--	All to Finland.
Lignite	1,000	1,129	--	All to Norway.
Coke and semicoke	26,502	114,174	--	Finland 113,994.
Hydrogen, helium, rare gases	171	580	NA	Norway 353; Finland 176.
Peat including briquets and litter	33,141	30,234	25	Denmark 15,858; Norway 10,313.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	569	646	--	All to Finland.
Refinery products:				
Gasoline do	r5,341	6,593	--	Denmark 2,618; Norway 1,321; United Kingdom 923.
Kerosine and jet fuel do	184	377	--	United Kingdom 223; France 84; Norway 60.
Distillate fuel oil do	4,602	8,318	--	Denmark 5,096; Norway 1,978.
Residual fuel oil do	12,360	17,608	--	Denmark 6,327; France 1,882; Netherlands 1,807.
Lubricants do	489	495	(1)	Norway 156; United Kingdom 94.
Other:				
Liquefied petroleum gas do	1,136	481	--	Norway 45; Denmark 36.
Mineral jelly and wax 42-gallon barrels	3,195	4,840	--	Norway 4,415.
Petroleum coke do	1,876	--		
Bitumen and other residues do	393,815	446,640	--	Denmark 248,745; Norway 94,100; Finland 73,726.
Bituminous mixtures do	34,990	34,542	(1)	Finland 7,230; Norway 4,987; Netherlands 4,436.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r207,740	166,296	--	Netherlands 129,311; Denmark 23,960.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]May include other precious metals.
[3]Excludes silicon metal valued at $18,113,000.
[4]Excludes quantity valued at $18,662,000 distributed to the United Kingdom ($17,781,000) and France ($881,000).

Table 3.—Sweden: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	67,791	65,335	--	Australia 24,426; Greece 12,619; Guyana 9,487.
Oxides and hydroxides	199,589	235,062	48,161	Jamaica 94,774; West Germany 59,562; Panama 26,000.
Metal including alloys:				
Scrap	5,802	3,507	1,004	Norway 1,755; United Kingdom 377.
Unwrought	36,738	36,868	970	Norway 28,244.
Semimanufactures	59,377	52,012	4,733	West Germany 13,337; Norway 8,973; France 5,070.
Arsenic, all forms	--	5	2	West Germany 3.
Antimony metal including alloys, all forms	19	14	--	China 10; United Kingdom 4.
Beryllium metal including alloys, all forms value, thousands	$17	$23	$15	West Germany $8.
Cadmium metal including alloys, all forms	168	268	--	Finland 160; Norway 56; Japan 52.
Chromium:				
Chromite	665,017	332,328	--	Finland 144,059; Albania 61,075; Turkey 43,938.
Oxides and hydroxides	500	432	--	West Germany 403.
Metal including alloys, all forms	215	144	NA	United Kingdom 77; France 37; Denmark 16.
Cobalt:				
Oxides and hydroxides	4	2	--	Belgium-Luxembourg 1; France 1.
Metal including alloys, all forms	507	487	13	Belgium-Luxembourg 231; Zaire 57; Finland 47.
Copper:				
Ore and concentrate	33,153	46,870	--	Norway 26,242; Chile 10,899; Yugoslavia 5,841.
Ash and residue containing copper	12,822	15,029	37	Uganda 7,667; West Germany 3,627; France 2,015.
Oxides and hydroxides	401	445	NA	Yugoslavia 189; Norway 173; West Germany 63.
Matte	10,371	8,009	--	France 7,937.
Sulfate	1,441	974	--	United Kingdom 459; Belgium-Luxembourg 316.
Metal including alloys:				
Scrap	6,232	4,988	429	France 3,454.
Unwrought	74,867	76,805	1,753	Chile 15,417; Belgium-Luxembourg 13,457; Zambia 11,122.
Semimanufactures	36,544	36,333	624	West Germany 9,292; United Kingdom 7,349; Netherlands 4,047.
Iron and steel:				
Ore and concentrate	33,000	513	--	United Kingdom 270; Netherlands 243.
Pyrite, roasted	--	5	--	All from Netherlands.
Metal:				
Scrap	129,756	75,605	7,390	United Kingdom 17,071; West Germany 13,265; U.S.S.R. 12,624.
Pig iron including cast iron	49,837	45,920	--	U.S.S.R. 13,621; East Germany 6,717; Canada 5,688.
Sponge iron, powder, shot	7,953	9,942	330	United Kingdom 4,148; West Germany 2,095; Czechoslovakia 1,893.
Ferroalloys:				
Ferromanganese	42,033	32,686	264	Norway 22,124; Republic of South Africa 8,991.
Other	133,042	98,072	588	Norway 36,818; Republic of South Africa 19,369.
Steel, primary forms	120,631	145,838	133	Finland 86,816; West Germany 44,500.
Semimanufactures:				
Bars, rods, angles, shapes, sections	483,873	468,698	969	West Germany 130,909; United Kingdom 62,212; Norway 58,263.
Universals, plates, sheets	946,010	902,637	5,906	West Germany 273,288; Belgium-Luxembourg 129,404; France 106,686.
Hoop and strip	168,729	153,289	292	West Germany 61,041; United Kingdom 21,005; Poland 19,007.
Rails and accessories	3,947	3,316	3	West Germany 1,754; United Kingdom 841.
Wire	30,183	26,030	111	Belgium-Luxembourg 5,356; West Germany 4,865; France 4,719.
Tubes, pipes, fittings	281,678	290,660	1,953	West Germany 80,238; Denmark 33,328; Finland 29,352.
Castings and forgings	10,041	12,317	(1)	Poland 3,251; West Germany 2,266; Norway 2,092.

See footnotes at end of table.

Table 3.—Sweden: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides and hydroxides	1,742	2,111	7	West Germany 1,453.
Metal including alloys:				
Scrap	7,012	3,971	146	Canada 2,385; Norway 1,439.
Unwrought	2,954	1,768	55	Denmark 737; United Kingdom 605; West Germany 242.
Semimanufactures	1,087	1,106	1	West Germany 987.
Magnesium metal including alloys:				
Scrap	22	3	--	All from Denmark.
Unwrought	1,572	1,963	267	Norway 1,640.
Semimanufactures	179	218	8	Austria 66; Switzerland 50; West Germany 44.
Manganese:				
Ore and concentrate	14,111	354	54	Netherlands 123; Belgium-Luxembourg 120; China 46.
Oxides and hydroxides	616	791	92	Belgium-Luxembourg 333; Greece 160.
Metal including alloys, all forms	1,269	1,459	NA	Republic of South Africa 1,097.
Mercury 76-pound flasks	696	464	--	Italy 174; China 145; Finland 58; U.S.S.R. 58.
Molybdenum:				
Ore and concentrate	7,902	6,014	2,604	Netherlands 1,988.
Oxides and hydroxides	97	44	1	West Germany 42.
Metal including alloys, all forms	78	103	40	West Germany 20; Austria 19; Chile 11.
Nickel:				
Ore and concentrate	40	--		
Matte and speiss	3,447	4,453	21	Australia 3,066; U.S.S.R. 1,117.
Metal including alloys:				
Scrap	2,829	2,614	747	West Germany 915; United Kingdom 747.
Unwrought	11,620	10,805	1,468	Canada 3,175; U.S.S.R. 1,372; Australia 1,126.
Semimanufactures	1,290	1,044	128	United Kingdom 281; Canada 246.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$35,169	$69,330	$14,685	Switzerland $21,944; United Kingdom $17,425; West Germany $8,875.
Silver:				
Ore and concentrate[2] do	$2,671	$8,422	--	Chile $3,938; France $2,159; Canada $1,901.
Waste and sweepings[2] do	$16,308	$33,999	$17,191	United Kingdom $5,770; Mexico $5,732; Finland $3,022.
Metal including alloys, unwrought and partly wrought thousand troy ounces	15,786	14,275	3,665	West Germany 4,565; United Kingdom 2,861; France 2,058.
Tantalum metal including alloys, all forms value, thousands	$106	$58	$44	Austria $5; West Germany $4; Switzerland $4.
Tin metal including alloys:				
Scrap	3	11	--	Canada 8.
Unwrought	628	475	(1)	Malaysia 190; United Kingdom 94; West Germany 66.
Semimanufactures	212	211	(1)	United Kingdom 86; West Germany 73; Netherlands 48.
Titanium:				
Ore and concentrate	2,393	3,592	--	Australia 2,463; Canada 1,003.
Oxides and hydroxides	5,539	3,613	1	Norway 1,385; Finland 1,362; Czechoslovakia 200.
Metal including alloys, all forms	619	548	2	West Germany 194; Japan 192; U.S.S.R. 115.
Tungsten:				
Ore and concentrate	2,161	3,711	329	China 1,010; Australia 963; Canada 746.
Metal including alloys, all forms	28	131	2	United Kingdom 109.
Vanadium oxides and hydroxides	990	517	--	Finland 487.
Zinc:				
Ash and residues containing zinc	22,834	10,444	NA	West Germany 8,152; France 1,887.
Oxides and hydroxides	1,206	1,197	--	Netherlands 581; Norway 319.
Metal including alloys:				
Scrap	71	31	--	All from Norway.
Unwrought	41,576	37,763	(1)	Norway 17,068; Finland 12,225.
Blue powder	527	522	--	Norway 513.
Semimanufactures	421	356	--	West Germany 142; Poland 109.
Zirconium:				
Ore and concentrate	1,129	1,592	NA	Republic of South Africa 1,296.
Metal including alloys, all forms	133	128	25	France 90.

See footnotes at end of table.

Table 3.—Sweden: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates	(3)	5,001	--	Australia 5,000.
Ash and residues containing nonferrous metals	r23,706	27,411	521	Spain 11,208; Norway 10,463; United Kingdom 3,058.
Oxides, hydroxides, peroxides	r1,027	967	55	United Kingdom 436; West Germany 178; France 134.
Base metal including alloys, all forms	r1,260	898	20	Norway 356; France 158; Republic of South Africa 114.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	1,839	2,809	37	Iceland 2,499.
Artificial corundum	5,630	7,217	--	West Germany 4,688.
Dust and powder of precious and semiprecious stones value, thousands	$2,603	$2,619	$1,105	Switzerland $1,105.
Grinding and polishing wheels and stones	3,097	3,225	204	Austria 1,106; United Kingdom 674; West Germany 495.
Asbestos, crude	861	1,195	18	Canada 1,175.
Barite and witherite	5,493	3,992	(1)	West Germany 3,684.
Boron materials:				
Crude natural borates	27,579	26,776	21,477	Turkey 3,340; Netherlands 1,900.
Oxides and acids	629	845	108	France 482; Belgium-Luxembourg 126.
Cement	326,122	175,727	407	Poland 112,049; Denmark 32,660; Finland 23,667.
Chalk	30,227	32,404	9	United Kingdom 10,836; West Germany 10,257; Denmark 8,505.
Clay and clay products:				
Crude:				
Kaolin	291,381	273,914	22,837	United Kingdom 234,590.
Bentonite	7,292	4,462	1,829	United Kingdom 1,295; Netherlands 701.
Other	38,168	46,899	10,136	United Kingdom 22,774; France 5,748; West Germany 5,324.
Products:				
Nonrefractory	32,006	34,684	11	Italy 11,159; West Germany 6,730; Denmark 4,731.
Refractory including nonclay brick	105,170	102,955	654	West Germany 33,398; Austria 21,057; United Kingdom 21,038.
Cryolite and chiolite	731	501	--	Denmark 481.
Diamond:				
Gem, not set or strung value, thousands	r$14,180	$25,982	$53	Belgium-Luxembourg $15,657; Israel $7,858.
Industrial do	$1,366	$1,097	$2	United Kingdom $371; Republic of South Africa $365; Belgium-Luxembourg $293.
Diatomite and other infusorial earth	5,562	3,805	1,414	Denmark 1,174; Spain 392; West Germany 224.
Feldspar, fluorspar, etc	15,858	25,852	--	Finland 7,987; Norway 4,613; Mexico 4,086; France 4,002.
Fertilizer materials:				
Crude:				
Nitrogenous	8,304	9,622	--	Chile 9,552.
Phosphatic	619,160	579,657	120,051	Morocco 255,079; U.S.S.R. 204,478.
Potassic	--	459	--	All from West Germany.
Manufactured:				
Nitrogenous	482,885	508,944	42,097	Norway 407,804;[4] Poland 18,396; Netherlands 11,666.[5]
Phosphatic	1,646	1,143	--	Israel 1,101.
Potassic value, thousands	$13,934	$21,480	$271	West Germany $8,812; U.S.S.R. $5,048; East Germany $4,198.
Other including mixed	214,974	143,891	1,262	Norway 84,788; Finland 24,271; France 15,801.
Ammonia	136,641	154,613	--	Trinidad and Tobago 68,514; Mexico 59,275.
Graphite, natural	855	911	1	China 454; West Germany 243; Norway 78.
Gypsum and plaster	374,308	350,445	123	Spain 252,344.
Lime	8,104	7,659	--	Denmark 2,367; West Germany 1,775; United Kingdom 1,693.

See footnotes at end of table.

Table 3.—Sweden: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Magnesite	22,676	20,584	107	Norway 6,033; Spain 3,771; Czechoslovakia 3,341.
Mica:				
Crude including splittings and waste	467	408	10	Norway 166; India 100; France 74.
Worked including agglomerated splittings	76	79	2	Switzerland 35; Belgium-Luxembourg 26.
Pigments, mineral: Iron oxides, processed	7,868	7,096	29	West Germany 6,319.
Precious and semiprecious stones excluding diamond:				
Natural value, thousands	$925	$1,599	$31	Sri Lanka $489; Switzerland $453; West Germany $152.
Synthetic do	$498	$881	$593	Israel $99; India $77; United Kingdom $42.
Pyrite, unroasted	26,431	79,938	100	Norway 60,044; Finland 19,615.
Salt and brine thousand tons	1,195	1,157	(1)	Netherlands 374; United Kingdom 132; Poland 168.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	645	967	(1)	West Germany 897.
Caustic soda	151,753	217,649	(1)	West Germany 95,313; East Germany 57,163; Netherlands 36,268.
Soda ash	120,082	119,008	--	France 33,075; East Germany 26,180; West Germany 24,890.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	7,014	5,334	--	Finland 1,615; Norway 1,516.
Worked	9,881	9,924	22	Portugal 4,209; Italy 2,054; Poland 1,530.
Dolomite, chiefly refractory-grade	110,426	108,971	--	United Kingdom 47,079; Norway 38,625; Belgium-Luxembourg 14,451.
Gravel and crushed rock	103,728	210,696	45	Finland 165,140; Denmark 27,107.
Limestone excluding dimension	95,784	97,151	--	United Kingdom 49,888; Denmark 31,240; Norway 9,315.
Quartz and quartzite	34,298	48,033	--	Spain 32,046; Greece 15,297.
Sand excluding metal-bearing	472,551	343,401	78	Belgium-Luxembourg 167,794; Denmark 139,236.
Sulfur:				
Elemental:				
Colloidal	32	1,138	--	Norway 525; Poland 520.
Other than colloidal	48,332	41,424	--	Poland 41,011.
Dioxide	422	4,243	NA	Norway 2,171; West Germany 2,071.
Sulfuric acid	63,201	162,128	(1)	Poland 74,461; Norway 45,477; West Germany 37,989.
Talc, steatite, soapstone, pyrophyllite	45,745	36,717	20	Finland 22,012; Norway 8,516; Belgium-Luxembourg 3,649.
Other:				
Crude	80,959	71,614	270	Norway 40,353; West Germany 28,010.
Slag, dross, similar waste	33,454	17,488	15	Finland 7,354; Netherlands 7,242; Norway 2,103.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	2,152	550	5	East Germany 444.
Bromine, iodine, fluorine	15	11	1	West Germany 4; Chile 2; Netherlands 2.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	11,686	11,250	25	United Kingdom 3,167; Norway 1,859; West Germany 1,684.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,065	780	365	Trinidad and Tobago 342.
Carbon black	9,320	6,802	603	West Germany 3,514; United Kingdom 1,464.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	2,109	2,182	1,159	U.S.S.R. 475; Canada 187; Poland 172; Czechoslovakia 134.
Briquets of anthracite and bituminous coal	--	137	24	West Germany 113.
Lignite including briquets	2,946	3,463	NA	East Germany 3,420.
Coke and semicoke	621,866	453,350	20,155	West Germany 216,745; United Kingdom 128,374; Denmark 22,545.
Hydrogen, helium, rare gases	3,696	3,899	9	Netherlands 2,673.
Peat including briquets and litter	8,241	10,748	--	Finland 6,719; U.S.S.R. 2,400; Denmark 1,604.

See footnotes at end of table.

Table 3.—Sweden: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products:				
Crude ___thousand 42-gallon barrels	117,736	131,698	__	Saudi Arabia 55,721; United Kingdom 22,898; Nigeria 15,270.
Refinery products:				
Gasoline _____do____	r26,257	21,475	(1)	Belgium-Luxembourg 4,609; Finland 3,714; Denmark 3,234.
Kerosine and jet fuel ___do____	r2,488	2,191	(1)	United Kingdom 884; Netherlands 560; France 235.
Distillate fuel oil _____do____	37,439	31,954	(1)	Venezuela 6,165; United Kingdom 5,043; U.S.S.R. 4,567.
Residual fuel oil _____do____	50,623	34,394	2	U.S.S.R. 7,912; United Kingdom 6,602.
Lubricants_____do____	2,115	2,100	166	Netherlands 392; United Kingdom 361; Portugal 346.
Other:				
Liquefied petroleum gas do____	1,099	1,517	(1)	United Kingdom 946; Venezuela 225; Norway 135.
Mineral jelly and wax 42-gallon barrels__	110,904	111,919	929	West Germany 69,146; United Kingdom 10,837.
Petroleum coke ____do____	287,782	231,072	166,089	West Germany 38,946; United Kingdom 26,032.
Bitumen and other residues do____	797,035	716,777	NA	NA.
Bituminous mixtures do____	18,792	21,295	4,939	United Kingdom 5,963; Denmark 3,442.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals_____	r61,274	52,459	648	West Germany 15,743; Netherlands 12,831; United Kingdom 7,606.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]May include other precious metals.
[3]Revised to none.
[4]Excludes quantity valued at $4,043,000.
[5]Excludes quantity valued at $1,353,000.

COMMODITY REVIEW

METALS

Aluminum.—Gränges Aluminium AB, one of Europe's smaller primary aluminum makers but Sweden's only one, operated its Sundsvall smelter on the east coast at near capacity but had to put on hold a project to build a new 80,000-ton-per-year smelter at Piteaa located south of Luleaa, also on the east coast.

Copper, Lead, and Zinc.—In 1981, Boliden AB remained Sweden's largest nonferrous sulfide ore mine operator, operating 15 mines, 7 ore processing plants, and 1 smelter. By yearend, the company had commissioned a new complex sulfide ore mine at Hornträsket in the Kristineberg area. Design capacity of the new mine was 70,000 tons of ore per year.

Expansion of Boliden's Aitik copper mine in the Gällivare area was completed, raising the mine's design capacity from 8 to 11.3 million tons of ore per year, but the added capacity could not be utilized during 1981 owing to mining and processing problems.

Boliden completed an extensive exploration project in the Vassbo area near Falun without finding any new ore deposits. The company was planning to close its Vassbo lead mine.

At the SKB Falun works, the company started to phase out open pit mining and increase underground operations. In 1981, the mine produced 29,000 tons of concentrates, but this was due to increase in the future, as new copper, lead, and zinc deposits had been found adjacent to the present mining areas.

LKAB continued construction of its Viscaria copper mine and processing plant located about 3 kilometers from the village of Kiruna. Full production was due to start by yearend 1983 when 1 million tons of ore were to be mined, yielding 85,000 tons of

25% concentrate containing about 12,500 tons of copper. The cost of the project was put at about $70 million. Copper concentrates were to be shipped to Finland's Outokumpu Oy Harjavalta smelter located on the west coast of Finland at Pori. AB Statsgruvor, an LKAB subsidiary, also operated sulfide ore mines at Haaksberg, Ludvika County, and at Stollberg, Smedjebacken County. The Stollberg Mine was to be closed in 1982.

Bolaget Vieille Montagne, a subsidiary of the Sté. des Mines et Fonderies de Zinc de la Vieille Montagne SA of Belgium, Sweden's only foreign owner of a mining company, improved operating techniques at its Aammebergsfeltet lead-zinc mine at Zinkgruvan, north of lake Vättern, producing almost 600,000 tons of ore in 1981. Zinc concentrate output rose substantially, accompanied by a 5% rise in the price of zinc.

Iron Ore.—In 1981, Swedish iron ore production decreased by 15%. Sweden's major iron ore producer, Government-owned LKAB, was forced to suspend production for 8 weeks in the summer. In Kiruna, production was shut down for another week in autumn, and for the next 7 weeks, production was cut to only 4 days per week. The estimated loss for the company was almost $140 million, corresponding to 30% of turnover or about $20,000 per employee.

The Swedish Parliament appropriated $250 million to meet LKAB capital requirements during 1982-84; it also set aside funds to halve the company's rail transportation costs in 1982 and decided to cut the company's work force by 1,000 by the end of 1983. The LKAB investment in iron ore mining was to be held down to about $65 million per year through 1986. By the mid-1980's, the company was to decide whether it was to go ahead with the very heavy investment required to develop lower levels in its existing mines for maintaining production. To help the industry, the Government decided to reduce the employee social security cost to 10%, from its present rate of about 40% of gross wages.

LKAB and its West European customers agreed to increase iron ore prices by 5%. Production in 1982 was to be maintained at the 1981 level. In 1981, major buyers of Swedish iron ore were Belgium-Luxembourg, 4.5 million tons; the Federal Republic of Germany, 3.5 million tons; and France, 3 million tons.

In 1981, LKAB operated four iron ore mines in Swedish Lappland: Kiruna, Svappavaara, Tuolluvaara, and Malmberget. SSAB operated two iron ore mines in the Bergslagen area in central Sweden at Grängesberg and Dannemora.

The Grängesberg Mine was in the process of modernizing its pelletizing equipment, due to start operation in 1982. The Dannemora Mine produced 550,000 tons of iron ore in 1981. Existing reserves at the mine were sufficient until the year 2000, and large additional ore reserves were discovered.

Iron and Steel.—The Swedish steel groups Fagersta AB and Uddeholm AB were in an advanced stage of talks for merging their production facilities. The companies have agreed to negotiate the formation of a jointly owned company that would take over high-speed steel production at four plants: Fagersta's Laangshytten, Oesterbruk, and Vikmanshytten works and Uddeholm's Söderfors works, all in central Sweden. Although no detailed production figures were issued, Sweden produced about 31,000 tons of high-speed steel in 1980, and Uddeholm and Fagersta were among the largest producers.

In 1981, SSAB became 75% Government-owned by the acquisition of a 25% share held by SKB. The other SSAB shareholder, Gränges-Electrolux Group, agreed to provide new funding needed by the company amounting to about $75 million.

In 1981, SSAB operated three steelworks: Luleaa in north Sweden, Oxelösund in south Sweden (both on the Baltic), and Domnarvet in central Sweden. Besides SSAB, Sweden had 28 mostly privately owned iron and steel makers, processors, ferroalloy makers, and steelworks in 1981.

Tungsten.—Increasing amounts of scheelite concentrate were produced in 1981 by Government-owned AB Statsgruvor, a subsidiary of LKAB, which operated the Yxsjöberg tungsten mine near Ljunarsberg in the Bergslagen district. The concentrates were sold in the domestic market.

NONMETALS

Apatite.—In 1981, LKAB produced 124,000 tons of apatite concentrate at its Kiruna Mine byproduct plant. Capacity of the plant was rated at 200,000 tons per year. Old iron ore tailings were enriched by froth flotation.

Asbestos.—The Swedish Government's Norrlands-Fonden discovered an anthophyllite deposit of 50 million tons, with 60% to 80% anthophyllite, at Kuekeskerp, about 100 kilometers northeast of Kiruna. The deposit was rated marginal in present

economic conditions.

Cement.—Cementa AB has successfully converted its Slite and Degerhamn cement plants from oil to coal. In 1981, the company's capacity was about 3.5 million tons per year.

Dolomite.—Enström Mineral AB continued production of white dolomite and produced over 300,000 tons in 1981.

Industrial Minerals.—The industrial mineral production of Sweden in 1981 was described in detail in the technical literature.[3]

Sulfur.—BP Raffinaderi Göteborg ordered from the Impianti Gas International a sulfur recovery plant for sour gases, rated at 2,000 tons of sulfur per year. The Göteborg plant already had an existing recovery plant of 3,000 tons of sulfur per year.

Sulfuric Acid.—In 1981, SKB produced 57,000 tons of sulfuric acid at its Falun plant in central Sweden.

Sulfuric acid used in Sweden for the production of fertilizers amounted to 245,000 tons in 1981.

MINERAL FUELS

In May, Sweden's new energy bill was approved. It included programs developed after the nuclear referendum of 1980, in particular, for energy conservation and for the decrease of oil consumption to 19 million tons of oil equivalent in 1990, two-thirds of the 1979 level; this was to be accomplished by coal and nuclear expansion, the expansion of electric power's share from 20% to 30% of the total, and the expansion of electric and district heating, particularly in combination heat and power plants.

The energy balance of Sweden in 1980 is shown in table 4.

In 1981, imported oil supplied 67% of Sweden's energy needs; imported coal, 4%; hydroelectric power, 13%; nuclear power, 6%; and wood, waste, and others, 10%. On the consumption side, space heating accounted for 44% of all energy used; industry, 38%; and transportation, 18%.

Coal.—Höganas AB discovered 20 million tons of coal in south Sweden with 0.4% sulfur and 25% ash. The coal deposit was regarded as suitable for mechanized underground mining. There were no plans to exploit it.

The energy industry planned to invest $1.1 million over the next 5 years, mostly for coal-fired power stations. In 1981, few plants were beyond the planning stage except that of the Södertalje central heating plant, southwest of Stockholm, costing $95 million and built to convert 250,000 tons of coal per year when completed by 1983.

Nuclear Power.—A uranium mining project at Pleutajokk was canceled because of uncertainty about the quantity and grade of ore. LKAB had obtained all permits for the development outside the city of Arjeplog in northern Sweden, but additional drilling revealed complex mineralization in the ore, making exploitation uneconomical. Original tests had shown 700 grams of uranium per ton.

The Swedish nuclear power utility signed a contract worth $22 million for the supply of natural uranium by Conzinc Riotinto Australia Ltd., an Australian company that owns the rich Ranger Mine near Darvin. The contract covered the period 1982-96 and was to provide Sweden with 2,400 tons of natural uranium.

In 1981, Sweden had nine operating nuclear powerplants at four locations: Oskarshamn 1 and 2; Ringhals 1, 2, and 3; Barsebeck 1 and 2; and Fosmark 1 and 2, with a total capacity of 6,455 megawatts electrical. Furthermore, three nuclear powerplants, with a total capacity of 3,025 megawatts, were under construction: Ringhals 3, Fosmark 3, and Oskarshamn 3, for commissioning in 1982, 1985, and 1986, respectively.

A central facility for nuclear waste storage was being built at Oskarshamn. Final

Table 4.—Sweden: Energy balance for 1980

(Million tons of oil equivalent)

	Total energy	Solid fuels	Petroleum and refinery products	Hydroelectric power	Nuclear power
Production[1]	16.3	3.2	--	13.1	--
Imports	39.5	1.8	31.7	--	6.0
Exports	5.0	.1	4.9	--	--
Apparent consumption	50.0	4.9	26.8	13.1	6.0

[1]Includes only primary energy.

Source: Organization for Economic Cooperation and Development Energy Report, 1980.

storage of low activity waste was planned at Fosmark.

Peat.—In 1975, Swedish mineral legislation transferred peat rights from landowners to the Government. Peat was classified as a fuel mineral, making a Government permit or concession necessary to exploit it. When oil prices rose higher in 1978-79, more interest arose in peat as a fuel. It was planned to produce about 50,000 tons of peat in 1982. In 1990, the goal for peat production according to the Government's energy bill was 4.5 million tons or 10 terawatts per year, requiring the exploitation of 16,000 hectares of peat bogs annually, which industry sources regarded as hard to achieve.

Petroleum.—In 1981, Sweden had only an insignificant production of crude oil located on Gotland Island. Most petroleum used had to be imported. Four oil companies operated six oil refineries with a total distillation capacity of 453,000 barrels per day, and there were plans to build new cracking capacity of 61,000 barrels per day at the Skandinaviska Raffinaderi AB Lysekill refinery on the Skagerrak.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Swedish krona (SKr) to U.S. dollars at the rate of SKr5.07 = US$1.00.

[3]Industrial Minerals (London). December 1981, pp. 21-33.

The Mineral Industry of Switzerland

By Roman V. Sondermayer[1]

As in the past, Switzerland remained poor in economic mineral deposits. During 1981, many mineral deposits existed but few were in production. Domestic mineral output was limited to construction materials and salt. In addition, Switzerland was a processor of imported crude oil, alumina, and raw materials for production of iron and steel. Imports of bituminous coal, crude petroleum, natural gas, and petroleum refinery products were essential to meet the country's energy demand. Hydroelectric power and fuelwood were the primary sources of energy produced in the country.

The economic slowdown in Europe slightly affected the mineral industry of Switzerland. Construction activity suffered a lesser downturn than in other European countries; thus, the production of construction materials did not decline as elsewhere. About 2% of the gross national product can be attributed to the mineral industry. Modernization of two aluminum plants was the only significant development in the mineral industry of the country during 1981.

PRODUCTION

Salt was produced by a Government-owned monopoly; otherwise, the mineral industry of Switzerland was privately owned. Table 1 shows the latest trends in production during 1977-81.

Table 1.—Switzerland: Production of mineral commodities[1]

(Thousand metric tons unless otherwise specified)

Commodity[2] and unit of measure	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum metal, smelter, primary ----tons--	79,751	79,468	82,974	86,302	[3]82,202
Iron and steel:					
Pig iron and blast-furnace ferroalloys ------	27	35	30	[e]29	30
Electric-furnace ferroalloys[e] ----------	5	6	5	5	5
Crude steel ----------	654	784	886	[e]900	800
Semimanufactures ----------	635	679	[e]720	[e]750	700
NONMETALS					
Cement, hydraulic ----------	3,649	3,697	3,934	4,252	[3]4,350
Gypsum[e] ----------	70	70	70	64	85
Lime ----------	66	68	70	75	80
Nitrogen: N content of ammonia[e] ----------	45	45	45	45	[3]33
Salt ----------	366	391	390	368	370
Sodium compounds: Sodium carbonate[e] ---tons--	45,000	45,000	45,000	45,000	46,000
Sulfur, byproduct, all sources ---------do----	[e]2,000	[e]3,000	[e]3,000	3,262	[3]3,364
MINERAL FUELS AND RELATED MATERIALS					
Gas, manufactured ------ million cubic feet--	2,303	1,808	1,855	1,789	1,800

See footnotes at end of table.

Table 1.—Switzerland: Production of mineral commodities[1] —Continued

(Thousand metric tons unless otherwise specified)

Commodity[2] and unit of measure	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum refinery products:					
Liquefied petroleum gas thousand 42-gallon barrels	(4)	(4)	1,229	1,199	[3]1,092
Gasoline, all kinds do	8,475	7,434	8,381	9,527	[3]10,371
Jet fuel do	1,512	1,604	1,664	1,793	[3]1,851
Kerosine do	39	--	39	44	[3]46
Distillate fuel oil do	14,278	13,457	14,696	15,527	[3]13,201
Residual fuel oil do	6,747	5,354	6,380	4,431	[3]3,615
Other refinery products do	2,103	2,265	906	798	[3]768
Refinery fuel and losses do	1,318	1,200	2,041	1,896	[3]1,766
Total do	34,472	31,314	35,336	35,215	[3]32,710

[e]Estimated. [p]Preliminary.

[1]Table includes data available through July 12, 1982.

[2]In addition to the commodities listed, a variety of crude construction materials (common clay, sand and gravel, and stone) is undoubtedly produced, but output is not reported and available general information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Included in "Other refinery products."

TRADE

Tables 2 and 3 show the latest trends in foreign trade in minerals of Switzerland. It should be noted that large numbers of commodities are reexported. Fuels were the most expensive import items.

Table 2.—Switzerland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate kilograms	530	--	--	
Oxides and hydroxides	1,189	1,311	4	West Germany 1,095; Belgium-Luxembourg 56; Finland 22.
Metal including alloys:				
Unwrought including scrap	47,376	44,953	360	Italy 22,633; West Germany 15,920; France 2,903.
Semimanufactures	76,395	75,260	162	West Germany 13,772; France 10,483; United Kingdom 6,546.
Antimony metal including alloys, all forms kilograms	375	363	NA	NA.
Beryllium metal including alloys, all forms do	56	36	6	West Germany 26; France 1.
Chromium: Oxides and hydroxides	22	16	1	West Germany 4; Algeria 3; United Kingdom 3.
Cobalt: Oxides and hydroxides kilograms	1,531	509	--	Yugoslavia 450; West Germany 2.
Columbium and tantalum: Tantalum metal including alloys, all forms do	1,023	1,373	226	West Germany 961; France 77; Netherlands 48.
Copper:				
Sulfate	47	55	3	France 49.
Metal including alloys:				
Scrap	[r]9,285	12,075	(1)	West Germany 4,524; Austria 2,419; Hungary 1,351.
Unwrought	9,837	6,630	--	West Germany 3,498; Italy 2,221; Belgium-Luxembourg 412.
Semimanufactures	19,379	21,428	2,211	West Germany 4,854; Italy 3,459; France 2,735.
Gold metal including alloys, unwrought and partly wrought troy ounces	226,309	161,557	32	Portugal 48,612; West Germany 27,907; Iran 21,670.

See footnotes at end of table.

Table 2.—Switzerland: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Ore and concentrate including roasted pyrites	54	88	(1)	Peru 75; Brazil 4; West Germany 4.
Metal:				
Scrap	r12,119	63,738	--	Italy 49,818; West Germany 8,769; France 2,539.
Pig iron, ferroalloys, similar materials	1,210	2,001	(1)	West Germany 1,293; Poland 180; Italy 58.
Steel, primary forms	21,399	9,740	--	Italy 5,015; West Germany 4,454; United Kingdom 11.
Semimanufactures:				
Bars, rods, angles, shapes, sections	293,001	290,645	80	West Germany 217,349; Italy 27,121; France 19,659.
Universals, plates, sheets	37,959	34,439	206	West Germany 21,526; Austria 5,826; Italy 3,149.
Hoop and strip	25,515	22,596	23	Austria 9,042; West Germany 8,683; France 4,557.
Rails and accessories	1,647	1,086	9	France 461; Austria 379; West Germany 63.
Wire	6,062	6,925	7	West Germany 3,712; France 1,187; Austria 591.
Tubes, pipes, fittings	161,988	157,776	358	West Germany 55,817; Netherlands 21,364; France 12,059.
Castings and forgings, rough	12,714	16,510	13	West Germany 6,515; France 4,224; Italy 2,181.
Ingots and semimanufactures, alloy steel and high-carbon steel	46,066	42,374	23	West Germany 18,253; Italy 10,313; France 8,713.
Lead:				
Oxides and hydroxides	57	6	--	Austria 2; Italy 2; Ivory Coast 2.
Metal including alloys:				
Scrap	11,608	8,174	--	Italy 4,314; Austria 1,637; France 921.
Unwrought	4,874	4,063	--	West Germany 1,537; Italy 1,416; Netherlands 872.
Semimanufactures	55	76	(1)	Italy 28; Belgium-Luxembourg 27; West Germany 12.
Magnesium metal including alloys, all forms	440	442	12	West Germany 127; United Kingdom 121; France 54.
Manganese oxides	9	15	(1)	Sweden 12; Belgium-Luxembourg 1; France 1.
Mercury 76-pound flasks	174	262	--	West Germany 201; Iran 32.
Molybdenum-metal including alloys, all forms	2	7	(1)	Romania 3; West Germany 2; Iran 1.
Nickel:				
Matte and speiss including unwrought metal	384	180	42	West Germany 117; Netherlands 11; Algeria 7.
Metal including alloys:				
Scrap	295	233	7	West Germany 189; Austria 10; Finland 9.
Semimanufactures	376	376	16	West Germany 102; Italy 46; France 31.
Platinum-group metals including alloys, unwrought and partly wrought thousand troy ounces	r632	591	35	Japan 189; West Germany 98; Italy 74.
Silver metal including alloys, unwrought and partly wrought do	r33,467	33,419	425	Italy 8,763; France 7,814; West Germany 4,816.
Tin metal including alloys:				
Scrap	90	117	--	West Germany 89; France 25; Netherlands 2.
Unwrought	168	186	1	West Germany 58; Denmark 45; France 41; Italy 31.
Semimanufactures	36	39	(1)	Austria 13; Italy 9; West Germany 6.
Titanium oxides and hydroxides	210	240	(1)	Austria 90; West Germany 69; Ivory Coast 54.
Tungsten metal including alloys, all forms	24	51	(1)	West Germany 26; France 14; United Kingdom 5.
Uranium and thorium: Oxides including rare-earth oxides kilograms	1,334	2,381	163	Bulgaria 783; West Germany 174; Italy 96.

See footnotes at end of table.

Table 2.—Switzerland: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Oxides and hydroxides	45	43	--	West Germany 36; Yugoslavia 5.
Metal including alloys:				
Scrap	1,242	892	--	Italy 654; West Germany 116; France 96.
Unwrought	151	84	--	West Germany 82.
Blue powder	14	172	--	United Kingdom 162; Austria 9.
Semimanufactures	15	10	--	Austria 3; France 1; Iran 1; West Germany 1.
Other:				
Ores and concentrates	592	1,025	--	Austria 464; Turkey 219; Italy 100; West Germany 100.
Ash residue containing nonferrous metals	25,811	22,124	--	West Germany 11,506; Italy 4,078; Belgium-Luxembourg 3,486.
Waste and sweepings of precious metals value, thousands	$122,505	$212,194	$319	Spain $112,354; West Germany $49,614; France $43,979.
Oxides, hydroxides, peroxides	403	324	23	West Germany 168; Italy 74; Yugoslavia 11.
Metals:				
Metalloids	6,459	6,527	(1)	West Germany 5,975; United Kingdom 324; Austria 180.
Alkali, alkaline-earth, rare-earth metals kilograms	15,568	1,847	6	West Germany 107; France 73.
Base metals including alloys, all forms	167	139	36	West Germany 63; United Kingdom 6; Yugoslavia 5.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	29	19	(1)	Sweden 15.
Corundum, artificial	161	169	18	West Germany 127; France 9; Italy 7.
Dust and powder of precious and semiprecious stones kilograms	1,970	2,705	100	Italy 965; France 388; Belgium-Luxembourg 379.
Grinding and polishing wheels and stones	1,058	1,216	10	United Kingdom 310; West Germany 209; France 110.
Asbestos, crude	142	43	(1)	Italy 16; Austria 10; Barbados 7.
Barite and witherite	10	115	--	West Germany 108; Peru 5.
Boron materials:				
Crude natural borates	1	8	--	Mainly to West Germany.
Oxide and acid	5	12	(1)	Austria 6; Algeria 2; Peru 1.
Cement	28,340	30,335	--	West Germany 29,727; France 533; Austria 39.
Chalk	2,282	2,610	--	France 2,463; West Germany 108; Austria 14.
Clays and clay products:				
Crude	9,435	10,287	--	West Germany 9,689; Italy 265; Austria 160.
Products:				
Nonrefractory	46,802	53,335	36	West Germany 15,898; Italy 16,117; Austria 11,712.
Refractory including nonclay brick	1,563	2,156	(1)	Egypt 803; West Germany 542; Austria 431.
Cryolite and chiolite	1	53	--	Italy 50.
Diamond:				
Gem, not set or strung value, thousands	$1,234,023	$1,289,071	$78,983	Israel $409,891; United Kingdom $387,371; Belgium-Luxembourg $209,583.
Industrial do	$32,058	$40,721	$629	Italy $14,985; Belgium-Luxembourg $6,053; France $5,039.
Diatomite and other infusorial earth	6	19	(1)	Yugoslavia 10; France 1; Hungary 1.
Feldspar and fluorspar	255	282	--	Peru 133; Portugal 47; West Germany 47.

See footnotes at end of table.

Table 2.—Switzerland: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials:				
Crude:				
Nitrogenous ____ kilograms	600	91	NA	NA.
Phosphatic ____ do	20	340	NA	France 40.
Potassic	2	24	--	Italy 20; France 1.
Manufactured:				
Nitrogenous	706	1,304	--	West Germany 1,046; Italy 80; Austria 43.
Phosphatic	4	13	--	Saudi Arabia 5; Czechoslovakia 3; Ghana 2.
Potassic	2	24	--	Italy 20; United Arab Emirates 2; France 1.
Other including mixed	1,709	2,159	(1)	West Germany 515; Ecuador 499; France 460.
Ammonia	7	47	--	Austria 40; Thailand 3; France 2.
Graphite, natural	11	10	2	Mexico 2; Peru 2; Philippines 2.
Gypsum and plasters	667	4,100	(1)	France 3,478; Austria 421; Italy 122.
Lime	1,944	2,091	--	West Germany 1,387; France 634.
Magnesite	32	35	--	Denmark 12; Peru 7; West Germany 6.
Mica:				
Crude including splittings and waste	46	117	NA	West Germany 95; Austria 9; Sweden 2.
Worked including agglomerated splittings	508	544	1	India 67; Norway 47; United Kingdom 45.
Pigments, mineral:				
Natural, crude	18	4	NA	Austria 1.
Iron oxides, processed	50	22	--	Yugoslavia 6; West Germany 4; France 2.
Precious and semiprecious stones, excluding diamond:				
Natural ____ value, thousands	$206,272	$243,384	$18,658	France $44,106; West Germany $32,530; United Kingdom $31,954.
Manufactured ____ thousand carats	262,930	219,585	4,610	West Germany 59,390; Italy 39,695; Austria 35,115; U.S.S.R. 20,000.
Salt and brine	3,459	234	--	France 214; West Germany 11.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	33	127	--	Italy 100; France 14; Colombia 8.
Caustic soda	47,149	30,687	--	West Germany 18,318; Austria 10,749; France 1,092.
Soda ash	33,773	64,717	(1)	Italy 41,956; West Germany 21,544; Hungary 1,200.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	33,299	35,218	--	West Germany 20,255; Italy 9,582; France 3,781.
Worked	14,553	20,157	--	West Germany 17,078; Austria 2,490; France 174.
Dolomite, chiefly refractory-grade	8	19	--	West Germany 16; Austria 1.
Gravel and crushed rock	9,728	29,391	(1)	West Germany 23,698; France 3,665; Italy 854.
Limestone excluding dimension	--	31	--	West Germany 4; Italy 2; France 1.
Quartz and quartzite	34,441	39,356	1	Italy 37,445; West Germany 1,435; Austria 177.
Sand excluding metal-bearing	6,790	10,375	--	France 5,545; West Germany 3,101; Italy 1,191.
Sulfur:				
Elemental:				
Other than colloidal	15	20	--	All to Austria.
Colloidal	5	10	(1)	United Kingdom 3; West Germany 3; France 2.
Sulfuric acid	26,801	25,528	1	West Germany 17,473; Czechoslovakia 2,506; Italy 2,442.
Talc, steatite, soapstone, pyrophyllite	71	97	--	Austria 41; France 17; Argentina 11.

See footnotes at end of table.

Table 2.—Switzerland: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other:				
Crude	2,665	3,829	1	Austria 2,105; West Germany 1,473; France 77.
Slag, dross, similar waste, not metal-bearing:				
From iron and steel manufacture	15,128	2,674	--	All to West Germany.
Unspecified	795	1,335	--	France 909; Italy 232; West Germany 194.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	22	17	(1)	Italy 6; Colombia 2; West Germany 2.
Halogens	21	27	(1)	United Kingdom 16; Romania 4; Bulgaria 1.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	6,157	4,481	3	West Germany 1,663; Austria 736; Italy 721.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2	--		
Carbon black	192	224	--	Czechoslovakia 84; France 45; West Germany 24.
Coal, all grades, including briquets	5,225	415	(1)	France 402; Austria 12.
Coke and semicoke	938	37	--	West Germany 26; Italy 11.
Gas, hydrocarbon, manufactured	58	95	--	France 94.
Hydrogen, helium, rare gases	53	39	(1)	Austria 18; West Germany 8; Saudi Arabia 6; Nigeria 4.
Peat including briquets and litter	2,215	1,396	--	France 814; Austria 511; West Germany 70.
Petroleum:				
Crude and partly refined 42-gallon barrels	3	17	--	Mainly to Canada.
Refinery products:				
Gasoline including natural do	31,041	92,185	(1)	Austria 91,760; Italy 183.
Distillate fuel oil do	24,760	85,198	99	Austria 55,030; Italy 21,075; West Germany 2,489.
Residual fuel oil do	104,672	132,577	--	Austria 125,525; France 7,052.
Lubricants do	28,225	37,313	107	West Germany 12,592; Italy 4,175; France 3,643.
Other:				
Liquefied petroleum gas do	194,551	119,115	--	Italy 48,310; West Germany 44,835; Austria 17,676.
Pitch and pitch coke do	142	183	82	West Germany 31; Yugoslavia 29.
Petroleum coke do	1,192	7	--	Mainly to West Germany.
Mineral jelly and wax do	4,398	1,695	2	Iraq 792; Yugoslavia 209; Colombia 156.
Bitumen and other residues and bituminous mixtures, n.e.s. do	14,710	15,353	--	Austria 11,791; West Germany 1,238; Finland 548.
White spirit do	674	727	--	Austria 643; West Germany 37; Israel 34.
Mineral tar and coal-, petroleum-, and gas-derived crude chemicals	1,169	1,139	--	West Germany 579; Italy 252; France 77.

r Revised. NA Not available.
1 Less than 1/2 unit.

Table 3.—Switzerland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate	6,995	5,533	--	France 3,963; Italy 1,453; West Germany 114.
Oxides and hydroxides	151,287	174,010	184	Australia 138,693; Italy 19,676; West Germany 11,080.
Metal including alloys:				
Unwrought including scrap	41,184	54,162	290	Norway 17,307; Iceland 14,660; Egypt 6,236.
Semimanufactures	42,540	50,785	420	West Germany 20,469; Belgium-Luxembourg 6,654; France 5,836.
Antimony metal including alloys, all forms	28	91	--	China 85; Yugoslavia 5; Zaire 1.
Beryllium metal including alloys, all forms kilograms	2,530	1,250	1,097	West Germany 124; France 21.
Chromium: Oxides and hydroxides	519	565	2	West Germany 406; Italy 86; Poland 30.
Cobalt: Oxides and hydroxides	2	1	--	Mainly from Belgium-Luxembourg.
Columbium and tantalum: Tantalum metal including alloys, all forms kilograms	1,828	1,343	295	Austria 646; Netherlands 164; West Germany 102.
Copper:				
Ore and concentrate	20	21	--	Mainly from Belgium-Luxembourg.
Sulfate	1,036	733	(1)	France 224; U.S.S.R. 170; Czechoslovakia 115.
Metal including alloys:				
Scrap	3,395	3,566	330	West Germany 1,335; Austria 729; France 410.
Unwrought	12,100	10,565	219	West Germany 3,940; Belgium-Luxembourg 2,514; Austria 1,510.
Semimanufactures	78,027	88,040	629	West Germany 34,705; United Kingdom 15,918; Italy 9,159.
Gold metal including alloys, unwrought and partly wrought troy ounces	78,158	125,131	1,350	West Germany 23,792; France 22,956; Lebanon 22,023.
Iron and steel:				
Ore and concentrate including roasted pyrites	58,723	49,431	4	Mauritania 39,380; West Germany 4,961; Italy 4,944.
Metal:				
Scrap	179,051	136,853	23	West Germany 115,216; Netherlands 7,371; Belgium-Luxembourg 4,620.
Pig iron, cast iron, powder, shot	98,118	98,961	6	West Germany 50,494; France 23,530; Canada 11,775.
Ferroalloys	24,295	21,753	246	France 6,323; Norway 4,125; West Germany 3,265.
Steel, primary forms	109,734	142,116	5	West Germany 83,456; Belgium-Luxembourg 16,275; Italy 10,219.
Semimanufactures:				
Bars, rods, angles, shapes, sections	467,475	515,761	26	West Germany 195,562; Italy 121,648; France 76,433.
Universals, plates, sheets	548,234	613,794	273	West Germany 174,326; France 158,580; Belgium-Luxembourg 82,660.
Hoop and strip	203,856	225,195	646	West Germany 73,506; Belgium-Luxembourg 73,192; France 29,929.
Rails and accessories	55,708	53,743	--	Austria 27,829; West Germany 17,150; Italy 4,715.
Wire	22,060	20,328	7	West Germany 7,580; Austria 4,736; Belgium-Luxembourg 3,037.
Tubes, pipes, fittings	155,189	159,601	165	West Germany 66,986; France 37,291; Italy 20,887.
Castings and forgings, rough	7,186	9,006	(1)	West Germany 4,484; Austria 1,895; Romania 1,309.

See footnotes at end of table.

Table 3.—Switzerland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ingots and semimanufactures, alloy steel and high-carbon steel	166,936	210,615	1,128	West Germany 84,979; France 28,357; United Kingdom 24,338.
Lead:				
Ore and concentrate	5	4	--	All from Austria.
Oxides and hydroxides	102	111	--	Mexico 48; Bulgaria 40; United Kingdom 11.
Metal including alloys:				
Scrap	1	2	--	France 1; West Germany 1.
Unwrought	11,592	17,981	2,824	United Kingdom 5,509; France 3,845; Canada 3,603.
Semimanufactures	1,407	1,562	1	West Germany 1,432; Belgium-Luxembourg 92; United Kingdom 12.
Magnesium metal including alloys, all forms	2,190	2,717	76	Norway 1,854; Canada 394; Italy 249.
Manganese: Oxides and hydroxides	800	786	18	Greece 360; Japan 192; United Kingdom 90.
Mercury 76-pound flasks	731	1,106	--	West Germany 736; Spain 180; China 100.
Molybdenum metal including alloys, all forms	13	24	5	West Germany 7; Austria 7; Belgium-Luxembourg 3.
Nickel:				
Matte, speiss, similar materials	1,579	1,340	126	Finland 288; Philippines 217; Canada 190.
Metal including alloys:				
Scrap	227	164	(1)	West Germany 82; Italy 60; Austria 17.
Semimanufactures	1,351	1,445	254	West Germany 620; United Kingdom 261; Sweden 71.
Platinum-group metals including alloys, unwrought and partly wrought thousand troy ounces	r495	993	95	Netherlands 303; United Kingdom 210; West Germany 117.
Silver metal including alloys, unwrought and partly wrought do	r25,377	50,728	855	United Kingdom 13,387; France 7,409; Belgium-Luxembourg 4,341.
Tin:				
Ore and concentrate kilograms	50	--		
Metal including alloys:				
Scrap	24	11	--	Italy 10.
Unwrought	868	1,026	1	Malaysia 376; Indonesia 312; Thailand 86.
Semimanufactures	178	326	(1)	West Germany 147; France 130; United Kingdom 24.
Titanium: Oxides and hydroxides	6,141	3,773	5	France 1,311; West Germany 767; United Kingdom 687.
Tungsten metal including alloys, all forms	39	113	3	West Germany 33; France 28; United Kingdom 22.
Uranium and thorium: Oxides including rare-earth oxides	14	14	3	France 6; West Germany 3; Austria 1; Japan 1.
Zinc:				
Ore and concentrate	5	10	--	All from West Germany.
Oxides and hydroxides	2,632	2,596	11	France 1,324; West Germany 533; United Kingdom 452.
Metal including alloys:				
Scrap	(1)	21	--	Mainly from West Germany.
Unwrought	21,605	25,342	25	West Germany 8,181; Italy 3,564; Netherlands 3,441.
Blue powder	2,171	2,806	NA	Belgium-Luxembourg 1,092; Netherlands 608; France 465.
Semimanufactures	1,103	1,174	--	West Germany 528; Belgium-Luxembourg 368; Italy 72.

See footnotes at end of table.

Table 3.—Switzerland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates	7,237	7,650	--	Republic of South Africa 5,239; Australia 976; West Germany 749.
Ash and residue containing nonferrous metals	198	280	--	West Germany 125; Austria 106; France 33.
Waste and sweepings of precious metals value, thousands	$32,203	$188,952	$28,092	Sweden $27,611; United Kingdom $18,540; Kuwait $16,795.
Oxides, hydroxides, peroxides	1,585	1,384	41	West Germany 925; France 225; Belgium-Luxembourg 82.
Metals:				
Metalloids	3,474	2,991	118	Italy 1,242; France 714; Republic of South Africa 298.
Alkali, alkaline-earth, rare-earth metals	521	764	56	West Germany 700; United Kingdom 3; France 2; Austria 2.
Base metals including alloys, all forms	803	840	320	Republic of South Africa 135; West Germany 78; Belgium-Luxembourg 76.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	1,140	979	188	West Germany 481; Italy 296.
Corundum, artificial	5,769	6,780	179	West Germany 3,348; Austria 2,359; France 588.
Dust and powder of precious and semi-precious stones kilograms	3,069	3,800	602	Ireland 2,867; West Germany 175; Romania 43.
Grinding and polishing wheels and stones	1,774	1,990	85	West Germany 976; Italy 245; Austria 231.
Asbestos, crude	20,689	21,029	13	Canada 10,505; U.S.S.R. 4,477; Republic of South Africa 3,752.
Barite and witherite	2,291	3,181	--	West Germany 2,718; France 383; Italy 40; Morocco 40.
Boron materials:				
Crude natural borates	10,340	11,245	10,566	Netherlands 266; Turkey 232; Peru 72.
Oxide and acid	509	532	43	France 294; Turkey 150; Netherlands 27.
Cement	173,124	195,527	60	Italy 82,720; West Germany 50,881; Austria 31,777.
Chalk	22,143	23,168	--	France 19,524; West Germany 1,453; Italy 1,177.
Clays and clay products:				
Crude	185,428	180,354	1,352	West Germany 76,094; United Kingdom 65,294; France 23,505.
Products:				
Nonrefractory	274,066	347,467	2	Italy 215,505; West Germany 85,280; France 28,427.
Refractory including nonclay brick	40,807	47,007	43	West Germany 20,972; Austria 8,426; United Kingdom 4,065.
Cryolite and chiolite	349	618	--	Denmark 610; West Germany 8.
Diamond:				
Gem, not set or strung value, thousands	$1,396,979	$1,631,293	$131,027	United Kingdom $1,057,097; Panama $67,351; U.S.S.R. $38,803.
Industrial do	$33,863	$41,788	$3,547	Ireland $31,356; Israel $2,214; West Germany $1,235.
Diatomite and other infusorial earth	9,102	9,381	153	Denmark 6,429; Spain 1,101; France 869.
Feldspar, fluorspar, leucite	8,605	12,097	--	Italy 5,451; Hungary 2,491; West Germany 2,467.

See footnotes at end of table.

Table 3.—Switzerland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials:				
Crude:				
Nitrogenous	35	77	--	Chile 74.
Phosphatic	13,020	13,055	--	Morocco 10,652; Togo 2,119; France 186.
Manufactured:				
Nitrogenous	91,791	89,412	--	Austria 35,070; West Germany 27,522; France 10,284.
Phosphatic:				
Thomas (basic) slag	140,075	134,845	--	France 87,482; Belgium-Luxembourg 45,280; West Germany 2,083.
Other	13,258	8,485	2,656	France 2,136; Tunisia 1,267; Belgium-Luxembourg 1,261.
Potassic	87,606	87,735	--	France 59,978; West Germany 23,228; East Germany 4,504.
Other including mixed	133,797	131,245	12,189	France 50,558; West Germany 24,268; Belgium-Luxembourg 18,967.
Ammonia	22,836	21,744	--	Austria 11,546; France 6,161; Italy 3,957.
Graphite, natural	202	232	7	West Germany 89; Italy 52; Austria 47.
Gypsum and plasters	63,138	75,344	14	West Germany 49,757; Italy 12,992; France 12,373.
Lime	46,166	56,420	--	Italy 29,887; West Germany 25,822; France 593.
Magnesite	4,369	4,466	39	Austria 2,916; Spain 1,136; West Germany 173.
Mica:				
Crude including splittings and waste	598	546	--	India 281; West Germany 92; France 54.
Worked including agglomerated splittings	496	535	(1)	France 329; Belgium-Luxembourg 120; Austria 41.
Pigments, mineral:				
Natural, crude	319	357	--	West Germany 187; Austria 115; France 41.
Iron oxides, processed	2,896	2,842	5	West Germany 2,643; United Kingdom 118; France 47.
Precious and semiprecious stones excluding diamond:				
Natural value, thousands	$263,208	$329,400	$23,023	United Kingdom $33,627; Hong Kong $32,297; West Germany $29,151.
Manufactured thousand carats	99,660	136,290	4,805	France 120,185; West Germany 7,460; Hong Kong 1,165.
Pyrites, gross weight	16,020	10,556	--	U.S.S.R. 10,101; Sweden 297; Italy 120.
Salt and brine	1,966	1,994	16	France 1,648; West Germany 185; Belgium-Luxembourg 95.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	4,075	4,485	(1)	France 1,889; Italy 1,437; West Germany 815.
Caustic soda	12,382	11,227	(1)	Italy 3,763; France 3,563; West Germany 3,542.
Soda ash	4,092	3,949	(1)	France 1,739; East Germany 1,556; Poland 300.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	128,364	114,750	--	West Germany 74,601; Italy 17,883; France 14,961.
Worked	92,605	104,380	--	Italy 82,652; Austria 8,620; West Germany 4,026.
Dolomite, chiefly refractory-grade	28,404	29,257	--	Italy 22,156; France 6,052; West Germany 521.
Gravel and crushed rock thousand tons	4,823	5,024	(1)	France 2,624; West Germany 1,368; Italy 776.
Limestone excluding dimension	19,893	32,822	--	Italy 26,299; France 6,378; West Germany 120.

See footnotes at end of table.

Table 3.—Switzerland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Quartz and quartzite	26,435	37,108	177	Italy 30,097; West Germany 5,660; France 797.
Sand excluding metal-bearing thousand tons	1,226	1,193	--	Italy 520; West Germany 290; France 264.
Sulfur:				
Elemental:				
Colloidal	158	231	--	France 196; West Germany 34.
Other than colloidal	46,560	48,188	--	West Germany 47,137; France 895; Italy 140.
Sulfuric acid	2,581	2,746	--	West Germany 2,416; Austria 194; Italy 113.
Talc, steatite, soapstone, pyrophyllite	10,910	12,951	--	Austria 7,391; France 2,165; Italy 2,092.
Other:				
Crude:				
Meerschaum, amber, jet kilograms	4	27	--	NA.
Unspecified	80,650	83,838	380	West Germany 47,265; France 11,494; Netherlands 8,069.
Slag, dross and similar waste, not metal-bearing:				
From iron and steel manufacture	5,284	5,079	--	West Germany 3,474; France 1,504; Austria 99.
Unspecified	18,805	19,044	--	France 9,388; West Germany 9,067; Italy 588.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	259	168	21	France 90; West Germany 46; Italy 9.
Halogens	3,578	2,008	173	France 858; Israel 518; East Germany 236.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	26,678	23,438	--	West Germany 13,457; Austria 4,157; Italy 2,562.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,266	1,039	150	Trinidad 882.
Carbon black and gas carbon:				
Carbon black	3,982	4,550	154	West Germany 2,936; France 678; Italy 346.
Gas carbon	164	110	--	West Germany 95.
Coal, all grades, including briquets	378,668	639,239	16,789	Republic of South Africa 337,096; West Germany 181,540; Poland 53,251.
Coke and semicoke	137,706	127,036	--	West Germany 79,820; France 31,676; Netherlands 6,896.
Gas, hydrocarbon, manufactured kilograms	230	150	--	Israel 30.
Hydrogen, helium, rare gases	3,617	4,585	31	West Germany 3,440; Italy 1,020; Belgium-Luxembourg 54.
Peat including briquets and litter	74,313	86,459	--	West Germany 53,474; U.S.S.R. 31,504; Poland 700.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	31,660	28,740	--	Libya 8,368; United Arab Emirates 8,307; Nigeria 5,515.
Refinery products:				
Gasoline including natural do.	15,638	14,332	(1)	France 4,075; Belgium-Luxembourg 3,231; Italy 2,522.
Distillate fuel oil do.	6,671	8,412	14	U.S.S.R. 3,532; Italy 1,040; France 802.
Residual fuel oil do.	36,482	34,879	--	U.S.S.R. 13,998; France 5,907; Netherlands 5,394.
Lubricants do.	37	40	3	West Germany 22; Netherlands 4; Belgium-Luxembourg 3.

See footnotes at end of table.

Table 3.—Switzerland: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products —Continued				
Refinery products —Continued				
Other:				
Liquefied petroleum gas thousand 42-gallon barrels	8,904	10,140	(1)	Netherlands 6,850; West Germany 3,268; France 18.
Pitch and pitch coke do	74	65	(1)	Czechoslovakia 41; France 21; West Germany 2.
Petroleum coke do	553	642	376	West Germany 257; France 9.
Mineral jelly and wax do	117	107	2	West Germany 63; France 18; Hungary 6.
Bitumen and other residues including bituminous mixtures do	1,185	1,312	1	France 743; West Germany 361; Italy 189.
White spirit do	146	133	(1)	France 45; Netherlands 45; West Germany 29.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	28,827	29,301	475	France 9,586; Netherlands 7,017; West Germany 5,660.

rRevised. NA Not available.
1Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Work started on modification of aluminum smelters at Chippis, 30,000 tons of aluminum capacity per year and at Steg, 48,000 tons of aluminum capacity per year. Both plants were owned by Swiss Aluminium Ltd. Most of the modifications planned were to improve protection of the environment.

NONMETALS

Cement.—During 1981, the cement-producing segment of the Swiss mineral industry had an uneventful year. No new plants were commissioned, and there were no plant closures. Table 1 shows the trend of cement production for 1977-81.

The total capacity of 12 plants operating in Switzerland was 6.3 million tons. During 1981, the industry was operating at about 69% of the installed capacity. In addition, six clinker grinding plants were operational. The cement industry employed 1,405 persons, and the energy consumption amounted to about 16,000 terajoules. The switch from liquid fuels to coal continued. In 1979 about 20% of the total energy used in the cement industry was from coal, but by 1981 this figure was 67%.

Most of the cement plants used marly limestone of the Effingen beds in the Jura; various Jurassic limestones and Opalinus clays of the Aalenian were produced and added to obtain the right composition for production of portland cement.

In the Helvetic Alps, Zementstein at the Jurassic-Cretaceous boundary was another important source of raw materials for the cement industry. The Couches Rouges of the Prealps, Upper Cretaceous-Paleocene, and the Upper Jurassic-Cretaceous Maiolica and Scaglia in the southern Alps were used for cement production.

Gypsum.—The gypsum deposits of Switzerland were restricted to the Triassic formations in the Jura and in the Alps. Deposits were abundant but of rather low quality. In most deposits, primary gypsum was not preserved, and anhydrite replaced gypsum at depths between 15 to 50 meters. The Swiss gypsum industry was dominated by Gips-Union A.G., which operated three quarries in the Alps and two in the Jura Mountains.

Lime.—During 1981, the two largest producers of lime in Switzerland remained Kalkfabrik Netstal A.G. (Netstal) and Holderbank A.G. Netstal operated a 100,000-

ton-per-year plant situated at Netstal, some 30 miles southeast of Zurich. Holderbank operated its own plant at Holderbank with a capacity of 30,000 tons of lime per year. In addition, through its subsidiaries—the Kalkenfabrik Unterterzen A.G. and Société de Chaux et Ciments de la Suisse Romande—Holderbank operated plants near Unterterzen (30,000 tons per year) and Lausanne (12,000 tons per year). Limestone for production of lime was found in numerous places in the country, the purest of which was produced at St. Ursanne and near Glarus.

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[1]Physical scientist, Division of Foreign Data.

The Mineral Industry of Taiwan

By E. Chin[1]

Taiwan's gross national product (GNP) at current market prices was estimated at $45.1 billion[2] in 1981 compared with $44.3 billion in 1980. The net domestic product (NDP) in 1981 was $36.1 billion and was comprised as follows: Industry, $14.8 billion; commerce, $5.3 billion; Government services, $4.5 billion; agriculture and livestock, $3.5 billion; transportation and communications, $2.2 billion; real estate, $2.0 billion; money and banking, $1.6 billion; and other, $2.2 billion.[3]

Aside from construction raw materials, the only domestic mine output of significance included coal, china clay, oil and natural gas, salt, and serpentine. Output of the mining sector was valued at $708.9 million in 1981 compared with $595.9 million in 1980. The value of oil and natural gas production in 1981 was $294.7 million; coal, $183.5 million; metal mining, $148.2 million; and miscellaneous mining and quarrying, $82.5 million. Taiwan is deficient in many minerals, and domestic mine output is insignificant in terms of the world market.

Despite its dependency on foreign raw materials, Taiwan's manufacturing sector continued to grow. Total value of manufacturing was $41.5 billion in 1981 compared with $38.7 billion in 1980. Input by the major minerals sector to total manufacturing in 1981 included basic metals and metal products, $2.9 billion; chemical materials and products, $4.9 billion; nonmetallic mineral products, $1.5 billion; and petroleum and coal products, $4.7 billion.

The value of Taiwan's mine output has increased annually since 1976 resulting from higher world prices rather than the quantity of mine output. The total value of domestic mining in 1981 was less than 2% of GNP and/or NDP. Moreover, the mineral-processing sector outweighed the domestic mining sector in output value by a 20-to-1 ratio in 1981 compared with 13-to-1 a decade ago (1971).

During the past three decades, Taiwan's economic profile has changed drastically as a result of Government planning. During the 1950's, industrial production centered around goods in limited supply in the domestic market such as food products, fertilizer, and textiles. By the late 1960's and early 1970's, industrial production shifted to export products such as electronics, wood and plastic products, and optical equipment. During the 1970's, Taiwan's industrial base was geared for the manufacture of chemicals and heavy machinery. During this decade, petrochemicals, steel, and other metal production also gained prominence. For the 1980's, the Government's economic planning policies emphasized the development of precision technology industries.

The Executive Yuan approved the 4-year Economic Development Plan (1982-85) drafted by the Council for Economic Planning and Development. The 4-year plan, which stresses both growth and stability, projects an average annual growth of 8% of Taiwan's economy during the period, accompanied by an inflation rate not to exceed 7.5%. An economic growth of 7.5% was planned as a target for 1982 along with a 5.5% rise in wholesale prices. Per capita GNP was expected to reach $2,785 in 1982. The overall targets for the decade (1980-90) included a 7.9% annual economic growth rate and a 6% annual rate of increase in wholesale prices. Objectives for the 10-year period were to enhance energy efficiency, improve the industrial structure, improve

administrative efficiency and promote foreign trade, coordinate industrial and export development, and enhance efficient utilization of the work force and promote full employment.

Monthly employment in the mining and quarrying sector averaged 52,014 in 1981 compared with 1.9 million in manufacturing. Monthly earnings in the mining sector were $381 based on a monthly average of 188 working hours.

The Central Bank of China officially devalued the New Taiwan dollar from 36 to 38 per U.S. dollar, effective August 12, 1981. The Central Bank agreed to the devaluation in order to stimulate export sales by making Taiwan's export products more competitive worldwide.

PRODUCTION

In terms of value, coal, natural gas, limestone, and marble were Taiwan's leading mine products although none were significant in the world market. The other minerals mined in locally significant quantities included china clay and fire clay, dolomite, feldspar, salt, and serpentine. Taiwan also produces small amounts of gem stones, oil, and mica.[4] Metal mining output is likewise insignificant and included small quantities of copper and, periodically, iron sands. Most of the gold and silver produced was recovered as byproducts of imported copper concentrates. Taiwan is more important for its processing industries—aluminum, cement, copper, iron and steel, and petroleum refining. Aside from construction aggregates, Taiwan is virtually dependent on foreign ores and materials required by its value-added industrial sector.

Table 1.—Taiwan: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
METALS					
Aluminum:					
Alumina, gross weight	51,047	51,000	58,000	e65,000	e61,000
Metal, primary	29,740	50,512	56,218	63,549	30,532
Copper:					
Mine output, metal content	2,000	800	800	e1,200	e1,000
Metal: Refined, secondary	r11,689	r14,353	15,305	19,495	53,230
Gold metal, primary troy ounces	14,995	13,407	14,243	13,278	56,693
Iron and steel metal:					
Pig iron	r623,000	r1,417,000	r1,760,000	1,685,000	1,610,000
Ferroalloys: Ferrosilicon	24,672	29,785	37,500	35,326	39,585
Crude steel	r1,770,000	r3,432,000	r4,250,000	4,225,000	3,143,000
Lead metal, smelter, secondary[e]	10,000	14,000	20,000	16,800	17,000
Silver metal, primary	67,905	75,316	85,383	95,073	214,875
NONMETALS					
Asbestos	673	2,031	2,957	683	2,317
Cement, hydraulic thousand tons	10,334	11,461	11,897	14,062	14,342
Clays:					
Kaolin	29,230	66,180	85,041	79,802	90,836
Fire clay	23,477	24,889	48,539	48,048	34,879
Feldspar	16,219	15,757	24,403	25,149	17,215
Gypsum:					
Precipitated	2,325	1,526	2,535	3,364	1,985
Other	5,087	1,859	--	4,706	4,054
Lime thousand tons	178	191	177	199	143
Mica	1,334	1,388	1,150	338	85
Nitrogen: N content of ammonia	325,485	438,605	390,923	414,350	406,097
Pyrite and pyrrhotite (including cuprous) gross weight	7,304	767	536	150	20
Salt, marine thousand tons	496	341	366	722	351
Sodium compounds, n.e.s.:					
Caustic soda	301,047	362,180	419,545	400,086	356,576
Sodium carbonate (soda ash)	80,050	76,992	80,715	92,540	72,064
Stone:					
Dolomite thousand tons	284	417	530	489	359
Limestone do	11,679	12,857	13,126	12,822	13,221
Marble thousand cubic meters	1,620	1,641	1,976	2,839	3,269
Serpentine	26,398	35,580	50,915	102,927	118,175

See footnotes at end of table.

Table 1.—Taiwan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Sulfur:					
S content of pyrite	2,664	298	195	55	11
Byproduct, all sources	7,778	9,506	[r]8,946	8,099	9,849
Total	10,442	9,804	[r]9,141	8,154	9,860
Talc and related materials: Soapstone	10,160	9,946	11,194	9,911	24,774
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	2,500	9,501	12,983	15,070	23,406
Coal, bituminous thousand tons	2,956	2,884	2,720	2,574	2,446
Coke do.	229	236	240	227	219
Gas, natural:[3]					
Gross million cubic feet	66,609	64,999	60,759	60,329	53,042
Marketed do.	[r]64,900	[e]63,400	[e]59,000	[e]58,600	52,000
Petroleum:					
Crude thousand 42-gallon barrrels	1,597	1,552	1,451	1,330	1,150
Refinery products:					
Gasoline do.	9,778	11,383	12,560	13,086	[e]13,100
Kerosine do.	320	--	79	--	--
Distillate fuel oil do.	16,262	20,533	20,643	22,418	[e]20,800
Residual fuel oil do.	48,573	58,264	57,525	63,988	[e]60,300
Lubricants do.	760	917	945	857	[e]800
Asphalt do.	2,308	2,420	1,715	1,749	[e]1,900
Other[4] do.	4,374	7,905	5,304	2,595	[e]1,600
Refinery fuel, losses and not reported[5] do.	10,378	7,965	7,760	[e]8,225	[e]7,500
Total do.	92,753	109,387	106,531	112,918	106,000

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Includes data available through July 6, 1982.

[2]In addition to the commodities listed, tin and zinc may be produced, but statistical information is not available.

[3]Largely processed into natural gas liquids.

[4]Naphtha, solvent oil, and base oil.

[5]Includes liquefied petroleum gas and jet fuel among "not reported."

TRADE

Taiwan's two-way trade totaled $42.6 billion in 1981 compared with $39.5 billion in 1980. Exports increased 16.5% reaching $22.0 billion in 1981, while imports increased 9.4% to $20.6 billion. The value of total shipments to the United States was $7.9 billion; followed by Japan, $2.4 billion; Hong Kong, $1.5 billion; and the Federal Republic of Germany, $1.0 billion. Other major export destinations were Australia, Saudi Arabia, Singapore, Canada, and the United Kingdom, in that order. Japan was Taiwan's major supplier of imports, providing $5.8 billion. Receipts from the United States were $4.6 billion; Kuwait, $2.2 billion; Saudi Arabia, $1.7 billion; the Federal Republic of Germany, $0.63 billion; Australia, $0.58 billion; and Indonesia, $0.52 billion.

In 1981, Taiwan imported 17.2 million tons of crude oil, valued at $4.3 billion (about 21% of the value of total imports). Kuwait, Saudi Arabia, and Venezuela, in that order, supplied all of Taiwan's receipt of crude oil. Receipts of diesel fuel were valued at $449 million; iron and steel sheet and plate, $398 million; scrap ships and vessels, $225 million; stainless steel, $144 million; iron and steel scrap, $118 million; iron ore and concentrates, $65 million; and refined copper, $74 million. Taiwan's major export classes included food stuffs, fabric and wearing apparel, electronic and communications equipment, luggage and other travel goods, and machine tools and small machinery.[5]

Taiwan's trade posture was hampered by its high fuel import bill, a slowdown in the economies of its major export markets, and increasing competition from South Korean

exports. To enlarge its trade base, Taiwan has diversified its marketing efforts and is selling products in Africa, the Middle East, and Latin America. Taiwan lifted its trade ban with five East European countries in late 1979, and Polish ships were allowed to make regular port of calls in Taiwan. To service European trade, the Government gave approval for six European banks to set up branches in Taiwan.

Table 2.—Taiwan: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxide and hydroxide	104	3,740	--	Indonesia 2,725; Republic of Korea 904.
Metal including alloys, all forms	6,943	7,456	41	Hong Kong 3,132; Japan 1,712; Indonesia 1,027.
Copper:				
Sulfate	18	195	--	Philippines 117; Indonesia 40.
Metal including alloys:				
Scrap	7,552	5,279	--	Japan 5,173.
Unwrought	236	273	--	Japan 256.
Semimanufactures	5,807	9,189	119	Singapore 3,461; Hong Kong 1,580; Malaysia 809.
Gold metal including alloys, unwrought and partly wrought troy ounces	225,666	607,070	--	Philippines 341,891; Republic of Korea 146,800.
Iron and steel metal:				
Scrap	72,065	12,863	(1)	Japan 12,022.
Pig iron, ferroalloys, similar materials	21,406	24,271	73	Japan 8,366; Indonesia 3,360.
Steel, primary forms	420,299	120,247	29	Indonesia 61,785; Malaysia 25,120; Philippines 11,636.
Semimanufactures:				
Bars, rods, angles, shapes, sections:				
Wire rod and other bars and rods	617,690	264,607	346	Hong Kong 82,153; Saudi Arabia 78,298; Malaysia 27,056.
Angles, shapes, sections	25,962	25,212	607	Saudi Arabia 5,829; Jordan 3,095; Hong Kong 2,762.
Universals, plates, sheets	266,345	161,175	1,822	Singapore 42,601; Japan 22,702; India 13,792.
Hoop and strip	4,015	3,416	86	Hong Kong 661; Indonesia 507; Jordan 450.
Rails and accessories	11,211	3,203	--	Malaysia 1,450; Singapore 1,248.
Wire	12,194	10,640	184	Hong Kong 1,985; Philippines 1,879; Thailand 1,355.
Tubes, pipes, fittings	158,480	179,754	71,101	Saudi Arabia 29,624; Hong Kong 11,173; United Arab Emirates 8,510.
Castings and forgings, rough	11,703	7,555	3,842	Japan 753; Thailand 689; Philippines 578.
Lead metal including alloys, all forms	11,423	11,895	1,128	Japan 6,446; Republic of Korea 2,060.
Magnesium metal including alloys, all forms	295	5	--	All to Malaysia.
Manganese oxides	7	(1)	--	All to Indonesia.
Nickel:				
Matte, speiss, similar materials	51	263	--	All to Japan.
Metal including alloys:				
Scrap	641	572	9	Japan 563.
Unwrought and semimanufactures	156	83	4	Japan 71.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	57,871	--		
Silver:				
Waste and sweepings kilograms	367	664	--	United Kingdom 413; West Germany 132.
Metal including alloys, unwrought and partly wrought troy ounces	22,956	1,061	--	All to Switzerland.
Tin metal including alloys, all forms	113	145	(1)	Hong Kong 90; Japan 31.
Titanium oxides	(1)	243	216	Republic of Korea 22.
Tungsten metal including alloys, all forms	10	8	--	Japan 4; West Germany 3.
Zinc:				
Oxide and peroxide	1,369	1,957	18	Japan 1,478.
Metal including alloys, all forms	597	493	68	Japan 237; Nigeria 52; Uruguay 42.
Other:				
Ash and residue containing nonferrous metals	524	761	22	Japan 456; Hong Kong 283.
Oxides, hydroxides, peroxides	91	25	--	Indonesia 22.
Metals:				
Metalloids: Silicon	17	20	--	Mainly to Malaysia.
Pyrophoric alloys kilograms	84	17	--	All to Chile.
Base metals including alloys, all forms	106	98	15	Hong Kong 43; Australia 12.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	3	19	--	Indonesia 9; Hong Kong 5; Malaysia 5.

See footnotes at end of table.

Table 2.—Taiwan: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Abrasives, n.e.s —Continued				
Artificial corundum	19	26	--	Indonesia 17; Republic of South Africa 6.
Dust and powder of precious and semiprecious stones including diamond kilograms	304	1,098	303	Japan 436; Hong Kong 359.
Grinding and polishing wheels and stones	2,354	2,148	434	Indonesia 401; Thailand 386; Hong Kong 210.
Barite and witherite	30	--		
Boric oxide, acid, borates, perborates	35	49	17	Republic of South Africa 17; Hong Kong 11.
Cement thousand tons	353	598	1	Hong Kong 261; Singapore 212.
Clays and clay products:				
Crude:				
Kaolin	30	--		
Bentonite	80	49	--	Nigeria 39; Malaysia 10.
Fire clay	20	--		
Other	168	178	--	Philippines 104; Singapore 40.
Products:				
Refractory (including nonclay brick)	6,371	7,488	19	Indonesia 1,758; Philippines 1,578; Singapore 1,123.
Nonrefractory	20,980	23,859	234	Hong Kong 13,926; Venezuela 3,328; Saudi Arabia 2,460.
Diamond:				
Gem, not set or strung:				
Natural thousand carats	2,675	345	5	Italy 160; Australia 135.
Manufactured do	2,455	12,410	7,440	France 1,740; New Zealand 1,220; Switzerland 770.
Industrial, natural do	(2)	3,915	3,895	Belgium 20.
Diatomite and other infusorial earth	50	184	--	Japan 178.
Feldspar and fluorspar	24	4	--	All to Indonesia.
Fertilizer materials:				
Manufactured:				
Nitrogenous	47,062	(3)	--	Do.
Potassic	--	1,000	--	All to Japan.
Other including mixed	11,382	373	5	Hong Kong 366.
Ammonia	9	144	--	Thailand 139.
Graphite, natural	615	505	--	Japan 437.
Gypsum and plasters	2,045	4 1,582	1	Indonesia 1,030; India 400.
Lime	1,682	5,247	--	Hong Kong 4,665; Nigeria 520.
Mica, all forms	112	119	--	New Zealand 51; Australia 34; United Kingdom 34.
Pigments, mineral: Processed iron oxides	93	53	--	Thailand 20; Singapore 17; Malaysia 9.
Precious and semiprecious stones except diamond:				
Natural kilograms	7,676	9,666	4,971	Italy 932; Panama 848; Switzerland 825.
Manufactured do	59,002	73,611	14,788	West Germany 30,504; United Kingdom 13,811.
Salt and brines	16,106	13,590	--	Hong Kong 10,350.
Sodium and potassium compounds, n.e.s.: Caustic soda	46,371	20,917	--	Republic of Korea 10,284; Indonesia 4,075; Philippines 3,185.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	61,884	4,367	11	Japan 3,410.
Worked	20,370	25,972	1,493	Japan 9,931; Saudi Arabia 8,057.
Dolomite, chiefly refractory-grade	80,133	93,390	--	Japan 90,550.
Gravel and crushed rock	229,082	315,349	--	Japan 314,873.
Limestone except dimension	2,388	2,416	--	Hong Kong 2,251.
Sand excluding metal-bearing	111,800	180,953	--	Japan 179,851.
Sulfur:				
Elemental:				
Other than colloidal	3,695	1,310	--	Indonesia 974; Singapore 112.
Colloidal	139	631	--	Indonesia 615.
Sulfuric acid, oleum	3,858	2,046	--	Hong Kong 1,505; Saudi Arabia 380.
Talc, steatite, soapstone, pyrophyllite	1,401	1,043	--	Thailand 264; Malaysia 230; Indonesia 178.
Other:				
Crude:				
Meerschaum, amber, jet kilograms	--	113	76	Bahrain 37.
Unspecified	552	654	--	Japan 338; Malaysia 134; Indonesia 100.
Slag, dross, and similar waste, not metal-bearing	4,608	1,573	--	Thailand 750; Indonesia 450; Japan 245.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	2,307	338	4	Yemen 108; Thailand 94; Saudi Arabia 54.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black and gas carbon:				
Carbon black	1,762	489	--	Thailand 235; Indonesia 191.
Gas carbon	11	7	--	All to Hong Kong.

See footnotes at end of table.

Table 2.—Taiwan: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal, all grades, including briquets	230	210	--	Indonesia 200.
Coke and semicoke	11,495	10,466	--	Indonesia 4,320; Thailand 2,920; Singapore 1,450.
Hydrogen and rare gases ____ kilograms	r35,298	127,360	--	Philippines 77,600; Singapore 49,200.
Petroleum refinery products:				
Gasoline -- thousand 42-gallon barrels	476	62	--	All to Republic of Korea.
Kerosine, jet fuel, white spirit ___ do	2,305	1,028	--	Indonesia 653; India 210; Philippines 133.
Distillate fuel oil ___ do	r7,736	5,037	--	NA.
Lubricants ___ do	54	610	1	Republic of Korea 329; India 197.
Other:				
Liquefied petroleum gas ___ do	150	178	--	Hong Kong 169.
Nonlubricating oils, n.e.s ___ do	14	11	--	Thailand 4; Hong Kong 2.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r181,420	40,441	--	Japan 27,597; Indonesia 10,514.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]Unreported quantity valued at $222.
[3]Unreported quantity valued at $2,746.
[4]Excludes unreported quantity valued at $444.

Table 3.—Taiwan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate	209,618	260,438	--	Malaysia 218,673; Australia 37,765.
Oxide and hydroxide	67,528	59,026	894	Japan 43,672.
Metal including alloys:				
Scrap	13,762	19,255	16,169	Hong Kong 1,264.
Unwrought	52,860	58,320	26,723	Bahrain 12,880; Canada 4,998.
Semimanufactures	11,165	25,513	1,731	Japan 21,266.
Arsenic:				
Natural sulfides	10	4	NA	NA.
Trioxide, pentoxide, acids	682	190	--	Belgium 103; France 72.
Beryllium metal including alloys, all forms kilograms	8	1,653	1,653	
Chromium:				
Chromite	6,653	6,363	--	Philippines 3,500; Republic of South Africa 2,833.
Oxide and hydroxide	1,548	2,410	1,250	Japan 746.
Cobalt oxide and hydroxide	17	23	2	Belgium 13; Netherlands 5.
Columbium and tantalum: Tantalum metal including alloys, all forms -- kilograms	33	79	16	Japan 61.
Copper:				
Ore and concentrate	61,106	131,315	--	Philippines 67,038; Canada 31,900.
Matte	35	14	NA	NA.
Sulfate	245	227	32	Japan 192.
Metal including alloys:				
Scrap	16,297	35,072	28,134	Hong Kong 3,461.
Unwrought	56,945	66,185	2,651	Japan 55,232.
Semimanufactures	26,886	31,989	2,226	Japan 26,629.
Germanium metal including alloys, all forms value	$915	--		
Gold:				
Metal, including alloys, unwrought or partly wrought ___ troy ounces	175,061	340,122	115,678	Japan 216,824.
Bullion ___ do	508,364	376,504	320,832	Switzerland 55,672.
Iron and steel:				
Ore and concentrate -- thousand tons	2,649	2,844	--	Australia 1,853; Brazil 401; Republic of South Africa 378.

See footnotes at end of table.

Table 3.—Taiwan: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Roasted pyrite	50,980	49,142	--	All from Philippines.
Metal:				
Scrap thousand tons	761	1,232	812	Hong Kong 281.
Pig iron, ferroalloys, similar materials	79,232	167,469	376	Australia 74,016; Brazil 61,526.
Steel, primary forms	r74,580	266,521	48,412	Republic of Korea 69,991; Malaysia 45,438; Republic of South Africa 26,051.
Semimanufactures:				
Bars, rods, angles, shapes, sections	277,869	301,500	3,308	Japan 267,824.
Universals, plates, sheets thousand tons	1,467	1,625	57	Japan 1,153.
Hoop and strip	16,744	21,749	2,057	Japan 17,673.
Rails and accessories	2,920	13,814	671	Republic of South Africa 7,548; Japan 3,496.
Wire	12,615	10,987	1,049	Japan 7,625.
Tubes, pipes, fittings	52,000	54,828	3,156	Japan 50,688.
Castings and forgings, rough	1,627	1,896	440	Japan 1,429.
Lead:				
Oxides	3,701	3,939	110	Australia 3,144; Mexico 602.
Metal including alloys:				
Scrap	46,805	44,690	19,706	Kuwait 7,416; Australia 7,156; Japan 3,922.
Unwrought	8,856	10,776	1,467	Australia 7,089; Japan 1,000.
Semimanufactures	476	240	78	Peru 100; Japan 32.
Magnesium metal including alloys, all forms	217	67	31	Italy 15; Norway 11.
Manganese:				
Ore and concentrate	148,013	142,975	30	Republic of South Africa 68,045; Malaysia 32,481; Japan 29,861.
Oxides	2,320	2,057	(1)	Japan 758; Gabon 684.
Metal including alloys, all forms	52	77	22	Republic of South Africa 52.
Mercury 76-pound flasks	1,644	373	22	Japan 211; Belgium 66.
Molybdenum metal including alloys, all forms	48	44	36	Japan 5.
Nickel metal including alloys, all forms	2,889	2,709	78	Canada 1,494; Japan 431; Republic of South Africa 304.
Platinum-group metals:				
Ore and concentrate value	$60,782	$28,377	--	All from United Kingdom.
Metal including alloys, unwrought and partly wroughtthousand troy ounces	290	113	2	Japan 99.
Selenium, elemental kilograms	4,923	5,971	518	Japan 4,446; United Kingdom 1,000.
Silicon metal	118	1,036	213	West Germany 432; Canada 165; Sweden 119.
Silver metal including alloys, unwrought and partly wrought thousand troy ounces	4,078	780	102	Japan 348; West Germany 215.
Tin:				
Ore and concentrate	7	5	--	All from Singapore.
Oxides kilograms	404	51,413	19,653	Japan 15,507; France 13,000.
Metal including alloys, all forms	1,328	1,498	566	Malaysia 521; Hong Kong 277.
Titanium oxides	16,123	14,515	2,079	Japan 6,975; West Germany 2,305; Australia 1,660.
Tungsten metal including alloys, all forms	38	55	3	Japan 30.
Uranium and thorium oxides	31	93	92	Japan 1.
Zinc:				
Oxides and peroxides	1,132	129	20	West Germany 61; Japan 47.
Metal including alloys:				
Scrap	15,756	28,823	26,285	Canada 1,740.
Blue powder	76	67	1	Japan 66.
Unwrought	37,350	38,382	516	Australia 24,178; Japan 7,961.
Semimanufactures	668	663	11	Japan 544.
Other:				
Ores and concentrates:				
Of molybdenum, tantalum, titanium, vanadium, zirconium	48,543	17,761	--	Malaysia 10,667; Australia 6,574.
Of base metals, n.e.s.	13	66	54	Belgium 10.
Ash and residue containing nonferrous metals	19,113	14,944	8,296	Australia 2,631; Philippines 882; Singapore 777.
Oxides, hydroxides, peroxides	1,020	984	45	Japan 427; France 148.
Metals:				
Metalloids	203	260	179	Japan 36; Republic of South Africa 24.
Alkali, alkaline-earth, rare-earth metals	290	310	(1)	Japan 259; West Germany 50.

See footnotes at end of table.

Table 3.—Taiwan: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Other —Continued				
Metals —Continued				
Pyrophoric alloys ____ kilograms__	4,300	3,902	--	Austria 1,700; Australia 1,000; Japan 997.
Base metals including alloys, all forms	448	435	55	Japan 197; Zaire 56; France 38.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	3,274	2,848	907	Japan 1,775.
Artificial corundum	6,039	5,716	305	Japan 4,817; India 452.
Dust and powder of precious and semi-precious stones including diamond kilograms	6,524	862	187	Japan 641.
Grinding and polishing wheels and stones	710	710	44	Japan 317; Italy 313.
Asbestos, crude	29,103	31,247	593	Republic of South Africa 15,592; Canada 14,293.
Barite and witherite	2,870	7,605	--	All from Thailand.
Boron materials:				
Crude natural borates	1,098	1,238	--	Netherlands 1,059; Japan 179.
Oxide, acid, borates, perborates	8,285	7,736	7,633	Japan 84.
Bromine ____ kilograms__	18	153	--	Japan 144.
Cement	9,874	9,690	13	Japan 9,370.
Clays and clay products:				
Crude:				
Bentonite	6,893	6,435	5,303	Japan 510; India 500.
Fire clay	2,180	2,274	77	Japan 1,707; India 300.
Kaolin	40,425	66,753	32,365	Republic of Korea 15,550; Malaysia 9,011.
Other	150,218	156,129	8,164	Hong Kong 59,895; Japan 57,108.
Products:				
Refractory including nonclay brick	31,590	24,982	634	Japan 13,627; West Germany 7,855.
Nonrefractory	17,866	20,393	29	Italy 16,432.
Cryolite and chiolite	1	5	--	All from Japan.
Diamond:				
Gem, not set or strung:				
Natural ____ thousand carats__	165	--		
Manufactured ____ do____	315	30	30	
Industrial:				
Natural ____ do____	[2]230	7,270	5,350	Japan 1,890.
Manufactured ____ do____	90	540	--	Japan 480.
Diatomite and other infusorial earth	3,072	2,909	1,853	Japan 1,036.
Feldspar and fluorspar	44,221	54,262	366	Republic of Korea 18,740; Thailand 17,507; Japan 8,393.
Fertilizer materials:				
Crude, phosphatic	359,569	297,797	54,851	Jordan 226,000.
Manufactured:				
Nitrogenous	2,408	812	--	Japan 801.
Phosphatic	3	(1)	(1)	
Potassic	161,647	224,387	30,266	Canada 163,955; Israel 30,166.
Other including mixed	250	13,114	215	Canada 10,936.
Ammonia	41	22	19	Japan 2.
Graphite, natural	13,722	15,696	--	Republic of Korea 12,515.
Gypsum and plasters:				
Gypsum	289,752	224,293	--	Japan 169,500; Republic of Korea 38,950.
Plasters	3,079	2,984	513	Japan 2,347.
Iodine	7	8	--	Mainly from Japan.
Lime	--	3	--	All from Japan.
Mica:				
Crude including splittings and waste	524	337	--	Japan 217; India 96.
Worked including agglomerated splittings	99	102	15	Japan 74.
Pigments, mineral:				
Natural, crude	133	26	11	Japan 15.
Iron oxides, processed	8,497	7,859	54	Japan 6,593; West Germany 616.
Precious and semiprecious stone, except diamond:				
Natural ____ kilograms__	945,961	1,659,509	4,418	Canada 609,757; Brazil 522,541.
Manufactured ____ do____	6,023	12,734	877	Italy 8,150.
Salt and brines	677,456	563,710	4	Australia 544,080.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	27,630	57	14	Japan 40.
Caustic potash, sodic and potassic peroxides	1,443	1,801	1	Japan 1,737.
Soda ash	12,112	24,135	10,169	Japan 13,735; Kenya 230.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	15,681	20,997	128	Italy 6,251; India 3,213; Brazil 2,853.

See footnotes at end of table.

Table 3.—Taiwan: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Dimension stone —Continued				
Worked	3,112	728	626	Italy 95.
Dolomite, chiefly refractory-grade	860	1,485	75	Japan 1,392.
Gravel and crushed rock	2,867	3,366	--	France 2,512; Japan 359.
Limestone except dimension	6	680	18	Japan 662.
Quartz and quartzite	824	605	--	Republic of Korea 232; Japan 219.
Sand excluding metal-bearing	2,000	2,813	209	Australia 1,626; Japan 921.
Sulfur:				
Elemental:				
Other than colloidal	186,479	122,737	--	Canada 99,016; Japan 23,721.
Colloidal	130,629	250,497	197	Canada 183,310; Japan 66,985.
Dioxide	52	46	(1)	Mainly from Japan.
Sulfuric acid, oleum	15,912	14,597	4	Japan 14,588.
Talc, steatite, soapstone, pyrophyllite	5,297	4,775	632	Republic of Korea 1,820; Japan 578; Australia 559.
Other:				
Crude:				
Meerschaum, amber, jet kilograms	3,633	885	NA	NA.
Unspecified	143,080	158,744	288	Republic of Korea 114,789; Japan 28,915.
Slag, dross, and similar waste, not metal-bearing:				
From iron and steel manufacture	29,736	34,416	--	Japan 28,048; Hong Kong 6,350.
Unspecified	63	202	--	Japan 166.
Oxides, hydroxides, peroxides of magnesium, strontium, barium	14,344	11,420	205	Japan 10,993.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals, n.e.s	1,044	2,102	138	Japan 1,785.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	128	106	45	West Germany 29; United Kingdom 29.
Carbon black and gas carbon:				
Carbon black	18,000	15,923	9,026	Australia 6,085.
Gas carbon	NA	5	--	All from Japan.
Coal, all grades, including briquets thousand tons	2,720	4,069	532	Australia 1,696; Republic of South Africa 1,658.
Coke and semicoke	133,182	98,785	--	All from Japan.
Hydrogen and rare gases	1,738	632	19	Japan 542.
Peat including briquets and litter	18	40	--	New Zealand 29; Finland 8; Canada 3.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	127,557	132,371	--	Kuwait 61,167; Saudi Arabia 51,447; Indonesia 4,547.
Refinery products:				
Gasoline do	NA	NA	--	Mainly from West Germany.
Kerosine, jet fuel, white spirit do	NA	--		
Distillate fuel oil do	11,773	18,668	2,952	Kuwait 8,024; Iran 5,758.
Lubricants (including grease) do	r551	584	246	Japan 276.
Mineral jelly and wax do	95	88	12	Japan 53.
Other:				
Liquefied petroleum gas do	1,372	1,487	--	Kuwait 523; Australia 518.
Nonlubricating oils, n.e.s do	784	1,558	43	Singapore 947; Sri Lanka 225.
Petroleum coke do	241	238	238	
Bitumen and other residues and bituminous mixtures, n.e.s do	2	2	1	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r14,366	51,841	11,661	Republic of Korea 20,770; Canada 13,502.

rRevised. NA Not available.
1Less than 1/2 unit.
2Excludes unreported quantity valued at $162,860.

COMMODITY REVIEW

METALS

Aluminum.—Taiwan Aluminum Corp. (Talco), a wholly Government-owned company, operates two smelters at Kaoshiung. The older smelter, Kaoshiung I, with an annual capacity of about 35,000 tons, dates to the mid-1960's and was shut down in early 1981. Construction of Kaoshiung II, with an annual capacity of 50,000 tons, was completed in June 1980, and operated at about 60% of capacity during 1981. Shutdown of Kaoshiung I was attributed to inefficiency and pollution. Rising cost of electricity and decreased domestic demand for aluminum were cited in the curtailment in operating capacity for Kaoshiung II.

Taiwan's annual consumption of aluminum ingot was about 110,000 tons. Talco's inventory of ingot began to mount inasmuch as manufacturers were purchasing foreign metal with a distinct price advantage on the spot market. The Government banned the import of ingot in early June 1981 and partially lifted the ban in late June on the condition that users purchase 1 ton of Talco's inventory for each ton imported.

The cost per kilowatt-hour of electricity to Talco was 57 mills, compared with 70 mills in Japan, 15 mills in the United States, and about 25 mills in Western Europe. Talco maintained a cash price of $1,778 per ton of ingot, losing about $640 per ton. The construction industry accounts for about 60% of metal used in Taiwan, mostly for doors, siding, and windows. While demand in this sector was down, resurgence in construction was expected to pick up in 1982-83.

Talco has a 46,000-ton-per-year rolling mill that was built in the early 1960's and a 10,000-ton-per-year extrusion plant. A new 50,000-ton-per-year rolling mill was expected to begin operations in 1983. The $100 million rolling plant was to be equipped with a hot-rolling mill from Schloemann-Siemag AG, the Federal Republic of Germany; a cold-rolling mill from Secrim Division, Creusot-Loire, France; and additional equipment from Italy, Japan, and the United Kingdom.

Taiwan imports all of its bauxite and alumina requirements from Australia, Japan, and Malaysia. Low-grade bauxite occurs in the Tantunshan region in northern Taiwan, and in 1979 new deposits were discovered in the area with ore grade ranging from 30% to 50% Al_2O_3. The Industrial Technology Research Institute announced in September 1981 the discovery of a deposit estimated to contain 4 million tons of bauxite. A 3-million-ton bauxite deposit was found earlier in the vicinity.

Copper.—Taiwan Metal Mining Corp. (TMMC), a Government-owned company, operates an 18,000-ton-per-year copper smelter-refinery near Chinkuashih. This small plant, dating from 1947, was expanded subsequently in two stages in 1969-71 and in 1971-73. The plant uses ore and cement copper from the Chinkuashih Mine and imported concentrate and cement copper. About 90% of the copper refined is from imported material. TMMC started operation of a 50,000-ton-per-year smelter-refinery at Keeling in August 1980. This plant uses copper concentrates imported from Chile and the Philippines. With the increase in production of electrolytic copper, there was a notable increase in output of gold, silver, and sulfuric acid.

Because of falling copper prices and rising inventories, TMMC postponed the proposed expansion of its new smelter from 50,000 to 80,000 tons. The first stage of the expansion program, to begin in 1982 and be completed in 1983, was to be followed by a second-stage expansion to 130,000 tons. Annual domestic consumption of copper was about 110,000 tons.

Iron and Steel.—China Steel Corp. (CSC), a Government-owned company, operates the only integrated iron and steel mill in Taiwan at Kaohsiung. In July 1978, CSC began construction of its second-stage expansion whereby the capacity of its steelworks would be increased from 1.5 million tons of steel per year to 3.25 million tons per year in July 1982. As of the beginning of 1981, CSC had completed 51% of the phase 1, stage 2 construction of its expansion program. Cost of equipment supplied by U.S. manufacturers was valued at $250 million. Wean United Inc. was supplying a cold-rolling mill; General Electric Co. and Westinghouse Electric Corp., electric driving equipment; and Dravo Corp., sintering equipment. Overhead cranes were also to be imported from the United States. Equipment from Japan was to cost $400 million, which included a $40 million blast furnace to be supplied by Ishikawajima-Harima Heavy Industries, Inc. European companies were to supply additional equipment to cost about $150 million. When completed, new production was to be split between hot- and cold-rolled sheet.

Taiwan's consumption of steel is about 4 million tons. About two-thirds of CSC's output is consumed domestically and the remainder is exported. About 1.3 million tons is supplied by independent operators of electric furnaces, and the remainder of the nation's supply, from 1.2 to 1.4 million tons, by imports.

The Government initiated a program to consolidate the industry by offering incentives to small steelworks to merge, modernize, and expand. Companies that merge would be eligible for subsidy to install equipment to meet the statutory minimum limit of 50-ton-heat-size furnaces and 100,000-ton-per-year rolling mills. Also, merging companies would receive tax exemption for 5 years and an increase in electricity supply to match the capacity increase.

Tang Eng Iron Works Co. was expected to complete construction of its 50,000-ton-per-year stainless steel plant at Kaohsiung in May 1982, which was to be expanded later to 100,000 tons per year. Waterbury Production Machinery Corp. and General Electric Co. was providing the equipment for the plant's first phase. American Rolling Mill Corp. was assisting with the technology. Taiwan currently imports all of its requirements for stainless steel strip and sheet which totaled about 80,000 tons in 1981.

Mine output of iron ore in Taiwan is insignificant as well as sporadic. Production is limited to magnetite sand from placers between Tanshui and Wanli along the northern coast of Taiwan. Some limonite was mined in Tayiikeng, also in northern Taiwan, but there is presently no production from this source. Virtually all of Taiwan's requirement for iron ore was being met by imports of concentrates from Australia, Brazil, and the Republic of South Africa.

Zinc.—Annual demand for zinc in Taiwan was about 60,000 tons and consumption has increased yearly about 8% to 10%. TMMC's original plans for construction of a zinc smelter in northeast Taiwan was shelved in 1980. Officials of TMMC and the Government of the Republic of South Africa held discussions for Taiwan to purchase 50% equity in a South African zinc mine and for Taiwan to finance wholly the cost of constructing an 80,000-ton-per-year zinc smelter in South Africa. Consideration was also given to Taiwan's possible involvement in a copper and lead smelter in South Africa.

NONMETALS

Cement.—Taiwan's cement industry was comprised of 17 plants operated by 11 companies. Total industry capacity was about 14.5 million tons per year. Taiwan Cement Corp., the largest producer, has four plants: Kaohsiung, 1.9 million tons per year; Suao, 1.8 million tons per year; Chutung, 1.28 million tons per year; and Hualien, 290 tons per year. Asia Cement Corp. has three plants: Hsin-chu, 1.4 million tons per year, Hualein, 1.4 million tons per year, and Kuanhsi, 50 tons per year. Chia Hsin Cement Corp. has one plant at Kang Shan with an annual capacity of 1.2 million tons. These companies account for 66% of the total industry capacity for cement. Other producers were Chien Tai Cement Co., Ltd.; China Rebar Co., Ltd.; Chi-Shin Enterprise Inc.; Hsing Ta Marble and Cement Co., Ltd.; Hsin Hsin Cement Corp.; Southeast Cement Corp.; Universal Cement Corp.; and Yung Kang Industrial Development Co., Ltd. China Rebar Co., Ltd., with one plant at Tung-Shan, was to increase its capacity from 990 to 1.8 million tons per year in 1982.

Taiwan's three major producing areas were around Hsin-chu in the northwest, Taipei and Suao in the northeast, and Kaohsiung in the southwest. Except for the small operations, most of the cement plants had their own limestone quarries. Ten of the plants used oil, four used coal, and three were based on oil and coal. Total electric power consumption by the cement industry was 3,949 million kilowatt-hours in 1981.

Other Nonmetals.—There are many limestone deposits of commercial value that occur in Taiwan. The important ones are in the southwest and the east where large quarries are operated. The cement industry was the largest consumer of limestone in Taiwan followed by the sugar refining industry. Crystalline limestone, also in eastern Taiwan, is quarried for marble-decorative building stone. While most of the output is used by the cement and fertilizer industries, the production for decorative uses has grown from 193,000 cubic meters in 1971 to 3,300,000 cubic meters in 1981. Commercially important dolomite quarries are located in the Tachoshuichi stream north of Hualien. Other quarries include Hoping, Hojen, and Chungteh. However, the most important deposit is Chingchang-shan which was developed to provide dolomite for China Steel's iron and steel com-

plex in southern Taiwan. Other nonmetallic mineral production of local significance included clays, feldspar, and serpentine.

MINERAL FUELS

Taiwan produces only small quantities of coal, petroleum, and natural gas, and domestic energy output from all sources provided only 13.6% of the country's total energy supply in 1980. Taiwan's estimated total coal resources were close to 500 million tons with an estimated total recoverable reserve of 260 million tons. All of the commercially important coal deposits are in Miocene formations in northern Taiwan. Almost all of the coal mines are likewise in the north with about 70% of the workings around Keelung and Taipei. Coal mining is undertaken by different owners in small and irregular concession blocks. About 10% of the mines produce more than 3,000 tons per month while only two mines have a monthly production of over 10,000 tons. Most of the coal mines were based on slope development. In 1958, adit mining accounted for 7.7% of the total production, 3.4% in 1968, and as mining proceeded deeper, was negligible in overall production.

Domestically produced coal is used according to rank and quality; about 20% is classified as coking coal. Coal was the chief fuel in powerplants, railways, sugar mills, cement plants, ceramic kilns, and paper mills. Lesser amounts were used in fertilizer plants, aluminum smelters, textile mills, and alcohol plants. Also, household use consumes a small amount. Semi-coke produced from low-grade coking coal was more suitable for household use than raw coal.

Natural gas and small quantities of oil were produced in Taiwan since the first discovery made around the turn of the century. The important gas-producing fields included Chingtsaohu, Chinshui, Chiting, Chutung, Niushan, Pashatun, Tiehchenshan, and Yunghoshan. The major oil-producing fields were Chuhuangkeng and Tungtzechiao. The Chinese Petroleum Corp. (CPC) is the sole oil company in Taiwan and is under the supervison of the Government. CPC, which operates all of the gasfields in Taiwan, is responsible for all phases of the petroleum industry in the country from exploration, production, and refining to marketing. Because of the dim prospects of offshore finds, CPC has temporarily halted offshore exploration activities to conduct a reevaluation of its data. CPC was expected to shift gradually the focus of its domestic exploration and development program to participation in overseas projects. CPC has agreements for joint venture operations in the Philippines with Pioneer, Redeco, and Sulu Sea; in Colombia with Sunray Colombia Co.; and in Indonesia with Amoco Indonesia Petroleum.[6]

Taiwan energy supply-demand configuration was as follows, in 1,000 kiloliters of oil equivalence:

	1980	1981
Domestic production:		
Coal	1,722.9	1,684.9
Natural gas	1,958.5	1,668.9
Hydropower	728.9	1,194.3
Crude oil	211.4	182.8
Imports:		
Crude oil	20,590.6	19,878.8
Petroleum products	3,552.5	2,237.2
Coal	3,443.4	3,557.0
Nuclear	2,042.5	2,659.3
Total	34,250.7	33,063.2
Domestic consumption:		
Petroleum products	14,433.0	13,655.5
Electric power:		
Thermal	7,330.1	6,186.2
Hydropower	681.2	1,119.7
Coal and coal products	2,505.4	2,315.9
Nuclear	1,909.0	2,493.1
Natural gas	1,747.5	1,530.1
Exports:		
Petroleum products	883.9	1,199.0
Coal and coal products	5.5	7.5
Inventory adjustment	1,825.7	2,602.2
Total	31,321.3	31,109.2

In 1980, energy consumed by the energy sector was 3,939,300 kiloliters equivalent of oil; nonmetallic minerals sector, 3,517,700 kiloliters; chemicals, 2,758,900 kiloliters; metal products, 2,591,600 kiloliters; and other mining, 1,723,900 kiloliters. The industries with the fastest growing energy consumption during 1971-80 were as follows, in percents: Transportation, 16.5; miscellaneous mining, 13.2; metal products, 13.0; energy, 12.6; textiles, 11.9; agriculture, 9.6; and nonmetallic products, 8.9. Consumption of electrical energy in 1981 by select industries was as follows in million kilowatt-hours: Other chemical products, 3,949; iron and steel, 2,351; cement, 1,863; industrial chemicals, 1,181; metal products, 911; mining and quarrying, 718; aluminum, 663; and chemical fertilizers, 332.

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[1]Physical scientist, Division of Foreign Data.

[2]All values are given in U.S. dollars unless otherwise indicated. The exchange rate between 1974 and 1977 was New Taiwan dollar (NT$) NT$38.05=US$1.00. Subsequently the average annual parity was as follows: 1978, NT$36.05; 1979, NT$36.08; 1980, NT$36.06; and 1981, NT$37.74.

[3]Council for Economic Planning and Development. Industry of Free China. V. 57, No. 3, March 1982, 208 pp.

[4]Directorate-General of Budget, Accounting and Statistics. Statistical Yearbook. 1981, 743 pp.

[5]———. Monthly Statistics. V. 194, February 1982, 268 pp.

[6]Petroleum News. V. 12, No. 10, January 1982, pp. 16-17.

The Mineral Industry of Tanzania

By Thomas O. Glover[1]

Diamonds continued to be the most important mineral commodity produced in Tanzania during 1981. The mineral industry contributed only a small amount to the country's real gross domestic product, estimated at $5.5 billion in 1981.[2] Nearly 90% of the value of mineral production and 50% of mineral export revenues were attributed to diamond sales.[3] Minerals produced on a small-scale basis, including cement, salt, kaolin, gypsum, and coal, were of domestic significance only. Precious stones, mica, gold, and tin comprised the majority of mineral exports during the year.

The Tanzanian Government continued to play a large role in the mineral industry sector of the economy. A new Minister of Minerals post was established, which was solely responsible for development of the minerals sector. The Minister of Minerals was responsible for (1) gathering geologic information, (2) proposing mining legislation, (3) organizing and coordinating the mining sector into several related institutions, and (4) actively pursuing mine development programs. Tanzania had a new mining act, cited as the Mining Act, 1979-No.17-12/8/79, and a new petroleum act, cited as the Petroleum Act, 1980-No.27-9/8/80. Both acts increase the role of the state in developing geological resources. The state identified many mineral-rich localities but lacked the funds to exploit them. The new Minister of Minerals was to concentrate on strengthening existing mines instead of embarking on new projects that would overstretch the meager financial resources available. He would, however, continue to encourage outside exploration and mining investment. The Geology and Minerals Exploration Division of the new ministry was responsible for carrying out geological mapping and mineral exploration programs. Petroleum exploration, development, and marketing continued to be carried out by the Tanzania Petroleum Development Corp. (TPDC) under joint-venture agreements with foreign investment companies. The State Mining Corp. (STAMICO) was responsible for exploring new mineral deposits and developing and operating new mines and mineral-related activities.

In July 1981, the Minister of Minerals presented a three-part plan concerning mining in Tanzania. A short-term plan to exploit gold, tin, gem stone, and mica deposits to solve the country's current economic problems was announced. The plan involved carrying out direct mining activity by utilizing locally available technology and minimal capital as well as completing ongoing projects that had been long overdue. Medium-term plans would concentrate on exploitation of minerals requiring moderate investment and simple technology. The Ministry's policy was to assist small-scale miners and, at the same time, open mines that would be equipped with smaller processing units that could be moved from one mining site to another. The medium-term plans were to also emphasize gold, tin, diamonds, and other minerals vital in other sectors of the economy such as coal, soda ash, kaolin, gypsum, and salt. Long-term plans included mineral projects requiring extensive studies, heavy investment, and heavy use of electrical power during both production and transportation. Long-term projects cover nickel, cobalt, copper, uranium, and iron, coal, and soda ash for export.

East and Central African countries

announced plans for a geologic, stratigraphic, and geochemical exploration program to be carried out over two areas in Zambia and Tanzania between 1982-84.

PRODUCTION AND TRADE

Having a longstanding international reputation in diamonds and with a record of supplying high-grade sheet mica, Tanzania had been looking intently at the possibilities for extending its participation in the world industrial minerals sector. This was needed to satisfy domestic needs for materials imported and to build up export markets from which foreign currency could be earned. Exploration work carried out by various organizations and state corporations demonstrated that many nonmetallic minerals were available for exploitation. Although not always proven to be large, many deposits exist as outcrops, easily amenable to small-scale mining operations. These operations could provide indicators about possible larger deposits nearby. One mineral resource, trona, was known to be present in quantities large enough to support massive extraction and refining operations. STAMICO's activities were constrained by lack of trained workers, finances, and infrastructure. To exploit the trona deposit, for example, would require massive investment, because no infrastructure existed where the trona was located.

The Government was pursuing a unified energy policy in an endeavor to diminish reliance on imported oil, the cost of which was estimated to have consumed 55% of Tanzania's export earnings in 1981, compared with 12% in 1973. As part of the Government's energy policy, existing energy-saving measures were strengthened, limited reserves of natural gas were to be tapped, and research was under way to develop a considerable hydroelectric potential. In addition, agreements for oil exploration were reached with a number of international companies in 1981. China was taking part in the construction of a thermal power station to use local coal, while a project for exploiting substantial deposits of coal at Songwe-Kiwira was under consideration.

Agrico Chemical Co. in the United States and the Tanzania Government formed a joint venture, called Kilwa Ammonia, to build a large-scale fertilizer complex at Kilwa Masoko in Tanzania. The $450 million ammonia-urea plant was to supply Tanzania with its urea fertilizer needs as well as urea for export to neighboring countries. Natural gas from Tanzania's offshore Songo Songo Field was to be used by the plant.

Table 1.—Tanzania: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Gold, refined ---- troy ounces	23	133	322	246	250
Tin, mine output, metal content	--	9	10	[e]10	[2]9
NONMETALS					
Cement ---- thousand tons	260	231	280	1,100	1,200
Clays:					
Bentonite	35	20	80	80	50
Kaolin[e]	1,000	1,000	1,100	1,100	750
Diamond:					
Gem[e 3] ---- carats	204,016	140,894	156,776	136,852	125,000
Industrial[e 3] ---- do	204,016	140,894	156,775	136,853	125,000
Total ---- do	408,032	281,788	313,551	273,705	250,000
Gem stones, precious and semiprecious excluding diamond:[4]					
Amethyst ---- kilograms	2	4	28	48	50
Aquamarine ---- do	NA	--	NA	533	560
Beryl (gem only) ---- do	67	--	2	(5)	5
Chrysoprase and opal ---- do	--	23	2	(5)	[2]12
Corundum (gem only) ---- do	--	--	6	[e]7	7
Garnet and rhodolite ---- do	20	3	37	9	[2]13
Ruby and sapphire ---- do	1	(5)	20	10	11
Scapolite ---- do	7	--	9	[e]10	10
Tourmaline ---- do	3	(5)	5	2	3

See footnotes at end of table.

Table 1.—Tanzania: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Gem stones, precious and semiprecious excluding diamond[4] —Continued					
Zircon ____ kilograms	20	(5)	5	3	4
Zoisite (tanzanite) ____ do	(5)	11	10	2	3
Unspecified ____ do	55	21	--	9	10
Gypsum and anhydrite, crude	8,255	20,206	9,430	[e]11,300	12,000
Lime, hydrated, and quicklime	[e]2,000	5,128	6,111	[e]6,500	6,800
Mica, sheet	7	6	6	[e]10	[2]5
Nitrogen: N content of ammonia	NA	NA	5,000	[e]5,500	6,000
Salt, all types	27,991	[r]21,100	37,078	[e]40,000	41,000
Stone, sand and gravel:					
Calcite	2	NA	NA	NA	NA
Ornamental stone:					
Art stone	16	5	10	[4]5	5
Amethystine quartz ____ kilograms	2	4	NA	NA	NA
Glass sand	28,000	28,000	[e]30,000	30,000	30,000
Vermiculite[e]	20	20	20	20	20
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous	3,000	3,500	[e]900	1,000	1,000
Petroleum refinery products:					
Gasoline ____ thousand 42-gallon barrels	895	794	781	780	800
Kerosine ____ do	349	328	292	300	300
Jet fuel ____ do	241	173	244	240	220
Distillate fuel oil ____ do	1,170	978	976	1,000	1,050
Residual fuel oil ____ do	1,847	1,573	1,710	1,700	1,750
Liquefied petroleum gas ____ do	72	63	78	80	80
Refinery fuel and losses ____ do	317	310	300	300	300
Total ____ do	4,891	4,219	4,381	4,400	4,500

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 16, 1982.

[2]Reported figure.

[3]Estimates based on reported total diamond output and best available information on the ratio of gem to industrial stones in total output.

[4]Exports.

[5]Less than 1/2 unit.

Table 2.—Tanzania: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, semimanufactures	(1)	928	--	Zambia 465; Burundi 186; Mozambique 124.
Copper metal including alloys, scrap	240	129	--	India 104; West Germany 25.
Iron and steel:				
Ore and concentrate	14	--		
Metal:				
Scrap	12	5	--	All to Netherlands.
Pig iron and similar materials	55	250	--	All to Zambia.
Steel, primary forms	2	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	18	360	--	All to Zambia.
Universals, plates, sheets	1,783	948	--	Uganda 515; Zambia 427; Zaire 6.
Rails and accessories	154	148	--	All to Zambia.
Wire	--	50	--	Uganda 49; Zambia 1.
Tubes, pipes, fittings	104	--		
Castings and forgings, rough	--	150	--	All to Uganda.
Lead metal including alloys:				
Scrap	68	70	--	India 30; Denmark 25; Hong Kong 10.
Unwrought	--	14	--	All to Spain.
Nickel metal including alloys, scrap	5	--		
Tin: Ore and concentrate	18	14	--	All to Malaysia.
Zinc metal including alloys:				
Scrap	--	338	--	Spain 204; India 134.
Unwrought	(2)	20	--	All to Uganda.

See footnotes at end of table.

Table 2.—Tanzania: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Other:				
Ash and residue containing nonferrous metals	187	98	--	Belgium-Luxembourg 35; India 35; Denmark 20.
Oxides, hydroxides, peroxides value, thousands	--	$5	--	All to Uganda.
NONMETALS				
Cement	7,976	11,260	--	Burundi 11,110; Zambia 150.
Clay and clay products: Crude	25	--		
Diamond:				
Gem, not set or strung value, thousands	$30,309	$15,037	--	United Kingdom $11,648; Belgium-Luxembourg $3,360.
Industrial ---do---	--	$24,403	--	United Kingdom $13,831; Switzerland $10,572.
Gypsum and plasters	--	40	--	All to Zambia.
Mica: Crude including splittings and waste	9	4	--	All to United Kingdom.
Precious and semiprecious stones other than diamond: Natural value, thousands	$255	$277	$14	West Germany $246; Australia $15.
Salt and brine	13,751	11,516	--	Burundi 7,534; Zaire 3,834; Uganda 143.
Stone, sand and gravel:				
Dimension stone, crude	30	--		
Gravel and crushed rock	10	5	--	All to West Germany.
Quartz and quartzite	12	--		
Sulfur: Elemental, crude	8	--		
Other: Meerschaum, amber, jet	4	--		
MINERAL FUELS AND RELATED MATERIALS				
Coke and semicoke	70	--		
Petroleum refinery products:				
Gasoline ----- value, thousands	$3,979	$4,776	--	Burundi $3,219; Zambia $1,002; Zaire $535.
Kerosine and jet fuel ---do---	$247	$606	--	Burundi $383; Zaire $179.
Distillate fuel oil ---do---	$1,533	$2,707	--	Burundi $1,150; Zaire $701; Malawi $76.
Residual fuel oil ---do---	$11,014	$17,765	--	People's Democratic Republic of Yemen $2,924; Switzerland $2,001.
Lubricants ---do---	$47	$215	--	Burundi $103; Zambia $87.
Other:				
Liquefied petroleum gas ---do---	$13	--		
Nonlubricating oils ---do---	--	$2	--	All to Uganda.
Bitumen and other residues ---do---	$2	$2	--	All to Zambia.

[1]Unreported quantity valued at $1,241,000.
[2]Unreported quantity valued at $7,000.

Table 3.—Tanzania: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	10	--		
Unwrought	2,110	2,958	--	Netherlands 1,518; Canada 786; Egypt 500.
Semimanufactures	1,646	2,402	1	Canada 1,249; West Germany 649.
Copper metal including alloys:				
Scrap	1	--		
Unwrought	24	--		
Semimanufactures	3,019	453	(1)	Zambia 192; United Kingdom 104; Netherlands 39.
Iron and steel:				
Ore and concentrate	414	1,061	--	All from Sweden.
Metal:				
Pig iron and similar materials	1,958	1,249	--	West Germany 694; Belgium-Luxembourg 310; Netherlands 210.
Steel, primary forms	35,973	22,667	4	Japan 17,250; Belgium-Luxembourg 1,768; Netherlands 1,506.
Semimanufactures:				
Bars, rods, angles, shapes, sections	15,455	62,143	--	India 44,898; Japan 6,899; Belgium-Luxembourg 2,827.
Universals, plates, sheets	31,646	12,413	1	Japan 8,935; West Germany 1,317; Belgium-Luxembourg 1,154.
Hoop and strip	1,530	2,130	178	Japan 864; United Kingdom 485; West Germany 331.
Rails and accessories	13,888	1,604	--	Canada 653; Australia 475; United Kingdom 332.
Wire	4,176	5,579	1	United Kingdom 3,037; Belgium-Luxembourg 1,280; West Germany 494.
Tubes, pipes, fittings	9,002	8,376	4	Japan 2,621; West Germany 2,284; United Kingdom 1,502.
Castings and forgings, rough	(2)	37	--	West Germany 29; United Kingdom 7.
Lead metal including alloys:				
Unwrought	60	248	--	Zambia 166; United Kingdom 82.
Semimanufactures	205	259	--	United Kingdom 191; Zambia 43.
Magnesium metal including alloys, scrap	1	--		
Nickel:				
Ore and concentrate value, thousands	$1	--		
Metal including alloys, all forms	2	50	--	Mainly from United Kingdom.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	--	$3	--	Hong Kong $2; United Kingdom $1.
Silver metal including alloys, unwrought and partly wrought do.	$3	$2	--	All from Italy.
Tin metal including alloys:				
Unwrought	6	13	--	United Kingdom 8; Netherlands 5.
Semimanufactures	105	305	--	United Kingdom 150; Japan 149.
Zinc metal including alloys:				
Scrap	220	1,050	--	Zaire 1,000; Zambia 50.
Unwrought	6,547	3,169	--	Belgium-Luxembourg 1,556; Zambia 1,113; Zaire 500.
Blue powder	--	3	--	All from Sweden.
Semimanufactures	3	201	--	Japan 199.
Other:				
Ore and concentrate value, thousands	--	$1	--	All from Italy.
Oxides, hydroxides, peroxides	1,077	198	--	Zambia 79; West Germany 66; France 20.
Pyrophoric alloys value, thousands	$7	--		
Base metals including alloys, all forms	2	406	--	Brazil 392; Japan 10.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	14	29	--	India 23; United Kingdom 6.
Dust and powder of precious and semiprecious stones value, thousands	$1	$1	--	All from West Germany.
Grinding and polishing wheels and stones	75	55	(1)	China 28; India 10; United Kingdom 4.
Asbestos, crude	--	329	--	All from Canada.
Barite and witherite	939	--		
Cement	54,982	83,890	(1)	United Kingdom 45,930; Mozambique 13,843; Bulgaria 9,198.
Chalk	453	354	--	Belgium-Luxembourg 323; West Germany 31.

See footnotes at end of table.

Table 3.—Tanzania: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clay and clay products:				
Crude	1,008	170	39	Netherlands 34; West Germany 24; United Kingdom 20.
Products:				
Nonrefractory	360	927	(1)	West Germany 800; India 33; Italy 31.
Refractory including nonclay brick	3,457	3 1,826	--	United Kingdom 853; Denmark 443; West Germany 112.
Diamond:				
Gem, not set or strung value, thousands	$1,350	--		
Industrial do	$1	--		
Diatomite and other infusorial earth	214	257	251	West Germany 3; United Kingdom 2.
Feldspar and fluorspar	4	65	--	All from West Germany.
Fertilizer materials:				
Crude: Phosphatic	17,951	(4)	--	All from Jordan.
Manufactured:				
Nitrogenous	41,365	56,029	--	Netherlands 34,432; Japan 13,702; United Kingdom 4,000.
Phosphatic	116	--		
Potassic	6,050	8,333	--	West Germany 4,832; Belgium-Luxembourg 3,501.
Other including mixed	2	340	--	Netherlands 199; West Germany 137.
Graphite, natural	1	3	--	All from Sweden.
Gypsum and plasters	782	350	--	West Germany 324; United Kingdom 25.
Lime	3	1,401	--	Kenya 1,400; Japan 1.
Magnesite	330	300	--	West Germany 250; Austria 50.
Mica:				
Crude including splittings and waste	4	13	--	United Kingdom 12; Norway 1.
Worked including agglomerated splittings	165	(5)		
Pigments, mineral: Natural, crude	10	4	--	All from United Kingdom.
Pyrites, unroasted value, thousands	$1	--		
Salt and brine	1,665	14,141	1	Israel 6,650; India 5,495; West Germany 811.
Sodium and potassium compounds, n.e.s.:				
Soda ash	17,901	18,344	--	West Germany 14,306; Kenya 2,051; Netherlands 1,201.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1	--		
Worked	--	8	--	Sweden 6; Italy 2.
Dolomite, chiefly refractory-grade	10	2	--	All from Norway.
Gravel and crushed rock	7	(1)	NA	NA.
Quartz and quartzite	7	1	--	All from West Germany.
Sand other than metal-bearing	20	40	--	Do.
Sulfur:				
Elemental, crude	10,635	12,145	--	Iraq 11,600; Netherlands 470; West Germany 42.
Sulfuric acid	8,235	124	7	West Germany 106; United Kingdom 6.
Talc, steatite, soapstone, pyrophyllite	899	272	--	India 88; Belgium-Luxembourg 75; West Germany 46.
Other:				
Crude:				
Meerschaum, amber, jet	10	5	--	All from Italy.
Unspecified	10	5	--	All from West Germany.
Slag and ash, not metal-bearing	1	--		
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	1,372	1,342	(1)	United Kingdom 815; Italy 348; India 85.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,070	201	--	Japan 99; United Kingdom 58; Kenya 37.
Coal, all grades including briquets	63	54	--	All from Japan.
Coke and semicoke	(6)	318	--	Sweden 180; United Kingdom 133; West Germany 5.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	4,160	3,764	--	Iraq 2,624.
Refinery products:				
Gasoline value, thousands	$11,304	$27,215	--	People's Democratic Republic of Yemen $8,926; France $6,923; Netherlands $5,708.
Kerosine and jet fuel do	$16,051	$24,960	--	Bahrain $14,368; People's Democratic Republic of Yemen $4,349; Italy $1,818.

See footnotes at end of table.

Table 3.—Tanzania: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products —Continued				
Refinery products —Continued				
Distillate fuel oil				
value, thousands	$28,539	$60,680	--	Bahrain $ 22,344; People's Democratic Republic of Yemen $19,007; France $7,113.
Residual fuel oil ------do----	$3,052	--		
Lubricants ----------do----	$16,432	$17,193	$157	Netherlands $7,955; Italy $2,957; United Kingdom $1,239.
Other:				
Liquefied petroleum gas do----	$782	$39	--	Mainly from West Germany.
Mineral jelly and wax do----	$424	$1,945	$147	West Germany $1,600; Kenya $41.
Nonlubricating oil--do----	$725	$1,981	$43	Australia $778; Netherlands $556; West Germany $296.
Bitumen and other residues including bituminous mixtures ------do----	$1,257	$4,534	--	West Germany $2,148; Italy $846; United Kingdom $718.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals ----	511	1,286	--	United Kingdom 401; Italy 400; West Germany 161.

[1]Less than 1/2 unit.
[2]Unreported quantity valued at $12,000.
[3]Excludes an unreported quantity valued at $364,000.
[4]Unreported quantity valued at $2,462,000.
[5]Value only reported at $12,000 of which $3,000 from Sweden and $2,000 each from Canada, Denmark, Netherlands, and West Germany.
[6]Unreported quantity valued at $187,000.

COMMODITY REVIEW

METALS

Gold.—The production of gold from Tanzania's Buckreef gold mine in Geita district, Mwanza region, was scheduled to begin in January 1982. The Buckreef plant could mine 250,000 tons of ore, which would be processed to yield 2 kilograms of gold per day. The Buckreef Mine was one of two producing gold mines in Tanzania. Lupa gold mine in Chunya, Mbeya region, produced alluvial gold.

Machinery was to be ordered from abroad in 1981 for two small-scale gold mines to be opened at Nzega and Kahama. Countrywide surveys identified eight areas with gold deposits, but owing to financial and work force constraints, the ministry decided to start small-scale mining in only two areas.

NONMETALS

Cement.—The Tanzania Saruji Corp.'s 800-ton-per-day Mbeya cement plant in the southwest commenced operations in 1981. Major equipment at this plant was supplied by F. L. Smidth (Denmark) and consisted of a 1,250-kilowatt raw mill; one 3.95- by 58-meter kiln with a four-stage cyclone preheater and a Unax planetary cooler; as well as an 1,820-kilowatt finish mill. Additionally, another 800-ton-per-day dry-process plant was being considered at Wazo Hills by Tanzania Saruji Corp. Kulijan Corp. was handling the conceptual design, design and engineering, construction supervision, commissioning, and initial operation of the new plant. Kulijan was also doing a feasibility study of two more cement plants. One was a one-line, 600-ton-per-day operation. The other was a two-line, 1,500-ton-per-day plant.

Diamond.—Diamond output decreased in 1981. Approximately 250,000 carats were produced at the two kimberlite mines in 1981, registering a 9% decrease below 1980 levels. Diamond continued to be the most important mineral foreign exchange earner during 1981, despite depressed world market conditions. Roughly $11.4 million in foreign exchange earnings were attributed to Tanzania's diamond industry in 1981.

Fertilizer Materials.—*Ammonium Hydroxide.*—The Tanzania Fertilizer Co. Ltd. (TFC) started production of ammonium hydroxide solution that was used in paint production, wood treatment, and other

chemical processes. The plant had capacity enough to satisfy the country's yearly demand of 2,000 liters.

Phosphate.—The foundation stone for the Minjingu phosphate mine was laid in August 1981 to officially mark the launching of the project in Hanang district, Arusha, but production was not scheduled to start until 1983. The Minjinqu deposits, discovered more than 20 years ago, have phosphate reserves to last 15 years if exploited at the rate of 100,000 tons per year. The exploitation being carried out by STAMICO with the Kone Corp. of Finland was expected to cost $22 million. The Finnish Government was to meet over one-half of this investment. TFC would save $8.5 million in foreign currency by utilizing the local phosphate mineral.

Mica.—Mica has been mined in Tanzania since the beginning of the 20th century, although the operations have always been very simple and with no mechanization. The quality of the product has always had a good standing internationally and was at one time one of the country's more important exports. Small-scale mining of mica continued at Morogoro, the Pave Mountain area, within the Karagwe district. Recent inquiries from United Kingdom mica brokers indicate that although demand for good-quality Tanzanian mica remained brisk, the problem of inadequate supply remained production oriented. Production of mica in 1981 was approximately the same as in 1980.

MINERAL FUELS

Coal.—The coal mine at Ilima reported remaining reserves of only about 70,000 tons. The operation was fairly primitive, with manually propelled carts and kerosine lamps. Across the Kiwira River was a new minesite that the Chinese finished surveying in 1980, and to which construction of a road and bridge had begun. A revised proven reserves estimate showed that close to 20 million tons were in the deposit. However, any idea of exporting the coal was canceled, as were plans for general commercial availability. The mine was now expected to produce coal only for specific projects, including a 24-megawatt power-generating facility yet to be built, a cement plant at nearby Mbeya, and the new papermill under construction at Mufindi.

Natural Gas.—Exploration for gas at Songo Songo confirmed a minimum recoverable reserve of 18.9 billion cubic meters, with another 13.9 billion cubic meters probable. The known reserves were more than sufficient to meet the needs of an ammonia-urea plant to be built nearby at Kilwa.

Petroleum.—Tanzania, assisted by the Algerian Oil Co., Sonatrach, was to start drilling a 4,000-meter (12,000-foot) exploratory well on the tiny coastal island of Mafia to determine the amount of available oil there. The project was being financed through an Algerian loan of $10 million. Tanzania was spending about one-half of its foreign exchange earnings on oil imports.

The Organization of Petroleum Exporting Countries (OPEC) Fund for International Development granted Tanzania an oil and gas exploration loan for $12 million. This loan was the first to be specifically tied to exploration for oil and gas resources and was to be complemented by $5 million in local counterpart funds generated under a previous balance-of-payments support loan.

The European Investment Bank gave Tanzania a further loan of $7.7 million for drilling operations at Songo Songo Island in the Indian Ocean. The Songo Songo scheme, which was also financed by the World Bank through the International Development Association and the OPEC special fund, was scheduled for completion by September 1982 and is expected to involve a total outlay of more than $42.5 million.

Tanzania signed two other major agreements for petroleum exploration in 1981. The first was with Shell Petroleum Development Tanzania, who agreed with the Government to explore for oil and gas in a 72,000-square-kilometer area south of Dar es Salaam. The area, which ran diagonally from Kisarawe to Songea in Southern Tanzania, excluded the coastal strip where the Italian company Azienda Generali Italiana Petroli S.p.A. was prospecting. The second agreement was between Tanzania and the Vienna-based International Energy Development Corp. (Tanzania) Ltd. (IEDC). They signed an agreement under which IEDC was to explore for oil and gas over an estimated 12,000-square-kilometer area northwest of Dar es Salaam.

Under both agreements, the exploration company was to have full responsibility for generating the capital involved. Any petroleum found in their respective exploration areas was to be shared jointly between the exploration company and TPDC.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Tanzanian shillings (TSh) to U.S. dollars at the rate of TSh8.2894 = US$1.00.

[3]Estimated percentages include nonfuel minerals only.

The Mineral Industry of Thailand

By Gordon L. Kinney[1]

The 1981 economy showed signs of recovery after the recessionary trends of the second half of 1980. A bumper farm crop did not benefit the economy as much as expected because of the depressed world prices for most agricultural commodities. A liquidity crisis beginning in midyear led to a general economic slowdown. Exports grew at less-than-expected levels and imports remained high, resulting in a high balance of trade and payment deficits.[2]

The problems notwithstanding, gross national product (GNP) for 1981 was estimated at $36.6 billion[3] in current prices compared with over $32 billion in 1980.[4] Real growth in GNP was estimated at differing levels by different organizations and ranged from 6.5% to 8.0% depending on how the GNP was measured.

A high rate of inflation was a serious handicap to the Thai economy. After a 20% rate in 1980, the year opened with 4 months of even higher inflation, nearly 30%. After April the rate slowed and in August it was only 0.3%. Various estimates of the inflation rate for the whole year place the figure between 14% and 18%, still uncomfortably high. The leading cause appeared to be rising energy costs. After mostly holding the line on petroleum products during 1980, the Government was forced to increase the heavily subsidized prices an average of 20% in January 1981. Increases in electricity rates of 16% and 20% also added to the inflationary push.

In an effort to relieve the economic situation, the Government devalued the baht. The Bank of Thailand adjusted the rate downward by 1.083% in May and by another 8.7% in July. In addition, the Bank of Thailand increased its discount rates to 13.5% and 17.5%. Bank deposit rates were raised in July to 13% and 14% for 1- and 2-year deposits, respectively. Interest ceilings were also raised in July to 19% for commercial banks and 21% for finance companies. The Government also lowered corporate tax rates 5% and the tax credit for dividends was raised from 25% to 35%.

The relative importance of the mining sector in the Thai economy dropped a small amount in 1980 for the first time in several years and the small decline was expected to continue in 1981. Final figures were not available for 1981, but it was estimated that 2% of the GNP was derived from the mining and quarry sector. The decline was mostly due to the drop in value of tin exports during the year. As was normal, agriculture, manufacturing, and wholesale and retail trade were the leading sectors, contributing 26.2%, 18.7%, and 18.6%, respectively, to the GNP.[5]

The Thai Government has been trying to encourage the exploration and development of its mineral resources. It has been claimed in the past that despite theoretical encouragement, the actual practice of getting a project from paperwork through start of construction was a long, tedious, and often discouraging task. During the year, a group of American Agency for International Development officials and private businessmen were invited to Thailand to examine the problems of private investment. Their preliminary findings indicated (1) a need to clarify energy-utilization policies for investors, (2) a need to remove uncertainties in

the tax structure, (3) that Thai decision-making processes needed to be speeded up, and (4) price control policies were uncertain and needed clarification.

In another action to get mineral development moving, the Department of Mineral Resources (DMR) began to review its policies for granting exploration permits. As the law stands, once an exploration permit was issued, there was nothing to force the permit holders to begin exploring. Many people have been holding exploration rights to vast areas of land, but have done nothing about it for years. The policy prevents others genuinely interested in exploration from doing so. One change being considered was to set a time period under which the exploration activity must begin. Failure to do so would terminate the permit or a penalty fee would be owed to the Government. Another idea was to have the permits renewed each year. This would enable better records to be kept on the number of permits outstanding, who has them, and the location and the nature of the mineral to be sought. A final incentive to actual exploration would be a sharp increase in the yearly exploration and concession fees owed to the Government.

The major mining developments of the year were centered on the offshore natural gas, a probable start on the zinc project, progress toward developing a potash industry, the development of a nitrogen fertilizer complex, and possible development of the salt deposits. Also there was partial relief to previous critical cement shortages, and a second tin smelter opened during the year.

PRODUCTION

Thailand was the third largest market economy producer of tin, but production was off a small amount during 1981. The value of tin production was about $468 million, a drop of more than 16% from the 1980 level. In addition to tin, Thailand was a major world source of tantalum and columbium, mainly in the form of high-grade tin-smelter slags. Thailand also produced modest amounts of antimony, lead, manganese, tungsten, barite, and flourspar. In all, Thailand produced 35 types of ore minerals with a total value of $578 million, about 15% less than the 1980 level.

Huge deposits of salt underlay a large part of the northeast plateau area and there have been several important discoveries of potash minerals in these salt horizons. Neither the salt nor the potash was being exploited during 1981, but plans were moving along toward the eventual production of both of these minerals.

Thailand's first commercial use of the large natural gas reserves discovered several years ago in the Gulf of Thailand was in September 1981. Production began at a modest scale, but will soon become a major factor in Thailand's economy. There were plans to use the gas as either fuel or raw material in the cement, iron and steel, ammonia, potash, soda ash, liquified natural gas (LNG), and petrochemical industries. A 1981 discovery of onshore oil by Shell Exploration and Production Co. could be a great help to the Thai economy if the strike turns out to be commercially exploitable.

Table 1.—Thailand: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS					
Antimony:					
Ore and concentrate:					
Gross weight	5,774	6,759	6,905	6,862	2,820
Metal content	2,454	2,873	2,935	2,916	[e]1,199
Metal, smelter	159	35	101	22	36
Chromium: Chromite, gross weight	490	65	42	--	--
Columbium and tantalum ores and concentrates, gross weight:[2]					
Columbite	33	64	382	213	[e]200
Tantalite	41	--	25	143	48
Mixed columbite-tantalite	NA	NA	231	301	--
Iron and steel:					
Iron ore (55% Fe), gross weight	63,470	88,121	103,101	84,966	62,472
Metal:					
Pig iron	19,333	20,812	30,224	17,738	9,169

See footnotes at end of table.

Table 1.—Thailand: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS —Continued					
Iron and steel —Continued					
Metal —Continued					
Ferroalloys:					
Ferrosilicon	--	1,635	[r]3,041	60	--
Ferromanganese	706	747	[r]2,187	112	--
Steel, primary forms:					
Ingots	300,000	314,132	270,000	183,130	331,484
Billets		17,017	20,000	245,304	
Semimanufactures (selected):					
Bars	NA	NA	NA	321,517	109,711
Galvanized iron sheets	101,687	84,808	85,000	[e]129,342	151,620
Tinned plates	36,118	43,939	40,000	70,183	78,834
Lead:					
Mine output, metal content of 42.5% Pb concentrate	506	1,663	8,719	10,560	[e]17,283
Metal: Ingot, unwrought, secondary	1,181	1,101	[r]756	1,667	[e]1,800
Manganese ore:					
Chemical grade, over 75% MnO_2	63	78	42	11	[e]5
Battery grade and chemical grade, 75% MnO_2	4,762	6,635	5,828	2,716	3,095
Metallurgical grade, 46%-50% MnO_2	72,137	65,498	29,496	51,583	7,817
Total	76,962	72,211	35,366	54,310	10,917
Rare-earth metals:					
Monazite concentrate, gross weight	--	([3])	32	152	107
Xenotime	50	--	6	52	45
Tin:					
Mine output, metal content	24,205	30,186	33,962	33,685	[e]31,474
Metal, smelter, primary	23,102	28,945	33,058	34,689	32,626
Titanium: Ilmenite concentrate, gross weight	--	482	780	--	37
Tungsten concentrate:					
Gross weight	4,276	6,182	3,543	3,134	[e]2,348
Metal content	2,204	3,187	1,826	1,615	[e]1,300
Zinc, smelter production	31	8	10	30	--
Zirconium ore and concentrate, gross weight	303	25	116	61	104
NONMETALS					
Asbestos	4				
Barite	118,466	274,564	378,654	305,057	307,046
Cement, hydraulic thousand tons	5,110	5,091	5,255	5,337	[e]6,000
Clays:					
Ball clay	720		1,766	1,557	1,856
Kaolin	24,810	33,764	42,769	19,934	14,086
Kaolinite (dickite)	1,160	930	1,320	5,020	7,450
Diatomite	190	1,105	3,418	1,982	128
Feldspar	17,619	32,583	26,428	24,158	24,243
Fluorspar:					
Crude mine output:					
High grade	193,315	175,531	177,730	172,784	157,311
Low grade	46,490	84,255	82,122	133,547	113,667
Total	239,805	259,786	259,852	306,331	270,978
Salable product:					
Acid grade (beneficiated low grade)	54,826	55,000	[r]56,574	60,108	[e]55,181
Metallurgical grade	193,315	175,531	177,730	172,784	[e]157,311
Total	248,141	230,531	[r]234,304	232,892	[e]212,492
Graphite	23	23		2,074	1,800
Gypsum	380,090	280,904	352,398	411,977	540,383
Nitrogen, N content of ammonia	7,000	9,000	--	--	--
Phosphate rock, crude	3,100	3,485	4,542	5,570	[e]5,800
Salt:					
Rock	12,750	11,839	11,000	16,744	11,000
Other[e]	165,000	165,000	165,000	165,000	165,000
Sand, silica	112,168	170,227	157,076	171,000	76,330
Stone:					
Calcite	75	1,182	1,860	360	[e]500
Dolomite	3,370	4,400	4,030	8,130	[e]8,000
Limestone for cement manufacture only thousand tons	706	2,631	2,964	3,958	5,486
Marble	--	--	4,896	5,649	8,016
Marl for cement manufacture only thousand tons	585	1,460	2,262	1,939	1,787
Quartz, not further described	34,520	22,220	22,240	7,828	[e]8,000
Shale for cement manufacture only	180,696	484,518	748,499	800,682	1,123,000

See footnotes at end of table.

Table 1.—Thailand: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Talc and related materials:					
Pyrophyllite	9,851	12,190	11,191	10,350	10,370
Talc	517	2,698	2,351	1,376	1,665
MINERAL FUELS AND RELATED MATERIALS					
Coal: Lignite thousand tons	436	639	1,356	1,427	1,686
Petroleum:					
Crude thousand 42-gallon barrels	103	107	109	[e]110	[e]100
Refinery products:					
Gasoline do	13,317	12,965	14,535	[e]14,700	NA
Jet fuel do	4,732	4,750	5,720	[e]5,800	NA
Kerosine do	1,761	1,643	1,860	[e]1,900	NA
Distillate fuel oil do	17,591	16,200	16,860	[e]17,200	NA
Residual fuel oil do	17,787	19,673	19,980	[e]20,300	NA
Liquefied petroleum gas do	1,508	1,374	1,450	[e]1,500	NA
Naphtha do	2,317	1,955	1,920	[e]2,000	NA
Asphalt do	988	954	1,121	[e]1,200	NA
Unspecified do	--	223	[e]250	[e]300	NA
Refinery fuel and losses do	750	1,692	[e]1,800	[e]2,100	NA
Total do	60,751	61,429	65,496	[e]67,000	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Includes data available through Aug. 9, 1982.

[2]Excludes columbium- and tantalum-bearing tin slags, which make Thailand the world's largest source of newly mined tantalum.

[3]Revised to zero.

TRADE

The estimated value of total trade was $18 billion in 1981, up from $15.8 billion during 1980.[6] Exports rose from $6.5 billion in 1980 to over an estimated $7.5 billion in 1981. The planned target had been well over $8 billion. The lower amount of export was attributed to the generally depressed world prices of most commodities. Imports, however, began the first 6 months of 1981 at a 20% increase over the 1980 levels.

The Government was concerned over the growing trade deficit and devaluation of the baht was initiated to boost exports and discourage imports. The Thai baht had not fluctuated more than 4% against the U.S. dollar during the past 30 years. As a result of the devaluation, the balance-of-trade deficit for 1981 was expected to be lowered by about $275 million.

By far the most important mineral export was tin, accounting for 81% of total mineral exports. Revenues from tin exports were adversely affected by the nearly 20% drop in world tin prices during 1981. Total tin exports were valued at $468 million in 1981. Other mineral exports were antimony, barite, columbium, fluorite, gem stones, lead concentrate, and tantalum. The export of tin smelter slag constituted the major source of new tantalum on the world market.

Thailand's most important mineral was crude oil, which accounted for over 31% of all imports in 1981. Because of world price increases, Thailand's oil import bill continued to rise in 1981 despite a substantial drop in the volume imported. The Government planned for the output of natural gas to substitute for a significant proportion of these oil imports in the years to come.

Table 2.—Thailand: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Unwrought	r261	(1)	--	All to Malaysia.
Semimanufactures	1,393	1,554	(1)	Japan 534; Singapore 311; Hong Kong 247.
Antimony:				
Ore and concentrate	5,689	5,704	283	Belgium 2,543; France 1,046; West Germany 566.
Metal including alloys, unwrought	60	5	--	All to India.
Chromium: Chromite	62	--		
Columbium: Ore and concentrate	332	359	3	Netherlands 170; Singapore 145.
Copper metal including alloys, semimanufactures	7	1	--	Mainly to Singapore.
Gold metal including alloys, unwrought and partly wrought value	--	$90	$90	
Iron and steel metal:				
Scrap	492	1,423	--	Japan 1,257; Malaysia 166.
Ferroalloys	--	85	--	Taiwan 55; Japan 20.
Semimanufactures	44,122	92,089	207	China 55,820; Hong Kong 7,202; Singapore 4,029.
Lead:				
Ore and concentrate	16,796	21,653	--	Netherlands 13,350; Japan 8,000.
Metal including alloys, all forms	91	249	--	Indonesia 200; Hong Kong 29.
Manganese:				
Ore and concentrate	35,718	50,820	--	Japan 44,700; Taiwan 6,000.
Dioxide, synthetic	20	--		
Nickel metal including alloys, semimanufactures kilograms	--	20	--	All to Italy.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	--	3,215	--	All to Pakistan.
Rare-earth metals: Xenotime	10	10	--	All to Malaysia.
Silver:				
Waste and sweepings value	--	$42,223	--	Hong Kong $38,238; Singapore $3,985.
Metal including alloys, unwrought and partly wrought thousand troy ounces	3,637	31	(1)	Switzerland 18; United Arab Emirates 7; Netherlands 3.
Tantalum: Ore and concentrate	1,154	199	9	Netherlands 99; Singapore 83.
Tin:				
Ore and concentrate	867	112	--	Mainly to Australia.
Metal including alloys, unwrought	31,348	33,980	13,090	Netherlands 14,951; Japan 5,914.
Titanium: Ore and concentrate kilograms	--	25	--	All to Laos.
Tungsten: Ore and concentrate	3,609	3,638	839	Netherlands 1,217; West Germany 779.
Zinc:				
Ore and concentrate	5	2	--	All to Belgium.
Oxides and hydroxides	130	--		
Metal including alloys, semimanufactures	234	909	--	Laos 852; Malaysia 28.
Other:				
Ores and concentrates	289	537	--	Indonesia 500; Netherlands 27.
Ash and residue, metal-bearing	366	14,670	3,333	Netherlands 10,816; Belgium 197.
Metalloids	--	1,000	--	All to Hong Kong.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc.	20	--		
Dust and powder of precious and semiprecious stones kilograms	--	374	74	Malaysia 300.
Grinding and polishing wheels and stones	7	81	--	Hong Kong 48; Laos 29; Japan 2.
Barite and witherite	288,852	361,335	127,050	Indonesia 87,200; Singapore 60,030; Saudi Arabia 25,500.
Cement	22,086	61,549	--	Malaysia 33,636; Singapore 18,999.
Chalk	38	(1)	--	All to Laos.
Clays and clay products:				
Crude:				
Fuller's earth, dinas, chamotte	1,290	1,415	--	Taiwan 1,373; Singapore 38.
Kaolin	550	1,130	--	Taiwan 879; Singapore 108; Indonesia 106.
Products:				
Nonrefractory	22,156	21,124	35	West Germany 9,942; Netherlands 4,904; Singapore 1,852.
Refractory including nonclay brick	1,811	1,764	1	Indonesia 686; Philippines 581; Singapore 231.

See footnotes at end of table.

Table 2.—Thailand: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Diamond:				
Gem, not set or strung ____ carats	4,302	5,871	390	Japan 2,636; Netherlands 1,000; H Kong 666.
Industrial ____ do ____	33	2,576	--	United Kingdom 1,500; West Germany 1,076.
Feldspar, leucite, nepheline syenite ____	2,304	2,874	--	Japan 2,000; Malaysia 712.
Fertilizer materials:				
Crude and manufactured ____	60	2,003	--	Kampuchea 2,000.
Ammonia ____ kilograms	27	3,042	--	All to Laos.
Fluorspar ____	219,390	226,305	--	Japan 128,679; U.S.S.R. 47,500; Taiwan 16,524.
Graphite, natural ____	--	77	--	All to Japan.
Gypsum and plaster ____	89,960	147,169	--	Malaysia 118,323; Indonesia 22,73
Pigments, mineral including processed iron oxides ____	--	18	--	All to Singapore.
Precious and semiprecious stones, except diamond:				
Natural:				
Precious ___ thousand carats	17,392	17,222	5,931	West Germany 2,709; Hong Kong 1,817; Switzerland 1,319.
Semiprecious ____ kilograms	r98,314	539,567	3,557	Singapore 300,334; Hong Kong 105,584.
Manufactured ____ do ____	57	63	20	Singapore 28; Canada 10.
Pyrophyllite ____	500	3,000	--	All to Singapore.
Salt ____	113,274	123,989	--	Malaysia 83,655; Singapore 31,543.
Sodium and potassium compounds, n.e.s:				
Caustic soda ____	216	17	--	All to Laos.
Soda ash ____	10	1	--	Do.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked ____	(1)	270	--	All to Singapore.
Worked ____	267	446	(1)	Singapore 414; Malaysia 18.
Gravel and crushed rock ____	(1)	58	--	Laos 40; Singapore 18.
Limestone excluding dimension ____	r9	189	--	Singapore 173; Laos 13.
Quartz and quartzite ____	26,949	9,600	--	All to Japan.
Sand excluding metal-bearing ____	13	10	--	Mainly to Malaysia.
Sulfur:				
Elemental:				
Other than colloidal ____	--	10	--	Do.
Colloidal ____	192	428	--	Sri Lanka 405; Singapore 20.
Sulfuric acid, oleum ____	390	555	--	Sri Lanka 550; Bahrain 5.
Talc, ground ____	50	50	--	All to Singapore.
Other:				
Slag, dross, and similar waste, not metal-bearing ____	r5,188	3,901	19	West Germany 1,016; Netherlands 898; Japan 712.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals ____	3,583	5,304	1	Singapore 3,642; Hong Kong 1,215; Laos 393.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural ____	282	51	--	Kenya 45; Singapore 6.
Carbon black and gas carbon ____	2	2,003	--	India 905; Sri Lanka 635.
Coal, all grades including briquets ____	1,176	1,306	--	Malaysia 492; Indonesia 342; Pakistan 295.
Coke and semicoke ____	--	20	--	All to Japan.
Hydrogen, helium, rare gases kilograms	314	600	--	All to Laos.
Petroleum refinery products:				
Gasoline ____ 42-gallon barrels	30,195	6	--	'Hong Kong 4.
Kerosine ____ do ____	--	385	--	All to Malaysia.
Jet fuel ____ do ____	455,487	1,003,496	14,263	India 173,511; Hong Kong 129,336 Pakistan 72,410.
Lubricants ____ do ____	r364	497	--	Malaysia 167; Hong Kong 63; Singapore 54.
Other:				
Liquefied petroleum gas do ____	116	151	--	All to Malaysia.
Nonlubricating oils ____ do ____	940	1,496	114	Malaysia 892; Indonesia 484.
Petroleum coke ____ do ____	550	--		
Bitumen and other residues do ____	7,745	6,427	--	Singapore 5,466; Malaysia 909.
Bituminous mixtures ____ do ____	303	2,606	--	Malaysia 1,394; Laos 1,212.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals kilograms	--	56	--	All to Hong Kong.

rRevised.
1Less than 1/2 unit.

Table 3.—Thailand: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate	10,192	205	--	China 200.
Oxides and hydroxides	8,868	13,016	143	China 9,903; Japan 1,487; Taiwan 1,100.
Metal including alloys:				
Scrap	1,142	81	42	Laos 34.
Unwrought	43,206	44,908	5,700	Canada 15,921; Ghana 4,977; New Zealand 2,949.
Semimanufactures	4,960	3,263	742	Japan 1,203; Australia 452; Romania 163.
Antimony:				
Ore and concentrate	9	15	--	All from Burma.
Metal including alloys, unwrought	4	20	--	All from China.
Arsenic:				
Sulfides, natural	111	6	--	Do.
Trioxide, pentoxide, acid	152	93	(1)	Belgium 67; France 26.
Cadmium metal including alloys, all forms --kilograms	995	109	51	United Kingdom 54.
Chromium:				
Chromite	100	56	--	Belgium 50.
Oxides and hydroxides	385	354	10	West Germany 282; Italy 18; U.S.S.R. 14.
Metal including alloys, unwrought kilograms	--	692	685	West Germany 7.
Cobalt: Oxides and hydroxides	13	92	(1)	Canada 91.
Copper:				
Sulfate	266	245	230	United Kingdom 15.
Metal including alloys:				
Scrap	511	337	291	Singapore 25; Laos 21.
Unwrought:				
Blister copper and other unrefined copper	802	2	--	All from Zambia.
Refined, unalloyed	5,379	4,459	7	Zambia 2,457; Japan 1,479.
Master alloys	206	7	(1)	Mainly from Japan.
Semimanufactures	12,533	12,782	254	Japan 8,529; Taiwan 1,765.
Gold metal, including alloys, unwrought and partly wrought --troy ounces	108,370	12,686	9,370	Singapore 3,264.
Iron and steel:				
Ore and concentrate	11	6	--	Burma 4; Malaysia 2.
Metal:				
Scrap	614,808	337,670	82,914	Italy 64,441; Canada 41,923; West Germany 31,871.
Pig iron and cast iron	22,460	4,622	--	Sweden 4,614; Singapore 7.
Ferroalloys	6,556	8,565	30	Taiwan 6,934; Japan 425; China 405.
Sponge iron, powder, shot	683	546	1	Japan 402; India 92.
Steel, primary forms	r13,992	44,270	(1)	Mozambique 13,415; West Germany 9,787; Taiwan 9,620.
Semimanufactures thousand tons	1,255	1,302	131	Japan 840; Republic of Korea 125.
Lead:				
Oxides	322	403	--	Australia 367; China 35.
Metal including alloys:				
Scrap	30	253	253	
Unwrought	10,837	16,780	775	Australia 8,630; Taiwan 2,064.
Semimanufactures	141	61	(1)	West Germany 15; Australia 12; United Kingdom 11.
Magnesium:				
Oxides	41	78	15	Japan 26; India 25.
Metal including alloys:				
Unwrought, including scrap	13	16	11	Japan 3.
Semimanufactures --kilograms	710	163	49	Italy 65; United Kingdom 40.
Manganese:				
Ore and concentrate	847	--		
Dioxide, synthetic	2,220	9	--	All from Japan.
Oxides, other	401	151	--	Japan 86; China 48.
Metal including alloys, all forms	5	15	15	
Mercury --76-pound flasks	363	365	(1)	Japan 232; China 100.
Molybdenum metal including alloys, all forms --kilograms	885	972	511	West Germany 359.
Nickel:				
Matte, speiss, similar materials	2	10	--	Mainly from Japan.
Metal including alloys:				
Unwrought	242	338	--	Netherlands 133; Canada 112; Japan 40.
Semimanufactures	680	831	(1)	Republic of Korea 740.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	1,543	1,222	64	West Germany 1,061.

See footnotes at end of table.

Table 3.—Thailand: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Silver metal including alloys, unwrought and partly wrought thousand troy ounces	529	463	28	Burma 316; Japan 82.
Tin:				
Oxides	3	8	--	Italy 4; Japan 4.
Metal including alloys:				
Unwrought	7	5	--	United Kingdom 4.
Semimanufactures	15	88	3	Japan 79.
Titanium:				
Ore and concentrate	799	930	--	Australia 894; Japan 36.
Oxides	1,458	555	(1)	Japan 223; West Germany 106; Australia 76.
Tungsten metal including alloys, all forms kilograms	3,157	1,131	519	Japan 413.
Zinc:				
Oxides	245	191	1	Japan 72; China 65; West Germany 22.
Metal including alloys:				
Scrap	r237	30	--	All from China.
Blue powder	46	55	5	Singapore 28; Norway 15.
Unwrought	r33,922	34,423	--	Australia 24,261; Canada 4,756; China 2,727.
Semimanufactures	274	245	(1)	United Kingdom 132; West Germany 57; Yugoslavia 28.
Zirconium: Ore and concentrate	3	--		
Other:				
Ores and concentrates:				
Of precious metals	88	14	--	All from Japan.
Unspecified	9,395	12,466	--	China 4,894; Guyana 3,150; India 2,000; Philippines 2,000.
Metals:				
Alkali, alkaline-earth, rare-earth metals kilograms	40	43,637	34	West Germany 33,607; Japan 9,900.
Metalloids	57	62	14	China 16; Japan 11; Sweden 8; Yugoslavia 6.
Pyrophoric alloys	86	176	55	China 87; West Germany 18.
Waste and sweepings of precious metals value	--	$1,036	--	Switzerland $710; Taiwan $326.
Base metals including alloys, all forms	20	6	2	Japan 2; United Kingdom 1.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	2,285	1,938	12	Netherlands 1,057; India 739.
Corundum, artificial	209	521	190	Japan 323.
Dust and powder of precious and semi-precious stones kilograms	34	204	11	Japan 180.
Grinding and polishing wheels and stones	2,246	1,822	8	Japan 675; Taiwan 447; China 191.
Asbestos, crude	72,528	58,756	2,533	Botswana 23,374; Australia 12,906; Canada 12,202.
Barite and witherite	31	55	--	Indonesia 45; West Germany 10.
Boron materials: Oxide and acid	541	72	69	Australia 1; China 1.
Bromine:				
Elemental kilograms	33	13	1	Switzerland 12.
Compounds, n.e.s	102	32	(1)	Israel 15; Japan 9; Netherlands 5.
Cement thousand tons	1,237	942	1	Republic of Korea 498; Japan 187.
Chalk	1,018	(1)	--	All from United Kingdom.
Clays and clay products:				
Crude:				
Bentonite	2,141	848	595	China 220.
Fire clay	60	60	--	Japan 35; China 10; United Kingdom 10.
Fuller's earth, dinas, chamotte	9,557	9,840	3,800	Swaziland 3,023; Japan 1,440.
Kaolin	3,452	3,800	115	Japan 1,599; Australia 1,512.
Kyanite and sillimanite	10	5	--	All from Japan.
Other	616	648	--	All from United Kingdom.
Products:				
Nonrefractory	9	68	(1)	West Germany 27; Republic of Korea 12; Taiwan 11.
Refractory including nonclay brick	9,646	10,715	1,474	Japan 4,710; Austria 1,463; West Germany 955.
Diamond:				
Gem, not set or strung carats	5,845	22,506	--	China 7,743; Zaire 4,000; Republic of South Africa 3,257.
Industrial do	133,774	72,076	--	Ghana 47,251; China 10,000; Canada 5,000; Ireland 5,000.

See footnotes at end of table.

Table 3.—Thailand: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Diatomite and other infusorial earth	35	35	34	NA.
Feldspar, leucite, nepheline syenite	740	2,031	(1)	India 1,606; Finland 234; Canada 154.
Fertilizer materials:				
Crude: Phosphatic	--	357	--	All from Israel.
Crude and manufactured:				
Nitrogenous	189,387	177,338	4,410	Japan 45,250; West Germany 39,575; Italy 28,770.
Phosphatic	11,650	14,736	13,536	Netherlands 1,000.
Potassic	35,997	29,505	4,000	West Germany 21,374; United Kingdom 3,131.
Other including mixed	624,343	473,402	162,701	Romania 105,318; Japan 88,759; Norway 50,620.
Ammonia	1,832	1,689	1	Japan 627; Indonesia 422; Belgium 169.
Fluorspar	1,586	879	(1)	Finland 576; Japan 231.
Graphite, natural	1,519	913	1	China 450; Republic of Korea 370.
Gypsum and plasters	555	562	--	Japan 313; West Germany 168; China 80.
Iodine kilograms	1,324	1,917	12	West Germany 601; Japan 500; Netherlands 406.
Lime	285	45	--	All from United Kingdom.
Magnesite	7,276	10,671	--	Japan 8,165; China 1,698.
Mica, crude and worked	131	149	8	India 85; Japan 34.
Pigments, mineral including processed iron oxides	2,215	1,779	47	West Germany 1,032; Japan 267.
Precious and semiprecious stones, except diamonds:				
Natural:				
Precious thousand carats	197,382	136,303	6,759	Australia 73,233; India 16,616; Mozambique 9,172.
Semiprecious do	855,980	665,930	1,435	Burma 520,695; India 60,345.
Manufactured do	28,572	21,217	3,723	Switzerland 7,802; France 5,575; India 2,769.
Pyrites, unroasted kilograms	--	100	--	All from China.
Salt and brine	332	425	56	United Kingdom 173; West Germany 97; Australia 94.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	656	73	--	Japan 63; West Germany 6; Sweden 3.
Caustic soda	35,205	26,511	3,068	Japan 18,700; Romania 2,400; Poland 1,502.
Soda ash	66,916	64,330	(1)	Romania 24,440; Kenya 20,500; France 12,970.
Stone, sand and gravel:				
Dimension stone:				
Crude:				
Calcareous (marble)	14	87	(1)	Mainly from Italy.
Slate	--	10	--	All from Netherlands.
Other	197	53	--	Mainly from Italy.
Worked:				
Calcareous (marble)	775	229	--	All from Italy.
Slate	337	121	1	Italy 120.
Other	235	372	--	Italy 359.
Dolomite, chiefly refractory-grade	60	42	--	Taiwan 30; Norway 12.
Gravel and crushed rock	1,002	905	(1)	France 885.
Limestone excluding dimension	--	100	(1)	Mainly from Japan.
Quartz and quartzite	416	119	3	Hong Kong 110.
Sand excluding metal-bearing	698	412	33	Norway 162; Malaysia 93; Italy 90.
Sulfur:				
Elemental:				
Other than colloidal	27,063	39,714	(1)	Canada 39,304.
Colloidal	643	294	66	Taiwan 95; France 60.
Dioxide	14	5	--	Australia 2; China 2.
Sulfuric acid, oleum	2,101	88	8	Singapore 25; Italy 19; Netherlands 14.
Talc, steatite, soapstone, pyrophyllite	15,582	11,776	22	Republic of Korea 7,120; China 4,440.
Other:				
Crude	774	3,269	2	Singapore 2,250; West Germany 600; China 332.
Slag, dross, and similar waste, not metal-bearing	21	32	--	Japan 27.
Oxides, hydroxides, peroxides of barium and strontium	1,572	2,098	10	Japan 2,032; Ireland 54.
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals	1,269	813	253	Taiwan 246; Japan 186; United Kingdom 62.

See footnotes at end of table.

Table 3.—Thailand: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural kilograms	--	1	1	
Carbon black	17,289	13,592	129	Australia 7,913; China 1,880; India 721.
Coal, all grades including briquets	20,270	19,235	--	Vietnam 11,700; Indonesia 7,500.
Coke and semicoke	43,080	69,861	--	Japan 35,945; Australia 30,145.
Hydrogen, helium, rare gases	100	65	(1)	Australia 42; Japan 13; Singapore 8.
Petroleum:				
Crude and partly refined:				
Crude thousand 42-gallon barrels	62,727	58,788	--	Saudi Arabia 28,192; Qatar 15,638; Brunei 6,277.
Partly refined do	1,637	3,234	--	Saudi Arabia 3,126; Singapore 108.
Refinery products:				
Gasoline:				
Aviation do	87	171	--	Italy 76; Greece 47; Singapore 36.
Motor do	1,226	2,555	--	Singapore 1,807; Philippines 469.
Kerosine do	80	49	--	Mainly from Singapore.
Jet fuel do	609	1,128	--	Singapore 705; Italy 166; Yemen 137.
Distillate fuel oil do	10,108	18,071	289	Singapore 3,514; Iran 1,275; Republic of Korea 529.
Lubricants do	r354	195	25	Singapore 100; China 32.
Other:				
Liquefied petroleum gas do	550	860	6	Singapore 560; Saudi Arabia 108.
Mineral jelly and wax do	98	64	3	China 30; Indonesia 15; Japan 7.
Nonlubricating oils, n.e.s. do	r823	968	60	Singapore 771; Australia 65; Netherlands 41.
Bitumen and other residues do	16	11	--	Singapore 9.
Bituminous mixtures do	6	11	1	United Kingdom 8.
Petroleum coke do	54	60	60	
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r23,123	19,052	17,392	Taiwan 935.

rRevised. NA Not available.
1Less than 1/2 unit.

COMMODITY REVIEW

METALS

Iron and Steel.—Plans for major new steelmaking facilities in Thailand have been intensely debated for several years. The basic problem was what kind of facility would be economically viable in a country with no known favorable iron ores, no coking coal, high energy costs, and enthusiastic environmental groups seemingly capable of stalling any plans not meeting their approval.

Two main projects were discussed during 1980-81. One new one was proposed for the first time in 1981.

A private sector joint venture, Siam Ferro Industry Co. Ltd. was set up in 1979 to operate a proposed 400,000-ton-per-year direct-reduction (D-R) plant at Laem Chabang. The plant would use natural gas from the Gulf of Thailand and furnish its output to the Thai electric furnace operators who were dependent on scarce and expensive scrap for their operations. Increases in the Thai natural gas price, the need to change the proposed location for environmental reasons, and potential high interest charges prevented any progress toward construction during 1981.

The second project was a Government proposed 2.1-million-ton-per-year integrated steelworks. It was originally planned for Rayong Province but the same environmen-

tal problems again caused a reappraisal of the plan. As a result, the Government called for bids for a feasibility study of a plant on the west side of the Gulf of Thailand. Estel Technical Services of the Netherlands won the contract in late 1981.

The study will be in two parts. Phase one will determine site selection, prepare a general design and layout of the plant and port facilities, and make preliminary financial projections. The first phase was to be ready in 5 months. The second phase of the study will determine technical specifications of the plant based on Estel's recommendations and will be tendered separately.

The Thai Ministry of Industry was believed to favor a D-R-based plant with electric arc furnaces producing hot-rolled and cold-rolled flat products. Serious consideration of a conventional blast furnace plant was no longer likely because of the higher capital costs and nearly total raw material import requirements.

The third project under consideration would be a second integrated works with a 500,000-ton-per-year capacity. The plant would be only for nonflat products and would be planned for a 1992 startup. Considering the problems encountered with planning the other steel projects, this new idea is not likely to move beyond the planning stage for many years.

Steelmaking capability was in the hands of seven electric-furnace-based plants. The most important were: S.S. Steel Co., 160,000 tons per year; Bangkok Iron and Steel Works, Ltd., 150,000 tons per year; Siam Iron and Steel Co., 140,000 tons per year; and Bangkok Steel Industry Co., 100,000 tons per year. Total raw steel capacity was reported to have increased to 605,000 tons per year at yearend.[7]

Tantalum and Columbium.—The World Bank was reportedly considering a loan to Thai Tantalum Industries Co. Ltd. for part of the construction costs of the tin slag smelter and tantalite-columbite processing center at Phuket. The company had acquired the necessary Government approvals and investment incentives during 1980. The Government was expected to hold up to 30% of the equity in the 90% Thai-owned venture.

The plant was to produce ferrotantalum in its first stage and then to add a 300-ton-per-year tantalum oxide and columbium oxide second stage. A later third stage was proposed to produce tantalum potassium-salts. Preliminary preparations for construction were believed underway at yearend. Construction and project management contracts could be signed early in 1982.

Tin.—Tin was by far the most important mineral produced during 1981, both from the viewpoint of the number of miners employed and from the amount of foreign exchange earned by exporting the tin produced. The tin industry, however, faced increasing problems during 1981. World prices were lower than in 1980 and production dropped off enough to cause concern among Thai officials. The lowering trend in production was caused by a combination of three factors: Lowering average grade of the alluvial deposits; increasing costs of production, coupled with a high royalty rate; and the declining world price for tin, reflecting the world recession and a production surplus in the market economy countries.

The declining grade of the tin ore was in itself a complex problem. Many of the higher grade deposits both onshore and offshore have been worked for a number of years and reserves have been exploited faster than new exploration has replaced the worked out deposits. For example, nearly 60% of Thailand's tin was mined in the Andaman Sea off Phuket and Phangnga Provinces. Proved reserves in this area were being rapidly depleted, and without additional discoveries one source estimated that most mining operations in this area would have to stop in 2 or 3 years.

A continuing problem in the offshore areas has been the quasi-legal suction boats that frequently operate in the concession areas reserved for big ocean dredges. In March 1981, an estimated 200 suction boats surrounded a Billiton dredge operating under an offshore mining organization concession near Phangnga. The miners reportedly forced the dredge to temporarily stop operating. Order was restored after a series of armed clashes with the police. The small boat operators demand more areas to dredge. The Government originally allocated them 13,800 acres off Phangnga, but the miners claimed that reserves there were too poor. The problem was by no means settled by yearend.

The suction boats concentrate on mining the very profitable high-grade pockets in a given area and the operators are quite efficient at finding them. The resulting area is left with a substantially lower average tin assay per cubic meter of ore. With the high-grade pockets gone, the big commercial

dredges, operating legally, can barely work the deposit at a profit. Southern Kinta Consolidated Ltd. stopped dredging in its Kakuapa concession in 1980 because of the depletion of its reserves by the suction boats.

The environmental issue further complicates the production picture. Some of the best potential mining areas lay just off some of the best tourist beaches in the country. During the year, students from 11 universities protested any further mining development in the area, fearing damage to the famous Patong Bay beaches at Phuket Island.

The cost of producing tin concentrate has risen steadily in recent years. Spare parts, maintenance, labor, and fuel prices have all increased in the face of lowering world tin prices and a very high Government royalty. The high rate of inflation, coupled with an 8.7% devaluation of the baht in July 1981, made additional problems for the miners, especially those small operators that were working marginal onshore deposits. Even one of the large companies, Tongkah Harbour Ltd., dredging in Chalong Bay reported its costs per cubic meter mined rose 40% during 1980, the latest available figure.

The Government was not able to do much to reduce operating costs, but did make a revision of the tin royalty payments. The variable rate on the value of production was as high as 40%, depending on the value of the concentrate. In July 1981, the Ministry of Industry announced a decrease in the tin royalty by an average of 10% and the imposition of a new special fee of 5% collected on the royalty's value, to be used to benefit miners and their localities. The changes will result in an average net reduction of about 5% in the overall royalty charge.

The Government made one other concession as well. The commission paid by the suction boat operators to the tin purchasing agents for the sale of their concentrate was reduced by more than 75%. The Government refused the suction boat operators demand for more mining areas in Ta Tang and Baan Bor Daan, a guaranteed purchase price for tin concentrate, and a further royalty reduction.

Fluctuating world prices for tin have contributed to production problems. In 1980, the high price was around $19.84 per kilogram of tin. By March 1981, however, the price had dropped to around $14.55 per kilogram. Later in the year it climbed back over $17.64 per kilogram because of political factors. Decreased demand on the world market brought the price back down and the decline was continuing at yearend. A price below $15.43 per kilogram would force at least the temporary closing of several more of the marginal onshore mines. The number of suction boats operating off Phangnga Province during 1981 has reportedly dropped to about one-half the 1980 number, due to a combination of the above grade, cost, and price factors.

The Thai Government has undertaken an intensive tin survey of the Andaman Sea coastal areas from Phuket, north to the Burmese border. A preliminary survey covering about 2,200 square kilometers was completed late in 1981 and indicated the possibility of commercial tin deposits in the deeper water areas. The project was being done by DMR in collaboration with United Nations agencies and is the first such exploration in waters between 30 and 45 meters deep. The preliminary survey defined targets for the drilling program scheduled for the next few years. A total of 300 assay borings were to be completed before 1986. Favorable findings in these deeper waters could give the tin industry a much needed boost. The big contract dredges would be able to work these deeper waters with relatively little interference from the suction boat poachers. The suction boats are generally limited to waters no deeper than 20 meters because of technical and economic constraints.

Aokham Thai Ltd. and Tongkah Harbour Ltd. have started to set up a new company to explore and evaluate possible tin deposits offshore Takuapa in waters 45 to 125 meters deep, beyond the Government's 30- to 45-meter survey area. The joint venture was to be named Sea Minerals Ltd. and would have shareholders from Aokham Tin Berhad, Southern Kinta Consolidated, Aokham Thai, International Finance Corp., the Siam Commercial Bank Ltd., and probably the Government's Crown Property Bureau. An application has been made for a special prospecting licénse over the area in question. The company would be capitalized if the license is granted. No exploitation is currently underway in water of this depth.

Trial tin production began at the Thai Pioneer Enterprise Co. Ltd.'s new smelter in Feburary 1981. This, the country's second tin smelter, is located at Pathum Thani, about 40 kilometers north of Bangkok, and has a startup capacity of 3,600 tons per year

of tin ingot. The plant is designed for an eventual capacity of 6,000 tons per year. The plant had official opening ceremonies on July 30, 1981. By yearend, problems had developed over distribution of tin concentrate to the country's two operating smelters. Thai production of tin concentrate was not sufficient to keep both smelters operating at full capacity.

Construction apparently began in late spring on the country's third tin smelter. Thai Present Smelter Co. Ltd. announced the new 10,000-ton-per-year plant would be in operation in early 1983 at a site on Phuket Island. Both the location and capacity of the plant have been changed since it was originally approved by the Government in July 1977. The final location on Phuket Island puts it in direct competition for tin concentrate with the big Thaisarco smelter, also at Phuket. Thai Present took the precaution of having local miners as stockholders in the newly formed company.

Zinc.—Twelve years after it was originally proposed, Thailand's trouble-plagued plan to build a zinc refinery appeared ready to become a reality in November 1981. It was reported in late fall that construction, financing, and equity contracts were all formally signed and that construction could begin by yearend.

A new company was set up with the help of the Thai Government after a proposed Republic of Korea-Thai consortium fell through in late 1980 for lack of financing. The new venture was called Padaeng Industry Co. and will be 70% Thai owned. The major breakthrough in setting up the venture was the agreement by Belgian companies, who are supplying technology and construction expertise, to take the 30% remaining equity. The final makeup of the company will be as follows:

Participant	Share interest (percent)
Thai equity:	
Thailand Finance Ministry	20
Krung Thai Bank	13
Industrial Finance Corp. of Thailand	10
Thai Bankers Association (14 members).	10
Bangkok Bank	7
Sino-Thai Engineering and Construction.	7
Mitsui & Co. (Thailand)	3
Belgian equity:	
Societe des Mines & Foundries de Zinc de la Vielle-Montagne S.A.	14
Mechim S.A	14
Societe Belgique d'Investment	2
Total	100

Participation by the Mitsui Co. was particularly welcome in the project from the marketing side. Mitsui has an equity share in a Thai galvanized sheet-steel producer that will be a potential major consumer of part of the plant's output. About one-half of the plant's output should be available for export.[8]

The 60,000-ton-per-year electrolytic smelter was to cost $75 million in 1972 when originally proposed. The price has now escalated to $142 million. The plant will be located near Tak about 400 kilometers north of Bangkok near the Burma border. About 340,000 tons of high-grade zinc ore per year will be supplied from a nearby mine, which has been inactive for several years pending arrangements for the zinc smelter.

NONMETALS

Cement.—Thailand was in the middle of an ambitious cement expansion program. All of the companies were again operating at their maximum output during the year.

Two of the expansion projects came online during the year, although firm produc-

tion data was not available at yearend. Siam Cement Co. completed a large expansion project at its Ta Luang plant in Saraburi Province. Siam City Cement Co. also completed a more than 1-million-ton expansion of its Kaeng Khoi plant in Saraburi Province.

In addition, there were several other expansions or new plants under construction or planned. Of particular importance was the report that Siam Cement has let a $46 million contract to Nippon Kokan Co. of Japan to lay a 110-kilometer gas pipeline. The line will be a branch from the main Thai pipeline servicing the Bangkok area to the cement company's Ta Luang and Kaeng Khoi cement plants. The project was scheduled for completion in 1982.

Nitrogen Fertilizer.—A Scandinavian consortium consisting of Haldor Topsoe AS of Denmark, Norsk Hydro AS of Norway, and the state-run Swedyards Development Corp. of Sweden has been awarded the contract rights for the construction of a $590 million fertilizer complex in the Rayong area. As proposed, the complex will produce 1,200 tons per day of nitrogen of ammonia. Up to 900 tons per day of this nitrogen will go into production of urea and the rest will go to making ammonium phosphate.

Haldor Topsoe will provide the process and engineering for the plant. Norsk Hydro will provide management, train personnel, and handle marketing. Swedyards will build the plant in Sweden on four large floating platforms. The platforms will be barged to a prepared shallow basin at the plant site. The basin will then be filled with earth and the plant will stand on solid ground.

This will be the first nitrogenous fertilizer plant in Thailand, which presently imports all of its fertilizer needs. The cost of the plant will be financed by a reported $350 million credit, which will be guaranteed by the Swedish Government, and a $90 million loan from the Nordic Investment Bank. The remaining will be inshare capital totaling about $150 million. The Thai Government will hold 10% of the shares.

The plant will use about 65 million cubic feet of natural gas per day from the offshore gasfields. The only possible snag to the start of construction was the negotiations on the price of the Government's natural gas. Thailand agreed to supply gas at about cost price, but that term was not defined to the consortium.

Potash.—There were several projects under consideration for developing one or more of the potash deposits located in the vast salt formations of northeast Thailand.

The World Bank agreed to loan the DMR over $8 million for a feasibility study consisting of exploration and trial mining in Bamnet Narong district of Chaiyaphum Province. British and French companies will provide engineering and equipment for the project. An inclined adit will be excavated to the deposit and a continuous miner will be used for exploratory excavation in the ore body. Rock mechanics tests will assist in determining the potential mining methods and cost estimations.

During the year, the Government awarded a 3,500-square-kilometer exploration and development concession in Khon Kaen and Maha Sarakham Provinces to a consortium comprising Duval Corp., United States; CRA Exploration Pty. Ltd., Australia; and Siam Cement, Thailand. If the detailed exploration proves the economic viability of the deposit, the company proposes to invest a reported $35 million in the first-stage development and $172 million in the second stage. Late in the year, the Thai Board of Investment (BOI) agreed in principle to grant promotional privileges to this and two other potash development project plans. The BOI's action grants various tax and investment incentives to a company to help a new project along.[9]

Another joint venture, between Agrico Chemical Co. and Thai Central Chemical Co., was negotiating for exploration and development rights to a 2,333-square-kilometer area in Udon Thai Province.

The third potential concessionaire was an Amax Exploration Co.-Siam Cement joint venture. It proposed to explore and develop a 144-square-kilometer area at Wanon Niwat in Sakon Nakhon Province.

These Thai potash occurrences were the only potentially large high-grade deposits known in the Southeast Asia area. Bringing any of the deposits into production, even if abundant reserves are proved, will require unusually large capital expenditures because of the remoteness of the areas and the poorly developed infrastructure. The potential market for the potash in the Asian area was estimated as high as 6 million tons per year of marketable product.

Salt.—Plans for a $380 million rock salt and soda ash project moved forward during the year. The project would be Thailand's Association of Southeast Asian Nations

(ASEAN) contribution to the area's industrial development program. Economic viability of the soda ash plant was enhanced by the availability of natural gas. Previous plans called for use of bunker fuel oil, which would have been about 20% more expensive.

Salt will be mined near Bamnet Narong in Chaiyaphum Province and limestone will be quarried in Saraburi Province. The 400,000-ton-per-year soda ash plant probably would be located at Sattahip. Environmental groups protested the plan to site the plant at Laem Chabang, fearing potential damage to the valuable tourist beaches. It was expected that the necessary ASEAN approval for construction would be granted at an economic minister's meeting scheduled for January 1982.

MINERAL FUELS

Lignite.—The Electricity Generating Authority of Thailand continued its exploration for additional lignite reserves or new deposits and several discoveries were announced during the year.

Reserves of 78 million tons were claimed in three deposits in Lampang and Lamphun Provinces. The continued survey of the Mae Moh area revealed indicated reserves of 1,400 million tons. Thai sources reported that 450 million tons of that was usable in first-stage development and another 200 million tons would be usable in later stages. Virtually all of the Thai plans call for use of lignite for mine-mouth electric power generation as is the current use in Mae Moh and at Krabi in southern Thailand.

Malaysia announced discovery of large lignite deposits in Perlis State adjacent to Thailand's Songkhala and Satun Provinces. Malaysia apparently invited Thailand to join in a joint evaluation and development of the deposits. Thai officials were reported ready to consider the offer.

Natural Gas and Petroleum.—On September 12, 1981, the valves were opened at Ban Mabtaput to bring the first commercial natural gas production ashore from Union Oil Co. of Thailand's Erawan Gasfield. Production began 9 years after the initial discovery was made more than 400 kilometers south of Sattahip. The 425-kilometer-long, 86-centimeter-diameter, offshore portion of the pipeline was the world's longest seabed gas pipeline and cost over $500 million. Initial gas deliveries were limited to about one-half of the contracted amount because of overheating problems at the wellheads. The problem was being examined at yearend. Union Oil was to initially supply 200 million cubic feet of gas per day in 1982, and then increase to 400 million cubic feet per day in 1985. The gas was being used only for electric power generation at the Bang Pakong and South Bangkok powerplants. The domestic gas will directly replace the equivalent of 34,000 barrels per day of heavy fuel oil in 1982. By 1985, the planned gas production will be replacing about 21% of domestic oil demand.

Before production could begin, 12 offshore structures were placed and hooked up. Sixteen production wells were completed by yearend. A total of 42 wells are planned to be drilled from the 5 drilling platforms in the Erawan Field.

Offshore exploration continued during the year. Union Oil drilled nine wildcat wells during 1981. Six of the nine wells tested natural gas and condensate, and two new gasfields were established; Pladang in Block 11 and Jakrawan in Blocks 12 and 13.

Texas Pacific Thailand Inc. drilled six wells in 1981, four of which tested commercial gas. All of the strikes were in Block 15.

Only two new offshore concessions were awarded during 1981. One went to Pecten Thailand Co. which took Blocks 1, 2, and 3 in the northern section of the Gulf of Thailand. Seismic surveys were completed on these blocks in mid-November 1981 and the company intended to start drilling in Block 2 in January 1982. At least four wells were scheduled during the next 3 years.

The other was the Terramar Corp., a Denver-based firm, which won a concession located in the Andaman Sea just north of Malaysian territorial water. No seismic work had been undertaken in that particular area.

The result of the continued drilling program in the Gulf of Thailand has been to further increase the already substantial natural gas reserve figures. The Thai Department of Natural Resources now lists total reserves at 16.5 trillion cubic feet. Offshore gas reserves by field in trillion cubic feet follow:

Field	Concessionaire	Reserves
Erawan	Union Oil Co	1.8
Kaphong-Platong	do	1.3
Baanpot	do	0.8
Satun	do	3.2
Pladang	do	0.6
Jakrawan	do	1.0
Structure B	Texas Pacific Thailand Inc.	5.8
Structure 17E	do	2.0
Total		16.5

Negotiations continued between the Government and Texas Pacific on a pricing agreement for the gas that Texas Pacific Thailand Inc. has discovered in its concession areas in the Gulf of Thailand. Exploitation of the deposits cannot proceed until some equitable arrangement can be made. The problem was complicated in 1981 by the possibility of the Government allowing some of the gas to be exported. The company announced during the summer that it had reached a preliminary agreement with a Thai group of investors headed by Paul Sithi-Amunuai's group of companies and the Nissho-Iwai Corp. of Japan. The consortium was investigating the feasibility of building a LNG plant and exporting the LNG to Japan. Nissho-Iwai controls 50% of the natural gas market in Japan.

This project would be the largest industrial development in the history of the country if it were to be approved by the Government. Cost estimates for the project range as high as $3.5 billion. Approval of the project was by no means certain because of the extreme political sensitivity of the mineral exploitation industry in Thailand. The basic controversy is whether the country's natural resources should be used domestically or exported to earn foreign exchange.

Plans for a natural gas separation plant near Rayong, where the pipeline comes ashore, were delayed when the Petroleum Authority of Thailand (PTT) changed consultants for the job in March 1981. The letter of intent to Fluor Ocean Services International Inc. was cancelled because PTT felt Fluor Corp.'s cost estimates were too high. Fluor Corp. was replaced as consultant by Linde AG of the Federal Republic of Germany and construction proposals were invited in August 1981.

The plant would have the capacity to process 350 million cubic feet per day of natural gas and produce ethane, propane, butane, liquefied petroleum gas (LPG), and gasoline totaling over 860,000 tons per year.

Onshore exploration activity picked up during 1981 as two new concessions were awarded and an announcement was made of possible oil and gas discoveries.

The new concessions went to Esso Udon Corp., an Exxon Corp. subsidiary, and Phillips Petroleum Corp. Esso will explore in Udon and Loei Provinces in northeast Thailand. The Phillip's concession runs from the Esso area eastward to the Mekong River.

A gas strike was reported by Esso Exploration and Production Khorat Inc. in its first well in Thailand. The Nam Phong-1 well, located 25 kilometers north of Khon Kaen, reportedly flowed good-quality, dry-gas from below 3,100 meters. More work will be needed to determine the commercial potential of the find. Three more wells were planned for the Esso concessions. If commercial, the find could bare favorably on the development of nearby salt and potash deposits and also on local industries.

An oil strike was reported by the Thai Government at the Shell Exploration and Production Co.'s Lan Krabu-1 wildcat well in Kamphaeng Phet Province. The discovery well had a reported flow of 3,000 barrels per day of 40° API low-sulfur, high-wax crude. Several additional wells will be drilled to delineate the structure and determine if it can be developed commercially.

In February 1981, the Defense Ministry terminated the Summit Industrial Corp. lease on its Bangchak oil refinery. The company turned the plant over to the Defense Energy Department on March 31, 1981. Summit had operated the refinery since its construction in 1965 under a lease that would have expired in 1990. Later in the year the Defense Energy Department selected Lummus Operating Associates Inc. to provide management and technical advisory services for the refinery.

During 1979 and 1980, there were plans to expand all three of Thailand's refineries. In addition, there was a plan by a new firm to build a large refinery at Krabi on the Andaman Sea opposite Phuket Island. These ambitious plans were for the most part scrapped during 1981. The only positive decision during the year was approval by the Ministry of Industry for Esso Standard Thailand Corp. to debottleneck its Sriracha refinery. The project will raise the throughput capacity from about 45,000 to 60,000 or 65,000 barrels per day. At least

one other Government agency needed to approve the project before construction could begin.

The oft-delayed expansion of the Thai Refining Co. refinery at Sriracha was debated during the year but no firm decision was reached. At yearend, it appeared that the PTT would probably approve a modified expansion from 65,000 to 120,000 barrels per day instead of the 165,000 barrels per day originally planned. The expansion would consist of installing a hydrocracker and associated equipment.

Thailand's three large refineries operated entirely on imported crude oil, mostly from the Persian Gulf countries. Saudi Arabia supplied about one-half of the oil in 1981. The cost of imports for the year was estimated at $3 billion. Imports were predicted to decline in 1981 and succeeding years as the use of heavy fuel oil to power electric powerplants and furnaces is phased out in favor of the less-costly natural gas.

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[1]Physical scientist, Division of Foreign Data.

[2]Far Eastern Economic Review, Hong Kong. Asia 1982 Yearbook, p. 255.

[3]Where necessary, values have been converted from Thia baht (B) to U.S. dollars at the rate of B20.42=US$1.00 in 1979 and 1980; the baht was devalued twice in 1981, once by 1.083% and the second time by 8.7%. By yearend the rate was about B21.82=US$1.00.

[4]U.S. Embassy, Bangkok, Thailand. Economic Situation and Trends in Thailand. Department of State Airgram A-115, Oct. 19, 1981, p. 3.

[5]Bank of Thailand, Bangkok, Thailand. Quarterly Bulletin. V. 21, No. 3, September 1981, p. 86 (statistical section).

[6]Work cited in footnote 3.

[7]Metal Bulletin (London). No. 6668, Mar. 2, 1982, p. 22.

[8]Asian Wall Street Journal (Hong Kong). V. 6, No. 42, Oct. 27, 1981, p. 1.

[9]Engineering and Mining Journal. V. 182, No. 10, October 1981, p. 188.

The Mineral Industry of Tunisia

By E. Shekarchi[1]

The year 1981 was the final year of the Fifth Development Plan (1977-81). Based on the estimates for 1981, the success of the fifth plan was due in large part to the rapid expansion of Tunisia's oil production during a period of rising international oil prices. It appeared that many of the plan's broad macroeconomic targets were met. The 5-year investment target of $10 billion was also met, representing close to 30% of the gross domestic product (GDP), as planned. The sectoral distribution of these investments, however, was significantly different than expected. While investment in agriculture, services, and infrastructure exceeded targets, capital expansion in industry was well short of the projected level. This was due primarily to the postponement of the giant Miskar offshore gas project. The employment target of the plan was nearly attained, but even so, the overall rate of unemployment was higher at the end of 1981 than it was in early 1977.

Although the Sixth Development Plan (1982-86) was still in draft form, early indications were that the investment package was to be about $20 billion,[2] twice as high in nominal terms as under the fifth plan. Major emphasis was to be placed on the expansion of the tourist, textile, and phosphate industries to increase foreign exchange earnings to compensate for the decline in oil revenues. The search for new oil reserves was to be intensified, and the Miskar Gasfield was to be exploited.

Expenditures on oil exploration and development were about $328 million in 1981 and were to increase to $414 million in 1982 as part of a campaign to restore declining crude oil output. Production was forecast to fall to 5.3 million tons by 1982 owing to declining production at the El Borma Field. It was also expected that the Tazarka offshore and Laarich onshore oilfields would come onstream later in the decade.

Output of natural gas was expected to fall from 330 million cubic meters in 1981 to 300 million cubic meters in 1982, while consumption of natural gas was predicted to rise to 450 million cubic meters. The Government planned to import 50 million cubic meters of gas from Algeria to help satisfy domestic demand. The shortfall of 100 million cubic meters in 1982 was expected to be replenished by royalty gas from the Transmed gas pipeline, which was under construction from Algeria to Italy. Investments earmarked for the natural gas sector in 1982 included $30 million for the first phase of the 300-kilometer pipeline to distribute Transmed gas within the country, and $12 million for engineering studies and preparatory work on the projected development of the offshore Miskar Field.

The most encouraging exploration results in 1981 were in the petroleum industry. Amoco Tunisian Oil Co., a joint venture of Standard Oil Co. (Indiana) and the Tunisian Government, discovered oil and natural gas 120 kilometers southwest of Gabes. The 13,000-foot wildcat well tested at rates as high as 12.6 million cubic feet of gas and 1,800 barrels of oil per day on a 1 1/2-inch choke. Tenneco Inc. reported its Houston Oil and Minerals unit found oil onshore near Sfax. During a test at 9,000 feet, oil flowed at a rate of 1,500 barrels per day through a 1/2-inch choke. Both companies anticipated more drilling and testing in 1982 before deciding the economic significance of the discovery.

Tunisia offered attractive opportunities for investment by foreign companies. Production for export purposes was to receive

tax, duty, and exchange control advantages based on the Export Industries Investment Code of 1972. Investment in the domestic market was governed by a 1974 code, which granted tax and other advantages based on the creation of employment. Export industries may be 100% foreign-owned, although companies producing for the domestic market usually had majority Tunisian equity, but this was negotiable. The Investment Promotion Agency performed surveillance over these programs and made every effort to overcome any problems. In 1981, significant amounts of U.S. capital were expended in Tunisia by U.S. oil exploration and service companies searching for new petroleum and natural gas target areas.

PRODUCTION AND TRADE

Because of increases in crude oil and phosphate prices, export receipts rose 30% above the 1980 level, to $2.7 billion, while import outlays rose only 18% to $3.9 billion in 1981. The trade deficit of $1.2 billion was somewhat less than anticipated. Tunisian exports were dominated by three products: Petroleum, textiles, and phosphate, which together accounted for about 75% of merchandise export receipts. Tunisia exported most of its own high-quality crude oil and imported lower priced oil for domestic requirements. Production of minerals, as well as exports and imports of minerals and some mineral-related semimanufactures, are presented in tables 1, 2, and 3.

Table 1.—Tunisia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Iron and steel:					
Iron ore and concentrate, gross weight thousand tons	344	339	394	389	[3]396
Metal:					
Pig iron do	132	134	150	151	[3]160
Steel, crude do	156	159	176	178	[3]178
Lead:					
Mine output, metal content	10,249	8,009	10,021	8,310	8,000
Metal:					
Primary[4]	19,200	16,074	16,163	19,195	[3]20,000
Secondary[e]	500	500	600	600	600
Total	19,700	16,574	16,763	19,795	20,600
Silver metal, primary thousand troy ounces	236	281	231	235	230
Zinc, mine output, metal content	7,081	7,392	8,706	7,579	[3]7,458
NONMETALS					
Barite	16,049	16,358	16,358	26,949	[3]24,671
Cement, hydraulic thousand tons	572	882	1,383	1,780	[3]2,005
Clays, construction do	200	210	280	300	[3]352
Fluorspar, chemical- and metallurgical-grade	28,857	33,258	33,808	39,451	[3]34,844
Gypsum	40,000	40,000	60,000	[e]75,000	[3]75,000
Lime, hydraulic thousand tons	338	427	430	529	[3]466
Phosphate rock, gross weight do	3,615	3,712	4,154	4,502	[3]4,543
Salt, marine do	405	425	400	437	400
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross million cubic feet	25,815	24,438	[r e]28,000	[e]28,000	28,000
Marketed do	9,923	9,390	11,657	11,505	11,600
Petroleum:					
Crude thousand 42-gallon barrels	34,675	36,500	42,679	39,761	38,700
Refinery products:					
Gasoline do	1,199	1,270	1,292	1,085	1,200
Kerosine do	791	1,267	1,777	1,684	1,770
Distillate fuel oil do	2,536	2,365	3,166	3,016	2,400
Residual fuel oil do	3,383	3,341	4,294	4,099	3,400
Other do	957	399	358	325	600
Refinery fuel and losses do	156	710	150	652	500
Total do	9,022	9,352	11,037	10,861	9,870

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through June 30, 1982.

[2]In addition to the commodities listed, a variety of crude construction materials (common clays, sand and gravel, and stone) is produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]From domestic and imported ores.

Table 2.—Tunisia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	119	401	--	Algeria 252; Netherlands 81; Belgium 52.
Copper:				
Matte	221	--		
Metal including alloys, all forms	653	832	--	Belgium 394; Italy 250; Spain 150.
Iron and steel:				
Scrap	14	791	--	Spain 784; Italy 6.
Pig iron, cast iron, ferroalloys	108	197	--	Mainly to U.S.S.R.
Steel, primary forms	5,797	--		
Semimanufactures	11,672	3,095	1	Algeria 1,709; West Germany 724; Libya 287.
Lead metal including alloys, all forms	11,675	12,281	--	Greece 5,404; Italy 3,851; Algeria 1,388; Switzerland 1,300.
Silver metal including alloys, unwrought and partly wrought, troy ounces	--	133,200	--	All to France.
Tin metal including alloys:				
Unwrought and waste, kilograms	470	--		
Semimanufactures, do.	--	4	--	Do.
Zinc:				
Ore and concentrate	6,421	20,309	--	Italy 7,780; France 5,333; Yugoslavia 3,330.
Oxides and hydroxides	--	330	--	All to Italy.
Metal including alloys, all forms	11	1	--	All to Greece.
Other:				
Ores and concentrates	--	2	--	All to France.
Ash and residue containing nonferrous metals	151	398	--	France 320; Belgium 78.
Oxides, hydroxides, peroxides	77	--		
Metals including alloys:				
Precious metals: Ash, waste, sweepings	7	--		
Unspecified, all forms kilograms	742	--		
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	r9	--		
Grinding and polishing wheels and stones	1	2	--	United Kingdom 1.
Asbestos, crude	1	--		
Barite and witherite	200	2,840	--	All to Algeria.
Cement	80	4,300	--	Mainly to Yugoslavia.
Clays and clay products:				
Crude clays	--	36	--	All to Italy.
Products:				
Nonrefractory	r166	36	--	Mainly to United Arab Emirates.
Refractory including nonclay brick	376	1,595	--	Algeria 1,216; Syria 379.
Diamond:				
Gem, not set or strung thousand carats	NA	305	--	All to Belgium.
Industrial, do.	NA	145	--	Do.
Fertilizer materials:				
Crude, phosphatic, thousand tons	1,598	1,317	--	France 415; Turkey 240; Greece 151; Poland 109.
Manufactured:				
Nitrogenous	(1)	--		
Phosphatic	543,067	513,509	--	Italy 84,522; France 64,511; Algeria 59,580.
Other including mixed	55,754	169,801	--	Italy 45,495; France 28,419; West Germany 16,892.
Ammonia	450	--		
Fluorspar	--	6,025	--	All to Italy.
Graphite, natural, kilograms	12	--		
Gypsum and plasters, do.	--	250	--	All to Algeria.
Pigments, mineral: Natural, crude	75	--		
Precious and semiprecious stones, except diamond, carats	2680,000	NA	NA	NA.
Pyrite, gross weight	80	--		
Salt and brines	352,050	272,972	--	Italy 76,598; Yugoslavia 52,984; Bulgaria 44,332.

See footnotes at end of table.

Table 2.—Tunisia: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	20	10	--	All to Italy.
Worked	2	3	--	Mainly to United Arab Emirates.
Gravel and crushed rock	1	520	20	Italy 500.
Limestone, except dimension	3,130	--	--	
Quartz and quartzite kilograms	--	250	--	All to Italy.
Sand excluding metal-bearing	2	30	--	U.S.S.R. 25; Italy 5.
Sulfur:				
Elemental, collodial kilograms	--	100	--	All to Libya.
Sulfuric acid, oleum	7,699	5,955	--	Algeria 5,690; Libya 265.
Talc, steatite, soapstone, pyrophyllite kilograms	--	26	--	All to U.S.S.R.
Other: Crude	--	1	--	All to Netherlands.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black kilograms	--	66	--	Do.
Hydrogen, helium, rare gases do	--	1	--	All to France.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	r40,503	36,435	9,012	Greece 12,245; Italy 7,506; West Germany 3,324.
Refinery products:				
Gasoline do	1	--		
Kerosine and jet fuel do	853	652	--	Greece 89; Italy 50.
Distillate fuel oil do	139	74	(1)	Italy 4.
Residual fuel oil do	234	26	1	Turkey 2.
Lubricants 42-gallon barrels	455	948	--	Mainly for bunkers.
Other:				
Liquefied petroleum gas do	3,488	--		
Nonlubricating oils do	698,092	231	--	NA.
Bituminous mixture do	--	49	--	All to Algeria.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]May include diamond.

Table 3.—Tunisia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	[1]25,293	23,160	--	Italy 18,463; France 4,678.
Metal including alloys:				
Unwrought	382	236	--	Canada 196; France 38; Italy 2.
Semimanufactures	2,519	3,553	6	France 1,181; Italy 930; Greece 569.
Arsenic:				
Elemental	NA	5	--	All from Sweden.
Oxide, hydroxide, acid	(2)	10	--	Mainly from Belgium.
Chromium:				
Ore and concentrate	--	2	--	All from Spain.
Oxides and hydroxides	25	36	--	West Germany 30; France 3; Belgium 2.
Cobalt: Oxides and hydroxides kilograms	--	823	182	France 541; Belgium 50; West Germany 50.
Copper:				
Oxides and hydroxides	NA	31	--	West Germany 30.
Sulfate	126	237	--	Italy 84; France 74; Yugoslavia 40; U.S.S.R. 36.
Metal including alloys, all forms	2,963	5,856	7	France 4,100; Italy 1,215; Belgium 413.
Gold metal including alloys, unwrought and partly wrought troy ounces	21,766	NA	NA	NA.

See footnotes at end of table.

Table 3.—Tunisia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Ore and concentrate	--	11,402	--	Mainly from Mauritania.
Metal:				
Scrap	483	49	--	Italy 29; Sweden 20.
Pig iron and ferroalloys	2,204	1,518	--	Algeria 582; Yugoslavia 301; Portugal 235.
Sponge iron, powder, shot	565	1,854	--	France 1,693; Italy 118; Spain 40.
Steel and primary forms	6,385	7	--	Mainly from Sweden.
Semimanufactures	301,008	358,017	1,244	France 125,128; Italy 116,792; West Germany 36,524.
Lead:				
Ore and concentrate	8,277	9,985	--	Morocco 7,567; Algeria 2,418.
Oxides and hydroxides	144	203	--	France 158; West Germany 35; Netherlands 7.
Metal including alloys, all forms	24	75	(2)	Mainly from France.
Magnesium metal including alloys, all forms	16	11	(2)	Italy 10.
Manganese: Oxides and hydroxides	(2)	2	--	France 1; West Germany 1.
Mercury 76-pound flasks	166	5	--	France 3; United Kingdom 1; West Germany 1.
Molybdenum metal including alloys, all forms kilograms	193	71	--	Austria 36; Sweden 32; Switzerland 3.
Nickel metal including alloys, all forms	62	33	(2)	France 25; West Germany 4; Italy 3.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	2,926	354	--	France 257; West Germany 96.
Selenium, elemental kilograms	NA	352	--	France 300; West Germany 52.
Silicon, elemental do	NA	279	--	All from Italy.
Silver metal including alloys, unwrought and partly wrought troy ounces	29,546	15,690	354	Switzerland 6,623; West Germany 3,697; France 2,861.
Tin:				
Oxides and hydroxides kilograms	235	270	--	All from Italy.
Metal including alloys, all forms	86	120	--	Thailand 51; Malaysia 17; Indonesia 14; Italy 12.
Titanium: Oxides and hydroxides	379	139	--	Italy 55; West Germany 32; Belgium 26; France 26.
Tungsten metal including alloys, all forms kilograms	250	99	--	France 52; Sweden 25; United Kingdom 21; Japan 1.
Uranium and thorium compounds do	895	3,362	1,498	France 1,694; Italy 165; West Germany 5.
Vanadium: Oxides and hydroxides	NA	38	33	West Germany 5.
Zinc:				
Oxides and peroxides	131	249	--	France 205; West Germany 26; Belgium 15.
Metal including alloys, all forms	964	1,583	--	Spain 1,071; Algeria 203; Belgium 150.
Other:				
Ores and concentrates	115	246	--	Italy 216; United Kingdom 29; France 1.
Oxides, hydroxides, peroxides	376	39	7	West Germany 23; France 9.
Metals:				
Metalloids kilograms	NA	4	--	Mainly from West Germany.
Alkali, alkaline-earth, rare-earth metals	NA	1	--	Mainly from France.
Ferrocerium and pyrophoric alloys	4	--		
Metals including alloys, all forms	44	49	--	Spain 48.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	159	220	--	France 142; Italy 78.
Artificial: Corundum	NA	72	--	France 48; Italy 23; Austria 1.
Dust and powder of precious and semi-precious stones including diamond kilograms	33	16	--	All from Belgium.
Grinding and polishing wheels and stones	449	530	1	Italy 408; France 77; Austria 9.
Asbestos, crude	3,658	5,838	--	Mozambique 2,809; Canada 1,713; U.S.S.R. 1,155.
Barite and witherite	2,480	233	--	France 203.

See footnotes at end of table.

Table 3.—Tunisia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Boron materials: Crude natural borates kilograms	44	7	--	All from France.
Cement	558,653	323,207	(2)	U.S.S.R. 89,377; Spain 86,201; Yugoslavia 48,709; Greece 47,939.
Chalk	509	703	--	France 493; Italy 200; Spain 10.
Clays and clay products:				
Crude clays	21,450	18,530	401	United Kingdom 6,671; Italy 4,568; France 1,667.
Products:				
Nonrefractory	9,319	13,120	--	Spain 9,154; Italy 3,288; France 595.
Refractory including nonclay brick	4,796	7,624	(2)	West Germany 2,464; France 2,006; Italy 814.
Diamond:				
Gem, not set or strung thousand carats	NA	270	--	All from Belgium.
Industrial do	NA	365	--	West Germany 360; Belgium 5.
Diatomite and other infusorial earth	169	150	12	France 126; West Germany 11.
Feldspar and fluorspar	3,149	1,871	--	France 1,867; Italy 4.
Fertilizer materials:				
Crude, phosphatic kilograms	1,000	916	--	France 906; West Germany 10.
Manufactured:				
Nitrogenous	96,309	66,602	--	Bulgaria 20,711; Netherlands 19,610; Poland 15,044.
Phosphatic kilograms	50	54	--	All from West Germany.
Potassic	12,228	15,112	(2)	Spain 10,097; Italy 5,000; France 13.
Other including mixed	5	70	34	Belgium 15; France 5; West Germany 3.
Ammonia	5,410	59,869	30,555	Iran 10,000; Kuwait 7,350; Libya 4,500.
Graphite, natural	3	2	--	All from France.
Gypsum and plasters	215	474	--	Mainly from France.
Lime	7	72	--	Do.
Magnesite	89	63	--	Yugoslavia 35; West Germany 27.
Mica, all forms	79	103	19	Netherlands 40; United Kingdom 30; France 8.
Pigments, mineral, including processed iron oxides	182	280	--	West Germany 234; France 27; Italy 11.
Precious and semiprecious stones, except diamond carats	[3]625,000	10,000	--	Belgium 5,000; France 5,000.
Salt and brines	36	22	--	France 11; West Germany 6; Netherlands 3.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	14	18	--	France 13; West Germany 2; Belgium 1.
Caustic soda	18,082	13,587	--	France 10,565; Spain 2,352.
Soda ash	3,040	39,086	--	Romania 30,160; France 5,965; Bulgaria 1,747.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	11,933	11,979	--	Italy 11,019; Algeria 540; Portugal 420.
Worked	338	94	--	Italy 72; France 22.
Dolomite, chiefly refractory grade	207	315	--	Italy 152; France 113; Spain 50.
Gravel and crushed rock	15,780	21,377	--	Italy 17,672; Spain 3,200; France 505.
Quartz and quartzite	555	524	--	Belgium 500; West Germany 18; France 5.
Sand excluding metal-bearing	485	832	3	Netherlands 800; France 20.
Sulfur:				
Elemental, all forms	581,665	678,489	34,721	Canada 282,723; France 166,865; Poland 100,907.
Sulfuric acid, oleum	888	3,318	(2)	United Kingdom 2,681; France 462; Netherlands 130.
Talc, steatite, soapstone, pyrophyllite	1,676	1,875	--	France 1,587; Spain 251; Italy 14.
Other:				
Crude:				
Meerschaum and amber kilograms	100	--	--	
Unspecified	--	52	--	All from France.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	16	16	--	West Germany 15; France 1.
Slag, ash, similar material, not metal-bearing	2	(2)	--	All from France.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	395	14,321	(2)	Italy 7,143; Spain 6,236; Morocco 920.

See footnotes at end of table.

Table 3.—Tunisia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	496	1,207	7	Italy 1,000; Hungary 198.
Carbon black	319	299	(2)	Italy 199; West Germany 61; France 32.
Coal, all grades including briquets	32,739	21,006	--	Morocco 7,615; France 6,003; Belgium 4,475; U.S.S.R. 2,913.
Coke and semicoke	120,299	75,011	--	West Germany 46,668; Italy 28,343.
Hydrogen, helium, rare gases	[4]53	39	(2)	West Germany 20; France 18.
Peat including briquets and litter kilograms	--	50	--	All from France.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	10,738	8,411	--	Saudi Arabia 8,053; Liberia 357.
Refinery products:				
Gasoline including aviation do	9	(2)	--	All from Italy.
Kerosine do	2,105	1,134	--	Greece 650; Italy 484.
Distillate fuel oil do	3,489	2,730	--	Greece 1,407; Italy 1,230.
Residual fuel oil do	654	1,111	--	Greece 822; Italy 236; Syria 52.
Lubricants do	172	218	(2)	Italy 184; France 32.
Other:				
Liquefied petroleum gas do	1,048	325	--	Libya 107; Italy 75; France 73; Greece 42.
Mineral jelly and wax do	12	7	--	France 3; China 1; Romania 1; Spain 1.
Bitumen and petroleum coke do	130	195	--	Italy 190; Spain 3; Hungary 2.
Bituminous mixtures do	19	5	--	France 2; Italy 2.
Unspecified do	(2)	14	(2)	Greece 13.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	62	547	30	Italy 491; West Germany 14; France 11.

NA Not available.
[1]Includes artificial corundum.
[2]Less than 1/2 unit.
[3]Includes diamonds.
[4]Includes oxygen, nitrogen, and metalloids.

COMMODITY REVIEW

METALS

Iron and Steel.—Iron ore production was primarily from the Djebel Djerissa Mine, because both the Douaria and Tamera Mines were exhausted. Although production from Djebel Djerissa was increased considerably in 1981 to supply steel industry requirements, the grade of the iron ore remained a problem. Hematite ore containing 50% to 60% iron had been mined from the two closed mines. The deposits at Djebel Djerissa Mine were largely siderite ore containing 48% iron. This ore required expensive crushing and roasting before use. Furthermore, the Arab iron and steel unions concluded that the potential for upgrading the ore by further beneficiation was extremely limited.

On the basis of domestic iron ore resources, the Société Tunisianne de Sidérurgie (STS) built up a significant steel operation, the El Fouladh works, at Menzel Bourguiba. In 1981, STS engaged in a project to double its rolled-steel-products capacity to 400,000 tons per year. However, the iron output from Tunisia had not reached a level high enough to satisfy STS demand, and it was anticipated that STS would have to seek overseas supplies of iron for its steel mill.

Lead and Zinc.—The feasibility study to upgrade the low-grade ore of the Fedj Hassene lead-zinc deposit was completed in 1981, but the results were not made public. Should the deposit be developed, it was expected that its output would compensate for declining lead-zinc production from the

country's other mines. The Société Tunisianne d'Expansion Minère (STEM) remained the only producer of lead-zinc during 1981. The smelting plants of STEM imported about 8,000 tons of lead concentrate from Morocco and about 2,500 tons from Algeria to blend with the company's concentrate. Most of the lead produced in Tunisia was consumed domestically. Some of STEM's zinc concentrate was exported to France for smelting on a barter basis.

STEM's exploration activity continued in all possible geological target areas. However, with no new finds, the company would be compelled to expand its import of lead-zinc concentrate to satisfy domestic demands.

Other Metallic Minerals.—Tunisia produced a limited amount of silver and mercury for the domestic market. Silver was produced as a byproduct from the smelting of lead and zinc. A small amount of arsenic for domestic consumption was obtained from the Tabett ben Ksouri deposits.

NONMETALS

Barite.—Barite production, which had increased every year since 1977, declined in 1981. Nearly all production was consumed domestically. Under the sixth plan, barite production was to be increased to 122,000 tons per year by the end of the plan. It was anticipated that Tunisia would supply barite for drilling mud to most of northern Africa and the Persian Gulf region.

Cement.—Although cement production in 1981 was the highest ever recorded in Tunisia, the Government had to import about 500,000 tons of cement to satisfy domestic demand. Construction of the new cement plant near Jebel Oust continued under the supervision of the Société Les Ciments Tunisians and was expected to go into production in early 1984. The cost of the plant, originally estimated at $200 million, was expected to exceed this figure by the time the plant becomes operational. The 1-million-ton-per-year production capacity of the Jebel Oust cement plant was expected to eliminate cement imports by 1984. However, with the construction industry growing at a rapid rate and the new highway network proposed in the sixth plan, it seemed likely that Tunisia would continue to import cement after that date.

The asbestos cement products plant continued production at its rated capacity of 26,000 meters of pipe per year in 1981. Most of the products of this plant were consumed domestically in irrigation and sanitation works. With the construction industry booming, it seemed likely that the capacity of this plant would have to be increased to avoid imports of pipe and attendant expenditure of hard currency.

Fertilizer Materials.—Production of phosphate rock by Cie. des Phosphates de Gafsa (CPG) leveled out in 1981 with a slight decline over 1980 output. Production was largely from the Gafsa Basin, where CPG operated six underground mines and one opencast mine. Outside of the Gafsa Basin, CPG produced phosphate from an underground mine at Kalaa Khasba. About two-thirds of the total production was consumed locally, and the remainder was exported. Under the sixth plan, Tunisia intended to expand its domestic capacity for phosphoric acid production. CPG, therefore, announced the expansion of phosphate rock mining capacity to supply domestic consumers while maintaining its position in the world market. It planned to double phosphate rock production by 1990 to 10 million tons per year. To reach this goal, CPG intended to open four new opencast mines in the Gafsa Basin. A fifth mine was to be opened at Sra Ouertane in northwest Tunisia. Not only did CPG intend to increase mine production capacity by 1990, but beneficiation capacity and transportation facilities were to be improved as well. For example, a direct rail line between Gafsa and the fertilizer plants at Gabes was to begin operation by late 1982. Indeed, it would be a challenge to accomplish all this in an area of the country where supplies of water and energy have always been problematic.

The fertilizer plant of Société Arabe des Engrais Phosphates et Azotes (SAEPA), a joint venture between the Tunisian Government and the Abu Dhabi Development Fund (40%), produced at 85% capacity during 1981. The plant produced about 400,000 tons per year of phosphoric acid, of which more than two-thirds was exported.

Tunisia exported its phosphate rock mainly to Europe, the Middle East, Latin America, and, for the first time in recent years, China.

Fluorite.—Fluorite production from the Hammam Zriba Mine increased steadily over the past few years. Most of the fluorite produced was chemical grade except a few hundred tons that were exported as metallurgical grade. Much of the production was consumed by the Société des Industries Chimiques du Fluor (SICF), which operated an aluminum fluoride plant at Gabes. SICF intended to expand its facility at Gabes and to increase mine output of fluorite to

115,000 tons per year. Behind this expansion, apparently, was the financial support of the Arab Mining Co., which had agreed to obtain up to a 28% interest in SICF.

Potassium.—A feasibility study to examine ways to exploit the potassium, magnesium, bromine, and sodium deposits in the Sebka area was completed in 1981. These deposits, situated in a dry salt lake basin on the eastern coast near Zarzis, reportedly were to be exploited in two stages. In the first stage, two plants were to be built, one for 30,000 tons of potassium chloride per year, and the other for 10,000 tons of potassium bisulfate. The cost of both plants was estimated at $22 million, and they were slated to be operational by 1987. In the second stage, new units were to be added to produce magnesium compounds and bromine products, at a cost of $92 million. No date was set for completion of the second stage.

With implementation of the potassium program, Tunisia should be able to satisfy the fertilizer needs of the country and also export potassium competitively in the international market. The constraining factor would be the availability of over 430,000 tons of phosphoric acid, which was to be manufactured in the country from indigenous phosphate rock.

MINERAL FUELS

Petroleum.—Crude petroleum production coordinated by Enterprise Tunisienne des Activites Petroliers in 1981 totaled 41 million barrels, compared with 42.6 million barrels in 1980. The expectation of the 5-year plan that 1981 would be the peak oil production year did not materialize, and no new production fields were in sight for 1982. Almost 94% of the 1981 production was from the El Borma and Ashtart Fields.

Shell Internationale Maatschappij BV (SIM) contracted to install a subsea oil production control system in the Tazerka offshore field at a depth of 820 feet. The control system was to serve eight wells and was to be equipped with a chemical-injection system designed to treat corrosion problems that might be encountered during production. SIM expected the whole system to be operational by mid-1982.

New Refinery.—In a partnership with the Governments of Iraq, Kuwait, and Saudi Arabia, the Government provided a tentative site of 1,500 hectares of land between Bizerte and Tabarka on the north coast for construction of a petroleum refinery, a 9,300-megawatt powerplant, and a deep-water port at a total cost of $1.5 billion. The designated area was to serve as a major industrial center with plans eventually to install a steel mill as well. The contracts for the construction of all these facilities was to be awarded in early 1983.

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[1]Chief, Division of Foreign Data.

[2]Where necessary, values have been converted from Tunisian dinars (D) to U.S. dollars at the rate of D434 = US$1.00.

The Mineral Industry of Turkey

By Peter J. Clarke[1]

The economic reform program instituted in Turkey in January 1980 resulted in a significant improvement in most sectors of the Turkish economy in 1981. For the first time since 1974, the real growth rate of the gross national product (GNP) increased from about $39.57 billion[2] in 1980 to $41.16 billion in 1981. For the past several years, Turkey has suffered from massive balance-of-payment deficits, inflation of over 100% per year, unemployment nearing 20%, and a nearly stagnant economy. Little or no capital investment has flowed into the country during these years, serving to only worsen the general economic situation.

In January 1980, the Government instituted an economic recovery program designed to remove many of the free-market barriers in the economy, open up the productive sectors to private and foreign investment, restrict the rate of monetary growth, and trim the external deficit by promoting exports. The first half of 1980 showed little improvement, while the political problems remained in the forefront. In September 1980, the Turkish armed forces seized power, citing the inability of the elected Government to effectively govern the country. Labor disruptions were outlawed, and top priority was given to maintaining efficient operation of the country's industries. The economic reforms were kept in place, and in the last quarter of 1980, industrial production rose for the first time in 2 years. This spurt in industrial production continued through all four quarters of 1981 and was expected to continue in 1982. This growth led to a dramatic rise of 105% in industrial exports in 1981.

One of the most impressive achievements of the economic reform program has been to reduce the inflation rate from between 100% and 120% in 1979 and 1980 to below 40% in 1981. To reduce inflation, the Government first imposed credit restrictions on deficit financing and public sector spending. It then took a firm stand against expensive labor agreements and prohibited strikes. Finally, it sought and obtained nearly $1 billion in financial assistance from the Organization of Economic Cooperation and Development (OECD) nations and the International Monetary Fund (IMF) to finance imports and reduce the current account deficit. With these policies continuing through the year, inflation was expected to remain at or below 40% in 1982.

Several other reform measures were instituted as part of the recovery program to revive the sagging economy, including changes in taxation, exchange rates, interest rates, and state subsidies. Through 1980-81, tax laws had been legislated that were designed to increase Government revenues in order to reduce the deficit on the budget. The Turkish lira (LT) was devalued several times during the year, from LT94 per U.S. dollar in early 1981 to LT125 per U.S. dollar by the end of the year. The Government also removed controls on domestic bank interest rates, which increased bank deposits by about 100% over those of the previous year. While deposits increased rapidly, fixed capital investment declined owing to the high cost of credit. To further reduce its budget deficits, the Government began gradually lowering the subsidies provided for many domestically produced items, including agricultural products and fertilizer. Finally, one of the most significant reforms over the past year was the liberalization of Turkey's investment laws, including those

that apply to mining, to attract more domestic and foreign private capital into the country. The mineral sector, with tremendous foreign exchange earning potential, was only beginning to benefit from changes in the law and attitude of the country over the past 2 years.

Turkey's mineral industry provided slightly over 4% of the country's GDP in 1981. Overall mineral production increased marginally in 1981 but remained below the Government's expectation. Total mineral production was valued at nearly $4 billion, but mineral exports totaled only about 4.3% of total exports. The Government planned to increase this share to about 5% of total projected exports of $5.8 billion for 1982. To accomplish this, the Government was contemplating some sweeping changes in the laws governing the mineral industry. First, Law No. 6309, the basic mining code enacted in 1954, was in the process of being modernized. One of the primary goals of this modernization was to improve the climate for foreign and domestic private investment in the mining sector. A revised mining code was being drafted by the Ministry of Energy and Natural Resources in 1981 and was to be presented to the Consultative Assembly sometime in 1982.

Major changes were also being considered for Law No. 2172, the Mines Expropriation Law, which was passed in October 1978. This law allowed the Government to cancel private concession agreements without the consent of Parliament. In the 6 months following passage of the law, the Government canceled private concessions agreements for most boron, iron ore, and lignite mines and turned them over to the State Economic Enterprises (SEE). Boron went to Etibank, iron ore concessions were given to Turkiye Demir ve Celik Isletmeleri (Turkish Iron and Steel Works), and lignite mines were given to Turkiye Komuleri Isletmeri (TKI) (the Turkish Coal Authority), all of which were owned by the Government. The result of nationalization was an almost universal drop in production from that of the previous year. The private sector had previously accounted for 35% of boron output, 50% of iron ore output, and 30% of lignite production. The SEE, once in control of the concessions, lacked both sufficient funds to purchase new capital and the skilled personnel to efficiently operate the mines. These were, ironically, the Government's reasons for nationalizing them in the first place. Although mineral production in some areas, notably boron, has recovered, opposition to the law has remained strong. The Ministry of Energy and Natural Resources was preparing a bill to submit to the Consultative Assembly by mid-1982 that would authorize returning many of the mines to the private sector, although it was still unclear which commodities would be returned and which would be reserved for the SEE.

In June 1981, the state mining company Etibank, for the first time in its history, invited interested foreign private companies to participate in selected joint-venture projects involving mining and mineral processing. Among the projects listed were two copper projects, a new aluminum plant, and marble, perlite, and pumice projects. The petroleum industry, which was in a similar situation to the hard-rock mining sector, was also badly in need of foreign expertise and money. Petroleum production has declined steadily since 1969, and petroleum imports have expanded to over $4 billion. In 1980, the state-owned Turkiye Petrolleri Anonim Ortakliki (TPAO) was allowing foreign exploration in many regions of the country, including some on its own concessions. It was also allowing 35% of new oil production to be exported at world market prices.

These initial steps toward liberalization of restrictions on the mining and mineral fuel industries in Turkey were generally considered to be capable of initiating a strong resurgence in these sectors of the economy. Major inflows of capital were necessary to bring up Turkey's low capacity utilization factor, however, and many companies were unwilling to invest without strong guarantees against future nationalization and state interference.

PRODUCTION AND TRADE

Total output from the mineral sector in Turkey increased slightly in 1981, reversing an overall declining trend that was established in 1978-79. The increase in production across the industry averaged about 1%, but mineral production remained well below the Government's targets. Despite its rather poor performance in recent years, the overall mineral potential in Turkey was enormous. Even with inefficient operations and underutilized capacity, Turkey ranked fifth in world chromite production and second in world boron output. Substantial increases in production were registered

for several commodities during the year, such as copper, bauxite, nitrogen fertilizers, and coal. Production of most other commodities, although increasing slightly, remained low. There were several reasons for this. First, a combination of depressed demand for raw materials in Turkey, especially construction materials, owing to a stagnant domestic construction industry, and generally depressed demand for minerals worldwide held production down. Second, most of Turkey's mining operations were unable to fully utilize their processing and refining capacities. This was a result of general inefficiency of the SEE in running these operations and a lack of adequate capital investment to keep factories and machines running and up to date. Inadequate investment has plagued Turkey for several years, creating a cycle of low production levels and low export earnings, which in turn made less money available for reinvestment and capital expenditure, which further reduced production. Turkey was only beginning to pull out of this slump in 1981 under the economic recovery program instituted in January 1980.

On the more positive side, the labor actions that had forced many factories and mines to close for long periods in 1979-80 were prohibited by the military Government during the year. For the large mining ventures, this action substantially increased production levels. This was particularly true in the case of coal, where production of hard coal increased for the first time since 1974. Production of lignite also increased by almost 20%. This provided more fuel to neighboring lignite-fired thermal power stations, which allowed for greater production of electricity. Shortages of electricity has also held mineral production to low levels in recent years. Greater output from the lignite mines and more foreign currency available for fuel oil imports contributed to a significant increase in electricity production, which helped to boost the mineral sector during the year.

Of the three commodities in the mining sector that were nationalized by the Government in October 1978 (iron ore, lignite, and boron), iron ore was the only one whose production level remained below its prenationalization level. Prior to the nationalization decree, the private sector had produced about 45% to 50% of the country's iron ore from several mines around the country. Following the decree, iron ore output dropped 50%, and it has yet to increase significantly. The generally depressed state of the world iron and steel industry was partly responsible for the continued poor performance in Turkey. Also contributing to the drastic decline in iron ore production was the refusal of many of the private owners to continue to operate the mines in the 6-month period between passage of the law and the Government's actual takeover. Even after the state took over, it lacked the personnel and capital to effectively operate the mines and was forced in every case, with the exception of the two largest mines, to contract back the operation of the mines to the former private owners.

Several other commodities were able to register significant increases in production during the year. Production of blister and electrolytic copper increased an average of 44% over the 1980 level, mainly as a result of more efficient operation of the smelters and increased availability of electricity. Output from Etibank's Uludag tungsten mine increased again in 1981. After experiencing technical problems with the concentrating process from 1976 to 1979, several plant modifications and the purchase of new equipment led to increased production over the following 2 years. Etibank was operating a pilot project with a new flowsheet for concentrating the ore that could substantially increase production and recovery over the next several years. Turkey's cement industry continued its rapid expansion despite the depressed state of the domestic construction industry. Capacity of the industry was to rise 20% in the next 2 years, providing the country with an exportable surplus of cement of about 4 million tons by 1984. One of the more outstanding developments in Turkey's mineral industry was the success of the Fertilizer Rationalization and Energy Saving Project, which managed to nearly double production of nitrogenous fertilizers from 1980 to 1981. Nearly 10 million tons of fertilizer was produced during the year, exceeding the State Planning Organization's production targets. The project represented almost a complete revamp of the industry in an effort to increase efficiency, expand output, and reduce energy consumption. Further gains in production were expected as additional units are brought onstream over the next several years.

Production of crude petroleum increased slightly in 1981, in marked contrast to the previous 12 years, during which production

declined fairly steadily. Turkey was making a determined effort to increase oil production from existing fields and locate and develop new fields to reduce the awesome burden oil imports have placed on the economy over the past 3 or 4 years. It was difficult to determine whether these efforts would pay off quickly enough to offset the expected decline in production. Many of Turkey's existing wells were 10 to 20 years old and encountering water and pressure maintenance problems. Substantial results from the secondary recovery programs at the major oilfields were not expected before 1984. Production of mineral commodities in Turkey is shown in table 1.

Table 1.—Turkey: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum:					
Bauxite	567,200	449,124	[e]350,000	416,500	[2]518,360
Alumina	170,364	74,244	70,152	137,508	[2]131,400
Metal	51,300	32,300	31,800	34,200	37,600
Antimony:					
Ore, mine output:					
Gross weight	38,423	42,000	[e]37,800	43,000	[2]27,934
Metal content	1,921	2,100	1,890	2,153	2,150
Regulus	61	50	50	68	70
Chromium:					
Chromite:					
Gross weight (34% to 43% Cr_2O_3)	952,422	651,148	680,000	550,700	[2]574,474
Salable product[e]	508,357	375,000	450,000	400,000	400,000
Copper:					
Mine output, metal content	33,431	[r]27,300	31,400	20,800	35,000
Metal:					
Smelter	31,524	26,220	22,212	15,900	[2]27,264
Refined	25,300	30,100	22,200	18,800	[2]22,434
Iron and steel:					
Iron ore, gross weight thousand tons	3,446	3,208	[e]3,000	2,579	[2]2,669
Metal:					
Pig iron and ferroalloys:					
Ferrochromium[e]	35,380	39,900	30,000	32,000	33,000
Pig iron and other ferroalloys thousand tons	1,728	1,827	2,228	2,040	[2]1,954
Crude steel including castings do	[r]1,902	[r]2,172	2,396	2,536	[2]2,363
Lead:					
Mine output, metal content[3]	[e]8,718	9,500	7,500	6,700	[2]6,804
Metal, smelter	3,000	3,000	5,900	6,500	6,000
Manganese ore, gross weight	19,300	[e]20,000	19,000	15,000	[2]14,937
Mercury 76-pound flasks	4,686	5,020	4,786	4,437	4,400
Silver, mine output, metal content thousand troy ounces	[e]200	219	250	200	200
Tungsten, metal content of concentrate[e]	10	7	130	365	370
Zinc:					
Mine output, metal content[e 4]	67,100	40,700	27,100	20,400	20,400
Metal, smelter, primary	20,900	20,000	20,000	13,100	15,000
NONMETALS					
Abrasives, natural: Emery	66,018	55,620	[e]55,000	39,900	[2]44,135
Asbestos	3,975	13,372	17,210	8,800	[2]2,833
Barite	143,510	32,031	[e]100,000	127,000	[2]183,326
Boron materials thousand tons	1,099	1,320	940	1,190	[2]1,755
Cement, hydraulic do	13,833	15,344	13,784	12,875	[2]15,036
Clays:					
Bentonite	4,357	8,280	[e]14,000	10,000	10,000
Kaolin	59,162	43,685	[e]59,000	50,000	50,000
Other	67,854	402,440	[e]300,000	110,000	100,000
Diatomite	9,000	9,000	[e]9,000	9,500	10,000
Feldspar	75,200	75,300	[e]72,600	72,000	70,000
Fluorspar	1,711	1,253	6,200	6,000	--
Gypsum	65,327	60,332	[e]63,500	72,200	73,000
Magnesite, crude ore	516,162	417,201	510,000	447,000	[2]881,790
Meerschaum kilograms	4,150	3,050	5,100	6,250	6,300
Nitrogen: N content of ammonia thousand tons	107	217	205	250	410
Perlite	30,000	26,861	30,000	25,800	26,000
Phosphate rock	65,418	32,205	[e]25,000	82,655	[2]103,029
Pyrites, cuprous, gross weight	38,332	[e]30,000	[e]30,000	35,000	[2]63,690
Salt, all types thousand tons	777	929	1,130	626	[2]1,319

See footnotes at end of table.

Table 1.—Turkey: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Sodium compounds, n.e.s.:					
Sodium carbonate[e]	60,000	65,000	70,000	60,000	60,000
Sodium sulfate	72,917	64,271	48,000	48,000	50,000
Stone, sand and gravel, n.e.s.:					
Limestone thousand tons	19,121	22,069	[e]20,000	20,000	20,000
Marble	118,600	122,000	130,000	130,000	130,000
Quartzite	234,643	243,210	[e]240,000	240,000	240,000
Sand, siliceous	27,636	67,307	[e]60,000	60,000	60,000
Strontium minerals: Celestite	16,600	17,500	[e]18,000	16,000	15,000
Sulfates, natural, n.e.s.: Aluminum sulfate (alunite)	6,402	[e]6,000	[e]6,000	6,000	6,000
Sulfur:					
Native, other than Frasch	20,040	28,000	[e]30,000	30,000	[2]28,270
S content of pyrites	17,552	[e]13,500	[e]13,500	21,000	24,000
Byproduct	80,000	[e]80,000	70,000	70,000	66,000
Total	117,592	121,500	113,500	121,000	[2]118,270
MINERAL FUELS AND RELATED MATERIALS					
Asphalt, natural thousand tons	434	297	335	300	300
Carbon black	15,808	12,254	16,000	15,900	18,108
Coal:					
Bituminous thousand tons	4,405	4,377	4,051	3,730	7,630
Lignite do	14,828	17,034	11,600	12,760	18,578
Coke and semicoke:					
Metallurgical do	1,740	1,690	2,625	1,928	[2]1,875
Gashouse[e] do	340	270	300	300	250
Breeze do	[e]135	[e]125	125	125	100
Total do	2,215	2,085	3,050	2,353	2,225
Gas:					
Manufactured (from coal gas plants) million cubic feet	4,752	[e]4,800	NA	NA	NA
Natural:					
Gross do	[e]36,700	36,500	36,000	30,000	29,000
Marketed do	[e]785	794	1,200	1,000	1,200
Petroleum:					
Crude thousand 42-gallon barrels	19,428	19,595	20,276	16,682	[2]16,918
Refinery products:					
Gasoline do	19,848	17,033	15,960	16,000	16,200
Jet fuel do	1,544	1,367	1,460	1,400	1,400
Kerosine do	4,621	4,474	3,429	3,682	3,400
Distillate fuel oil do	25,232	63,168	17,520	16,000	18,000
Residual fuel oil do	42,671		30,295	28,000	34,000
Lubricants do	1,142	1,366	1,182	1,200	1,000
Liquefied petroleum gas do	4,487	4,241	4,229	4,200	4,300
Naphtha do		131	139	140	140
Asphalt do	5,580	2,615	1,972	1,934	1,950
Unspecified do		2,672	3,500	3,000	3,000
Refinery fuel and losses do	4,345	3,454	1,203	1,200	2,100
Total do	109,470	100,521	80,889	76,756	85,490

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 2, 1982.

[2]Reported figure.

[3]Includes Pb content of lead and lead-zinc ores but excludes Pb content of zinc ore.

[4]Includes Zn content of zinc and lead-zinc ores but excludes Zn content of lead ore.

Turkey's overall foreign trade disposition improved considerably in 1981, boosted by higher levels of industrial and mineral exports and by higher remittances from Turks working abroad. Even with these improvements, Turkey's balance-of-payments deficits remained as one of the country's most severe economic problems. Total exports from Turkey rose 55% from that of 1980 to about $4.5 billion in 1981. Imports, on the other hand, rose about 26% from that of 1980 to $8.7 billion in 1981, leaving a deficit in the merchandise trade balance of slightly over $4 billion.

Mineral exports increased substantially for some commodities, notably boron minerals and fertilizer, while decreasing in some others. Overall, mineral exports increased from $191 million in 1980 to $193 million in 1981. Minerals represented about 4.3% of Turkey's total exports. Exports of industrial products have shown the most dramatic growth in 1981, increasing 105% over the 1980 level. The largest growth areas were in rubber and plastics, ceramics and glass, textiles, metal products, and industrial machinery. Industrial exports were valued at about $1.7 billion in 1981. As in previous years, between 50% and 60% of Turkey's total exports were agricultural products. This share was decreasing, however, as industrial production continued to expand. Agricultural exports increased 28% in 1981 to about $2.5 billion.

Overall, Turkish exports were at record levels in 1981, which can be attributed in large part to the economic reform program. The Government placed particular emphasis on increasing industrial production, reorienting Turkish industry toward foreign markets, and maintaining realistic exchange rates. Although these policies were able to achieve a good deal of success for being in existence for only 2 years, they were unable to eliminate the most serious and persistant problem, the soaring cost of petroleum imports. Imports of crude and refined petroleum topped $4 billion in 1981, almost a 30% increase over the 1980 level. This represented an increase in consumption that was accommodated almost entirely by increased imports. Petroleum accounted for about 47% of the country's total imports.

As a result of this high level of imports, Turkey ran a large deficit in its current accounts balance, as it has every year since 1961, with the exception of 1975. The deficit was estimated at $2.8 billion, down 5% from that of 1980. The drop was due in part to increased worker remittances and balance-of-payments assistance provided by IMF and OECD. Despite its difficulty in financing these deficits, Turkey was improving its trading image overseas, mainly as a result of its economic reform program and Western support. Over the next several years, these reforms were expected to pay off in terms of improving Turkey's balance-of-payments situation, increasing domestic productivity, and reducing the country's debt. Turkey's foreign mineral trade is illustrated in tables 2 and 3.

Table 2.—Turkey: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	2,600	9,400	--	U.S.S.R. 8,400; Lebanon 1,000.
Oxides and hydroxides	1,500	74,600	--	All to U.S.S.R.
Metal including alloys, semimanufactures	5,547	5,628	--	Kuwait 1,591; Syria 1,149; Saudi Arabia 1,034; Iraq 788.
Antimony:				
Ore and concentrate	400	NA		
Metal including alloys, all forms	290	NA		
Cadmium metal including alloys, all forms	20	NA		
Chromium: Chromite and concentrate	322,046	334,555	42,300	Czechoslovakia 58,030; Italy 55,225; Sweden 32,900; West Germany 19,810.
Copper metal including alloys, semimanufactures	--	80	--	Portugal 36; Netherlands 20; Switzerland 20.
Iron and steel:				
Pig iron, cast iron, powder, shot	17,744	8,000	--	All to Egypt.
Ferroalloys: Ferrochrome	32,075	27,500	1,000	Netherlands 11,500; Belgium-Luxembourg 4,000; France 4,000.
Steel, primary forms	--	465	--	West Germany 363; Italy 57; Pakistan 45.
Semimanufactures	6,069	14,619	1	Libya 5,800; Iran 3,263; West Germany 1,805; Lebanon 1,443.

See footnotes at end of table.

Table 2.—Turkey: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Lead: Ore and concentrate	--	4,275	--	Bulgaria 2,400; Italy 1,875.
Manganese: Ore and concentrate	8,450	8,960	--	Belgium-Luxembourg 5,000; Italy 3,960.
Mercury 76-pound flasks	r2,416	3,916	--	United Kingdom 2,292; Czechoslovakia 754; Romania 493.
Molybdenum: Ore and concentrate	40	NA		
Tungsten metal including alloys, all forms	69	139	139	
Other:				
Ores and concentrates	--	1,466	--	Belgium-Luxembourg 887; Yugoslavia 560; Sweden 19.
Ash and residue containing nonferrous metals	--	840	--	All to Greece.
Base metals including alloys, all forms	--	319	--	United Kingdom 244; Bulgaria 50; Jordan 25.
NONMETALS				
Abrasives, natural, n.e.s.: Emery	35,905	40,186	4,200	France 27,830; United Kingdom 3,186; Romania 2,850.
Barite and witherite	95,844	81,666	7,000	U.S.S.R. 43,238; Iraq 19,500; Romania 8,650.
Boron materials:				
Crude natural borates	621,915	764,931	69,255	Italy 177,110; France 140,806; United Kingdom 59,115.
Oxide and acid	13,933	12,141	1,750	West Germany 6,490; Poland 1,500; Italy 918.
Cement thousand tons	1,190	737	--	Syria 521; Libya 94; Iran 45.
Chalk	5,972	2,268	--	Lebanon 985; Iraq 645; Libya 300; Iran 285.
Clays and clay products:				
Crude	8,119	17,785	--	Lebanon 8,130; West Germany 4,020; Romania 3,790.
Products:				
Nonrefractory	9,502	17,013	1	U.S.S.R. 7,373; West Germany 3,403; Egypt 1,585.
Refractory including nonclay brick	r422	3	--	All to Syria.
Diatomite kilograms	200	NA		
Feldspar, fluorspar, nepheline	30	6,510	--	All to Lebanon.
Lime	104	20	--	All to Iran.
Magnesite	41,506	77,840	520	Austria 31,370; U.S.S.R. 25,500; Yugoslavia 6,970.
Pigments, mineral: Natural, crude	32	NA		
Salt and brine	--	525	--	All to Iraq.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	19,352	41,014	--	Syria 14,235; Lebanon 6,457; Italy 5,263.
Worked	28	895	(1)	Libya 881; Saudi Arabia 10; West Germany 3.
Dolomite, chiefly refractory-grade	--	54	--	Iraq 25; Greece 14; Syria 14.
Gravel and crushed rock	1	2,363	--	Syria 1,693; Libya 470; Saudi Arabia 200.
Quartz and quartzite	10	20	--	Syria 15.
Sand other than metal-bearing	400	--		
Talc, steatite, soapstone, pyrophyllite	615	1,692	--	Albania 1,000; Iraq 305; Jordan 41; Lebanon 38.
Other:				
Crude:				
Meerschaum, amber, jet	8	NA		
Unspecified	42,200	38,075	--	West Germany 19,630; Italy 5,600; United Kingdom 5,350.
Slag and dross, not metal-bearing, from iron and steel manufacture	--	5,200	--	All to Greece.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	370	3,817	--	Iraq 3,435; Iran 215; Libya 167.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	--	345	--	All to Iran.
Coal and briquets:				
Anthracite and bituminous excluding briquets	1,485	2,000	--	All to Iraq.
Lignite including briquets	130,885	197,055	--	All to Romania.
Petroleum refinery products:				
Gasoline 42-gallon barrels	--	726,410	--	Lebanon 480,752; Italy 245,658.
Kerosine and jet fuel do.	--	30,434	--	NA.
Lubricants do.	700	160,258	--	Iran 81,123; Syria 67,179; Spain 10,976.
Bituminous mixtures do.	--	30	--	All to Jordan.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	532	71,508	--	France 54,013; Greece 16,993; Italy 502.

rRevised. NA Not available.
1Less than 1/2 unit.

Table 3.—Turkey: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	138	79	2	West Germany 50; France 16; Italy 10.
Metal including alloys:				
Unwrought	13,022	11,163	200	Canada 3,281; Switzerland 2,550; Romania 1,583.
Semimanufactures	870	925	--	Sweden 445; France 173; West Germany 120.
Arsenic: Oxides and acid	143	35	--	Belgium-Luxembourg 34; West Germany 1.
Cadmium: Oxides and hydroxides	5	NA		
Chromium:				
Oxides and hydroxides	246	72	--	West Germany 63; United Kingdom 5; Hungary 2.
Metal including alloys, all forms	2	NA		
Cobalt:				
Oxides and hydroxides	21	25	--	Belgium-Luxembourg 19; United Kingdom 3; West Germany 3.
Metal including alloys, all forms kilograms	200	NA		
Copper:				
Ore and concentrate	--	14,012	5,310	Chile 8,702.
Matte, speiss, similar materials	83	1,209	--	Switzerland 491; Netherlands 457; Yugoslavia 103.
Oxides and hydroxides	25	NA		
Sulfate	7,500	NA		
Metal including alloys:				
Scrap	622	1,200	189	West Germany 659; Bulgaria 139; Belgium-Luxembourg 99.
Unwrought	2,282	11,345	72	Chile 7,291; West Germany 1,828; Switzerland 1,352.
Semimanufactures	2,319	5,091	262	West Germany 1,645; Albania 779; Switzerland 726.
Iron and steel:				
Ore and concentrate	732,756	810,541	--	Brazil 701,256; Sweden 48,750; Netherlands 28,853.
Metal:				
Scrap	362,300	346,455	252,010	West Germany 56,375; Lebanon 19,269; Switzerland 11,982.
Pig iron, cast iron, powder, shot	512	8,985	--	Canada 8,315; Sweden 295; United Kingdom 219.
Ferroalloys:				
Ferromanganese	9,360	22,851	--	Switzerland 8,568; Republic of South Africa 6,016; Portugal 2,077.
Other	6,443	6,806	--	Switzerland 2,115; Spain 1,694; Norway 901; U.S.S.R. 838.
Steel, primary forms	225,417	165,419	971	U.S.S.R. 62,180; West Germany 32,130; Romania 14,926.
Semimanufactures:				
Bars, rods, angles, shapes, sections	189,245	136,992	--	West Germany 59,766; Switzerland 50,850; Japan 9,513.
Universals, plates, sheets	157,126	314,716	3,555	West Germany 119,153; Switzerland 53,062; Belgium-Luxembourg 30,708.
Hoop and strip	3,151	5,118	243	West Germany 2,135; Austria 621; France 620.
Rails and accessories	4,496	6,648	--	France 6,042; Japan 400; West Germany 122.
Wire	1,618	1,730	2	West Germany 1,347; Belgium-Luxembourg 149; Sweden 61.
Tubes, pipes, fittings	20,098	35,796	41	Japan 17,518; West Germany 6,747; Switzerland 3,259.
Castings and forgings, rough	1,525	1,916	4	France 1,462; Spain 290; United Kingdom 77.
Lead:				
Oxides and hydroxides	--	57	--	Belgium-Luxembourg 50; France 7.
Metal including alloys:				
Scrap	--	1,059	699	West Germany 360.
Unwrought	2,921	5,451	--	United Kingdom 2,993; West Germany 1,244; Switzerland 764.
Semimanufactures	61	--		
Magnesium metal including alloys:				
Unwrought	53	296	--	Norway 250; France 26; West Germany 20.
Semimanufactures	--	21	--	West Germany 20; Sweden 1.

See footnotes at end of table.

Table 3.—Turkey: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Manganese:				
Ore and concentrate	2,214	2,429	--	Belgium-Luxembourg 2,428; West Germany 1.
Oxides and hydroxides	201	235	--	Belgium-Luxembourg 130; West Germany 105.
Metal including alloys, all forms	1	NA		
Molybdenum metal including alloys, all forms	1	1	(1)	Mainly from United Kingdom.
Nickel:				
Matte, speiss, similar materials	215	319	--	Canada 87; Switzerland 80; United Kingdom 66.
Oxides and hydroxides	47	NA		
Metal including alloys, all forms	r120	121	(1)	West Germany 43; United Kingdom 23; Italy 15; Sweden 11.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	4,340	--		
Silicon: Elemental	475	NA		
Silver:				
Waste and sweepings[2] value	$3,000	--		
Metal including alloys, unwrought and partly wrought do	r$64,683	$237,000	--	West Germany $210,000; Switzerland $19,000.
Tantalum metal including alloys, all forms	--	1	--	All from France.
Tin:				
Ore and concentrate kilograms	28	--		
Oxides and hydroxides	--	36	--	All from West Germany.
Metal including alloys, all forms	321	366	--	United Kingdom 146; Belgium-Luxembourg 140; Malaysia 30.
Titanium:				
Ore and concentrate	1,930	NA		
Oxides and hydroxides	3,321	1,681	127	West Germany 684; Switzerland 263; Czechoslovakia 205.
Tungsten metal including alloys, all forms	5	28	(1)	United Kingdom 14; West Germany 13.
Zinc:				
Oxides and hydroxides	5	106	4	West Germany 102.
Metal including alloys:				
Blue powder	10	NA		
Unwrought	475	726	--	Belgium-Luxembourg 317; West Germany 296; Switzerland 55.
Semimanufactures	4	970	--	Switzerland 962; West Germany 7; United Kingdom 1.
Zirconium:				
Ore and concentrate	42	NA		
Oxides and hydroxides	1	NA		
Other:				
Ores and concentrates	--	2,280	--	Australia 1,175; Netherlands 447; Sweden 255.
Oxides and hydroxides	63	NA		
Metals:				
Alkali, alkaline-earth, rare-earth metals	2	5	--	France 4.
Metalloids	r2	1,250	--	Portugal 994; Spain 200; West Germany 31.
Base metals including alloys, all forms	9	208	197	West Germany 4; Switzerland 2.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	NA	3	1	West Germany 2.
Artificial: Corundum	647	833	--	Poland 408; Czechoslovakia 208; West Germany 201.
Dust and powder of precious and semi-precious stones value	r$61,541	$95,000	--	Netherlands $25,000; United Kingdom $25,000; Switzerland $24,000.
Grinding and polishing wheels and stones	207	273	64	Norway 52; West Germany 47; Italy 33.
Asbestos, crude	10,247	16,671	--	U.S.S.R. 13,597; Republic of South Africa 1,281; Canada 829.
Boron materials: Oxide and acid	(1)	2	--	All from Switzerland.
Cement	r470	543	4	France 389; West Germany 147; United Kingdom 2.
Chalk	125	--		

See footnotes at end of table.

Table 3.—Turkey: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products:				
Crude clays	2,069	1,246	10	Czechoslovakia 817; West Germany 230; United Kingdom 126.
Products: Refractory including nonclay brick	r22,373	19,977	374	West Germany 5,499; Austria 4,121; Belgium-Luxembourg 2,862.
Cryolite and chiolite	57	4	--	Denmark 3; Switzerland 1.
Diamond: Industrial value	r$85,086	$78,000	--	Netherlands $50,000; United Kingdom $20,000; India $4,000.
Diatomite and other infusorial earth	84	154	69	West Germany 83; Denmark 1; Italy 1.
Feldspar and fluorspar	70	55	--	Mainly from Sweden.
Fertilizer materials:				
Crude:				
Nitrogenous	18,313	18,492	--	Italy 8,625; Belgium-Luxembourg 5,100; Yugoslavia 4,300.
Phosphatic	513,122	856,070	--	Jordan 472,554; Tunisia 191,033; Morocco 169,098.
Manufactured:				
Nitrogenous	979,788	963,680	64,244	Italy 329,559; Romania 142,587; U.S.S.R. 83,222.
Phosphatic	179,164	154,925	45,843	Lebanon 45,951; Japan 22,514; Tunisia 10,082.
Potassic	33,058	26,854	--	Switzerland 12,624; Belgium-Luxembourg 8,650; France 3,050.
Other including mixed	888,928	690,038	95,233	Switzerland 214,749; Yugoslavia 140,443.
Ammonia	156,122	280,327	191,337	U.S.S.R. 42,429; United Kingdom 21,482; Iran 9,000.
Graphite, natural	169	527	--	West Germany 499; Norway 16; Sri Lanka 11.
Gypsum and plasters	7	--		
Magnesite	2	1	--	All from West Germany.
Mica:				
Crude including splittings and waste	45	52	--	Bulgaria 20; West Germany 20; Italy 12.
Worked including agglomerated splittings	33	15	--	India 5; Spain 5; West Germany 1.
Pigments, mineral:				
Natural, crude	--	27	9	Cyprus 18.
Iron oxides, processed	297	278	--	All from West Germany.
Precious and semiprecious stones other than diamond value	r$20,236	$58,000	--	West Germany $42,000; East Germany $16,000.
Salt and brine	50,015	25	--	All from West Germany.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	975	1,510	2	Italy 839; Switzerland 500; Spain 55.
Caustic soda	r35,379	71,258	3,556	Netherlands 22,413; Spain 9,957; West Germany 8,620.
Soda ash	43,544	5,561	--	Bulgaria 5,137; Italy 201; France 141.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	49	--		
Worked	--	12	--	All from United Kingdom.
Quartz and quartzite	102	80	--	West Germany 42; Sweden 38.
Sand other than metal-bearing	2	476	--	Czechoslovakia 475; Belgium-Luxembourg 1.
Sulfur:				
Elemental, all forms	52,759	41,090	--	Mexico 15,000; Iraq 9,917; Kuwait 9,917.
Sulfuric acid, oleum	240,920	283,466	--	Switzerland 257,537; West Germany 15,729; Greece 10,200.
Talc, steatite, soapstone, pyrophyllite	235	115	--	All from West Germany.
Other:				
Crude	784	1,548	--	West Germany 981; United Kingdom 250; Belgium-Luxembourg 200.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	138	82	10	Italy 26; West Germany 24; United Kingdom 10.
Halogens	1,032	NA		
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	r6	3	--	All from France.

See footnotes at end of table.

Table 3.—Turkey: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,612	35	35	
Carbon black	8,503	8,038	25	Switzerland 2,505; West Germany 2,040; United Kingdom 1,221.
Coal, anthracite and bituminous including briquets	549,694	508,318	477,790	West Germany 30,528.
Coke and semicoke	44,074	6,062	--	Netherlands 3,562; Italy 2,500.
Hydrogen, helium, rare gases value, thousands	$120	$74	--	West Germany $54; Austria $13; Netherlands $4.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	53,660	83,598	(1)	Iraq 37,621; Libya 21,533; Iran 19,122.
Refinery products:				
Gasoline do.	611	76	--	France 60; Italy 16.
Kerosine and jet fuel do.	5	2	--	All from Netherlands.
Distillate fuel oil do.	13,695	10,030	--	Bulgaria 2,494; Romania 2,480; U.S.S.R. 1,804.
Residual fuel oil do.	15,213	12,480	343	Iran 2,300; Greece 2,232; Romania 1,365.
Lubricants do.	r403	102	53	Netherlands 16; West Germany 10; United Kingdom 10.
Other:				
Liquefied petroleum gas value, thousands	$51,323	$153,144	--	Kuwait $111,990; Saudi Arabia $40,599.
Mineral jelly and wax 42-gallon barrels	22,457	12,411	55	West Germany 4,982; Bulgaria 3,699.
Petroleum coke do.	42,128	109,764	107,124	Syria 2,640.
Bitumen including bituminous mixtures do.	r66,155	82,192	12	West Germany 73,253; Albania 8,363.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	38,401	52	3	West Germany 43; Netherlands 6.

rRevised. NA Not available.
1Less than 1/2 unit.
2May include platinum-group metals.

COMMODITY REVIEW

METALS

Aluminum.—Aluminum production from the Seydisehir aluminum complex in Konya Province increased slightly from 1980 to 1981 but remained far below its design capacity. The integrated aluminum complex was designed to process 460,000 tons per year of bauxite into 200,000 tons per year of alumina to produce 60,000 tons per year of primary aluminum. Bauxite for the plant was mined at the Seydisehir Mortas Mine, near the city of Seydisehir, where reserves were estimated at 13 million tons of boehmite and gibbsite, with an Al_2O_3:SiO_2 ratio of 6.77. Some bauxite for the plant was also mined in western Anatolia, on the Aegean coast, near Mugla. Turkey reportedly possessed almost 2% of the world's reserves of bauxite, with substantial resources at Milas in Mugla Province and in the central Taurus region, near Seydisehir, which remain unexploited. Bauxite production that was not utilized at the Seydisehir complex was exported, primarily to Romania.

The Seydisehir complex and both bauxite mines were owned entirely by Etibank. The complex was built in 1973 with a $200 million loan and technical support from the Soviet Union. Production from the mine and smelter increased rapidly in the first years of operation but tumbled in 1978-80, when it operated at just above 50% capacity. The rapid decline was due to frequent power shortages at the mine and smelter caused by the lack of fuel around the country. In 1980, only two of the four potlines were able to operate on the available power. Stabilization of the economy and political scene combined with strictly enforced labor regulations led to a slight

increase in production in 1981. Turkey was negotiating with the Soviet Union in 1981 to obtain financing for expansion of Seydisehir's aluminum refining capacity to 120,000 tons per year. No agreements were signed, however, by the end of the year.

As part of the Government's efforts to attract foreign capital into the country, Etibank invited several companies to consider becoming a joint-venture partner in the country's second aluminum complex. The plant was to be located at Milas in Mugla Province on the Aegean Sea. Resources at Mugla were estimated at 28 million tons of diaspore, containing 58% Al_2O_3 and 6% to 7% SiO_2. The plant at Mugla was to produce 250,000 tons per year of alumina and 120,000 tons per year of primary aluminum. Total cost of the project was estimated at about $830 million. The foreign partner of the project would be allowed to own between 10% and 49% of the equity of the plant and was also expected to provide some direct financing as well as securing necessary loans for the foreign debt capital portion of the project. No partner had been selected by yearend 1981.

Antimony.—Antimony production remained stable in 1981, with over 27,000 tons of ore produced, yielding about 3,300 tons of concentrate containing 2,150 tons of antimony metal. Antimony was produced mainly by Ozdemir Antimuan Madenleri Ltd. Sti. from the Turhal Mine near Tokat in central Anatolia Province. Reserves at Tokat were estimated at 350,000 tons containing 12% to 14% antimony. Other small producers of antimony were Usak Mermer Sanayi ve Madencilik AS, which produced 1,000 tons per year of ore from a mine in Kutahya Province, and Ahmet UZ., which mined antimony ore from a small mine near Balikesir. Reserves at Balikesir were estimated at 300,000 tons containing 5% to 6% antimony. Reserve tonnage levels at Kutahya were not available, but the ore grade was also in the range of 5% to 7% antimony. Turkey's large reserves and current low output suggests that if demand and prices were to rise, output, especially from the Turhal Mine, could increase significantly.

Chromite.—Production of chrome ore remained at about the same level as in 1980, and Turkey held its position as the fifth largest producer of chromite in the world, supplying about 4% of the world's chromite.

Chromite deposits were widespread in Turkey, having been located in 40 of the country's 67 provinces. The major deposits were in the Provinces of Elazig in central Turkey, Bursa in northwest Turkey near the Sea of Marmara, and Mugla in southwest Turkey, with other deposits located at Eskisehir, Kutahya, and Kayseri. The chromite deposits in Turkey have been grouped into three geologic provinces. The northern Alpine ores are of the massive type and occur as small lens-shaped ore bodies with their axes parallel to the trend of the Pontus Mountains in northern Turkey. The southern Alpine province, which contains the deposits at Elazig, occur as elongated lenticular bodies that extend mostly in an east-west direction. The lenses commonly reach a depth of 120 to 150 meters and may be 100 to 300 meters in length. The third province has been termed the Middle Chrome province and is located around Kutahya and Bursa. The ore in this province occurs as banded zones, pipes, or lenses, extending to greater depths than the other two types. The Dagardi and Kavak Mines in Kutahya Province were examples of this type of deposit.

Chromite mining was carried out by many companies, the largest of which was Etibank, the state-run mining enterprise. Etibank was responsible for over one-half of the country's output of chrome ore, with a total production capacity of over 300,000 tons per year. Etibank operated mines in Mugla, Elazig, and Bursa Provinces, the largest of which were in the Guleman district in Elazig. Output from Guleman and the nearby Kefdag and Soridag Mines was fed to two concentrators at Elazig. The Sori concentrator had a capacity of 30,000 tons per year of 44% to 48% Cr_2O_3. The Kefdag concentrator treated low-grade disseminated ore from the Mount Kef region. The ore grade from the Kefdag concentrator was below expectations at about 42% Cr_2O_3, but Etibank was working on improving the grade.

Etibank's other concentrator was located at Karagedik, in Mugla Province. Output from the Uckopru, Karagedik, and Goeck Mines was processed at the Karagedik concentrator, which produced approximately 50,000 tons per year of 44% to 48% Cr_2O_3. Several other mines and a concentrator at Mugla were operated by Turk Maadin Sirketi AS, a subsidiary of Metallurg, Inc., of New York. Turk Maadin also operated the Kavak Mine and concentrator near Bursa, in Kutahya Province. Two other

small concentrators were operated by Turkish companies in the Bursa region, bringing to seven the total number of concentrators operating in the country. Chrome ore was also mined by many small one-person operations, who generally transported the ore by truck to large ports, where it was sold to exporters.

In a related development, the Mineral Research and Exploration Institute of Turkey (MTA) announced the discovery of large reserves of low-grade chromite in the Karsanti region in Adana. The initial estimate indicated at least 4 million tons of 7% chromite, but other estimates went as high as 30 million tons. Samples from the Karsanti region were being studied at MTA laboratories.

Ferrochrome.—Etibank was responsible for all ferrochrome production in the country from its two plants at Antalya and Elazig. At the Antalya Ferrochrome Works, approximately 10,000 tons of low-carbon ferrochrome was produced annually. In 1981, Etibank converted an old calcium carbide furnace into a ferrosilicon production unit, utilizing power from the regular hydroelectric supply. Production capacity at the new unit was quoted at 5,000 tons per year of FeSi with 2% carbon. The particles came in various sizes and weighed a maximum of 25 kilograms. Total capacity of the unit was equal to about one-half of Turkey's annual consumption. In an effort to encourage local consumers to purchase Etibank's FeSi, on January 10, 1981, the Turkish Government imposed a stiff tariff on imported FeSi, equivalent to almost one-fourth of the selling price of imported FeSi.

Etibank's Elazig Ferrochrome Works produced an average of 23,000 tons of high-carbon ferrochrome in 1981. Capacity of the plant, which came onstream in 1977, was 50,000 tons per year, but production has never reached the expected level. Etibank planned to expand the Elazig works to 100,000 tons per year of high-carbon ferrochrome by 1985. The expansion program, valued at $33 million, was to be undertaken by Elkem AS of Norway, providing engineering services, and Outokumpu Oy of Finland, providing process technology. Nearly two-thirds of all chromite produced in Turkey was used for the production of ferrochrome, and almost all of this production was exported. Chrome ore not used in the production of ferrochrome was usually exported as concentrate.

Copper.—Turkey's copper industry continued to experience difficulties in 1981, with production of blister copper rising by 71% but remaining below 50% of the industry's capacity. Copper was mined in three provinces in Turkey, Murgul, Kure, and Ergani, but two new deposits at Siirt Madenkoy and Rize-Cayeli were being considered for exploitation. Two companies, Etibank and Karadeniz Bakir Isletmeleri (KBI), owned 49% by Etibank, were responsible for all of the country's production of ore, concentrate, blister copper, and pyrite. Most of the refined copper was produced by private companies in and around Istanbul.

At Murgul, two open pit mines were operated by KBI, with a combined capacity of 1.2 million tons per year of 1.2% copper ore. Two concentrators were in operation at Murgul. Etibank operated a concentrator that was designed to produce 30,000 tons per year of 18% copper and 18,000 tons per year of pyrite from an annual input of 400,000 tons of ore. The KBI concentrator was designed to handle 600,000 tons per year of ore in the production of 60,000 tons of copper concentrates and 20,000 tons per year of pyrite. Output from Etibank's concentrators was delivered to Etibank's smelter at Murgul, which was designed to produce 12,000 tons per year of blister copper. Actual production in 1981 was below 8,000 tons. From Murgul, the blister was trucked to Istanbul for refining. Output from the KBI concentrator at Murgul and pyrite from Etibank's concentrator were pipelined in slurry form to Hopa, 60 kilometers north of Murgul. At Hopa, copper and pyrite were concentrated, and some of the concentrate was exported. The remaining concentrates were shipped to the KBI smelter at Samsun, for production of blister copper and byproduct sulfuric acid.

The Samsun smelter was part of the KBI Black Sea Copper Works, located in the Kure district on the coast of the Black Sea in northern Turkey. At Kure, both Etibank and KBI operated mines. Etibank's Kure Cuprous Pyrite Works consisted of the 1-million-ton-per-year open pit Asikoy Mine and a concentrator. The KBI operation consisted of the Bakibaba underground mine at Kure, also with a 1-million-ton-per-year capacity, and a concentrator and smelter located at Samsun. Output from Kure was run through Etibank's concentrator and then transported to Samsun. Etibank, with the assistance of Outokumpu Oy of Finland, was expanding mining operations at Kure in 1981. The project involved

expansion of the open pit mine, the start of underground operations, and the construction of a new concentrator. Capacity of the expanded works was to be 1.1 million tons per year of ore, yielding 100,000 tons per year of copper concentrates and 500,000 tons per year of pyrite concentrate. The KBI Samsun smelter, built in 1976, had a production capacity of 40,000 tons per year of blister copper. Output from Murgul and Hopa, as well as Kure ore, was to be used in the Samsun smelter. The Black Sea Copper Works has been unable to reach even one-half capacity since starting production, however, owing to technical problems, lack of spare parts, and labor disruptions. The smelter was built by McKee Overseas Corp., United States, with financing from the U.S. Agency for International Development (AID). With Turkey's foreign exchange earnings limited over the past several years, maintaining U.S. equipment with spare parts has made continuous operation of the smelter difficult. The Samsun smelter produced approximately 7,000 tons of blister copper in 1981, representing less than 20% capacity utilization. From Samsun, blister copper was shipped to Istanbul for refining.

At Ergani in eastern Turkey, Etibank operated an integrated copper complex consisting of a 1-million-ton-per-year mining operation, a concentrator, and a smelter. Production capacity of the Ergani concentrator was 70,000 tons per year of 14% copper concentrates, which was in turn fed to a 25,000-ton-per-year smelter. Output from the Ergani smelter was about 50% of its rated capacity in 1981. Reserves at Ergani were estimated at 20 million tons of copper-pyrite ore.

Late in 1981, Etibank announced that it was seeking foreign partners to develop two copper mining projects for which it did not have sufficient development capital. Foreign participation in the projects would represent the first private sector share in Turkey's copper industry since the majority share in KBI was nationalized in 1977. The first project was a mine to be located at Cayeli, near Trabzon on the Black Sea coast. The project was to produce 62,000 tons per year of 23% copper concentrates and a lesser amount of zinc. Etibank planned to begin construction of a pilot plant in 1982. Reserves at Cayeli were estimated at 25 million tons of copper-pyrite ore. The second project involved a mine and concentrating plant to be located at Siirt Madenkoy, in eastern Turkey. This plant was to produce about 64,000 tons per year of copper concentrates, but the whole project was still in the feasibility study stage. Reserves at Madenkoy were estimated at 15 million tons of copper ore. Fenni-Gamma, a Turkish company that owned the Cayeli deposit before Etibank took over, was investigating the possibility of mining the deposit. Fenni-Gamma was seeking both a foreign partner to start development and financial assistance from AID. Phelps Dodge Corp., United States, was also considering involvement in the project, but no definite plans were made by yearend 1981.

Iron Ore.—Production of iron ore in Turkey increased slightly in 1981 to 2.67 million tons from 2.58 million tons in 1980. Nearly 2 million tons of this output was supplied by the Divrigi Mine in central Turkey, at Sivas, Malataya. The remaining 0.5 million tons of ore was supplied by several different mines around the country. These smaller mines were nationalized in 1978 and brought under the control of the state-owned Turkish Iron and Steel Works (Turkiye Demir ve Celik Isletmeleri). Up until 1978, these mines provided between 40% and 60% of the country's iron ore output. Following nationalization, iron ore production tumbled from a high of 3.6 million tons in 1976 to below 2.6 million tons in 1980. To restore output to its previous level, the Government was preparing a bill to present to the Consultative Assembly authorizing the return of the mines to their former private sector owners. Turkey continued to import over 500,000 tons per year of iron ore, mostly from Brazil.

Government plans to develop the Hasancelebi iron ore deposit were shelved in 1981, owing to both technical and economic problems. Hasancelebi, located southwest of Divrigi, contained an estimated 300 million tons of low-grade, 15% to 30%, magnetite ore. It was determined that, because the ore grade was too low to be used as direct charge and substantial concentration would be required before converting it to pellet or sinter feed, the project was uneconomic.

Iron and Steel.—The production of iron and crude steel in Turkey declined slightly in 1981, from a high of over 2.5 million tons in 1980 to 2.4 million tons in 1981. The iron and steel industry in Turkey consisted of three large steel plants, all operated by the state-owned Turkiye Demir ve Celik Isletmeleri, seven smaller private producers, and several fabricating companies. The

three large Government steelworks were located at Karabuk, Iskenderun, and Eregli.

The largest of the three plants, and also the most profitable, was the Eregli Demir ve Celik Febrikalari T.A.S. (Eregli Iron and Steel Works Association). Eregli was the only state steel plant that had a minority share of private sector partners, including the Ankara Chamber of Commerce, Sumerbank, and others. The plant was originally established in 1960 with an 800,000 ton per year steelmaking capacity. In 1973, Nippon Kokan (Japan) expanded capacity of the plant to 1.8 million tons per year through the addition of a new blast furnace. Eregli had the highest level of capacity utilization in the Turkish steel industry from 1976 to 1981. In 1981, production from Eregli was 50% greater than in 1980, totaling well over 1 million tons.

The other two steel plants, located at Iskenderun and Karabuk, were owned entirely by the Government. The Iskenderun plant, located on the Mediterranean coast near the Syrian border, was originally built by the Soviet Union in 1970 and has experienced serious operating problems since it opened. These difficulties were caused mostly by poor management, shortages of electricity, and a work force 80% larger than was necessary for the plant to operate. In 1981, Iskenderun operated at less than 35% of design capacity. Following a series of on-again, off-again negotiations, the U.S.S.R. appeared ready to assist Turkey in expanding the capacity of the plant from the current level of 1 million tons to 2.2 million tons per year of raw steel. The expansion program was to have been carried out in 1980, but the economic crisis in Turkey and the ambivalence of the Soviets delayed implementation of the project. No date was set for completion of the expansion work.

The country's third steelworks, at Karabuk, was also preparing a modernization program in 1981. In June 1981, the World Bank provided a $70 million loan to expand and modernize Karabuk along with other industrial projects in Turkey. Romania was to supply the technical knowledge to modernize the coke ovens and replace the sinter plant and rolling mills. Capacity at Karabuk was to be raised from 600,000 to 1 million tons per year of raw steel.

In the private sector, a new specialty steel plant came onstream near the end of 1980. The plant, Asil Celik Sanayi ve Ticaret AS, was located in Orhangazi, 160 kilometers southeast of Istanbul, near the two largest automobile factories in Turkey. The plant was established by Turkey's Koc Holdings (22%), Turkiye Is Bankasi (17%), Celik Industrisi (12%), Turkiye Sinai Kalkinma Bankasi (10%), International Finance Corp. (10%), and private investors (29%). It was designed to produce 85,000 tons per year of specialty steel products aimed primarily for producing cars, tractors, and other transport machinery. The plan was to add two 45-ton electric arc furnaces in 1982.

Other large private sector steel producers in Turkey were Colakoglu Metalurji AS in Istanbul (350,000 tons per year), Metas Izmir Metalurji Fabrikasi T.A.S. in Izmir (260,000 tons per year), Istanbul Celik ve Demir Izabe Sanayii AS in Istanbul (27,000 tons per year), Elektro Metal Sanayii AS in Istanbul (30,000 tons per year), Izmir Demir Celik Sanayii AS in Izmir (600,000 tons per year), and MKEK Celik Fabrikasi in Kirikkale (20,000 tons per year).

MKEK, the Turkish Government's engineering and chemical enterprise, was nearing an agreement with the Soviet Union for the establishment of a 300,000-ton-per-year specialty steelworks at Foca. The project was originally put out to tender in 1977, but no satisfactory bids were received. In September 1980, the U.S.S.R. signed a preliminary agreement with MKEK to build the plant, and a final go-ahead was expected early in 1982.

The Turkish Government's plan to build a fourth steelworks was temporarily shelved in 1981, owing to the world steel crisis and lack of available financing. The plant, which was to be located at Sivas in eastern Anatolia, was originally intended to produce 2 million tons per year of steel utilizing domestic iron ore and coal. The plan was shelved on the advice of the World Bank, which was assisting in sorting out Turkey's financial problems.

Lead and Zinc.—The primary producers of lead and zinc ore in Turkey were Etibank and Cinko-Kursun Metal Sanayi AS (Cinkur), which was owned 47% by Etibank. At Keban near Elazig in central Anatolia, Etibank operated the Keban Lead and Zinc Works, which produced about 50,000 tons per year of lead and zinc ore, averaging 4.0% lead and 4.5% zinc. Annual output from the concentrator averaged 4,000 tons of 50% lead and 4,000 tons of 41% zinc.

Cinkur operated the only lead-zinc smelter in Turkey, located at Kayseri in central Anatolia. Cinkur operated several mines in the Zamanti area, which produced an aver-

age of 80,000 tons per year of lead-zinc ore. The Zamanti ore was concentrated and fed to the smelter, which had an annual capacity of 40,000 tons of electrolytic zinc, 6,000 tons of lead, and 150 tons of cadmium. In 1981, the Cinkur plant produced 6,000 tons of refined lead and 15,000 tons of zinc slab.

Several other smaller companies were actively mining lead and zinc deposits in the Biga Peninsula, encompassing the Provinces of Balikesir and Canakkale south of the Sea of Marmara in eastern Turkey. The Biga Peninsula contained over 200 known lead-zinc and lead-zinc-copper deposits, most of which were claimed in 100 mining or prospecting concessions. In Canakkale, Canakkale Madencelik Ltd. operated a 10,000-ton-per-year concentrator, treating lead and zinc sulfide ore from its Karundere Mine. At Balya, in Balikesir, Turker Izabe ve Rafina Sanayii AS operated two 60-ton-per-day concentrators, utilizing ore from the company's Handeresi and Halilar Mines. Also in Balikesir, Bayramoglu Madencelik ve Flutasyon Tesisi operated an 80-ton-per-day concentrator. Tailings from this company's Papazlik Mine and also from the Bayla Mines were treated by Etibank at Keban to obtain a concentrate containing 40% lead and 18% zinc. At Dursunbey in Balikesir, Andolu Maden Adi Komandit Sti. brought onstream a 60,000-ton-per-year concentrating plant. The unit treated ore from the company's Alacam Mine, where both open pit and underground operations were in progress. Also planning new operations in the Biga Peninsula were Balkesir Ararat Madencelik ve Ticaret and the Galena Mining Co., both of which owned concessions in the area.

Mercury.—Production of mercury in Turkey continued to decline in 1981, owing mainly to the depressed state of world demand. Mercury production, which dates back nearly 8,000 years, has declined steadily from a high of over 10,000 76-pound flasks in 1971 to below 4,500 76-pound flasks in 1980 and 1981. Cinnabar was mined from three main districts around Konya, Karaburun, and Aydin in southwestern Turkey. Output from these mines was delivered to two smelters, both owned by Etibank, at Halikoy and Sarayonu. Both smelters produced better than 99.99% mercury. Production capacity at Halikoy was 120 tons per year, and at Sarayonu, 80 tons per year. With demand for mercury low, some of the smelting facilities at Halikoy were converted to antimony smelting.

Tungsten.—Production of tungsten from Turkey's Uludag tungsten mine increased slightly in 1981, owing primarily to more efficient operation of the concentrating plant. The mine was located near the summit of Uludag Mountain, 42 kilometers from the town of Bursa, in northwestern Turkey. The deposit contains approximately 9.4 million tons of proven reserves and 4.9 million tons of probable reserves of both wolframite, (Fe, Mn) WO_4, and scheelite ($CaWO_4$), with an average WO_3 content of 0.5%. Mining at Uludag was by both open pit and underground methods, but the pit was closed from autumn through spring, usually about 7 months out of the year, because of poor weather and heavy snowfalls. Primary output of the mine was scheelite. Ore production in 1981 was estimated at 300,000 tons, two-thirds of which came from underground. Mining operations at the open pit were being carried out by private companies under seasonal contract from Etibank, which operated the underground mine, but Etibank planned to take over all mining operations in the near future.

The concentrator at Uludag was originally designed to treat 550,000 tons per year of both scheelite and wolframite ore, utilizing dry grinding and magnetic separation techniques for the scheelite and wet grinding and magnetic separation for the wolframite ore. The dry concentrating circuit, designed to treat 1,000 tons per day, had not come into full operation, owing to equipment problems and inadequate feed from the open pit mine. The wet grinding circuit and concentrator was being used above its rated capacity to handle both types of ore until the scheelite system could be redesigned. The flowsheet also included a flotation section following magnetic separation. The flotation section yielded a rich concentrate containing over 60% WO_3, while low-grade concentrate (20% WO_3) was obtained from the magnetic separation units. Average recovery from the entire operation was about 50%. A pilot project utilizing an "all-flotation" flowsheet design was completed in 1981, and studies were in progress to determine the feasibility of using this design to process all the Uludag ore.

NONMETALS

Barite.—Production of barite continued to expand in 1981, fueled by increased demand for high-density drilling muds from the petroleum industry. Total reserves in

Turkey were estimated at over 10 million tons in 1976, but several new discoveries since then have raised that estimate considerably. In 1976, the Government of Turkey placed a ban on the export of raw barite to increase the value of exports by forcing producers to install grinding equipment. Since 1976, grinding capacity in Turkey has risen to about 500,000 tons per year. About 90% to 95% of Turkey's barite production was exported, mostly to the U.S.S.R. and other neighboring countries. Up until about 1976, all barite was produced by private sector companies. Since that time, Etibank, the state-owned mining and minerals concern, has gradually taken a larger share of the industry. In 1980, public sector production accounted for about 60% of total output. The major barite-producing companies and their mine and grinding capacities are shown in the following table.

Company	Location, mine(s), mill(s)	Mine capacity (tons per year)	Grinding capacity (tons per year)
Bastas Barytes Industry and Trading Co. Inc.	Alanya-Sarikaraagac, Trabzon, Antalya.	150,000	120,000
Etibank	Beysehir	100,000	100,000
Barit Maden Turk AS	Marash, Adana	50,000	70,000
Polbar Baryte Industries AS	Alanya	40,000	50,000
Bager Maden Sanayive Ticaret AS	Sarikaraagac	60,000	80,000
Kimya Tesisleri Sanayi ve Ticaret AS	Silifke, Kutahya, Yarimca, Kocaeli.	30,000	100,000
Emas Industrial Minerals AS	Mas	60,000	60,000
Dolsan Dolgu Maddeleri Sanayi Kollektif Sirketi	Antalya, Eskisehir	40,000	10,000
Dunmus Yaser ve Ogullari	Beysehir	10,000	10,000
Kale Madencilik	Icel	1,000	--
Egemetal Madencilik	Mersin	1,000	--

Most of Turkey's barite deposits were located around the Sarkikaraagac, Alanya, Maras, and Konya regions. Bastas Barytes, the largest barite producer in the country, owned large deposits in Sarkikaraagac and Alanya but produced most of its raw material from a mine near Trabzon. Bastas and Kimya Tesisleri (Kimtes) both ground barites for other small producers in the country in addition to processing their own output. Although most of the barite producers in Turkey were primarily export oriented, Dolson Dolgu produced ground minerals, including barite, for Turkey's domestic market. Domestic consumption of barite averaged about 5,000 to 10,000 tons per year.

The Central Anatolian Directorate of Mining Research and Exploration announced late in 1981 that rich barite deposits had been found in the Karaman district near Konya. Tests were being conducted to determine the level of reserves and quality of the deposit. Once the tests were completed, the Government indicated it would begin exploiting the deposit.

Boron.—Production of boron minerals in Turkey increased substantially in 1981, to over 1.7 million tons from 1.2 million tons the year before. All boron output from Turkey has been produced by Etibank since 1979, when the Government nationalized all boron, lignite, and iron ore mines. Following nationalization, boron production tumbled to about 900,000 tons, and most of that was material already in accumulated stocks of the former private owners. Contrary to the Government's expectation of increasing output from the mines, Etibank produced almost no boron for the 10 months following nationalization. In 1980, Etibank was able to increase its efficiency and produce over 1 million tons, but this was still less than the mines had produced under private sector ownership. However, boron production improved substantially in 1981, reaching its highest level ever. Etibank devoted a large percentage of its resources and management skills to improving the production levels of most boron mines. This effort was designed to both prove its point that the mines had been inefficiently managed prior to nationalization and, more importantly, to generate much needed foreign exchange from boron exports. Boron mineral exports generated approximately $100 million in receipts for the Turkish Government in 1981, up nearly 40% from the 1980 level. Turkish borates were exported mainly to Western Europe, the United States, and Japan.

Turkey possessed reserves of boron minerals estimated at 490 million tons, most of which was high-quality 27% B_2O_3. This represents about 70% of the world's total reserves, with the remainder located in China and the United States. Turkey was the second largest producer of boron minerals in the world, producing about 36% of the world's total output. The United States was the world's largest producer, with about 56% of the world total.

In Turkey, Etibank mined boron from three major deposits, at Bigadic, Kirka, and Emet, all in northwest Turkey. In Bigadic, Etibank operated a 150,000-ton-per-year open pit colemanite and ulexite mine and a recently completed 150,000-ton-per-year concentrator. Output from Bigadic was either exported as concentrate and crude ore or delivered to the Bandirma facility for processing. In Emet, Etibank operated the Emet Colemanite Works, which consisted of both underground and open pit colemanite mines and a 450,000-ton-per-year concentrator. Output from the concentrator in 1981 was 400,000 tons at 40% to 47% B_2O_3. In Kirka, Etibank produced tincal at a rate of about 400,000 tons per year. In 1980, Etibank brought onstream a chemical complex at Kirka, designed to produce 180,000 tons per year of crude borax pentahydrate, 60,000 tons per year of refined anhydrous borax, and 6,000 tons per year of refined borax decahydrate. The complex was unable to operate near its rated capacity during the year and produced only a limited quantity of boron compounds.

Most of Turkey's domestically refined boron was produced at Etibank's Bandirma borax and acid plant, located on the Sea of Marmara in northwest Turkey. Annual capacity of the plant was 55,000 tons of borax decahydrate, 35,000 tons of borax pentahydrate, 25,000 tons of boric acid, 20,000 tons of sodium perborate, and 120,000 tons of sulfuric acid. Several new units were to be added to the complex over the next few years, including a 100,000-ton-per-year boric acid plant under construction by a French firm, to be completed in 1982, and a 20,000-ton-per-year hydrogen peroxide plant under construction by a Soviet company, scheduled for completion in 1985. Etibank was also planning to build a 100,000-ton-per-year borax plant in Eskisehir, to be completed in 1982. Crude and refined borates were exported mainly from the Port of Bandirma.

Cement.—Production capacity of Turkey's cement industry stood at 19.5 million tons at the end of 1981 and was scheduled to reach 22 million by the end of 1982. There were 35 operating cement factories in Turkey, 16 of which were run by the public sector, and 19, by the private sector. The public sector plants, operated by Turkiye Cimento Sanayii T.A.S. (Cisan), were mostly of relatively small size, producing between 100,000 and 500,000 tons per year of cement. The private sector plants generally had a productive capacity of 500,000 tons per year or more. The cement industry in Turkey has been in a severe slump since 1979, owing to a nearly stagnant construction industry and shortages of fuel. Cement production recovered somewhat in 1981, reaching a high of 15 million tons, while domestic demand increased only slightly, to about 13 million tons from 12 million tons in 1980. The remaining 2 million tons was exported, bringing in revenues of about $95 million.

There were five new plants under construction in Turkey in 1981, all by the public sector. The location of the new plants and their annual capacities were as follows: Samsun, 620,000 tons; Adiyaman, 610,000 tons; Diyarbakir, 610,000 tons; Siirt, 620,000 tons; and Urfa, 1 million tons of cement. All but the Urfa plant were to come into operation in 1982. Urfa was not scheduled to start production until 1984. There were no immediate expansion plans for privately owned cement plants in Turkey.

Emery.—Turkey's production of fine-grained emery increased slightly to about 44,000 tons per year in 1981. Production of emery has declined from a high of over 150,000 tons in 1973 to the current level. Most of the decline has come from the private sector operations, which produced 144,000 tons in 1974. Output has declined every year since then to the 1981 level of about 36,000 tons. Production from the public sector, carried out by Etibank, has been irregular, fluctuating between 2,000 and 10,000 tons per year from 1974 onward. Etibank's production in 1981 averaged 8,000 tons. The largest private sector producer of emery was Lutfullah E. Kitapci Mineral Co. Ltd., with a productive capacity of 70,000 tons per year from several small mines in the vicinity of Mugla. Etibank's share of emery production was derived from the Milas Mine in western Anatolia. Production capacity at the mine was 30,000 tons per year of raw emery.

Turkey produced about 60% of the world's output of emery. Most of the materi-

al was produced and exported mainly for use in abrasives in raw form, with very little processing carried out within the country. About 5,000 tons of emery powder and abrasives was exported in 1981, compared with about 34,000 tons of raw emery. Most of the output was dried, ground, bagged, and exported as unprocessed emery. Exports were delivered mainly to France, the United Kingdom, the Netherlands, and the Federal Republic of Germany.

Fertilizer Materials.—The Turkish fertilizer industry was able to achieve a dramatic increase in production in 1981, with total nitrogen content in fertilizers reaching 672,000 tons, nearly double the 1980 level. Consumption of nitrogen fertilizers in 1981 was about 810,000 tons, compared with 685,000 tons the previous year, both of which were lower than the 1979 figure of 852,000 tons. The decline in consumption was primarily a result of the higher costs. A combination of reduced Government subsidies on fertilizer and high interest rates caused farmers to cut back on purchases of fertilizer of all types. Consumption of diammonium phosphate (DAP) was lower in 1981, at 97,200 tons contained nitrogen (N), compared with 110,000 tons in 1980. Production of DAP rose from 16,800 tons N in 1980 to 57,300 tons in 1981.

This high production level of all types of fertilizer meant a substantial reduction in imports, the cost of which had been a severe drain on the Turkish economy. Imports of all types of fertilizers were 330,000 tons N in 1981, compared with 450,000 tons N in 1980. Imports of urea declined from 121,000 tons N in 1980 to just 14,000 tons N in 1981.

The dramatic turnaround in the Turkish fertilizer industry was a result of the implementation of the Fertilizer Rationalization and Energy Saving Project, which was started early in 1980 and, by the end of 1981, was reaching its second phase. The project involved a large-scale restructuring of the whole fertilizer sector in an effort to eliminate the shortages of feedstock, electricity, raw materials, and spare parts and improve the efficiency of all plants. The Turkish Government received a $110 million loan from the World Bank to finance the foreign exchange requirement of the reorganization. A further $60 million loan from the World Bank was applied for late in the year to finance the second phase. The entire revitalization program was to be completed by 1986.

The project called for plant modifications and additions, an increase in capacity utilization, improvements in energy efficiency, and a reduction in pollution across the whole industry. The first phase involved modernization of the Bandirma Gubre Fabrikalari plant at Bandirma on the Sea of Marmara in northwest Turkey. The original facilities at Bandirma consisted of a triple superphosphate plant, a 495,000-ton-per-year sulfuric acid unit, a 150,000-ton-per-year DAP unit, and a 40,000-ton-per-year nitrogen ammonium sulfate plant. Three new units were commissioned in 1981: a 145,000-ton-per-year phosphoric acid plant, a 15,000-ton-per-year DAP plant, and a 150,000-ton-per-year complex fertilizer unit.

Four other fertilizer plants were undergoing similar expansions. Gubre Fabrikalari at Iskederun planned to rehabilitate its sulfuric acid and phosphoric acid plants and add a 240,000-ton-per-year DAP plant and a new ammonium sulfate unit. Akdeniz Gubre Sanayii, which operated phosphoric acid and sulfuric acid production units at a complex in Mersin, was planning to add a 450-ton-per-day DAP unit and a 600-ton-per-day ammonium sulfate plant. Also, E.G.E. Gubre was modernizing its 350,000-ton-per-year compound fertilizer plant at Foca, and KBI, the copper company, was planning to refurbish its sulfuric acid facility at Samsun. Azot Sanayii's fertilizer plant at Samsun was also to be restructured. The complex consisted of a DAP plant and a pyrite-based sulfuric acid unit and had the capacity for both phosphoric acid and triple superphosphate production. Azot Sanayii's other lignite-based ammonia units at Kutayah, originally built in 1962, were also to be modernized. Istanbul Gubre Sanayii's plant at Izmit and Gubre Sanayii's monoammonium phosphate plant at Yarimca were also being expanded. Finally, the Toras Chemical and Fertilizer Industry Co. brought onstream a 330,000-ton-per-year monoammonium phosphate plant at Ceyhan in southern Turkey in 1981.

This almost total revamping of the industry resulted in the production of nearly 10 million tons of fertilizer materials in 1981, exceeding the Government's production target by 2%. Most of the modernization programs included construction of ancillary facilities, such as storage tanks, to prevent shortages of raw materials and feedstock.

Phosphate.—With the rest of the fertilizer industry expanding fairly rapidly, production of phosphate rock also increased in

1981. Etibank was the only producer of phosphate rock in the country from its Mazidag deposit in southeast Turkey. Reserves at Mazidag were fairly extensive, estimated at 410 million tons containing 10% to 25% P_2O_5. Operating capacity at the mine was 250,000 tons per year of phosphate rock, but Etibank was only able to produce about 100,000 tons of phosphate rock in 1981. Consumption of phosphate rock has risen sharply over the past several years, from about 650,000 tons in 1978 to about 1.2 million tons in 1981. Turkey imported nearly all of this domestic requirement in 1981. Phosphate rock was supplied by Jordan, 36%; Morocco, 30%; Tunisia, 18%; Israel, 7%; Togo, 5%; and Taiba, 4%. Imports of phosphate rock, Turkey's largest and costliest mineral import, were valued at over $30 million in 1981.

Magnesite.—Production of magnesite increased substantially in 1981, to about 880,000 tons of crude ore. About 90% of this production was supplied by four companies from deposits in the Kutayah, Konya, and Eskisehir districts. Kutayah Manyezit Isletmeleri (Kumas), Manyezit AS, and Sumerbank all produced dead-burnt magnesite, and Continental Madencilik Sanayii ve Ticaret (Comag) produced caustic-calcined magnesite.

Manyezit AS operated mines in the area between Kutayah and Eskisehir and was capable of producing 60,000 tons per year of dead-burnt magnesite, but output was well below that level. Manyezit, a subsidiary of Veitscher Magnesitwerke AG of Austria, exported most of its production to Austria. Sumerbank produced both dead-burnt magnesite and refractory bricks from its operation near Konya. The brick plant had a capacity of 26,500 tons per year of chrome-magnesite-type refractory bricks from a total sinter-magnesite capacity of 40,000 tons per year. Kumas was the country's largest producer of magnesite from its mines and facilities located near Kutayah. The company was in the process of adding a 31,000-ton-per-year brick plant to its three mines, and ore preparation and dead-burning facilities to further integrate the operation. As part of the integration plan, new machinery was to be added to the mines, the ore preparation facilities were to be modernized, and dead-burning capacity was to be increased. The expansion program was to be completed by 1983.

Comag was the country's largest producer of caustic-calcined magnesite. Ore was mined in two areas, Tavsanli and Kumbet, and calcining plants were located adjacent to both mines. Raw material for the Kumbet plant was high-grade magnesite, low in silica and iron. The calcining plant was able to produce a high-quality product, suitable for use in electrofused magnesia products.

Perlite.—Perlite production remained at about the 26,000-ton-per-year level in 1981. Etibank and Zihni International Trade and Marketing were the major producers, but Etibank operated the largest grinding and expansion plant, at Cumaovasi, Izmir. Etibank began operating the facility in 1975. Annual production capacity from the plant was about 140,000 tons of processed perlite and 50,000 to 60,000 cubic meters of expanded perlite. Raw material for the processing plant was supplied from two mines, one adjacent to the plant and one several kilometers away at Minassa. Reserves at the Cumaovasi deposit were placed at 4.5 million tons measured and another 5.6 million tons indicated. Perlite from the Minassa deposit had significantly better expansion characteristics than Cumaovasi ore. Reserves at Minassa were estimated at about 7 million tons, 3.4 million tons of which were measured.

Zihni International, a Turkish shipping, trading, and mining company, operated an open pit mine near Izmir, with a capacity of 50,000 tons of perlite ore per year. Zihni recently bought the majority of equity shares in Ege Perlit to obtain ownership of its small perlite expansion plant. Pabalk Ticaret Ltd. also operated a perlite expansion plant. Other producers of perlite, all with a capacity of 10,000 tons per year or less, were Izmir Perlite Mining and Industry Ltd., Anadolu Per-Mer Madencilik Sanayii ve Ticaret Ltd. Sti., and Durun Urun. Most of Turkey's production of perlite was used in construction materials and sold on the local market. Turkey hoped to market some of its unexpanded perlite overseas in the near future.

MINERAL FUELS

In 1981, Turkey's energy situation improved considerably, although temporary power interruptions and cutbacks were still necessary in some cases. The country's current installed electric generating capacity was 5,553 megawatts, 3,182 megawatts of which were produced by thermal (oil and coal) powerplants, and 2,351 megawatts by hydroelectric plants. About 35% of the thermal plant electricity was supplied by oil-

fired furnaces, and 65% from coal, mostly lignite. Production of electricity stood at 23 billion kilowatt-hours in 1980 and rose to 25 billion kilowatt-hours in 1981. Turkey's gross electrical energy demand stood at 27.3 billion kilowatt-hours in 1981, which led to the importation from the Soviet Union and Bulgaria of 1.89 billion kilowatt-hours of electricity. About 83.4% of Turkey's domestically produced electrical energy was supplied by the Turkish Electricity Authority (TEK), which was operated by the Government. The remainder was supplied by other domestic organizations.

Turkey's difficulties with imported oil convinced the Government that the best answer to the energy problem was to utilize the country's huge reserves of lignite to produce power. Increasing coal production capacity and building coal-fired thermal powerplants were given top priority by the Government. Of the 21 thermal powerplants that were to be completed by 1986, 1 was to use natural gas, 1 was to use diesel fuel, 1, hard coal, and the remaining 17, lignite. All these projects operating at full capacity were to provide Turkey with another 16.7 billion kilowatt-hours of electricity beyond the current level of 25 billion kilowatt-hours. Many of the planned projects have yet to be initiated, and attaining this production target seemed unlikely given the shaky state of Turkey's finances. Some projects have nearly been completed, however, and significant increases in electricity production did seem likely over the next several years.

Coal.—Turkey possessed significant reserves of both hard coal and lignite. Hard-coal reserves were estimated at 1.26 billion tons, and lignite reserves were estimated at about 7 billion tons. Production of both types increased in 1981, from 3.7 million tons of hard coal in 1980 to 7.6 million tons in 1981, and from 12.7 million tons of lignite in 1980 to over 18 million tons in 1981. TKI was the sole producer of hard coal in the country and produced about 85% of all lignite. Turkey imported about one-third of its coking coal and high-grade coke requirements, however, mostly from the United States. Imports of coking coal have averaged 925,000 tons per year over the past 4 years, costing the Government about $60 million per year. Turkey did not need to import any lignite. TKI, the coal producer, worked closely in conjunction with TEK, which was responsible for setting up thermal power stations in coal mining areas. Ten expansions or new coal-fired power projects were under construction in 1981 by TKI and TEK. Efficiency at most of the operating plants was improved in 1981, which led to an average increase in production for both hard coal and lignite of about 75%.

Hard coal was produced in the Zonguldak region by TKI. Coal has been mined in the region since 1860. The mines were operated by Eregli Komuleri Isletmeri under the authority of TKI. Coal was produced from several mines in the area, including Kandili, Kozlu, Uzulmez, and Gelik. About 2 million tons of the total output of hard coal was allocated for use as coking coal. All of this output was supplied to the Eregli steel plant, whose coking coal charging capacity was 1.5 million tons per year. Coking coal for the other steel plants was imported.

Lignite was produced in several areas in Turkey and concentrated mostly in the eastern and western parts of the country. Up until 1978, between 30% and 50% of the country's lignite production was from private sector companies. In October 1978, the Turkish Government, in an attempt to increase lignite production, nationalized nearly all of the private sector holdings. Contrary to increasing lignite production, annual output declined over 30%, mainly because the Government did not have the human or financial resources to operate the mines. Lignite production fully recovered to its highest level ever in 1981, with output reaching 18 million tons. The private sector's share in lignite production was down to about 15%.

TKI produced most of its lignite from five major lignite mining establishments, most of which were integrated with onsite thermal power stations. Production capacity at these sites alone was expected to reach 100 million tons of lignite per year by 1990. The largest of the lignite mines were located at Seyitomer, Beypazari, Soma, Afsin Elbistan, and Tunebilek, nearly all of which were undergoing some degree of expansion in 1981. Production capacity at Beypazari was to be expanded to 3 million tons per year by 1984, at a cost of $83 million. Capacity was also to be upgraded at Tunebilek to 2.05 million tons per year, at a cost of $24 million, and production from Seyitomer was to reach 2 million tons per year early in 1982, at a cost of almost $20 million. Two large projects were nearing completion late in 1981, both of which were integrated lignite mines and thermal power stations.

The Soma thermal power project (Soma Isiklar), located in far western Turkey, was to be the first of the new generation of power projects in Turkey to come online. After a 4-year delay caused by lack of financing, the first of four units was to begin producing electricity early in 1982. The entire project, once complete in 1985, was to consume over 5 million tons of lignite to produce 660 megawatts of electricity per year. The plant will supply power to the entire northwestern portion of Turkey. Lignite was also to be supplied by a second mine, Soma-Denis, located near the powerplant.

By far the largest and most ambitious of Turkey's new integrated power stations was the TKI Afsin-Elbistan project, where construction was continuing on a 20-million-ton-per-year lignite mine and a 2,400-megawatt thermal powerplant. This plant was to be the largest lignite-fueled powerplant in the world. Cost of the project, being built by Foster-Wheeler Corp., United States, and many other corporations, was estimated at over $3 billion, 60% of which required foreign financing. The first phase of the project was to come onstream late in 1982. The first phase alone was to utilize nearly 60,000 tons per day of lignite and employ about 61,000 people. The second phase involved mining an additional 20 million tons of lignite for use with four other electric generators.

These two projects were only the first on a long list of powerplants and lignite mines scheduled to come into operation before 1995. Other large projects were under construction at Mugla-Yatagan, where 3.5 million tons per year of lignite was to be fed to a thermal power station, and Sivas-Kangal, where 4.2 million tons per year of lignite was to be integrated with another powerplant. Other projects further down the line were to be located at Bursa-Orhaneli, Bursa-Keles, and Tekirdag-Saray.

Petroleum.—Turkey's petroleum situation improved somewhat in 1981, rebounding from near disaster in 1979-80, but the country continued to be plagued by massive balance-of-trade deficits caused by the high level of oil imports. Turkey imported 85 million barrels of crude oil in 1981, valued at $3.46 billion, and $613 million worth of refined oil products, bringing the country's total oil import bill to over $4 billion. The country's receipts from all its exports, on the other hand, were estimated at about $4.5 billion. Imports of petroleum represented almost 50% of the country's total imports in 1981, which were estimated at about $8.8 billion. Turkey imported 84% of its crude oil requirement in 1981, and as domestic crude oil production levels off, the share of imports was expected to increase to accommodate any increase in domestic consumption. Turkey imported almost one-half of its crude oil requirement from Iraq in 1981 through the Kirkuk Yumurtalik (Botas) pipeline. The remaining supply was derived 24% from Libya, 15% from Iran, and 13% from Saudi Arabia. This increased level of imports considerably eased the supply situation for Turkey, where for the previous 2 years, lack of fuel has caused frequent blackouts and power shortages. The recovery of Turkey's economy and the relatively soft conditions on the world oil market contributed to the overall improvement in energy supply, but the country continued to spend nearly all its foreign exchange receipts for oil imports. This situation probably will not improve during the next several years until most of Turkey's energy needs can be supplied by coal and lignite.

Production.—Turkey's domestic production of crude oil reached 16.9 million barrels in 1981, representing a 1.4% increase over the 1980 level, but still well below the 19- to 20-million-barrel level maintained from 1975 to 1979. Turkey's crude oil production has declined steadily since 1969, when it reached an alltime high of about 70,000 barrels per day, to 1980, when it reached an alltime low of 46,000 barrels per day. Combined with the slight increase in production in 1981 was a decrease in consumption, by about 2 million barrels from 1980 to 1981. As Turkey's economy begins to expand, consumption of petroleum was expected to increase fairly steeply, most of which would have to be supplied by imports. Turkey produced about 16% of its crude oil requirement in 1981.

The largest oil-producing company in Turkey was TPAO, which produced about 40% of the country's total output. N.V. Turkes Shell, a subsidiary of Shell Oil of the United States, produced about 30%, and Mobil Exploration Mediterranean Inc., a Mobil Oil Corp. U.S. subsidiary, and Ersan Sanayii both produced about 15% of the country's total. The prospects for TPAO's future appeared mixed in 1981. It was the largest company involved in oil development in the country and had the authority of the Government behind it. It also held

many of the new promising areas for oil exploration and has made several significant discoveries in the past few years. Its problems, however, stem from the age of its producing wells, which averaged well over 10 years old. If TPAO was able to bring new fields online as rapidly as it would like, the company predicted it could be producing about 25,000 barrels per day by the middle of the decade. With TPAO drilling less than 50 production wells in 1981, it seemed likely that production would continue to decrease as its older wells depleted the reservoirs over the next few years.

TPAO was in the process of implementing secondary recovery techniques at its West Raman Oilfield. Turkey's Bati Raman (West Raman) Oilfield, located in southeastern Turkey near the Bay of Iskenderun, was the country's most prolific field, producing about 7,500 barrels per day in 1981. The secondary recovery program involved pumping carbon dioxide into injection wells to boost the production level. An 81-kilometer pipeline was to be built in 1982 to transport carbon dioxide to the field. Reserves at Bati Raman were estimated at 300 million barrels, but only a fraction of this was recoverable because of the heavy weight and generally low quality of Raman oil. With the enhanced recovery program in full operation, TPAO hoped to extract up to 20,000 barrels per day from the field, but this level was unlikely before 1985.

One of the most promising TPAO discoveries in recent years was located in the southern Dincer region, where two production wells had been drilled into a field of unknown size. The first well was capable of producing about 3,400 barrels per day of crude oil, and the second was to achieve a similar flow rate. TPAO planned to drill three additional wells into the structure early in 1982, and it was hoped that output from the Guney Dincer Field would equal that of the Raman Field, and possibly surpass it by 1983.

Realizing that Turkey's oil industry was not expanding to meet the country's needs, the Government took a new approach, as part of its economic reform program of 1980, to encourage foreign participation in the industry. The idea behind the new approach was to make Turkey more attractive for oil exploration by the multinational companies, and thereby attract new technology to boost Turkey's sagging production. New decrees were issued by the Government that removed many of the disincentives of the old petroleum code. Companies were no longer required to sell all their oil production domestically at below market prices and were allowed to export 35% of oil produced from new wells at world market prices and to use receipts from this oil to repatriate capital and profits. Also, areas that had been open only to TPAO for exploration became available for lease to foreign oil companies, in joint-venture arrangements with TPAO. In 1981, over 20 foreign oil companies had discussed exploration in Turkey with TPAO, but most companies were awaiting clarification of the new decrees, including legal guarantees against nationalization and protection against currency devaluation, before beginning work.

Exploration.—The pace of exploration for oil and gas picked up somewhat in 1981, with 31 new petroleum exploration licenses issued during the year, only 7 of which went to TPAO. The majority of these licenses went to private Turkish companies, including Ersan Petroleum Corp. and Comag, the magnesite producer. Comag was to search for oil in Siirt Province under a 3-year license. Thirty-eight exploration licenses were released during the year, and another eight expired. Two hundred and two licenses were carried over by Turkish corporations during the year, and 11 licenses were renewed. Figures were not available for Turkish private sector drilling.

TPAO was the most active company involved in petroleum exploration during the year, drilling an estimated 85 exploration wells, 17 of which encountered hydrocarbons. The most promising discoveries were at Guney Dincer in the TPAO Nusaybin oil exploration field, 20 kilometers from Camurlu, near the Syrian border. TPAO was also focusing attention on the Korkandil region in the Pervari district, mainly around the towns of Baykan and Kozluk. Drilling was to begin on the Korkandil Field, where oil had been discovered several years earlier. Drilling in this area was delayed because of access problems to the field. TPAO was also exploring for oil south of the Adana petroleum region in the Mediterranean and south of the Hafay petroleum region, also in the Mediterranean, both of which were located outside of Turkish territorial waters. Onshore work was also being accelerated in southeastern Anatolia, Trakya, Adana, and the Salt Lake region of central Anatolia. TPAO also began to emphasize its exploration for natural gas reserves. Exploration for and production of

natural gas was to be encouraged for the first time in Turkey's new petroleum code. Significant reserves of natural gas were discovered by TPAO in 1980 at Thrace, where initial production from a single well flowed at 3 million cubic feet per day and has since risen to almost 6 million cubic feet per day with several new wells onstream. Natural gas production was utilized at local cement factories and for electricity production.

There were many foreign oil companies conducting exploration work in Turkey in 1981, including several U.S. companies. Shell, which produces almost one-half of Turkey's oil already, was exploring the Agachan site in the Siverek district of Urfa under two exploration permits. Other U.S. companies operating in Turkey were Phillips 66, Occidential Petroleum, Sunmark of California, and Union Texas Co. Union Texas picked up eight exploration licenses in 1981, covering about 1 million acres in Mardin, Urfa, Hakari, and Siirt Provinces. All the licenses carried 3-year terms. Other foreign companies exploring for oil in Turkey were Veba, of the Deminex group (Federal Republic of Germany), CFP-Total (France), Azienda Generali Italiani Petroli S.p.A. (AGIP) (Italy), and Salem Energy (Sweden). AGIP bought a 51% interest in Salem's production and exploration contract, offshore in Turkey's Iskenderun Bay. AGIP became operator of the concession and began drilling with the Saipem II drillship. Results of the drilling were unavailable by yearend 1981. Iskenderun Bay was considered one of the more promising areas for oil exploration in Turkey.

Refining.—Turkey's four operating oil refineries produced more than the country's requirements for gasoline and light distillates but fell short of domestic needs for diesel oil, fuel oil, and other middle and heavy distillate products. About 2 million barrels of naphtha, gasoline, kerosine, and jet fuel were exported in 1981, while about 20 million barrels of diesel oil and fuel oil had to be imported.

All four of Turkey's oil refineries were owned by the Government petroleum organization TPAO. Total crude oil throughput capacity at all the refineries was estimated at about 120 million barrels per year, but actual throughput of all four refineries was placed at 100.2 million barrels in 1981, which represents a substantial improvement over that of 1980, when refinery capacity utilization was about 75% compared with 83% in 1981. Most of the improvement resulted from a return to near full capacity of the TPAO Anadolu Tasfiyehanesi AS refinery. The plant, originally owned by Mobil Oil Corp. (United States), Royal Dutch/Shell (Netherlands), British Petroleum, and Marmara Refining, was nationalized in 1979 because it was operating below capacity. TPAO was unable to improve matters, however, and devised an agreement allowing Mobil to continue operating the refinery while using oil supplied by TPAO. Capacity at the ATAS refinery was estimated at about 90,000 barrels per day of crude oil input. TPAO also owned the Turkish Petroleum Corp.'s two refineries at Batman and Aliaga. Throughput capacity of the Batman refinery was 21,000 barrels per day, and the Aliaga facility was capable of processing 75,000 barrels per day of crude oil.

The fourth TPAO refinery was operated by Istanbul Petrol Rafinerisi Anomin Sirketi (IPRAS). The refinery, Turkey's largest, was nearing completion of an expansion project designed to raise throughput capacity from 170,000 to about 270,000 barrels per day. Although IPRAS was owned 99% by TPAO, it was given authority to operate autonomously from the state. IPRAS, in addition to operating the most efficient refinery in the country, did most of the spot market purchasing of crude oil for Turkey, imported and processed all the country's liquefied petroleum gas, and helped negotiate its long-term supply contracts.

Pipelines.—The maintenance and operation of the Iraq-Turkey pipeline took on strategic importance in 1981. Turkey received about 40% of its domestic oil requirement from Iraq through the Botas pipeline. For Iraq, the pipeline was of equal importance, it being the only operable means of exporting crude oil. Capacity of the pipeline was about 200 million barrels per year in 1981, but only about 42 million barrels of that was supplied to Turkey. The remainder was exported from the seaport of Iskenderun. Iraq was interested in increasing the flow through the pipeline to about 700,000 barrels per day to increase the country's export revenues. Further down the line was a plan to increase the capacity of the line to 1 million barrels per day through the addition of several new pumping stations. The pipeline operated fairly continuously during the year despite several instances of breakdowns and sabotage.

Turkey was also involved in negotiations

with Iran regarding the purchase of oil and the possible construction of pipeline facilities. Turkey planned to increase its purchases of Iranian oil from about 10 million barrels in 1981 to about 30 million barrels in 1982. The two countries also signed a preliminary agreement to deliver Iranian natural gas to Europe via a pipeline through Turkey. Also planned was a pipeline from northwest Iran to Turkish ports around Iskenderun. This gradual increase in supply from Iran and Iraq was a major factor in easing Turkey's petroleum situation in 1981. In light of the current glut in the world oil market, Turkey was taking advantage of both countries' growing need for export revenues and renegotiating its contracts whenever possible. Payment for oil to both countries was with goods and services as well as with foreign currency.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Turkish lira (LT) to U.S. dollars at the rate LT112.0= US$1.00.

The Mineral Industry of the U.S.S.R.[1]

By Richard M. Levine[2]

Reported production in the ferrous metals sector either grew slowly or declined. In 1981, production of raw steel, finished rolled output, and steel pipe was less than planned, and iron ore production fell below its 1980 level. Crude oil production, including gas condensate, rose 0.9% to 4.48 billion barrels, falling slightly short of the planned target. Natural gas production rose 7% to 16.4 trillion cubic feet, compared with a planned 16.2 trillion cubic feet. Production of coal, which was to be substituted increasingly for oil as a fuel in 1981, not only fell below the planned target but declined 2%. Better results were obtained in 1981 in the production of electric energy and cement, which rose 2% each.

In 1981, production of the Ministry of Nonferrous Metallurgy increased 0.3%, which was slightly below the planned target, but labor productivity decreased 0.4% in comparison with the 1980 level. For the year, the Ministry of Ferrous Metallurgy production increased 0.5%, which was 3% below the planned target, and labor productivity dropped by 0.4%.

Indexes of several important economic indicators either failed to increase as planned or declined. According to official Soviet statistics, in 1981, national income rose 3.2%, compared with a 3.8% growth in 1980; growth did not attain the 1981 planned target of 3.4%, which was the lowest in the last decade. Industrial output rose 3.4% in 1981; this was lower than both the planned growth of 4.1% and the 1980 industrial production growth rate of 3.6%. Growth in industrial labor productivity, an important factor in achieving economic growth with the current labor shortage, rose only 2.7% compared with a planned 3.6%.

Occupying one-sixth of the world's land surface, the U.S.S.R. has large reserves and resources of many minerals and in 1981 was a significant factor in world mineral trade. The U.S.S.R. was the world's leading producer of asbestos, cement, manganese ore, petroleum, platinum-group metals, potassium salts, and steel. It occupied second place in the world, following the United States, in the production of aluminum, coal, lead, natural gas, and phosphate rock; ranked second after Canada in the production of nickel; and second after the Republic of South Africa in gold and chrome ore output.

Table 1.—U.S.S.R.: Soviet reported industrial production

(Million tons unless otherwise specified)

Commodity	1980		1981		Production change, percent	1982 planned
	Planned[1]	Reported	Planned	Reported		
Iron ore	276	245	NA	242	99.1	NA
Pig iron	115	107.3	NA	107.8	100.5	113.7
Steel, raw	157	148	156.8	149	100.4	156.2
Rolled finished ferrous metal	109	103	109.2	103	100.1	108.5
Coal, raw (bituminous, anthracite, lignite)	745	716	738	704	98	728.3
Petroleum, crude including condensate	606	603	610	609	100.9	614
Natural gas (billion cubic meters)	435	435	458	465	107	492
Mineral fertilizers	115.5	104	113.8	e109	105	119.1
Steel pipe	18.5	18.2	18.5	18.3	100.5	18.8
Cement	NA	125	128.5	127	102	NA
Power, electric (billion kilowatt-hours)	1,295	1,295	1,335	1,325	102	1,365

eEstimated. NA Not available.

[1]1980 planned figures, with the exception of iron ore, are the revised goals because targets for many commodities were decreased.

Government Policies and Programs.—In 1981, major emphasis was placed on the efficient use and conservation of fuel and raw materials. Savings in raw materials were considered possible at all stages of the production process. For example, in mining, up to the following amounts of raw materials were left in deposits: coal, 30% to 40% of resources; natural gas, 50%; petroleum, 70%; and iron ore, 20%.[3] At the same time, many useful ore constituents were not being recovered including antimony, bismuth, gold, tungsten, silver, and zinc.[4]

A substantial opportunity for savings existed in reducing losses of raw materials in the production, transportation, and storage processes. Reportedly, if the metal losses in metalworking were reduced by one-half, this would be equivalent to increasing the production of finished rolled metals by 10%. In nonmetallics, particularly big losses occurred at all stages of production, transport, and application of mineral fertilizer.[5]

Owing to a shift in the last two decades of mineral production to more remote areas in the east and north and to declining ore grades, the cost of mineral production rose considerably. According to Soviet calculations, the capital-output ratio for mining would increase 150% from 1965 to 1985.[6] Savings in mineral and energy resources were considered important owing both to rising domestic production costs and increased prices on the world market. In the 11th 5-year plan (1981-85), the following goals were set for reducing consumption of materials: rolled ferrous metals, 18% to 20%; steel pipes, 10% to 12%; and nonferrous metals, 9% to 11%.

Production of finished rolled steel declined from its 1978 peak, but there was growth in the output of machine building and metalworking. This created a shortage and led to an attempt to lower metal consumption. Much room for economy in the use of steel existed. Machinery and equipment were generally heavier than their Western counterparts, and their production required more fuel and energy. Furthermore, the machinery produced was not energy efficient, which led to energy losses in other economic sectors.[7]

Waste in machine building and metalworking, along with other sectors, was stimulated by the Soviet practice of measuring production in terms of the weight of output. This led to production goals being met by building heavy machinery and equipment.[8] In mining, it led to the production of low-grade ores, and in metallurgy, to the production of lower quality products.

When production was measured in ruble[9] value of output instead of tons, enterprises tended to use more expensive raw materials to increase the value of output. The introduction of the net production indicator was an attempt to eliminate this incentive by excluding from the value of output expenditures for materials and energy purchased outside the enterprise. This reform was being introduced slowly into the Ministries of Ferrous and Nonferrous Metallurgy.[10]

Increased effort was to be made to utilize and recover secondary materials. In 1981, secondary materials accounted for one-third of steel and one-fifth of nonferrous metal production. Efforts, however, to economize by using secondary materials often resulted in waste. Quotas for recycling metal were met at times by scrapping good metal and

machinery.[11]

Gas and coal were to be substituted for oil as a fuel wherever possible, and nuclear power was to be rapidly developed. In 1981, however, expansion of the nuclear power industry was not occurring as rapidly as planned.[12]

As of January 1, 1982, new wholesale prices went into effect for Soviet raw materials. The new prices were intended to fully account for the cost of raw materials and to use the profit motive to stimulate the production of priority resources and to economize on the use of resources. This was the first revision of wholesale prices since 1967. Prior to the price reform, many resources were being extracted at a loss; i.e., the extraction was subsidized.[13] Also, the number of extracted raw material components for which an enterprise would be paid was expanded to increase recovery of products. For industrial consumers, wholesale prices were set to encourage appropriate substitution. For example, prices of gas were set at an average 20% lower than those for fuel oil.

Mineral Industry Labor.—The low rate of overall growth in the Soviet industrial labor force in the 1980's, estimated at 0.7% annually, posed a serious constraint to economic growth, including mineral development. Growth in the labor force varied considerably in the different ethnic regions. Many major new mineral production areas were in the already labor-deficient regions of Siberia and the Soviet Far East, and there had not been an adequate migration of workers to these areas despite numerous wage and benefit incentives. The Soviets at times had to rely on a costly program of flying in shifts of workers for limited periods to provide labor at some mineral development sites. It was reported in the Soviet press that in West Siberia, the main source of oil and gas, 60,000 exploration workers were employed.[14]

The coal mining industry made greater use of wage incentives to attract and retain workers. In 1981, a wage increase was announced in the coal mining industry. Although miners' pay and working hours were better than the Soviet average, there were frequent complaints about having to work on free days. In addition, full-time operation hindered necessary maintenance work.

Increased use of Council of Mutual Economic Assistance (CMEA)[15] labor was being considered for mineral development, but the CMEA countries had their own labor problems and would probably not be able to supply labor in adequate measure. Owing to the problem in labor supply, the Soviets needed to increase labor productivity, which could be partially accomplished by importing state-of-the-art equipment from Western countries. The major means of acquiring hard currency to pay for this equipment was by sales of minerals to Western countries, particularly oil and gold. Sales of gas to Western Europe from the trans-Siberian pipeline, scheduled to commence in the mid-1980's, could compensate for loss of revenues from lagging oil production. The Soviets could further use the foreign exchange earned from gas sales to buy high-technology equipment to increase oil production.

Mineral Industry Technology.—Declining ore quality further increased the need for mechanization and high-technology equipment. During the 1980's, the metal content was calculated to decrease 10% to 15% in the majority of nonferrous ores and 12% to 15% in iron ores.[16] Over 60% of nonferrous metal ore was mined in open pits.

Soviet industry experienced many difficulties in supplying the mining and metallurgical sector. The Soviets had been able, at times, to develop good experimental models of needed equipment but then were either unable to introduce these items into production or produce them in quantity. No satisfactory base model for a heavy-duty bulldozer could be developed. Production of 110- to 180-ton dump trucks lagged; production of 75-ton dump trucks was insufficient, and the trucks were technologically behind foreign models.[17] In 1980, capacity of dump trucks used in nonferrous open pit mining averaged 33.8 tons, and there had been inadequate growth in dump truck capacity.[18] Production of shovels with a 12.5- to 20-cubic-meter capacity was also insufficient, and there was an inadequate supply of drilling machinery, particularly in northern areas.[19] Also lacking were small-scale mechanized devices for underground work. Lack of this equipment was blamed for declining production in the coal industry.[20]

A continued effort to improve the quantity and quality of equipment was planned for 1981-85. The production of large-diameter, multilayered steel pipeline, which was being imported from Western countries, was to receive special attention.

A major concern for mining in remote areas was the electricity supply. Also, owing to increased mining in remote areas, there

was a need for improving the quantity and quality of locomotives and freight cars, particularly specialized rolling stock for mineral transport.[21]

The Plan for 1982.—The plan called for a 3% growth of national income in 1982, which was lower than the attained growth of 3.2% in 1981. The 1982 growth-rate target for industrial production was 4.7%, which was higher than the unattained target of 4.1% in 1981, when growth was 3.4%. Capital investment in 1982 was to grow 3% as it did in 1981. The 1981 plan called for a 5% growth. Investment was to be directed toward intensive structural improvements. For example, while electric energy output was to increase only 2.6%, the growth in nuclear electric power was to increase 24%.

Investment in iron and steel was to be directed toward developing "progressive and economical" metal products. This was in keeping with the goals of the 11th 5-year plan to produce more cold-rolled sheet, improved alloys, and special steel pipes and to develop power metallurgy, oxygen converter and electric steel production, and continuous casting. The poorest performance in steel production in the past was registered in improving the assortment and quality of output. Although the steel industry had in past years fallen short by 10% to 15% in achieving investment goals, it had fallen short by 40% to 50% in achieving investment goals for diversification and improving quality.[22]

In production of nonferrous metals, emphasis was to be placed on expanding the ore base, modernization and expansion of existing enterprises, and improving extraction and processing techniques. During 1981-85, aluminum output was to increase 15% to 20%; copper production, 20% to 25%; and nickel and cobalt production, at least 30%. Increases were planned in the production of lead, magnesium, molybdenum concentrates, precious metals, tungsten, columbium (niobium), and other alloying elements.

Exploration.—In 1981, the volume of geological work accomplished for the Soviet Ministry of Geology increased 6.6% compared with that of 1980. The volume of deep drilling increased 5.2% including a 13% increase in Tyumen' Oblast'. However, growth in the volume of deep drilling was lower than planned, and deep-drilling goals for oil and gas were not met. This failure was attributed to serious organizational and planning deficiencies that resulted in insufficient equipment being supplied for winter work, particularly for the R.S.F.S.R., including Tyumen' Oblast'. The complaint was raised that inadequate technological support for geological work led to an increase in accidents.[23]

The Ministry of Geology called for an intensified search for bauxite, copper, lead, tin, and zinc and also called for a greatly intensified search for oil and gas, not only in Siberia but also in Soviet Central Asia. The intended growth in coal use necessitated increasing coal reserves in Siberia, the Soviet Far East, and Kazakhstan. Owing to fertilizer shortages, emphasis was being given to increasing reserves of phosphates and potash.

A sharp increase was called for in the volume of geological survey work, but the complaint was also raised that many major reserves waited a long time for development. Also, after development, substantial losses occurred in enrichment and processing of ores while many potential byproducts were not recovered.[24]

In the coming years, exploration was to be carried out by deep drilling and seismic sounding, particularly in the search for oil and gas deposits. The Soviets claimed to have drilled the world's deepest borehole to a depth of 10.8 kilometers in the Kola Peninsula. Despite the emphasis on deep drilling, there was little incentive for it because quota fulfillment was based on the number of meters drilled, regardless of the depth.

PRODUCTION

A Soviet decree of April 1956 classified as secret statistics on output, enterprise capacity, and production plans in physical units of output of nonferrous, precious, and rare metals and some nonmetallics. Soviet trade data on precious metals had not been available for decades, and in 1976, the Soviets stopped publishing trade statistics for nonferrous metals. Production and trade data were available for ferrous metals and some nonmetallics.

Some information was available on most mineral commodities and could be used in determining the relative size or growth of the mineral industry. However, Soviet information had to be carefully qualified. Comparisons with Western countries were difficult because Soviet statistics showed minerals produced rather than usefully consumed.

Table 2.—U.S.S.R.: Estimated[1] production of mineral commodities[2]

(Thousand metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS					
Aluminum:					
Ore and concentrate:					
Bauxite, 26% to 57% alumina	4,600	4,600	4,600	4,600	4,600
Nepheline concentrate, 25% to 30% alumina	2,500	2,500	2,500	2,500	2,500
Alunite ore, 16% to 18% alumina	600	600	600	600	600
Alumina	2,600	2,600	2,600	2,700	2,800
Metal, smelter:					
Primary	1,640	1,670	1,750	1,760	1,800
Secondary	150	150	150	150	150
Total	1,790	1,820	1,900	1,910	1,950
Antimony, mine output, recoverable metal content tons	7,900	7,900	8,200	8,200	8,200
Arsenic, white (As_2O_3) do	7,500	7,600	7,700	7,700	7,750
Beryllium: Beryl, cobbed, 10% to 20% BeO do	1,700	1,750	1,800	1,800	1,800
Bismuth, mine output, recoverable metal content do	65	70	72	72	75
Cadmium metal, smelter do	2,750	2,800	2,850	2,850	2,900
Chromium:					
Crude chrome ore, 30% to 40% Cr_2O_3	3,000	3,200	[3]3,200	[3]3,400	[3]3,300
Marketable chromite, 45% to 56% Cr_2O_3	2,180	2,300	[r]2,300	2,450	2,400
Cobalt:					
Mine output, recoverable metal content tons	1,900	1,950	2,000	2,150	2,250
Metal, smelter do	3,400	3,550	3,600	3,650	3,750
Copper:					
Ore:					
Gross weight, 0.5% to 2% Cu	124,450	125,000	[r]126,000	127,000	128,000
Metal content, recoverable	830	865	885	900	950
Metal:					
Blister:					
Primary	[r]830	865	885	900	950
Secondary	85	90	95	95	95
Refined:					
Primary	790	810	830	845	890
Secondary	160	170	170	170	170
Gold, mine output, metal content thousand troy ounces	7,850	8,000	8,160	8,300	8,425
Iron and steel:					
Iron ore, 55% to 63% Fe[3]	241,851	246,251	241,738	244,713	242,000
Iron ore, metal content[3]	132,019	134,369	131,453	132,885	131,400
Agglomerated products:[4]					
Sinter	158,195	159,564	[r]157,427	153,818	155,000
Pellets	36,170	45,005	44,012	50,894	54,100
Metal:					
Pig iron and blast-furnace ferroalloys:					
Pig iron for steelmaking[3]	[r]98,692	[r]102,496	[r]101,255	99,958	[4]100,600
Foundry pig iron[4]	[r]7,800	[r]7,500	[r]7,000	6,600	6,600
Spiegeleisen[5]	[r]75	[r]50	[r]50	50	50
Ferromanganese[5]	[r]725	[r]550	[r]550	550	550
Other blast-furnace ferroalloys[4]	[r]100	[r]100	[r]100	100	--
Total[3 5]	[r]107,392	[r]110,696	[r]108,955	[r]107,258	[4]107,800
Electric-furnace ferroalloys	[r]2,000	[r]2,200	[r]2,400	2,700	2,800
Crude steel[3]	146,678	[r]151,453	149,099	147,941	149,000
Semimanufactures:[4]					
Sections	38,697	39,842	38,716	38,483	38,285
Wire rod	8,349	8,231	7,989	8,066	7,877
Pipe stock	5,845	6,071	6,040	6,020	6,122
Tubes from ingots	1,811	1,862	1,880	1,976	1,917
Plates and sheets:					
More than 5 millimeters thick	13,852	14,076	13,592	[e]13,900	NA
Other	18,907	20,076	19,682	[e]20,600	NA
Total	32,759	34,152	33,274	[e]34,500	NA
Strip	10,714	11,109	11,475	10,898	11,010
Railroad track material	3,943	4,143	3,971	4,137	3,900
Wheels, tires, axles	1,118	1,125	1,068	1,115	1,084
Unspecified shapes for sale	631	671	633	[e]725	NA
Other and unspecified	68	71	71	70	59
Total semimanufactures	103,935	107,277	105,117	[6]104,878	[6]104,880

See footnotes at end of table.

Table 2.—U.S.S.R.: Estimated[1] production of mineral commodities[2] —Continued

(Thousand metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS —Continued					
Iron and steel —Continued					
Selected end products:					
Total pipes and tubes[3]	17,021	17,553	18,185	18,180	18,265
Cold-rolled sheet[4]	7,054	7,017	7,019	6,887	7,551
Electrical sheet[4]	1,154	1,173	1,152	1,173	1,136
Cold-reduced strip[4]	431	471	477	[e]500	NA
Lead:					
Mine output, recoverable metal content	[r]405	[r]410	[r]410	410	410
Metal, smelter:					
Primary	[r]405	[r]410	[r]410	410	410
Secondary	[r]205	[r]210	[r]215	215	220
Magnesium metal including secondary	65	70	72	75	78
Manganese ore:[3]					
Gross weight	8,595	9,057	10,244	9,750	9,400
Metal content	2,904	2,945	3,162	3,040	2,930
Mercury metal including secondary 76-pound flasks	58,000	60,000	61,000	62,000	63,000
Molybdenum, mine output, metal content tons	9,700	9,900	10,200	10,400	10,900
Nickel:					
Mine output, metal content	[r]147	[r]149	[r]151	154	158
Metal, smelter	[r]167	[r]169	[r]171	174	176
Platinum-group metals, mine output, metal content thousand troy ounces	3,100	3,150	3,200	3,250	3,350
Silver metal including secondary do	45,000	46,000	46,000	46,000	46,500
Tin:					
Mine output, recoverable metal content tons	33,000	34,000	35,000	36,000	36,000
Metal, smelter:					
Primary do	33,000	34,000	35,000	36,000	36,000
Secondary do	12,000	12,000	12,000	12,000	12,000
Total do	45,000	46,000	47,000	48,000	48,000
Titanium:					
Concentrates:					
Ilmenite do	400,000	410,000	410,000	420,000	425,000
Rutile do	[r]10,000	[r]10,000	[r]10,000	10,000	10,000
Metal do	34,000	35,000	36,000	37,000	38,500
Tungsten concentrates, metal content do	8,200	8,500	8,700	8,700	8,850
Vanadium do	[r]8,500	[r]9,000	[r]9,000	9,500	9,500
Zinc:					
Mine output, recoverable metal content	735	770	770	785	790
Metal:					
Primary	735	770	770	785	790
Secondary	80	80	80	80	80
Zirconium metal	65	70	75	75	75
NONMETALS					
Asbestos	1,900	1,945	2,020	2,070	2,105
Barite	450	475	500	500	500
Boron minerals and compounds:					
Gross weight	180	200	200	200	200
B_2O_3 content	[r]36	[r]40	[r]40	40	40
Bromine	64	65	66	67	68
Cement, hydraulic[3]	127,056	126,956	123,019	125,049	127,000
Clays: Kaolin including china clay	2,300	2,400	2,500	2,500	2,500
Corundum, natural tons	8,000	8,500	8,500	8,600	8,600
Diamond:					
Gem thousand carats	2,100	2,150	2,200	2,250	2,100
Industrial do	8,200	8,400	8,500	8,600	8,500
Total do	10,300	10,550	10,700	10,850	10,600
Diatomite	[r]215	[r]220	[r]225	230	230
Feldspar	290	300	310	310	320
Fluorspar	500	510	520	520	530
Graphite	95	100	100	100	105
Gypsum	5,200	5,300	5,400	5,400	5,500
Iodine	2	2	2	2	2
Lithium minerals, not further specified	50	50	50	55	55
Lime, dead-burned	23,500	23,500	24,000	24,500	25,000
Magnesite:					
Crude	3,700	3,800	3,900	4,000	4,150
Marketable product	1,850	1,900	1,950	2,000	2,075
Mica	44	45	46	46	47
Nitrogen: N content of ammonia	[r]10,700	11,300	12,200	12,400	12,600
Perlite	340	360	360	360	360

See footnotes at end of table.

Table 2.—U.S.S.R.: Estimated[1] production of mineral commodities[2] —Continued

(Thousand metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Phosphate rock:					
Crude ore:					
Apatite, 17.7% P_2O_5	41,000	42,300	44,700	[3]46,500	47,500
Sedimentary rock, 13% P_2O_5	[r]22,850	[r]23,500	[r]24,150	24,800	25,500
Total	[r]63,850	[r]65,800	[r]68,850	71,300	73,000
Concentrate:					
Apatite, 39.4% P_2O_5	15,500	15,962	16,330	[3]17,300	17,700
Sedimentary rock, 19% to 25% P_2O_5	[r]11,425	[r]11,750	[r]12,075	12,400	12,750
Total	[r]26,925	[r]27,712	[r]28,405	29,700	30,450
Potash:					
Ore, gross weight	62,900	61,750	50,000	[3]60,800	63,000
K_2O equivalent[3]	8,347	8,193	6,635	8,064	8,350
Pyrites, gross weight	[r]7,800	[r]7,800	[r]7,800	7,900	8,000
Salt, all types[3]	14,300	14,500	14,300	14,600	14,600
Sodium compounds, n.e.s.:					
Sodium carbonate[3]	4,876	4,858	4,782	4,780	4,800
Sodium sulfate:					
Natural	320	330	340	350	350
Manufactured	230	240	240	250	250
Sulfur:					
Frasch	500	800	800	900	925
Other native	2,400	2,700	2,700	2,800	2,850
S content of pyrites	3,500	3,500	3,500	3,550	3,600
Byproduct:					
Of coal	40	40	40	40	40
Of metallurgy	2,190	2,210	2,210	2,310	2,350
Of natural gas	920	1,100	1,100	1,200	1,250
Of petroleum	200	200	200	200	200
Total	9,740	10,550	10,550	11,000	11,215
Sulfuric acid[3]	21,104	22,411	22,364	23,033	24,100
Talc	450	470	480	490	500
MINERAL FUELS AND RELATED MATERIALS					
Coal:[7]					
Anthracite	79,000	79,000	79,000	79,000	79,000
Bituminous:					
Coking	185,000	185,000	185,000	185,000	185,000
Other (not further specified)	[r]291,100	[r]293,140	289,960	288,954	276,000
Total "hard" coal[3]	[r]555,100	[r]557,140	553,960	552,954	540,000
Lignite and brown coal[3]	167,025	166,484	164,704	163,417	164,000
Coke: Coke oven, beehive, breeze, gas coke	86,000	86,400	86,000	86,000	86,000
Fuel briquets:					
From anthracite and bituminous coal	715	700	[r]650	600	600
From lignite and brown coal	7,840	7,302	[r]6,777	6,185	5,900
Total[3]	8,555	8,002	[r]7,427	6,785	6,500
Gas, natural, marketed:					
As reported[3] million cubic meters	346,003	372,194	406,597	435,217	465,000
Converted million cubic feet	12,218,923	13,143,845	14,358,770	15,369,471	16,421,243
Peat:					
Agricultural use	[r]200,000	[r]215,000	[r]225,000	[3]235,000	[3]280,000
Fuel use	60,000	60,000	60,000	60,000	60,000
Oil shale	[r]35,000	[r]35,500	[r]36,000	36,250	[3]37,000
Petroleum:					
Crude:					
As reported, gravimetric units[3]	545,799	571,531	[r]585,571	603,207	609,000
Converted, volumetric units thousand 42-gallon barrels	4,011,623	4,200,753	[r]4,303,947	4,433,571	4,476,150
Refinery products[4 8]	392,722	403,048	[e]415,000	NA	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Unless otherwise specified.

[2]Includes data available through Oct. 13, 1982.

[3]Reported in Soviet sources.

[4]Reported in United Nations sources.

[5]Estimate based on total of spiegeleisen and blast-furnace ferromanganese reported by United Nations sources.

[6]Data do not add to total shown because of independent rounding.

[7]Run-of-mine coal. The average ash content of coal shipped from mines was 20.2%, and the average calorific value was slightly more than 5,000 kilocalories per kilogram (9,000 British thermal units per pound in 1977).

[8]Not distributed by type and, therefore, not suitable for conversion to volumetric units. Data include all energy products and some nonenergy products as well as refinery fuel and exclude petrochemical feedstocks, paraffin, petroleum coke, white spirit, unspecified minor nonenergy products, and refinery losses.

TRADE

The Soviet Ministry of Foreign Trade administered all foreign trade through more than 70 foreign trade organizations. Laws of comparative advantage played less of a role in foreign trade than did Government objectives. Two major Soviet objectives were to integrate the economies of Eastern Europe with the Soviet economy and to earn sufficient hard currency to purchase essential commodities, such as grain and advanced technology and equipment.

Mineral exports were used to meet both objectives. The Soviet Union was the chief supplier of fuel and other raw materials to the CMEA states, and mineral exports were the chief source of hard currency earnings. The U.S.S.R. provided the great majority of CMEA imports of oil, gas, iron ore, pig iron, rolled ferrous metals, nonferrous metals, phosphate fertilizers, etc. The CMEA states did not pay for these imports with hard currency but rather supplied the Soviet Union with manufactured goods that were often of a higher quality than those produced domestically.

Over four-fifths of all Soviet hard-currency export earnings came from raw materials, and over one-half of the hard-currency earnings came from oil. Other significant hard-currency-earning mineral exports included chrome ore, diamonds, gold, natural gas, nickel, platinum-group metals, uranium compounds, and others. With the completion of the trans-Siberian pipeline to Western Europe in the mid-1980's, gas sales could compensate for loss of revenues from declining oil sales.

The Soviets attempted to meet their hard-currency earning goals by selling a combination of the least amount of minerals at the highest prices; many commodities exported were not actually surpluses and could easily have been consumed in the domestic economy. During periods of increased economic need, to gain entry into a market, or for political purposes, the Soviets were willing to sell in a depressed market or below the world market price.

Although a large mineral exporter, the Soviet Union was also a mineral importer. Approximately 11% of Soviet imports were minerals. For some commodities such as tin, bauxite, fluorite, and high-quality steel products, the Soviet Union did not produce enough to meet its domestic needs. For other commodities, Soviet mineral imports served to supply regions far from Soviet sources of supply, to overcome temporary supply breakdowns, or as a political gesture to help friendly countries.

In 1981, Soviet foreign trade turnover (exports plus imports) increased 17% compared with the 1980 figures. For 1981, Soviet trade turnover with developed market economy countries increased 12%; with CMEA countries, 14%; and with the developing countries, 37.5%.

Regarding major mineral exports, in 1981, Soviet oil deliveries to many Western European countries decreased. Estimated oil deliveries to the CMEA states, about 590 million barrels, were near the 1980 level. Estimated Soviet gold sales of 250 tons in 1981 approximately tripled compared with that of 1980. There was a large increase in Soviet selling in late 1981 despite the fact that the price of gold had fallen. Along with the need to buy grain owing to another poor harvest, it was speculated that these sales could have been made in part to prop up the Polish economy. The Soviet Union traditionally marketed gold in Zurich and in 1981 resumed making deliveries to London. Soviet titanium exports to the Western World continued in 1981 after speculation that the Soviet Union was going to cease exporting titanium. The Soviet Union also supplied Western European countries with enriched uranium.

Increased trade with Western Europe in 1981 was especially pronounced in the case of Finland, which became the Soviet Union's second largest market economy trading partner. The U.S.S.R. supplied Finland with crude oil, petroleum products, natural gas, nuclear fuel, coal, coke, and electricity and obtained ships and marine equipment, machinery, cables, other steel products, etc. In 1981, Finland was negotiating for the construction of a joint Soviet-Finnish nuclear powerplant to be built in Finland. The Soviets had already assisted Finland in constructing two nuclear powerplants with a capacity of 440 megawatts each.

The Federal Republic of Germany remained the Soviet Union's principal Western World trading partner. Construction of the trans-Siberian pipeline and the subsequent gas deliveries were to greatly increase the volume of Soviet-West German trade. It was foreseen that when the pipeline came onstream, it would provide a minimum of 30% of the West German natural gas requirements.

Upon completion of the pipeline, France also would be importing a sizable amount of its natural gas from the Soviet Union. Other Western European countries that were committed or were negotiating to receive gas from the pipeline included Austria, Belgium, Italy, the Netherlands, Spain, and Switzerland. The trans-Siberian pipeline was to supply Western Europe annually with 1.1 to 1.4 trillion cubic feet of natural gas.

The Federal Republic of Germany, France, and Italy were to be major suppliers of pipeline equipment, along with other Western European countries. Japan also was to be a major equipment supplier. The assistance of Western countries in the pipeline construction was considered an important factor in enabling the Soviets to meet their timetable for gas sales to Western Europe.

Trade turnover between the United States and the Soviet Union increased in 1981, with a large trade balance in favor of the United States. Corn and wheat dominated U.S. exports, and the Soviets also purchased some equipment for use on the trans-Siberian pipeline. Principal Soviet exports to the United States were mineral commodities including ammonia, chrome ore, gold, heavy and light fuel oils, naphtha, nickel, platinum-group metals, secondary aluminum, and titanium. In 1981, the United States increased exports of molybdenum concentrates to the U.S.S.R. and began exporting copper concentrate.

Table 3.—U.S.S.R.: Exports to the United States

(Million dollars)

Commodity	1980	1981
Light fuel oil, testing 25° A.P.I. or more, Saybolt Universal viscosity at 100° F of less than 45 seconds	--	80.7
Anhydrous ammonia	94.8	78.4
Nickel, unwrought	20.7	37.8
Palladium	54.6	31.1
Gold bullion, refined	85.7	21.4
Naphthas derived from petroleum, etc., n.e.s	5.0	16.6
Uranium compounds, fluorides	34.6	11.3
Heavy fuel oil, testing 25° A.P.I. or more, Saybolt viscosity at 100° F of more than 125 seconds	--	9.5
Platinum-group metals and combinations, n.e.s	5.5	6.4
Platinum sponge	4.6	4.6
Rhodium	6.3	3.5
Aluminum waste and scrap	--	3.0
Palladium bars and plates	11.7	2.8
Chrome ore:		
46% or more chromic oxide	1.7	2.8
Not over 40% chromic oxide	3.8	2.5
Titanium sponge, unwrought	2.7	1.7
Platinum bars, plates, etc	7.0	[1].6

[1]Reported figure for January-June 1981.

In 1981, sanctions previously imposed by the U.S. Government because of the Soviet invasion of Afghanistan were lifted, allowing Occidental Petroleum Corp. to continue shipments of superphosphoric acid to the Soviet Union in exchange for ammonia. At the end of 1981, the United States imposed trade sanctions against the Soviet Union in reprisal for the imposition of martial law in Poland. The sanctions affected, among others, U.S. companies supplying equipment or technology directly or indirectly for use on the trans-Siberian pipeline.

Regarding trade with Asia, Japan was the Soviet's fifth largest market economy trading partner. According to a 1981-85 trade agreement, Japanese exports to the Soviet Union were to include rolled ferrous products, tinplate, steel pipe, cable goods, other steel products, etc., while Japanese imports were to include aluminum (secondary), asbestos, chrome ore, ferroalloys, graphite, magnesium, nickel, crude oil and petroleum products, palladium, petroleum coke, pig iron, platinum, rare earths and metals, steel scrap, titanium sponge, and zinc.

In 1981, Japan agreed to a further $38.7 million loan for the development of the Neryunga coking coal complex in South Yakutia. Original loans of $450 million in 1974 to buy Japanese machinery and equipment were made with the goal of enabling the U.S.S.R. to supply 84.4 million tons of coking coal to Japan over a 16-year period, beginning with a 3.2-million-ton shipment in 1983. Owing to delays in development, deliveries might not begin on schedule.

In 1981, the Soviet Union signed a 20-year agreement with the Japanese firm Sakhalin Oil Development Corp. (SADECO) to build a $95 million plant for liquefying natural gas, and SADECO contracted to import 3 million tons of liquefied natural gas annually. Construction of the plant was scheduled to begin in 1982, but deliveries were not considered likely to begin until 1986. The U.S.S.R. was cooperating with Japan in offshore oil development off Sakhalin Island in the Sea of Okhotsk. Production from offshore wells had not yet begun.

The U.S.S.R. was replacing the United States as India's largest trading partner. In 1981, the U.S.S.R. entered into agreements to help India develop oil, coal, steel, and alumina facilities. In 1981, India was to import crude oil supplied in transfer arrangements by the U.S.S.R. from Persian Gulf sources and refined products from the U.S.S.R. A trade agreement for 1981-85 provided for India to import asbestos, fertilizers, nickel, refractories, rolled steel prod-

ucts, sulfur, and zinc. The U.S.S.R. met most of its demand for strategic-grade mica from imports from India and, according to the 1981-85 trade agreement, was also to import alumina, barite, and pig iron.

In 1981, the U.S.S.R. declared a willingness to help Pakistan develop nuclear and thermal power and to aid in oil exploration. However, the tension between Pakistan and the U.S.S.R. over the invasion of Afghanistan may have made this offer difficult to accept.

In other parts of Asia, the U.S.S.R. was the major supplier of oil to Vietnam and Kampuchea, and a portion of Soviet deliveries to Vietnam were reportedly diverted to Laos. However, consumption of oil in these Asian countries had dropped sharply since the early 1970's. In 1981, the Soviet Union and Vietnam signed a contract setting up a joint enterprise for cooperative oil and gas development on Vietnam's southern coastal shelf. No mention was made of exploration in the disputed northern waters of the Tonkin Gulf adjacent to an area in which China recently made oil and gas strikes. In addition, the Soviet Union assisted Vietnam and Laos in tin development, presumably in exchange for tin.

In Mongolia, a joint Soviet-Mongolian enterprise, Mongolsovtsvetmet, handled 92% of the output of Mongolia's mining industry. Along with copper and molybdenum, the U.S.S.R. assisted Mongolia in the development of coal, fluorite, gold, and phosphate reserves.

In the Mideast, in 1981, the Soviet Union increased its deliveries to Iran of steel and fertilizers. Soviet imports from Iran included 2.2 million tons of oil and lead-zinc and copper ores. The Soviet Union had assisted Iraq in the development of oilfields and in 1981 was assisting Iraq in maintaining oil production.

In Africa, the majority of Soviet trade was with North African countries; Libya, Algeria, Egypt, and Morocco were the leading Soviet trade partners. Angola, Mozambique, Ghana, Guinea, Nigeria, and Ethiopia were the leading trade partners in the rest of Africa. Soviet exports to Africa consisted mainly of manufactured goods, including armaments. Soviet imports were primarily agricultural products, fuels, and raw materials, including bauxite from Guinea, ores and concentrates from the Congo, nonferrous metal concentrates from Mozambique, pig iron from Algeria, fuel from Libya and Mali, and superphosphate from Morocco.

In 1981, in South America, the Soviet Union signed a contract with Brazil to purchase bauxite for its Nikolayev alumina plant on the Black Sea. The U.S.S.R. also agreed to supply Brazil with 20,000 barrels of oil per day for 5 months at a price of $35 per barrel. This agreement was to be renegotiated before the end of 1981. Soviet oil shipments represented approximately 3% of Brazil's oil imports. The Soviets were also providing technology to Brazil for a coal gasification process.

The U.S.S.R. was an important trade partner for Cuba, a Caribbean member of CMEA. Cuba was providing the U.S.S.R. with nickel and cobalt concentrates, and the U.S.S.R. was participating in their development in Cuba. In 1980, petroleum and petroleum products accounted for over 25% of Soviet exports to Cuba. Other exports included rolled steel, nonferrous metals, and fertilizers.

In 1981, the U.S.S.R. agreed to assist Cuba in the construction of a nuclear powerplant. The Soviets had been involved in aiding Cuba in nuclear research since 1967, when an agreement was concluded for installing an experimental nuclear reactor in Cuba. The Soviets had been further instrumental in establishing nuclear research centers in Cuba.

Trade with the CMEA countries comprised almost one-half of total Soviet trade turnover and was particularly important in the mineral area. Other centrally planned economy countries with which the U.S.S.R. conducted trade in mineral products included China and North Korea. In 1981, the U.S.S.R. increased its exports of pig iron, rolled steel products, and steel pipes to the centrally planned economy countries.

The German Democratic Republic was the Soviet Union's largest trade partner, and raw materials made up a large portion of exports to that country. According to a 1981-85 trade agreement, the German Democratic Republic was to import annually from the Soviet Union 140 million barrels of petroleum, 230 billion cubic feet of natural gas, 1.7 million tons of iron ore (iron content), 960,000 tons of pig iron, 130,000 tons of aluminum, 42,300 tons of copper, 1.3 million tons of coke, and 4.2 million tons of hard coal. The German Democratic Republic imported a number of other minerals from the Soviet Union such as zinc, lead, and magnesium, but figures were not reported. These planned imports from the Soviet Union during 1981-85 were to be essentially the same as the 1980 import

figures. Nevertheless, indications were that oil shipments in 1981 fell below their 1980 level of 140 million barrels.[25]

Despite shortfalls in Polish shipments, Soviet reciprocal deliveries of raw materials to Poland in 1981 remained at approximately the 1980 level. The Soviet Union supplied approximately 40% of Poland's raw material needs, including 100% of the natural gas and 75% of crude oil and iron ore. Soviet deliveries to Poland in 1981 included 96 million barrels of crude oil, 22 million barrels of petroleum products, 190 billion cubic feet of natural gas, 9 million tons of iron ore (iron content), 69,000 tons of asbestos, and 53,000 tons of aluminum. Poland, however, reduced its coal exports to the U.S.S.R. from 9.5 million tons in 1980 to 5.5 million tons in 1981. Polish sulfur exports to the U.S.S.R. reportedly increased in 1981.

Although Hungary conducted the majority of its trade with market economy countries, it was dependent on the Soviet Union for the majority of its raw material imports. Hungary imported approximately 70% of its crude oil, 40% of its natural gas, and a large percentage of its ore and metal requirements from the Soviet Union. In 1981, Hungary, as part of a continuing exchange, was to export 330,000 tons of alumina to the Soviet Union and to receive 165,000 tons of aluminum in return. Indications were that a certain amount of this aluminum was held back as a smelting fee.

Romania was the only CMEA country that did not rely on the Soviet Union for the majority of its imported raw materials; Romania also reportedly paid for Soviet oil imports in hard currency at world market prices. Soviet crude oil exports to Romania in 1981 were projected to remain at their 1980 level of 11 million barrels. The Soviet Union supplied approximately 45% of Romania's imported iron ore and 20% of its imported phosphate along with pig iron, rolled ferrous and nonferrous metals, and ferroalloys. When more complete Soviet trade data were last published in 1975, the Soviet Union was reportedly supplying Romania with asbestos, apatite, copper, and aluminum. According to a 1981-85 trade agreement, the Soviet Union was to supply Romania with apatite, asbestos, coke, coking coal, ferroalloys, iron ore, natural gas, pig iron, rolled ferrous and nonferrous metals, steel, etc. In 1981, Romania's imports of coke, coking coal, copper, and iron ore from within CMEA were expected to fall below their 1980 level.

Czechoslovakia imported almost 70% of its fuel and raw materials from CMEA countries, particularly the U.S.S.R. In 1981, Czechoslovakia was scheduled to receive from the U.S.S.R. 130 million barrels of crude oil, 307 billion cubic feet of natural gas, 8 million tons of iron ore (iron content), and 1 million tons of pig iron, along with chrome ore, manganese ore, ferrous and nonferrous metals, ferroalloys, etc. In 1981, Czechoslovakia was to export to the U.S.S.R. 300,000 tons of steel pipe, of which 120,000 tons was for use in the oil and gas industries.

The U.S.S.R. and Bulgaria also signed a trade agreement for 1981-85. The value of trade for this period was to equal 40 billion rubles. During 1976-80, the Soviet-Bulgarian value of trade was 28 billion rubles. During 1981-85, the Soviet Union was to supply Bulgaria with energy and raw materials including coal, crude oil and oil products, electric energy, iron ore, ferrous and nonferrous metals, natural gas, etc.

The Soviet Union was engaged in a number of assistance and cooperative programs with the CMEA countries. All of the East European full CMEA member countries and Cuba were developing nuclear power programs, and all except Romania were doing so with Soviet assistance. The U.S.S.R. supplied nuclear fuels to the CMEA countries and reprocessed the spent fuels. Furthermore, a number of CMEA countries were participating in nuclear development projects within the Soviet Union for which they were to receive energy in return.

The CMEA countries were also cooperating in other mineral development ventures. These included Petrobaltic, an offshore drilling consortium including the U.S.S.R., Poland, and the German Democratic Republic, organized for drilling in Baltic waters and the Kiembay asbestos complex in Orenburg Oblast', U.S.S.R., with a projected capacity of 500,000 tons per year, which was being built with a one-third investment of the CMEA countries in return for one-third of the output.

Table 4.—U.S.S.R.: Estimated production, trade, and consumption of mineral commodities in the U.S.S.R. in 1981

(Thousand metric tons unless otherwise specified)

Commodity	Production	Imports	Exports	Apparent consumption
METALS				
Aluminum:				
Bauxite	4,600	3,700	(1)	8,300
Nepheline concentrate	2,500	--	--	2,500
Alunite	600	--	--	600
Alumina	2,800	1,200	--	4,000
Metal:				
Primary	1,800	1	600	1,200
Secondary	150	--	70	80
Antimony tons	8,200	900	--	9,100
Arsenic, white (As_2O_3) do	7,750	--	35	7,715
Beryllium, 10% to 20% BeO do	1,800	(1)	(1)	1,800
Bismuth do	75	100	--	175
Cadmium do	2,900	150	45	3,005
Chromium, 30% to 56% Cr_2O_3	2,400	--	800	1,600
Cobalt tons	2,250	1,600	--	3,850
Copper:				
Primary	950	100	240	810
Secondary	95	--	16	79
Gold thousand troy ounces	8,425	--	8,038	387
Iron and steel:				
Iron ore	[2]242,000	--	40,000	202,000
Sinter	155,000	--	--	155,000
Pellets	54,100	--	9,000	45,100
Pig iron and ferroalloys	107,800	(1)	4,600	103,200
Steel:				
Crude	[2]149,000	(1)	800	148,200
Rolled	[2]103,000	7,500	6,600	103,900
Scrap	51,000	--	2,500	48,500
Lead:				
Primary	410	90	100	400
Secondary	220	--	--	220
Magnesium metal	78	--	3	75
Manganese ore	[2]9,400	--	1,250	8,150
Mercury 76-pound flasks	63,000	--	(1)	63,000
Molybdenum tons	10,900	800	(1)	11,700
Nickel	158	18	40	136
Platinum-group metals thousand troy ounces	3,350	(1)	1,700	1,650
Silver do	46,500	1,000	--	47,500
Tin:				
Primary tons	36,000	15,000	--	51,000
Secondary do	12,000	--	--	12,000
Titanium metals do	38,500	--	3,600	34,900
Tungsten do	8,850	1,400	(1)	10,250
Zinc:				
Primary	790	80	100	770
Secondary	80	--	--	80
NONMETALS				
Asbestos	2,105	(1)	525	1,580
Barite	500	500	--	1,000
Boron, B_2O_3 content	40	--	10	30
Cement	[2]127,000	600	3,500	124,100
Clays	2,500	(1)	250	2,250
Corundum, natural tons	8,600	2,000	--	10,600
Diamond:				
Gem thousand carats	2,100	(1)	1,200	900
Industrial do	8,500	(1)	700	7,800
Diatomite	230	(1)	(1)	230
Feldspar	320	--	--	320
Fertilizer materials:				
Nitrogen: N content	12,600	100	2,500	10,200
Phosphatic:				
Apatite:				
Ore, 17.7% P_2O_5	47,500	--	(1)	47,500
Concentrate, 39.4% P_2O_5	17,700	--	5,000	12,700
Sedimentary rock:				
Ore, 13% P_2O_5	25,500	--	--	25,500
Concentrate, 19% to 25% P_2O_5	12,750	--	700	12,050
Potash, K_2O equivalent	8,350	--	3,000	5,350
Fluorspar	530	550	--	1,080
Graphite	105	(1)	12	93
Gypsum and plasters	5,500	(1)	150	5,350
Lime, dead-burned	25,000	(1)	(1)	25,000
Magnesite, crude	4,150	550	30	4,670
Mica	47	1	--	48
Pyrites: Sulfur content	3,600	--	410	3,190
Salt, all types	14,600	(1)	500	14,100
Sulfur, elemental (excluding sulfur content of pyrite)	7,615	800	130	8,285

See footnotes at end of table.

Table 4.—U.S.S.R.: Estimated production, trade, and consumption of mineral commodities in the U.S.S.R. in 1981 —Continued

(Thousand metric tons unless otherwise specified)

Commodity	Production	Imports	Exports	Apparent consumption
NONMETALS —Continued				
Sulfuric acid	[2]24,100	75	175	24,000
Talc	500	26	[1]	526
MINERAL FUELS				
Coal:				
Anthracite	79,000	--	4,000	75,000
Bituminous: Coking	185,000	6,500	23,000	168,500
Other	276,000	--	--	276,000
Lignite and brown coal	164,000	20,000	[1]	184,000
Gas, natural ---- million cubic meters	[2]465,000	4,000	58,000	411,000
Peat:				
Agricultural	[2]280,000	--	--	280,000
Fuel use	60,000	--	--	60,000
Oil shale	[2]37,000	--	--	37,000
Petroleum:				
Crude	[2]609,000	5,000	110,000	504,000
Refinery products	415,000	1,000	40,000	376,000

[1]Less than 1/2 unit.
[2]Reported in Soviet sources.

Table 5.—U.S.S.R.: Net import reliance of selected minerals and metals as a percent of consumption in 1981

Commodity	Net import reliance (negative numbers show exports)	Principal sources
METALS		
Aluminum	-50	
Antimony	10	Yugoslavia.
Bauxite and alumina	39	Guinea, Hungary, India, Jamaica, Yugoslavia.
Cadmium	3	
Chromium ore, over 45% Cr_2O_3	-50	
Cobalt	42	Cuba.
Columbium	--	
Copper	-18	
Gold	-2000	
Iron ore	-20	
Iron and steel scrap	-4	
Lead	-2	
Manganese	-26	
Mercury	--	
Molybdenum	7	
Nickel	-29	
Platinum-group metals	-103	
Selenium	--	
Silver	2	
Steel mill products	2	West Germany, Japan, Italy, France.
Strontium	--	
Tantalum	--	
Tellurium	--	
Tin	24	Malaysia, Singapore, United Kingdom.
Titanium	-10	
Tungsten	14	China, Mongolia.
Vanadium	-5	
Zinc	-2	
NONMETALS		
Asbestos	-33	
Barite	50	Bulgaria, North Korea, Yugoslavia.
Cement	-2	
Gypsum	--	
Fluorspar	51	China, Mongolia, Thailand.
Mica sheet	2	India.
Potassium	-56	
Pumice	--	
Salt	-4	
Sulfur including pyrite	6	Poland.
MINERAL FUELS		
Natural gas	-13	
Petroleum	-29	

Table 6.—U.S.S.R.: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	[r]36	2,250	--	All to Cuba.[2]
Metal including alloys:				
Scrap	[r]31,457	27,385	--	Austria 26,810; Finland 482; Italy 72.
Unwrought	382,147	377,960	20	Hungary 166,749; Czechoslovakia 63,000; Japan 62,136.
Semimanufactures	[r]14,314	12,037	--	Poland 8,364; Finland 1,309; Hungary 930.
Antimony: Ore and concentrate	--	45	--	All to Austria.
Arsenic:				
Oxides and acids	76	NA	--	NA.
Metal including alloys, all forms	87	NA	--	NA.
Beryllium metal including alloys, all forms	1	2	--	All to France.
Chromium:				
Ore and concentrate[2] thousand tons	775	567	99	Czechoslovakia 131; Poland 128; Yugoslavia 64.
Oxides and hydroxides	[2]5,780	[2]3,496	--	United Kingdom 805; Yugoslavia 700; France 654.
Cobalt: Oxides and hydroxides kilograms	50	NA	--	NA.
Copper:				
Sulfate[2]	20,862	20,856	--	Bulgaria 8,000; Hungary 3,890; Switzerland 1,520.
Metal including alloys:				
Scrap	1,962	1,913	--	Austria 1,808; West Germany 104.
Unwrought	48,250	47,260	--	Czechoslovakia 39,000; Finland 4,885; West Germany 2,058.
Semimanufactures	[r]1,472	530	--	West Germany 171; Poland 153; Yugoslavia 132.
Germanium metal including alloys, all forms kilograms	--	200	--	All to West Germany.
Iron and steel:				
Ore and concentrate[2] thousand tons	44,504	46,873	--	Poland 13,664; Czechoslovakia 10,327; Romania 7,386.
Pyrites, roasted do	48	93	--	All to Hungary.
Metal:				
Scrap[2] do	1,987	2,500	([3])	Italy 559; East Germany 444; Yugoslavia 346.
Pig iron, cast iron, powder, shot do	2,704	2,968	--	Poland 1,370; Czechoslovakia 804; Bulgaria 403.
Ferroalloys do	[r]112	117	--	Hungary 48; Poland 44; Finland 7.
Steel, primary forms do	[r]813	969	--	Hungary 396; Yugoslavia 221; Italy 169.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	[r]1,556	1,493	--	Poland 670; East Germany 554; Hungary 139.
Universals, plates, sheets do	[r]918	999	--	East Germany 517; Hungary 238; Bulgaria 140.
Hoop and strip	16,574	14,738	--	Yugoslavia 9,368; Bulgaria 4,591; Finland 426.
Rails and accessories	26,377	1,676	--	Yugoslavia 1,596; Egypt 65.
Wire	15,771	6,749	--	Hungary 5,772; Jordan 548; Cyprus 299.
Tubes, pipes, fittings	56,737	45,294	--	West Germany 10,623; Saudi Arabia 8,036; Poland 6,002.
Castings and forgings, rough	1,840	868	--	West Germany 574; Austria 64; Saudi Arabia 20.
Lead metal including alloys:				
Scrap	[r]581	31	--	All to Saudi Arabia.
Unwrought	[r]37,143	36,118	--	Czechoslovakia 25,000; Finland 7,058; Poland 3,995.
Magnesium metal including alloys, unwrought	1,077	752	--	Yugoslavia 655; West Germany 51; United Kingdom 46.
Manganese:				
Ore and concentrate[2] thousand tons	1,317	1,255	--	Poland 490; Czechoslovakia 397; Bulgaria 125.
Oxides	--	23	--	All to Italy.
Mercury 76-pound flasks	406	2,930	--	West Germany 2,396; Austria 122; Portugal 87.
Molybdenum:				
Ore and concentrate	11	14	--	All to West Germany.
Metal including alloys, all forms	13	NA	--	NA.

See footnotes at end of table.

Table 6.—U.S.S.R.: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Nickel:				
Ore and concentrate	25	29	--	All to West Germany.
Matte and speiss	811	1,206	--	Sweden 1,117; France 65.
Metal including alloys:				
Scrap	62	858	--	Austria 606; Finland 169; West Germany 65.
Unwrought	r29,552	32,068	5,573	West Germany 6,411; Czechoslovakia 4,743; France 4,529.
Semimanufactures	118	160	--	All to Yugoslavia.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$205,399	$438,068	$90,070	Japan $215,997; West Germany $75,338; Switzerland $30,709.
Silver:				
Waste and sweepings[4] do.	$919	$665	--	All to West Germany.
Metal including alloys, unwrought and partly wrought do.	$4,634	$2	--	All to Belgium-Luxembourg.
Tin metal including alloys:				
Unwrought	5	1	--	All to West Germany.
Semimanufactures kilograms	50	NA	--	NA.
Titanium:				
Ore and concentrate	485	NA	--	NA.
Oxides	22	20	--	Italy 18; United Kingdom 2.
Metal including alloys, all forms	4,678	2,770	1,475	West Germany 808; Italy 193; France 164.
Tungsten: Ore and concentrate	25	NA	--	NA.
Zinc:				
Ore and concentrate	--	83	--	All to West Germany.
Oxides	44	8	--	All to Saudi Arabia.
Metal including alloys:				
Blue powder	20	NA	--	NA.
Unwrought	29,894	24,875	--	Czechoslovakia 20,000; India 2,383;[5] Poland 2,164.
Semimanufactures	r90	NA	--	NA.
Other:				
Ores and concentrates	18,178	1,292	--	All to Hungary.
Ash and residues, nonferrous	r66,875	67,341	--	Austria 66,351; Japan 846.
Oxides and hydroxides	65,188	100,648	55	United Kingdom 99,635; Japan 421.
Metalloids	r2,646	2,425	1	Japan 1,990; Switzerland 218; West Germany 163.
Alkali, alkaline-earth, rare-earth metals	--	34	4	Netherlands 20; Italy 5; United Kingdom 3.
Base metals including alloys, all forms	r20,898	21,110	--	Czechoslovakia 19,000; Poland 1,628; Austria 394.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	r1,169	NA	--	NA.
Artificial: Corundum	1,707	1,299	--	West Germany 988; Hungary 311.
Dust and powder of precious and semiprecious stones value, thousands	r$2,122	$1,674	$205	Belgium-Luxembourg $659; Italy $340; Yugoslavia $233.
Grinding and polishing wheels and stones	r31	e13	--	Yugoslavia 8; Turkey 4.
Asbestos, crude	r234,146	315,780	--	Poland 66,898; Japan 41,703; Hungary 41,639.
Barite and witherite	294	120	--	All to Yugoslavia.
Boron materials:				
Crude, natural borates	3,215	2,778	--	All to Japan.
Oxide and acid	r12,760	r15,355	641	Japan 1,944; Hungary 1,064;[2] Italy 884.
Cement[2] thousand tons	3,084	3,245	--	Saudi Arabia 905; Hungary 505; Czechoslovakia 387.
Chalk	r196	87	--	All to Finland.
Clays and clay products:				
Crude:				
Chamotte earth	49,367	26,095	--	Poland 26,092.
Fire clay	8,297	9,239	--	Poland 8,231; Hungary 1,008.
Kaolin	38,905	32,769	--	Yugoslavia 17,112; Poland 13,210; Austria 2,402.
Unspecified	4,272	79	--	Finland 30; Algeria 26; Denmark 21.

See footnotes at end of table.

Table 6.—U.S.S.R.: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products —Continued				
Products:				
Refractory[2]	129,812	120,255	--	Cuba 27,395; Romania 21,999; Bulgaria 19,436.
Nonrefractory	[r]7,800	20,687	--	Finland 20,610.
Diamond:				
Gem, not set or strung value, thousands	$314,731	$1,305,714	$3,668	United Kingdom $848,218; Belgium-Luxembourg $325,241; Japan $41,982.
Industrial do	$291	$253	--	Belgium-Luxembourg $233; United Kingdom $20.
Diatomite and other infusorial earth	114	NA	--	NA.
Fertilizer materials:				
Crude:				
Phosphatic thousand tons	3,980	3,780	--	East Germany 1,167; Poland 741; Hungary 478.
Potassic	6,014	1,077	--	All to Hungary.
Manufactured:				
Nitrogenous[2] thousand tons	2,321	2,866	--	Czechoslovakia 345; India 204; Hungary 157.
Phosphatic[2] do	638	704	--	Cuba 309; Bulgaria 183; Hungary 112.
Potassic[2] do	4,773	6,603	38	Poland 2,417; Hungary 679; Japan 426.
Other including mixed do	50	55	--	Hungary 45; Turkey 9.
Ammonia do	[r]1,339	1,825	1,000	Italy 262; Finland 162; Spain 104.
Graphite, natural	12,697	11,536	3,260	Japan 5,056; Poland 1,990; Italy 448.
Gypsum and plasters	52,578	35,205	--	Finland 20,405;[2] Sweden 14,800.[2]
Iodine	40	33	--	All to Hungary.
Lime	56	45	--	All to Saudi Arabia.
Magnesite	[r]27,311	29,402	--	Finland 8,756; Netherlands 8,568; Hungary 7,760.
Mica, worked including agglomerated splittings	--	2	--	All to Algeria.
Pigments, mineral: Iron oxides and hydroxides, processed	24	244	--	All to Yugoslavia.
Precious and semiprecious stones:				
Natural value, thousands	$10,321	$749	$82	Hong Kong $277; Austria $174; West Germany $92.
Synthetic do	$1,617	$438	$20	Austria $204; Canada $90; West Germany $49.
Pyrites, unroasted[2] thousand tons	915	911	--	Italy 391; Bulgaria 243; West Germany 101.
Salt and brine[2]	402,660	480,865	--	Hungary 179,861; Czechoslovakia 166,733; Denmark 54,602.
Sodium and potassium compounds:				
Caustic potash	--	1	--	All to Singapore.
Caustic soda	210	745	--	Turkey 743.
Soda ash	[r]48,022	43,275	--	Italy 21,822; Finland 9,961; Hungary 5,570.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	[r]19,201	22,162	--	West Germany 10,170; Italy 8,902; Japan 874.
Worked	[r]2,079	[7]1,524	(7)	Yugoslavia 1,302; Saudi Arabia 167; France 20.
Gravel and crushed rock	[r]2,515	394	--	Finland 237; Hungary 157.
Sand excluding metal-bearing	210	228	--	Algeria 117; Hungary 111.
Sulfur:				
Elemental:				
Crude	28,382	60,525	--	Hungary 37,075; Morocco 23,234.
Refined	2	NA	--	NA.
Sulfuric acid[2]	143,676	172,181	--	Czechoslovakia 138,643; Mongolia 910.
Talc, steatite, soapstone, pyrophyllite	561	(8)	(8)	
Other:				
Crude	82,876	[9]97,412	(9)	Italy 40,023; Belgium-Luxembourg 30,257; France 10,090.
Slag and dross, not metal-bearing	--	420	--	All to Yugoslavia.
Oxides and hydroxides of barium, magnesium, strontium	654	539	--	Netherlands 363; Belgium-Luxembourg 149; France 22.
Halogens	--	101	--	Hungary 100.

See footnotes at end of table.

Table 6.—U.S.S.R.: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	8	--	All to France.
Carbon black[2]	102,286	103,835	(10)	Bulgaria 31,083; Hungary 19,292; Czechoslovakia 15,974.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	21,730	21,334	--	Bulgaria 4,900; East Germany 3,376; Czechoslovakia 3,174.
Lignite including briquets	54,799	79,905	--	Yugoslavia 60,550; Japan 15,295; Austria 2,593.
Coke and semicoke thousand tons	[r]2,424	2,938	--	East Germany 1,156; Finland 776; Hungary 665.
Gas, natural million cubic feet	1,063,760	1,406,292	--	Czechoslovakia 293,887; Italy 240,598; East Germany 227,097.
Hydrogen, helium, rare gases	NA	2,341	--	Finland 2,118; Sweden 208.
Peat including briquets	[r]197,677	219,511	--	West Germany 71,658; Switzerland 31,504; Austria 29,183.
Petroleum:				
Crude thousand 42-gallon barrels	[r]674,880	651,465	--	East Germany 139,731; Czechoslovakia 138,202; Poland 96,285.
Refinery products:				
Gasoline do	[r]30,303	40,140	258	Netherlands 12,021; West Germany 8,773; United Kingdom 8,773.
Kerosine and jet fuel do	[r]3,689	2,570	--	Hungary 1,939; West Germany 377; Norway 123.
Distillate fuel oil do	[r]76,107	91,990	--	Switzerland 18,904; West Germany 14,033; Netherlands 11,844.
Residual fuel oil do	[r]55,015	48,621	220	Finland 8,744; Sweden 7,910; Belgium-Luxembourg 5,994.
Lubricants do	[r]2,292	2,120	--	Denmark 1,146; Austria 598; Finland 108.
Other:				
Liquefied petroleum gas do	[r]991	1,845	--	France 816;[2] West Germany 430; Hungary 219.
Mineral jelly and wax do	[r]58	42	--	Finland 38; Austria 2; Yugoslavia 2.
Nonlubricating oils do	182	1	--	All to Egypt.
Petroleum coke do	1,115	1,109	--	Japan 523; Italy 286; Spain 265.
Bitumen and other residues do	--	56	--	All to Spain.
Bituminous mixtures do	(3)	NA	--	NA.
Unspecified do	19,360	21,776	--	All to Poland.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals[2]	313,342	242,958	(11)	East Germany 28,190; Italy 20,730; Yugoslavia 19,932.

[p]Preliminary. [r]Revised. NA Not available.

[1]Owing to a lack of official trade data published by the U.S.S.R., this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from various sources, which include United Nations information, data published by the partner trade countries, and partial official trade statistics of the U.S.S.R.

[2]Official Trade Statistics of the U.S.S.R.

[3]Less than 1/2 unit.

[4]May include other precious metals.

[5]Metallgesellschaft Aktiengesellschaft (Metallstatistics), Frankfurt am Main, Federal Republic of Germany.

[6]Excludes imports by Hungary valued at $1,142,000 and France valued at $122,000.

[7]Excludes imports by the United States valued at $13,000.

[8]1980 exports of talc were valued at $9,000, all of which were imported by the United States.

[9]Excludes imports by the United States valued at $10,000 and Japan valued at $9,000.

[10]The United States reported imports of 17 tons.

[11]The United States imported 125,000 barrels of naphtha.

Table 7.—U.S.S.R.: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite thousand tons	2,826	3,316	--	Guinea 2,500;[2] Greece 586; Jamaica 213.
Oxides and hydroxides do.	938	1,123	--	Yugoslavia 437; Hungary 387; India 80.[2]
Metal including alloys:				
Unwrought	1,028	645	--	United Kingdom 438; Norway 200.
Semimanufactures	r9,380	9,622	2	Austria 3,761; Japan 1,799; West Germany 1,481.
Antimony metal including alloys, all forms	730	600	--	All from Yugoslavia.
Bismuth metal including alloys, all forms	--	15	--	All from Japan.
Chromium: Oxides and hydroxides	--	17	--	All from Austria.
Cobalt:				
Oxides and hydroxides kilograms	--	25	--	All from Japan.
Metal including alloys, all forms	1	2	--	All from Sweden.
Copper:				
Ore and concentrate	140,316	111,378	--	Canada 80,627; Philippines 29,891.
Metal including alloys:				
Scrap	55	25	--	All from Belgium-Luxembourg.
Unwrought	14,428	9,980	--	Poland 5,698; Canada 2,331; Japan 1,945.
Semimanufactures	r20,322	20,361	2	Yugoslavia 7,278; Poland 6,005; Japan 3,369.
Iron and steel:				
Ore and concentrate	--	20,577	--	All from Norway.
Metal:				
Scrap	20,000	20,577	--	Mongolia 20,000;[3] Belgium-Luxembourg 533.
Pig iron, cast iron, powder, shot	r47,300	71,260	--	Algeria 67,683; Sweden 2,920; Japan 268.
Ferroalloys	2,998	6,975	--	North Korea 5,613;[3] Brazil 809; Canada 337.
Steel, primary forms	31,190	61,137	--	Czechoslovakia 40,000; West Germany 18,884.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	r1,177	[4]1,348	(5)	Japan 367;[4] Poland 207; Spain 159.
Universals, plates, sheets do.	r2,984	2,836	--	West Germany 1,349; Belgium-Luxembourg 334; Japan 241.
Hoop and strip	303,399	[6]370,185	--	West Germany 273,972; Belgium-Luxembourg 25,895; France 13,146.
Rails and accessories	6,027	381	--	Canada 380.
Wire	33,198	r25,488	--	Belgium-Luxembourg 12,114; Yugoslavia 2,768; Italy 2,422.
Tubes, pipes, fittings thousand tons	r3,490	2,833	(5)	West Germany 861; Japan 793; Czechoslovakia 386.
Castings and forgings, rough	6,046	3,666	--	West Germany 2,115; Italy 1,525.
Lead:				
Ore and concentrate	r86,099	53,706	--	Canada 14,437; Ireland 14,417;[3] Japan 6,139.
Oxides	r1,336	5,645	--	France 2,844; West Germany 2,100; Netherlands 450.
Metal including alloys:				
Unwrought	87,605	60,513	--	Yugoslavia 13,953; Canada 11,664; United Kingdom 10,211.
Semimanufactures	r33	2,046	--	Spain 2,000; Yugoslavia 45.
Magnesium metal including alloys, unwrought	--	5	--	All from Italy.
Manganese oxides	5,367	4,082	1,048	Ireland 1,274; Greece 1,260; Spain 500.
Mercury 76-pound flasks	2	NA	--	NA.
Molybdenum:				
Ore and concentrate	3,391	326	229	Netherlands 97.
Metal including alloys, all forms kilograms	1,408	1,150	--	France 1,000; Japan 150.
Nickel:				
Matte and speiss	4,055	NA	--	NA.
Metal including alloys:				
Unwrought	10	(5)	--	All from West Germany.
Semimanufactures	42	25	(5)	West Germany 10; France 6; Italy 5.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$1,519	$3,069	$299	West Germany $2,121; United Kingdom $649.

See footnotes at end of table.

Table 7.—U.S.S.R.: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Silver:				
Ore and concentrate value, thousands	[r]$4,488	$4,172	--	All from Canada.
Metal including alloys, unwrought and partly wrought do.	$5,556	$17,271	$7	Switzerland $16,269; France $807; Canada $156.
Tantalum metal including alloys, all forms	([5])	18	--	All from Singapore.
Tin:				
Ore and concentrate	2,100	1,851	--	Do.
Metal including alloys:				
Unwrought	12,530	14,241	--	Malaysia 6,485;[2] United Kingdom 3,788; Singapore 2,577.
Semimanufactures kilograms	315	904	--	Japan 782; Yugoslavia 122.
Titanium:				
Oxides	2,684	2,321	--	West Germany 1,675; Japan 640.
Metal including alloys, all forms	--	1	--	All from Japan.
Tungsten:				
Ore and concentrate	[e]757	963	--	Netherlands 933; Singapore 30.
Metal including alloys, all forms	62	67	15	Japan 52.
Zinc:				
Ore and concentrate	73,729	51,128	--	Sweden 11,510; Canada 11,494; Spain 10,977.
Oxides	100	107	--	United Kingdom 100; Japan 5.
Metal including alloys:				
Blue powder	--	1,089	--	All from Yugoslavia.
Unwrought	38,473	61,305	--	Finland 9,369; Poland 9,351; West Germany 7,662.
Semimanufactures	[r]2,738	2,965	--	Poland 2,955; Finland 6.
Other:				
Ores and concentrates	NA	[e]97,104	--	Norway 97,025; West Germany 65.
Ash and residues, nonferrous	667	160	--	Spain 112; Yugoslavia 36.
Oxides and hydroxides	[r]674	12,812	--	Sweden 10,359; Austria 1,350; Japan 555.
Metalloids	[r]39,790	51,834	3	Norway 19,992; Yugoslavia 11,013; France 9,308.
Base metals including alloys, all forms	[r]3,063	4,171	3	Poland 4,000; Japan 146; Belgium-Luxembourg 15.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	30	14	3	Sweden 7; West Germany 4.
Artificial: Corundum	123	NA	--	NA.
Dust and powder of precious and semiprecious stones value, thousands	$1	$338	--	All from Belgium-Luxembourg.
Grinding and polishing wheels and stones	[r]2,638	2,411	45	Austria 565; United Kingdom 464; Italy 460.
Asbestos, crude	3	NA	--	NA.
Barite and witherite	95,538	44,438	--	Turkey 43,238; Japan 1,200.
Boron materials:				
Crude, natural borates	4	NA	--	NA.
Oxide and acid	--	2	--	All from West Germany.
Cement	[3]545,000	[3]523,000	--	North Korea 481,000;[3] Finland 33,710.
Clays and clay products:				
Crude	1,952	1,568	--	Yugoslavia 1,323; United Kingdom 106; West Germany 65.
Products:				
Refractory	[r]24,025	28,769	2,098	Yugoslavia 14,475; Japan 4,391; France 2,257.
Nonrefractory	[r]7,101	15,440	--	Turkey 7,376; Yugoslavia 5,245; Italy 1,492.
Diamond:				
Gem, not set or strung value, thousands	$858	$246	--	Switzerland $213; Belgium-Luxembourg $33.
Industrial do.	$252	$530	--	Belgium-Luxembourg $498; United Kingdom $32.
Diatomite and other infusorial earth	1,284	1,875	--	Iceland 1,620; Japan 255.
Feldspar, fluorspar, etc	62,640	104,377	--	Thailand 47,500; Kenya 44,334; Spain 9,955.

See footnotes at end of table.

Table 7.—U.S.S.R.: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials:				
Crude, nitrogenous	--	2,000	--	All from Bulgaria.
Manufactured:				
Nitrogenous	[r]40,338	96,146	17	Afghanistan 75,500;[3] North Korea 20,469.[3]
Phosphatic[3]	76,088	249,958	--	Morocco 107,653; Sweden 24,111.
Potassic	1	NA	--	NA.
Other including mixed	1	22,262	--	Sweden 21,001; Yugoslavia 1,150.
Graphite, natural	227	10	--	All from France.
Gypsum and plasters	162	10	--	All from Yugoslavia.
Lime	[r]103	1,024	--	Finland 846; Yugoslavia 131; Italy 38.
Magnesite powder[3]	518,021	539,601	--	North Korea 500,608; Turkey 32,690.
Mica:				
Crude including splittings and waste	12	1	--	All from United Kingdom.
Worked including agglomerated splittings kilograms	420	40	--	All from Yugoslavia.
Pigments, mineral: Iron oxides and hydroxides, processed	662	977	--	Japan 609; West Germany 311; United Kingdom 55.
Precious and semiprecious stones:				
Natural value, thousands	$8	$40	--	United Kingdom $24; Italy $16.
Synthetic do	$1,855	$2,175	--	France $1,641; Switzerland $526.
Salt and brine	[r]98,997	102,390	--	China 102,344;[3] West Germany 41.
Sodium and potassium compounds:				
Caustic potash	501	2,435	--	Japan 1,300; Yugoslavia 620; Belgium-Luxembourg 505.
Caustic soda	[r]50,683	64,819	([5])	Italy 31,217; Netherlands 12,007; Spain 10,900.
Soda ash	481,272	487,990	--	Bulgaria 459,939; Poland 26,646.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	62	213	--	Italy 137; Yugoslavia 38; Finland 31.
Worked	609	964	--	Yugoslavia 588; Italy 233; Finland 118.
Gravel and crushed rock	[r]5,273	19,060	--	Hungary 15,905; Finland 3,143.
Quartz and quartzite	[r]919	1,264	--	Finland 1,164; Sweden 100.
Sand:				
Construction cubic meters	20,463	4,806	--	All from Hungary.
Industrial	776	522	--	Italy 256; Finland 228.
Sulfur:				
Elemental, crude	705,008	742,000	--	All from Poland.
Sulfuric acid	[r]66,907	92,394	--	Poland 92,166; Japan 200.
Talc, steatite, soapstone, pyrophyllite	3,065	3,447	--	Finland 3,401; France 46.
Other:				
Crude	[r]2,960	5,756	--	Algeria 5,385; Japan 348.
Slag and dross, not metal-bearing	--	13	--	All from Finland.
Oxides and hydroxides of barium, magnesium, strontium	3,573	5,017	--	France 4,966; Japan 50.
Halogens	41	NA	--	NA.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	[r]687	1,002	--	Finland 1,001.
Carbon black	[3]960	[3]448	--	Japan 280; West Germany 167.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	9,512	6,041	--	All from Poland.
Lignite including briquets	18,091	20,326	--	All from Hungary.
Coke and semicoke	722,000	501,404	--	Poland 500,000.
Gas, natural million cubic feet	311,066	140,380	--	Iran 80,764;[10] Afghanistan 59,305.[10]
Hydrogen, helium, rare gases	NA	5	--	West Germany 2; Italy 2.
Peat including briquets	34	227	--	All from Finland.
Petroleum refinery products:				
Gasoline 42-gallon barrels	8,203	289	--	Netherlands 213; Greece 43.
Kerosine and jet fuel do	502,200	367,288	--	Hungary 236,910; Italy 111,058; Yugoslavia 14,252.
Distillate fuel oil do	[r]275,744	212,662	--	Hungary 165,724; Finland 24,051; Greece 16,584.
Residual fuel oil do	49,018	48,984	--	Greece 44,795; Finland 1,592; Yugoslavia 1,332.
Lubricants do	[r]375,746	[11]691,147	52,670	Italy 333,313; France 142,618; Finland 65,352.
Other:				
Liquefied petroleum gas do	290	209	--	France 128; Finland 81.
Mineral jelly and wax do	3,345	12,041	102	Italy 4,006; West Germany 3,990; Austria 2,377.
Nonlubricating oils do	924	119	119	
Petroleum coke do	633,749	805,620	755,333	Norway 50,287.

See footnotes at end of table.

Table 7.—U.S.S.R.: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products —Continued				
Other —Continued				
Bitumen and other residues				
42-gallon barrels	14,847	20,834	--	Finland 14,023; Hungary 6,575.
Bituminous mixtures do	14,659	16,332	--	Finland 15,550; Yugoslavia 721.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	73,003	49,489	--	Japan 48,800;[3] West Germany 513.

[p]Preliminary. [r]Revised. NA Not available.

[1]Owing to a lack of official trade data published by the U.S.S.R., this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from various sources, which include United Nations information, data published by the partner trade countries, and partial official trade statistics of the U.S.S.R.

[2]Metallgesellschaft Aktiengesellschaft (Metallstatistics), Frankfurt am Main, Federal Republic of Germany.

[3]Official Trade Statistics of the U.S.S.R.

[4]Excludes part of Japanese exports valued at $123,676,000.

[5]Less than 1/2 unit.

[6]Excludes part of Japanese exports valued at $32,005,000.

[7]Excludes part of Japanese exports valued at $7,753,000.

[8]Excludes exports by Australia valued at $2,635,000.

[9]Excludes exports by Australia valued at $3,064,000.

[10]1980 Yearbook of World Energy Statistics, United Nations, New York.

[11]Excludes part of Japanese exports valued at $5,009,000.

COMMODITY REVIEW

METALS

Aluminum.—In 1981, estimated production of aluminum increased to 1.95 million tons, including 150,000 tons of secondary aluminum, and production of alumina increased to 2.8 million tons. In 1980, production of aluminum had increased 15% in comparison with that of 1975. In 1981, there was no evidence of increased production of domestic ore and concentrate, and the Soviets were trying to obtain additional foreign supplies.

The U.S.S.R. operated 14 primary reduction plants and 15 secondary aluminum plants. The rapid expansion of the aluminum industry was based on foreign technology and imported bauxite. Aluminum was produced for export as well as domestic consumption, and the U.S.S.R. exported aluminum to hard currency markets along with CMEA countries. In 1981, the U.S.S.R. increased its exports of aluminum to both centrally planned and market economy countries.

Although the Soviet Union produced large amounts of low-grade bauxite, supplies were not sufficient, and production was being developed from nepheline and alunite. Still, in 1980, over 82% of primary production was derived from bauxite, 16% from nepheline, and less than 2% from alunite. The major sources of nepheline were the apatite complex on the Kola Peninsula and Siberian nepheline syenite rock.

The Soviets imported about 40% of their bauxite and alumina requirements. Principal suppliers were Greece, Guinea, Hungary, and Yugoslavia, with imports also coming from France, Italy, Jamaica, Japan, and Turkey. Offsetting import costs was the availability of large supplies of hydroelectric power in Siberia, where most of the smelting capacity was located. The low energy costs, however, had to be calculated with respect to the higher transport costs for raw materials and output.[26]

During 1981-85, production of aluminum was to increase 15% to 20%. Growth in aluminum production was to be obtained by completing construction at the Krasnoyarsk and Regar (Tadzhik) plants, beginning operations at the Sayansk plant, and by increasing the capacity of existing potlines. Alumina production was to be increased by achieving full capacity at the Nikolayev and Achinsk alumina plants, putting into operation a new alumina shop at the Bogoslovsk aluminum plant, and transferring the bauxite supply for the Tikhvin alumina plant from depleted reserves in the Tikhvin area to the Severoonezhsk deposit.

The following developments were report-

ed in the Soviet aluminum industry in 1981. At the end of 1981, the Regar (Tadzhik) aluminum plant had prepared potline 6 to begin operations. To bring the remaining planned potlines into operation, the pace of construction work at the Regar plant would have to be increased by 50%.[27] In 1981, renovation of the potlines continued at the Bratsk aluminum plant. At the Kanaker aluminum plant, expansion and reconstruction of the foil shop was underway, and capacity of the foil shop was to increase 150%.

In late 1981, the Irkutsk aluminum plant was reportedly exceeding its production goals. A capacity increase of 20% to 25% was planned during 1981-85. The Irkutsk plant produced aluminum wire and ingots, and approximately one-third of production was exported. In 1981, the Krasnoyarsk aluminum plant was reported to have fulfilled its plan.

The long-range development program provided for a major increase in alumina production. The Nikolayev alumina plant was undergoing expansion; it used domestic and imported bauxite. The plant was to have a final capacity of 1 million tons per year, comprised of four 250,000-ton-per-year stages. In 1981, the first and second stages of the Nikolayev plant were reported to have reached capacity, and production was reported from the third stage. The fourth and last stage was still being prepared for operation in late 1981.

In 1981, the Pavlodar aluminum plant reported fulfilling its yearly output plan. During the 11th 5-year plan, production of alumina at the Pavlodar plant was to increase 2% compared with that of the 10th 5-year plan. This increase in output was to be achieved without any addition to the labor force. All necessary renovations at the Pavlodar plant to make better use of low-grade bauxite were to be completed by 1985. Despite its being called an aluminum plant, there was no indication in Soviet sources that the Pavlodar aluminum plant produced primary aluminum.

In 1981, the Achinsk alumina plant was again not achieving its production goals. The plant had not met its production goals since it went onstream 10 years earlier. The main cause of lagging production was technological problems in producing alumina from nepheline. The Achinsk plant was also faulted for inefficient pollution controls.[28]

In 1981, the Soviet Union signed contracts to buy approximately 200,000 tons of Brazilian bauxite to acquire raw materials to supply the Nikolayev plant. The U.S.S.R. agreed to help finance an alumina refinery at Visakhapatnam in India with a capacity of 600,000 to 800,000 tons per year. A percentage of the output was to go to the U.S.S.R., depending on its contribution to the financing.

Table 8.—U.S.S.R.: Estimated annual capacity of primary aluminum plants

(Thousand metric tons)

Plant	Probable capacity Dec. 31, 1981
Bogoslovsk	140
Bratsk	540
Dneprovsk	70
Irkutsk	240
Kanaker	70
Kandalaksha	30
Krasnoyarsk	390
Nadvoitsa	35
Novokuznetsk	160
Regar (Tadzhik)	200
Sayansk	(1)
Sumgait	70
Uralsk	135
Volkhov	20
Volgograd	200
Total	2,300

[1]Not yet in operation.

Antimony.—The Kadamzhay complex in the Kirgiz S.S.R. was the principal antimony center; integrated facilities produced most of the country's refined products. Production at this complex was to have increased 50% in 1976-80. Deposits of antimony also occurred in Kazakhstan and at Sarylakh and Tazhdolinsk in Siberia. Detailed exploration was occurring at the Novoye antimony-mercury deposit in Kirgiziya. Construction was being carried out at the new Aznob Mine and mill unit at the Dzhidzhikrutskiy complex in Tadzhikistan, and the recovery of antimony from lead scrap was planned.

Arsenic.—Arsenic ore reserves are estimated at 12 million tons. Small arsenic deposits are located in Tadzhikistan; however, all Soviet arsenic output was obtained as a byproduct of smelting or roasting metallic ores. A plant to recover arsenic from sulfur was installed at the Mednogorsk copper and sulfur complex in Orenburg Oblast'.

Beryllium.—The Soviet Union ranked as one of the world's largest producers and consumers of beryl and beryllium alloys and metal. Beryllium is found in variable quantities in most pegmatites throughout

the U.S.S.R. Numerous deposits are located in the Altay, Kazakhstan, Kola Peninsula, Soviet Far East, Transbaykal, and western Ukraine. The probable level of production in 1981 was 1,800 tons of beryl (10% to 12% BeO). The recovery of beryllium from the Dzhidinsk tungsten and molybdenum ores in the Buryat A.S.S.R. was planned.

Bismuth.—In 1981, estimated production of bismuth increased to 75 tons. Bismuth was recovered as a byproduct of lead and zinc smelting in Kazakhstan and other regions; from dust and crude metal at the Balkhash, Kirovgrad, and Mednogorsk complexes; and from tungsten and molybdenum ores. Two copper-bismuth deposits (Taryzkan and Kantarkhana) were under exploitation in Tadzhikistan. The Ustarassy Mine in the Chatkal Mountains was the only enterprise mining bismuth ore, and its concentrates were sent to the Chimkent lead plant in Kazakhstan for processing. In 1981, production of bismuth at the Ust'-Kamenogorsk lead-zinc complex in Kazakhstan increased 46% compared with 1980 output; in 1980, production of bismuth at Ust'-Kamenogorsk had declined.

Chromium.—Soviet-reported production of crude chrome ore (30% to 44% Cr_2O_3) was 3.4 million tons in 1980 and decreased to 3.3 million tons in 1981. The 1981 production of marketable chrome ore (45% to 56% Cr_2O_3) was estimated at 2.4 million tons. By 1985, production of crude chrome ore was to increase to 3.8 million tons.

The U.S.S.R. was the world's second largest producer and exporter of chrome ore. Over 60% of output was consumed or stocked in the Soviet Union, and approximately three-fourths of the exports were to centrally planned economy countries. According to 1978 data, Soviet consumption of chrome ore was distributed as follows: metal production, 45%; refractories, 35%; and chemical and other products, 20%.

The Donskoye mining and concentration complex at Khrom-Tau in western Kazakhstan produced over 90% of Soviet output and was the only supplier of high-quality ore. The rest came primarily from the Saranov underground operation in the Urals. By 1985, output at the Donskoye complex was to increase 14%, raising production to 3.6 million tons per year of crude chrome ore. In January 1982, the first stage of the Molodezhnaya underground mine at the Donskoye complex was officially put into operation. The first stage was to have a capacity by 1985 of 800,000 tons per year of crude chrome ore with a Cr_2O_3 content of 45% to 51%. Ultimate capacity was to be 2 million tons per year.

Cobalt.—Cobalt production in 1981 was estimated at 3,750 tons. Production of cobalt along with nickel during 1981-85 was to increase more than 30%. Cobalt production rose 16% between 1970 and 1975 and about 10% between 1976 and 1980. Gross cobalt reserves are estimated at 100,000 tons of contained metal, found chiefly in nickel-cobalt ores and in cobalt ores of the Khovu-Aksy deposit in the Tuva A.S.S.R. north of Mongolia.

Cobalt production was concentrated at Noril'sk in East Siberia, at Monchegorsk and Pechenga on the Kola Peninsula, at the Yuzhuralnikel, Ufaley, and Rezh plants in the Urals, and at some copper plants. During 1976-80, Noril'sk became the main producer. Expansion of domestic output depended greatly on the rate of development of the Noril'sk complex. Domestic ore production was augmented by large shipments of Cuban cobalt-nickel concentrates, and the Soviets were financing the expansion of Cuban nickel production.

Copper.—In 1981, blister copper production increased to approximately 1.05 million tons, including 95,000 tons of secondary copper. This increase was due primarily to new capacities coming onstream at the Erdenet copper-molybdenum complex in Mongolia. In 1981, the United States began exporting copper concentrate to the Soviet Union.

During 1981-85, copper production was to increase 20% to 25% over the 1980 level. Blister copper was produced at 13 smelters. Secondary blister copper was produced by the Kirovgrad smelter in the Urals, by the Moscow smelting and electrolytic plant, and by several small units at secondary nonferrous plants. The country operated 40 concentrators and 11 copper refineries. Approximately 80% of all ore was mined in open pits. About 10% of the primary copper was produced as a byproduct.

The main copper ore regions are in central and eastern Kazakhstan, the eastern slope of the Ural Mountains, Uzbekistan, Transcaucasia, East Siberia, and Noril'sk. Other deposits of lesser importance are found in the North Caucasus, West Siberia, and the Kola Peninsula.

Kazakhstan contains about one-half of the total copper reserves and produced approximately 30% of the total Soviet copper output. During 1981-85, output of refined copper in Kazakhstan was to increase 15.9%. In Kazakhstan, plans called for put-

ting into operation facilities at the Dzhezkazgan complex, for developing the Boshchekul copper deposit, and for completing construction of the East Kazakhstan mining and chemical complex.

With the decline in growth in copper production in the Ural region as older mines became depleted, Kazakhstan, farther to the east, became the leading copper-producing region. However, shortages of concentrate were occurring in Kazakhstan. Problems in securing adequate raw materials led to the Balkhash complex, Kazakhstan, working under capacity. Blister copper production was at 80% of capacity and refined copper production at 77% of capacity. The results of work completed in 1981, along with plans for 1982, indicated that construction and installation work planned for 1981-85 at the Balkhash and Dzhezkazgan complexes would be one-half completed and would thus delay commissioning of planned facilities. At Balkhash, renovation of the copper smelting plant, which went into operation in 1938, and the rolling shop, which went into operation in 1941, was considered necessary.[29]

In 1981, the Dzhezkazgan mining and metallurgical complex in Kazakhstan exceeded its 1981 production quota for refined copper. During 1981-85, output of refined copper at the Dzhezkazgan complex through renovation of facilities was to increase 3.6%. At Dzhezkazgan, the first stage of the No. 3 concentration plant, two stages of Mine No. 67, and the first stages of the Annenskiy and Akchiy-Spassk Mines were to begin operation. In 1981, redevelopment of the Kounrad open pit in Dzhezkazgan Oblast', Kazakhstan, was reportedly completed; Kounrad was one of the largest copper mines in the U.S.S.R.

The Ural region was the second largest copper-producing area, with mostly copper-pyrite deposits that contain gold, silver, zinc, and other metals. There are over 100 individual pyrite deposits in the Urals. With the opening of new mines, the proportion of open pit mines in the Urals increased to approximately 75%, and the trend to open pit mining continued.

In the Ural region in Bashkiriya, the first stage of the open pit Molodezhnyy copper-zinc mine was put into operation at the Uchaly mining and beneficiation complex. The Uzel'ginskiy underground mine was also being developed at the Uchaly complex.

At the Kirovgrad copper smelting complex in the northern Urals, the 1981 production goal was lower than 1980 production, and in 1981, the work force at the smelting complex decreased. The major problem at Kirovgrad, as at the Krasnoural'sk and Karabash copper smelters in the northern Urals, was obtaining raw materials, one-third of which had to be transported from other regions.[30] Plans for the Krasnoural'sk copper smelting complex for the 1980's called for putting into operation the first stage of the Volkovskiy open pit, which was to be a major raw material supplier. Supplying Krasnoural'sk with local ore from the Volkovskiy open pit was seen as a means of alleviating the chronic ore shortage. At Krasnoural'sk, renovation was also planned for the metallurgical workshop, and renovation and expansion were planned for the main concentration plant. In 1981, the Krasnoural'sk complex reportedly exceeded its goal for copper production.

Copper production was being expanded in Siberia with the development of the Noril'sk metallurgical complex, the site of a rich copper-nickel deposit. At the Nadezhda complex at Noril'sk, which was being built with Finnish technology and equipment, construction of the No. 2 smelter was reportedly completed, with a planned capacity of 650,000 tons per year of copper concentrate. Also reported completed at Noril'sk was a 33-kilometer slurry pipeline for transporting copper-nickel concentrates. In Khabarovsk Kray in the Soviet Far East, copper production was projected to increase with the development of the Pereval'nyy Mine at the Solnechnyy complex.

Problems persisted with the development of the well-known Udokan deposit near Lake Baykal in East Siberia. Gross reserves at Udokan amount to over 700 million tons, averaging 1.5% copper (20% oxides and 80% sulfides). Years passed without any significant development, and enrichment technology for the ore was not perfected experimentally.[31] Because of the distant location, severe climate, and seismic activity, construction costs at Udokan were stated to be three times greater than normal. The Government believed that completion of the Baykal-Amur Railroad (BAM) to Chara during 1981-85 would stimulate development of the Udokan deposit. Still, production at Udokan would not begin until at least the 1990's, and Western World participation would probably be necessary.

In Mongolia, the Erdenet copper-molybdenum complex, with an annual projected capacity of 16 million tons of ore and

118,000 tons of copper in concentrate, was being developed jointly with the U.S.S.R. The ore averages 0.85% copper and 0.012% molybdenum. Construction began in 1974, and in December 1978, the first of the four stages of the complex was put into operation. In 1981, the complex was projected to produce approximately 72,000 tons of copper in concentrate. The 1980 production was approximately 44,000 tons. Concentrate from the complex was sent to the U.S.S.R. for smelting.

Gold.—Since the 1930's, there has been little Soviet statistical reporting on precious metals production, trade, stockpiles, or exploration.

Estimated Soviet gold production in 1981 was 8.43 million troy ounces. Over two-thirds of Soviet gold production came from the Soviet Far East and East Siberia (mainly from placers at Kolyma, Aldan, Dzhugdzhur, Indigirka, Yana, and Chukotka); most of the balance came from gold and mixed sulfide ores in the Urals, Tadzhikistan, Armenia, and West Siberia. Byproduct nonferrous operations produced substantial quantities of gold. The biggest source of byproduct gold was copper and lead-zinc ores.

Magadan Oblast' was the Soviet Union's main producing center with 35 placer mines, 23 dredges, over 500 sand washing rigs, and about 1,500 bulldozers. Although production in Magadan Oblast' was reported lagging for the first 9 months of 1981, by November, shortfalls had been made up at all complexes and placer mines, and the 1981 production plan for the Oblast' was expected to be fulfilled.

The first stage of the Severnaya underground mine was put into operation in 1980 in the Urals, one of the oldest gold-producing regions in the U.S.S.R., at the Berezovskiy mining complex. At the Berezovskiy complex, two mines were in operation, the Severnaya and Yuzhnaya, and all smaller mines had been eliminated or were being used for ventilation. In 1981, at Berezovskiy, renovation of the concentration plant had begun, and construction was continuing on the Severnaya Mine.

Also in 1981, a gold mining complex was reported under construction in the Toguz-Torouzkiy region, Kirgiziya. Extensive prospecting was continuing in the Asian part of the country to find new reserves.

Soviet gold sales were a principal source of hard-currency earnings. Total sales in 1981 were estimated at 8 million ounces, approximately triple 1980 sales. Owing to persistent problems in agriculture and in other areas, sales in 1982 were projected to remain at their 1981 level. Gold holdings were secret, and gold sales were carefully managed for political and economic considerations. Through the first 9 months of 1981, gold sales were approximately double their 1980 levels. However, in October 1981, sales were reported to have virtually ceased. Then in November-December 1981, the Soviets reportedly sold a very large quantity of gold (possibly 3.2 million ounces) despite the fact that the price of gold had fallen. Along with the need to pay for agricultural products, owing to the poor harvest, the late gold sales in 1981 could have been used to prop up the Polish economy.

Iron Ore.—In 1981, production of usable iron ore decreased slightly to 242 million tons. Output of pellets increased to 54.1 million tons.

The iron ore industry was characterized by concentrated production facilities, and the tendency was to further augment existing large enterprises. Eight large open pits, each with a capacity of over 20 million tons per year, accounted for 53% of iron ore extraction. Nineteen large underground mines produced approximately 80% of the underground production. Open pit mining in 1980 accounted for 84.6% of iron ore production. Large mining and concentration complexes included the Severnyy (projected capacity of 45 million tons of crude ore), the Lebedi (40 million tons), the Novo-Krivorozhsk (35 million tons), and the Sokolovo-Sarbaysk (35 million tons).

Conditions for iron ore mining worsened. Between 1975 and 1980, the average metal content of crude iron ore decreased from 33.4% to 32.3%,[32] and there was a significant increase in the depth of open pits. The number of open pits up to 200 meters deep producing over 10 million tons per year decreased 26% in 1975-80, and the percentage of ore extracted from such pits decreased from 74.1% to 58.1%. At the same time, the number of open pits more than 200 meters deep and the percentage of crude iron ore extracted from such pits increased 50%.[33] Over the last decade, the cost per ton for the extraction of usable iron ore increased approximately 40%.[34]

Exports of iron ore went principally to CMEA countries. In 1980, over 95% of Soviet iron ore exports went to CMEA countries. Although a large exporter of iron

ore, the Soviet Union had problems supplying its own plants.

The largest iron ore producing region was the Krivoy Rog Basin in the Ukraine, followed by the Kursk region, the Urals, Kazakhstan, Siberia, and the Kola Peninsula. Among iron ore producing regions, the Kursk Magnetic Anomaly (KMA) was of increasing importance both in percentage of reserves and in ore extraction. The Krivoy Rog Basin in the Ukraine, another major producing area, was declining in importance.[35] Although growth in iron ore extraction was expected from basins in the Asian part of the country including the Kustanay Basin in Kazakhstan, the Angara-Ilimsk Basin in East Siberia, and the Aldansk Basin in the Soviet Far East, principal growth in iron ore reserves was to come from the KMA, which reportedly contained proved reserves of high-grade ore totaling 27 billion tons. There were shortages of iron ore in the Urals, and over 10 million tons of ore was shipped annually to the Urals from the KMA.

The chief underground iron ore mining regions were the Krivoy Rog Basin in the Ukraine (approximately 60% of total production) and the Gornaya Shoriya in West Siberia and the Tagilo-Kuvshinskiy region of the Urals, which supplied approximately 15% each. Underground mining was conducted at 40 mines. The majority were in the Ukraine (22), in the Urals (9), and in Siberia (6). Owing to the exhaustion of reserves at the upper levels of a number of surface mines, production was projected to increasingly shift to mixed modes of mining.

As of January 1976, total iron ore reserves in place in categories $A+B+C_1+C_2$[36] were 111 billion tons averaging 34.8% iron. Over 70% of these reserves were in the European part of the country including the Urals. The iron ore reserves were distributed as follows: the Ukraine, 31%; European center, 24.4%; Urals, 15.7%; Kazakhstan, 15%; Siberia, 7.4%; northwest, 3%; Soviet Far East, 2.5%; and others, 1%. Total national reserves in categories $A+B+C_1$ were estimated at 60.2 billion tons, averaging 38% iron. This included 10.3 billion tons averaging over 55% iron that did not require dressing and 34.8 billion tons of easily dressed ore. Of total iron ore reserves in place, only 14% could be used without beneficiation, 77% required simple beneficiation, and 9% needed complex beneficiation. In 1980, more than 84% of all crude iron ore was concentrated.[37]

In 1981, construction continued on the three new large mining-concentration complexes to be built during 1981-85 at Kachar (Kazakhstan), Kostamush (Karelia), and Stoylensk (KMA). Construction of the second stage of the Mikhaylov (KMA) and Lebedi (KMA) complexes began, and there was expansion and renovation of the Kovdor (Murmansk Oblast'), Olenegorsk (Murmansk Oblast'), Tsentral'nyy (Ukraine), and Yuzhniy (Ukraine) complexes.

In 1981, at the Mikhaylov complex, the capacity for iron ore extraction increased by 2 million tons per year, reaching 37 million tons. At the Yuzhniy complex, capacities were put into operation for the extraction of 1.5 million tons per year of crude ore and the production of 400,000 tons per year of concentrate. As a result, the Yuzhniy complex's capacity reached 37 million tons per year of crude ore and 17.5 million tons per year of concentrate. At the Olenegorsk complex, new capacities were put into operation. The capacity of the Kirovogorsk open pit at Olenegorsk was reportedly expanded by 1.2 to 2.2 million tons per year of crude ore, and the concentration plant was reportedly doubled in size to produce 800,000 tons per year of concentrate. Iron ore extraction capacities were put into operation at the Azerbaydzhan, Kovdor, and Novo-Krivorozhsk complexes; at the Sheregeshskiy Mine in Kemerovskaya Oblast', Siberia; at the Irbinskiy Mine in the Khakasskaya Autonomous Oblast', Siberia; and at the Imeni V. I. Lenin mining directorate in the Krivoy Rog Basin.

Major projects scheduled to go onstream in 1982 included capacities at the Kostamush complex in Karelia, being built with the aid of Finnish companies, and at the Stoylensk complex in Belgorod Oblast' (KMA). Mining of iron ore on a limited scale started at Kostamush in 1980. The project was being built in three stages and was to have an annual capacity of 8.9 million tons of pellets from 24 million tons of crude ore. The deposit contains an estimated 1.2 to 1.5 billion tons of ore with an average iron content of 31%. Construction of the first stage began in 1977, and total construction time was to be 8 to 10 years. Finland was to buy annually up to 1.2 million tons of pellets during 1983-90.

Iron and Steel.—In 1981, production of raw steel, rolled finished steel, and steel pipe increased slightly but fell short of the

goal. Although the Soviet Union was the world's largest producer in total quantity of iron ore, coke, refractories, raw steel, and steel pipe, the country was a net importer of high-quality rolled steel products. Waste was extensive in the Soviet iron and steel industry, and only approximately 45% of the raw steel production was efficiently used in the Soviet economy.

Major problems occurred in producing the needed assortment of ferrous metal products. For example, while in 1981 the plan for finished rolled ferrous metal fell short by 6%, the plan for the production of low-alloy steel needed to reduce metal consumption was short 29%.[38] Production problems were attributed in part to the practice of registering plan fulfillment in physical units (i.e., tons), which encouraged production of simple products.

Eleven metallurgical enterprises were responsible for more than one-half the Nation's output of raw steel. The largest producer was the Magnitogorsk complex. The other 10 major producers were the Chelyabinsk works, Cherepovets works, Karaganda complex, Krivoy Rog works, Kuznetsk complex, Nizhniy Tagil complex, Novolipetsk works, West Siberia works, Zaporozhstal works, and Zhdanov "Il'ich" works.

During 1981-85, capital investment in ferrous metallurgy was to increase by approximately 40% over that of 1976-80. The share of total steel production by oxygen converter was to increase from 28.5% to 33%. Electric steel production, which in 1981 accounted for about 11% of production, was to be increased almost 60% to 22 to 23 million tons in 1985. Continuous-casting steel production was to increase to 35 to 37 million tons per year from the 16.6 million tons (11% of total steel production) produced in 1980. Emphasis also was to be placed on powder metallurgy and the production of high-quality steel pipes for gas transport.

Growth in electric steel production was to be achieved by activating capacities at existing enterprises and by putting new electric furnaces into operation at the Donetsk and Uzbek works, at the Orsko-Khalilovo and Kuznetsk complexes, and at other enterprises. The country's continuous-casting capacity was to be increased, primarily at the Cherepovets, Dzerzhinsk, and Novolipetsk enterprises.

In 1981, at the Cherepovets works, capacity of the "2000" rolling mill was to be expanded by 500,000 tons per year. At the Magnitogorsk complex, renovation of the No. 6 blast furnace was completed. The No. 8 coking battery at Magnitogorsk, with a capacity of 1 million tons per year, was officially declared in operation on the last day of 1981. It replaced a 50-year-old coking battery. The new electric pipe-welding shop at the Vyksa metallurgical plant was not put into continuous operation in 1981, and plans were for the first stage of this shop to reach its full capacity of 250,000 tons per year of large-diameter pipe for high-pressure gas transport in 1983. At the Orsko-Khalilovo complex, the electric steel shop, with two electric furnaces of 250,000 tons per year capacity each, was officially put into operation in 1980, and the first steel from furnace No. 1 was produced. At the end of 1981, the Yermakov ferroalloys plant in Kazakhstan reported that a new furnace had been put into operation and that another furnace was under construction.

At the Oskol electric steel complex in Belgorod Oblast', construction continued in 1981 of the first roasting unit with a design capacity of 2.5 million tons per year of iron pellets for steelmaking by the direct reduction process. The first stage, which was scheduled to be commissioned in 1981, was to go into operation in December 1983. The Oskol complex was to be supplied with raw material from capacities being developed at the Lebedi mining and concentration complex. A $313 million contract for a complete rolling mill at the Oskol complex was concluded with a consortium led by the Schloemann Siemag AG of the Federal Republic of Germany. The mill was to begin operation in 1985. Other West German firms had been supplying facilities for the pelletizing plant and other works.

In 1982, plans called for putting into operation a tinplate shop at the Karaganda metallurgical complex, a converter shop at the Dzerzhinsk plant, and shops for cold-rolled steel at the Magnitogorsk and Novolipetsk complexes.

Table 9.—U.S.S.R.: Crude steel production by process, in percent

Process	1980	1981
Open hearth	60.2	59.1
Oxygen converter	28.5	29.5
Electric	10.8	10.9
Bessemer	.5	.5
Total	100.0	100.0

Table 10.—U.S.S.R.: 1981 planned production of rolled finished ferrous metal at major enterprises

(Million tons)

Enterprise	Planned output
Magnitogorsk complex	11.2
Cherepovets works	10.4
Krivorozh works	8.5
Novolipetsk works	6.0
Western Siberia "Zapsib" works	4.7
Zhdanov "Azovstal" works	4.6
Karaganda complex	4.4
Nizhniy Tagil complex	4.2
Zhdanov "Il'ich" works	4.2
Chelyabinsk works	3.9
Dzerzhinsk works	3.8
Kuznetsk complex	3.4
Zaporozhye "Zaporozhstal" works	3.4
Makeyevka works	3.4
Orsko-Khalilovo complex	3.3
Kommunarsk works	3.2
Rustavi works	1.3
Amur works	1.0

Source: Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 16, April 1981, p. 2.

Lead and Zinc.—In 1981, estimated output of primary lead at 410,000 tons remained the same, while primary zinc at 790,000 tons increased slightly compared with 1980 output. The 1981 estimated output of secondary lead increased to 220,000 tons, and the 1981 estimated output of secondary zinc remained at 80,000 tons. Lead and zinc imports were estimated to have increased in 1981. A large portion of lead and zinc exports went to the CMEA countries.

Over 10% of total lead and zinc production in 1980 was recovered as a byproduct. Of the total volume of lead produced, 35% came from secondary sources.[39] Ore reserves in 1980 were estimated at 16 million tons of contained lead and 20 million tons of contained zinc, over two-thirds of which are located in Kazakhstan, chiefly in the Altay region and the district of Karatau. There are also reserves of zinc in the Urals. Kazakhstan was the leading lead-zinc producing area, followed by the Urals, Uzbekistan, Siberia, North Caucasus, and the Ukraine. The largest part of the secondary lead was produced in shaft smelting at the "Ukrzink" plant in the Ukraine.

In recent years, production quotas for lead and zinc had not been met owing to the slow construction of new facilities, supply problems, and low metal recovery. For example, regarding lags in the construction of new mining capacity, development of the Gorevka lead and zinc deposit on the Angara River in Siberia still had not started, although exploitation of this deposit, where lead was "...practically lying on the surface..." was planned for the mid-1960's.[40]

In 1980, Kazakhstan produced over 70% of Soviet lead and approximately 50% of Soviet zinc. The 1981-85 plan for Kazakhstan was for lead production to increase 11.6%, and zinc production, 7.7%. In Kazakhstan, production of lead was to increase 12% and zinc 12.7% at the Ust'-Kamenogorsk lead-zinc complex during 1981-85, and new facilities were to be added. In 1981, the Ust'-Kamenogorsk complex reported the fulfillment of its plan for lead and zinc production. In Dzhezkazgan Oblast', Kazakhstan, plans were to increase the production of lead-zinc ore 53% during 1981-85. The Dzhezkazgan copper complex produces byproduct lead, and lead-in-concentrate output was to be raised 22% during the 11th 5-year plan.

The Zhayremsk complex was the newest lead-zinc producing enterprise in Kazakhstan; the first stage achieved its design capacity in 1978, and lead and zinc output were to increase 45% and 40%, respectively, during 1981-85, compared with that of 1976-80. Extraction of ore at the complex was to increase 50%. By 1988, the second stage of the complex was to be operating at design capacity. Construction was behind schedule at Zhayremsk, and this was foreseen as affecting commissioning of the second stage. A major problem for ore extraction at Zhayremsk was excess water in the pits, resulting in the ore freezing in winter. Plans to improve operations entailed acquiring more equipment including water pumps, 8-cubic-meter shovels, and 40- and 75-ton dump trucks.[41] Furthermore, projected targets for recovery of lead and zinc from Zhayremsk ore at the Achisay and Tekeli complexes were not being reached.[42] By 1985, a concentration plant was to be commissioned at the Zhayremsk complex along with new capacities at the Dal'nyezapad Mine and the Ushkatyn open pit. Failure to commission concentrating facilities at the Zhayremsk and Kargayly complexes in Kazakhstan resulted in ore being shipped hundreds of kilometers for processing. The commissioning of concentrating facilities at these complexes was deemed essential to overcoming this problem.[43]

At the Grekhovskiy Mine in the Zyryanov complex in Kazakhstan, which had been in operation more than 25 years, a new underground conveyor system doubled the transport capacity. In addition, an underground crushing complex was under construction,

and the ventilating system was being overhauled. A surface mine on the same deposit was being developed, along with construction of a pipeline to the concentrating plant. These improvements were projected to increase ore extraction by a minimum of 50% by 1985. The potential exploitation period for the Zyryanov deposit was extended 15 to 20 years with the detection of five new prospective mining areas.

At the Mirgalimsk deposit, which was being developed by the Achisay complex, approximately one-half of the ore was being left at higher levels, and some ore left in pillars reportedly contained two to three times more metal than ore being extracted at a depth of approximately 500 meters.[44]

The future development of the ore base in eastern Kazakhstan was of serious concern to Soviet officials. Although the output of polymetallic ores had increased fourfold in the past 10 years, the grades had dropped 40%. At the Leninogorsk mixed-sulfide complex in East Kazakhstan Oblast', production decreased 50% during 1970-79 because of ore shortages; a complaint was raised at the Leninogorsk plant about the lack of qualified basic-production workers.[45] In 1981, at the Leninogorsk complex, a new shop went into operation to process zinc concentrates. In Armenia, the Alaverdi copper complex began to recover lead from flue gases with electrostatic precipitators. An installation was to be constructed at Akhtala to upgrade this material.

Magnesium.—The 1981 estimated output of magnesium in the five operating plants increased to 78,000 tons, and production was to increase during 1981-85. The Ust'-Kamenogorsk titanium-magnesium complex in Kazakhstan exceeded its goal for magnesium production by 0.2% in 1981, and production of magnesium was to increase 40.7% in 1981-85. For this purpose, new capacities were to be put into operation at Ust'-Kamenogorsk. During 1976-80, output of magnesium at Ust'-Kamenogorsk increased 10%.

Manganese.—The 1981 Soviet manganese ore production decreased to 9.4 million tons. Expansion of the manganese industry during 1981-85 was to occur through expansion of existing enterprises as well as the construction of new enterprises. By 1985, production was to increase to 10.1 million tons.

In 1981, manganese ore capacity increased by 300,000 tons per year at the Ordzhonikidze complex in the Nikopol' Basin in the Ukraine. Nikopol' is the principal Soviet manganese basin, producing over one-half of Soviet manganese ore, but the ore, with an average grade of 26.4% manganese, is a little more than 2 meters thick and lies under about 80 meters of overburden.

Growth in manganese output during 1981-85 was to come from poorer and harder to concentrate carbonate ores.[46] During 1981-85, the Government planned to begin exploitation of the Bol'shoy Tokmak carbonate ore deposit in the Ukraine, which was to serve as a base for the construction of the Tavricheskiy mining and concentration complex in Zaporozh'ye Oblast'. The Bol'shoy Tokmak deposit was divided into northern, central, and southern sectors. Exploitation was to begin in the northern sector where the majority of reserves are concentrated. In Kazakhstan, a mine was to be developed at the Ushkatyn deposit; the output of the enterprise was intended for ferroalloy production.

The Bol'shoy Tokmak deposit is lower grade and deeper than the Nikopol' deposit, and there were unforeseen delays in bringing the deposit onstream. Lack of ore hindered production at the large ferroalloy plants in Nikopol' and Zaporozh'ye and in the entire ferrous metallurgy sector.[47]

Along with delays in bringing facilities onstream, another major cause of ore shortages was waste. Insufficient concentration and processing resulted in losses of up to one-half of the manganese in slime from concentration and in slag from metallurgical processing. The manganese content of the slag was approximately 16%, and manganese in the slag generally was not recovered. Rather high manganese-content slag was being used with asphalt for road paving, giving some roads a reddish color. An additional waste of manganese occurred during steel production. The average amount of manganese used in the Soviet steel industry was 10 kilograms per ton of steel, which was higher than in many countries. There was, furthermore, no program for secondary manganese recycling.[48]

At yearend 1969, manganese ore reserves in categories $A+B+C_1+C_2$ were estimated at 2.5 billion tons with an average manganese content of 23.0% to 26.4%, including 1.02 billion tons in the Nikopol' Basin. The Chiatura Basin in Georgia contains reserves of high-grade ore.

Two concerns, the Ordzhonikidze and Marganets, operated in the Nikopol' Basin. In 1980, there were 19 underground mines,

10 open pits, and 9 concentrators in the basin. The Chiatura Basin in 1980 had 24 mines and 8 concentrators. Approximately 80% of production from Chiatura came from underground mines.

Mercury.—In 1981, the output of mercury was estimated at 63,000 flasks (76 pounds each). Numerous mercury deposits exist, mainly in Soviet Central Asia, the Soviet Far East, and the Ukraine.

The largest Soviet mercury operation was the Khaydarkan complex in southern Kirgiziya, where mercury was mined by both underground and open pit methods. In 1981, the first output was reported at the Uluu-Too site from a new shaft of the Glubokaya mining directorate of the Khaydarkan complex. Ore was being mined at this shaft to a depth of 700 meters, and mercury production was projected to increase at Khaydarkan.

The Nikitovskiy complex in the Ukraine was the second largest mercury producer. Approximately 70% of the ore at Nikitovskiy was mined by underground, and 30%, by surface methods. Two underground mines, Second Novaya and Novozavodskaya, and the Polukupol Novyy open pit were in operation.

The small Zakarpatskiy complex processed ores from the Borkutnoye, Shayanskoye, and other small deposits in Zakarpatskaya Oblast', western Ukraine.

In the Tadzhik S.S.R., construction of the new Dzidzikrutskiy (Aznob) mercury-antimony complex was underway. Future development was planned of small deposits in the North Caucasus, at Chukotka in the Soviet Far East, and in other regions. Exploration for new deposits was continuing in Kirgiziya, the Soviet Far East, and other areas.

Molybdenum.—Output of molybdenum concentrates in 1981 was estimated to have increased to 10,900 tons of metal. In 1981, the United States increased exports of molybdenum concentrate to the U.S.S.R.

Molybdenum reserves in ore (molybdenite, copper-molybdenum, and tungsten-molybdenum ores) in the U.S.S.R. may approach 200,000 tons. Approximately 50% of the production was based on copper-molybdenum ores from Armenia, Kazakhstan, Siberia, and the Mongolian People's Republic. Approximately 30% of the production was from tungsten-molybdenum ores of Tyrny-Auz (Kabardin A.S.S.R. in the North Caucasus) and Dzhida (Buryat A.S.S.R.). The remainder came from molybdenite ore mined in Uzbekistan and Siberia. There are over 100 known deposits of molybdenum, but most are too small to be mined economically.

Armenia was one of the leading Soviet producing regions, but concentrates were shipped out of Armenia for processing. The Zangezur copper-molybdenum complex in Armenia, combining the former Kadzharan and Kafan complexes, supplied approximately 25% of the Soviet molybdenum.

The largest Soviet producer was the Sorsk complex in Krasnoyarsk Kray, which operated the Sorsk open pit. Other producers included the Tyrny-Auz tungsten-molybdenum complex, which operated the Molibden underground mine and the Mukulanskiy open pit. The Chorukhdayransk concentrator processed copper-molybdenum ores from the Chorukhdayransk and South-Yashransk deposits in the Tadzhik S.S.R. Construction of the Zhireken molybdenum complex in Chita Oblast', north of Mongolia, was being conducted. In Kazakhstan at the Akchatau mining and metallurgical complex, where production was based on tungsten-molybdenum ore, facilities were reportedly put into operation at the Yugo-Vostochniy Mine for the production of high-metal-content molybdenum concentrate. In 1981, the Akchatau complex reported exceeding its production plan. However, results of construction work indicated that development plans for the complex for 1981-85 would be only one-half fulfilled. Also, in Kazakhstan, the Balkhash mining and metallurgical complex had difficulty securing raw materials, and in 1981, capacities for processing molybdenum were only 65% utilized.[49]

The Erdenet open pit copper-molybdenum complex in Mongolia, which was being jointly developed by the U.S.S.R. and Mongolia, had an annual projected capacity of 1,000 tons of molybdenum metal from concentrate. The ore at Erdenet averaged 0.85% copper and 0.012% molybdenum. In 1981, the Erdenet complex was projected to produce 660 tons of molybdenum in concentrate; 1980 production was approximately 490 tons.[50] The concentrate was shipped to the U.S.S.R. for processing.

Nickel.—In 1981, Soviet nickel production, including production from Cuban raw material, increased to an estimated 176,000 tons. The delay in bringing production capacities onstream at Noril'sk, the site of a rich copper-nickel deposit, prevented the Soviets from attaining planned growth. The

10th 5-year plan (1976-80) called for an increase of 20% to 30% in nickel production, but the actual increase was 8.8%.[51] During the 11th 5-year plan (1981-85), production of nickel was also targeted to increase by not less than 30%, and much of this increase was to come from Noril'sk.

Known Soviet nickel reserves, almost one-half of which consist of low-grade silicate ores, are estimated not to exceed 5 million tons of contained nickel. Over 50% of the total reserve is in cupriferous pentlandites containing recoverable copper, cobalt, platinum-group metals, and some minor metals. Sulfide ores were mined in Noril'sk in Krasnoyarsk Kray (East Siberia), and in the Pechenga-Monchegorsk area in the Kola Peninsula. Oxide ores were produced in the Aktyubinsk area of the southern Urals, the Ufaley area of the central Urals, and the Ukraine.

The centers of production in order of importance were Noril'sk, the Urals, and the Kola Peninsula. There were seven smelters in operation, of which Noril'sk was the most important. Following a close second to Noril'sk were the Ufaley, Rezh, and Khalilovo smelters in the Urals. The Monchegorsk and Pechenga smelters were third, and the Pobuzhsk ferronickel plant in the Ukraine was fourth. The Soviet Union was foreseen as playing an increasing role as a nickel exporter, based on both Soviet and Cuban concentrates.

During the 11th 5-year plan, the Severonikel complex on the Kola Peninsula planned to increase nickel production by 80% based on raw materials from Noril'sk. Work on installing additional facilities at the Severonikel complex was reported.

At the Nadezhda complex in Noril'sk, the nickel flash-smelting plant, with a capacity of 550,000 tons per year of nickel concentrates and built with Finnish equipment and technology, was reportedly completed at the start of 1982. A 33-kilometer copper-nickel slurry line to Talnakh was put into operation at Noril'sk in 1981.

Soviet nickel sales to gain hard currency were partly blamed for depressed world nickel prices in 1981 as the U.S.S.R. increased its nickel exports to market economy countries. Soviet imports of Cuban nickel in nickel-cobalt concentrate were approximately 18,000 tons in 1980. The Soviet Union was assisting in Cuban nickel development, including the construction of the Punta Gorda plant in Cuba, with a capacity of 30,000 tons per year of nickel and cobalt.

Platinum-Group Metals.—The U.S.S.R. was steadily expanding its output of platinum-group metals. The 1981 output was estimated at 3.35 million troy ounces. The U.S.S.R. was one of the world's largest producers and exporters of platinum-group metals, and Soviet ore reserves are adequate for increasing production and exports for many years.

Production of platinum and platinum-group metals occurred at the Noril'sk copper and nickel complex in Krasnoyarsk Kray in East Siberia, the Severonikel and Pechenganikel complexes on the Kola Peninsula, and several smaller placer deposits in the Urals. Virtually all platinum-group metals were produced as byproducts, with over 75% coming from Noril'sk.

Production was to increase at Noril'sk in 1971-75 by 60% over the 1970 level and in 1976-80 by approximately 80% over the 1975 level. Slow construction of the Nadezhda plant at Noril'sk, however, limited production increases to 4% to 5% annually. Problems in completing construction work on schedule at the Nadezhda plant persisted in 1981.[52]

Along with attainment of capacity at the Nadezhda plant, expansion of output at Noril'sk was to accelerate with the completion of the Oktyabr' underground mine. The Oktyabr' Mine, which had been under development since 1969, was to be completed in six stages. The first four stages were in operation, and the last two were scheduled for completion during 1981-85.

Silver.—The estimated 1981 output of silver was 46.5 million troy ounces. Almost all silver was produced as a byproduct of nonferrous operations, including gold treatment plants. Production was centered in the Urals, Kazakhstan, the Soviet Far East, East Siberia, and Armenia. Complex ores in the Urals contain 0.2 to 0.4 gram of silver per ton. Production of silver was projected to increase approximately 4% in 1980-85. Some of this increase was to come from the Noril'sk complex, which produced silver. Copper-nickel enterprises on the Kola Peninsula were also producing silver.

A number of plants produced secondary silver. The Moscow plant for secondary production of precious metals was the main producer. Secondary sources included photographic film ash.

Tin.—Primary tin production in 1981 was estimated at 36,000 tons. By the mid-1980's, tin output was projected to reach 40,000

tons, based on new production from existing or developing mines in the Soviet Far East and Central Asia.

Despite Soviet policy to achieve self-sufficiency in mineral production, tin output continued to be inadequate, and imports accounted for approximately 25% of requirements. The major Soviet tin-producing areas were the Soviet Far East, Yakutia, and Transbaykal. Approximately 25% of total output was from placers, of which the Soviet northeast accounted for 75%.

Intensive exploration programs were being carried out for tin reserves. Positive results were reported in Magadan Oblast', Khabarovsk Kray, the Yakut A.S.S.R., and the Kirgiz S.S.R. In 1981, the Kirgiz Directorate for Geology planned a 3% increase in tin reserves for the Kirgiz S.S.R. Soviet gross tin reserves are currently estimated at 600,000 tons of contained metal, and the average content of tin ore ranges from 0.6% to 1% tin.

The largest tin-producing region was the Maritime Kray in the Soviet Far East. The major producer in the Maritime Kray was the Khrustal'nyy complex, which operated both lode and placer deposits. The Khrustal'nyy complex operated the Khrustal'nyy, Ege-Khaya, Imeni Lazo, Kholodnyy, and Alyaskitovyy Mines.

The largest tin producer in the U.S.S.R. was the Khingan complex, in Birobidzhan (Jewish Autonomous Oblast'), Khabarovsk Kray, of the Soviet Far East. At Khingan, renovation of the concentrator occurred in 1979, and the Berezovyy Mine and a mine near Obluchye were under development. The Solnechnyy complex in Khabarovsk Kray operated the Solnechnyy, Molodezhnyy, and Pereval'nyy Mines. At the Pereval'nyy Mine, a 7-kilometer tunnel was completed that was to serve as the main transport artery for the mine. The concentrating plant at the Solnechnyy complex was undergoing renovation, and a metallurgical plant was to be constructed.

There were three known tin refineries operating in the U.S.S.R. at Novosibirsk, Ryazan', and Podol'sk, near Moscow. Concentrates from Siberia and the Soviet Far East were sent to the Novosibirsk plant, which was the principal Soviet tin supplier.

Construction of a tin complex during 1981-85 was being planned in the Kirgiz S.S.R. on the Saryzhaz River not far from the village of Inyl'chek in Issyk-kul'skaya Oblast'.

In 1981, Bolivia was reportedly having trouble with the La Palca plant being built near Potosi with Soviet technical and financial assistance. The complaint was that the plant was causing serious contamination of agricultural land. The Soviet Union was also assisting tin development in Vietnam and Laos, presumably in exchange for tin.

Titanium.—Titanium production in 1981 was estimated to have increased to 38,500 tons. The 11th 5-year plan, 1981-85, called for an increase in titanium production. During 1976-80, production of titanium was programed to rise 40%, but during this period, production increased only 19%.[53] The industry continued to be based mainly on Ukrainian and Siberian ilmenite and rutile. Soviet reserves of TiO_2 have been estimated at approximately 10 million tons, contained in 70 million tons of ore averaging 10% to 20% TiO_2.

The Soviet Union exported titanium sponge to Western countries in 1981, and reportedly was to export titanium sponge at competitive market prices in 1982. Decreased Soviet titanium sponge trading activity in 1979 and 1980 caused confusion as reports circulated that the Soviets planned to cut off titanium exports to some Western World buyers. The Soviets claimed that they had continued to offer titanium sponge, but that importers were unwilling to meet their price. In 1981, the United States imported Soviet titanium sponge valued at $1.75 million compared with $2.7 million in 1980.

The most important sources of Soviet ilmenite are placer deposits on two right-bank tributaries of the Dnieper River in the Ukraine. Deposits with major production are the Samotkanskoye zirconium-titanium alluvial deposit; the Volchanskoye titanium deposit in Dnepropetrovsk Oblast'; the Irshanskoye, Streminogorskoye, and Zelenogorskoye titanium deposits in Zhitomirskaya Oblast'; and the Tarasovskoye deposit in Kiyevskaya Oblast'. These deposits were operated by the Verkhnedneprovskiy and Irshanskiy complexes. The Irshanskiy complex made use of dredges. Four stages of the Irshanskiy concentrator were in operation in 1980.

The Ust'-Kamenogorsk titanium-magnesium complex in Kazakhstan, a 16-year-old enterprise, planned to increase titanium production 27.1% during 1981-85. This was equivalent to the total growth in titanium output planned in Kazakhstan, in which the Ust'-Kamenogorsk complex was the only producer. In 1981, the Ust'-Kamenogorsk

enterprise exceeded its quota for titanium sponge production by 0.8%. Other major Soviet titanium producers included the Berezniki titanium-magnesium plant, the Dneprovsk titanium-magnesium plant, the Moscow titanium sponge works, and the Khar'kov plant.

Tungsten.—Production of tungsten in concentrates in 1981 was estimated to have increased by less than 2% to 8,850 tons. In 1981, Soviet tungsten production was again insufficient for domestic needs. The Soviets were reportedly seeking to purchase approximately 1,500 tons of tungsten concentrate in the fourth quarter of 1981, and there were reportedly greater than usual Soviet tungsten purchases in 1981.

Principal tungsten-producing regions were the North Caucasus, Kazakhstan, Uzbekistan, Transbaykal, and the Soviet Far East. Most of the deposits in the U.S.S.R. are low grade. The large Tyrny-Auz deposit in the North Caucasus contains both molybdenum and tungsten. The largest deposits in Kazakhstan are the Verkhne-Kayraktin tungsten and Akchatau molybdenum-tungsten deposits. There are considerable reserves of tungsten in the Ingichka deposit in Samarkand Oblast', Uzbekistan, and the Dzhida deposit in the Buryat A.S.S.R.

The main producer of tungsten concentrates is the Tyrny-Auz tungsten and molybdenum complex in the North Caucasus, where both underground and open pit methods were used. The Nal'chik plant produced tungsten metal from Tyrny-Auz concentrates. In Kazakhstan, the Akchatau mining and metallurgical complex fulfilled its production plan for 1981. However, results in 1981 indicated that construction planned for 1981-85 at Akchatau would be only one-half completed in that time.[54]

Tungsten production capacity was expanding in the Soviet Far East. At the Iul'tin complex, the only tungsten mining enterprise in Magadan Oblast', intensive improvement was reportedly carried out. During 1976-80, the Vostok tungsten mining and concentration complex was established in the Soviet Far East. Also in the Soviet Far East, the second stage of the Maritime Kray complex was under construction.

In Soviet Central Asia, tungsten development was slated for the Kirgiz S.S.R., and exploitation was reportedly beginning at an unnamed tungsten deposit in Samarkand Oblast', Uzbekistan; Samarkand Oblast' contains the large Ingichka deposit.

Vanadium.—The Soviet Union was a large vanadium producer with an estimated production in 1981 of 9,500 tons. The principal source of vanadium is as a coproduct with iron from open pits at the Kachkanar complex in Sverdlovsk Oblast' in the Urals, where expansion was planned during 1981-85. Expansion of Kachkanar was currently the only practical means for increasing vanadium production.[55] Projections indicated that increased production at Kachkanar could be achieved at the earliest by 1985.[56] Ways were being developed to extract vanadium from powerplant ash, but work was only in the research stage. The vanadium lost in powerplant ash reportedly could provide one-quarter of domestic industrial consumption.[57]

Vanadium-bearing slag was produced in the Urals at the Nizhniy Tagil metallurgical complex and the Chusovoy metallurgical plant. The Nizhniy Tagil complex, where the vanadium slag was produced in 130-ton oxygen converters, was the only modern producer. The vanadium content of the pig iron was 0.45% at Nizhniy Tagil and 0.54% at Chusovoy. After processing of the pig iron, the average V_2O_5 content of the resulting slag at Nizhniy Tagil was 21.2%, and at Chusovoy, 17.2%.

Although enlargement of the Kachkanar complex for processing from 33 to 40 million tons of iron ore annually was completed, delays in construction of facilities for additional vanadium processing at the Nizhniy Tagil metallurgical complex slowed the increase in output of vanadium products.

Minor Metals.—The Soviet Union possesses commercial deposits of all the metals that have assumed importance in modern rocketry, aircraft, and nuclear energy. However, extraction of many of the metals remained low. During 1981-85, the production of rare metals was to double in East Kazakhstan Oblast' with metallurgical facilities at Leninogorsk, Ust'-Kamenogorsk, and Zyryanovsk. The growth in extraction of rare-metal concentrates in 1979 compared with 1970 output at the Belogorsk complex in eastern Kazakhstan was 3.8% at the Ognevsk plant, 6.6% at the Belogorsk plant, and 2.37% at the central finishing plant.

The main deposits of rare metals are in Kazakhstan, Kola Peninsula, Uzbekistan, Armenia, Urals, Ukraine, Noril'sk, Transbaykal, and the Soviet Far East. Explored reserves were considered adequate to en-

sure the planned rate of growth for all rare metals during 1981-85 and for most rare metals until 1990. The limiting factor in increasing production of rare metals was construction delays.[58]

The primary sources of rhenium are molybdenite from copper-molybdenum deposits of Armenia, Kazakhstan, and East Siberia. Byproduct rhenium was recovered at the Balkhash and Dzhezkazgan complexes and the Chimkent lead plant in Kazakhstan, the Khadzharan copper-molybdenum complex in Armenia, and at the hard-alloy plant in Uzbekistan.

The selenium content in the copper-molybdenum ores of Armenia ranged from 3.6 to 10.5 grams per ton, and that of tellurium, from 1.5 to 6.2 grams per ton. There were 110 grams of selenium per ton and 40 grams of tellurium per ton in the charge of the Alaverdi metallurgical complex in Armenia.

Byproduct gallium was recovered from raw materials used to produce alumina at the Volkhov (Leningrad Oblast') and Pavlodar (Kazakhstan) aluminum plants and at the Tikhvin (Leningrad Oblast') alumina plant. The main centers of indium and thallium extraction were the Ust'-Kamenogorsk lead-zinc complex (Kazakhstan) and the Chelyabinsk zinc plant (Urals).

In 1976-80, recovery of thallium at the Chimkent lead plant in Kazakhstan increased 3.4%. The Ust'-Kamenogorsk titanium and magnesium complex in Kazakhstan began recovering scandium, and recovery of scandium and lanthanum from slime from alumina plants in the Urals was being studied. During 1976-80, output of minor metals at the Ust'-Kamenogorsk lead-zinc complex increased as follows: indium, 80%; gallium, 95%; and selenium, 70%.

The decade 1965-75 saw the start of production of rhenium in Kazakhstan at the Balkhash and Dzhezkazgan copper complexes and the Chimkent lead plant. The recovery of rhenium at the Dzhezkazgan complex increased from 3.1% in 1973 to 42.0% in the first half of 1980. The Chimkent lead plant produced thallium, tellurium, and germanium. In 1980, facilities for the production of tantalum from tailings at the Ognevsk and Belogorsk concentration plants of the Belogorsk complex in Kazakhstan were put into operation.

The Soviets claimed that the world's largest columbium and tantalum deposits lie within the boundaries of the Lovozero massif in the Kola Peninsula. Two underground mines, Karnasurt and Umbozero, were in operation at Lovozero. Smaller columbium-tantalum-bearing deposits are located in the Caucasus, Transbaykal, Ukraine, and Urals. Tantalum was produced as a byproduct at the Orlovskiy mining and concentration complex in Chitinskaya Oblast'. Soviet ilmenite concentrates contain an average of 0.12% Cb_2O_5 and 0.008% Ta_2O_5.

The Verkhnedneprovskiy complex in the Dneprovsk Oblast' in the Ukraine was exploiting an alluvial zircon deposit. The complex, brought into operation in 1969, increased production of zircon concentrate in 1980.

NONMETALS

Asbestos.—Asbestos production in 1981 was estimated at 2.11 million tons. The Soviet asbestos industry was the largest in the world. Over one-half of the production came from the Uralasbest complex in the central Urals, and over one-fourth of the output came from the Dzhetygara deposit in Kustanay Oblast', Kazakhstan. Other important producers included the Tuvaasbest complex in the Tuva A.S.S.R. in East Siberia and the Kiembay complex in Orenburg Oblast' in the southern Urals.

At the Uralasbest complex, production was reported at 1.26 million tons in 1979 and at 1.24 million tons in 1978; in 1980, three open pits produced 149 million tons of ore and overburden, producing approximately 1.19 million tons of marketable asbestos. In 1981, ore mining increased to a total of 173 million tons of ore and overburden, but production of marketable asbestos decreased to 1.16 million tons because of reduced ore grades. Construction of the No. 7 concentrator, with a capacity of 340,000 tons per year, was planned. Three concentrators were in operation.

At the Dzhetygara deposit in Kustanay Oblast', Kazakhstan, the first mill, with a capacity of 200,000 tons per year, was commissioned in 1965. During 1971-75, the mill was renovated, and production increased from 259,000 tons per year in 1970 to an estimated 350,000 tons per year in 1981. The Dzhetygara No. 2 mill, with a capacity of 400,000 tons per year, was completed in 1975 and produced an estimated 290,000 tons in 1980. Output at the Dzhetygara complex was estimated at 640,000 tons in 1981.

At the Tuvaasbest complex, the first mill was commissioned in 1964, and a second mill was commissioned in 1976. Output at

this complex in 1981 was estimated at 110,000 tons.

Construction of the Kiembay complex in Orenburg Oblast' (southern Urals) was started in 1968 and was continuing in 1981. Seven CMEA members assisted in the construction. Design capacity was 500,000 tons per year of grades III and IV from 24 million tons of ore with an average grade of 4.4%. The project was being developed in two stages of 250,000 tons per year each. The first stage was completed in December 1979 and was estimated to have produced 130,000 tons in 1981. The second stage was put into operation in December 1980 and was estimated to have produced 70,000 tons in 1981.

One-third of the output of the Kiembay complex was to be exported to the participating CMEA countries in return for their one-third investment of 106.2 million out of 300 million rubles. According to the plan, starting in 1981, about 170,000 tons of asbestos was to be exported annually to the participating countries for 12 years, after which they would be able to extend the agreement for an additional 10 years. However, this goal was not met in 1981; in December, the yearly delivery of asbestos from Kiembay to CMEA countries was reported as approximately 65,000 tons.[59]

At the Sayan asbestos deposits, on the border of Krasnoyarsk Kray and the Tuva A.S.S.R. in East Siberia, reserves were estimated at 7 million tons of asbestos. The asbestos lies at a comparatively shallow depth and was to be mined by open pit methods. Exploration was completed, and development of the Lenin complex, with a capacity of 200,000 tons per year, was underway.

Barite.—Estimated barite production in 1981 remained at 500,000 tons. About 50% of the country's barite consumption was imported, mainly from North Korea, Yugoslavia, and Bulgaria. Main centers of domestic production were Georgia, West Siberia, and Kazakhstan at the Zhayremsk mixed-sulfide complex. During 1981-85, production was to greatly increase at the Zhayremsk complex; the second stage of the complex was to achieve its design capacity in 1988. The complex fulfilled its production plan for 1976-80. The complaint was raised in 1981 that projected capacities for barite recovery from Zhayremsk ore were not being achieved at concentration plants at the Achisay polymetallic complex and the Tekeli lead-zinc complex.[60] The Zhayremsk area reportedly was extremely rich in barium sulfate, with approximately one-fourth of the world's reserves. More than 40% of the barite ore could be surface mined. In addition, rich deposits of barite were reportedly discovered in the Komi A.S.S.R., and development was underway of a 45,000-ton-per-year complex in Svanetiya, Georgia.

Diamonds.—In 1981, diamond output was estimated very roughly to have decreased to 8.5 million carats of industrial quality and 2.1 million carats of gem quality owing to more difficult mining conditions. The diamond industry was centered in Yakutia, where about 20 deposits have been discovered. Included among known producers were the Mirnyy open pit with five concentrators, the Aykhal open pit and concentrator, the Udachnaya placer mine and concentrator, and the Irelyakh placer mine with two dredges. Small quantities of gem and industrial stones were produced from the Vishera River region in Perm Oblast' (western Urals) with four dredges and two separation plants in operation at two deposits.

After fossil fuels and precious metals, diamond exports were one of the significant earners of hard currency. Gem stones were cut in Leningrad, Sverdlovsk, and Smolensk. The U.S.S.R. marketed part of its diamond output in Antwerp through a Soviet-Belgian diamond export organization, Almazyuvelirexport, in which the Soviet Union had controlling interest.

A substantial, but unknown, quantity of synthetic diamonds was produced by plants in Kiyev, Moscow, Poltava, Tashkent, and Yerevan. In 1981, at the Yerevan plant, the production of synthetic diamonds and diamond instruments increased 20% compared with 1980 output. The Kabardino-Balkar synthetic-diamond-instrument plant, Imeni Leninskogo Komsomola, was the only plant in the country producing diamond drilling instruments and rollers for accurate finishing of abrasive grinding disks. The plant, located in Terek, in 1981 reported exceeding its plan. Also, during 1976-80, production of diamond instruments in Moscow reportedly increased 16.9%.

During the 1980's, there was to be intensified geological exploration for diamonds. In 1981, diamond prospecting was reported in the European part of the U.S.S.R., including the western Ukraine and Byelorussia. In 1981, in Yakutia, the sinking of two 1,000-meter-deep shafts was started at a new diamond mine, scheduled to go into operation during 1981-85. One shaft, with

a diameter of 6.5 meters, was to be used for extraction, and the other, for ventilation. In the village of Nadezhda in the north of Yakutia, the large Nadezhda concentration plant was being renovated but was reported working at full capacity during renovation.

Fluorspar.—Despite efforts to achieve self-sufficiency, the Soviet Union remained a net importer of fluorspar, with imports providing approximately one-half of domestic consumption. Fluorspar imports came mainly from China, Mongolia, and Thailand.

Soviet production of fluorspar in 1981 was estimated at 530,000 tons. The main production areas were the Maritime Territory (Yaroslavsk deposit), Transbaykal (Kalunguy, Abagatuy, and Usugli deposits), Uzbekistan, and Kazakhstan. Small quantities were produced in Tadzhikistan and other regions. The mined ore contained 20% to 45% CaF_2. The iron and steel industry consumed more than 85% of the fluorspar, and increases in consumption had been well ahead of increases in production. During 1981-85, the Republic Ministries of Geology for Kazakhstan and Uzbekistan set goals to increase the reserves of fluorspar by 5% and 2%, respectively.

Mica.—Mica output, estimated at 47,000 tons in 1981, was inadequate to meet demand, and strategic-grade mica was imported from India. The mica industry included the following four mining and beneficiation complexes: Aldan mica (Yakutia), Karel mica (Karelia), Kovdor mica (Murmansk Oblast' on the Kola Peninsula), and Mam mica (Irkutsk Oblast').

Mamsko-Chuyskiy County in Irkutsk Oblast' contains about 75% of the country's muscovite deposits. Nine small underground mines were in operation there in 1980. Vermiculite was mined at the Kovdor mica complex in Murmansk Oblast', at the Yena, Pikolatva, and Kovdor underground mines, and a vermiculite open pit. Capacity of the concentrator at Kovdor was 56,000 tons per year. The Karel mica complex in Karelia operated the Plotina, Malinovaya Varakka, and Tedino underground mines.

In 1981, production of strategic-grade byproduct mica increased at the Ognevskiy Mine of the Belogorsk polymetallic complex in Kazakhstan. Byproduct mica production began in 1981 at the Orlovskiy lead-zinc mining complex in Chita Oblast', Siberia, where the first 200 tons were reportedly produced. Price negotiations between India and the U.S.S.R. intensified in 1981 as India again wanted a price increase for mica. The U.S.S.R. was traditionally India's largest buyer of mica, and Indian mica exports also went to the six East European CMEA states.

Mineral Fertilizers.—In 1981, output of mineral fertilizer totaled 26 million tons in nutrient content, approximately 109 million tons in bulk fertilizer, less than the 1981 target of 113.8 million tons.[61] Estimated production, in nutrient value, of nitrogen fertilizers constituted about 41%; potassium fertilizers, 33%; phosphate fertilizers, 23%; and phosphate flour, 3% of total fertilizer production. Table 11 shows production of fertilizer raw materials in 1980 and the 1985 plan targets. The Soviet mineral fertilizer industry in 1985 planned to produce 150 to 155 million tons of bulk fertilizer.

There were many problems in supplying fertilizer to farms. In 1981, there was an insufficient delivery to farms of 1.2 million tons (nutrient value) of fertilizer, including 0.2 million tons of nitrogenous, 0.1 million tons of phosphate, and 0.9 million tons of potassium fertilizers.[62] Problems in supplying fertilizer to farms occurred at every stage of the production-supply cycle. Problems caused by delays in putting production facilities into operation were compounded by problems in transport and storage.[63]

About 85% of the mineral fertilizer output was produced at enterprises subordinate to the recently created Ministry of Mineral Fertilizer Production. The rest was supplied by the Ministries of Petroleum Refining and Petrochemicals, Nonferrous Mining and Metallurgy, Ferrous Mining and Metallurgy, and others. Mineral fertilizer production was distributed to over 13 of the 15 Soviet republics.

During 1981-85, the Ministry of Fertilizer Production planned to put into operation 13 ammonia production units, each with an annual capacity of 450,000 tons. In 1981, 450,000-ton-per-year ammonia plants were put into operation at the Pridon chemical plant at Rossosh' (Voronezh Oblast') and at the Tolyatti "Azot" firm. In 1981, construction was completed of the approximately 2,400-kilometer-long Tolyatti-Odessa ammonia pipeline with an annual capacity of 2.5 million tons of liquid ammonia. The U.S. embargo of exports of superphosphoric acid to the U.S.S.R. was lifted in 1981, allowing the Occidental Petroleum Corp. to resume deliveries, for which Occidental imported ammonia in exchange.

Table 11.—U.S.S.R.: Fertilizer raw material production

(Thousand tons)

	1980	1985 (planned)
Potash ore	60,800	92,000
Apatite-nepheline ore (17.7% P_2O_5)	46,000	53,200
Sedimentary rock (13% P_2O_5)	24,800	32,100

Source: Shakhtnoye stroitel'stvo (Mine Development), Moscow. No. 12, December 1981, p. 3.

Phosphate.—The estimated 1981 output of phosphate rock totaled 73 million tons, including 47.5 million tons of apatite ore (17.7% P_2O_5) and 25.5 million tons of sedimentary rock (13% P_2O_5). Plans for 1985 called for extraction of 53.2 million tons of apatite ore and 32.1 million tons of sedimentary phosphate rock.

The main centers for phosphate production were the Apatit Association on the Kola Peninsula and phosphate deposits at Karatau in Kazakhstan. The Chilisay phosphorite basin in Aktyubinsk Oblast', Kazakhstan, was under development and was to be a major center of phosphorite production. Generally, low-grade deposits of phosphorites also occur in Upper Kama in the Urals, Yegor'yevsk and Lopatino in Moscow Oblast', Kingisepp in Leningrad Oblast', and other regions. Apatite concentrates provided the majority of all phosphate production. During 1981-85, the output of mineral fertilizers was to increase 50%, and the most rapid growth was to be for phosphorus fertilizers. Soviet exports of apatite concentrate to Western Europe have been progressively reduced in recent years.

The largest single phosphate source is the Khibiny apatite-nepheline deposit on the Kola Peninsula. Mined ore averaging 17.7% is upgraded to 39.4% P_2O_5. At the Karatau phosphate basin, in Kazakhstan, there are over 40 commercial deposits. The five largest deposits contain more than one-half of the reserves at Karatau. The 1981-85 plan called for production of phosphate rock at the Karatau Basin to increase by 50% over that of 1980.

As of January 1, 1980, reserves in place in categories $A+B+C_1$ were approximately 1.5 billion tons of P_2O_5 in 14 billion tons of ore. These reserves are in the apatite-nepheline ore of the Khibiny deposit and the phosphorites in the Karatau Basin, accounting for 37% and 26% of the reserves, respectively. The remaining reserves are the phosphorites in the European part of the country and the apatite and phosphorites in Siberia. In addition, there are approximately 550 million tons of reserves in category C_2. The majority of the reserves is low-quality ore that is difficult to process, and the ore bodies are in distant, labor-deficient areas requiring high capital investment.[64]

Increased demand for phosphate raw material necessitated both development of new capacities and increasing the volume of production at existing developments. Only 40% of the economic reserves are categorized as easy to concentrate. During the past 10 years, the average P_2O_5 content of the reserves has decreased from 14.3% to 13.1%, and the average P_2O_5 content of new deposits was only 10.8%. This was accompanied by an increase in the depth of open pits, an increase in underground extraction, and an absence of effective concentration technology for complex ores. For ore with a complex mineral composition, P_2O_5 recovery did not exceed 65% to 75%, and the average P_2O_5 content of prepared concentrate was 24% to 28%. Owing to the discovery of new apatite deposits with poor-quality ore, the P_2O_5 content of apatite ore was projected to decrease by 40% to 50% compared with that of 1975.[65]

Phosphorites from the Karatau Basin have been mined for over 40 years. During 1981-85, capacities at the Karatau complex were to increase by 8.5 million tons of ore and 2.5 million tons of concentrate. In 1981, only 57% of the ore mining capacity at the Karatau complex was being used, and capacity utilization had been declining during the past 5 years. Therefore, the building of new capacities was questioned.[66] Along with the development of the 4.75-million-ton-per-year Kok Dzhon Mine, construction of the Kok-Su Mine was planned. The first stage of Kok-Su was to begin operations during 1981-85. In the Karatau Basin, it was intended to change a number of sites to underground mining. By 1985, annual output of the Karatau complex was to exceed 20 million tons of ore.

At the Khibiny deposit on the Kola Peninsula, the Apatit firm's production of apatite concentrate was approximately 17.3 million tons in 1980 and was to increase to approximately 19 million tons by 1985. The percentage of underground mining was also to increase. In 1980, open pit mining accounted for 64% of apatite-nepheline ore extraction. For 1973-80, goals were not met

for underground mining but were surpassed for surface mining.[67] The cutoff grade of apatite-nepheline ore from open pits was 6% P_2O_5, and from underground mines, 8% P_2O_5. However, the Oshurkovskiy apatite deposit in the Buryatskaya A.S.S.R., with under 4% P_2O_5 content, was being developed. Other deposits with low P_2O_5 content to be developed included Kovdor (3% to 6% P_2O_5), Chilisay (9% to 10%), Toolse (10%), and Seligdar (6%).

The Koashva (Vostochniy) open pit, with a capacity of 7 million tons per year of ore, in Murmansk Oblast', assigned to the Apatit Association, was rescheduled for completion in 1981 after delays in 1980. The first stage, 2.4 million tons, went into operation in late 1981. In 1981, construction began on the No. 3 concentration plant at the Apatit firm. It was designed with a projected capacity of 8.8 million tons per year of apatite and was to concentrate low-quality ore from the Koashva deposit. The first stage was to go into operation during 1981-85. At the Apatit Association, development of the N'yurpakhsk open pit was underway, and the Tsentral'nyy open pit was to increase its capacity by 4 million tons to 25 million tons per year of ore. The Apatit Association also operated the Kirovskiy, Yuksporskiy, and Rasvumchorskiy Mines.

Development of the Chilisay deposit and construction of the Chilisay complex in Kazakhstan, which continued in 1981, were reported to have experienced significant delays.[68] In 1981, construction continued of the mining and concentration enterprises based on this 9% to 10% P_2O_5 phosphorite deposit.

The Seligdar apatite deposit in South Yakutia was undergoing extensive exploration. A mining-concentration complex along with a city of 50,000 inhabitants were envisioned for this deposit. Explored reserves in place at the end of 1981 consisted of 1.6 billion tons of ore, or 108.5 million tons of P_2O_5. The complex was projected to process 41 million tons of ore annually, producing more than 4 million tons of apatite concentrate and more than 13 million tons of phosphate fertilizer. This complex was to provide fertilizer for East Siberia and the Soviet Far East, which was being shipped at high cost from Karatau and the European part of the U.S.S.R.

Potassium.—The 1981 estimated output of potassium ore was 63 million tons, 8.35 million tons of K_2O equivalent. The 1985 plans called for production of 92 million tons of ore; original plan targets for 1976-80 called for potassium ore output to rise to 85 to 90 million tons by 1980. Potash exports were reported to have increased to 3 million tons of K_2O equivalent in 1981 with a 30% increase to East European markets, most noticeably to Poland. All other East European members of CMEA, except Yugoslavia, took a greater volume of potash. Potash exports to Western Europe, however, decreased. The major potash centers were Solikamsk and Berezniki on the western side of the central Urals, Soligorsk in Belorussia, and Stebnik and Kalush in the western Ukraine. Potash reserves are estimated at 3.8 billion tons of K_2O.

Potash production was administered by the All-Union Production Association Soyuzkaliy, which had five subordinate firms. During 1981-85, two new facilities were to be added to the five firms, the Novosolikamsk and the Berezniki No. 4 plants, each with two stages and capacities of 18.1 and 16.1 million tons per year, respectively. In Belorussia, which produced about 50% of the Soviet output of potash, the increase in output was to be mainly achieved by increasing extraction at the Soligorsk No. 4 complex to 17.9 million tons per year of ore. The mining depth at this complex was to reach 1,200 meters.

Plans to add new facilities were criticized because production capacities were not being fully utilized at existing enterprises.[69] For example, the Uralkaliy firm, which had a design capacity of 12 million tons of potassium fertilizer, in 1979 produced only 6 million tons, and in 1980, 8.3 million tons.[70] For 1979 and 1980, the Belaruskaliy firm did not fulfill the production plan, and production problems persisted in 1981. The Belaruskaliy firm's failure to meet production goals was attributed to production problems at the Soligorsk No. 4 complex, the first two stages of which were put into operation during 1976-80. Lagging production at Soligorsk No. 4 was blamed on delays in installing equipment along with the installation of faulty and obsolete equipment.[71] Attempts were also made to blame poor worker performance.[72]

A large potash deposit, estimated to be five times greater than the Solikamsk deposit, was reportedly discovered in Irkutsk Oblast'. The deposit, which covers an area of approximately 10,000 square kilometers, is located at a relatively shallow depth and consists of several seams 1.5 to 5 meters thick. Mining of this deposit was scheduled to start in 1985. Based on past Soviet experience, development of a mining proj-

ect, particularly in this distant region, in that period of time is doubtful.

Salt.—The Soviet Union was one of the world's leading countries for salt production, reserves, and exports. Soviet salt production in 1981 was estimated at 14.6 million tons. Exports were an estimated 500,000 tons. Over one-third of the Soviet salt production came from Lake Baskunchak in Astrakhanskaya Oblast', R.S.F.S.R., and over 40% came from the Donets Basin. The Artemsol' concern, which mined rock salt in the Donets Basin from five underground mines, was the main salt supplier. This concern had a 14,000- to 15,000-ton-per-day design capacity but was operating at approximately two-thirds capacity owing to production and transportation problems. Similar problems existed at other Soviet salt enterprises. These included Aral'sk salt, Pavlodar salt, and the Iletsk Mine. Original plans called for salt output to increase to 20 million tons by 1980, but these plans were revised to 14.7 million tons. In 1981, a salt mine at Khodzhaikan in Uzbekistan was under development along with a crushing and sorting plant with a capacity of 1 million tons per year.

Sulfur.—In 1981, estimated production of contained sulfur totaled 11.2 million tons, of which 3.6 million tons was recovered from pyrites, 3.8 million tons from native sulfur, and 3.8 million tons from other elemental sulfur sources.

The principal producers of native sulfur were Rozdol and Yavorov (western Ukraine), Gaurdak (Turkmen S.S.R.), and the Volga group of the Kuybyshev sulfur complex. Native sulfur sources are concentrated in four regions: the Carpathian, Soviet Central Asia, central Volga, and the Soviet Far East.

At the Yavorov and Gaurdak plants, where production began in 1968, approximately 30% of the output of native sulfur was produced by the Frasch process. During 1981-85, the development of mines using the Frasch process was to account for the basic growth in sulfur production. Mines using this process were to be developed at the Staroyazovskiy site of the Yavorov complex and also at the Zagaypol'skiy and Grimnovskiy sites. In 1981, the Nemirov Mine in L'vov Oblast' in the Ukraine, with a capacity of 250,000 tons per year, began production using the Frasch process.

Open pit ore extraction was to increase. At the Yavorov complex, the Tsentral'nyy open pit was to increase capacity, and the Yuzhniy open pit was to go into operation.

In 1981, approximately 1.25 million tons of sulfur was recovered from sour gas. Sulfur ore production in 1985 was to increase to 14.3 million tons.

MINERAL FUELS

Estimated primary energy production derived from fossil fuels, fuelwood, and hydroelectric and nuclear generation increased from 1,936 million tons (standard coal equivalent) in 1980 to 2,146 million tons in 1981. Total consumption of all types of primary energy increased from 1,638 million tons in 1980 to 1,862 million tons in 1981. In 1981, the U.S.S.R. produced 4.48 billion barrels of crude oil, which was slightly below the planned target but a 0.9% increase over 1980 output, and 16.4 trillion cubic feet of natural gas (planned target 16.2 trillion cubic feet), which was a 7% increase over 1980 output. Production of coal, however, which was to be increasingly substituted for oil, decreased 2% to 704 million tons of raw coal.

In addition to coal, natural gas was to be of increased importance as a substitute for oil and as a hard-currency-earning export commodity. Revenues earned from the increased sale of natural gas could be used to purchase advanced technology and equipment to increase oil production. Nuclear power was to be of increasing importance for domestic electric energy production. By 1985, nuclear power capacity was to increase by about 25,000 megawatts, raising total capacity to 40,000 megawatts, and was to provide 14.2% of the electric energy, compared with 5.6% in 1980. In 1981, expansion of nuclear power generation was not occurring as rapidly as planned.

Table 12.—U.S.S.R.: Estimated total primary energy balance in 1981

(Million tons of standard coal equivalent)

	Production	Imports	Exports	Apparent consumption
Total primary energy	2,146	30.0	314	1,862.0
Coal (lignite, anthracite, bituminous, coke)	622	16.5	23	615.5
Crude oil and petroleum products	895	8.8	221	682.8
Natural and associated gas	549	4.7	68	485.7
Peat	14	--	--	14.0
Oil shale	13	--	--	13.0
Hydropower	22	--	2	20.0
Nuclear power	7	--	--	7.0
Fuelwood	24	--	--	24.0

Coal.—In 1981, the Soviet Union produced 704 million tons of run-of-mine coal, which was 2% below 1980 production and the third successive year of decreasing production. Capacities for extracting 5 million tons of coal were put into operation in 1981. The Donets Basin was one of the major areas with slumping coal production. The decline in coal production was blamed on unfavorable mining conditions and missed deliveries of rolled steel, timber, electric motors, railroad equipment, and spare parts for mining machinery.[73] General problems that affected the development of the industry included construction delays, slow attainment of installed capacities, low level of technology and equipment, and inefficient use of labor.[74] The domestic coal supply was further hurt by a large drop in imports from Poland. The decline in coal production led to fuel shortages accompanied by some restrictions on the sale of coal to the population. Along with declining production, there was a sharp deterioration in the quality of coal.[75]

To increase worker incentives, a pay raise was announced in 1981 for coal miners. The new wage scale was to take effect in the first quarter of 1982 in the Donets, Kuznetsk, Karaganda, Ekibastuz, and Pechora coal basins, and in the remaining areas in 1983.

Output of surface-mined coal was 268 million tons (37% of the total) in 1980 and 273 million tons (39% of the total) in 1981. The 1985 plan target called for surface-mined coal output to increase to 315 million tons, 41% of the total output.

Table 13 shows 1980 coal output and planned 1985 coal output from the major basins. As can be seen from table 13, the largest planned increases among major producers were in Siberia and the Soviet Far East in the Kuznetsk, Ekibastuz, Kansk-Achinsk, and Yakutsk Basins.

There were approximately 800 underground coal mines in the Soviet Union, each with an average capacity of about 500,000 tons per year of raw coal, and in 1981, there were 73 open pits in operation, each with an average output of about 3.7 million tons of run-of-mine coal or lignite. Those open pits with the largest design capacities included the Bogatyr', 50 million tons per year; Tsentral'naya, 20 million tons per year; Irsha-Borodinskiy, 20 million tons per year; Nazarovskiy, 13 million tons per year; and Azeyskiy, 10 million tons per year.

Table 13.—U.S.S.R.: Coal production by major basins

(Million tons unless otherwise specified)

Basin	1980 production	1985 planned production	1985 planned increase over 1980, percent
Donets	204	210	3
Kuznetsk	141	154	9
Ekibastuz	66	84	27
Karaganda	48	50	4
Kansk-Achinsk	35	48	37
Pechora	28	28	0
Moscow	25	20	-20
Yakutsk	3	12	400

Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 7, February 1982, p. 1.

Despite the fact that coal mine construction was transferred directly to the Coal Ministry, construction delays persisted. Pravda stated that "it can hardly be considered normal" that the Samsonovskaya-Zapadnaya Mine had been under development for 17 years with still no end in sight. Furthermore, several mines were commissioned with considerable defects that delayed achieving design capacity. As an example, although the Dolzhanskaya Kapital'naya Mine was commissioned in 1981, it was producing far less than was planned.[76]

Coal preparation for the market did not play a great role and was generally restricted to coking coals and coal for exports. Practically all Soviet coal required beneficiation, but less than one-half was treated. Some 66 preparation plants treated coking coal, 38 plants processed anthracite, and 50 plants treated coal and lignite for powerplants. The official ash content of coal shipped to consumers was 20.3% in 1980. Approximately 20% of the coals and lignites delivered annually to powerplants were substandard. The shortage of coal beneficiation facilities forced Soviet planners to call for increasing the quantity produced.

Natural Gas.—Natural gas production had been increasing at higher than the planned rate and was in part to compensate for lagging oil production for domestic consumption and export. Natural gas production was growing 7% or more annually. In 1981, natural gas production grew 7% and totaled 16.4 trillion cubic feet or 0.2 trillion cubic feet more than planned. The 1982 production was targeted at 17.4 trillion cubic feet, and 1985 output, at 22.2 trillion cubic feet. The trans-Siberian gas pipeline to Western Europe, scheduled to go into operation during the mid-1980's, was to

supply between 1.1 to 1.4 trillion cubic feet of natural gas annually to Western Europe for at least 20 years. The sale of gas was to be an important hard-currency source, and Western World aid for pipeline construction was considered an important factor for the Soviets to achieve their hard-currency earning goals on time.

The large projected increase in natural gas production during 1981-85 was to be achieved primarily through a fivefold increase in production, compared with that of 1980, at the Urengoy Field in West Siberia. By 1985, production at Urengoy was to reach 9.7 trillion cubic feet. Total gas production in West Siberia in 1981 was 6.25 trillion cubic feet and in 1985 was projected to reach 12.7 trillion cubic feet. Output from other regions generally was not projected to increase, although production in Turkmenistan was projected to increase from 2.5 trillion cubic feet in 1980 to approximately 2.9 trillion cubic feet in 1985.

In 1981, construction was completed of the third stage of the Mubarek gas processing plant. In addition to the Urengoi-Uzhgorod export gas pipeline, by 1985, five other pipelines from West Siberia to the European part of the U.S.S.R. were to be operating. During 1981-85, a total of approximately 50,000 kilometers of gas pipeline were to be put into operation, of which the six major pipelines from West Siberia were to account for about 20,000 kilometers. Along with pipe, there was a need for hundreds of compressor stations, both of which were to be supplied, in part, from the Western World.

Natural gas was used as a fuel domestically to produce approximately 93% of the iron and steel, 95% of the mineral fertilizers, 59% of the cement, 22% of the electricity, and 37% of the thermal energy. Approximately 15% of the natural gas was used as a chemical feedstock. According to Soviet data, gas reserves in place as of January 1978 in the $A+B+C_1$ categories were about 1,000 trillion cubic feet; 15% of the reserves are in the European part of the country, 72% in Siberia and the Soviet Far East, and 13% in Soviet Central Asia, including Kazakhstan.

Petroleum.—Soviet oil production continued to increase, although not as rapidly as planned. In 1981, crude oil and gas condensate production increased 0.9% to 4.48 billion barrels, and the 1982 target was set at 4.51 billion barrels. In 1985, oil production was targeted to increase to 4.63 billion barrels, 2.8 to 2.9 billion barrels of which was to come from West Siberia. In 1981, West Siberia exceeded its production quota of 2.5 billion barrels; the Tyumen' Fields in Tyumen' Oblast', West Siberia, the major large producing area, exceeded their production quota of 2.4 billion barrels. About one-half of Tyumen's output came from the Samotlor Oilfield, the largest in West Siberia.

The 1981 increase in oil production was attributable in part to increased drilling in West Siberia. During 1981-85, plans called for drilling to increase by 70% to 80%. Goals for 1981-85 were to increase oil production, mainly in West Siberia, Kazakhstan, and the European North, and to slow the decline in output in the older producing regions.

Declines in production were occurring in the Tatar A.S.S.R., the Bashkir A.S.S.R., Kuybyshev Oblast', Perm Oblast', and Orenburg Oblast'. The most severe production declines were in the older production areas of the Ukraine, Turkemenistan, Azerbaidzhan, Belorussia, and the North Caucasus. Failure to discover significant oil reserves in East Siberia during the 1970's was a major disappointment for the Government.

The potential existed for oil production to again increase with new development occurring at a more rapid rate during the 1990's. Large portions of Siberia had not been well explored, and other discoveries were likely to be made. There was also to be an increased effort in offshore development. Western World production forecasts for the U.S.S.R. were highly speculative owing to Soviet secrecy regarding reserves, labor problems, and the need for advanced technology.

Increasing oil production in Siberia would involve tens of thousands of workers moving to remote areas in an already tight labor market. To ameliorate the labor problems, additional emphasis was put on using advanced technology and equipment to enhance labor productivity. One-third of the drilling rigs were considered obsolete.[77] Newer equipment went to Siberia, while the older equipment was concentrated in the older production areas, where production nevertheless had to be continued for production goals to be met. Soviet equipment was criticized by workers in the field for its poor quality.[78] Investment in foreign and domestic equipment was often squandered as the equipment was improperly used and maintained.

Increasing the recovery rate was a main

factor in increasing oil production. The Soviet Union claimed an average recovery of 43%, primarily using water flooding to maintain well pressure. Negative assessments of this technique by Western analysts were labeled by the Soviets as "political in character" and "miles from reality."[79] Future plans called for the recovery rate to rise 55% to 60%. Despite claims, the Soviets have acknowledged much lower rates of recovery than 43%,[80] and the planned rate of recovery of 55% to 60% was unlikely to be generally attained in operations considered commercially viable.

In 1981, full operation commenced of the Surgut-Polotsk pipeline, the longest Soviet underground oil route, supplying oil from the Tyumen' Fields to refineries in Belorussia and the Baltic Republics. Operation of these refineries was now declared assured.

Efforts were being made to economize on the use of oil. Wholesale price revisions, the first since 1967, were to reflect the increased cost of oil production. This price revision for oil was intended as an incentive for increased production and conservation. As part of the effort to economize, the oil industry was ordered to reduce losses owing to spills and pipeline mishaps.[81]

In 1981, Soviet oil deliveries to some Western World customers were reduced, while other market economy countries received increased deliveries. In 1981, indications were that oil exports to the CMEA countries were near their 1980 level of 80 million tons. A decrease in deliveries to Eastern Europe in 1982 was projected.

While the U.S.S.R. led the world in total crude oil production, it was far behind in offshore oil output, which was a very small part of total production. The offshore industry had been neglected in the 1970's with priority being given to West Siberia. Increased effort was therefore to be devoted to offshore operations. The Caspian Sea was to remain the major offshore exploration area despite a surge in exploration elsewhere on Soviet coastal shelves. Although, in 1980, the U.S.S.R. had only five mobile drill rigs, all jack up, working in the Caspian Sea, plans called for the Caspian fleet to reach 13 mobile rigs by 1985 and 23 rigs by 1990.

The Soviets were engaged in a cooperative venture with the Japanese for oil production offshore Sakhalin Island. The Soviets were also displaying an interest in cooperation with French and British companies for oil production in the Barents Sea. A joint venture with Poland and the German Democratic Republic for oil production in the Baltic Sea had been underway for several years.

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[1]This publication is based on a review of sources published by the U.S.S.R.
[2]Foreign mineral specialist, Division of Foreign Data.
[3]Voprosy ekonomiki (Problems in Economics), Moscow. No. 8, August 1981, pp. 3-14.
[4]Work cited in footnote 3.
[5]Planovoye khozyaystvo (Planned Economy), Moscow. No. 9, September 1981, p. 9.
[6]Gorodskoye khozyaystvo Moskvy (Moscow City Economy), Moscow. No. 1, January 1982, pp. 13-15.
[7]Page 14 of work cited in footnote 5.
[8]Pravda (Moscow). Aug. 10, 1981, p. 2.
[9]The ruble is a nonconvertible currency, and the Soviet official exchange rate cannot be used as even a rough measure of relative purchasing power. The official exchange rate for December 1981 averaged 1 ruble=US$1.44.
[10]Trud (Labor), Moscow. Nov. 24, 1981, p. 2.
[11]Pravda (Moscow). Apr. 1, 1982, p. 3.
[12]———. Feb. 26, 1982, p. 1.
[13]Izvestiya Akademii Nauk S.S.S.R., Seriya ekonomicheskaya, (Reports of the U.S.S.R. Academy of Sciences, Economic Series), Moscow. No. 1, January-February 26, 1982, p. 1.
[14]Sotsialisticheskaya industriya (Socialist Industry), Moscow. Apr. 16, 1982, p. 2.
[15]CMEA was founded in January 1949. The founding members were Bulgaria, Czechoslovakia, Hungary, Poland, Romania, and the U.S.S.R. Albania joined in February 1949 but ceased to take part in meetings in 1961. The German Democratic Republic was admitted in 1950; Mongolia, in 1962; Cuba, in 1972; and Vietnam, in 1978. Yugoslavia obtained permanent observer status in 1965.
[16]Planovoye khozyaystvo (Planned Economy), Moscow. No. 12, December 1981, p. 28.
[17]Page 15 of work cited in footnote 5.
[18]Gornyy zhurnal (Mining Journal), Moscow. No. 12, December 1981, p. 4.
[19]Work cited in footnote 17.
[20]Agitator (Moscow). No. 17, September 1981, pp. 22-28.
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[23]Razvedka i okhrana nedr (Exploration and Conservation of Resources), Moscow. No. 2, February 1982, pp. 6-8.
[24]Pravda (Moscow). Aug. 6, 1981, p. 2.
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[26]Pages 80 through 83 of work cited in footnote 16.
[27]Planovoye khozyaystvo (Planned Economy), Moscow. No. 10, December 1981, pp. 18-22.
[28]Sotsialisticheskaya industriya (Socialist Industry), Moscow. Mar. 24, 1981, p. 2.
[29]Narodnoye khozyaystvo Kazakhstana (The Economy of the Kazakhstan Republic), Alma-Ata. No. 4, April 1982, pp. 5-8.
[30]Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 4, January 1982, p. 7.
[31]Literaturnaya gazeta (Literary Gazette), Moscow. No. 4, January 1982, p. 7.
[32]Gornyy zhurnal (Mining Journal), Moscow. No. 1, January 1982, p. 4.
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[34]Metallurg (Metallurgist), Moscow. No. 11, November 1981, p. 1.
[35]Vestnik Moskovskogo Universiteta, Seriya 5, Geografiya (Moscow University Journal, Series 5, Geography), Moscow. No. 2, 1981, p. 15.
[36]$A+B+C_1$ are economic reserves called "explored reserves." C_2 are uneconomic reserves of lower reliability that are taken into account but do not constitute a justification for project planning.
[37]Gornyy zhurnal (Mining Journal), Moscow. No. 1, January 1981, pp. 3-7.
[38]Sovetskaya Rossiya (Moscow). Apr. 18, 1982, p. 2.
[39]Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 19, May 1982, p. 10.
[40]Literaturnaya gazeta (Literary Gazette), Moscow. No. 1, January 1981, p. 10.
[41]Page 6 of work cited in footnote 29.
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[43]———. July 19, 1981, p. 2.
[44]Pravda (Moscow). July 7, 1981, p. 1.

[45]Pravda (Moscow). Nov. 15, 1981, p. 2.
[46]Gornyy zhurnal (Mining Journal), Moscow. No. 5, May 1981, p. 6.
[47]Pravda (Moscow). July 30, 1981, p. 2.
[48]Work cited in footnote 47.
[49]Work cited in footnote 29.
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[52]Sotsialisticheskaya industriya (Socialist Industry), Moscow. Oct. 16, 1981, p. 3.
[53]Work cited in footnote 51.
[54]Work cited in footnote 29.
[55]Sotsialisticheskaya industriya (Socialist Industry), Moscow. July 3, 1981, p. 2.
[56]Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 17, April 1982, p. 14.
[57]Work cited in footnote 55.
[58]Planovoye khozyaystvo (Planned Economy), Moscow. No. 4, April 1981, pp. 36-37.
[59]Sovetskaya Rossiya (Moscow). Dec. 15, 1981, p. 1.
[60]Kazakhstanskaya pravda (Alma-Ata). Jan. 16, 1982, p. 3.
[61]Bulk fertilizer production was given in Soviet standard fertilizer units. Nitrogen (N) was expressed as ammonia sulfate, 20.5% N, phosphate as 18.7% P_2O_5, potash as 41.6%, K_2O, and ground rock phosphate (phosphate flour) as 19% P_2O_5.
[62]Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 11, March 1982, p. 2.
[63]Work cited in footnote 62.
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[64]Khimicheskaya promyshlennost' (Chemical Industry), Moscow. No. 3, March 1981, p. 53.
[65]———. No. 3, March 1982, pp. 152-156.
[66]Pravda (Moscow). July 16, 1981, p. 2.
[67]Work cited in footnote 64.
[68]Kazakhstanskaya pravda (Alma-Ata). Jan. 20, 1982, p. 2.
[69]Sotsialisticheskaya industriya (Socialist Industry), Moscow. June 16, 1981, p. 1.
[70]Work cited in footnote 69.
[71]———. July 1, 1981, p. 2.
[72]———. Feb. 7, 1982, p. 2.
[73]Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 7, February 1982, p. 2.
[74]Ugol' (Coal), Moscow. No. 1, January 1982, p. 4.
[75]Ekonomika i organizatsiya promyshlennogo proizvodstvo (The Economics and Organization of Industrial Production), Novosibirsk. No. 2, February 1982, pp. 84-94.
[76]Pravda (Moscow). May 17, 1982, p. 1.
[77]Sotsialisticheskaya industriya (Socialist Industry), Moscow. Sept. 11, 1981, p. 1.
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[79]Dvorets, N. U.S.S.R. State Planning Committee, "Soviet Program for Higher Oil Recovery." Oil and Gas J. (Tulsa, Okla.), Sept. 4, 1981, p. 99.
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The Mineral Industry of the United Arab Emirates

By Peter J. Clarke[1]

The mineral industry of the United Arab Emirates consisted primarily of the production and refining of petroleum, and the production of aluminum and cement. Despite Government efforts to diversify the economy, oil remained the driving force behind economic and social development of the seven-Emirate federation. Approximately 570 million barrels of crude oil were produced in the United Arab Emirates in 1981, of which about 535 million barrels were exported. Revenue from oil exports reached $19 billion[2] in 1981, down only 3% from 1980, despite the large 9% drop in crude oil production from the 1980 level. Combined oil and gas production accounted for about 82% of the gross domestic product in 1981, estimated at $30 billion. Abu Dhabi was by far the leading oil-producing Emirate, accounting for over 80% of the country's total oil production, followed by Dubai (19%), and Sharjah (1%). Stable oil prices and declining production levels caused a rapid dwindling of Abu Dhabi's cash surplus (oil revenues-budget expenditures) during the year, from $5 billion in 1980, to $1 billion in 1981. Despite the decline, the United Arab Emirates was able to maintain one of the world's highest per capita incomes, estimated at slightly over $21,000 in 1981, for each of the United Arab Emirates's 800,000 nationals.

Abu Dhabi's annual surplus was composed of oil revenues remaining after payment to the Federal Government (50%), local government, and to foreign governments, contribution to the Abu Dhabi Fund for Arab Economic Development, and payments made to the private purse of Sheikh Zayed of Abu Dhabi. The Federal Government invested its shares of oil revenues through the Central Bank, which was established in 1980. Abu Dhabi invested its surplus through the Abu Dhabi Investment Authority. Over 50% of the surplus was invested in dollar denominated securities, while the other half was in West German and Japanese securities. Abu Dhabi's investment income in 1981 was estimated at $1 billion.

Despite the predominance of Abu Dhabi in the United Arab Emirates overall economy, efforts were continuing in 1981 to increase the role of the Federal Government in determining economic policy and oil exploitation and marketing policy. In November 1980, the Emirates General Petroleum Corp. (EGPC) was formed to take over responsibility for marketing and distribution of petroleum products within the United Arab Emirates, and also to administer the petroleum subsidy, which amounted to about $350 million in 1981. EGPC was responsible for marketing operations in all the Emirates except for Abu Dhabi, where the Adu Dhabi National Oil Co. (ADNOC) had sole marketing authority.

In December 1980, the United Arab Emirates Central Bank was established to issue currency, regulate interest rates, and oversee the commercial banks. The rulers of Abu Dhabi and Dubai both agreed to channel 50% of their oil revenues to the Federal Government through the Central Bank to stablize the dirham and provide liquidity within the country. The most recent restriction imposed by the Central Bank in 1981 allowed foreign banks to operate only eight branches in the United Arab Emirates, thereby providing greater opportunities for local commercial banks.

The Federal Government was contemplating the establishment of an Industrial Bank in the United Arab Emirates in 1981. The bank was to be a joint venture of the United Arab Emirates Ministry of Finance

(51%) and 10 local banks and insurance companies (49%). The bank planned to lend money at low interest rates of 6% or lower to finance medium- and small-scale industrial projects, and would also carry out feasibility studies and oversee work on industrial projects. Small industrial ventures had previously been unable to obtain financing because commercial banks preferred to direct their funds into trade financing where they could receive more rapid return on their investment.

The United Arab Emirates Ministry of Planning announced its first comprehensive 5-year plan for economic and social development covering the period from 1981 to 1985. The main goals of the plan were to eliminate the chaotic planning and duplication of projects that marked the 1970's, to check inflation, and to reduce the number of foreign workers in the United Arab Emirates, which made up three-fourths of the total population. The plan projected an increase in national revenue, from $27 billion in 1981, to $34 billion by 1985. Attention was to be directed toward "Arabization" of the population, through reduction in the huge contingent of non-Arab foreign workers, diversification of the country's sources of income by raising industry's share of national income above the previous level of 5.5%, further development of the country's natural resources, including a major mineral and petroleum exploration program, and a wise investment program for the country's oil-generated financial surplus. The plan also allocated funds directly to the individual Emirates governing bodies as follows: Fujarah ($387 million), Ajman ($110 million), Ras al-Khaimah ($293 million), Umm-al-Qaiwain ($139 million), Sharjah ($217 million), Dubai ($146 million), and Abu Dhabi ($327 million).

The major infrastructure project in the United Arab Emirates centered around two main industrial areas: Ruweis in Abu Dhabi and Jebel Ali in Dubai. The Ruweis complex was the home of a major gas liquefication plant, a 120,000-barrel-per-day oil refinery, and a nitrogenous fertilizer plant. Jebel Ali contained the Dubai Aluminum Co. (Dubal), the Dubai Gas Co. (Dugas) processing plant, and a 66-berth port. Several new ports were under construction in the United Arab Emirates, including Jebel Ali, Ruweis, Fujarah Sea Port, and the already completed 35-berth facility at Port Rashid. Dubai also owned the huge Dubai Dry Dock Co., a $500 million facility that sat idle during the year.

The United Arab Emirates was conducting the third stage of its mineral survey in 1981. The survey was being conducted by Hunting Geology and Geophysics (United Kingdom), which also conducted the first two stages. The initial work had located copper deposits in Fujarah; chromite in Sharjah, Fujarah, Ras al-Khaimah, and Ajman; and asbestos in Fujarah. The third stage of the survey was to assess the quality and quantity of the discoveries and to determine the feasibility of commercial exploitation.

PRODUCTION AND TRADE

Petroleum production, mainly from Abu Dhabi, continued to dominate the mineral industry of the United Arab Emirates in 1981. Abu Dhabi produced about 420 million barrels of crude oil during the year or 80% of the total. Dubai produced about 130 million barrels, and Sharjah, 4.0 million barrels. Overall production from the United Arab Emirates declined about 8% from the 1980 level, owing to the imposition of slightly lower production ceilings by ADNOC. Production ceilings were lowered to reduce the downward pressure on crude oil prices created by oversupply conditions in world markets during the year.

Despite reduced production ceilings for the year, ADNOC, in conjunction with its foreign partners Compagnie Francaise des Petroles (CFP) (France) and Japan Oil Development Corp. (JODCO) (Japan), was in the process of expanding its crude oil production capacity from the 1.7 million barrels per day to 3 million barrels per day. The majority of the increase was to come from a huge development project at the large Upper Zakum Oilfield. Output from the field, which averaged 29,000 barrels per day in 1981, was to rise to 500,000 barrels per day by 1983. ADNOC was also developing the onshore Bu Hasa and Asab Oilfields. Production from Dubai's four offshore fields declined about 12% from the 1980 level. Although these fields did not contain large reserves, production was expected to increase in 1983 or 1984, when a large water and gas injection scheme will be implemented. Petroleum reserves in Abu Dhabi, Dubai, and Sharjah were estimated at over 40 billion barrels.

Production capacity of natural gas and natural gas liquids (NGL) was increasing nearly as rapidly as that of crude oil. Abu Dhabi Gas Industries Co.'s (GASCO) natural gas processing plant at Ruweis came on-

stream in March 1981. The plant was capable of handling 800 million cubic feet per day of associated gas from Abu Dhabi's onshore oilfields, for the production of liquefied petroleum gas (LPG) and condensates, mainly for export. Abu Dhabi's Das Island NGL plant was capable of processing another 500 million cubic feet per day of natural gas from the offshore oilfields. To supply Das Island with sufficient quantities of gas, ADNOC was completing a gas gathering project to collect, treat, and deliver 280 million cubic feet per day of associated gas from the Upper Zakum Oilfield. Abu Dhabi was also starting a program to develop its potentially huge reserves of deep nonassociated gas in 1981. Several major deep gas discoveries were made during the year, and early estimates of Abu Dhabis' possible nonassociated gas reserves were in the range from 40 to 50 trillion cubic feet.

Table 1.—United Arab Emirates: Production of mineral commodities[1]

Emirate,[2] commodity,[3] unit of measure	1977	1978	1979	1980[p]	1981[e]
ABU DHABI					
Cement, hydraulic[e] thousand metric tons	200	200	200	[r]500	700
Gas, natural:					
Gross production million cubic feet	541,760	478,617	483,809	508,445	480,000
Marketed production do.	111,876	177,914	189,286	255,594	260,000
Natural gas liquids thousand 42-gallon barrels	8,411	4,983	15,000	32,200	35,000
Petroleum:					
Crude do.	602,761	527,827	533,995	492,154	415,187
Refinery products:					
Gasoline do.	1,073	1,132	[e]1,500	1,500	6,000
Kerosine do.	188	328	[e]400	400	1,000
Distillate fuel oil do.	1,390	1,314	[e]1,600	1,600	6,500
Residual fuel oil do.	1,045	1,095	[e]1,400	1,400	5,600
Naphtha do.	37	73	[e]100	100	1,000
Other do.	NA	NA	NA	NA	NA
Refinery fuel and losses do.	306	323	[e]500	500	500
Total do.	4,039	4,265	[e]5,500	5,500	20,600
Sulfur: Byproduct from petroleum refining metric tons	--	--	--	--	5,000
AJMAN					
Marble[e] square meters	26,000	26,000	26,000	NA	NA
DUBAI					
Aluminum, primary ingot metric tons	--	--	--	25,000	106,000
Cement, hydraulic thousand metric tons	--	370	400	500	500
Gas, natural:[e]					
Gross production million cubic feet	130,000	147,000	144,000	142,000	146,000
Marketed production do.	31,000	30,600	31,000	36,500	38,000
Natural gas liquids:					
Propane thousand 42-gallon barrels	--	--	--	1,500	2,500
Butane do.	--	--	--	1,000	1,100
Natural gasoline do.	--	--	--	1,000	1,700
Petroleum, crude do.	116,472	132,240	129,316	127,818	128,313
RAS AL-KHAIMAH					
Cement, hydraulic thousand metric tons	450	450	450	500	800
SHARJAH					
Cement, hydraulic do.	50	[r]220	220	220	220
Gas, natural, gross production[e 4] million cubic feet	15,000	15,000	8,700	6,600	20,000
Petroleum, crude thousand 42-gallon barrels	10,293	8,067	4,697	3,586	4,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through June 1, 1982.

[2]In addition to the Emirates listed, Fujarah and Umm al-Qaiwain record no mineral production but presumably produce small quantities of crude construction materials.

[3]In addition to the commodities listed, crude construction materials such as common clays, stone, and sand and gravel presumably are produced, but output is not recorded quantitatively and general information is inadequate to make reliable estimates of output levels.

[4]No marketed production is reported; there is probably some small field use.

Table 2.—Abu Dhabi: Exports of crude petroleum, by destination

(Thousand 42-gallon barrels)

Destination	1978	1979	1980
Australia	6,278	9,198	5,804
France	61,210	55,662	56,758
Germany, Federal Republic of	11,680	28,324	27,083
Italy	13,396	7,592	14,527
Japan	172,754	163,556	174,616
Netherlands	30,842	38,398	21,900
United Kingdom	16,680	8,066	16,608
United States	69,350	64,897	48,983
Yemen, Democratic Republic of	--	2,008	13,578
Other	140,454	147,023	108,549
Total	r522,644	r524,724	488,406

rRevised.

The United Arab Emirates two major nonoil minerals were aluminum and cement. Production from Dubal aluminum smelter reached its rated capacity, of 135,000 tons per year, by the end of 1981. Output for the year reached 106,000 tons of high-purity aluminum. The United Arab Emirates cement industry was also expanding rapidly during the year. Every Emirate except Umm-al-Qaiwain was to have an operating cement plant by the end of 1982. Cement production capacity was to reach 5 million tons per year by 1983, far exceeding domestic demand and providing a large surplus for export.

Abu Dhabi was to become a producer of nitrogenous fertilizer in 1983, when the Ruweis fertilizer complex is expected to come onstream. Also in the planning stage was a 500,000-ton-per-year sponge iron and steel complex. The plan was initiated by the Abu Dhabi Government to help diversify the Emirates sources of income away from dominance by petroleum. The mineral production of the United Arab Emirates is shown in table 1.

The United Arab Emirates balance of trade surplus declined for the first time in over 4 years, from a record high $12.15 billion in 1980, to $9.45 billion in 1981. The decline was due to the constant level of exports, mainly petroleum, and a significant increase in the level of imports. Imports rose from $8.65 billion in 1980 to $11 billion in 1981. The United States, the United Arab Emirates second largest trading partner behind Japan, provided $1.1 billion worth of imports, representing a 12% market share. Exports from the United Arab Emirates declined very slightly in 1981, to $20.5 billion, from a high of $20.8 billion in 1980. The drop was a direct result of the decline in petroleum revenues from $19.5 billion in 1980 to $19.0 billion in 1981. Although petroleum revenues make up the vast majority of the United Arab Emirates total exports, their actual percentage of the total has declined 1% every year since 1974. In that year, petroleum revenues accounted for 99% of total exports, and that figure has dropped to 93% in 1981. This figure represented the United Arab Emirates overall effectiveness in promoting the development of its nonoil resources.

Aluminum was the major nonpetroleum mineral export in 1981. Dubal's aluminum became available on the international market in 1980 and was traded on the London Metal Exchange (LME). Since opening in 1979, Dubal has exported over $100 million worth of high-purity aluminum. Most of its output was exported to Japan under contract to C. Itoh and Co. and Mitsui and Co.

The United Arab Emirates continued to provide a major market for U.S. and other Western goods in 1981. The United Arab Emirates was the United States third largest market among all the Arab states. Major exports to the United Arab Emirates were consumer and luxury items, oil- and gasfield machinery and services, electrical power generating equipment, food products, medical supplies, and computer systems. In return, the United States received about 8% of the United Arab Emirates oil. Other countries that imported oil from the United Arab Emirates were Japan (40%), France (10%), the Netherlands (9%), the Federal Republic of Germany (5%), and other Western European and African countries. Oil exports of the United Arab Emirates are shown in table 2.

COMMODITY REVIEW

METALS

Aluminum.—The Dubal aluminum smelter at Jebel Ali reached full-rated capacity of 135,000 tons per year in October 1981 as its third potline became fully operational. The plant produced 106,000 tons of aluminum in 1981. The smelter was 80% owned by the Dubai Government and 20% by Alusmelter Holdings, a Grand Caymen Co. owned by Southwire Co. (United States) and Selection Trust Ltd. (United Kingdom).

The smelter complex included a 515-megawatt power generating facility, a 25-million-gallon-per-day seawater desalinization plant, and the main smelter facility. Alumina for the smelter was supplied under a 10-year contract by Alcoa of Australia. The operation was powered by natural gas supplied by Dugas. The average gas input to the smelter was 100 million cubic feet per day, on which Dubal achieved an energy conversion factor of 65%, one of the highest in the world. This was achieved through a computer-controlled waste heat collection system, which served to reduce energy consumption at the water desalinization plant. Besides providing water for the smelter complex, Dubal supplied the Dubai Water Department with over 10 million gallons of water per day, for use by the population of Dubai.

Since the smelter began producing aluminum in November 1979, the company has sold over $100 million worth of high-purity (99.86%) metal. By the end of December 1981, the plant was producing above capacity, at a rate of 142,000 tons per year, with a reduced level of personnel, averaging below 1,500 workers. The combination of these factors, added to the low-cost energy supply, resulted in a metal production cost below that of many long-established smelters elsewhere in the world. The company was able to sell nearly all of its noncontracted metal at prices consistantly higher than LME levels and was not significantly hurt by a slump in the world market late in the year.[3]

Gulf Extrusions Ltd., an aluminum fabricating plant, began operating in Dubai in 1978. The plant originally imported aluminum billets from Aluminum Bahrain (Alba) but switched to Dubal feed in 1980. The company operated a single 1,600-ton press, which limited its capacity to about 3,000 tons per year of anodized architectural sections. The company was owned by the Arab Al-Ghurain Group and, like the Dubai smelter, was built by British Smelter Constructions.

The Dubai Cable Co., a joint venture of the Dubai Government and British Insulated Callender Cables (United Kingdom) began operating in October 1979. The plant was capable of producing wire, flexible conductors, insulating conductors, and polyvinyl chloride (PVC) bedding and sheath. The basic raw materials were electrical-grade copper and aluminum rod plus granular PVC supplied mainly from Europe. The plant utilized about 1,100 tons of copper, 500 tons of aluminum, 700 tons of PVC, and about 900 tons of galvanized steel wire in 1981. With greater supplies of aluminum, copper, and PVC soon to be available in the Middle East, the company planned to significantly increase its production in the future, although no timetable had been established.

It was reported in 1981 that Abu Dhabi was in the process of constructing an aluminum smelter and that construction was at an advanced stage. The smelter's initial design capacity was to be 50,000 tons per year of aluminum, with expansion planned to 150,000 tons per year. Information on the plan was very limited, and the entire project may be under review in light of the declining demand for aluminum and two viable smelters already operating in the gulf. There was no semifabricating aluminum industry in Abu Dhabi.

Iron and Steel.—There were two operating steel mills in the United Arab Emirates in 1981. The Ahli Steel Co., located in the Rashidiya industrial area of Dubai, operated a 12-ton electric arc furnace along with a two strand continuous billet caster, and a 10-ton-per-hour continuous bar mill capable of producing 36,000 tons per year of reinforcing bars, between 10 and 32 millimeters. The Abu Dhabi Steelworks operated a single 25,000-ton-per-year reroller, which began operating in 1977.

Two other steel projects were under study in 1981, both in Abu Dhabi. The Abu Dhabi Government commissioned a feasibility study for a 500,000-ton-per-year to 900,000-ton-per-year iron and steel complex to be located in the industrial city of Ruweis. The plant was to produce sponge iron from ore supplied by India. Some of the sponge iron was to be exported to India, with the re-

mainder to be used as throughput for planned electric steel furnaces. The plan was initiated by the Abu Dhabi Government, with the collaboration of Kobe Steel Co. of Japan, and Krupp GmbH and Klöckner & Co. of the Federal Republic of Germany.

Also nearing completion in 1981 was an agreement for a 50,000-ton-per-year seamless pipe mill, to be set up as a joint venture of the Government of India, and Dubai's Al-Ghurain Group. The plant was to be built in Gujarat, India, with the Al-Ghurain Group providing 40% of $125 million capital for the project. The agreement was not finalized by the end of 1981. The Gujarat pipe project came shortly after the Indian Government offered to assist Sharjah in the establishment of a direct reduction plant and steelworks. The offer was made as part of India's desire to expand its role in the Middle East. No agreement was reached with Sharjah concerning the project.[4]

NONMETALS

Cement.—The cement industry of the United Arab Emirates continued to expand in 1981, producing over 2.4 million tons of portland cement during the year. There were five operating cement plants in the federation: Abu Dhabi, Dubai, Fujarah, Ras al-Khaimah, and Sharjah. Additional plants were either being built or planned in Ajman and Ras al-Khaimah. Production of cement fell just short of domestic consumption of 2.5 million tons for the year. When all the plants under construction come into operation sometime in 1984, capacity of the cement industry will increase from the current 2.9 million tons per year to 5 million tons per year. As the contemporary wave of basic infrastructure projects are completed, domestic demand for cement was expected to hold steady or to decline, leaving a substantial surplus for export by the middle of the decade.

The Fujarah Cement Industries cement plant in Fujarah became the newest addition to the Emirates cement industry in 1981. The 500,000-ton-per-year plant was built by Voest-Alpine AG of Austria, and completed in the second half of 1981. Also nearing completion was a 500,000-ton-per-year facility in Ajman.

In Dubai, the National Cement Co. planned to double the capacity of its plant to 1-million-tons-per-year. The plant was to be converted from the current wet process to dry process technology, through which the company expected to cut energy costs by 35%. Development Consultants International (India) was preparing the feasibility study.

The Gulf Cement Co., a joint venture of the United Arab Emirates Government and Kuwait, was planning to construct a 1-million-ton-per-year cement plant in Ras al-Khaimah, principally to supply the domestic market in Kuwait. The current and planned capacities of the United Arab Emirates cement industry are shown in the following table.

Location	Operating company	Current capacity (thousand tons)	Planned capacity (thousand tons)	Year
Al Ain, Abu Dhabi	Al Ain Cement Factory	750		
Dubai	Dubai National Cement Co	500	1,000	1983
Fujarah	Fujarah Cement Industries	500		
Sharjah	Sharjah Cement Co	220		
Ras al-Khaimah	Union Cement Co	1,000		
Do	Gulf Cement Co	--	1,000	1982
Ajman	NA	--	500	1982

NA Not available.

Fertilizer Materials.—Abu Dhabi was expected to begin production of nitrogenous fertilizer sometime in 1983. A $300 million fertilizer complex was being built at the Ruweis industrial zone, under the construction management team of Mitsubishi Oil Co. and the Chiyoda Chemical Engineering and Construction Co. (Japan). The plan for the complex was initiated in 1979 by ADNOC, who signed a joint venture agreement with CFP (France). ADNOC was to own 66% of the equity, and CFP, 33%. Feasibility studies were conducted in 1979 and 1980 by Snamprogetti S.p.A. (Italy), and the construction contract was awarded in July 1980.

The plant was designed to produce 1,000 tons per day of ammonia as feed for a 1,500-

ton-per-day urea unit. Haldor Topsoe A/S, Denmark technology, was being used in the ammonia unit, and Stamicarbon's process in the urea plant. Feedstock for the plant was to be supplied from Abu Dhabi's onshore natural gasfields through a direct natural gas pipeline from Habshan. Included in the project were export terminals and a powerplant desalinization complex. Output from Ruweis was to be exported, mainly in the form of urea. The company was planning to export ammonia sometime in the future, through the addition of a 1,000-ton-per-day ammonia expansion plant.

Late in 1981, the Abu Dhabi Executive Council allocated $25 million to be used to increase the capacity of the Al-Ain compost fertilizer plant. The plant, built by Buhler A.G. (Switzerland), and Moller-Anderson & Co. (Denmark), began producing 150 tons per day of compost fertilizer in 1977. The new order would increase capacity to 225 tons per day.

The Sharjah Fertilizer plant, which came onstream in 1975, also produced chemical fertilizer for the local market. Capacity at the $5 million facility was raised from 10,000 tons per year to 35,000 tons per year in 1979.

MINERAL FUELS

Natural Gas.—The United Arab Emirates production of associated and nonassociated gas expanded rapidly in 1981 as the United Arab Emirates Government continued to promote the utilization and processing of the country's natural gas reserves. Abu Dhabi played a dominant role in natural gas development owing to its extensive reserves, estimated at around 40 trillion cubic feet, and its gas processing capacity of 1,300 million cubic feet per day.

Abu Dhabi produced associated gas from the following four onshore oilfields- in million cubic feet per day: Bu Hasa (250), Asab (250), Sahil (7), and Bab (171). The fields were linked by pipeline to the Ruweis gas processing complex, which began operating in March 1981. The $1.6 billion project was implemented by GASCO, a joint venture of ADNOC (68%), Shell Oil Co. (United States) (15%), CFP-Total (France) (15%), and Participations and Exploration Corp. (Partex) (Portugal) (2%). The Ruweis facility was designed to process 800 million cubic feet per day of associated gas in the production of 150,000 barrels per day of NGL, with a product split of 60% NGL and 40% condensates. The fractionation plant at Ruweis was designed to produce 61,000 barrels per day of propane, 62,000 barrels per day of butane, and 81,000 barrels per day of heavier hydrocarbons. The first shipment of LPG, 24,000 tons of butane and 22,000 tons of propane, was delivered to Japan in August 1981. Eight Japanese companies signed 5-year contracts for the purchase of a total of 1.49 million tons per year of GASCO's LPG output, of which 1.01 million tons per year was to be supplied from ADNOC's share, and the remaining 350,000 tons per year from the shares of CFP and Partex.

Bechtel Inc. (United States) completed engineering, procurement, and construction management for another gas processing facility, located at the Bu Hasa Oilfield. The plant was a two train NGL extraction plant capable of producing 110,000 barrels per day of raw NGL. Bechtel was also responsible for construction management at the Ruweis complex.

Abu Dhabi was also planning to increase natural gas recovery from its major offshore fields, Umm Shaif (440 million cubic feet per day), Upper and Lower Zakum (200 million cubic feet per day), and other, smaller fields (95 million cubic feet per day), in line with increased production of crude oil. Associated gas from those oilfields was processed at the Das Island Natural Gas processing plant. Das Island, which began operating in 1977, was operated by the Abu Dhabi Gas Liquefaction Co. Ltd., a joint company composed of ADNOC (51%), Mitsui (Japan) (22%), British Petroleum Co. Ltd. (BP) (United Kingdom) (16%), CFP (8%), and Bridgeston Liquefied Gas Co. Ltd. (Japan) (3%). The facility was designed to process 550 million cubic feet per day of associated gas to produce 40,000 barrels per day of LNG, 15,000 barrels per day of LPG, 4,000 barrels per day of light distillates, and 4,400 barrels per day of pelletized sulfur. The Das Island facility operated at about 79% of capacity during the year, processing about 433 million cubic feet per day of gas, mainly because not enough gas was supplied to the facility. ADNOC was in the process of solving that problem in 1981, through construction of a gas-gathering system in the Upper and Lower Zakum Oilfields.

The project, called Gas Gathering II, was to utilize all the previously flared associated gas (125 million cubic feet per day) at the oilfields. A gas treatment plant at the Zakum West supercomplex was nearing completion at the end of 1981. The facility was designed to treat, compress, cool, and

dry 280 million cubic feet per day of associated gas from the Zakum Fields and then pipe it via the Umm Shaif supercomplex gas treatment platform, to Das Island. Most of Das Island's current input was from Umm Shaif. With the Zakum Fields connected to the facility, Das Island was expected to reach capacity by mid-1982. To handle the increased output from Das Island, the British company, CBI, was in the process of building seven natural gas storage tanks. Three tanks, each with a capacity of 80,000 cubic meters, were to store liquefied natural gas, while four others, with a combined capacity of 50,000 cubic meters, were to store propane and butane. Cost of the storage tanks was estimated at $320 million.

Offshore associated gas was also processed at ADNOC's gas treatment plant at Habshan. The plant was designed to separate and treat 350 million cubic feet per day of associated gas, mainly to supply power stations in Abu Dhabi. The plant processed just over 100 million cubic feet per day in 1981. ADNOC planned to double the capacity of Habshan to 550 million cubic feet per day by 1983. Fluor Corp. (United States) was constructing the new units.

Abu Dhabi was just beginning to utilize its huge reserves of nonassociated gas in 1981. Deep nonassociated gas was discovered onshore in 1978, in the Thamama C and Thamama F Zones, underlying the Bab Oilfield. In April 1981, Fluor was contracted to develop a project to utilize gas from the Thamama C reservoir. The contract, worth $26 million, covered engineering and design specifications for production and treatment of 450 million cubic feet per day to supply projects in the Ruweis Industrial Zone, electric powerplants, a desalinization plant, and other local requirements.

Another project for the Bab Oilfield was in the planning stage in 1981. This called for the production of nonassociated wet gas from the Thamama F Zone, from which LPG and condensate would be recovered. The remaining dry gas would be reinjected into the reservoir for recycling.

Deep nonassociated gas from the Permian Khuff Formation was also discovered in several areas offshore. Deep gas was discovered offshore by the Abu Dhabi Marine Areas Operating Co. (ADMA-OPCO) in 1979 in the Umm Shaif Field at 15,000 feet. Since that time, Khuff gas has been located below the Zakum Oilfield, and exploration wells were underway onshore at Bu Hasa and Jarn Yaphour and offshore at Abu-al-Bukhoosh and Nasr. Initial results indicated that Khuff gas could be present under the entire offshore area. Work was continuing rapidly on delineating the extent of offshore gas reserves. Tentative estimates of Abu Dhabi's nonassociated gas reserves were in the range from 40 to 50 trillion cubic feet.

Petroleum.—*Abu Dhabi.*—Of the United Arab Emirates total crude oil production of nearly 550 million barrels, Abu Dhabi produced about 78%. Crude oil production in the Emirate was controlled by two major companies, both of which were majority owned subsidiaries of ADNOC, the Government-owned oil company. Production levels at all fields were set by the Minister of Petroleum in conjunction with the operating company. Abu Dhabi was planning to expand its petroleum production capacity from the current 1.7 million barrels per day to 3 million barrels per day by 1983.

The Abu Dhabi Co. for Onshore Oil Operations (ADCO) produced oil from four major onshore fields, whose production levels for 1981 were as follows: Bu Hasa (255,000 barrels per day), Asab (255,000 barrels per day), Sahil (20,000 barrels per day) and Bab (15,000 barrels per day). Also under development was the onshore Shah Field in southern Abu Dhabi, which was expected to produce 15,000 barrels per day in 1982 and 30,000 barrels per day in 1983. The major development project for the onshore oilfield was selective waterflood projects at the Asab, Bab, and Sahil Fields. The plan involved drilling 121 new production and water injection wells into various strata. At the Bu Hasa Field, 234 new wells were to be drilled, and 74 existing wells were to be worked over to increase that field's productive capacity.

ADMA-OPCO administered the Emirate's major offshore fields. These fields and their 1981 production levels were as follows: Umm Shaif (227,700 barrels per day), Upper Zakum (29,210 barrels per day), and Lower Zakum (198,316 barrels per day). Abu Dhabi's single largest development project in 1981 was the $4.8 billion Upper Zakum Development Project, which was intended to increase production from 30,000 barrels per day to 500,000 barrels per day by 1983. The project was being implemented by the Zakum Development Co., a joint venture of ADNOC and CFP (France). The Zakum Field, a complex limestone, multizone reservoir, required significant levels of water and

gas injection, for which facilities were being installed at the start of production. The initial water injection capacity at the field was to be 750,000 barrels per day, eventually rising to 1.25 million barrels per day. Output from Upper Zakum was to be exported from Zirku Island, 60 kilometers from the field. The first phase of Zirku Island, a manmade export terminal, was to be completed in 1982. This was to include two separation units, storage tanks, pumping stations, and loading installations. Phase 2 was to install new tanks and loading facilities and further increase overall handling capacity to 500,000 barrels per day.

CFP operated another Abu Dhabi offshore oilfield, at Abu-Al-Bukhoosh. Output from this field averaged 75,000 barrels per day. The Mubarraz Oil Co., a joint company of Daiyko Oil and Nippon Mining (Japan) and the Japan National Oil Corp. operated the small Mubarraz Oilfield. The field, which produced about 20,000 barrels per day in 1981, was located in Abu Dhabi's offshore area. Amerada Hess also produced about 20,000 barrels per day of crude oil from the offshore Arzanah Field.

Four other offshore fields were being developed during the year, all by the Umm Addalkh Development Co. (UDECO), a 50:50 joint company of ADNOC and JODCO. Output from all four fields was not likely to exceed 50,000 barrels per day; 25,000 from UDECO, and 25,000 from the three-field complex of Satah-Dalma-Jarnain. Reserves at the three fields were estimated to be 1 billion barrels. First production from these fields was to begin late in 1983.

Several new discoveries were made in 1981 that were likely to significantly increase Abu Dhabi's current crude oil reserves of about 30 billion barrels. The largest onshore discovery was at Zubbaya, on the coast southwest of Abu Dhabi City. The area had previously shown signs of oil potential, but new drilling by ADCO in 1981 revealed a reservoir at 9,000 feet that was much larger than originally thought. The structure was thought to extend offshore, and drilling was continuing off the coast from artificial islands.

Offshore, crude oil was discovered at Gasha by ADMA-OPCO. Test rates and depth of drill holes were unavailable, but the Gasha Field was thought to be part of the same structure as Bu-Tinah, discovered by ADMA-OPCO in 1980. The combined field was estimated to be capable of producing about 200,000 barrels per day when fully developed. Mubarraz also announced a commercial discovery in its offshore concession 140 kilometers off the coast of Abu Dhabi at wildcat No. 1. The well tested at 5,000 barrels per day of 39° to 45° API crude with a sulfur content of less than 1%, plus 24 million cubic feet per day of gas. Mubarraz planned to start commercial production from the field in 1985.

Two other discoveries, both by ADMA-OPCO in the offshore area, were at Um-al-Lulu, 15 kilometers north of Abu Dhabi City, and at Hair Dalma, east of Dalma Island. Um-al-Lulu was the larger of the two discoveries, with the well testing at 24,000 barrels per day. The ADMA-OPCO annual report for 1981 described the field as one of the largest oil-bearing formations discovered in the United Arab Emirates since the discovery of Umm Shaif and Upper Zakum.

ADNOC began exploration activity in 1980, independent of its field operators, Shell, BP, and CFP. The company was engaged in exploring five onshore and offshore areas, and preparing geophysical surveys of other areas having oil-producing potential.

Several other companies began exploration work in Abu Dhabi for the first time in 1981. Sceptre Resources (Canada) planned to spud its first wildcat on its onshore concession area "A" in eastern Abu Dhabi. The well was located 30 kilometers north of the Jarn Yaphour Oilfield. Sceptre was also conducing a seismic survey of the concession.

In May 1981, Deminex-Deutsche Erdölversorgungsgesellschaft GmbH, (Federal Republic of Germany) signed a 35-year concession agreement with the Abu Dhabi Government covering an 1,835-square-kilometer tract offshore, northwest of Abu-al-Abyad Island. Union Texas Petroleum (United States) acquired exploration rights in two concession areas. The company gained a 16% interest on a 1,500-square-kilometer tract offshore, and a 10% interest in a 7,500-square-kilometer concession onshore. Deminex operated the offshore area, and Amerada Hess, the onshore. Attock Oil Co. (United Kingdom) was also awarded a 2,500-square-kilometer concession in an Abu Dhabi offshore area. Attock agreed to spend $50 million on exploration work over an 8-year period.

Petroleum refining capacity in Abu Dhabi underwent large-scale expansion in 1981,

with the commissioning of the 120,000-barrel-per-day Ruweis refinery. The new refinery was able to satisfy domestic demand in all the Emirates, averaging 115,000 barrels per day. Plans to expand the refinery to a capacity of 300,000 barrels per day were shelved during the year, owing to softening of the market late in the year. ADNOC decided, instead, to install a 26,000-barrel-per-day hydrocracking facility at the plant to upgrade fuel oil residues into lighter products. The Ruweis refinery, built at a cost of $500 million by Snamprogetti (Italy), was expected to reach full capacity early in 1982.

Expansion of the Umm-al-Nar refinery near Abu Dhabi City was under way in 1981. Pullman Kellog Co. (United States) was awarded a contract in September 1980 to construct a new refinery adjacent to the 15,000-barrel-per-day refinery already operating at Umm-al-Nar. The new plant was to have a capacity of 60,000 barrels per day. Output from both units was to be used to satisfy domestic requirements, freeing most of the output from Ruweis for export. This new capacity was to come onstream in March 1983. Also located at Umm-al-Nar was Abu Dhabi's first lube oil blending plant. The plant was built by Balmer Laurie Co. (India) and was capable of producing 14,000 barrels per day of 50 different types of lubricants for the local market. The plant came onstream in mid-1980.

ADNOC decided in 1981 to construct a 160,000-ton-per-year petroleum coke plant in the Ruweis Industrial Area. Initial plans were to make the plant a joint venture of ADNOC and the Doha-Based Gulf Organization for Industrial Consulting. Estimated cost of the project was $220 million. The plant, the first of its type in the Persian Gulf, was designed to meet the needs of the area's two aluminum smelters at Dubal and Alba.

In 1980, Dubai opened its own natural gas processing plant. Dugas was a joint venture of the Dubai Government and Scimitar Oils Ltd., formerly known as Sunningdale Oils Ltd., of Canada. The plant was designed to handle output of about 100 million cubic feet per day of associated gas from Dubai's offshore fields. The plant, built by Hudson Engineering of Houston, Tex. (United States), was designed to produce 11,000 barrels per day of propane, 7,000 barrels per day of butane, 7,000 barrels per day of condensates, and 55 million cubic feet per day of lean residue gas. The propane, butane, and natural gasoline was sold under contract to Japanese buyers. The lean residue gas was supplied by pipeline to Dubai's aluminum smelter, to fuel the steam turbines at Dubal.

Petroleum production in Dubai came entirely from the offshore areas. The Dubai Petroleum Co. (DPC) operated four offshore oilfields: Fateh, Southwest Fateh, Falah, and Rashid. Total crude oil production in Dubai was about 112 million barrels in 1981, a 12% decline from the 1980 level. The drop was due in part to depletion of the existing fields and also was a result of sluggish demand for oil in the world market. The Falah and Rashid Fields, both discovered in the 1970's, were undergoing further development by DPC to shore up declining output.

Several foreign oil companies operated Dubai's offshore oilfields, all of which were shareholders in one of the main companies. The DPC was owned 50% by the Dubai Marine Areas, a joint company of CFP (France) and Hispanoil (Spain), 30% by Conoco (United States), and 10% by Deutsche Texaco (Federal Republic of Germany). In 1979, the Dubai Government signed an agreement to purchase about one-half of the crude oil produced by the companies at 93% of the posted price. The companies then had the right to repurchase the oil at prices set by the Government. The Government attempted to establish its own marketing agency in this manner. It was unable to sign any contracts during 1980, and Conoco repurchased 33% of the Government's share of oil. The rest was sold on the spot market. In March 1981, Idemitsu signed Dubai's first direct-deal contract for the purchase of 33,000 barrels per day of Government crude. The contract ran from April to the end of 1981 and was renewable on an annual basis.

Exploration was continuing in Dubai onshore at Jebel Ali. The consortium of Southeastern Drilling Co. and Houston Oil and Minerals Corp. a subsidiary of Teneco Inc. both of the United States, struck oil at Jebel Ali at 17,875 feet in 1980. Additional drilling was underway to determine the extent of the field. Arco-Dubai, a wholly owned subsidiary of Atlantic Richfield Co. (United States), was awarded a 760,000-acre, 35-year concession for onshore exploration in 1980. The agreement called for an initial investment of $1 million for geophysical work, and a $5 million investment in each well drilled. Arco was required to drill one well by 1983 and one well per year there-

after until 1988, if the preliminary tests were encouraging.

Sharjah.—The Emirate of Sharjah was the most recent of the seven Emirates to become an oil and gas producer. All of Sharjah's crude production, averaging 10,000 barrels per day in 1980, came from the small offshore Mubarak Field, near Abu Musa Island. The production level from the field peaked in 1975 at 38,000 barrels per day and has declined fairly rapidly since then. It was estimated that reserves at Mubarak would be exhausted by the end of the decade. The field's operator, Crescent Petroleum Corp. (United States), was in the process of installing a complex gas and water injection system. The equity shareholders in Crescent Petroleum were Buttes Gas & Oil Co. (25.7%), Ashland International Oil Co. (United States) (25%), Advance Petroleum Services Inc. (United States) (25%), Kerr McGee Corp. (United States) (12.5%), Cities Service Oil Co. (United States) (10%), and Juniper Petroleum Corp. (United States) (1.8%). Sharjah's oil revenues were based on 16.5% royalty and 77% income tax.

Sharjah's future as a petroleum producer brightened considerably in 1980 and 1981, because of two large discoveries. In 1980, oil was discovered in on offshore concession operated jointly by Forman Exploration Co. (United States) and London and Scottish Marine Oil Co. (Lasmo) (United Kingdom). The field, named Hamriyyah, was located 16 kilometers east of the Mubarak Field. The test well encountered oil and gas in two formations down to 14,300 feet. The field was deemed commercial, and additional wells were being drilled. The field was owned entirely by the Emirate of Sharjah.

The second and larger of the two finds was made in December 1980 by Amoco Sharjah Oil Co., a subsidiary of Standard Oil Co. (Indiana) (United States) at its Sajaa No. 1 well, onshore just west of the Oman Mountain Range. The well tested at 5,000 barrels per day of high-gravity crude and 50 million cubic feet per day of gas. Subsequent wells drilled by Amoco confirmed the presence of large reserves of recoverable condensate and natural gas. Amoco characterized the field as one of the largest discoveries ever made by the company. The company was implementing a five-well development plan, with potential of 250 million cubic feet per day of natural gas and 25,000 barrels per day of low-sulfur condensate by June 1982. Further expansion was planned to allow production of 80,000 barrels per day of condensate by mid-1983. Work had already started on 10 storage tanks with a capacity of 50,000 barrels each at Sajaa, and four additional 500,000 barrel tanks at Sharjah's export terminal at Hamariya were also under construction. Crude oil exports were to start in June 1982. Sharjah was also studying plans for the utilization and exploitation of natural gas from the field. As a result of the new discovery, Sharjah's crude oil reserves were estimated at 3 billion barrels.

Exploration work was continuing offshore in Sharjah. In 1981, Chieftan Development Corp. (Canada) acquired a 20% interest in a 188,500-acre concession offshore of Sharjah near Abu Musu Island, about 10 kilometers west of the Mubarak Field and 20 kilometers northwest of Dubai's Fateh Field. The concession was formerly held entirely by Meridian Oil of Australia. Chieftan was to act as operator and was committed to spend $1.47 million on exploration.

Ras al-Khaimah.—Exploration was continuing in Ras al-Khaimah, led by Gulf Ras al-Khaimah, a subsidiary of Gulf Oil Corp. (United States). Gulf was active in two offshore concession areas, the first in a 421-square-kilometer tract off Ras al-Khaimah's west coast. Participation in the concession was by Gulf, as operator (45.46%), International Petroleum Corp. (Canada) (28.33%), Chinese Petroleum Corp. of Taiwan (21.21%), and a European group, Petrokal (5%). Gulf spudded Najah No. 9, the first well on the concession, late in 1981. The concession agreement called for exploration expenditures of $20 million in 1981 and 1982, and the drilling of two exploration wells. Gulf planned to drill its second well on a separate structure early in 1982. Gulf held a second concession in Ras al-Khaimah in a joint venture with Amoco (United States). The tract was located 12 kilometers southeast of Ras al-Khaimah airport. The consortium was drilling its first test at Khatt, but no details were available.

Umm-al-Qaiwain.—Two exploration agreements were signed in 1981, covering separate concessions in the Emirate. Texaco International Exploration Co., a subsidiary of Texaco Inc. (United States), was granted a 650-square-kilometer offshore concession in December 1981. Texaco was to conduct seismic studies and drill two wells by 1984. The acreage was located southwest of the entrance to the Strait of Hormuz and about 8 kilometers east Sharjah's Mubarak Oil-

field. It was thought that Sharjah's offshore Sajaa structure might extend into Umm-al-Qaiwain, providing further incentive for Texaco's exploration efforts. A consortium consisting of Forman Exploration Co. (United States), U.S. Companies Inc. (United States), Minoco UAQ Ltd. (United States), Rimrock Offshore Ltd. (United Kingdom), and Atlantic Marine Inc. (United States) spudded their first wildcat in Umm-al-Qaiwain in October 1981. The well, located on a 50,000-acre concession, was to go to a total depth of 15,000 feet. No details on the location or results of the test well were available.

Ajman.—A consortium of Forman Exploration and Lasmo remained active on their 300-square-kilometer offshore concession. The tract was awarded in 1978, and Forman-Lasmo completed seismic work at the end of 1980. The group was preparing to spud its first well on the concession in 1981. Delhi Pacific Resources Co. (United States) reached an agreement, in principal, with Reynolds Diversified Corp. (Australia) to acquire 17.45% interest on an 85,000-acre concession offshore and onshore Ajman. No details were available on Delhi's exploration plans.

Fujarah.—Little progress has been made in oil exploration work in Fujarah since 1980. A consortium of Denison Mines Ltd. (Canada) (50%), Getty Oil Co. (United States) (15.7%), Mitsubishi (Japan) (10%), and 15 other companies have operated a 700,000-acre concession off the coast of Fujarah since 1979. A single test well was drilled on the concession in 1980, with no significant show of oil or gas. Exploration activity has subsided since that well was abandoned.

Fujarah was also preparing to open the first two berths of its new seaport. The port, which was being built by Hyundai Construction Corp. of the Republic of Korea at a cost $46 million, was to eventually operate 11 berths capable of handling imports and exports for Fujarah and other Emirates. The port was to be operated by Felixstowe Dock and Railway Co. (United Kingdom).

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from United Arab Emirates dirhams (UAED) to U.S. dollars at the rate UAED3.67 = US$1.00.

[3]Metal Bulletin Monthly (London). January 1982, pp. 47-48.

[4]Metal Bulletin (London). June 5, 1981, p. 13.

The Mineral Industry of the United Kingdom

By Tatiana Karpinsky[1]

The decline in output and employment evident in the United Kingdom's economy during 1980 continued in 1981. By the fourth quarter 1981, the gross domestic product (GDP) was running 5% lower, and manufacturing output was down by 14% compared with that of 1979. The number of unemployed continued to increase, reaching about 11.5% of the total work force by the end of 1981. However, there were signs that economic activity had begun to recover in the second half of 1981. The GDP rose slightly, and the indices of industrial and manufacturing output also showed a slight upward tendency. There was, in addition, a significant rise in manufacturing productivity, mainly because of the continuing fall in employment. Overseas trade figures for 1981 indicated that there was a surplus balance of payments.

PRODUCTION

Total energy production in the United Kingdom increased 3.9% in 1981 over that of 1980. Petroleum production increased 65 million barrels or 11%. Coal production dropped slightly to 126.4 million tons. Natural gas production was steady in 1981, while nuclear and hydroelectric power combined increased 4%.

The British Government's income from oil and gas, in royalties, petroleum revenue, and corporation taxes, was about $12.2 billion[2] in 1981, or 9% of the United Kingdom's total tax revenue and 2.5% of its gross national product (GNP).

The total value of gross industrial production in 1980 amounted to $157.9 billion. Mining and quarrying contributed 14% to this and 5.6% to the GNP.[3]

Production of minerals in the United Kingdom in 1977-81 is reported in table 1.

Table 1.—United Kingdom: Production of mineral commodities[1]

(Thousand metric tons unless otherwise specified)

Commodity		1977	1978	1979	1980	1981[p]
METALS						
Aluminum:						
Alumina		99	94	88	102	e100
Metal:						
Primary	tons	349,725	346,200	359,474	374,446	339,183
Secondary	do	200,848	193,748	176,696	162,056	148,009
Cadmium metal including secondary	do	295	291	424	375	278
Copper:						
Ore and concentrate, metal content	do	450	135	e100	200	700
Metal, refined:						
Primary	do	44,397	46,158	48,512	68,290	59,834
Secondary	do	77,827	79,403	73,185	93,048	76,329
Total	do	122,224	125,561	121,697	161,338	136,163

See footnotes at end of table.

Table 1.—United Kingdom: Production of mineral commodities[1] —Continued

(Thousand metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS —Continued					
Iron and steel:					
Iron ore ---- gross weight	3,745	4,239	4,268	916	731
Iron content	899	1,102	1,110	238	190
Metal:					
Pig iron	12,285	11,532	12,894	6,412	9,616
Ferroalloys, blast-furnace: Ferromanganese	97	69	136	52	84
Steel, crude	20,410	20,311	21,438	11,278	15,576
Semimanufactures:					
Sections	4,878	4,949	4,937	3,414	3,899
Wire rods	1,650	1,423	1,760	972	1,103
Plates and sheets	6,821	6,858	7,383	3,802	5,990
Strip	1,134	1,144	1,134	413	249
Pipe, tube, stock	687	727	647	433	642
Railway track material	262	233	257	176	219
Other rolled[2]	1,081	1,014	1,003	873	929
Castings and forgings	338	307	275	252	210
Total	16,851	16,655	17,396	10,335	13,241
Lead:					
Mine output, metal content ---- tons	7,753	4,582	4,701	2,400	e2,400
Metal:					
Bullion from imported ores and concentrates ---- do	35,015	30,371	32,314	30,039	26,556
Refined:					
Primary[3] ---- do	139,654	122,841	124,138	113,405	135,369
Secondary[4] ---- do	211,424	222,947	244,192	211,385	197,992
Total ---- do	351,078	345,788	368,330	324,790	333,361
Magnesium metal including secondary ---- do	2,700	2,700	2,700	e2,700	e2,700
Nickel metal, refined including ferronickel ---- do	23,156	21,367	18,863	19,300	25,400
Silver metal ---- thousand troy ounces	134	41	NA	NA	NA
Tin:					
Mine output, metal content ---- tons	4,100	3,132	2,373	2,982	3,869
Metal:					
Primary ---- do	10,458	8,445	8,025	5,829	6,839
Secondary ---- do	3,398	2,711	3,367	5,535	6,071
Tungsten, mine output, metal content ---- do	78	65	66	e70	e70
Zinc:					
Ore and concentrate, metal content ---- do	7,551	2,718	572	4,400	10,900
Metal, smelter ---- do	81,481	73,575	76,686	86,682	81,650
NONMETALS					
Barite and witherite	50	54	45	54	50
Bromine ---- tons	24,700	25,100	29,200	25,000	e25,000
Calcite	14	13	21	18	18
Cement, hydraulic	15,456	15,916	16,140	14,808	12,732
Chalk	16,253	16,731	16,265	14,049	e12,000
Clays:					
Fire clay	1,764	1,404	1,711	1,217	e1,217
Fuller's earth	223	218	220	210	e210
Kaolin (china clay)	4,338	4,199	4,444	3,964	3,800
Pottery clay and ball clay	16	16	22	NA	NA
Other including clay shale	24,378	25,473	r21,644	21,252	18,400
Diatomite ---- tons	2,000	2,000	r1,000	1,000	e1,000
Feldspar (china stone)[e] ---- do	50,000	50,000	50,000	50,000	50,000
Fluorspar:					
Acid-grade	105	130	104	137	e100
Metallurgical-grade	23	16	12	10	e10
Ungraded	r31	r27	r23	24	e40
Total	r159	r173	r139	171	e150
Gypsum and anhydrite[5]	3,310	3,322	3,500	3,371	2,666
Nitrogen: N content of ammonia	1,631	1,600	1,666	1,633	1,780
Potash, K_2O equivalent	81	150	264	280	306
Refractory products:[6]					
Brick	768	r665	r681	448	NA
Cement	61	54	r66	34	NA
Other	r454	460	r462	332	NA
Salt:					
Rock	905	1,311	1,590	1,746	e1,600
Brine (in brine for purposes other than saltmaking)	1,871	1,760	1,915	1,608	e1,580
Other	5,426	4,239	4,315	3,800	e3,800
Sodium compounds: Sodium carbonate[e]	1,500	1,600	1,400	e1,360	e1,300

See footnotes at end of table.

Table 1.—United Kingdom: Production of mineral commodities[1] —Continued

(Thousand metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Stone, sand and gravel:					
Chert and flint	39	52	47	14	NA
Igneous rock	35,613	32,250	36,178	34,676	NA
Limestone and dolomite	85,992	88,819	92,069	89,152	NA
Sandstone including ganister	11,755	13,407	13,544	12,597	NA
Slate	1,824	945	513	225	NA
Crushed rock, not further described	NA	98,721	102,991	[e]102,000	NA
Sand and gravel:					
Common sand and gravel	110,063	110,200	[r]111,600	104,400	[e]110,000
Special sands	3,288	6,224	5,829	5,708	[e]6,000
Strontium minerals tons	5,100	4,300	[r]6,100	6,700	[e]6,600
Sulfur, byproduct:					
Of metallurgy	[r]53	[r]44	[r]56	[e]50	[e]50
Of spent oxides	5	5	[r]4	4	[e]4
Unspecified	[r]46	[r]56	[r]53	[e]69	[e]70
Total	[r]104	[r]105	[r]113	[e]123	[e]124
Talc, soapstone, pyrophyllite tons	15,000	18,000	16,600	17,300	[e]17,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	193	199	200	172	[e]170
Coal:					
Anthracite	2,529	2,952	3,030	2,902	3,000
Bituminous	118,145	118,743	117,607	125,307	121,260
Other	1,426	1,882	1,732	2,140	2,140
Total	122,100	123,577	122,369	130,349	126,400
Coke:					
Metallurgical	11,518	9,879	[r]10,259	7,829	NA
Breeze, all types	1,070	972	[r]853	673	NA
Fuel briquets, all grades	2,679	2,597	2,389	2,339	NA
Gas:					
Manufactured[7] million therms	33	42	25	20	NA
Natural:					
Gross million cubic feet	1,560,124	1,548,859	1,675,673	[e]1,564,451	[e]1,569,065
Marketed do.	1,416,041	1,382,315	1,410,285	1,316,878	1,320,762
Natural gas liquids thousand 42-gallon barrels	4,489	3,050	3,468	[e]3,500	[e]3,500
Petroleum:					
Crude including field condensate do.	278,838	388,538	561,656	586,040	650,832
Refinery products:					
Gasoline:					
Aviation do.	425	329	570	534	505
Motor do.	149,721	155,950	136,374	140,667	145,694
Jet fuel do.	33,904	38,872	42,584	41,632	36,472
Kerosine do.	20,592	20,166	20,995	15,764	14,756
Distillate fuel oil do.	141,468	175,219	189,850	165,261	149,401
Residual fuel oil do.	152,133	203,250	190,476	157,842	127,000
Lubricants do.	7,319	8,412	9,310	8,750	7,441
Other do.	81,454	75,506	89,225	61,885	[e]46,910
Refinery fuel and losses do.	50,939	48,178	45,766	44,219	49,005
Total do.	637,955	725,882	725,150	636,554	[e]577,184

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Includes data available through Sept. 20, 1982.

[2]Includes wheels, centers, tires, axles, and semimanufactures for immediate sale.

[3]From imported bullion, including Pb content of alloys produced.

[4]From scrap materials. Series revised to comprise all secondary output including Pb content of secondary antimonial lead and to exclude output from domestic ores.

[5]Excludes plasters.

[6]Consists of brick, retorts, molds, and other refractory products made from clays, silica, silicious materials, magnesite, alumina, and chrome materials.

[7]Gas made at gasworks plus purchased coke oven refinery gas.

TRADE

Trade data for minerals and metals for 1979-80 are given in tables 2 and 3.

Table 2.—United Kingdom: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate	1,409	1,221	--	West Germany 500; Sweden 299; Belgium-Luxembourg 280.
Oxides and hydroxides	33,562	42,670	1,432	Republic of South Africa 6,270; Norway 4,870; Portugal 4,052.
Metal including alloys:				
Scrap	r28,188	35,731	--	West Germany 19,562; Belgium-Luxembourg 5,682; Netherlands 4,404.
Unwrought	206,985	194,456	2,812	Netherlands 67,479; West Germany 58,368; Italy 12,594.
Semimanufactures	r73,888	184,980	1,655	West Germany 19,688; Ireland 11,950; France 10,123.
Antimony metal including alloys, all forms	173	288	NA	NA.
Arsenic: Trioxide, pentoxide, acids	3,101	2,695	NA	NA.
Beryllium metal including alloys, all forms	4	5	1	France 2; Spain 1; West Germany 1.
Bismuth metal including alloys, all forms	255	312	NA	NA.
Cadmium metal including alloys, all forms	73	133	NA	NA.
Chromium:				
Chromite	222	891	--	Spain 530; Sweden 135; India 98.
Oxides and hydroxides	3,726	4,785	3,482	France 592.
Metal including alloys, all forms	2,121	2,569	NA	NA.
Cobalt:				
Oxides and hydroxides	244	289	49	Belgium-Luxembourg 76; West Germany 66; Spain 19.
Metal including alloys, all forms	962	623	NA	NA.
Columbium and tantalum metal including alloys, all forms	43	34	2	West Germany 15; Belgium-Luxembourg 8.
Copper:				
Matte and cement	6	4	--	All to Switzerland.
Metal including alloys:				
Scrap	r59,593	82,903	--	West Germany 35,961; Italy 21,719; Belgium-Luxembourg 8,619.
Unwrought	r48,063	60,540	--	West Germany 17,536; Italy 12,625; France 7,475.
Semimanufactures	r118,943	119,868	3,604	Switzerland 15,098; Ireland 12,590; Netherlands 6,876.
Gold:				
Waste and sweepings value, thousands	$106,441	$91,217	--	Spain $40,920; Italy $19,034; Switzerland $14,637.
Metal including alloys:				
Bullion, refined thousand troy ounces	15,823	10,781	NA	NA.
Unwrought and partly wrought troy ounces	167,184	99,667	--	France 22,505; Belgium-Luxembourg 16,075; Switzerland 16,075.
Iron and steel:				
Ore and concentrate, except roasted pyrites	898	1,156	--	West Germany 794; Cuba 105; Ireland 94.
Metal:				
Scrap thousand tons	1,335	2,805	(1)	Spain 1,810; West Germany 328.
Pig iron, cast iron, spiegeleisen	22,536	30,245	--	Italy 15,180; Belgium-Luxembourg 11,393.
Sponge iron, powder, shot	22,098	25,543	107	West Germany 6,233; Sweden 4,011; Norway 2,087.
Ferroalloys:				
Ferromanganese	6,964	972	--	West Germany 277; France 188; Netherlands 182.
Ferrosilicon	1,782	1,353	433	West Germany 277; Italy 50.
Other ferroalloys	18,656	15,634	--	West Germany 4,846; Netherlands 1,133; Italy 997.
Steel, primary forms	482,649	242,678	13,568	Italy 116,376; West Germany 31,531; France 17,004.
Semimanufactures:				
Bars, rods, angles, shapes, sections:				
Wire rod thousand tons	451	279	2	West Germany 51; Egypt 33; Sweden 27; Belgium-Luxembourg 19.
Other bars and rods do	932	549	66	West Germany 91; France 43; Italy 37.
Angles, shapes, sections do	588	407	75	Ireland 38; India 31; Republic of Korea 30.
Universals, plates, sheets:				
Tinned plates and sheets do	244	160	--	India 32; Greece 15; Denmark 11.
Other do	1,012	497	1	West Germany 114; Ireland 38; India 19.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures —Continued				
Hoop and strip thousand tons	135	79	4	Ireland 8; U.S.S.R. 6; Italy 5.
Rails and accessories do	105	103	5	Pakistan 24; Italy 6; Ireland 5.
Wire do	117	89	13	Canada 9; Ireland 6; Nigeria 6.
Tubes, pipes, fittings do	491	404	21	Netherlands 53; Sweden 27; U.S.S.R. 17.
Castings and forgings, rough do	112	96	33	Sweden 14; Abu Dhabi 4; France 4.
Lead:				
Ore and concentrate	5,187	3,535	--	Belgium-Luxembourg 2,788; West Germany 721.
Oxides and hydroxides	5,860	5,855	22	Ireland 2,375; Sweden 494.
Metal including alloys:				
Scrap	32,369	30,662	--	Italy 10,610; West Germany 6,728; Denmark 6,101.
Unwrought	136,549	141,825	635	West Germany 31,054; Netherlands 25,127; Portugal 11,391.
Semimanufactures	5,223	6,123	--	Ireland 1,738; Portugal 1,012.
Magnesium metal including alloys:				
Scrap	272	111	7	Italy 81; West Germany 20; Ireland 3.
Unwrought	1,075	1,167	309	France 305; Canada 193.
Semimanufactures	704	659	8	India 306; Ireland 72.
Manganese:				
Ore and concentrate	4,043	8,331	323	Republic of South Africa 2,710; Italy 1,821.
Oxides and hydroxides	1,165	2,133	20	Nigeria 841; Republic of South Africa 368; Ireland 191.
Metal including alloys, all forms	362	405	NA	NA.
Mercury 76-pound flasks	3,974	2,321	116	Belgium-Luxembourg 551; West Germany 464; Republic of South Africa 464.
Molybdenum:				
Oxides and hydroxides	381	1,937	NA	NA.
Metal including alloys, all forms	332	175	3	Netherlands 72; West Germany 31; France 30.
Nickel:				
Ore and concentrate		5	--	All to Israel.
Matte, speiss, similar materials	1,383	2,911	--	Norway 2,823; India 59.
Oxides and hydroxides	252	58	NA	NA.
Metal including alloys:				
Scrap	4,341	4,454	550	Sweden 1,455; Netherlands 804; West Germany 789.
Unwrought	14,866	10,984	--	West Germany 2,973; Belgium-Luxembourg 1,687; France 1,489.
Semimanufactures	13,098	9,136	965	France 1,853; West Germany 934; Italy 864.
Platinum-group metals including alloys, unwrought and partly wrought thousand troy ounces	3,537	1,768	418	Italy 418; Switzerland 193.
Silver:				
Ore and concentrate value, thousands	$8,629	$1,000	$95	Canada $882; Switzerland $20.
Waste and sweepings do	$25,440	$144,798	--	East Germany $40,943; Italy $28,269; Belgium-Luxembourg $19,725.
Metal including alloys:				
Refined, wrought thousand troy ounces	18,229	17,426	579	Switzerland 4,823; Sweden 4,244.
Refined, unwrought do	35,398	62,726	3,537	Switzerland 51,345; East Germany 2,894.
Other do	2,926	2,090	NA	NA.
Tin:				
Ore and concentrate	4,019	3,035	--	Spain 1,304; West Germany 1,000; Belgium-Luxembourg 500.
Oxides and hydroxides	453	431	NA	NA.
Metal including alloys:				
Scrap	22	115	--	West Germany 92; Belgium-Luxembourg 20.
Unwrought	7,458	8,234	530	U.S.S.R. 3,788; Czechoslovakia 658; Netherlands 609.
Semimanufactures	352	635	--	Netherlands 272; Italy 47; Sweden 44.
Titanium: Oxides and hydroxides	18,705	14,038	1,545	Netherlands 2,132; Hungary 1,844; West Germany 1,316.
Tungsten:				
Ore and concentrate	30	222	51	Poland 84; Netherlands 39; West Germany 31.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Tungsten —Continued				
Oxides and hydroxides	5	1	NA	NA.
Metal including alloys, all forms	227	333	44	West Germany 131; Netherlands 26; Italy 13.
Uranium and thorium:				
Ore and concentrate, value, thousands	--	$8	--	All to France.
Metal including alloys, all forms	11	20	NA	NA.
Zinc:				
Ore and concentrate	--	7,695	--	France 4,330; Belgium-Luxembourg 3,365.
Oxides and peroxides	10,267	9,331	168	Belgium-Luxembourg 1,340; Netherlands 1,282; Cuba 1,266.
Metal including alloys:				
Scrap	4,818	5,400	--	West Germany 3,576; Belgium-Luxembourg 727.
Blue powder	2,210	2,162	NA	NA.
Unwrought	19,119	34,468	3,661	Netherlands 10,216; France 4,403; Belgium-Luxembourg 3,331.
Semimanufactures	3,737	3,152	363	Pakistan 346.
Other:				
Ores and concentrates:				
Of molybdenum, tantalum, titanium, vanadium, zirconium	7,565	4,753	--	Belgium-Luxembourg 1,006; Spain 738; France 580.
Unspecified	396	841	83	Belgium-Luxembourg 434.
Ash and residue containing nonferrous metals	49,272	46,020	494	West Germany 21,494; Belgium-Luxembourg 7,902.
Oxides, hydroxides, peroxides	r2,025	2,101	NA	NA.
Metals:				
Metalloids	2,589	2,604	35	Denmark 1,152; Malaysia 586; West Germany 92.
Alkali, alkaline-earth, rare-earth metals	222	172	23	Poland 31; Hungary 15; Italy 15.
Pyrophoric alloys	7,574	10,325	--	West Germany 6,412; Ireland 1,236.
Base metals including alloys, all forms	r114	140	NA	NA.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	2,262	2,203	6	Libya 506; Singapore 421; West Germany 215.
Artificial: Corundum	7,171	6,744	1,665	Republic of South Africa 1,288; West Germany 1,244.
Dust and powder of precious and semi-precious stones, value, thousands	$7,805	$4,646	$689	Belgium-Luxembourg $835; West Germany $449.
Grinding and polishing wheels and stones	7,369	7,281	182	West Germany 891; Sweden 880; Italy 629.
Asbestos, crude	615	1,118	--	France 340; Italy 188; West Germany 135.
Barite and witherite	4,622	4,050	36	Norway 694; West Germany 578; Denmark 306.
Boron materials:				
Crude natural borates	140	1,517	--	Netherlands 1,399; Republic of South Africa 74.
Oxide and acid	996	1,514	37	Netherlands 1,337; France 76; Canada 36.
Cement, thousand tons	1,600	1,025	214	Nigeria 576; Ireland 102.
Chalk	60,276	57,742	--	Sweden 12,611; Nigeria 9,893; Australia 6,274.
Clays and clay products:				
Crude, thousand tons	3,111	2,957	32	West Germany 491; Italy 447; Finland 366.
Products:				
Nonrefractory	191,938	182,521	12,250	Ireland 52,754; Saudi Arabia 14,230; Netherlands 13,303.
Refractory including nonclay brick	252,611	249,937	4,025	Italy 39,031; Sweden 21,928; West Germany 16,837.
Cryolite and chiolite	7	3	NA	NA.
Diamonds: Gem, not set or strung, value, millions	$5,835	$6,568	$691	Switzerland $3,586; Belgium-Luxembourg $1,634.
Diatomite and other infusorial earth	1,098	985	2	Ireland 360; Ghana 223; Singapore 53.
Feldspar and fluorspar	28,483	59,229	--	Canada 23,556; West Germany 17,177; Norway 7,788.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials:				
Crude:				
Nitrogenous	230	137	--	Ireland 107; France 20.
Phosphatic	222	94	--	Australia 71; Ireland 23.
Potassic	6	35	--	Ireland 20; Bangladesh 10; France 5.
Other including mixed	2,603	2,481	93	Ireland 1,319; West Germany 662; Netherlands 111.
Manufactured:				
Nitrogenous	148,141	118,186	16	Netherlands 46,773; Ireland 25,830; Belgium-Luxembourg 22,322.
Phosphatic	41,757	25,955	--	Ireland 14,536; France 5,785.
Potassic	164,740	200,695	267	Singapore 42,889; Norway 35,807; Finland 30,345.
Other including mixed	435,267	301,952	73	Ireland 171; West Germany 57.
Ammonia	98,035	102,581	10	Spain 25,632; Ireland 16,015; Sweden 11,380.
Graphite, natural	3,158	2,081	290	France 561; Belgium-Luxembourg 218; West Germany 218.
Gypsum and plasters	17,588	17,889	777	Ireland 4,190; Saudi Arabia 2,390; Hong Kong 1,988.
Lime	42,365	32,724	--	Nigeria 7,704; Venezuela 3,499.
Magnesite	65,004	80,042	NA	NA.
Mica:				
Crude including splittings and waste	4,878	3,773	213	West Germany 706; Belgium-Luxembourg 419; Hungary 321.
Worked including agglomerated splittings	417	231	NA	NA.
Pigments, mineral: Iron oxides, processed	9,400	7,208	365	Netherlands 433; Australia 428; Italy 424.
Precious and semiprecious stones, except diamonds:				
Natural value, thousands	$90,588	$126,653	$4,369	Switzerland $73,972; West Germany $12,646.
Manufactured do.	$246	$440	$103	Spain $107; India $84; West Germany $55.
Pyrites, unroasted	13	20	--	Italy 12; France 8.
Salt and brine	424,187	393,323	19	Sweden 136,665; Nigeria 112,288.
Sodium and potassium compounds, n.e.s.:				
Caustic potash, sodic and potassic peroxides	1,588	1,618	2	Australia 674; New Zealand 420; Ireland 281.
Caustic soda	54,835	45,891	50	Nigeria 5,320; Ireland 3,903; Tanzania 3,456.
Soda ash	146,169	149,910	20	Republic of South Africa 65,203; Ireland 14,164; Sweden 11,997.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	11,077	8,368	--	West Germany 5,171; France 1,515; Ireland 610.
Worked	5,936	7,746	248	France 1,915; Belgium-Luxembourg 1,329; Australia 603.
Dolomite, chiefly refractory-grade	27,267	30,116	--	Sweden 12,765; Ireland 5,416.
Gravel and crushed rock thousand tons	6,437	6,814	1	Belgium-Luxembourg 3,171; France 1,803; Netherlands 1,121.
Limestone, except dimension	867,742	799,103	--	Belgium-Luxembourg 231,270; West Germany 227,237; Norway 179,427.
Quartz and quartzite	317	277	15	Ireland 109; Iran 43; Singapore 27.
Sand excluding metal-bearing	85,525	48,199	1	Ireland 23,843; Sweden 17,264; Norway 2,740.
Sulfur:				
Elemental:				
Other than colloidal	1,344	1,116	--	Australia 282; Ireland 228; India 161.
Colloidal	247	133	2	Ireland 50; India 21; Belgium-Luxembourg 18.
Dioxide	104	90	NA	NA.
Sulfuric acid	172,556	228,676	1	Ireland 56,271; Turkey 48,630; Greece 23,228.
Talc, steatite, soapstone, pyrophyllite	5,605	5,806	--	Belgium-Luxembourg 1,970; Nigeria 1,313; Ireland 853.
Other:				
Crude	50,480	32,620	48	West Germany 8,056; Netherlands 5,624; Sweden 2,779.
Slag, dross, similar waste, not metal-bearing:				
From iron and steel manufacture	97,677	78,935	--	West Germany 67,958; Denmark 2,433; Norway 1,971.
Unspecified	4,493	5,943	570	West Germany 2,378; Sweden 1,039.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other —Continued				
Oxides, hydroxides, peroxides of barium, magnesium, strontium	250	581	--	West Germany 276; Belgium-Luxembourg 100.
Halogens other than chlorine	1,824	2,026	56	France 1,010; West Germany 367; Ireland 191.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	77,011	92,298	1,738	Ireland 21,263; Saudi Arabia 14,412; Iraq 4,603.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3,815	2,887	--	Ireland 1,293; Kenya 491; Norway 202.
Carbon black	48,527	35,195	51	Ireland 5,845; Nigeria 4,508; France 3,858.
Coal and briquets:				
Anthracite and bituminous coal thousand tons	2,339	4,042	(1)	France 1,474; West Germany 1,145; Denmark 606.
Briquets of anthracite and bituminous coal do	174	119	--	Norway 108; Ireland 5.
Lignite and lignite briquets	5	120	--	Saudi Arabia 30; Libya 23; Norway 23.
Coke and semicoke thousand tons	721	1,164	--	West Germany 198; Norway 195; Netherlands 170.
Hydrogen, helium, rare gases	7,091	5,135	7	Ireland 2,244; Norway 597; Netherlands 554.
Peat including briquets and litter	4,542	5,105	--	France 2,138; Lebanon 592; Spain 361.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	r291,360	291,566	55,322	West Germany 83,849; Netherlands 64,649; France 21,633.
Refinery products:				
Gasoline do	r18,444	16,882	--	Ireland 5,847; Netherlands 5,445; Sweden 1,956.
Kerosine and jet fuel do	r6,441	6,090	--	Ireland 2,281; Norway 1,045; Sweden 963.
Distillate fuel oil do	39,958	37,654	--	Ireland 5,721; Denmark 4,643; Sweden 3,927.
Residual fuel oil do	23,757	35,203	170	Netherlands 8,420; Ireland 7,455; Sweden 6,399.
Lubricants do	r7,454	10,037	--	France 4,075; Netherlands 944; West Germany 738.
Other:				
Liquefied petroleum gas do	r10,322	11,839	1,189	Netherlands 2,525; Ireland 2,239; Portugal 1,404.
Mineral jelly and wax do	328	349	--	Nigeria 63; West Germany 58; Finland 28.
Bitumen and other residues and bituminous mixtures do	r1,079	910	--	Ireland 621; Iceland 66.
Petroleum coke do	r1,890	2,047	NA	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	302,544	222,264	5,352	Norway 59,823; Netherlands 58,320; France 20,309.

rRevised. NA Not available.
1Less than 1/2 unit.

Table 3.—United Kingdom: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate	283,749	267,634	38	Ghana 161,574; Greece 48,223; Sierra Leone 16,188.
Oxides and hydroxides	609,833	778,909	976	Jamaica 547,186; Suriname 107,318.
Metal including alloys:				
Scrap	6,282	5,792	1,455	Ireland 2,400; Canada 467.
Unwrought	185,481	171,420	NA	NA.
Semimanufactures	188,794	155,465	15,051	West Germany 43,122; Belgium-Luxembourg 19,733; France 19,479.
Arsenic: Trioxide, pentoxide, acids	87	5,454	NA	NA.
Beryllium metal including alloys, all forms	11	10	9	NA.
Bismuth metal including alloys, all forms	335	389	NA	NA.
Cadmium metal including alloys, all forms	1,432	793	NA	NA.
Chromium:				
Chromite	92,041	92,573	--	Republic of South Africa 67,895; Mozambique 9,716.
Oxides and hydroxides	2,054	2,255	54	U.S.S.R. 805; West Germany 764.
Metal including alloys, all forms	[1]55	[1]25	NA	NA.
Cobalt:				
Oxides and hydroxides	683	1,333	2	Canada 1,267.
Metal including alloys, all forms	3,031	2,187	NA	NA.
Columbium and tantalum metals including alloys, all forms	75	59	31	West Germany 19.
Copper:				
Ore and concentrate	563	644	124	Czechoslovakia 520.
Metal including alloys:				
Scrap	10,546	9,171	1,874	Ireland 1,990; Ghana 864.
Unwrought	377,777	346,703	8,213	Canada 78,584; Chile 75,768; Peru 43,384.
Semimanufactures	103,602	77,817	8,085	West Germany 16,429; France 10,928; Belgium-Luxembourg 9,682.
Gold:				
Waste and sweepings value, thousands	$265,071	$269,409	$144,400	Kuwait $56,536; Canada $24,052.
Metal including alloys:				
Bullion thousand troy ounces	25,258	17,710	NA	NA.
Unwrought and partly wrought do.	768	2,132	71	Singapore 1,215; Dubai, 238; Hong Kong 212.
Iron and steel:				
Ore and concentrate, except roasted pyrites thousand tons	17,841	8,529	--	Canada 3,682; Brazil 1,417; Australia 1,109.
Roasted pyrites do.	221	218	--	Sweden 187; Ireland 29.
Metal:				
Scrap do.	35	26	2	Ireland 14; West Germany 4.
Pig iron, cast iron, spiegeleisen do.	132	168	--	Norway 48; West Germany 34; Brazil 24.
Sponge iron, powder, shot do.	41	24	(2)	Sweden 10; Venezuela 8.
Ferroalloys:				
Ferromanganese do.	81	52	(2)	Norway 20; Republic of South Africa 19.
Ferrosilicon do.	115	69	(2)	Norway 46; Spain 8.
Other do.	140	83	(2)	Republic of South Africa 23; Norway 21; Sweden 11.
Steel, primary forms do.	869	902	9	West Germany 257; Netherlands 132; Sweden 38.
Semimanufactures:				
Bars, rods, angles, shapes, sections:				
Wire rods do.	179	261	1	West Germany 81; France 57; Netherlands 33.
Other bars and rods do.	358	377	1	West Germany 72; France 49; Netherlands 22.
Angles, shapes, sections do.	277	290	4	Belgium-Luxembourg 77; Republic of South Africa 35.
Universals, plates, sheets:				
Tinned plates and sheets do.	129	302	100	Netherlands 76; West Germany 47; France 35.
Other do.	[r]1,537	1,824	--	West Germany 436; Belgium-Luxembourg 350; Netherlands 243.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures —Continued				
Hoop and strip thousand tons	102	219	2	West Germany 90; Netherlands 44; France 39.
Rails and accessories do	15	6	--	West Germany 3; Belgium-Luxembourg 2.
Wire do	51	62	(2)	Belgium-Luxembourg 17; West Germany 15; France 10.
Tubes, pipes, fittings do	r329	468	5	West Germany 71; Netherlands 52; Belgium-Luxembourg 27.
Castings and forgings, rough do	19	21	1	France 5; West Germany 5; Italy 2.
Lead:				
Ore and concentrate	67,812	56,060	38	Australia 27,295; Honduras 9,713; Canada 6,429.
Oxides and hydroxides	793	672	15	Ireland 247; Netherlands 207; Mexico 90.
Metal including alloys:				
Scrap	9,081	10,571	8,504	Canada 535; Ghana 376; Kuwait 212.
Unwrought	205,204	204,215	8,329	Australia 149,148; Canada 37,449.
Semimanufactures	2,304	2,848	22	Ireland 2,006.
Magnesium metal including alloys:				
Scrap	270	43	--	West Germany 25; Ghana 11.
Unwrought	5,910	4,974	170	Norway 2,527; Netherlands 1,489; Canada 656.
Semimanufactures	301	245	82	Switzerland 122; Austria 18.
Manganese:				
Ore and concentrate	544,220	126,549	139	Republic of South Africa 61,956; Brazil 38,475; Australia 10,677.
Oxides and hydroxides	5,900	5,576	224	Ireland 2,468 Belgium-Luxembourg 1,252; Greece 1,213.
Metal including alloys, all forms	3,071	3,291	NA	NA.
Mercury 76-pound flasks	8,877	6,730	406	Netherlands 4,090; Spain 1,015.
Molybdenum:				
Ore and concentrate	15,285	13,757	NA	NA.
Metal including alloys, all forms	274	108	35	Austria 44; France 19.
Nickel:				
Ore and concentrate	36	--	--	
Matte, speiss, similar materials	27,822	38,325	--	Canada 25,117; Guatemala 10,817.
Metal including alloys:				
Scrap	3,078	2,255	577	France 448; Canada 255; Sweden 226.
Unwrought	17,960	18,240	798	Canada 6,571; Belgium-Luxembourg 2,438; Norway 2,377.
Semimanufactures	4,680	4,629	1,641	West Germany 1,775; Canada 523.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	385,808	707,315	257,206	Netherlands 128,603.
Silver:				
Ore and concentrate value, thousands	r$198,866	$463,148	NA	NA.
Waste and sweepings do	r$244,495	$401,682	NA	NA.
Metal including alloys, unwrought and partly wrought thousand troy ounces	39,417	139,566	30,286	West Germany 39,009; France 13,150; Belgium-Luxembourg 11,413.
Tin:				
Ore and concentrate	35,987	36,656	11	Bolivia 24,704; Argentina 4,299; Peru 3,306.
Metal including alloys:				
Scrap	1,314	940	220	Belgium-Luxembourg 197; France 142.
Unwrought and partly wrought	8,600	7,368	404	Nigeria 1,705; Netherlands 1,123; Indonesia 830.
Titanium:				
Ore and concentrate	382,990	312,650	NA	NA.
Oxides and hydroxides	9,846	5,680	85	West Germany 1,286; Belgium-Luxembourg 1,135; Italy 867.
Metal including alloys, all forms	r 31,129	31,999	NA	NA.
Tungsten:				
Ore and concentrate	2,997	2,622	77	Portugal 673; West Germany 502; Netherlands 461.
Metal including alloys, all forms	245	298	23	Republic of Korea 78; Austria 71.
Uranium and thorium:				
Ore and concentrate	943	925	--	All from Australia.
Metals including alloys, all forms	1	2	1	Mainly from Canada.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	182,067	211,599	3,000	Peru 65,027; Australia 60,065; Ireland 39,564.
Oxides and peroxides	4,244	2,871	42	West Germany 1,046; France 751; Portugal 701.
Metal including alloys:				
Scrap and blue powder	1,431	1,136	--	Norway 531; Finland 152; Sweden 152.
Unwrought	178,144	134,273	10	Canada 47,300; Netherlands 34,838; Finland 26,104.
Semimanufactures	r4,771	4,401	NA	West Germany 1,809; France 673; Netherlands 650.
Zirconium:				
Ore and concentrate	33,667	32,426	NA	NA.
Metal including alloys, all forms	228	207	NA	NA.
Other:				
Ores and concentrates	621	131	NA	NA.
Ash and residue containing nonferrous metals	96,099	78,583	14,328	West Germany 6,638; Australia 4,659; Netherlands 3,211.
Oxides, hydroxides, peroxides	294,378	267,194	--	U.S.S.R. 99,635; Ireland 27,349; West Germany 21,721.
Metals:				
Alkali, alkaline-earth, rare-earth metals	1,101	879	7	France 649; West Germany 168.
Pyrophoric alloys	3,651	3,119	--	Ireland 2,873.
Base metals including alloys, all forms	588	367	NA	NA.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc value, thousands	r$11,157	$9,691	NA	NA.
Artificial: Corundum	14,827	17,543	289	Canada 8,053; Netherlands 4,227; Austria 2,335.
Dust and powder of precious and semiprecious stone value, thousands	$25,824	$18,638	NA	NA.
Grinding and polishing wheels and stones	3,994	4,314	161	Netherlands 857; Italy 769; West Germany 554.
Asbestos, crude	116,665	94,639	731	Canada 71,893; Republic of South Africa 8,980.
Barite and witherite	90,355	143,090	--	Ireland 74,892; Netherlands 42,008.
Boron materials:				
Borates and perborates	10,409	9,246	2,709	Netherlands 5,692.
Oxides and acids	8,525	2,518	20	Turkey 1,100; France 869.
Bromine	4,168	4,642	NA	NA.
Cement	146,855	118,167	707	Ireland 97,456; France 15,163.
Chalk	1,547	605	--	West Germany 412; France 109; Netherlands 36.
Clays and clay products:				
Crude	195,738	196,416	83,173	Republic of South Africa 31,484; France 28,425; Netherlands 13,724.
Products:				
Nonrefractory	84,395	93,270	336	Italy 50,722; Spain 11,050; West Germany 8,430.
Refractory including nonclay brick	60,332	45,906	4,298	Ireland 10,804; West Germany 9,989; Denmark 5,267.
Cryolite and chiolite	2,184	1,627	--	All from Denmark.
Diamond:				
Gem, not set or strung value, millions	$5,551	$6,914	NA	NA.
Industrial value, thousands	$188,651	$147,829	NA	NA.
Diatomite and other infusorial earth	11,902	13,602	4,692	Denmark 4,059; France 2,234.
Feldspar and fluorspar	193,476	144,008	--	Norway 90,288; Finland 22,794; Sweden 11,470.
Fertilizer materials:				
Crude:				
Nitrogenous	7,979	6,921	--	Chile 4,555; Belgium-Luxembourg 1,761.
Phosphatic thousand tons	1,752	1,755	407	Morocco 822; Senegal 428.
Potassic	37,626	25,453	25	East Germany 13,062; West Germany 12,366.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials —Continued				
Manufactured:				
Nitrogenous	506,616	355,567	14,789	Belgium-Luxembourg 126,419; Netherlands 119,663; West Germany 47,761.
Phosphatic:				
Thomas (basic) slag	12,829	16,380	--	Belgium-Luxembourg 16,304; Ireland 74.
Other	80,153	59,607	350	Portugal 10,835; Denmark 10,271; Netherlands 10,102.
Potassic	629,662	554,775	10	East Germany 204,894; West Germany 141,558; Belgium-Luxembourg 76,335.
Other including mixed	361,388	363,800	4,019	Netherlands 117,314; Belgium-Luxembourg 75,151; Ireland 30,750.
Graphite, natural	14,584	18,115	400	Norway 6,319; Madagascar 5,947; China 2,340.
Gypsum and plasters	r38,940	85,652	--	Ireland 72,488; France 10,706.
Iodine	1,359	1,596	NA	NA.
Lime	2,740	1,374	--	Ireland 1,244; France 106.
Magnesite	145,266	94,176	889	Spain 22,523; Greece 21,172; Italy 13,526.
Mica:				
Crude including splittings and waste	17,918	21,223	70	China 6,575; India 3,812.
Worked including agglomerated splittings	545	506	113	Belgium-Luxembourg 111; West Germany 110; Switzerland 57.
Pigments, mineral:				
Natural, crude	3,309	2,848	NA	NA.
Iron oxides, processed	24,926	22,137	639	West Germany 17,736.
Precious and semiprecious stones, except diamond:				
Natural value, thousands	$103,169	$126,662	$9,007	Switzerland $58,579; West Germany $11,501; France $10,801.
Manufactured do	$1,235	$1,677	$1,024	NA.
Salt and brine	748,017	434,427	192	Italy 280,873; Netherlands 124,954.
Sodium and potassium compounds, n.e.s.:				
Caustic potash including sodic and potassic peroxides	3,212	2,778	3	France 971; West Germany 655; Sweden 233.
Caustic soda	47,552	63,952	5,057	West Germany 46,085; Netherlands 5,342.
Soda ash	59,282	34,089	16,504	Bulgaria 5,668; Poland 5,024; U.S.S.R. 4,999.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Calcareous	9,083	8,973	--	Italy 8,254; Portugal 143; Sweden 136.
Slate	422	321	--	Italy 164; Spain 94; Ireland 40.
Other	18,019	12,664	210	Republic of South Africa 3,441; Sweden 1,379.
Worked:				
Slate	3,988	3,741	--	Italy 1,508; France 1,437.
Paving and flagstone	12,310	12,345	6	Portugal 12,178.
Other	18,945	24,016	153	Italy 15,364; India 3,260; Republic of South Africa 1,718.
Dolomite, chiefly refractory-grade	80,155	64,277	34	Spain 46,346; Norway 14,857.
Gravel and crushed rock	169,558	311,795	57	France 156,587; Ireland 68,119; Italy 21,033.
Limestone, except dimension	3,522	2,665	9	France 2,615; West Germany 37.
Quartz and quartzite	4,377	4,129	565	West Germany 767; Italy 598; Portugal 518.
Sand excluding metal-bearing	82,287	58,931	1,546	Belgium-Luxembourg 42,145; Ireland 8,161.
Sulfur:				
Elemental:				
Colloidal	491	475	15	France 259; West Germany 124; Spain 36.
Other than colloidal thousand tons	1,194	1,140	61	Poland 365; France 311; Belgium-Luxembourg 195.
Sulfuric acid	30,941	26,959	13	Norway 21,267; West Germany 5,669.
Talc, steatite, soapstone, pyrophyllite	65,757	62,376	499	Norway 17,005; France 9,603; China 8,865.
Vermiculite	148,396	116,963	NA	NA.
Other:				
Crude	r356,859	267,898	NA	NA.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other —Continued				
Slag, dross, similar waste, not metal-bearing:				
From iron and steel manufacture	62,668	54,963	15	Canada 23,231; Republic of South Africa 9,884.
Unspecified	6,734	13,118	53	Netherlands 12,009.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	1,116	857	58	Italy 356; France 176; West Germany 170.
Building materials of asphalt, asbestos and fiber cements, unfired non-metals	65,053	78,994	243	Belgium-Luxembourg 48,302; France 15,995.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	12,257	12,446	2,875	Trinidad and Tobago 5,306.
Carbon black	76,335	68,553	3,388	France 10,146; Norway 9,175.
Coal and briquets:				
Anthracite and bituminous thousand tons	4,353	7,334	3,613	Australia 2,820; Poland 446.
Briquets of anthracite and bituminous coal	91,988	169,986	--	West Germany 85,544; France 79,668.
Lignite including briquets	200	3	3	
Coke and semicoke	132,475	3,349	9	France 2,673; West Germany 122.
Hydrogen, helium, rare gases	1,337	1,569	NA	NA.
Peat including peat briquets and litter	160,076	151,105	--	Ireland 125,568; U.S.S.R. 12,214; Finland 7,580.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	r423,296	328,262	--	Saudi Arabia 134,554; Kuwait 40,838; Iraq 39,298.
Refinery products:				
Gasoline including natural do.	r45,677	50,890	122	Netherlands 13,650; Italy 7,478; Belgium-Luxembourg 6,732.
Kerosine and jet fuel do.	r4,857	3,639	--	Netherlands 1,336; France 660; Italy 581.
Distillate fuel oil do.	r8,660	12,519	--	U.S.S.R. 4,129; Netherlands 2,780; Belgium-Luxembourg 1,483.
Residual fuel oil do.	r40,296	19,653	--	Netherlands 9,017; Belgium-Luxembourg 1,675; West Germany 1,618.
Lubricants do.	r13,202	15,109	391	Belgium-Luxembourg 4,275; Netherlands 3,613; Denmark 1,838.
Other:				
Liquefied petroleum gas do.	r76,429	92,321	--	Norway 82,262; Algeria 6,734.
Mineral jelly and wax do.	302	260	14	Netherlands 195.
Bitumen and other residues and bituminous mixtures, n.e.s do.	r905	781	659	Netherlands 59.
Petroleum coke do.	2,053	2,010	1,590	Netherlands 191; Belgium-Luxembourg 154.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r514,771	549,983	328,343	Netherlands 94,571; France 62,834.

r Revised. NA Not available.
[1]Excludes unreported quantity valued at $2,259,500 in 1979 and $2,945,096 in 1980.
[2]Less than 1/2 unit.
[3]Excludes quantity valued at $28,764,563 in 1979 and $39,461,026 in 1980.

COMMODITY REVIEW

METALS

Aluminum.—Production of primary aluminum, at about 340,000 tons, decreased 9% in 1981.

Imports of primary aluminum decreased 25% to 120,000 tons, of which about 50% came from Norway. Consumption of primary aluminum decreased 15% to 350,000 tons, and exports declined 17% to 100,000 tons. Production of secondary aluminum decreased by some 10,000 tons to 150,000 tons, but imports increased 25% to 6,000 tons. Consumption of secondary aluminum increased 12% to 90,000 tons, and exports declined to 60,000 tons.

British Aluminium Co. Ltd. announced at yearend that its 100,000-ton-per-year Inver-

gordon smelting plant, near Inverness, had been shut down. The smelter operated at an average 90% of capacity in 1981 and posted a first-half pretax loss of $17.4 million, compared with a profit of $14.6 million in 1980. The loss was attributed primarily to low aluminum prices and the high cost of electricity. The company's other two smelters at Lochaber and Kinlochleven, both near Fort William, Scotland, had a combined annual capacity of 50,000 tons and were still in production. At the Lochaber smelter, the company completed a major expansion, increasing production capacity by one-third to 37,000 tons per year of aluminum.

Output of the Anglesey Aluminium Ltd. primary smelter at Holyhead, North Wales, was to be reduced by cutting the number of pots onstream to approximately 200 because of the depressed market for aluminum. Anglesey, in which Kaiser Aluminum and Chemical Corp. of the United States held a 67% interest, had a design capacity of 113,000 tons per year and in 1981 was operating at about 90% capacity. The cutback action was to reduce the operating rate by about 25%.

Alcan Aluminium (United Kingdom) Ltd. reported that the Lynemouth plant commissioned the second tie line to the national grid and that a new anode handling system and a new furnace were among the major projects underway.

A new trading branch, Alaftrade, was formed by Alcan to sell ingot and semifabricated products into African and Middle East markets established by Alcan Aluminium Africa and Middle East Ltd.

Iron and Steel.—British Steel Corp. (BSC), which traditionally produced about 90% of British steel, reported a loss of $512 million before interest in the 1981-82 financial year ending April 30, against its target loss of $457 million. BSC losses in 1980-81 were $972 million. The company was expected to overrun its 1981-82 $1,482 million external financing limit (EFL) by $77 million. The EFL was expected to be reduced from $1,559 million in 1981-82 to $741 million in 1982-83. Conditions in the British iron and steel industry were abnormal during 1980 so that the usual numerical comparisons between that year and 1981 were not meaningful. In 1981, there were further falls in both apparent and estimated real consumption of steel. The domestic demand was further reduced by a net stock drawdown by consumers and steel stockholders. Production of steel in 1981 was considerably improved from the very depressed level of 1980 but was well below the output achieved in 1979.

The improvement in production was most marked in the second half of 1981. About 16% of the total steel output was produced by private concerns, showing that they were hurt less by the depressed market than BSC. In 1981, there was a small surplus of exports over imports in steel, in terms of tonnage. Investment in the iron and steel industry decreased from $37 million in 1980 to $24 million in 1981. Employment declined from 134,000 to 96,000 employees in the same period.

The British steel industry depended largely on imported iron ore, of which 13.7 million tons was purchased in 1981. About 40% of the total came from Canada, 30% from South America, and 30% from Australia, Africa, and Europe. Indigenous production of iron ore in 1981 totaled 731,245 tons with a metal content of about 21.5%, a slight decrease compared with that of 1980. For the fifth year in succession, closures of ironmaking and steelmaking facilities occurred. The closings caused a capacity reduction of about 2.5 million tons of ingot steel per year at four sites. Of the steel capacity reduction, about one-half was electric arc, the greater part of which was in the private sector. In June 1981, the Leeds Road plant of Hadfields Ltd., at Sheffield, with a capacity of 300,000 tons of crude steel, was closed down with a loss of 1,200 jobs, but Hadfields nonetheless remained a significant producer of ingots, billets, and bars.

In July 1981, Round Oak Steel Works Ltd., Brierley Hill, West Midlands, reported closure of the Level steel mill, which produced rounds, squares, and flats, and the cogging mill and partial closure of No. 2 melting shop. The number of employees was reduced from about 2,200 to 1,300.

Major developments at BSC included commissioning of a six-strand billet caster at Templeborough, an order for an eight-strand billet caster for Scunthorpe, plans for an RH degassing unit at Lackenby, and a new spun-cast iron pipe plant at Stanton and Staveley Group. Round Oak commissioned a 130-ton Asea ladle refining system. F. H. Lloyd Ltd. installed a new high-reduction mill. Darlington & Simpson Rolling Mills Ltd. went ahead with its program of modernization and automation of its rolling mills.

Lead.—In 1981, the British Government

announced that the maximum level of lead in gasoline would be reduced from 0.40 to 0.15 gram per liter by 1985.

Australian Mining and Smelting Co. Ltd., AM & S Europe Ltd. temporarily halted lead-zinc production at the Avonmouth smelter, near Bristol, late in the year because of a fault in the main blower of the Imperial smelting furnace. Supplies to customers were not expected to be affected. Britannia Refined Metals Ltd., during 1981, refined 153,323 tons of lead at its refinery at Northfleet, east of London, compared with 124,674 tons in 1980.

Rio Tinto Zinc Corp. Ltd. received permission to drill for lead-zinc near Launceston, Cornwall, and the Institute of Geological Sciences was granted permission to carry out exploratory drilling for lead, zinc, and copper in the Snowdonia National Park in North Wales.

Nickel.—A new refining plant was under construction in North Wales to recover high-purity nickel and cobalt and their salts from superalloy grindings. The refinery was to be operated by Chapman Metallurgical Ltd. The plant, based in the Clwyd district, was to cost some $2.4 million and was to start production in 1982.

The project was financed jointly by the National Research Development Corp. (part of the British Technology Group) and Technical Development Capital (part of the Finance for Industry Group) and included a contribution from the European Coal and Steel Community. By early 1983, the plant was to be in full production on a three-shift basis. Nominal capacity, on the planned one shift per day, was to be 500 tons per year of grindings and turnings, generating around 250 to 300 tons per year of nickel and cobalt. With three shifts per day, capacity would increase to 1,500 tons per year, producing about 800 to 900 tons per year of nickel and cobalt.

Tin.—In 1981, the United Kingdom was the largest producer of tin in Western Europe. Its tin mining activity was confined to Cornwall in the southwest, with minor production in neighboring Devon. Preliminary figures showed that tin metal production of 7,020 tons increased 1,190 tons in 1981. Several new and revived mining operations were developed in Cornwall and Devon despite a sharp decline in tin prices from early 1980 to mid-1981. In the latter half of 1981, the tin price increased from about $12,200 to $17,300 per ton.

In 1981, underground lode mines at South Crofty and Pendarves, belonging to South Crofty Ltd., produced 1,981 tons of tin concentrates, a decrease of 54 tons compared with that of 1980. The company was the largest British tin producer. There were plans to increase output by extending its subincline shaft, deepening the Pendarves shaft, and modernizing underground equipment and the surface mill. An exploration program on the 12,950 hectares of mineral rights owned by its subsidiary, Tehidy Minerals Co., was underway. South Crofty Ltd. was to raise production of tin by 45% over the next 5 years under a $11.7 million plan including support from the Department of Industry, the European Investment Bank, and the Barclays Bank.

At the underground lode mines at Pendeen, Geevor Tin Mines Ltd. increased its tin concentrate production (65% tin content) from 1,142 tons in 1980 to 1,344 tons in 1981. The company intended to rehabilitate the old Allen's shaft for underground mining. The subincline extension to Victory shaft became fully operational during 1980. Work began on dewatering holes to intersect the old Levant workings. It was planned to increase ore treatment capacity to 50,000 tons per year.

Rio Tinto Zinc announced for its subsidiary, Carnon Consolidated Tin Mines Ltd., a $5.7 million development program over an 18-month period at the Wheal Jane. Plans were underway to deepen the Clemow shaft and relocate the underground pumping and crushing facilities. The mine's production was estimated at 382 tons of tin concentrate during January-October 1981.

Billiton Minerals United Kingdom Ltd., a part of the Billiton International Metals Group, ceased operations at its Mount Wellington and Bissoe plants in mid-1981; the sites were put on a care and maintenance basis, and exploratory activities were to continue.

The Wheal Concord Ltd. mines near Redruth went into production in 1981, and the output of ore was expected to reach 31,200 tons per year.

The plan by Southwest Consolidated Resources Inc. to reopen the old Redmoor Mine was approved by the Government in mid-1981. The mine was expected to be in production within 3 years. The company also acquired a 30% interest from Black Rock Mineral Ventures Ltd. in an eluvial-alluvial tin prospect in Cornwall.

The significant increase in tin exploration activities and mining operations in

1981 was in contrast to the decline in the country's smelting operations. The smelter of Williams, Harvey and Co. at Bootle, Liverpool, once Europe's major tin smelting company, was finally closed at the end of June 1981, owing to a lack of concentrates and uneconomic processing of slags. The only remaining tin smelter was that of Capper Pass in North Ferriby, Yorkshire.

Titanium.—Teeside Titanium Ltd., controlled by Billiton U.K. (62.5%), Rolls Royce Ltd. (20%), and IMI Ltd. (17.5%), was planning to open a new titanium granules plant at Teeside with a designed capacity of 5,000 tons per year. The plant was scheduled to come onstream in 1983.

Tungsten.—A major project was the proposed development of a full-scale open pit mine and mill complex at the Hemerdon tungsten-tin prospect near Hemerdon, Devon, by Amax Exploration of U.K. Inc. and Hemerdon Mining and Smelting U.K. Ltd. A pilot treatment plant was constructed and operated in 1980, and evaluation continued in 1981. Planning permission to develop a mine and mill complex was awaited.

NONMETALS

Barite.—Production at the SPO Minerals Co., Ltd., Golconda barite-fluorspar-lead retreatment plant at Brassington, in Derbyshire, was affected by technical problems along with dump material that proved to be of a lower grade than forecast. The company has applied for planning permission to process barite from an old mine in Caldbeck Fells, Cumbria.

Fordamin Co. Ltd., a subsidiary of English China Clays Ltd., purchased three properties from Athole G. Allen Ltd.: The 8,000- to 10,000-ton-per-year Closehouse barite mine at Middleton-in-Teesdale, mineral leases of more than 32.4 square kilometers near Middleton-in-Teesdale, and a grinding mill at Stockton-on-Tees.

Fluorspar.—Owing to reduced demand for fluorspar, Swiss Aluminum (U.K.) Ltd. temporarily ceased development of the Burtree Pasture and Frasers Hush Mines and closed the Stanhope Burn, Cambokeels, and Broadwood operations. The Broadwood plant was operating 15% below its rated capacity of 80,000 tons per year owing to a variety of technical problems.

Laporte Industries Ltd. reported a reduced demand in 1980 for its fluorspar output at Stoney Middleton, Derbyshire. Colin Steward Ltd. commissioned its new 45,000- to 50,000-ton-per-year attrition mill and drying plant and was to process up to 20,000 to 25,000 tons per year of acid-grade fluorspar on behalf of Kaiser Aluminium (U.K.) Ltd.

Gypsum.—British Gypsum Ltd. received permission to mine its gypsum deposit at Barrow-on-Soar in Leicestershire; some 30 million tons of reserves were proven. Production was to commence by 1983, rising to full capacity around 1985. Further exploration was taking place over an area of 125.5 square kilometers throughout Great Britain.

Potash.—Cleveland Potash Ltd. announced that the Boulby Mine in Yorkshire, owned by Anglo American Corp., Ltd., of South Africa, and Charter Consolidated, Ltd., produced 509,000 tons of potash in 1980 and was scheduled to produce 395,000 tons in 1981 versus an original goal of 1 million tons. The mine was to be shut down for 3 weeks in January 1982 owing to the depressed market and imports of potassium from the German Democratic Republic. The employees at Boulby, who total 880, would be paid 80% of their basic wage during the shutdown.

MINERAL FUELS

Coal.—British production of hard coal (bituminous, semibituminous, and anthracite) at 126.4 million tons decreased 1.8 million tons in 1981. Most of the coal output came from the National Coal Board's (NCB) deep mines with about 12% produced in opencast mines. In March 1981, there were 211 NCB deep mines and 65 opencast mines in operation. During the year, the NCB closed 10 pits with a loss of 12,000 jobs. Output per workshift rose from 2.32 tons in January to 2.47 tons in November. Consumption of coal dropped from 123.5 million tons in 1980 to 118 million tons in 1981, owing to the economic recession, a reduction in steelmaking capacity, and energy conservation measures. The United Kingdom became a small net exporter of coal in 1981, reversing an 8-year trend, but export prices did not cover actual costs of production and transport. In 1981, exports reached an estimated 8.7 million tons of coal, and imports, 4.2 million tons, a 4.5-million-ton total trade surplus compared with a deficit of 3.5 million tons in 1980. Members of the European commission countries took nearly all of the United Kingdom's coal exports. Australia continued to be the principal foreign coal supplier, with shipment of 2.1 million tons in 1981, and imports of U.S. coal totaled 1.5 million tons.

In 1980-81, the income of the NCB and

two small nonmining subsidiaries amounted to $9.4 billion, which included $7.3 billion in coal sales, $251 million in coke sales, and $213 million in operating and social grants provided by the Government. Despite a trading profit and Government subsidies, the NCB still ran a deficit of $117.7 million in 1980-81. Total Government grants for operating deficits and the social costs of pit closures, primarily payments to laid-off workers, increased from $473 million in 1980-81 to $1.1 billion in 1981-82. In January 1982, the new coal industry bill set a new grant limit of $2 billion for the period 1979-84, which could be raised to $3.6 billion by Parliamentary order.

At the end of November 1981, the United Kingdom's coal stocks totaled 43.1 million tons of which 22.3 million tons was distributed to power stations, coke ovens, and other enterprises.

Coal in place in the United Kingdom was estimated at 160 to 220 billion tons, of which 45 billion tons was probably economically recoverable.

Natural Gas.—The Government withdrew its support for the $5.5 billion gas-gathering pipeline project, intended to collect and distribute gas in the United Kingdom from more than a dozen fields in the northern and central North Sea. The decision left the oil companies to arrange for gas distribution onshore. Only one independent pipeline was announced in 1981, the BP Magnus pipeline, collecting gas from the Murchison and Thistle Fields and feeding the pipeline from Brent to St. Fergus in Scotland.

In the Irish Sea, the British Gas Corp. (BGC) planned to develop its Morecambe Bay Gasfield in an attempt to get the gas onstream in the latter part of the 1983-84 winter.

Petroleum.—With a total output of 650 million barrels of crude petroleum in 1981, the United Kingdom became the fifth largest oil producer in the Western World and seventh overall, being the most important producer of high-quality light crude oil. In 1981, the United Kingdom was self-sufficient in petroleum production. Production of crude oil exceeded consumption by about 100 million barrels. Crude oil production by fields was as follows:

Field	Operator	Approximate production rate (barrels per day)
Argyll	Hamilton Bros	Temporarily shut down.
Auk	Shell-ESSO	9,100
Beatrice	British National Oil Corp. (startup in 1981).	27,800
Beryl	Mobil	97,700
Brent	Shell-ESSO	198,900
Buchan	British Petroleum (startup in 1981).	40,400
Claymore	Occidental	96,800
Cormorant, South	Shell-ESSO	20,000
Dunlin	do	89,900
Forties	British Petroleum	398,900
Heather	Unocal	33,900
Montrose	Amoco	19,400
Murchison	Conoco (80% in United Kingdom sector).	92,700
Ninian	Chevron	307,300
Piper	Occidental	199,900
Tartan	Texaco (startup in 1981).	16,200
Thistle	British National Oil Corp.	130,700

The British National Oil Co. (BNOC) marketed about two-thirds of the United Kingdom's North Sea oil output.

The Tartan Field (Texaco) came onstream in January, 180 kilometers northeast of Aberdeen, at a cost of $500 million; The Buchan Field (British Petroleum) followed in May and was found to contain more than the 7 million tons of recoverable reserves originally estimated, and the Beatrice BNOC came onstream in November. Two more fields were expected to start operations in 1982, Fulmar, 275 kilometers east of Dundee, at a cost of $1.2 billion, and North Cormorant, located in the East Shetland Basin, at a cost of $1 billion; both were operated by Shell-ESSO. Initial recoverable reserves in the Fulmar Field were estimated at 500 million barrels, with an additional 420 million barrels in the North Cormorant Field. Estimated production of the Fulmar Field was 180,000 barrels per day, and for North Cormorant, 150,000 barrels per day. The British oil industry also expected production in two smaller fields, North West Hutton and North Claymore, to begin in 1982. North West Hutton had probable reserves of 285 million barrels, and North Claymore had 30 million barrels.

Oil exploration activity in the British

North Sea, as measured by footage drilled and the number of mobile rigs in operation, was up sharply in 1981 compared with that of 1979-80. In 1981, 54 exploration wells were sunk on the United Kingdom's Continental Shelf in the North Sea, compared with 35 in 1980, and the number of drilling units increased by 6 to 26. Drilling footage from mobile rigs increased by 12% in 1981 over that of 1980.

British Petroleum, which spent $710 million on exploration in 1981 and planned to spend about $1.5 billion in 1982, reported that a typical well cost was $10 to $15 million. To develop an average oilfield, the cost was about $1 to $1.5 billion. It took 5 to 9 years to bring a proven field into production and another 6 years before the oil companies could make a profit on their investment.

The British Secretary of Energy introduced the Government's oil and gas denationalization legislation in Parliament on December 17. The bill would authorize the sale of a majority share of the exploration and production activities of BNOC, require BGC to dispose of its offshore oil holdings, and end the BGC privileged monopoly position as a buyer and seller of North Sea gas.

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[1]Foreign mineral specialist, Division of Foreign Data.

[2]Where necessary, values have been converted from pounds sterling (£) to U.S. dollars at the rate of £1.00 = US$2.03, the average rate during 1981.

[3]United Kingdom Mineral Statistics (London). 1982, p. 6.

The Mineral Industry of Venezuela

By H. Robert Ensminger[1]

The Venezuelan economy remained substantially the same in 1981 as in 1980. The gross domestic product grew by an officially estimated 0.6% over the revised 1980 figure and amounted to $68.0 billion[2] at current prices.

Sharply rising oil prices in 1979 appeared to assure Venzuela's long-term requirements for increasing revenues. The perception that oil prices would continue to rise provided the basis for planned expenditures of approximately $20 billion to adapt the oil industry to changing domestic and world markets. A key element in the program was the development of the country's heavy oil resources, especially the Orinoco heavy oil belt. When petroleum prices reversed their upward trend. Venezuela was forced to reduce sectoral budget allocations. These budget cutbacks were also imposed on the petroleum sector, particularly the controversial Orinoco development plan.

Since heavy crude oil contains large amounts of contaminants, notably sulfur and metals, and yields large volumes of residual fuel oil that require expensive refinery upgrading, the demand for Venezuelan heavy crude was somewhat weak. This lessening of demand may have a negative impact on the national plan.

In 1981, exported petroleum and petroleum products comprised 94.4% of the total export earnings. The other mineral production provided export earnings of $847 million. The value of exported petroleum and petroleum products for 1981 increased over that of 1980; however, the volume of these same exports decreased relative to that in 1980.

Iron ore and concentrate production in 1981 fell below the level produced in 1980. An announcement was expected in early 1982 that C.V.G. Ferrominera Orinoco C.A. would close the Minorca High Iron Briquette (HIB) plant because it had been operating at 31% of capacity during 1981 and caused losses of $12 million with no prospects for improvement.

C.V.G. Siderúrgica del Orinoco, C.A. (SIDOR), produced a record 1.8 million tons of steel valued at approximately $893 million in 1981.

Venezuela's aluminum production suffered a temporary setback in 1981. The breakdown of 250 out of 720 pots at the Industria Venezolana de Aluminio (VENALUM) smelter reduced production 25%.

Interamericana de Alumina, C.A. (INTERALUMINA), planned to obtain long-term financing in 1982 to back construction of its alumina plant. Continuing questions about the viability of plans to mine bauxite have delayed the decision on the proposed Los Pijiguaos project.

The oil industry was a casualty of the budget cuts, with its original 5-year investment target of over $20 billion trimmed by 16%. What concerned segments of the oil industry was that planned investments of $5.6 billion for the development of the Orinoco heavy oil belt were halved while the other oil sectors remained virtually unchanged.

There was the likelihood that Petroleos de Venezuela, S.A. (PDVSA), which has been self-financed during the first 5 years following nationalization in 1976, would have to consider either to cut back its Orinoco heavy oil development plans or seek foreign funds through loans or direct foreign investment.

Metallgesellschaft of the Federal Republic of Germany has refused to renegotiate its alumina price agreed to in the contract with

VENALUM and has taken the issue to court.

Government Policies and Programs.—Venezuela's decision in 1981 to cut back official spending 20% over the next 5 years has left a wake of confusion and uncertainty over expansion of the State oil industry. Reduced Government spending in the heavy oil sector under the national plan reflected recognition that world oil markets are unlikely to provide substantial price increases in the immediate future. Oil income, originally forecast to reach a total of approximately $110 billion between 1981 and 1985, was subsequently projected at $98 billion.

A potential problem for the economy was the "Buy Venezuelan" decree that was instituted in 1981. It penalizes foreign imports, including those from the United States, and reduces the need for more efficient production domestically. The extent to which it will be enforced was not apparent by yearend.

The Venezuelan railroad system was being upgraded and expanded at an estimated cost of about $300 million. This included the opening of the Puerto Ordaz-Barcelona-Guanta trunkline in eastern Venezuela, a vehicular-railroad bridge spanning the Orinoco at Ciudad Guayana, and a projected bridge to Isla de Margarita on the northeast coast.

PRODUCTION

In 1981, petroleum continued as the mainstay of Venezuela's mineral production. Output for 1981 was 2.1 million barrels per day, which was 65,000 barrels less than the 1980 daily average.

The production of aluminum in 1981 fell by 4.4% compared with that of 1980. The shortfall resulted from the failure of 250 pots at the VENALUM smelter in May 1981. Aluminio del Caroni, S.A. (ALCASA) produced 111,300 tons during the year, and VENALUM produced 202,000 tons. VENALUM's production for 1982 was targeted at 228,000 tons.

All SIDOR plants increased their steel production during 1981. The production of crude steel reached a level of 1.8 million tons, an increase of almost 2% over that of 1980 and a 42% increase over that of 1979.

Gold production increased 32% over that of 1980.

Diamond production fell in both categories in 1981. Production of gem-quality diamonds fell by approximately 54% while industrial diamond production decreased by about 11%.

Table 1.—Venezuela: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
METALS					
Aluminum, unalloyed ingot	43,400	74,384	227,444	327,900	[2]313,523
Gold, mine output, metal content—troy ounces	17,403	13,384	14,989	13,841	[2]18,326
Iron and steel:					
Iron ore and concentrate—thousand tons	13,683	13,515	15,260	16,103	[2]15,553
Metal:					
Pig iron—do	497	693	1,331	2,367	2,230
Ferroalloys:					
Ferromanganese—do	--	--	1	[e]2	[e]2
Silicomanganese—do	--	--	1	[e]2	[e]2
Ferrosilicon—do	11	[e]28	35	47	[e]22
Total—do	[e]11	[e]28	[r]37	51	[e]26
Steel ingots and castings—do	855	860	[r]1,474	1,784	[2]1,817
Semimanufactures, hot-rolled—do	1,162	1,081	1,224	1,398	[e]1,400
Lead, secondary, smelter[e]	[r]6,000	[r]8,000	10,000	10,000	10,000
NONMETALS					
Cement, hydraulic—thousand tons	3,136	3,426	3,979	4,843	[e]4,900
Clays:[3]					
Kaolin	10,000	23,057	21,528	[e]22,000	65,642
Other—thousand tons	2,450	3,342	2,088	[e]2,000	2,629
Diamond:					
Gem—carats	[r]203,598	[r]269,398	236,606	210,520	[e]97,000
Industrial—do	[r]483,521	[r]486,471	566,040	455,336	[e]403,000
Total—do	[r]687,119	[r]755,869	802,646	665,856	[e]500,000

See footnotes at end of table.

Table 1.—Venezuela: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980	1981[p]
NONMETALS —Continued					
Feldspar	26,020	70,262	88,902	6,065	21,684
Gypsum	[r]166,514	[r]187,142	[r]260,141	117,476	218,234
Lime, hydrated	--	--	--	--	1,888
Nitrogen: N content of ammonia thousand tons	271	271	259	361	415
Salt, all types	241,000	158,000	[e]155,000	243,145	[e]250,000
Stone, sand and gravel:[3]					
Stone:					
Broken stone and dust, not further described thousand tons	NA	1,694	1,459	[e]1,500	7,962
Dolomite	NA	84,662	NA	NA	254,540
Granite	235	--	367	208	1,256
Limestone thousand tons	18,995	32,736	19,872	19,074	31,690
Marble cubic meters	NA	139	191	[e]200	292
Sand and gravel thousand tons	23,238	21,667	19,231	12,248	[2]9,946
Sand do	--	--	--	--	9,442
Sand, glass do	--	--	--	--	442
Sulfur, byproduct of petroleum and natural gas	95,000	95,000	85,201	[e]85,000	[e]85,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e] thousand tons	78	31	[e]16	23	19
Coal, bituminous	[r]120,833	[r]80,643	[r]55,377	39,421	[2]45,735
Gas, natural:					
Gross million cubic feet	1,324,702	1,230,428	1,304,624	1,251,864	1,224,586
Marketable do	523,667	520,171	575,556	589,046	584,349
Natural gas liquids:[4]					
Condensate thousand 42-gallon barrels	80	98	75	101	52
Natural gasoline do	7,158	5,320	6,120	5,472	5,177
Liquefied petroleum gas do	20,593	16,995	18,995	16,448	14,889
Total do	27,831	22,413	25,190	22,021	20,118
Petroleum:					
Crude[5] do	816,820	790,420	860,072	793,397	767,552
Refinery products:					
Gasoline:					
Aviation do	710	200	271	276	284
Motor do	47,260	51,810	54,102	57,557	59,578
Jet fuel do	10,706	11,187	10,970	11,699	11,369
Kerosine do	6,560	3,965	3,699	4,352	5,266
Distillate fuel oil do	50,054	51,555	56,484	63,688	61,890
Residual fuel oil do	200,645	206,335	202,306	168,906	147,117
Lubricants do	2,389	2,873	3,163	3,277	2,741
Liquefied petroleum gas do	3,204	2,424	2,241	2,537	1,765
Asphalt and bitumen do	4,285	5,544	7,798	7,634	10,082
Naphtha do	20,141	17,320	16,906	12,752	8,534
Refinery gas[6] do	6,766	6,534	6,692	6,497	8,518
Unspecified do	3,028	2,146	3,938	2,292	1,870
Total do	355,748	361,893	368,570	341,467	319,014

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through July 12, 1982.

[2]Reported figure.

[3]Data prior to 1981 was based on figures taken from the Memoria y Cuenta published annually by the Ministerio de Energia y Minas. Some of this information is not compatible with 1981 figures, but will be adjusted when more reliable data become available.

[4]From nonassociated natural gas only.

[5]Includes associated natural gas lease condensate and natural gasoline. Lease condensate is included as follows, in thousand 42-gallon barrels: 1976—1,088; 1977—1,174; 1978—1,048; 1979—1,803; 1980—1,227; and 1981—1,661. Natural gasoline is included as follows, in thousand 42-gallon barrels: 1976—283; 1977—none reported; 1978—329; 1979—255; 1980—308; and 1981—307.

[6]Liquid equivalent.

TRADE

The value of exported crude oil and refined products in 1981 was $19 billion, an increase of 5.6% over that of 1980; however, the corresponding volume decreased by 5.8%. The reduced 1981 export volume was the result of a developing worldwide oil glut, depressed economies in the industrial nations, and worldwide emphasis on conservation of energy.

In 1981, Venezuela exported approximately 147 million barrels of petroleum and refined products to the United States. This comprised about 23% of total petroleum exports and was 14% lower than that for the previous year.

The share of petroleum exports in 1981 by PDVSA subsidiary companies was as follows: Lagoven, S.A., 46%; Maraven, S.A., 31%; Corpoven, S.A., 19%; and Meneven, S.A., 4%.

In 1981, iron ore exports increased by almost 5% over those of 1980 while the U.S. share of iron ore exports increased to 44% in 1981 from 31% in 1980.

The value of steel exports increased by 36% to $94 million in 1981.

Petrochemical exports of 490,000 tons represented about 50% of the total production in 1981.

VENALUM contributed 71% of the aluminum exports while ALCASA contributed the remainder. VENALUM exported 84% of its production of aluminum while ALCASA exported 63%.

Table 2.—Venezuela: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	155	1,144	602	Spain 542.
Unwrought	102,707	209,068	--	Japan 148,714; Netherlands 28,339; Brazil 17,710; Mexico 7,578.
Semimanufactures	23,088	37,236	3,966	India 20,438; Japan 6,102; France 2,030.
Copper metal including alloys:				
Scrap	1,263	513	513	
Semimanufactures	--	76	76	
Iron and steel:				
Ore and concentrate thousand tons	NA	11,752	3,962	Italy 1,628; West Germany 1,595; Belgium-Luxembourg 1,092; Spain 790.
Metal:				
Scrap	--	324	(1)	Colombia 323.
Sponge iron, powder shot, grit	65,377	188,462	65,477	West Germany 49,920; Italy 34,849; Belgium-Luxembourg 17,474.
Ferroalloys	21,405	21,879	9,354	Japan 12,525.
Steel, primary forms	6,779	997	--	All to Italy.
Semimanufactures:				
Bars, rods, angles, shapes, sections	15,518	44,295	4,118	Belgium-Luxembourg 12,975; Ecuador 2,498; Nigeria 2,000.
Universals, plates, sheets	90,403	154,502	762	Italy 84,806; Japan 29,648; India 19,166.
Hoop and strip	196	39	--	All to Colombia.
Tubes, pipes, fittings	231	531	--	Colombia 527.
Castings and forgings, rough value, thousands	$2	--		
Lead:				
Oxides and hydroxides	--	9	--	All to Netherlands Antilles.
Metal including alloys:				
Scrap	2,300	10	--	Do.
Semimanufactures	6	4	--	Do.
Nickel metal including alloys, semimanufactures value, thousands	--	$1	--	All to Spain.
Silver: Waste and sweepings do	--	$44	$44	
Tin metal including alloys, semimanufactures do	$5	--		
Zinc:				
Oxides and hydroxides	236	245	--	Ecuador 129; Costa Rica 53; Jamaica 31.
Metal including alloys:				
Scrap	44	--		
Semimanufactures	5	--		

See footnotes at end of table.

Table 2.—Venezuela: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Other:				
Metalloids	--	18	--	Colombia 16; Netherlands Antilles 2.
Metals including alloys:				
Scrap	4,646	4,359	359	Brazil 4,000.
Unwrought and semimanufactures	--	111	--	Mainly to Italy.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	1	3	--	All to Netherlands Antilles.
Grinding and polishing wheels and stones	27	23	--	Trinidad and Tobago 12; Netherlands Antilles 6; Mexico 5.
Boron materials: Crude natural borates	--	2	--	All to Trinidad and Tobago.
Cement	564	425	--	All to Netherlands Antilles.
Clays and clay products:				
Crude	5	1	(1)	Mainly to Peru.
Products:				
Nonrefractory	109	73	--	All to Netherlands Antilles.
Refractory including nonclay brick	96	51	1	Netherlands Antilles 50.
Diamond:				
Gem, not set or strung value, thousands	$31,639	$5,100	$830	Belgium-Luxembourg $4,270.
Industrial do.	$7,637	$17,649	$11,042	Belgium-Luxembourg $6,607.
Fertilizer materials: Manufactured, nitrogenous	151,759	145,247	10,247	Colombia 48,893; Mexico 10,695; Argentina 10,025.
Gypsum and plasters	6,175	7,650	--	All to Trinidad and Tobago.
Precious and semiprecious stone, other than diamond:				
Natural value, thousands	$190	$868	$99	Belgium-Luxembourg $769.
Synthetic do.	$6	--		
Sodium and potassium compounds, n.e.s.: Caustic soda	6	5	--	All to Netherlands Antilles.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	864	133	--	Do.
Worked	7	147	--	Do.
Gravel and crushed rock	429	634	--	Netherlands Antilles 544; Spain 90.
Sand other than metal-bearing	118	605	--	All to Colombia.
Sulfur:				
Elemental, unpurified	39,833	8,645	--	Do.
Sulfuric acid, oleum	10,550	NA		
Other: Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	1,422	2,488	--	Netherlands Antilles 2,360; Colombia 72.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black and gas carbon	3,258	7,035	--	Ecuador 1,872; Guatemala 1,525; Trinidad and Tobago 1,312.
Hydrogen, helium, rare gases	--	8	--	Mainly to Netherlands Antilles.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	514,030	469,828	55,224	Netherlands Antilles 154,614; Canada 59,495; Spain 24,856; Italy 24,272; Brazil 22,338.
Refinery products do.	250,098	200,714	NA	NA.

NA Not available.
[1]Less than 1/2 unit.

Table 3.—Venezuela: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS:				
Aluminum:				
Ore and concentrate	66,747	34,290	9,918	Guyana 23,409; Suriname 963.
Oxides and hydroxides	383,849	503,846	178,493	Guyana 155,669; Jamaica 68,327; Suriname 53,244.
Metal including alloys:				
Scrap	1	--		
Unwrought	8,023	97	86	Italy 10.
Semimanufactures	17,631	26,159	20,672	Japan 1,807; West Germany 1,275; Canada 968.
Arsenic: Oxide, trioxide, acid	44	17	--	All from West Germany.
Chromium:				
Chromite	5,255	4,951	--	All from Philippines.
Oxides and hydroxides	299	319	184	West Germany 78; Italy 34; Netherlands 23.
Cobalt: Oxides and hydroxides	13	10	3	Belgium-Luxembourg 5; Canada 1.
Copper:				
Ore and concentrate	10	72	--	Colombia 70; Brazil 2.
Matte and spiess	8	--		
Metal including alloys:				
Scrap value, thousands	--	$2	$2	
Unwrought	5,665	4,046	1,681	Peru 2,256; Chile 100.
Semimanufactures	22,078	17,069	5,684	Chile 3,437; Canada 2,178; West Germany 1,323.
Iron and steel:				
Ore and concentrate	5,891	1	(1)	Mainly from West Germany.
Metal:				
Scrap	45,307	32,473	30,715	Netherlands Antilles 927; Japan 781.
Pig iron, cast iron, spiegeleisen	4,971	2,782	1,349	Brazil 900; Colombia 421; West Germany 55.
Sponge iron, powder, shot	4,364	3,945	3,375	West Germany 190; Italy 144.
Ferroalloys:				
Ferromanganese	17,133	35,333	1,122	Brazil 18,600; Republic of South Africa 13,372.
Others	14,996	8,787	3,864	Republic of South Africa 3,591; Netherlands 782.
Steel, primary forms	332,298	567,447	11,786	Japan 239,122; Netherlands 137,903; West Germany 71,816.
Semimanufactures:				
Bars, rods, angles, shapes, sections	341,155	243,327	21,275	West Germany 74,331; Spain 49,783; Japan 39,325.
Universals, plates, sheets	451,948	336,858	21,658	Japan 153,773; Republic of Korea 42,035; France 35,886.
Hoop and strip	4,281	7,396	2,042	Japan 3,239; West Germany 1,219; Sweden 234.
Rails and accessories	5,594	5,223	1,887	France 2,880; Belgium-Luxembourg 196; Italy 136.
Wire	3,777	5,314	1,487	Brazil 1,023; United Kingdom 874; Peru 502.
Tubes, pipes, fittings	209,367	128,018	33,973	Japan 74,367; Italy 5,210; Brazil 3,569.
Castings and forgings, rough	3,746	1,539	919	Belgium-Luxembourg 151; United Kingdom 134; Colombia 106.
Lead:				
Oxides and hydroxides	1,439	1,950	469	Mexico 847; Peru 604.
Metal including alloys:				
Scrap	3,378	3,225	2,870	Netherlands Antilles 197; Guatemala 111.
Unwrought	843	5,006	530	Peru 4,138; Denmark 210.
Semimanufactures	1,283	1,928	183	Peru 1,542; Belgium-Luxembourg 55; Spain 46.
Magnesium metal including alloys:				
Scrap	--	159	159	
Unwrought	454	717	226	Norway 396; West Germany 69.
Semimanufactures	36	92	5	Norway 85; Canada 1; West Germany 1.
Manganese:				
Ore and concentrate	52	5,552	2	Brazil 5,550.
Oxides and hydroxides	2,112	1,797	704	Mexico 1,015; West Germany 55.
Mercury 76-pound flasks	667	232	116	Belgium-Luxembourg 58; West Germany 29.
Molybdenum metal including alloys, unwrought and semimanufactures	5	3	(1)	Spain 1; United Kingdom 1.
Nickel:				
Ore and concentrate	145	14	--	All from Australia.
Matte and spiess	--	6	--	West Germany 5; France 1.
Metal including alloys:				
Scrap	--	1	--	All from West Germany.
Unwrought	181	185	140	Finland 23; Norway 10.
Semimanufactures	739	368	284	West Germany 49; Canada 10; Sweden 10.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$124	$80	$69	Italy $11.

See footnotes at end of table.

Table 3.—Venezuela: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS: —Continued				
Silver:				
Waste and sweepings[2] value, thousands	$3	$56	$14	United Kingdom $41; Spain $1.
Metal including alloys, unwrought and partly wrought do	$3,689	$3,695	$897	Panama $1,752; Spain $810; France $90.
Tantalum metal including alloys, all forms do	$1	$1	$1	
Tin:				
Oxides and hydroxides	2	7	2	West Germany 3; Italy 1.
Metal including alloys:				
Unwrought	512	187	115	Peru 40; Brazil 27.
Semimanufactures	232	148	10	Brazil 111; Bolivia 16.
Titanium: Oxides and hydroxides	2,046	2,665	234	Finland 1,022; United Kingdom 476; Italy 440.
Tungsten metal including alloys, unwrought and semimanufactures	139	24	19	Japan 4.
Uranium and thorium metals including alloys, all forms value, thousands	--	$29	$29	
Zinc:				
Ore and concentrate	(1)	1	--	All from United Kingdom.
Oxides and hydroxides	127	131	42	Canada 38; West Germany 21; Netherlands 20.
Metal including alloys:				
Scrap	2	2	--	All from Belgium-Luxembourg.
Unwrought	17,093	25,515	4,030	Canada 15,408; Peru 4,997; Mexico 676.
Blue powder	214	940	737	Mexico 99; West Germany 50; United Kingdom 26.
Semimanufactures	346	146	146	
Other:				
Ores and concentrates	294	972	149	Australia 407; United Kingdom 123; Canada 107.
Metals:				
Alkali, alkaline-earth, rare-earth metals	106	236	92	United Kingdom 143.
Metalloids	114	234	201	Canada 27.
Pyrophoric alloys	3	2	2	
Base metals including alloys:				
Scrap	--	28	18	Netherlands 10.
Unwrought and semimanufactures	413	354	226	Belgium-Luxembourg 57; Japan 48.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	3,288	277	97	Italy 76; France 50; West Germany 42.
Artificial: Corundum	1,167	1,817	64	Brazil 774; West Germany 507; Austria 279.
Dust and powder of precious and semiprecious stones value, thousands	$10	$12	$5	Belgium-Luxembourg $3; Spain $3; Colombia $1.
Grinding and polishing wheels and stones	125	281	63	Italy 62; Japan 48; Austria 43.
Asbestos, crude	14,523	9,111	402	Canada 7,719; West Germany 653.
Barite and witherite	126,410	141,349	17,975	Peru 76,047; Chile 28,733; Ireland 9,022.
Boron materials:				
Crude natural borates	504	474	287	Netherlands 76; Colombia 50; Italy 19.
Oxide and acid	381	316	307	Argentina 5; West Germany 3.
Cement thousand tons	2,312	800	68	Colombia 226; Spain 226; France 122.
Chalk	257	735	--	West Germany 495; Colombia 240.
Clays and clay products:				
Crude	50,605	67,504	63,197	United Kingdom 3,082; Colombia 271; France 266.
Products:				
Nonrefractory	28,605	42,127	245	Colombia 20,681; Italy 7,700; Spain 5,457.
Refractory including nonclay brick	42,967	88,484	12,337	West Germany 51,287; Austria 4,718; Belgium-Luxembourg 4,282.
Cryolite and chiolite	1,039	15	--	All from Denmark.
Diamond:				
Gem, not set or strung value, thousands	$142	$91	--	Belgium-Luxembourg $70; Israel $12; United Kingdom $9.
Industrial do	$101	$126	$53	Belgium-Luxembourg $37; United Kingdom $17; India $16.
Diatomite and other infusorial earth	7,489	7,007	5,826	Mexico 1,144; Sweden 37.

See footnotes at end of table.

Table 3.—Venezuela: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Feldspar and fluorspar	926	3,141	2,658	Finland 373; Mexico 92.
Fertilizer materials:				
Crude:				
Phosphatic	95,020	95,040	5,858	Republic of South Africa 89,000; Colombia 182.
Other including mixed	34	--		
Manufactured:				
Nitrogenous	285,975	191,497	36,762	Dominican Republic 60,000; Italy 45,541; Spain 15,476.
Phosphatic	23,193	47,421	37,275	France 9,000; Colombia 945.
Potassic	2	48,430	28,569	Belgium-Luxembourg 14,360; Italy 5,500.
Other including mixed	41,137	302,044	124,056	Finland 55,188; Italy 35,155; Spain 27,687.
Graphite, natural	931	776	749	Mexico 10; United Kingdom 10.
Gypsum and plasters	34,192	28,094	1,183	Dominican Republic 19,633; Jamaica 5,017; Colombia 908.
Lime	27,093	9,016	316	West Germany 3,453; United Kingdom 3,452; Colombia 1,792.
Magnesite	10,721	5,163	100	Japan 4,850; Austria 205.
Mica:				
Crude including splittings and waste	785	1,338	982	Brazil 125; Canada 117.
Worked including agglomerated splittings	11	13	10	Spain 2.
Pigments, mineral:				
Crude, natural	221	593	83	Spain 415; United Kingdom 82.
Iron oxides, processed	1,431	3,162	1,011	Spain 1,182; West Germany 588; United Kingdom 215.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$387	$292	$13	Belgium-Luxembourg $111; Thailand $58; Switzerland $32.
Synthetic do	$188	$130	$91	Canada $19; West Germany $7; France $6.
Pyrite, unroasted	29	122	122	
Salt and brine	18,389	17,256	38	Netherlands Antilles 9,000; Philippines 3,500; Argentina 2,500; Colombia 2,102.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	400	445	193	France 102; Italy 84.
Caustic soda	86,956	55,674	42,812	Peru 9,147; France 3,448; Belgium-Luxembourg 157.
Soda ash	85,674	119,480	119,096	United Kingdom 357; Belgium-Luxembourg 22.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	247,132	7,698	153	Italy 4,567; Portugal 786; Spain 536.
Worked	204	282	3	Italy 88; Colombia 39.
Dolomite, chiefly refractory-grade	141,478	101,843	101,625	West Germany 218.
Gravel and crushed rock	5,047	363	41	France 194; Belgium-Luxembourg 112; Italy 12.
Limestone other than dimension	24,995	--		
Quartz and quartzite	192	53	14	Sweden 31; Italy 6.
Sand other than metal-bearing	1,158	1,052	763	Italy 160; Mexico 75; Colombia 51.
Sulfur:				
Elemental, not purified	116	139	125	West Germany 11; France 2.
Dioxide	3,231	266	264	Netherlands 1.
Sulfuric acid, oleum	6,002	36,323	29,192	West Germany 6,671; Belgium-Luxembourg 220.
Talc, steatite, soapstone, pyrophyllite	7,729	8,379	6,099	Finland 687; China 461; France 305.
Other:				
Crude:				
Meerschaum, amber, jet	--	3	(1)	Mainly from Japan.
Unspecified	84	67	27	Netherlands 34; Spain 5; Italy 1.
Slag and ash, not metal-bearing	14	17	11	Brazil 6.
Halogens excluding chlorine	41	53	51	West Germany 2.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	16,247	34,579	8,764	Brazil 13,795; Netherlands 6,634; United Kingdom 2,533.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	3,550	3,040	2,742	Colombia 202; Brazil 48; Spain 28.

See footnotes at end of table.

Table 3.—Venezuela: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	268	174	174	
Carbon black and gas carbon	602	495	237	Canada 118; West Germany 80; France 39.
Coal and briquets:				
Anthracite and bituminous coal	28,364	34,278	9,054	Colombia 25,121; Belgium-Luxembourg 102.
Briquets of anthracite and bituminous coal	6,469	9,811	3,036	Colombia 6,775.
Lignite including briquets	832	2,348	2,275	Italy 73.
Coke and semicoke	163,105	222,392	114,137	Colombia 21,129; United Kingdom 18,338; Japan 17,855.
Hydrogen, helium, rare gases	94	189	178	West Germany 9.
Peat including briquets and litter	36	61	(1)	Sweden 43; West Germany 16.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	597	2,212	(1)	Nigeria 1,163; Netherlands Antilles 1,049.
Refinery products:				
Gasoline do	1,064	219	(1)	Mainly from Netherlands Antilles.
Kerosine 42-gallon barrels	5,053	5,549	4,239	Netherlands 783; Belgium-Luxembourg 287.
Distillate fuel oil do	1,962	(1)	(1)	
Residual fuel oil do	519	(1)	NA	NA.
Lubricants do	170,359	162,743	86,156	Netherlands 23,317; Italy 18,410; Netherlands Antilles 17,115.
Other:				
Liquefied petroleum gas do	220	650	638	NA.
Mineral jelly and wax do	48,015	98,824	28,985	West Germany 28,340; Japan 20,478; China 5,666.
Nonlubricating oils do	637	196	196	
Petroleum coke do	970,668	1,224,812	1,099,577	Canada 125,235.
Bitumen and other residues do	667,776	1,014,686	571,361	Canada 375,605; West Germany 41,838; Guyana 14,302.
Bituminous mixtures do	1,024	2,139	1,115	Colombia 770; West Germany 158.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	12,607	29,651	14,429	West Germany 13,268; Netherlands 1,066.

NA Not available.
[1]Less than 1/2 unit.
[2]May include platinum-group metals.

COMMODITY REVIEW

METALS

Aluminum.—The breakdown of 250 of the 720 pots at the VENALUM smelter caused a substantial loss in output of primary aluminum. Planned output for 1981 was 268,500 tons; however, output with reduced capacity declined by 25% to 202,200 tons. Sales amounted to 196,000 tons, of which 169,800 tons were exported. Exports to Japan increased to 160,000 tons in 1981 or 82% of the tonnage sold by the company.

Owing to the drop in aluminum prices on the international market, VENALUM's sales decreased to $342 million and net profit fell substantially. VENALUM's president claimed that the export subsidy to the aluminum industry was not needed and that the industry could function perfectly well without it.

Metallgesellschaft refused to renegotiate its alumina price with VENALUM and has taken the issue to court. VENALUM stated that this did not create a supply problem since it was buying alumina on the spot market for about 13% less than the Aluminum Co. of Canada international reference price.

For 1982, VENALUM projected a volume of sales of primary aluminum of 228,000 tons based on starting the year with 595 pots in operation.

By the end of May, ALCASA was the principal supplier of aluminum to the domestic market and the Andean Pact countries. The total production for the year was 111,300 tons, which represented an increase of 5% over that of 1980. Total exports amounted to 69,330 tons of which 69,100 tons were cast aluminum and 230 tons were laminated aluminum. ALCASA with its two plants, one for reduction and fabrication of aluminum in Ciudad Guayana, and the other for foil in Guacara, State of Carabobo, initiated studies directed to modifying its installed capacity for laminated products in

both plants. The total capital investment for the expansions was estimated at $378 million, of which $290 million would be spent on the plant at Ciudad Guayana and $78 million on the plant at Guacara.

INTERALUMINA planned to raise up to $400 million in long-term financing early in 1982 for completion of the 1-million-ton-per-year alumina facility currently under construction.

The reduction in Venezuela's projected oil revenues during the next few years, and the problems faced in the operation of existing aluminum plants, led the Government to sharply reduce planned investment in the aluminum sector in the period up to 1985. In the country's Sixth National Plan, covering the years 1981-85, the program envisaged in the preliminary version of the plan to increase capacity from 400,000 tons per year to 610,000 tons per year was dropped. The long-term plan to boost primary aluminum output to 1 million tons per year by 1990 remained as outlined in the preliminary plan, but until 1985, only feasibility studies and engineering design plans would be completed.

Bauxite.—Continuing doubts about project viability have delayed the final decision on initiating mining of the Los Pijiguaos bauxite project. C.V.G. Bauxita Venezolana, C.A. (BAUXIVEN), established to operate the mining project, was not allotted funds and work was limited in scope. Original plans called for BAUXIVEN to begin operations to coincide with the startup of INTERALUMINA; subsequently it appeared there will be a lag of at least 2 years because the Fondo de Inversiones (FIV) has insisted on further studies and testing of the Los Pijiguaos ore. The hesitation by FIV stemmed from a fear that it would have to subsidize the mine, if the project is not economically viable. The decision on Los Pijiguaos will essentially depend on what future the Government sees for its aluminum industry.

Iron Ore.—The iron ore mining operations were run by the Government-owned company, C.V.G. Ferrominera. The principal producing mines were Cerro Bolivar, Cerro El Pao, and Cerro Altamira. Venezuela's iron ore output in 1981 was down approximately 6% compared with that of 1980.

The Piar Div. of Ferrominera produced 75% of the iron ore. The greater part of Ferrominera's total output came from the Cerro Bolivar Mine, which had an output of 8.6 million tons in 1981. The remainder of the output came from the Cerro Altamira Mine, which was started up in 1974, closed in 1977 for lack of market demand, and reopened again in July 1980. Production from Altamira for 1981 was 3.2 million tons.

Since 1959, all ships carrying iron ore have sailed along the Rio Grande Channel, one of the major outlets of the Orinoco River Delta. One large dredger was continuously employed in keeping the channel navigable. The total channel length maintained in this manner was 341 kilometers, from Ciudad Guayana to the mouth of the river. The channel depth depends on the season. During the high water period, from June to October, the depth averages 13 meters of water and 80,000-deadweight-ton vessels can transit the channel. During the low water season, the average depth is considerably reduced and vessels can only take a 60% cargo.

At the end of 1981, Venezuela's proven iron ore reserves were estimated at 2.1 billion tons with an average grade of 63.7% iron.

Iron and Steel.—Ferrominera expected to announce in early 1982 its decision on closing down the Minorca HIB plant after months of uncertainly over its future. The reason given for the shutdown was that there has been little demand for the briquets, which are regarded as blast furnace feed. The plant produced only 200,000 tons in 1981, far below its 650,000-ton-per-year capacity. The operating loss for 1981 amounted to $12 million, bringing the cumulative loss over the last 8 years to $70 million.

In 1981, Fior de Venezuela, S.A., exported 246,000 tons of direct-reduced iron briquets from its plant in Ciudad Guayana to the United States, the German Democratic Republic, Yugoslavia, and Spain.

Gross sales of SIDOR increased during 1981 to $893 million from the sale of 1.8 million tons of products. SIDOR sold 1.5 million tons of steel on the domestic market in 1981, slightly below the amount in 1980. The company exported 400,000 tons of steel valued at about $94 million in 1981 versus the exportation of 300,000 tons valued at $69 million in 1980. Operations in 1981 resulted in a net loss of $507 million because of debt burdens.

Ferroalloys.—Negotiations were underway between Ferrosilico Venezolana, S.A. (FESILVEN), in which FIV is the major stockholder, and its foreign creditors to reschedule its foreign debt—approximately $38 million. Some of the outstanding foreign debt was expected to be paid off immediately while another part was to be converted

into medium-term debt with 10-year maturity dates. The remainder was to be converted into equity capital. Once negotiations are completed, the new shareholders would be FIV, Corporación Venezolana de Guayana, and a consortium of foreign banks.

FESILVEN has lost money since 1975, the year it was formed. It approached liquidation in 1980 in a dispute with Credit Lyonnaise of France over the payment of interest on a $13 million loan. The closure was avoided, and instead, the company expanded its operations from producing 35,000 tons of ferrosilicon in 1979 to 47,000 tons in 1980.

MINERAL FUELS

The latest figures on total energy production available are for 1980, of which petroleum comprised 83%. The total energy produced in 1980 showed a slight reduction from that of 1979, while the energy available internally from all sources increased by 11.0% over that of 1979.

Coal.—C.A. Minas de Carbon de Lobatera mines produced 44,600 tons of coal during 1981, or 99% of total production. The C.A. Minas de Naricual mine was shut down in 1981 while geologic and economic studies were being carried out.

In the early part of 1982, Carbones del Zulia, C.A., was expected to award its contract to design Venezuela's first major coal project, an open pit mine and ancillary facilities estimated to cost $200 million. The proposed mine, Paso Diablo, is to be located in the Guasare region in the State of Zulia 100 kilometers north of Maracaibo. The mine was initially scheduled to produce 4 million tons per year of steam and metallurgical coal beginning in 1986, with expansion capabilities to 6 million tons per year.

Petroleum and Natural Gas.—In 1981, the hydrocarbons industry registered a total income estimated at $19.6 billion, of which 97% was derived from export sales of crude oil and refined products. The remaining 3% of income was accounted for by the sale of refined products and natural gas on the domestic market.

The net profit of PDVSA for 1981 was $3.5 billion while the Government's share obtained through various forms of taxation was estimated to be $13.9 billion, an increase of 8.3% over that of 1980.

The budget of PDVSA during 1981 was estimated at $3.2 billion. Exploration and production expenditures accounted for 77% of the total for 1981. The objective of this allocation of funds was to increase in the shortest time, the capacity for the production of crude oil above the rate of 2 million barrels per day. Venezuela, as a member of the Organization of Petroleum Exporting Countries, followed the May 1981 recommendation to reduce production by 10% as of June 1981.

Of total reserves, an estimated 54% or 11 billion barrels was comprised of heavy crude oil of 22° API gravity or less. The Orinoco crude is typically 8° to 10° API gravity, and only 2% to 5% is recoverable by primary means. The following table[3] reflects the change in production of the various weights of crude oil from 1976 through 1982:

Table 4.—Venezuela: Daily production figures of light, medium, and heavy crude oil

(Thousand barrels per day)

	1976	1977	1978	1979	1980	1981[p]	1982[e]
Light (over 30° API gravity)	802	798	740	736	651	632	687
Medium (22° to 30° API gravity)	875	762	759	830	714	633	584
Heavy (less than 22° API gravity)	617	678	667	790	803	843	925
Total	2,294	2,238	2,166	2,356	2,168	2,108	2,196

[e]Estimated. [p]Preliminary.

At the end of June 1981, proven oil reserves totaled 20.5 billion barrels, which was a net gain of 834 million barrels over the 1980 yearend total.

In March 1981, Lagoven, S.A., a PDVSA subsidiary, awarded the first major contract for the Orinoco heavy oil belt to the Lummus Div. of Combustion Engineering Corp. The New York company will coordinate $700 million to $800 million worth of work in association with the Venezuelan firm Projectos Intergrados, C.A., over the next 8 years. The contract involves building a pilot refinery capable of handling the viscous Orinoco oil at the rate of 125,000 barrels per day and a city in the jungle for 30,000 inhabitants.

Maraven, S.A., also a PDVSA subsidiary,

let a contract to Union Oil Co. of California's Process Div. for process design work on its 360,000-barrel-per-day Cardon refinery. The contract was part of a $2.3 billion modernization of the refinery, scheduled for completion in 1985.

In October 1981, Brazil, Mexico, and Venezuela formed Latin America's first multinational oil company named PETROLATINA. It was created to explore and exploit oil resources in the Latin American region. It was intended that the company would also enter the world petroleum market in competition with the large multinational companies of the United States, the United Kingdom, the Netherlands, and other countries.

Lagoven, S.A., was embarking on a program to establish natural gas production from wells drilled in Caribbean waters. Full development was expected to take 8 to 10 years and cost $3 billion. During the past 3 years 38 wells have been drilled of which about half have produced gas. The average flow rate was 37 million cubic feet per day of gas with estimated reserves of 8 to 10 trillion cubic feet. A prefeasibility study by Société Nationale Elf Aquitaine of France stated that the fields would be attractive at one-half the reserve figure. The most promising area was north of Venezuela's Paria Peninsula, west of Trinidad and Tobago where wells reached a depth of 12,000 feet in 250 to 300 feet of water.

Meneven, S.A., awarded to Brown and Root, Inc., an $815 million contract to design and build facilities to extract liquids from natural gas and process them into propane, butane, and natural gasoline. An extraction plant with input capacity of 800 million cubic feet per day of natural gas is to be built in the State of Anzoatequi, with the 60,000-barrel-per-day processing plant to be situated near Barcelona, on the east coast.

Petrochemicals.—Petroquimica de Venezuela, S.A. (PEQUIVEN), is comprised of two basic petrochemical complexes. The older Moron complex produced nitrogen and phosphate fertilizer for the domestic market. The newer El Tablazo complex consisted of several fertilizer plants and an olefin plant. The fertilizer plants supplied the export market while the olefin plant supplied the private petrochemical sector with feedstocks for the manufacture of plastics, detergents, etc. PEQUIVEN's record sales increased by 32% to $244 million in 1981.

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[1]Physical scientist, Branch of Latin America and Canada, Division of Foreign Data.

[2]Where necessary, values have been converted from Venezuelan bolivars (Bs) to U.S. dollars at the rate Bs4.3=US$1.00.

[3]Data may differ from that reported elsewhere in this chapter owing to a difference in source.

The Mineral Industry of Yugoslavia

By Roman V. Sondermayer[1]

Difficulties created by the world economic slowdown, as well as high prices and shortages of fuels, electric power, and foreign exchange hampered activities of the mineral industry in Yugoslavia. A number of projects started several years ago were completed or continued but no new projects of any major economic significance were started. Although the year was slow for the mineral economy, Yugoslavia maintained its position as one of the leading producers of nonferrous metals in Europe during 1981.

The more prominent minerals with Yugoslav production expressed as a percentage of 1981 world output were as follows: Antimony 2% to 3%, bauxite 3% to 4%, lead mine 3% to 4%, smelter lead 2% to 3%, magnesite 3% to 4%, bismuth 2% to 3%, mine and smelter zinc 2% to 3%, and copper ore, refined copper, and aluminum, all 1% to 2%.

In 1980, the latest year for which complete data were available, the mineral industry's share of the gross social product was 7.5% and the mineral industry employed 5.9% of the total working labor force. By sectors, the value and number of employed persons in the mineral industry are shown in the following tabulation:[2]

Branch	Million dinars	Employment, thousand persons
Coal:		
Production	16,220	54.3
Processing	1,670	3.2
Crude oil:		
Production	8,759	4.1
Processing	11,194	9.6
Iron and steel:		
Iron ore, production	940	5.0
Steel, production	18,886	53.2
Nonferrous metals:		
Production of ores	8,037	26.3
Metal, production	5,746	16.0
Metal, processing	6,105	13.9
Nonmetallics:		
Production	2,571	12.5
Processing	11,307	49.3
Sand and gravel	5,610	23.9
Construction material	18,608	73.5
Total	115,653	344.8

The major events in the mineral industry included the completion of an aluminum plant near Mostar, Bosna i Hercegovina (BiH); commissioning of additional 50,000 tons per year aluminum capacity at the Titograd Aluminum Smelter, at Titograd, Crna Gora (Montenegro); closing of a 300,000-ton-per-year alumina plant at Obrovac, Hrvatska (Croatia); and the announcement of a decision by Industrija Nafte (INA) of Zagreb, Croatia, to accept bids for joint ventures in the Yugoslav offshore of the Adriatic.

PRODUCTION

Table 1 shows the latest trends in mineral production of the country. Because of the country's economic problems, a policy of limiting investments in the mineral industry was enforced during 1981. However, efforts continued to expand existing lead and zinc mines and to develop new copper mines. The authorities hoped to correct the existing gap between smelting facilities and mine output that necessitated imports of concentrates.

Table 1.—Yugoslavia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum:					
Bauxite thousand tons	2,044	2,565	3,012	3,138	[3]3,249
Alumina	499,341	496,479	836,428	[e]1,000,000	800,000
Metal ingot:					
Primary	176,468	175,950	167,681	[e]164,760	176,767
Secondary	20,989	19,758	21,841	[e]20,000	20,000
Total	197,457	195,708	189,522	184,760	[3]196,767
Antimony:					
Mine output, metal content	2,248	2,676	2,037	[e]2,100	2,000
Metal (regulus)	1,024	1,791	2,401	2,237	[3]2,198
Bismuth, smelter output	74	13	23	83	[3]102
Cadmium, smelter output	189	187	289	[e]290	280
Chromium:					
Chromite ore (domestic production)	1,546	1,907	168	[e]170	160
Chromite concentrate (produced largely from imported ores)	51,331	52,771	90,500	[e]91,000	90,000
Copper:					
Mine and concentrator output:					
Ore, gross weight thousand tons	17,533	17,098	16,446	19,559	[3]18,337
Concentrate:					
Gross weight	457,000	508,000	478,000	[e]560,000	540,000
Cu content	116,218	123,319	111,421	[e]134,000	130,000
Metal:					
Blister:					
Primary	97,397	107,507	108,732	114,000	110,000
Secondary	68,426	87,666	71,250	[e]72,000	71,000
Total	165,823	195,173	179,982	186,000	181,000
Refined:					
Primary	92,977	103,906	99,224	[e]100,000	100,000
Secondary	50,539	46,922	38,280	[e]31,288	32,603
Total	143,516	150,828	137,504	131,288	[3]132,603
Gold metal, refined troy ounces	164,226	142,556	138,987	[e]138,000	138,000
Iron and steel:					
Iron ore:					
Gross weight thousand tons	4,451	4,564	4,617	4,530	[3]4,794
Fe content do	1,514	1,621	1,619	[e]1,600	1,680
Iron concentrate do	1,726	1,713	1,636	[e]1,650	1,630
Metal:					
Pig iron do	1,938	2,081	2,360	2,425	[3]2,817

See footnotes at end of table.

Table 1.—Yugoslavia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
METALS —Continued					
Iron and steel —Continued					
Metal —Continued					
Ferroalloys:					
Ferrochrome	36,150	51,213	65,622	[e]63,000	67,000
Ferromanganese	54,639	37,470	45,591	[e]44,000	54,000
Ferrosilicon	55,513	60,189	67,884	[e]67,000	68,000
Silicon metal	27,476	30,670	31,598	[e]31,000	34,000
Ferrosilicomanganese	8,737	27,857	28,786	[e]28,000	29,000
Ferrosilicochrome	5,257	7,998	6,785	[e]7,000	8,000
Other	1,719	3,132	3,521	[e]3,000	4,000
Total	189,491	218,529	249,787	243,000	[3]264,000
Crude steel:					
From oxygen converters thousand tons	724	1,048	1,071	1,149	[3]1,424
From Siemens-Martin furnaces do	1,587	1,494	1,476	1,459	[3]1,504
From electric furnaces do	873	909	990	1,026	[3]1,048
Total do	3,184	3,451	3,537	3,634	[3]3,976
Semimanufactures do	3,329	4,142	4,140	4,244	[3]4,780
Lead:					
Mine and concentrator output:					
Ore, gross weight (lead-zinc ore) do	4,162	4,078	4,115	4,284	[3]4,365
Concentrate:					
Gross weight	169,504	163,501	168,971	[e]168,000	170,000
Pb content	129,977	129,389	129,776	121,400	120,000
Metal:					
Smelter:					
Primary	111,700	100,300	92,000	[e]91,000	49,000
Secondary[4]	33,341	40,069	41,603	[e]42,000	40,000
Total	145,041	140,369	133,603	[e]133,000	89,000
Refined:					
Primary[5]	111,690	100,300	92,040	[e]84,750	70,401
Secondary	18,200	16,400	19,000	[e]17,000	16,000
Total	129,890	116,700	111,040	101,750	[3]86,401
Magnesium metal	--	--	--	--	4,200
Manganese ore:					
Gross weight	24,750	27,400	30,150	[e]30,000	25,000
Mn content	8,702	9,771	10,552	[e]10,000	8,000
Mercury 76-pound flasks	3,133	--	--	--	--
Platinum-group metals:					
Palladium troy ounces	4,951	5,562	5,241	5,150	5,100
Platinum do	739	417	675	[e]640	650
Selenium metal, refined kilograms	50,360	52,840	46,257	[e]46,000	44,000
Silver, refined, including secondary thousand troy ounces	4,679	5,125	5,214	4,790	[3]4,437
Zinc:[6]					
Concentrator output:					
Gross weight	183,938	173,817	167,907	[e]150,000	187,000
Zn content	112,383	103,794	101,699	94,300	117,900
Smelter, including secondary	98,845	95,232	98,906	84,537	[3]96,370
NONMETALS					
Asbestos (fiber)	9,036	10,304	9,959	12,106	[3]13,591
Barite	52,245	42,800	46,073	[e]45,000	46,000
Cement, hydraulic thousand tons	8,006	8,698	8,081	9,315	[3]9,779
Clays:					
Fire clay:					
Crude	305,171	354,635	390,759	[e]400,000	500,000
Calcined	81,949	110,863	105,680	[e]106,000	110,000
Kaolin	110,817	180,017	177,958	[e]180,000	190,000
Feldspar, crude	56,146	48,013	56,160	56,000	57,000
Gypsum:					
Crude	482,552	502,904	567,746	[3]570,000	580,000
Calcined	96,540	99,722	119,041	[e]120,000	120,000
Lime:					
Quicklime thousand tons	1,261	1,297	1,526	[e]1,600	1,700
Hydrated do	786	758	875	[e] [3]900	1,000
Total do	2,047	2,055	2,401	[e]2,500	2,700

See footnotes at end of table.

Table 1.—Yugoslavia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Magnesite:					
Crude	345,000	333,000	293,000	362,000	[3]300,000
Sintered	164,180	151,782	145,723	[e]140,000	150,000
Caustic calcined	8,763	8,166	9,939	[e]10,000	12,000
Mica, all grades	139	69	338	[e]300	250
Nitrogen: N content of ammonia thousand tons	417	416	416	[e]416	[3]421
Pumice and related volcanic materials: Volcanic tuff	355,061	247,811	170,594	[e]170,000	180,000
Quartz, quartzite, glass sand:					
Quartz and quartzite thousand tons	483	227	239	[e]240	250
Glass sand do	1,448	1,717	1,923	[e]1,900	2,000
Total do	1,931	1,944	2,162	[e]2,140	2,250
Salt:					
Marine	20,576	20,966	20,500	NA	NA
From brines	188,000	192,000	192,000	NA	NA
Rock	85,210	85,231	137,441	NA	NA
Total	293,786	298,197	349,941	377,000	[3]418,000
Sand and gravel (except glass sand) thousand cubic meters	16,163	20,692	22,645	27,029	[3]26,589
Sodium compounds: Sodium carbonate do	156,826	166,350	164,382	[e]165,000	170,000
Stone (except quartz and quartzite):					
Dimension:					
Crude:					
Ornamental do	55	58	69	NA	NA
Other do	6	10	5	NA	NA
Partly worked facing thousand square meters	934	1,074	1,274	NA	NA
Cobblestones, curbstones, other thousand cubic meters	15	17	10	NA	NA
Dolomite thousand tons	382	557	673	NA	NA
Limestone do	3,149	3,778	4,125	NA	NA
Shale do	6,743	7,603	8,053	NA	NA
Crushed and broken, n.e.s. thousand cubic meters	5,503	6,785	8,703	NA	NA
Milled marble and other do	5,529	6,234	8,813	NA	NA
Sulfur and pyrite:					
Pyrite, gross weight thousand tons	394	406	452	450	400
Sulfur:					
S content of pyrite do	166	171	190	[e]189	190
Byproduct:					
Of metallurgy[e] do	200	200	200	200	200
Of petroleum[e] do	5	5	5	5	4
Total do	371	376	395	[e]394	394
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	23,884	25,823	23,261	[e]23,000	24,000
Coal:					
Bituminous thousand tons	510	471	434	388	[3]384
Brown do	8,960	8,854	9,351	9,665	[3]10,581
Lignite do	29,611	30,359	32,329	36,949	[3]41,279
Total do	39,081	39,684	42,114	47,002	[3]52,244
Coke:					
Metallurgical do	1,662	1,778	2,161	NA	NA
Breeze do	103	143	175	NA	NA
Foundry do	133	150	151	NA	NA
Total do	1,898	2,071	2,487	2,628	[3]2,693
Gas:					
Manufactured (excluding petroleum refinery gas):					
From coke plants million cubic feet	9,401	14,117	18,890	NA	NA
From lignite gasification plants do	3,467	4,025	3,749	NA	NA
From other gas generators do	915	721	401	NA	NA
Natural, gross production do	66,902	68,334	65,579	64,272	[3]77,585

See footnotes at end of table.

Table 1.—Yugoslavia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Natural gas plant liquids:					
Natural gasoline and pentane thousand 42-gallon barrels	100	98	149	NA	NA
Propane and butane do	567	590	531	NA	NA
Total do	667	688	680	NA	NA
Petroleum:					
Crude:					
As reported thousand tons	3,951	4,076	4,143	4,229	[3]4,375
Converted thousand 42-gallon barrels	29,265	30,190	30,687	31,324	32,405
Refinery products:[7]					
Gasoline do	18,964	20,230	22,177	21,318	[3]20,119
Liquefied petroleum gas do	3,000	2,873	2,898	NA	NA
Jet fuel do	2,682	2,437	2,695	NA	NA
Kerosine do	76	81	254	NA	NA
Distillate fuel oil: Diesel do	25,737	25,894	29,214	24,790	[3]2,292
Residual fuel oil do	38,748	40,753	43,217	44,289	NA
Lubricants do	1,719	2,713	2,898	NA	NA
Paraffin do	82	104	125	NA	NA
White spirit do	272	276	250	NA	NA
Asphalt and bitumen do	3,254	3,842	4,497	NA	NA
Petroleum coke do	336	362	300	NA	NA
Total[7] do	94,870	99,565	108,525	NA	NA

[e]Estimated. [p]Preliminary. NA Not available.

[1]Table includes data available through June 18, 1982.

[2]In addition to the commodities listed, germanium, bentonite, common clay, and diatomite are also produced, and tellurium may be recovered as a copper refinery byproduct, but available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Calculated as the difference between reported total and reported primary figure.

[5]Calculated as the difference between reported total and reported secondary figure.

[6]For ore production, see under "Lead."

[7]Excludes refinery gas, which was as follows, in million cubic feet: 1977—15,351; 1978—14,086; 1979—15,050; and 1980—not available; also excludes other materials produced by and used in the refineries as fuel.

TRADE

Tables 2 and 3 show latest available figures on trade in minerals. Dependence on imports for fuels heavily taxed the country's balance of payments.

Table 2.—Yugoslavia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	524,928	246,821	--	Czechoslovakia 128,950; Romania 77,302; East Germany 31,746.
Oxides and hydroxides:				
Alumina	395,378	213,433	--	U.S.S.R. 179,482; Czechoslovakia 19,655; Poland 14,296.
Other	68,374	439,991	--	U.S.S.R. 257,312; West Germany 85,854; Poland 85,808.
Metal including alloys:				
Scrap	352	276	--	West Germany 248; Italy 28.
Unwrought	46,180	53,872	--	East Germany 36,739; Czechoslovakia 7,037; Japan 2,628.
Semimanufactures	50,302	57,395	5,099	Czechoslovakia 15,414; East Germany 7,383; West Germany 4,828.
Antimony, regulus	975	1,055	30	U.S.S.R. 600; West Germany 225; Bulgaria 200.
Arsenic metal, all forms	52	36	14	West Germany 18; United Kingdom 4.
Cadmium metal, including alloys, all forms	133	105	60	Netherlands 21; Czechoslovakia 17; Italy 5.
Chromium:				
Chromite	10,475	11,537	--	All to Czechoslovakia.
Oxides, hydroxides, acid	125	4	--	All to Italy.
Cobalt: Oxides and hydroxides kilograms	--	50	--	All to Switzerland.
Copper:				
Ore and concentrate	--	16,131	--	Sweden 6,005; Finland 5,146; East Germany 3,979.
Sulfate	21,843	10,535	--	China 6,039; Turkey 2,000; Italy 1,042.
Metal including alloys:				
Scrap	7,948	6,129	--	Switzerland 2,324; Italy 2,128; West Germany 1,044.
Unwrought	8,356	14,334	3,641	East Germany 4,468; Sweden 2,000; United Kingdom 1,539.
Semimanufactures	29,814	34,685	2,057	U.S.S.R. 7,278; West Germany 6,304; Italy 6,141.
Iron and steel:				
Ore and concentrate	2	(1)	--	All to Hungary.
Pyrite, roasted	48,302	74,168	--	Hungary 53,515; Austria 17,537; West Germany 3,116.
Metal:				
Scrap	45,611	44,833	--	Italy 40,122; Switzerland 1,992; West Germany 1,969.
Pig iron, sponge iron, powder, shot	63,651	50,811	--	Romania 24,027; Italy 18,872; Switzerland 3,145.
Ferroalloys	148,458	120,558	39,639	Italy 29,259; Japan 12,644; Austria 12,314; Albania 4,600.
Steel, primary forms	22,494	21,406	--	Hungary 10,595; Poland 10,445; Italy 364.
Semimanufactures:				
Bars, rods, angles, shapes, sections	133,128	93,694	--	U.S.S.R. 18,453; West Germany 17,146; Albania 14,224; Bulgaria 10,760.
Universals, plates, sheets	36,691	9,659	--	Poland 1,986; Bulgaria 1,757; Turkey 1,304; West Germany 1,224.
Hoop and strip	5,403	8,598	--	Poland 5,001; Bulgaria 1,582; Romania 490; Italy 461.
Rails and accessories	32,049	14,172	--	Albania 7,723; Romania 5,344; Poland 595.
Wire	1,970	5,530	--	U.S.S.R. 2,768; Hungary 1,325; Czechoslovakia 349.
Tubes, pipes, fittings	102,247	111,321	283	East Germany 18,696; U.S.S.R. 14,361; China 13,970.
Castings and forgings, rough	4,401	4,986	--	Poland 1,200; Austria 1,083; West Germany 1,009.
Lead:				
Ore and concentrate	13,496	10,070	--	Bulgaria 8,165; Turkey 1,024; West Germany 842.
Oxides kilograms	725	1,534	--	West Germany 596; U.S.S.R. 490; Iraq 448.
Metal including alloys:				
Scrap do	--	7	--	All to Austria.
Unwrought	36,990	27,564	--	U.S.S.R. 13,953; Czechoslovakia 9,926; Austria 2,216.
Semimanufactures	2,377	1,476	--	Italy 691; France 415; Kuwait 192.
Magnesium metal including alloys:				
Scrap	5	3	--	All to Italy.
Unwrought	--	1,843	83	West Germany 911; Austria 265; Poland 126.
Semimanufactures	--	86	--	Austria 66; Poland 20.

See footnotes at end of table.

Table 2.—Yugoslavia: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Manganese: Ores and concentrates	922	--		
Molybdenum metal including alloys, all forms kilograms	7,135	634	--	All to West Germany.
Nickel:				
Ore and concentrate do	1,080	300	300	
Matte and speiss	--	99	--	West Germany 78; Austria 20.
Metal including alloys:				
Scrap	210	288	--	West Germany 155; Switzerland 105; Austria 20.
Unwrought	137	230	--	Austria 66; Netherlands 65; Italy 58.
Semimanufactures	27	80	--	West Germany 29; Italy 22; Austria 15.
Platinum-group metals including alloys:				
Waste and sweepings value	$34,034	$113,575	--	All to West Germany.
Unwrought and partly wrought troy ounces	64,205	4,308	3,247	United Kingdom 675; West Germany 386.
Silicon, elemental	26,496	20,437	502	U.S.S.R. 11,013; Japan 2,200; West Germany 1,900; Poland 1,568.
Silver:				
Ore and concentrate[2] kilograms	--	25	25	
Metal including alloys:				
Waste and sweepings value	$154,217	$692,713	--	All to Austria.
Unwrought and partly wrought thousand troy ounces	3,009	1,946	1,058	Czechoslovakia 586; West Germany 114; United Kingdom 94.
Tin metal including alloys:				
Unwrought	114	49	--	West Germany 29; Italy 20.
Semimanufactures	1	3	--	Albania 2.
Titanium: Oxides and hydroxides	12,132	11,353	--	East Germany 11,323; West Germany 30.
Tungsten metal including alloys, all forms kilograms	1,266	4,251	--	West Germany 3,185; Austria 1,066.
Zinc:				
Ore and concentrate	6,600	8,831	--	Bulgaria 7,492; Austria 760; Romania 579.
Oxides	1,669	193	--	Romania 175; West Germany 10; Iraq 3.
Metal including alloys:				
Scrap	25	35	--	All to Italy.
Unwrought	31,578	19,565	--	Czechoslovakia 11,044; U.S.S.R. 4,752; Hungary 3,752.
Semimanufactures	9,070	9,105	--	Czechoslovakia 5,756; West Germany 1,167; U.S.S.R. 1,090.
Other:				
Ash and residue containing nonferrous metals	23,762	31,086	--	Bulgaria 28,033; Italy 2,251; West Germany 601.
Oxides, hydroxides, peroxides of metals	92	162	--	Sweden 161.
Base metals including alloys, all forms, n.e.s	18	4	--	All to Czechoslovakia.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc. kilograms	2,093	50	--	All to Iraq.
Artificial: Corundum	15,908	15,486	18	Romania 6,741; Italy 2,910; Czechoslovakia 1,891.
Grinding and polishing wheels and stones	2,832	2,820	48	Romania 1,200; Italy 322; Poland 286; West Germany 229.
Asbestos, crude	1,983	2,506	--	Albania 2,310; Romania 136; West Germany 50.
Barite and witherite	13,965	19,077	--	Hungary 18,929; Afghanistan 69; Libya 65.
Boron materials: Oxide and acid	542	214	--	West Germany 150; Italy 44; Czechoslovakia 20.
Cement	359,920	406,746	10,150	Egypt 151,015; Tunisia 68,800; Malta 38,100.
Chalk	2	53	--	Czechoslovakia 41; Italy 12.
Clays and clay products:				
Crude:				
Bentonite	297	1,401	--	U.S.S.R. 1,301; Albania 50; Tunisia 50.
Fire clay	18,918	12,467	--	Italy 9,082; Greece 1,681; Hungary 1,107.
Kaolin	5,618	6,587	--	Greece 6,564; U.S.S.R. 22.
Other	556	482	--	West Germany 412; Greece 50; Italy 20.
Products:				
Nonrefractory	7,698	16,241	--	U.S.S.R. 5,245; Austria 2,480; Libya 2,311; Italy 1,794.
Refractory including nonclay brick	77,120	80,674	--	Romania 23,872; U.S.S.R. 13,718; West Germany 8,000.

See footnotes at end of table.

Table 2.—Yugoslavia: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Cryolite and chiolite	4	10	--	All to Malta.
Feldspar	9,695	11,498	--	Hungary 9,480; Czechoslovakia 1,340; Greece 558.
Fertilizer materials:				
Manufactured:				
Nitrogenous	46,630	60,471	--	Turkey 44,814; Ecuador 8,002; West Germany 7,100.
Phosphatic	98,787	203,469	--	Hungary 86,973; Czechoslovakia 75,755; U.S.S.R. 28,813.
Potassic	1	--	--	
Other including mixed	319,243	429,090	--	Turkey 168,940; Nigeria 109,196; Hungary 77,691.
Ammonia	20	36	--	All to Greece.
Graphite, natural	--	23	--	All to West Germany.
Gypsum and plasters	357	3,827	--	Hungary 3,814; U.S.S.R. 9.
Lime	59,319	72,158	--	Hungary 71,795; Greece 135; U.S.S.R. 131.
Magnesite	28,325	24,321	--	U.S.S.R. 7,126; Poland 5,928; Italy 4,052; Hungary 2,948.
Mica: Worked including agglomerated splittings kilograms	158	40	--	All to U.S.S.R.
Pigments, mineral: Iron oxides, processed	--	1	--	All to Hungary.
Pyrite, unroasted	75,825	67,941	--	Bulgaria 35,675; West Germany 20,129; Romania 12,074.
Salt and brine	3,078	2,812	--	Hungary 2,808; Central African Republic 4.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	2,349	1,208	--	U.S.S.R. 620; France 300; Romania 128.
Caustic soda	2,102	12,044	--	Iran 3,200; Netherlands 2,414; West Germany 1,650.
Soda ash	326	2,132	--	Italy 1,632; Iran 500.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	50,151	56,354	--	Italy 30,682; Czechoslovakia 16,387; East Germany 2,564.
Worked	4,254	8,282	48	Austria 3,347; Czechoslovakia 1,980; West Germany 1,232.
Gravel and crushed rock	5,195	8,553	--	Hungary 3,505; Italy 3,365; Czechoslovakia 421.
Limestone, except dimension	3	--	--	
Quartz and quartzite	13,056	12,124	--	West Germany 11,913; East Germany 211.
Sand excluding metal-bearing	3,294	6,703	--	Albania 2,999; Greece 2,491; Libya 1,031.
Sulfur:				
Elemental:				
Other than colloidal	5,334	1,138	--	Bulgaria 1,000; Hungary 138.
Colloidal	1,209	192	--	Australia 187; Egypt 5.
Sulfuric acid	162	119	--	Italy 80; Czechoslovakia 35.
Talc, steatite, soapstone, pyrophyllite	590	810	--	All to Albania.
Other:				
Crude	1,320	4,578	--	Greece 4,159; Austria 166.
Slag, dross, and similar waste, not metal-bearing	1,506	1,384	--	Austria 1,382.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	68	123	--	East Germany 76; Libya 46.
Carbon black	87	1,414	--	Czechoslovakia 1,218; West Germany 142; East Germany 51.
Coal: Lignite including briquets	375,118	397,493	--	Austria 250,863; Czechoslovakia 74,419; Italy 43,730.
Coke and semicoke	307,538	205,319	--	Hungary 135,661; Romania 25,124; Austria 23,452.
Hydrogen, helium, rare gases	459	250	--	Austria 245.
Peat including briquets and litter	1,820	481	--	Italy 322; Austria 125.
Petroleum refinery products:				
Gasoline thousand 42 gallon barrels	4,337	3,601	(1)	Netherlands 3,569; Austria 18.
Kerosine and jet fuel do	448	220	4	United Kingdom 64; France 35; Switzerland 17.
Distillate fuel oil do	584	105	1	Austria 15; Greece 13; Panama 8.
Residual fuel oil do	269	47	--	United Kingdom 12; Malta 11; Sudan 5.
Lubricants do	349	397	(1)	Austria 293; Czechoslovakia 81; Poland 11.

See footnotes at end of table.

Table 2.—Yugoslavia: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products —Continued				
Other:				
Mineral jelly and wax thousand 42-gallon barrels	46	30	2	West Germany 16; Italy 10.
White spirit do	6	2	--	All to Austria.
Petroleum coke, bitumen, and other residues do	43	29	--	West Germany 22; Poland 3; Libya 1.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	36,727	43,090	--	Italy 39,177; West Germany 2,218; Austria 1,688.

[1]Less than 1/2 unit.
[2]May include other precious metals.

Table 3.—Yugoslavia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	63,883	217,595	--	Guinea 129,141; Ghana 34,300; Greece 22,404.
Oxides and hydroxides	1,367	1,285	4	West Germany 1,076; Italy 22.
Metal including alloys:				
Scrap	34	(1)	--	Mainly from West Germany and Austria.
Unwrought	41,219	58,638	1,013	U.S.S.R. 47,655; Egypt 4,901; Hungary 2,703; Romania 1,823.
Semimanufactures	8,510	8,592	109	France 3,151; West Germany 2,021; Switzerland 1,290.
Antimony:				
Ore and concentrate	3,261	4,201	--	China 2,682; Turkey 748; Morocco 670.
Regulus kilograms	--	2	--	All from United Kingdom.
Arsenic:				
Trioxide, pentoxide, acids	66	102	--	Belgium-Luxembourg 33; West Germany 31; France 26.
Metal, all forms	138	85	(1)	U.S.S.R. 50; Netherlands 20; West Germany 11.
Beryllium metal, all forms kilograms	635	97	--	West Germany 82; Switzerland 15.
Bismuth metal, all forms do	5,012	4,315	310	Belgium-Luxembourg 4,005.
Chromium:				
Chromite	297,919	278,799	--	Albania 201,115; U.S.S.R. 63,519; Iran 6,401.
Oxides, hydroxides, acid	378	784	(1)	U.S.S.R. 700; West Germany 67; Hungary 15.
Cobalt: Oxides and hydroxides	22	17	7	Belgium-Luxembourg 8; Netherlands 1.
Copper:				
Ore and concentrate	7,739	47,817	--	Mexico 20,258; Chile 14,816; Peru 9,882.
Sulfate	1,304	1,030	--	U.S.S.R. 1,010; West Germany 14.
Metal including alloys:				
Scrap kilograms	50	--		
Unwrought	36,095	50,412	4	Peru 30,751; Zambia 14,905; Chile 4,708.
Semimanufactures	5,414	2,309	32	West Germany 1,081; Poland 517; Austria 190; U.S.S.R. 132.
Iron and steel:				
Ore and concentrate thousand tons	1,060	1,640	--	Peru 617; India 600; U.S.S.R. 140; Brazil 119.
Pyrite, roasted	--	50	--	All from Romania.

See footnotes at end of table.

Table 3.—Yugoslavia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal:				
Scrap	264,800	395,759	--	U.S.S.R. 333,926; Bulgaria 17,443; Senegal 9,183; Netherlands 9,079.
Pig iron, sponge iron, powder, shot	r100,534	48,677	(1)	Brazil 19,495; West Germany 16,347; Canada 11,112.
Ferroalloys	7,985	6,884	293	West Germany 4,226; France 1,033; Norway 343.
Steel, primary forms	958,775	994,908	--	Czechoslovakia 270,252; U.S.S.R. 220,923; Romania 101,903.
Semimanufactures:				
Bars, rods, angles, shapes, sections	204,194	222,768	22	Czechoslovakia 57,693; West Germany 42,040; Poland 25,158.
Universals, plates, sheets	466,031	471,182	3,492	Czechoslovakia 105,530; West Germany 72,833; Austria 57,395.
Hoop and strip	104,811	129,432	2	West Germany 43,699; Poland 34,601; Czechoslovakia 28,495.
Rails and accessories	59,123	28,499	43	Austria 22,331; U.S.S.R. 1,596.
Wire	36,288	43,374	3	West Germany 11,449; Austria 5,131; Czechoslovakia 4,888.
Tubes, pipes, fittings	113,532	69,601	303	West Germany 15,957; East Germany 14,952; Italy 8,073.
Castings and forgings, rough	3,438	2,639	(1)	Czechoslovakia 1,189; West Germany 699; Italy 255.
Lead:				
Ore and concentrate	1,978	2,731	--	All from Greece.
Oxides	3,365	2,994	6	Austria 1,388; East Germany 640; Bulgaria 611.
Metal including alloys:				
Scrap	1,124	--		
Unwrought	9,539	10,161	--	Peru 4,914; Bulgaria 3,826; Mexico 1,002.
Semimanufactures	97	23	--	West Germany 21; Italy 2.
Magnesium metal including alloys:				
Unwrought	1,072	863	50	U.S.S.R. 665; Norway 140; France 10.
Semimanufactures	15	14	--	Switzerland 9; France 4.
Manganese:				
Ores and concentrates	115,041	131,053	18	Gabon 33,640; Botswana 30,161; U.S.S.R. 29,470.
Oxides	909	1,176	--	France 712; Greece 153; Belgium-Luxembourg 121.
Mercury 76-pound flasks	301	541	--	Switzerland 290; China 250.
Molybdenum metal including alloys, all forms	16	15	--	Austria 11; United Kingdom 2.
Nickel:				
Matte and speiss	241	90	--	Netherlands 48; United Kingdom 39.
Metal including alloys:				
Scrap kilograms	2,307	45	--	All from Austria.
Unwrought	1,507	1,960	(1)	U.S.S.R. 1,751; Australia 150; West Germany 52.
Semimanufactures	657	776	12	West Germany 307; U.S.S.R. 160; Hungary 89.
Platinum-group metals including alloys, unwrought and partly wrought:				
Platinum troy ounces	92,080	6,495	(2)	U.S.S.R. 3,762; United Kingdom 2,315.
Other do	1,447	513,505	--	Italy 512,765; United Kingdom 611.
Silicon, elemental	2,464	226	(1)	Italy 224.
Silver metal including alloys, unwrought and partly wrought thousand troy ounces	869	16,543	6	Switzerland 6,165; West Germany 165; France 54.
Tantalum metal including alloys, all forms kilograms	1,465	760	311	West Germany 434; Austria 11.
Tin:				
Ore and concentrate	--	2	--	All from West Germany.
Oxides	8	5	--	West Germany 4.
Metal including alloys:				
Unwrought	1,304	1,031	--	China 783; Malaysia 140; Bolivia 29.
Semimanufactures	53	36	(1)	West Germany 31; United Kingdom 4.
Titanium:				
Ore and concentrate	23,742	52,142	--	Australia 48,987; Canada 3,143.
Oxides	1,420	1,961	18	West Germany 920; France 575; Belgium-Luxembourg 192.
Tungsten metal including alloys, all forms	25	24	(1)	Poland 6; Austria 5; West Germany 4.

See footnotes at end of table.

Table 3.—Yugoslavia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	55,760	65,227	--	Peru 48,816; North Korea 3,771; Spain 3,450; Greece 3,170.
Oxides	269	808	--	West Germany 500; East Germany 100; Netherlands 100.
Metal including alloys:				
Scrap kilograms	--	25	--	All from West Germany.
Unwrought	4,779	7,209	--	Zambia 4,251; Bulgaria 1,642; Italy 601.
Semimanufactures	162	45	(1)	Italy 34; France 10.
Other:				
Ores and concentrates of vanadium, tantalum, zirconium	1,596	1,832	60	Australia 930; West Germany 781; Italy 46.
Ash and residue containing nonferrous metals	1,071	2,022	--	Austria 1,085; Switzerland 883; Italy 53.
Oxides, hydroxides, peroxides of metals	1,135	1,304	13	West Germany 530; Japan 277; U.S.S.R. 120.
Metals:				
Alkali, alkaline-earth, rare-earth metals	202	118	2	France 100; West Germany 4.
Pyrophoric alloys	4	4	--	China 2; France 2.
Base metals including alloys, all forms	774	703	71	Japan 162; Netherlands 148; China 90.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	191	304	--	Denmark 184; Italy 83; Greece 25.
Artificial: Corundum	1,873	1,460	12	West Germany 1,358; France 45; Poland 25.
Diamond dust and powder kilograms	21	8,765	3	West Germany 8,734; Switzerland 16.
Grinding and polishing wheels and stones	706	656	14	Austria 273; Italy 69; West Germany 60; Malta 48.
Asbestos, crude	47,475	60,023	--	U.S.S.R. 36,260; Canada 12,184; Botswana 10,183.
Barite and witherite	1,204	1,146	36	West Germany 790; Czechoslovakia 200; U.S.S.R. 120.
Boron materials:				
Crude natural borates	28,289	32,717	17,662	Turkey 12,550; Peru 2,000.
Oxides and acids	723	69	--	France 45; West Germany 13; Austria 11.
Bromine	10	9	--	Mainly from Netherlands.
Cement	1,107,707	793,007	13	U.S.S.R. 358,943; Hungary 133,885; Czechoslovakia 87,976.
Chalk	r2,840	1,108	--	France 490; Austria 250; Switzerland 186.
Clays and clay products:				
Crude clay:				
Bentonite	19	21	--	Austria 20; West Germany 1.
Fire clay	38,771	40,580	1,908	Czechoslovakia 36,096; United Kingdom 772.
Fuller's earth, chamotte	2,294	2,078	18	Czechoslovakia 1,609; France 440.
Kaolin	75,804	86,363	4,982	Czechoslovakia 31,471; U.S.S.R. 17,112; East Germany 15,590.
Other	16,946	12,030	(1)	Poland 6,261; Czechoslovakia 5,458; West Germany 296.
Products:				
Nonrefractory	23,233	13,814	(1)	Czechoslovakia 7,701; Italy 3,194; Bulgaria 1,220.
Refractory including nonclay brick	37,119	36,152	236	West Germany 14,851; France 7,020; Italy 3,330.
Cryolite and chiolite	913	1,113	--	Mainly from Denmark.
Diamond:				
Gem, not set or strung carats	120,000	5,000	--	Mainly from West Germany.
Industrial do	105,000	295,000	50,000	Switzerland 135,000; United Kingdom 80,000.
Diatomite and other infusorial earth	285	421	209	Austria 110; Denmark 37; West Germany 22; Italy 20.
Feldspar	1,150	1,154	--	France 1,150; Norway 3.
Fertilizer materials:				
Crude:				
Nitrogenous	2	2	--	All from France.
Phosphatic thousand tons	896	1,383	--	Togo 468; Morocco 435; Jordan 245.

See footnotes at end of table.

Table 3.—Yugoslavia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials —Continued				
Manufactured:				
Nitrogenous	208,242	304,050	--	Hungary 138,090; U.S.S.R. 85,708; Czechoslovakia 40,974.
Phosphatic	48,804	42,636	--	Tunisia 38,200; Romania 4,436.
Potassic	394,996	461,798	--	East Germany 247,828; U.S.S.R. 210,961.
Other including mixed	65,163	101,355	--	Romania 31,388; Hungary 28,324; Poland 24,966.
Ammonia	95,946	93,562	--	Hungary 70,958; Romania 14,187; U.S.S.R. 7,928.
Fluorspar	5,121	5,716	--	West Germany 1,987; China 1,972; East Germany 1,054.
Graphite, natural	1,824	1,843	29	Czechoslovakia 854; Austria 469; U.S.S.R. 304.
Gypsum and plasters	8	33	--	West Germany 25; Italy 8.
Iodine	71	60	--	Japan 56; Poland 3.
Lime	--	60	--	All from Austria.
Magnesite	43,882	76,429	(1)	Greece 37,830; China 27,815; Turkey 7,118.
Mica:				
Crude including splittings and waste	1,177	687	(1)	India 276; Austria 173; Norway 155.
Worked including agglomerated splittings	129	132	--	Austria 46; Czechoslovakia 40; Belgium-Luxembourg 19.
Pigments, mineral: Iron oxides, processed	2,880	2,154	(1)	West Germany 973; Spain 462; U.S.S.R. 224; France 130.
Precious and semiprecious stones:				
Natural kilograms	128	110	--	West Germany 103; Switzerland 6.
Synthetic do	701	334	8	Austria 250; Switzerland 67; Czechoslovakia 7.
Pyrite	124,227	68,413	--	U.S.S.R. 40,772; Cyprus 14,579; Albania 7,061.
Salt and brine	194,103	282,389	--	Romania 193,570; Tunisia 60,096; U.S.S.R. 16,965.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	203	211	(1)	Czechoslovakia 205; Italy 5.
Caustic soda	264,904	272,958	(1)	France 78,230; West Germany 45,488; Italy 42,857.
Soda ash	25,862	75,391	--	Bulgaria 31,481; Austria 16,626; Romania 12,962.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	4,457	3,545	--	Greece 2,042; Italy 939; East Germany 200.
Worked	327	1,574	--	U.S.S.R. 1,302; Italy 262.
Dolomite, chiefly refractory-grade	1,563	25	--	Austria 20; Norway 5.
Gravel and crushed rock	153,751	44,493	--	Hungary 43,719; Italy 476.
Limestone, except dimension	64,812	28,182	4	Hungary 22,660; Italy 5,441.
Quartz and quartzite	13,470	11,750	137	West Germany 7,246; Greece 4,213.
Sand excluding metal-bearing	109,905	82,062	394	West Germany 24,681; Hungary 19,330; East Germany 18,772.
Sulfur:				
Elemental:				
Other than colloidal	66,642	56,417	--	Poland 55,923; Italy 444.
Colloidal	1,078	506	--	West Germany 446; Italy 47; United Kingdom 9.
Sulfur dioxide	400	529	--	All from Italy.
Sulfuric acid	88,225	63,913	(1)	Hungary 60,585; Austria 3,029; Romania 294.
Talc, steatite, soapstone, pyrophyllite	4,611	5,121	--	West Germany 2,370; East Germany 821; Austria 698.
Other:				
Crude	16,606	14,728	138	Hungary 11,871; Austria 970; Switzerland 821.
Slag, dross, and similar waste, not metal-bearing	454,273	439,950	--	Italy 286,603; Austria 93,551; Hungary 45,452.
Oxides, hydroxides, peroxides of magnesium, strontium, barium	79	64	--	East Germany 40; West Germany 14; France 6.

See footnotes at end of table.

Table 3.—Yugoslavia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,188	2,615	319	Albania 2,209; Austria 78.
Carbon black	20,680	21,855	47	Italy 15,621; France 2,099; West Germany 2,033.
Coal and briquets:				
Anthracite and bituminous thousand tons	3,536	3,558	1,081	U.S.S.R. 1,814; Czechoslovakia 593; Poland 69.
Lignite	51,550	111,948	--	U.S.S.R. 60,550; West Germany 31,414; East Germany 19,923.
Coke and semicoke	19,242	54,745	2,891	Italy 30,872; Poland 11,669; United Kingdom 6,399.
Gas, natural million cubic feet	33	63	--	All from U.S.S.R.
Hydrogen, helium, rare gases	13	8	--	Belgium-Luxembourg 4; Italy 2; Austria 1.
Peat including briquets and litter	13,514	9,722	--	U.S.S.R. 5,137; Poland 2,693; Hungary 1,869.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	87,675	81,215	--	U.S.S.R. 35,522; Iraq 28,942; Libya 7,010; Nigeria 4,440.
Refinery products:				
Gasoline do	188	81	--	Italy 42; Czechoslovakia 37.
Kerosine do	248	137	--	Italy 80; Czechoslovakia 55.
Distillate fuel oil do	805	1,512	4	U.S.S.R. 1,176; Romania 320; Italy 7.
Residual fuel oil do	6,702	4,626	--	U.S.S.R. 3,499; Bulgaria 713; Hungary 213.
Lubricants do	653	669	10	Bulgaria 144; Italy 123; Hungary 91; U.S.S.R. 55.
Other:				
Liquefied petroleum gas do	r990	974	--	Bulgaria 412; Hungary 348; West Germany 142.
Mineral jelly and wax do	25	20	(1)	West Germany 8; East Germany 4; Bulgaria 2.
Petroleum coke do	r183	293	136	Norway 82; U.S.S.R. 34; Albania 30.
Bitumen and other residues do	r91	21	--	Albania 12; Austria 7.
Bituminous mixtures do	15	4	(1)	Hungary 2; West Germany 1.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r47,648	37,650	15	U.S.S.R. 12,899; Italy 8,233; Hungary 6,441.

rRevised.
[1]Less than 1/2 unit.
[2]Quantity unreported; imports valued at $481.

COMMODITY REVIEW

METALS

Aluminum.—Discovery of a new bauxite deposit, completion of a new aluminum smelter, expansion of another smelter, and the closing of an alumina plant were the highlights of the aluminum sector of the mineral industry during 1981.

A new deposit of bauxite was discovered in the vicinity of the city of Titovo Uzice in western Serbia. Reportedly, the zone of bauxite mineralization covers an area of about 30 square kilometers located on the slope of the Zlatibor Mountain, near the village of the Mackat, extending toward the villages of Nikojevici, Rozanstvo, and Sirogojno. Except for claims that the reserves of the deposit are large and that the bauxite is of good quality, specific information was not made public.

At Bacevici, near Mostar, BiH, a new 92,000-ton-per-year aluminum smelter started production in the first quarter of 1981. The plant has 256 electrolytic cells and includes an anode plant and a foundry. Technology was provided by the French concern Péchiney. The new smelter at Bacevici should reach its design capacity during 1982.

At the aluminum smelter at Titograd, Montenegro (Kombinat Aluminijuma Titograd), facilities for smelting an additional 50,000 tons per year started production at the beginning of 1981. With the new addition, the Titograd smelter has a capacity of 100,000 tons per year of aluminum metal.

The 300,000-ton-per-year alumina plant at Obrovac operated by Jadral closed down in the fall of 1981 for economic reasons. The plant was placed in standby status, and during the rest of the year, efforts were made by all concerned to find solutions for the financial problems in order to restart production sometime in the future. At yearend, it appeared that the dismantling of the factory was not being considered.

Antimony.—At Zajaca in Serbia, a facility with capacity to produce 365 tons of antimony trioxide per year started production. Plant technology was designed by Yugoslav scientists. In addition, a new zinc-antimony mine, Vinogradi, operated by the Rudarsko Metalurski Kombinat Zajaca (RMKZ) and located at the village of Rujevac near Stolica in the western part of Serbia, started production. Reserves at Vinogradi were reported at 1 million tons of antimony-zinc ore, but metal content of the ore was not reported. The nearby flotation plant at Stolica was modernized in order to recover zinc. RMKZ is the major antimony producer in Yugoslavia and operates all the new Serbian facilities.

Copper.—At the Bucim copper mine and flotation plant in Macedonia (total investment 2.5 billion dinars), the year 1981 ended with a deficit of about 400 million dinars (about U.S. $10 million). The financial difficulties resulted from a lower ore grade than expected, although mining was switched to supposedly richer ore in 1981. Apparently the grade of ore in deposits near Bucim had been overestimated. Latest reports indicated a request by the management for new investment to triple the mine and mill capacity so that the operations could become economic.

The development of the Krivelj copper mine and mill near Bor, Serbia, continued. Denver Equipment, a division of Joy Process Equipment Inc., received a large order for delivery of milling equipment for the Krivelj project. The new equipment will be installed in the second stage of mill construction at Krivelj, scheduled for production in 1983-84.

Iron and Steel.—Stagnation of the iron and steel industry was evident in 1981. Modernization of the Zeljceara Boris Kidric steel plant in Niksic, Montenegro, was the only activity of any significance. Reportedly, when completed the Boris Kidric plant will have an annual capacity of 315,000 tons per year.

Mercury.—During 1981, the possibility of restarting production of the Idria Mine in Slovenia was examined, but no decision had been made at yearend.

Nickel.—The startup of the Kavidarci (capacity 16,000 tons per year of contained nickel) ferronickel plant and nickel mine in Macedonia was delayed. Unspecified technical and financial difficulties were mentioned as the cause. The new date for the beginning of Kavadarci's production was sometime in 1982.

Development of the Glogovac ferronickel plant and nickel mines in Kosovo (also known as Kosovo plant and mines) continued during 1981. Two mines, Cikatovo near Glogovac and Glavica near Lipljan, were in the last stages of development. The first tonnage of ore was expected in late 1982 or early 1983. The ore will be used in the ferronickel plant at Glogovac. The operations of Cikatovo and Glavica mines are based on 25 million tons of ore with an average nickel content of about 1.3%. The content of gangue minerals in ore was reported as follows: Silicates 40% to 50%; iron oxide 19% to 34%; bauxite 0.5% to 5%; magnesium oxide 3.0% to 10.0%; calcium oxide 0.3% to 1.0%; chromite 0.2% to 2.0%; manganese oxide 0.2% to 0.6%. In addition, another deposit with reserves totaling 5 million tons was discovered in the same area. The grade of ore from this deposit was not reported.

Construction continued on the ferronickel plant at Glogovac (capacity 12,000 tons per year of contained nickel). The new plant was designed by experts from the U.S.S.R. and most of the equipment for the smelter will be made in the Soviet Union. All raw material used at the smelter was to be domestic except anthracite. However, it was hoped that domestic dried lignite from nearby Kosovo mines would be found to be a suitable replacement.

Total investment for the project by the large enterprise Rudarsko Hemiski Kombinat Kosovo reportedly should reach 6 billion dinars.

Titanium.—Exploration led to the discovery of titanium deposits in the Timok River in the Trgoviste area and also near Maribor in Slovenia. No details were available as to the size of the deposits or grades of ore. These two deposits are the first titanium discoveries in the country.

NONMETALS

Ammonia.—Construction continued on a 280,000-ton-per-year ammonia plant at Pancevo, Serbia. Completion of a 369,000-ton-per-year plant at Kutina, Croatia, was

delayed, and startup was planned for 1982. Both plants will use natural gas feedstock.

Asbestos.—Around Stragari, Serbia, site of an existing asbestos mine, new reserves were discovered. The quality of the asbestos was not reported but the size of the reserves was described as large enough to sustain present mine output for the next 50 years. The Rudarsko Energetsko Industrijski Kombinat Kolubara (REIK Kolubara) through its Kolubara asbestos division operates the Stragari Mine. Reports indicated that new capacity at Stragari was planned to produce 500,000 tons of asbestos ore per year equivalent to 47,000 tons of asbestos concentrates.

Bentonite.—A new bentonite deposit was discovered near Sipovo in BiH. Reserves were estimated at 1 million tons. Plans call for opening a mine with a capacity of 25,000 tons of bentonite per year.

Cement.—At Popovac, Serbia, site of an existing cement plant, an additional 800,000-ton-per-year cement plant started production in the fall of 1981. The Popovac plant, fired with fuel oil, experienced difficulties in purchasing fuel oil for its operation during the rest of the year and its output was below that planned.

Financing of new cement plants at Bela Palanka and Golubac, both in Serbia, and expansion of the Kosjeric plant in Serbia were not assured by the end of the year, but 1985 was given as the completion year for all three projects.

Fluorspar.—A deposit of fluorspar was discovered at the village of Ravnaja near Krupanj, Western Serbia. Reserves were estimated at 1 million tons of unreported grade. Apparently this is the first economic deposit of fluorspar in the country.

Lime.—In the Ba village, near the town of Ljig, Serbia, a 50,000-ton-per-year lime plant went onstream during the summer of 1981. Equipment for the plant was purchased in the Federal Republic of Germany.

Marble.—Although completed 2 years ago in Cer near Kicevo, Macedonia, a marble quarry with a plant for cutting marble remained closed after 2 months of trial production. Lack of heat in the plant was reported as the principal reason for the delay. The installation is located in an altitude 900 meters above sea level, and temperatures are too low for workers to work without heat. Responsibility for not installing heating in the plant had not been determined at yearend.

Phosphate.—Development of a phosphate mine, Lisina near Bosilegrad in Serbia, was delayed for lack of funds. Lisina will be the first phosphate mine in Yugoslavia.

MINERAL FUELS

Low-rank coals, mostly lignite, were the principal energy source produced in the country during 1981, but Yugoslavia remained greatly dependent on imported high-rank coals, crude oil, and natural gas. High prices for imported fuels continued to impact heavily the country's trade balance.

Coal.—In Serbia, the largest coal-producing state in Yugoslavia, exploration continued at the Kovin lignite deposit and the deposit at Fruska Gora, both in Vojvodina, Serbia.

A new coal deposit was discovered near Petrovac na Mlavi, eastern Serbia, with reported reserves of about 40 million tons of coking coal.

At the Bogovina Mine near Boljevac, Serbia, a new mine was planned near the existing one that it will ultimately replace. Exploratory work has confirmed about 4.4 million tons of brown coal located in the new, so-called Eastern field.

At Rosna near Pozega, Serbia, site of an old mine closed 7 years ago, new reserves of about 3 million tons were discovered. Reported to be economic, lignite production by opencast mining is possible.

At Kolubara, Serbia, a new lignite drying plant planned to start production in 1985 with an annual capacity of 855,000 tons of dried lignite. In addition, it is expected that a plant for lignite gasification, of unspecified capacity, may be built at the Kolubara Mine after 1986.

In Bosnia, the largest known coal-producing region, exploration and preparation for production continued at the Juzna Sinklinala Mine near Tuzla in BiH. Plans call for a 3-million-ton-per-year opencast mine to start production by 1986.

At the Rasa Mine in Istria, Croatia, the largest producer of bituminous coal in the country, work continued on development of a new mining field, Tupljak. Plans for the new facility have set a yearly production target of 325,000 starting in 1985. Proven reserves of bituminous coal at Tupljak were reported at 8 million tons.

Petroleum and Natural Gas.—During 1981, INA of Zagreb, Croatia, the largest crude oil producer and refiner in the country, decided to ask large foreign oil companies to bid for joint offshore ventures in the

Yugoslav area of the Adriatic. Reports indicated that concessions should be granted during the first quarter of 1982. Although joint ventures for oil and gas exploration in the Yugoslav part of the Adriatic are not a new development, INA's concessions and the size of exploration should by far exceed the area of exploration carried out in the southern part of the Adriatic by Jugopetrol-Kotor and Buttes Gas & Oil Co. of the United States.

About 10 wells were drilled on the Adriatic shores. Gas was discovered in the northern part of the Adriatic. In the Pannonian Basin, discoveries of oilbearing formations were announced below the gas formation in Boksic Lug Field, Slavonia, Croatia. In both places, details on the size of the reserves and on other specifics were not available. About 25 drilling rigs were active throughout the country, and a total of 328,575 meters were drilled.

INA's enterprise for oil and gas production, Naftaplin, produced about 62% of the total country's crude oil output. Benicanci in Slavonia remained the largest producing oilfield in Yugoslavia during 1981.

Refining capacity at the disposal of the Yugoslav petroleum industry remained the same as during 1980 (about 25.5 million tons per year). Refinery utilization was approximately 58%. Of the total crude oil processed in Yugoslavia, about 71% was imported oil. Table 3 shows details of crude oil imports.

During 1981, the last leg of the pipeline that connects the Adriatic coast at Barkar near Rijeka and the inland refineries was completed with a connection to the Lendava refinery.

Uranium.—The first nuclear powerplant in Yugoslavia started production at the end of 1981. The 615-megawatt plant, constructed by Westinghouse of the United States, is located at Krsko, Slovenia, near the border with Croatia.

Development of the first uranium mine and mill at Zirovski Vrh continued. Regular production of yellow cake was to start during 1982, and output was planned at 120 tons annually. After enrichment abroad, fuel from domestic ores should be used in the Krsko plant by 1985.

Exploration for lead and zinc led to the discovery of uranium near Probistip in Macedonia, and preparations were underway to open this, the first uranium mine in Macedonia. Data on grade of ores and size of the deposit were not made public.

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[1]Physical scientist, Division of Foreign Data.

[2]Dinar is not convertible currency. A meaningful conversion to U.S. currency is impractical. At yearend, the official exchange rate was 42 dinars = US$1.00.

The Mineral Industry of Zaire

By Miller W. Ellis[1]

In 1981, Zaire continued to be the world's leading producer of cobalt and industrial diamonds and the sixth largest producer of copper. Mineral commodity exports provided 86% of the country's $1.7 billion foreign exchange revenue, with copper accounting for $825 million; cobalt, more than $200 million; and both petroleum and diamonds more than $100 million each. Zaire's foremost mining company, La Générale des Carrières et des Mines du Zaire (Gécamines) announced a near-record year for copper production and zinc exports. Cobalt production was about the same as in 1980, but export sales slumped badly until the U.S. General Services Administration (GSA) approved the purchase of 2,359 tons for its strategic stockpile. The negotiated price was $15 per pound.

The International Monetary Fund (IMF), apparently pleased with Zaire's economic progress during 1980, discussed the granting of extended financial credit during early 1981. On June 23, it announced that an Extended Fund Facility (EFF), totaling 912 million Special Drawing Rights or $1,058 million, would be made available to Zaire during the period June 1981 through 1983 in order to promote a revival of the economy, reduce the inflation, and improve the balance of payments. This was reportedly the largest credit ever advanced to an African country by the IMF.

The EFF plans call for the country to invest some $1.6 billion in basic infrastructure within the country. Thirty-four percent was slated for the rehabilitation of facilities for the mining industry, and smaller amounts were allocated to improve port and railway facilities and distribute energy more widely. The EFF plan also encouraged a reduced role for the state in the Zairian economy, greater participation from the country's private sector, and a major effort to increase production of agricultural staple foods, as well as export crops. A further condition of the loan was that Zaire should implement an austerity program conducive to an improved balance of payments status. This included the devaluation of the Zaire on June 19 by the Zaire Executive Council. In July, the 14 lending nations (the Club of Paris) rescheduled about $350 million of Zaire debts for each of the next 2 years. Zaire's total external debt amounted to more than $5 billion, with $2.2 billion due over the next 2 years. During 1981, only $355 million was scheduled for debt servicing.

According to an extension plan of the Lome II Convention, which became applicable on January 1, 1981, the European Economic Community (EEC) was prepared to offer long-term, low-interest (1%) loans to countries that produced certain strategic minerals. Copper, cobalt, tin, and other mineral commodities were specifically included in the plan, provided they accounted for at least 15% of a country's export earnings over the preceeding 4-year period. The loans were to counter short-term problems and to maintain or increase the output of mineral commodities. The loan arrangement was known by the term, "Sysmin", to the members of the EEC. At yearend, the European Investment Bank was still considering a $50 million Sysmin loan application from Zaire. A favorable decision was expected.

In late October, the Organization of Petroleum Exporting Countries (OPEC) Fund for International Development granted Zaire a loan of $5 million to finance the rehabilitation of power generation stations and transmission lines, particularly in the Shaba region. The loan was interest free, had a 5-year grace period, a 20-year maturity date, and a nominal service charge. In

December, a French loan of $1.5 million was announced for three projects, an inventory of mineral resources, development of agriculture, and civil aviation. The Arab Bank of African Economic Development committed a $10 million loan for improvements to Zaire's river navigation and railway transport system.

In April 1981, the First State Commissioner (prime minister) Karl-I-Bond resigned and fled to exile in Belgium. N'Singa Ndjuu, executive secretary of the ruling political party, was appointed to the vacant position. In early October, President Mobutu dismissed his entire Executive Council and reappointed himself and eight of his commissioners to their former ministries. The Commissioner for Mines, Lwamba Katansi, was appointed to the Ministry of Culture and Arts, and five others were named to different ministerial posts. New appointees filled the 12 remaining ministries, including Mbenga Sandonga as Commissioner of Mines, and a new post of Deputy Prime Minister was created.

The Swiss Aluminium Co., Alusuisse, and eight other international firms signed a charter on November 24, creating a new company, Aluzaire, to build an aluminum smelter at Mwanda, north of the Zaire River mouth. The Zaire Government was to hold 15% of the consortium and was committed to arrange for a $400 million deepwater port at nearby Banana, as well as a powerline and road from Inga-Shaba to the port and refinery. Other shareholders were as follows:

Company	Country of origin	Percent ownership
Alusuisse	Switzerland	20
Energoinvest	Yugoslavia	10
Sava-Aluminio-Veneto	Italy	10
Norsk Hydro AS	Norway	10
Yoshido Kogyo KK	Japan	10
Vereinigte Aluminium Werke A.G.	Federal Republic of Germany.	10
Sumitomo Aluminium Smelting Co. Ltd.	Japan	10
Estel Aluminum BV	Belgium-Netherlands.	5

The consortium contracted to plan an $800 million aluminum plant with a capacity of 150,000 to 200,000 tons per year, complete a feasibility study in 1982, and make a final decision on starting construction by 1984. First production was projected for 1989, and expansion during the next decade could bring capacity to 600,000 tons per year. The plant was to use bauxite imported from Guinea and was to employ 2,000 workers.

Zaire's largest hydroelectric plant was the Inga II plant on the lower Zaire River west of Kinshasa with an installed capacity of 1,272 megawatts (MW) for eight 159-MW turbines. The installation was to undergo testing into early 1982 and commence supplying the powerline to Shaba as soon as the Shaban converter stations are installed and tested. Shaba's previous power source was from four hydroelectric stations installed by Union Minière du Haut-Kantanga, Gécamines' predecessor. The oldest, Francqui, built in 1930 on the Lufira River northeast of Likasi, had a capacity of 47 MW, and the nearby Bia generator, with a capacity of 77 MW, was constructed in 1945. The Delcommune dam and 120-MW powerplant on the Lualaba River north of Kolwezi were completed in 1953, and the 276-MW Le Marinel station was installed 35 kilometers downstream in 1956. These installations provided power to Shaba's copper industries and cities and enabled the electrification of much of the railway system before independence in 1960.

On August 22, a ceremony at Kolwezi marked the completion of the last pylon on a 1,700-kilometer high-voltage, direct-current powerline from Inga, near the Zaire estuary, to the Shaba region's copper-cobalt mining and refining towns. The first pylon was erected in 1974 in lower Zaire, and since that time the U.S. firm Morrison-Knudsen Co., Inc., has remained as Chief of Contracteurs Inga-Shaba (CIS). CIS was also responsible for installing and testing the converter terminals at the Shaban mining centers. Final completion of the system was set for 1983. Morrison-Knudsen was one of several U.S. companies with a total of $250 million invested in Zaire. Others included Foote Mineral Co., with investments in tin-lithium mines near Manono, and Metallurg Inc., with a pyrochlore-bearing carbonatite development at Lueshe in the Kivu region.

A free industrial zone was established around the Inga hydroelectric site on the Zaire River to include Zaire's largest powerplant and its areas of greatest underdeveloped hydroelectric potential. The organization and operation of the Inga Zone was stipulated in Statute Law No. 81-010 dated April 2, 1981.

PRODUCTION AND TRADE

Gécamines, the giant Government owned firm, continued to account for the production of all of Zaire's cadmium, cobalt, and zinc, most of its copper, and a substantial part of its gold and silver. Its operations included the smelter at the Lubumbashi (formerly Elizabethville) center 30 kilometers from its Kipushi (formerly Prince Leopold) Mine near the Zambian border. The Shituru and Panda copper-cobalt refineries and the Kakanda and Kambove Mines comprised the central group of operations of Likasi (formerly Jadotville). The Kolwezi western center of operations has been the site of most of the industry's expansion since 1975 including the new Dikuluwe and Mashamba open pits, the Dima concentrator, additional capacity at the Luilu copper-cobalt refinery, and a new flash smelter. Gécamines also produced its own limestone, lime, and cement from quarries and kilns near Kakontwe, north of Likasi, and coal from its nearby Luena Colliery. The remainder of Zaire's copper was produced and shipped as concentrate by the Japanese-operated Société de Développement Industriel et Minière du Zaire (Sodimiza) from its Musoshi concentrator near the Zambian border southeast of Lubumbashi.

A preliminary estimate of the value of Zaire's 1981 exports indicated a substantial drop in overall value owing to depressed metal prices, particularly cobalt, in a year with generally higher metal production. Copper export sales were estimated at $825 million despite a 10% increase in production. Cobalt with a value of $200 million was less than one-half the 1980 figure. The value of petroleum exports doubled to $120 million, but diamond export value was estimated at $112 million, less than one-half the 1980 figure. The value of gold production was nearly constant at $33 million, but the silver value dropped from $55 million to less than $20 million. Sales of current and accumulated zinc stocks had an estimated value of $65 million, more than four times the value of 1980 zinc sales. The total value of Zaire's mineral exports was about $1.5 billion out of a total export figure of nearly $1.75 billion. Coffee, the principal agricultural export, had an estimated export value of $180 million in 1981.

On July 2, GSA announced that the Société Zairoise de Commercialisation des Minerais (Sozacom) of Kinshasa had been selected to supply 5.2 million pounds of refined cobalt for the National Defense Stockpile at a total cost of $78 million, or $15 per pound delivered to the GSA depots in the Midwestern United States. This was the first purchase under the Strategic and Critical Minerals Stock Piling Revision Act of 1979, and the first major stockpile acquisition for a number of years. The first cobalt shipment left the Luilu refinery at Kolwezi on August 13 and was shipped from Durban Harbor in the Republic of South Africa on September 25, destined for delivery to Warren, Ohio. Despite this sale, it was estimated that stocks of Zairian cobalt held in that country and in Belgium had reached 33 million pounds by yearend, and the local production rate was deliberately reduced.

During the first 8 months of 1981, Zairian railroad exports via Zambia and the Republic of South Africa included 139,375 tons of copper, 29,753 tons of zinc, and 65,881 tons of copper concentrate. The returning railcars carried 205,600 tons of imported supplies including 40,394 tons of coke mostly from Zimbabwe's Wankie colliery, 7,178 tons of sulfur for the manufacture of sulfuric acid, 32,705 tons of coal, and 82,585 tons of maize and wheat.

Details of Zaire's 1981 mineral products are shown in table 1, and the apparent exports and imports of mineral commodities are shown tables 2 and 3, respectively.

Zairian and Tanzanian authorities discussed improvements to the TAZARA Railway and to warehouses at the port of Dar es Salaam with the intention of increasing the amount of mineral commodities exported via the barge route across Lake Tanganyika and the meter gauge railway to Dar es Salaam.

Table 1.—Zaire: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Cadmium, smelter	246	186	212	168	[2]230
Cobalt:					
Mine output, metal content[e]	10,200	13,300	15,000	15,500	14,000
Refined	10,215	13,125	14,100	14,700	13,000
Columbium-tantalum concentrate	83	18	32	92	75
Copper:					
Mine output, metal content	481,550	423,800	399,584	459,392	505,000
Blister and leach cathodes	443,000	390,700	370,100	425,745	470,000
Refined	98,708	102,797	103,214	144,161	165,000
Gold[3] troy ounces	80,418	76,077	69,992	39,963	70,000
Iron and steel: Crude steel[e]	30,000	NA	NA	NA	NA
Manganese ore and concentrate	41,019	--	--	16,586	10,000
Monazite concentrate, gross weight	97	77	90	51	50
Silver thousand troy ounces	2,730	4,391	3,892	2,733	3,000
Tin:					
Mine output, metal content	5,073	4,390	3,879	3,000	2,200
Smelter, primary	765	496	458	458	550
Tungsten, mine output, metal content	170	148	112	72	135
Zinc:					
Mine output, metal content	73,000	73,700	68,000	67,000	[2]69,500
Metal, primary, electrolytic	51,049	43,500	43,508	43,800	58,000
NONMETALS					
Cement, hydraulic thousand tons	489	472	450	407	400
Diamond:					
Gem[e] thousand carats	533	640	294	345	350
Industrial[e] do.	10,681	10,603	8,440	9,890	9,650
Total do.	11,214	11,243	8,734	10,235	10,000
Lime	101,155	[e]109,400	[e]115,300	113,600	110,000
Sulfur:					
Byproduct of metallurgy, S content of sulfuric acid produced	30,700	[e]26,700	[e]25,700	24,800	25,000
Sulfuric acid, gross weight	151,423	137,800	135,100	142,700	140,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous thousand tons	[r]239	[r]215	225	287	280
Petroleum:					
Crude thousand 42-gallon barrels	8,255	6,604	7,535	7,500	7,500
Refinery products:					
Gasoline do.	275	279	483	NA	NA
Kerosine and jet fuel do.	142	231	319	NA	NA
Distillate fuel oil do.	320	289	682	NA	NA
Residual fuel oil do.	351	529	1,252	NA	NA
Liquefied petroleum gas do.	15	--	21	NA	NA
Refinery fuel and losses do.	110	125	[4]173	NA	NA
Total do.	1,213	1,453	2,930	NA	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through June 16, 1982.
[2]Reported figure.
[3]Excludes gold recovered from blister copper.
[4]Reportedly includes 75,000 barrels of unfinished oil shipped elsewhere for future refining.

Table 2.—Zaire: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, scrap	35	46	--	United Kingdom 23; Belgium-Luxembourg 16.
Cadmium metal including alloys, all forms	101	118	--	Belgium-Luxembourg 88; Netherlands 30.
Cobalt:				
Oxides and hydroxides	10	--		
Metal including alloys, all forms	4,771	3,973	2,830	Japan 672; West Germany 325.

See footnotes at end of table.

Table 2.—Zaire: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Copper:				
Ore and concentrate	94,864	107,095	--	All to Japan.
Metal including alloys:				
Scrap	--	191	--	Belgium-Luxembourg 133; United Kingdom 36.
Unwrought:[2]				
Blister	266,164	272,733	--	Belgium-Luxembourg 240,812; France 11,722; Italy 3,345
Refined	70,041	154,158	5,003	Brazil 30,287; Italy 27,905; West Germany 20,603.
Semimanufactures	2,471	503	503	
Iron and steel:				
Ore and concentrate	1,114	--		
Metal:				
Scrap	--	20	--	All to Kenya
Semimanufactures: Bars, rods, angles, shapes, sections	--	15	--	All to France.
Lead metal including alloys:				
Scrap	45	--		
Unwrought	27	--		
Manganese ore and concentrate	39,107	41,676	--	Belgium-Luxembourg 33,634; Spain 8,042.
Nickel metal including alloys, semimanufactures	--	1	--	All to Japan.
Silver:				
Ore and concentrate[3] value, thousands	--	$642	--	All to United Kingdom.
Metal, including alloys, unwrought and partly wrought do.	$54	$77	--	Belgium-Luxembourg $69; Switzerland $8.
Tantalum ore and concentrate	--	53	51	Japan 2.
Tin:				
Ore and concentrate	1,923	2,551	--	Belgium-Luxembourg 2,380; Spain 161.
Metal including alloys, unwrought	544	446	--	Belgium-Luxembourg 366; France 60.
Tungsten ore and concentrate	161	157	74	United Kingdom 42; Japan 30.
Zinc metal including alloys, unwrought	[2]30,800	[2]16,100	--	Greece 2,562; Brazil 1,236.
Other:				
Ores and concentrates	39	61	--	Japan 51; West Germany 10.
Ash and residue containing nonferrous metals	467	76	--	All to West Germany.
Base metals including alloys, all forms, n.e.s	51	[4]200	--	Taiwan 56; West Germany 43; Spain 24.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc. value, thousands	--	$22	--	All to Costa Rica.
Dust and powder of precious and semiprecious stones do.	$1,820	$1,521	$628	Japan $860; Spain $19.
Cement	8,172	--		
Diamond:				
Gem, not set or strung value, thousands	$3,109	$101,481	$21	United Kingdom $98,013; Belgium-Luxembourg $2,549.
Industrial do.	$12,729	$11,271	$7,311	West Germany $1,556; Belgium-Luxembourg $1,460; Japan $488.
Gypsum and plasters	--	24	--	All to Italy.
Precious and semiprecious stones excluding diamond:				
Natural value, thousands	[r]$849	$744	$50	United Kingdom $378; Thailand $129; Switzerland $127.
Synthetic do.	$5	$3	--	Sweden $2; Thailand $1.
Stone, sand and gravel: Quartz and quartzite	--	8	--	All to Italy.
Other: Crude	--	[5]2	--	All to Belgium-Luxembourg.
MINERAL FUELS AND RELATED MATERIALS				
Coal: Anthracite and bituminous	18,287	--		
Petroleum:				
Crude thousand 42-gallon barrels	1,514	9,594	4,462	Finland 4,751; Canada 201.

See footnotes at end of table.

Table 2.—Zaire: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products:				
Residual fuel oil thousand 42-gallon barrels	431	1,152	--	Thailand 303; Hong Kong 234; Italy 212.
Other:				
Liquefied petroleum gas 42-gallon barrels	23	--		
Mineral jelly and wax ---do---	--	8	--	All to United Kingdom.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	--	15	--	All to Taiwan.

[r]Revised.
[1]Owing to the lack of available official trade data published by Zaire, this table should not be taken as a complete presentation of this country's mineral exports. These data have been compiled from various sources which include United Nations information and data published by the trading partner countries. Unless otherwise specified, data are compiled from trade statistics of individual trading partners.
[2]Source: World Metal Statistics, published by the World Bureau of Metal Statistics, London, United Kingdom, March 1981.
[3]May include waste and sweepings.
[4]Excludes exports to Australia valued at $157,000.
[5]Excludes exports to Canada valued at $106,000.

Table 3.—Zaire: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	42	77	--	United Kingdom 75.
Metal including alloys, semimanufactures	626	801	--	Belgium-Luxembourg 343; Hong Kong 198; Kenya 102.
Cadmium metal including alloys, all forms	NA	40	--	All from West Germany.
Copper metal including alloys, semimanufactures	154	31	1	Belgium-Luxembourg 20; Italy 5.
Iron and steel:				
Scrap	43	--		
Pig iron, cast iron, spiegeleisen	97	84	--	France 79.
Ferroalloys	117	299	--	Italy 165; West Germany 108.
Steel, primary forms	--	3,000	--	All from Belgium-Luxembourg.
Semimanufactures:				
Bars, rods, angles, shapes, sections	11,105	13,400	192	Belgium-Luxembourg 8,755; West Germany 2,539.
Universals, plates, sheets	23,758	25,582	421	Japan 12,940; Belgium-Luxembourg 9,973.
Hoop and strip	757	1,452	--	Belgium-Luxembourg 1,015; West Germany 348.
Rails and accessories	2,325	2,632	--	Belgium-Luxembourg 2,292; France 338.
Wire	577	919	11	Belgium-Luxembourg 817; West Germany 40; Italy 27.
Tubes, pipes, fittings	5,817	12,715	1,298	Belgium-Luxembourg 4,411; Italy 2,139; West Germany 2,053.
Castings and forgings, rough	428	3,253	--	Italy 3,167; Belgium-Luxembourg 82.
Lead:				
Oxides and hydroxides	46	112	--	Belgium-Luxembourg 92; France 20.
Metal including alloys:				
Unwrought	433	[2]53	--	West Germany 49.
Semimanufactures	20	[3]15	--	All from Belgium-Luxembourg.
Magnesium metal including alloys, semimanufactures	5	--		
Manganese:				
Ore and concentrate	--	444	442	France 2.
Oxides	103	--		
Mercury 76-pound flasks	--	29	--	All from Belgium-Luxembourg.
Nickel:				
Matte and speiss	--	10	--	Do.
Metal including alloys, unwrought	1	12	--	Do.

See footnotes at end of table.

Table 3.—Zaire: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$7	--		
Silver metal including alloys, unwrought and partly wrought ---do---	$98	$695	$1	Belgium-Luxembourg $524; Switzerland $162.
Tin metal including alloys, all forms	1	1	--	Mainly from Belgium-Luxembourg.
Titanium oxides	4	18	--	United Kingdom 13; Italy 5.
Zinc:				
Oxides and peroxides	20	10	1	Italy 5; Belgium-Luxembourg 3.
Metal including alloys, semimanufactures	21	77	7	United Kingdom 51; Belgium-Luxembourg 18.
Other:				
Ores and concentrates	--	1	--	All from Belgium-Luxembourg.
Oxides, hydroxides, peroxides	--	15	--	Sweden 9; Belgium-Luxembourg 5.
Metalloids	251	169	--	All from France.
Base metals including alloys, all forms	2	28	9	Belgium-Luxembourg 18.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	7	3	--	Netherlands 2; Belgium-Luxembourg 1.
Dust and powder of precious and semiprecious stones value, thousands	$2	--		
Grinding and polishing wheels and stones	56	72	([4])	Italy 31; Belgium-Luxembourg 23.
Asbestos, crude	554	1,135	--	Canada 1,124.
Barite and witherite	2,500	3,088	3,085	Kenya 3.
Boron materials, oxides and acids	--	1	--	All from Belgium-Luxembourg.
Cement	1,282	1,807	--	Belgium-Luxembourg 1,537; Kenya 193; France 61.
Chalk	175	147	--	Israel 135; Kenya 9.
Clays and clay products:				
Crude:				
Bentonite	272	666	666	
Other	12	400	349	West Germany 25; France 20.
Products:				
Nonrefractory	2,645	[5]1,672	--	Italy 872; Spain 462; West Germany 98.
Refractory including nonclay brick	2,695	707	--	Austria 308; Belgium-Luxembourg 140; United Kingdom 9.
Diamond:				
Gem, not set or strung value, thousands	$5	$1,570	--	Belgium-Luxembourg $1,558.
Industrial ---do---	$3	$1	--	All from Belgium-Luxembourg.
Diatomite and other infusorial earth	91	230	--	France 204; Kenya 22.
Feldspar and fluorspar	440	315	--	Spain 165; United Kingdom 150.
Fertilizer materials:				
Crude, phosphatic	151	100	--	All from Belgium-Luxembourg.
Manufactured:				
Nitrogenous	6,586	20,210	--	France 15,503; Belgium-Luxembourg 2,023.
Phosphatic	5	539	--	Israel 494.
Potassic	484	1,032	--	All from Belgium-Luxembourg.
Other including mixed	5,135	6,971	--	West Germany 5,560; Netherlands 661; Portugal 500.
Ammonia	124	195	--	Belgium-Luxembourg 138; West Germany 32.
Gypsum and plasters	4,761	10,156	--	Spain 5,068; Morocco 5,000.
Lime	1,661	1,921	--	All from Belgium-Luxembourg.
Magnesite	120	[6]4	--	Belgium-Luxembourg 3; West Germany 1.
Mica, all forms	5	5	--	All from Belgium-Luxembourg.
Pigment, mineral: Iron oxides, processed	45	78	--	Belgium-Luxembourg 47; West Germany 17.
Precious and semiprecious stones excluding diamond: Natural value, thousands	--	$25	--	All from Switzerland.
Salt and brine	[r]3,229	2,282	--	Portugal 1,485; West Germany 540; United Kingdom 170.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	11	69	--	Belgium-Luxembourg 61.
Caustic soda	4,122	5,731	89	Belgium-Luxembourg 2,893; Spain 1,046; West Germany 977.
Soda ash	851	1,846	--	France 1,430; Belgium-Luxembourg 336.

See footnotes at end of table.

Table 3.—Zaire: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	--	68	--	Italy 63.
Worked	164	116	--	Italy 97; France 14.
Dolomite, chiefly refractory grade	--	22	--	West Germany 20.
Gravel and crushed rock	--	16	--	Italy 13.
Quartz and quartzite	2	--		
Sand excluding metal-bearing	33	--		
Sulfur:				
Elemental, other than colloidal	30	345	--	Belgium-Luxembourg 293; West Germany 45.
Sulfuric acid, oleum	135	326	198	Belgium-Luxembourg 75; Netherlands 39.
Talc	131	21	--	All from West Germany.
Other:				
Crude	25	5,567	--	Kenya 5,381; Belgium-Luxembourg 113; West Germany 70.
Halogens	1	--		
Slag, dross, and similar waste, not metal-bearing	--	15	--	All from Italy.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	52	133	--	All from Belgium-Luxembourg.
Carbon black	482	660	--	West Germany 373; United Kingdom 239.
Coal:				
Anthracite and bituminous	89	10	--	All from Belgium-Luxembourg.
Lignite including briquets	52	--		
Coke and semicoke	--	51	--	Belgium-Luxembourg 50.
Hydrogen, helium, rare gases	--	12	--	All from Belgium-Luxembourg.
Petroleum:				
Crude ----- thousand 42-gallon barrels	(7)	NA		
Refinery products:				
Gasoline ----- do	726	377	--	Brazil 207; Netherlands 112; Canada 31.
Kerosine ----- do	1,135	991	--	Brazil 918; Netherlands 39; Kenya 27.
Distillate fuel oil ----- do	1,136	1,436	--	Brazil 1,119; Canada 254.
Residual fuel oil ----- do	10	--		
Lubricants ----- do	167	[8]158	5	France 120; Belgium-Luxembourg 16; Netherlands 15.
Other:				
Liquefied petroleum gas 42-gallon barrels	[r]77	77	--	Kenya 54; France 23.
Mineral jelly and wax ----- do	2,668	3,534	874	Belgium-Luxembourg 858; West Germany 858; France 677.
Nonlubricating oils ----- do	--	750	750	
Petroleum coke ----- do	--	5,929	3,097	Spain 2,832.
Bitumen and other residues ----- do	12,072	152,361	327	Brazil 144,216; Spain 7,260.
Bituminous mixtures ----- do	4,818	3,691	321	Belgium-Luxembourg 2,115; Spain 1,188.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	111	23	--	Belgium-Luxembourg 13; United Kingdom 10.

[r]Revised. NA Not available.

[1]Owing to the lack of available official trade data published by Zaire, this table should not be taken as a complete presentation of mineral imports of this country. These data have been compiled from various sources which include United Nations information and data published by the trading partner countries. Unless otherwise specified, data are compiled from trade statistics of individual trading partners.

[2]Excludes exports from Japan valued at $3,000.

[3]Excludes exports from Japan valued at $1,000.

[4]Less than 1/2 unit.

[5]Excludes portion of exports from Japan valued at $4,000.

[6]Excludes exports from Canada valued at $9,000.

[7]The reported quantity of exports from Saudi Arabia valued at $23,549,000.

[8]Excludes exports from Japan valued at $62,000.

COMMODITY REVIEW

METALS

Copper, Cobalt, Zinc, and Associated Metals (Shaba region).—Gécamines production of copper increased to near-record quantities in 1981. The rate of cobalt production during the first half year was also high but was deliberately curtailed later in response to the large accumulations of cobalt stocks in Zaire, Zambia and Belgium. Gécamines' receipts of foreign exchange remittances from Sozacom were intermittent and insufficient to purchase vitally needed supplies, spare parts, and replacement equipment. At the best of times, Gécamines was allocated only 45% of the foreign exchange earned by the sale of its products by Sozacom. The Bank Commerciale du Zaire in Kinshasa received 45%, and 10% was slated directly to the Zairian Government to be applied on repayment of foreign loans. The Government reportedly levied an export tax on Gécamines products without regard to prevailing metal prices or company profitability.[2]

Sozacom announced a reduction in the price of cobalt from $25 to $20 per pound on March 2 and a further drop to $17.26 per pound in September. This price continued to be listed by both Zairian and Zambian producers through the yearend despite the GSA stockpile sale and some smaller transactions at much lower spot prices.

Completion of Gécamines' flash smelter and extensions to the Luilu refinery were put forward until 1983 when commissioning of the converters will allow power from Inga to be used in the Zairian mining centers.

Gécamines short-term planning called for the purchase of at least two new 25-cubic-yard diesel-electric shovels to speed up open pit mining and the installation of trolley-assist systems to allow the use of electric power for the 100- and 150-ton diesel-powered haulage trucks. Such systems have been tested at several South African mines and have resulted in higher speeds on steep slopes out of the mine pits, as well as substantial savings of scarce diesel fuel.

Resumption of construction work at the property held by Société Minière de Tenke-Fungurume was tentatively set for late 1982 by Compagnie Générale des Matieres Nucleaires (Cogema), an operating subsidiary of the French Bureau de Recherches Géologiques et Minières (BRGM). Cogema's holding of 26.5% originally belonged to the U.S. Amoco Minerals Co. (Standard Oil Co., Indiana). BRGM's holdings were 8.5%, with Anglo American Corp. and its Chartered Consolidated associate holding 28%, and the Zaire Government 20%. Cogema completed a feasibility study and was revising plans for the project during 1981. Startup in 1982 or 1983 at the rate of 55,000 tons of copper per year was to depend on the state of the Western economy. A substantial dependence on Gécamines smelting and refining capacity was a major factor in 1981 planning.

Sodimiza increased production of higher grade ore from its Kinsenda Mine and diminished the proportion of lower grade ore from its Musoshi Mine to the Musoshi concentrator. As a result, the 87,377 tons of concentrate contained 40.35% copper metal. Sodimiza's staff increased from 3,019 to 3,304 African and from 86 to 113 Japanese employees since 1980 because of increased production at the Kinsenda Mine. Despite the high freight cost, Sodimiza's concentrate continued to be railed through neighboring Zambia and Zimbabwe to the South African port of East London for shipment to Japan. Details of Zaire's copper production are shown in table 4.

Table 4.—Zaire: Details of 1980 copper production, by area

(Thousand metric tons)

Area	Ore	Concentrate	Copper content
MINE[1]			
Western Group:			
Open pits	7,482	--	352.1
Kamoto UG	3,050	--	127.7
Central Group:			
Open pits	1,129	--	40.7
Kambove UG	1,559	--	47.9
Kipushi UG[2]	1,461	--	66.5
Sodimiza UG	1,305	--	36.0
Total	15,986	--	670.9
CONCENTRATOR			
Western Group:			
Mutoshi	2,536	50	14.6
Kamoto	4,217	439	162.2
Dima	1,325	218	62.2
Kolwezi	4,201	655	147.6
Central Group:			
Kambove	1,511	92	41.0
Kakanda	786	100	23.6
Kipushi[2]	1,456	189	54.0
Sodimiza	1,305	93	34.3
Total	17,337	1,836	539.5

UG Underground.
[1]Gross weight.
[2]The Kipushi ore also contained 103,500 tons of zinc, and the Kipushi concentrator produced 123,000 tons of zinc concentrate containing 67,000 tons of zinc.

Metallurgie Hoboken-Overpelt S.A. of Belgium, one of the world's largest refiners of nonferrous metals, indicated that its output of 30 tons of germanium per year was derived from Zairian raw material. In the past, much of Zaire's germanium production came from its rich and unique copper-zinc ore body at Kipushi where a germanium-rich bornite mineral, renierite, was recovered by selective mining and magnetic separation for many years. Additional germanium-rich material was included in the flue dusts from the Lubumbashi smelter and from residues from the Metalkat zinc smelter-refinery north of Kolwezi. Gécamines has not reported the recovery of germanium since 1975.

Sozacom reportedly sold a record 90,000 tons of Gécamines' zinc during 1981, including 42,000 tons from stockpiled material. Sozacom also negotiated a preferential rate for shipping 5,000 tons of zinc per month through the Republic of South Africa.

Gold.—Zaire's major gold producer continued to be the state agency Offices des Mines d'Or de Kilo-Moto (OKIMO), which operated a number of mines in the remote Haute-Zaire region near the Ugandan and Sudanese borders in northeastern Zaire. OKIMO's plans to rehabilitate its gold processing plant failed to materialize in 1981, and both the company and the Zairian Ministry of Mines were seeking outside investors to finance improvements. Clandestine gold mining and smuggling to neighboring countries were reported to have increased during 1981. OKIMO remained the only legal exporter of gold in the Haute-Zaire region. Its Kilo Mines near Bunia produced 500 to 900 troy ounces of gold per month, and the Moto operations at Watsa had an output of 2,300 to 2,700 troy ounces per month. All production was flown to Kinshasa for export. The tankhouse slimes from Gécamines cobalt-copper refineries at Likasi and Kolwezi continued to be the source of about 3,500 troy ounces of gold per year. The alluvial deposits worked by the Société Minière et Industrielle (Sominki) in the Kivu region for tin, tungsten, and tantalum minerals accounted for 15,000 troy ounces.

Manganese.—Société Minière de Kisenge (SMK), a state-owned company, operated several manganese mines near the railroad west of Kolwezi until traffic was stopped by the Angolan war of independence in 1975. Most of the stockpile of 500,000 tons of crushed carbonate ore and 700,000 tons of uncrushed ore was mined before the railway was closed. In 1980 and again in 1981, SMK shipped a total of about 10,000 tons of manganese ore on the Benguela Railroad to Angola's Lobito Bay Port on the Atlantic Ocean. The South African Manganese Amcor Ltd. approached SMK with an offer to buy up to 100,000 tons per year of Zaire's low-iron ore to blend with its own high-iron product to make a better feedstock for the production of ferromanganese. Attempts to ship manganese on southbound trains were frustrated by the demand for cars to carry the more valuable copper metal and concentrate.

Tin, Tungsten, and Columbium-Tantalum.—Société Zairetain, 50% state-owned, and 50% owned and managed by Geomines Cie., a privately owned Belgian company, continued to produce cassiterite (tin oxide) concentrates from several open pit mines near Manono. The concentrates were smelted into tin metal and tantaliferous slag at the company's Manono foundry. Zairetain and the Zairian Government have also discussed options for financing and exploiting the lithium minerals occurring with the cassiterite.

Enterprises Minière du Zaire (EMZ) was a successor to the Sermikat Pilolet Group, which operated the Mitwaba, Bukena, Kibambo, and Mkoy tin mines south of Manono prior to 1960. EMZ studied the feasibility of reopening the mines and engaged a British engineering firm, Guest, Keen, and Nettlefolds Ltd., to rehabilitate the mines, install new mining equipment, build an airstrip and transportation facilities, train staff, and operate a tin industry at about three times the rate of Zairetain's Manono operation. The EMZ properties were reported to contain wolframite as well as cassiterite.

Compagnie Française des Mines, a French Government mining company owned 69% by BRGM, was reported to have invested $14.3 million into opening up the Kania open pit tin mine south-southwest of Manono in the eastern Shaba region and was slated to produce 500 tons of tin per year starting in 1982.

Sominki, 28% Government-owned, operated one lode deposit and a number of alluvial mines in the Kivu region and continued to be Zaire's leading producer of tin and tungsten concentrates.

The U.S. company Metallurg, a major consumer of columbium (niobium), agreed to participate in 70% of a French-Belgian-Zairian consortium, Somikivu. Sominki was to hold 10% and the Zairian Government was to receive a free 20% interest in the company, which was to construct a $2.5 million pilot plant to determine the best method of extracting pyrochlore from the

Lueshe carbonatite. The Lueshe deposit was reported to contain large reserves of the mineral pyrochlore and its feasibility as a mining project was to be established by 1984. Successful pilot testing was to be followed by expenditure of as much as $50 million for a production facility that would rank as one of the world's top three sources of columbium.

NONMETALS

Diamond.—Zaire's chief producer of industrial diamonds was the Société Minière de Bakwanga (MIBA), managed and 20% owned by the Société Générale de Belgique and the Oppenheimer Group. MIBA negotiated financial backing from the International Bank for Research Development to be used for altering and expanding its concentrating facility. Additional mining equipment was needed to mine the hard kimberlite ore underlying the nearly depleted decomposed eluvial and alluvial ore.

In May, President Mobutu authorized Sozacom to commence marketing Zaire's diamond output, and on May 29, 620,000 carats of industrial diamonds were sold to Antwerp and London dealers for $6.7 million. On August 20, Meltax and Britmond/Central Selling Organization (CSO) were given 48 hours to close their diamond-buying stations in the Tshikapa vicinity and to leave the area. This broke the monopoly on the sale of Zaire's diamonds held since 1967 by Britmond-Zaire, a subsidiary of De Beers CSO, by which Britmond-Zaire received commissions of 20% including costs during 1980. Since August, records indicate that Sozacom sold more than 3.5 million carats of MIBA diamonds for under $31.3 million at prices descending from $10.81 to $7.68 per carat. Also sold were 38,277 carats of gem diamonds from Tshikapa at rates varying from $187.60 to $100 per carat.

MINERAL FUELS

Petroleum.—Crude oil production from Zaire's maritime zone increased from 18,098 barrels per day in the second quarter, to 22,568 barrels per day for September to November. Total production was estimated at 7.4 million barrels for 1981 compared with 6.5 million barrels in 1980. Most of the production came from Gulf Oil's offshore wells, but an increasing percentage was derived from wells on the Mibale structure drilled by Moanada Oil Co., a subsidiary of Cometra Oil Co. Drilling of an additional offshore well was scheduled for late December. Esso-Zaire, an affiliate of the U.S. Exxon Oil Co., completed an onshore well at Mbandaka in the Equateur region and was drilling a second near Lokolama in the Bandundu region. The company was reportedly considering seismic exploration as well as drilling in 1982-83.

The Zairian-Italian Refining Co. completed and was testing its new plant for desalinization of crude petroleum from Zaire's offshore wells so that it might be blended with lighter imported crudes and processed through the refinery at Banana. Zaire's offshore field was operated by Zaire Gulf Oil, owned 50% by U.S. Gulf Oil, 32% by a subsidiary of Teikoku Oil Co. of Japan, and 18% by the Zairian firm Soliza.

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[1]Physical scientist, Division of Foreign Data.

[2]Mining Journal (London). Zaire—Problems Aplenty for Gécamines. V. 297, Nov. 13, 1981, pp. 367-368.

The Mineral Industry of Zambia

By Thomas Glover[1]

The mineral industry of the Republic of Zambia provided more than 95% of the country's foreign exchange credit and supported its position as the world's fifth largest producer of copper and the second largest in mine output of cobalt in 1981. Owing to many problems existing in the Zambian transportation network, transportation charges continue to be a large part of the cost of delivering copper and cobalt metal to world markets. The Benguela Railway line from Zambia thru Angola has been closed since 1975, and investment for the needed repair will be extremely high. Steps have been taken to reorganize the Tanzania-Zambia Railway (Tazara), making it possible to correct the deficit financial situation of the railway. Tazara purchased 12 new locomotives from China to add to its present stock of 97 locomotives. Cargo traffic between Dar es Salaam and Zambia has dropped 16% from that carried in 1980. The Zimbabwe route is now a significant one in the haulage of international traffic for imports and exports. This new routing has arisen because a large percentage of cargo comes from the Republic of South Africa and has the advantage of lower freight costs. Zambian miners, however, prefer to export their products through the port of Dar es Salaam rather than the South African port of East London.

The long-awaited feasibility study into the electrification of Zambia Railways has commenced. If electrification proves to be feasible, it would result in a substantial saving of foreign exchange that was being spent on importing diesel fuel for locomotives. The study, being financed under the World Bank Railway Project, will be completed in 1982.

Zambia submitted a request for financial assistance of approximately $54 million under the new mineral support scheme of the European Economic Community's Lome II Convention. The mineral support scheme aims at helping countries with short-term financial difficulties to maintain their production of certain strategic minerals. The scheme covers copper, cobalt, phosphates, manganese, bauxite, alumina, tin, and iron ore. The agreement started in 1981 and runs until 1985.

The International Monetary Fund (IMF) agreed in principle to loan Zambia approximately $800 million[2] to boost the country's troubled economy. The conditions and obligations were being negotiated.

The U.S. Export-Import Bank guaranteed a private loan of $20.5 million to Nchanga Consolidated Copper Mines, Ltd., (NCCM) to buy heavy mining equipment from the United States. In addition, the company secured two additional loans of $22.53 million each to recover copper from tailings at its Chingola Division. The two loans are a part of the $185.4 million necessary for the work on the tailings.

Zambia Industrial Mining Corp. Ltd. received a loan of $1.14 million from Romania for a second-stage development of the Mokambo copper mines near Mufulira. The work began in 1981 and was scheduled to be completed in 1982.

Zambia's two giant copper mining companies, NCCM and Roan Consolidated Mines Ltd. (RCM), will merge in early 1982 to form one company, Zambia Consolidated Copper Mines. The Zambian state holds 60% of the shares in each of the mines. The merger was aimed at rationalizing the operations of the mining industry in view of the world recession and the problems the industry has been experiencing.

PRODUCTION AND TRADE

Zambia's production of copper decreased 1% during 1981, while production of cobalt increased 20%. The grade of underground ore delivered to the mill from NCCM was 1.47% total copper and 0.097% cobalt compared with the open pit ore, which graded 2.37% copper. RCM discontinued production of leach cathode as a salable product in 1981 and is now reprocessing it to refined cathode. An acid plant is to be constructed at Chambishi to handle effluent gases from the RCM Chambishi leach-plant roasters. The new plant will enable the company to become self-sufficient in its requirements for sulfuric acid, which is presently purchased from NCCM. Table 1 shows details of Zambia's mineral production.

The economic importance of the mining sector is paramount, contributing approximately 20% of gross domestic product, one-third of Government revenues, and the bulk of foreign currency earnings. Rising fuel prices and wages, double-digit inflation, and delays in obtaining spare parts and new equipment have occurred at a time when international prices for copper have stagnated. Sixty-eight percent of the copper exported during 1980 went to five major countries. The countries were, in order of importance, Japan, France, Italy, the United States, and the Federal Republic of Germany. The value of exported copper in 1981 was $1,002 million compared with $1,279 million in 1980.

Zambia has given priority to imports for use in the mining, manufacturing, and construction industries. For the mining sector, this should reduce or eliminate production slowdowns due to delays in obtaining foreign exchange to import essential supplies and equipment.

Table 1.—Zambia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Cadmium metal	4	--	--	1	1
Cobalt:					
Mine output, metal content of concentrate	3,677	3,741	4,280	4,400	4,000
Metal	1,704	2,063	3,176	3,310	2,570
Copper:					
Mine output:					
Total content of ore	819,176	766,561	723,978	760,200	697,000
Recoverable content of concentrate	656,000	642,972	588,334	595,757	588,000
Metal:					
Blister and anodes, Cu content[2]	658,487	653,856	582,082	609,935	560,565
Refined	648,043	627,744	561,940	607,592	560,446
Gold[3] troy ounces	[e]11,250	8,457	7,933	10,576	10,545
Iron ore: Magnetite	[e]100	41	50	378	1,434
Lead:					
Mine output, metal content of ore	13,542	15,853	17,640	[e]13,900	17,152
Metal, smelter and refined[4]	13,109	12,878	12,758	10,047	9,866
Selenium, elemental kilograms	15,974	30,881	19,980	22,704	20,000
Silver[5] thousand troy ounces	[e]1,450	1,069	914	764	714
Tin concentrate, gross weight	3	([6])	1	([6])	([6])
Zinc:					
Mine output, metal content of ore	45,018	50,000	46,600	31,985	40,557
Metal, smelter plus electrolytic	40,114	42,462	38,213	32,686	33,298
NONMETALS					
Cement, hydraulic thousand tons	[e]400	123	200	160	144
Clays, building, not further specified do	NA	NA	[7]72	8,392	28,318
Feldspar	832	334	500	475	452
Fluorspar	[e]10	76	--	--	50
Gem stones:					
Amethyst kilograms	10,252	9,487	4,860	3,360	45,222
Emerald do	91	429	[e]400	--	--
Gypsum	4,634	1,726	138	--	--
Lime, hydraulic and quicklime thousand tons	[e]250	[e]250	250	182	201
Nitrogen: N content of ammonia	[e]20,000	[e]20,000	[e]20,000	19,600	20,000
Pyrite, gross weight	20,501	2,515	3,002	2,600	3,000
Sand, construction	NA	NA	[8]194,955	[8]196,797	276,522
Stone:					
Limestone thousand tons	[e]600	227	416	515	499
Phyllite do	13	10	7	8	4
Miscellaneous, for building	NA	NA	[8]216,136	[8]335,147	302,401

See footnotes at end of table.

Table 1.—Zambia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
NONMETALS —Continued					
Sulfur, elemental basis (produced as sulfuric acid):					
From pyrite	8,385	991	1,234	1,122	5
From copper ores	[e]86,915	108,784	73,903	91,233	90,149
Total	[e]95,300	109,775	75,137	92,355	90,154
Talc	[e]100	[e]100	--	258	921
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous thousand tons	708	1,169	599	569	527
Petroleum refinery products:[e]					
Gasoline thousand 42-gallon barrels	1,597	1,658	1,700	NA	NA
Jet fuel do.	294	360	400	NA	NA
Kerosine do.	167	200	220	NA	NA
Distillate fuel oil do.	2,551	2,686	2,830	NA	NA
Residual fuel oil do.	1,233	1,399	1,400	NA	NA
Other do.	110	152	110	NA	NA
Refinery fuel and losses do.	383	194	128	NA	NA
Total do.	6,335	6,649	6,788	6,800	6,800

[e]Estimated. [p]Preliminary. NA Not available.

[1]Table includes data available through July 28, 1982.

[2]Includes leach cathodes.

[3]Primarily contained in blister copper and refinery muds.

[4]For all practical purposes, Zambian output of crude lead and refined lead are regarded as equal; the latter is reported, and inasmuch as no impure lead is marketable, no attempt had been made to estimate the trivial difference between the two stages of processing.

[5]Refined silver and silver contained in blister copper and refinery muds.

[6]Less than 1/2 unit.

[7]Converted from figure reported in cubic meters; believed to represent only a small part of total output.

[8]Figure for 1979 reported as cubic meters, but that for 1980 reported as metric tons; it is believed that both figures actually represent metric tons.

Table 2.—Zambia: Exports of copper, by type and destination

(Metric tons)

Type and destination	1978	1979	1980
Blister, copper content:			
Japan	4,108	1,189	--
Korea, Republic of	--	6,834	--
Portugal	500	--	--
Spain	998	1,702	--
United Kingdom	--	--	41
United States	7,571	425	--
Yugoslavia	12,427	10,761	3,132
Total	25,604	20,911	3,173
Refined:			
Austria	2,738	450	3,006
Belgium	10,077	19,082	11,882
Brazil	--	11,618	5,897
Canada	--	1,999	--
China	17,503	20,626	15,387
Denmark	301	407	3,846
Egypt	4,325	3,797	3,001
Finland	566	3,454	1,827
France	61,234	86,041	86,574
German Democratic Republic	100	1,002	1,197
Germany, Federal Republic of	50,734	72,980	62,447
Greece	4,386	4,296	11,751
India	34,895	41,576	39,723
Indonesia	--	3,994	4,505
Italy	51,672	56,687	74,293
Japan	133,292	148,788	131,638
Korea, Republic of	--	8,899	--
Netherlands	679	1,833	2,581
Romania	3,999	2,002	1,002
Spain	--	1,998	--
Sweden	18,706	16,153	13,585
Switzerland	2,589	6,977	1,895
Thailand	--	2,852	100
United Kingdom	79,699	71,329	54,869
United States	53,771	23,453	64,526
Yugoslavia	17,852	10,835	15,912
Other	769	2,653	2,764
Total	549,887	625,781	614,208

Table 3.—Zambia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1977	1978	Destinations, 1978	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, semimanufactures ____ kilograms	20	NA		
Cobalt metal including alloys, all forms	1,682	NA		
Copper:				
Ash and residue containing copper	886	NA		
Metal including alloys:				
Scrap	30	NA		
Unwrought	665,553	578,282	53,691	Japan 122,406; West Germany 78,731; United Kingdom 73,962; France 60,287.
Semimanufactures	270	9,514	--	Japan 5,712; Yugoslavia 3,431; Kenya 266.
Iron and steel metal:				
Ferroalloys: Ferrosilicon	12	--		
Steel, primary forms ____ value	$196	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	--	29	--	All to Zaire.
Universals, plates, sheets	2	--		
Wire	12	--		
Tubes, pipes, fittings	1	35	--	Malawi 34; Zaire 1.
Lead:				
Oxides and hydroxides	117	219	--	Kenya 134; Malawi 72; Zaire 12.
Metal including alloys:				
Scrap	155	279	--	Republic of South Africa 234; United Kingdom 41; Tanzania 4.
Unwrought	11,673	6,649	--	Italy 2,655; India 1,400; Republic of South Africa 984.
Semimanufactures	--	8	--	All to Tanzania.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	32	(1)	--	All to United Kingdom.
Silver: Waste and sweepings[2] value, thousands	$76	$12	--	United Kingdom $11.
Tin metal including alloys, semimanufactures	--	1	--	All to Tanzania.
Zinc metal including alloys, unwrought	36,470	35,437	3,609	India 7,803; Kenya 4,765; United Kingdom 3,439; Yugoslavia 2,601.
Other:				
Metalloids ____ kilograms	260	--		
Metal including alloys:				
Scrap	--	1,310	3	United Kingdom 420; Belgium-Luxembourg 237; Switzerland 178; Japan 164.
Unwrought and semimanufactures	--	1,794	871	United Kingdom 737; U.S.S.R. 107; China 79.
NONMETALS				
Cement	38,824	35,627	--	Tanzania 11,874; Burundi 8,321; Malawi 8,313; Zaire 6,548.
Clays and clay products: Nonrefractory clay products ____ value	$177	NA		
Diamond: Industrial ____ carats	270,000	NA		
Fertilizer materials:				
Manufactured: Nitrogenous	224	314	--	Zaire 264; Malawi 50.
Ammonia	18	NA		
Lime	4,108	504	--	Malawi 491; Zaire 13.
Precious and semiprecious stones other than diamond:				
Natural ____ value, thousands	$1,667	$650	--	Hong Kong $431; Denmark $147; United Kingdom $46.
Synthetic ____ do	$63	$1	--	All to Egypt.
Salt and brine ____ kilograms	110	NA		
Stone, sand and gravel:				
Dimension stone: Crude and partly worked	8	NA		
Gravel and crushed rock	44,716	11,860	--	All to Zaire.
Sulfur: Sulfuric acid	22,349	12,640	--	Zaire 12,319; Angola 297; Malawi 23.
Other: Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	1	NA		

See footnotes at end of table.

Table 3.—Zambia: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	Destinations, 1978	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	11,283	--	Malawi 8,301; Zaire 2,981.
Coal, all grades including briquets	675	--		
Petroleum refinery products:				
Gasoline, 42-gallon barrels	6,420	2,270	--	All to Zaire.
Kerosine and jet fuel, do.	31,626	1,240	--	Do.
Distillate fuel oil, do.	19,477	4,013	--	Do.
Lubricants, do.	166	567	--	Zaire 560; Malawi 7.
Other:				
Liquefied petroleum gas, do.	4,164	3,400	--	Malawi 3,213; Zaire 187.
Bitumen and bituminous mixtures, do.	8,329	3,000	--	Malawi 2,521; Zaire 424; Tanzania 55.

NA Not available.
[1]Unreported quantity valued at $45,000.
[2]May include other precious metals.

Table 4.—Zambia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1977	1978	Sources, 1978	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides[1]	14	16	--	France 14; Belgium-Luxembourg 2.
Metal including alloys, semimanufactures	759	923	(2)	United Kingdom 289; Norway 176; Sweden 168.
Antimony:				
Ore and concentrate	35	NA		
Elemental: Powder	35	NA		
Arsenic: Oxide, pentoxide, acid	50	NA		
Chromium: Oxides and hydroxides	18	NA		
Cobalt metal including alloys, all forms	6	NA		
Copper:				
Ore and concentrate, value	$43	NA		
Matte and speiss, do.	$472	NA		
Metal including alloys:				
Unwrought	20	2	--	All from United Kingdom.
Semimanufactures	346	430	1	United Kingdom 228; Belgium-Luxembourg 58; Israel 39.
Gold metal including alloys, unwrought and partly wrought, troy ounces	63	NA		
Iron and steel:				
Ore and concentrate	234	--		
Metal:				
Pig iron, cast iron, powder, shot	235	133	--	United Kingdom 126; Republic of South Africa 7.
Ferroalloys	709	8,569	2	Indonesia 8,000; Republic of South Africa 390; United Kingdom 177.
Steel, primary forms	1,075	92	--	Republic of South Africa 90; United Kingdom 2.
Semimanufactures:				
Bars, rods, angles, shapes, sections	23,569	11,300	39	Republic of South Africa 4,866; United Kingdom 2,936; Japan 1,523.
Universals, plates, sheets	20,377	20,213	3	Japan 12,734; United Kingdom 4,123; France 2,054.
Hoop and strip	890	1,031	1	Japan 668; United Kingdom 352.
Rails and accessories	4,394	5,726	--	Republic of South Africa 5,014; India 242; United Kingdom 201.
Wire	6,163	3,171	55	Republic of South Africa 1,049; Belgium-Luxembourg 994; West Germany 224.
Tubes, pipes, fittings	6,132	3,306	99	Japan 905; Sweden 814; United Kingdom 602.
Castings and forgings, rough	17	--		

See footnotes at end of table.

Table 4.—Zambia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	Sources, 1978	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides and hydroxides	4	--		
Metal including alloys:				
Unwrought	4	3	--	All from United Kingdom.
Semimanufactures	34	8	--	United Kingdom 7; Republic of South Africa 1.
Manganese: Oxides and hydroxides	1	8	--	Belgium-Luxembourg 6; Kenya 2.
Nickel metal including alloys, semimanufactures	11	1	--	All from United Kingdom.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	[3]$199	$111	--	United Kingdom $108.
Silver metal including alloys, unwrought and partly wrought do	[4]39	$3	$2	West Germany $1.
Tantalum metal including alloys, all forms	40	NA		
Tin metal including alloys:				
Scrap	7	NA		
Unwrought	14	20	--	United Kingdom 14; Israel 3; Singapore 3.
Semimanufactures	37	9	--	United Kingdom 5; Republic of South Africa 4.
Titanium: Oxides and hydroxides	523	459	--	United Kingdom 169; Spain 155; West Germany 115.
Tungsten metal including alloys, all forms	10	9	--	All from United Kingdom.
Zinc:				
Oxides and hydroxides	140	176	--	United Kingdom 106; West Germany 35; Belgium-Luxembourg 33.
Metal including alloys, semimanufactures	3	(2)	--	All from West Germany.
Other:				
Ores and concentrates	(2)	10	--	All from Italy.
Oxides, hydroxides, peroxides	178	NA		
Metals:				
Alkali, alkaline-earth, rare-earth metals	5	1	--	All from West Germany.
Metalloids	29	23	--	United Kingdom 14; West Germany 8.
Base metals including alloys, all forms	9	42	(2)	United Kingdom 25; China 17.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	--	4	4	
Dust and powder of precious and semiprecious stones value	$9,557	--		
Grinding and polishing wheels and stones	[5]123	NA		
Asbestos, crude	1,234	2,946	--	Republic of South Africa 2,613; Switzerland 333.
Barite and witherite	40	--		
Boron materials: Oxide and acid	4	20	--	Mainly from Kenya.
Cement	961	501	11	United Kingdom 463; West Germany 24.
Chalk	1	51	--	United Kingdom 50.
Clays and clay products:				
Crude	1,819	1,601	394	United Kingdom 852; West Germany 136; India 100; Kenya 100.
Products:				
Nonrefractory value, thousands	$526	$351	--	United Kingdom $161; Spain $97; China $53.
Refractory including nonclay brick do	$6,617	$4,957	$3	United Kingdom $3,510; Canada $787; Austria $171.
Diamond:				
Gem, not set or strung do	$3	--		
Industrial do	$602	$438	--	All from United Kingdom.
Diatomite and other infusorial earth	1,022	123	--	Belgium-Luxembourg 92; Kenya 31.
Fertilizer materials:				
Crude	9	8	--	All from United Kingdom.
Manufactured:				
Nitrogenous	52,318	40,566	19,005	Indonesia 9,233; Netherlands 5,750; Japan 5,576.
Phosphatic	7,321	--		
Potassic	19	--		
Other including mixed	1	5	--	All from United Kingdom.
Ammonia	4	NA		
Graphite, natural	3	NA		
Gypsum and plasters	30	129	--	All from United Kingdom.
Magnesite	1	--		

See footnotes at end of table.

Table 4.—Zambia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	Sources, 1978	
			United States	Other (principal)
NONMETALS —Continued				
Mica: Worked including agglomerated splittings	3	1	--	All from United Kingdom.
Pigments, mineral: Iron oxides, processed	107	90	--	West Germany 65; India 15; United Kingdom 10.
Precious and semiprecious stones other than diamond:				
Natural, value, thousands	$8	$10	--	All from Ireland.
Synthetic, value	$330	--		
Salt and brine	38,316	9,007	--	United Kingdom 5,718; Yemen Arab Republic 1,492; Mozambique 630.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	(2)	2	--	All from United Kingdom.
Caustic soda	3,132	2,076	--	West Germany 507; China 500; United Kingdom 493.
Soda ash	1,550	2,755	--	Kenya 1,330; West Germany 1,302; Mauritius 59.
Stone, sand and gravel:				
Dimension stone: Worked	24	1	--	All from India.
Quartz and quartzite	2	5	--	All from United Kingdom.
Sand excluding metal-bearing, kilograms	358	--		
Sulfur:				
Elemental:				
Other than colloidal	68	51	--	All from United Kingdom.
Colloidal	2,132	22	--	West Germany 15; Belgium-Luxembourg 4; United Kingdom 3.
Oxide, kilograms	14	--		
Sulfuric acid	9	28	--	United Kingdom 26; Italy 2.
Talc, steatite, soapstone, pyrophyllite	36	12	--	All from United Kingdom.
Other:				
Crude	8	--		
Halogens	6	39	--	United Kingdom 21; West Germany 18.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	2	(2)	--	All from United Kingdom.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	86	220	--	China 102; United Kingdom 97; West Germany 1.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,488	807	--	United Kingdom 717; Trinidad and Tobago 72; France 18.
Carbon black	1,586	1,748	--	United Kingdom 582; West Germany 419; India 388.
Coke and semicoke	84,185	99,000	--	All from West Germany.
Gas, hydrocarbon, manufactured	10	7	--	All from United Kingdom.
Hydrogen, helium, rare gases, kilograms	210	NA		
Petroleum and refinery products:				
Crude, thousand 42-gallon barrels	5,953	5,992	--	All from Saudi Arabia.
Refinery products:				
Gasoline, 42-gallon barrels	14,685	33,702	--	Iran 33,252; Iraq 434.
Kerosine and jet fuel, do.	4,354	2,155	--	Republic of South Africa 814; United Kingdom 760; Iran 504.
Residual fuel oil, do.	13	9,744	--	All from Republic of South Africa.
Lubricants, do.	150,208	156,016	938	United Kingdom 61,131; Italy 31,269; Kenya 29,071.
Other:				
Liquefied petroleum gas, do.	77	70	--	Netherlands 58; Belgium-Luxembourg 12.
Mineral jelly and wax, do.	30,982	19,911	(3)	West Germany 6,312; United Kingdom 6,123; Singapore 2,589.
Nonlubricating oils, do.	2,330	NA		
Bitumen and bituminous mixtures, do.	62,155	812	206	United Kingdom 291; Republic of South Africa 248.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	(6)	11	--	All from United Kingdom.

NA Not available.
[1]May include artificial corundum.
[2]Less than 1/2 unit.
[3]Quantity reported at 1,742 troy ounces.
[4]Quantity reported at 2,958 troy ounces.
[5]Excludes unreported quantity valued at $2,896.
[6]Value only reported at $26,772; 1978 quantity valued at $6,000.

COMMODITY REVIEW

METALS

Copper, Cobalt, Byproduct Gold, Selenium, and Silver.—Zambia's two major mining companies treated about 30.5 million tons of ore containing about 700,000 tons of copper. Estimates of ore milled by RCM and NCCM during 1981 and the RCM ore reserve figures as published in the RCM annual report for the year ending March 31, 1981, are shown in table 5. RCM announced several development projects. At Luanshya-Baluba stage 2, the rock winding shaft was equipped, and the cage and skip compartments became operational to full depth by yearend. The foundations for the service shaft winder were completed, and construction of the hoist house and preparations for erection of the headframe are underway. At the Chibuluma Mine extension, design work and specifications for the 688-meter level crusher and pump stations at the new shaft at Chibuluma West were nearing completion with equipment orders placed. At the Chambishi Mine underground expansion, planning and feasibility studies for ore extraction above the 500-meter level at an increased rate of 230,000 tons per month by October 1981 and for continuing production below the 500-meter level were completed and approved. Detailed design for the copper tankhouse expansion at the Chambishi leach plant was completed. A cobalt metal vacuum refining plant is also being constructed at the Chambishi Mine. The recovery of gold and selenium at the RCM Ndola refinery set records in 1980 and continued at the same rate in 1981.

Table 5.—Zambia: Copper production and ore reserves, by company and mine

Company and mine	Ore mined and treated			Ore reserves		
	Gross weight (thousand metric tons)	Copper (percent)	Copper content (metric tons)	Gross weight (thousand metric tons)	Copper (percent)	Cobalt (percent)
Roan Consolidated Mines:[1]						
Mufulira (underground)	5,459	2.10	114,639	109,000	3.10	--
Luanshya (underground)	4,045	1.30	52,585	55,000	2.51	--
Baluba (underground)	1,691	1.70	28,747	59,000	2.54	0.16
Chambishi (underground)	2,080	1.56	32,448	31,000	2.84	--
Chibuluma (underground)	484	2.41	11,664	8,000	3.66	.20
Kalengwa (open pit)[2]	215	2.47	5,311	--	--	--
Total or average	13,974	1.76	245,394	262,000	2.84	.16
Nchanga Consolidated Copper Mines:[3]						
Nkana (underground)	4,757	1.60	76,112	113,433	2.35	.08
Bwana Mkubwa (open pit)	757	2.26	17,108	452,000	3.50	--
Chingola (underground and open pit)	9,016	3.34	301,134	281,089	3.16	--
Konkola (underground)	1,687	2.85	48,080	193,710	3.72	--
Kansanshi (open pit)	307	3.21	9,855	16,658	2.57	--
Total or average	16,524	2.74	452,289	1,056,890	3.31	.01
Grand total or average	30,498	2.29	697,683	1,318,890	3.22	.04

[1]Roan Consolidated Mines Ltd.-1981 Annual Report.
[2]Stockpiled ore was used for Kalengwa mill feed.
[3]Nchanga Consolidated Copper Mines Ltd.-1981 Annual Report.

NCCM estimated ore production of 16.5 million tons was obtained equally from underground mines and open pits. Delays in the delivery of spare parts and lack of skilled and experienced maintenance staff is still causing the deterioration of plants and equipment throughout Zambia's copper belt. Copper prices remained stagnant during 1981. Zambia lowered its price of cobalt from $20 to $17.50 late in 1981. Spot markets for cobalt in the United States went to $15.00 in late 1981. In the Rokana Division, 1981 production was slightly below 1980 production. At the Mindola shaft, a prolonged overhaul of the main underground crusher severely curtailed production from the lower levels. At the central shaft, where stoping mainly depends on drawpoint loading, production was affected by low availability of loaders.

Also in the Rokana Division, copper and cobalt recovery rates improved over those of 1980. In the Chingola Division, at the Nchanga open pit, additional boreholes

were drilled to provide information for planning the future mining of cobalt-bearing ore. Despite shortages of replacement spares, underground development proceeded on schedule. Some old production areas, previously declared exhausted, were reopened successfully and have provided additional ore. In the Konkola Division surface exploration, one borehole was completed on the west limb, in the north ore body area, that intersected ore at 2.66% over a true width of 14 meters at a depth of 1,129 meters. As a result of this hole, there will be an addition to the ore reserves at the No. 3 shaft. Also at the Konkola Division, underground exploration and drilling are underway at both the north and south ore bodies. Silver production for the Broken Hill Division of NCCM totaled approximately 750,000 troy ounces.

Lead, Zinc, and Byproduct Cadmium.—Ore hoisted totaled 217,503 tons at grades of 6.4% lead and 17.7% zinc. Byproduct cadmium output totaled approximately 1 ton. The NCCM Broken Hill Division has conducted exploration programs at both its surface and underground operations yielding only low-grade mineralization to date.

NONMETALS

Cement.—A shortage of bagged cement due to the lack of paper bags became evident in late 1981. The sale of bagged cement was suspended in October 1981. Firms with bulk handling equipment were not affected.

Fertilizer Materials.—Zambia Industrial and Mining Corp. (ZIMCO) has discovered large deposits of high-grade phosphate at Kaluwe, 220 kilometers east of Lusaka, and at Petauke in the Eastern Province. Zambia now imports phosphate for manufacture of compound nitrate fertilizer at Nitrogen Chemicals of Zambia at Kafue, near Lusaka. ZIMCO is expected to start exploitation of the phosphate deposits, which are estimated at over 200 million tons, in the near future. The Zambian Government will soon start mining lime deposits in Chief Mapanza's area in the Southern Province. The lime will be used mainly for improving soil fertility.

Gem Stones (Amethyst and Emerald).—Low-grade amethyst ore was mined by Northern Minerals (Zambia) Ltd. with an alleged theft of gem production affecting 1981 sales. The Government has started mining emeralds through the Reserved Minerals Corp. in Chief Nkana's area of Ndola Rural. Production started during the first part of August 1981. Production figures are being withheld as a security matter.

MINERAL FUELS

Coal.—Production at Maamba Collieries in the Southern Province is set for a major boost following the installation of new machinery under a multimillion-dollar loan from the Africa Development Bank and the Federal Republic of Germany. The Zambian Geological Survey has recently discovered a major coal belt near Kafue National Park.

A consortium of Canadian companies will spend approximately $30 million in a 4-year oil prospecting venture that starts in the Western Province in 1982.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, Zambian kwachas (K) have been converted to U.S. dollars at the rate of 1K = US$1.1466.

The Mineral Industry of Zimbabwe

By George A. Morgan[1]

The mineral industry in Zimbabwe was in broad decline throughout 1981. Production of most commodities was below previous levels. Production of gold, the second largest foreign exchange earner after tobacco, was relatively unchanged.

The industry was adversely affected by the post-Civil War and the world recessions. Other important factors contributing to the sector's downturn were increased costs, higher Government expenditures leading to tax increases, producer and investor uncertainty regarding legislation affecting marketing and production of minerals, loss of skilled personnel, and a decline in labor skills and management.

On a world scale, the major portion of minerals produced in Zimbabwe was mined from low-grade deposits with low volume of output. Previous success of the industry has been attributed to relatively low costs, including wage costs. The implementation of minimum wage levels throughout the mining sector was directly responsible for the closure of numerous small mines in the Hartley and Gatooma districts, affecting about 2,000 workers. Several mines were granted exemptions from the minimum wage provision pending investigation into their viability, but all exemptions were suspended in September. At yearend, a second higher minimum wage level was imposed. Small workers employed about 9,000 miners and were most affected by the legislation. Higher wages actually led to a fall in productivity at some workings. The Government considered taking over some mines most affected by the new wage level in order to maintain employment.

The country's two mine labor unions merged. Wildcat strikes occurred at a number of mines owing to an erosion of labor union control and external interference. The mining industry's labor force was officially reported at about 71,000. Approximately 20,000 Zimbabweans employed in the Republic of South Africa, many of them miners, were being repatriated. Planned expansion in Zimbabwe's mining sector was not sufficient to absorb them.

The Central Government Budget Account for 1981-82 allocated $5.7 million for the mining sector out of a total budget of $2,306 million.[2] Other sectors share of the budget were defense, 17%; education and culture, 16%; agriculture, 4.7%; and transportation, 3.4%. The gross national product in 1980 was $7.5 billion. A 3-year Interim Development Plan for the period 1981-84 was underway. The gross domestic product was expected to rise 8% per year; the mining sector, 8%; agriculture, 12%; and manufacturing, 11%. Wage increases from 35% in industry to 130% in commercial agriculture were to take place over a period of 3 years. The consumer price index for high-income and low-income groups increased 14.2% and 11.5%, respectively, in the period through November 1981. Foreign currency allocations came under tighter control because of the decline in mineral sector exports and continued high spending for imports. Only export-oriented firms could qualify for foreign currency allocations. In addition, allocations for the first quarter of 1982 were cut 12%.

A deficit of $433.8 million was estimated for 1981-82. The higher level of Government spending was to be paid for by a 30% increase in tax revenue. Tax measures that had an effect on mining in Zimbabwe were a 20% tax on local and foreign dividends, a capital gains tax of 30% on immovable property and marketable securities, a re-

duction in the percentage deduction of initial capital expenditures from 100% to 30% for tax purposes, a surcharge of 5% on customs duties, and an increase in sales taxes. Being considered was a proposal for the abolition of the 5% depletion allowance.

Exploration permits were granted to Shell Union Co. of Central Africa Ltd. and Cluff Mineral Exploration (Zimbabwe) Ltd. Targets included copper, lead, zinc, nickel, tungsten, gold, and molybdenum. Union Carbide Corp. began a gold exploration program and had applied for an Exclusive Prospecting Order to search for uranium and tungsten in the Zambezi Valley. It was reported that several companies had cut exploration expenditures by 50%.

Government Policies and Programs.—The creation of a Minerals Marketing Corp. (MMC) by the Government of Zimbabwe appeared likely at yearend 1981. MMC was to consist of a board of 5 to 10 members with responsibility for determining if, when, and to whom all minerals and mineral products, excluding gold and iron and steel, could be sold. It would be permitted to set stockpile levels and to withhold payment received from sales of minerals for a period of 30 days. It would also be able to seek an equity position in both new ventures and existing mining enterprises. All sales of gold were made by the Reserve Bank of Zimbabwe, and iron and steel was included under the Ministry of Industry. Several companies postponed decisions to start up new mining projects, including a primary platinum-group metal mine, pending the outcome of the new legislation.

Effective December 1981, new borrowing regulations were placed on private companies. A company must have over 85% local shareholder participation to be free of any limits on borrowing. In addition, no single shareholder who was the major shareholder may own 10% or more of the company. Previously, companies with over 50% local shareholder participation were free to borrow. The Government was expected to acquire shares in a number of mines in 1982.

PRODUCTION

The index of volume of production of minerals fell for the fifth consecutive year to 166.8 from a high of 205.8 in 1976 (1964=100). The value of crude minerals produced was estimated at $532 million compared with $614 million in 1980. This was the first decline in value of mineral production recorded from statistics available since 1964. Although the mineral raw materials sector was in general recession, the manufacturing sector continued to expand processing of mineral-related products. In the period from January to October 1981, the index of volume of production of nonmetallic mineral products was 270 (1964=100) compared with 225.8 in 1980, and the index for metals and metal products was 328 compared with 307.9. The chemical and petroleum products index of volume of production was 282, up from 234.7 in 1980. The Government has encouraged mining companies to process and upgrade their commodity to a finished product. This policy was aimed at increasing the value added and reducing the demand for imports, but also to reduce the burden on the country's transport system. No special incentives have been offered to the industry despite the encouragement.

Table 1.—Zimbabwe: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS					
Aluminum: Bauxite, gross weight	3,276	4,818	5,076	4,281	5,139
Antimony, mine output, metal content	551	121	158	150	263
Arsenic, white	201	129	--	79	21
Beryllium: Beryl concentrate, gross weight	103	35	28	9	42
Cesium minerals: Pollucite	--	--	--	88	100
Chromium: Chromite, gross weight thousand tons	677	478	542	554	536

See footnotes at end of table.

Table 1.—Zimbabwe: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
METALS —Continued					
Cobalt:					
Mine output, recoverable metal content[e]	NA	17	210	120	100
Metal (including content of refinery sludges)	--	17	204	115	94
Columbium-tantalum minerals, gross weight: Tantalite	30	31	30	41	45
Copper:					
Mine output, metal content	34,767	33,848	[r]29,600	26,921	24,583
Metal:[2]					
Smelter, primary[e]	32,500	32,200	28,500	26,100	23,000
Refinery, primary[e]	3,000	3,000	3,000	3,100	8,000
Gold, mine output, metal content thousand troy ounces	402	399	388	368	371
Iron and steel:					
Iron ore:					
Gross weight thousand tons	1,176	1,123	1,201	1,622	1,096
Metal content[e] do.	706	674	721	973	660
Metal:					
Pig iron[e] do.	310	600	600	600	400
Ferroalloys:[e]					
Ferromanganese	2,400	2,400	2,400	2,400	2,000
Ferrochromium	200,000	200,000	200,000	260,000	209,072
Total	202,400	202,400	202,400	262,400	211,072
Crude steel thousand tons	734	778	740	804	600
Nickel:					
Mine output, metal content	16,671	15,701	14,591	15,075	13,018
Metal, smelter[e 3]	13,000	13,000	13,200	14,100	11,500
Platinum-group metals:					
Platinum troy ounces	--	--	--	2,990	2,300
Palladium do.	--	--	--	6,784	5,200
Total do.	--	--	--	9,774	7,500
Silver, mine output, metal content thousand troy ounces	207	1,109	978	949	857
Tin:					
Mine output, metal content[e]	1,280	1,310	1,340	1,300	1,600
Metal, smelter	920	945	967	934	1,157
Tungsten, concentrate output:					
Gross weight	252	279	224	194	119
Metal content[e]	120	130	110	90	55
NONMETALS					
Abrasives: Natural corundum	4,846	7,366	16,628	18,681	12,202
Asbestos thousand tons	273	249	269	251	248
Barite	2,798	878	449	195	--
Cement, hydraulic thousand tons	492	408	396	[e]400	400
Clays:					
Bentonite (montmorillonite)	58,529	53,319	54,320	69,153	78,403
Fire clay	13,113	12,430	16,745	17,005	14,658
Kaolin	4,543	1,017	2,686	4,450	4,657
Feldspar	896	726	1,085	1,263	2,393
Fluorspar	522	312	--	--	--
Gem stones, precious and semiprecious:[4]					
Amethyst kilograms	6,828	3,491	3,228	4,001	NA
Garnet do.	--	133	2,000	125	NA
Topaz do.	8	2	--	--	NA
Tourmaline do.	523	98	6	5	NA
Graphite	[e]3,000	[e]5,000	5,736	7,385	11,218
Kyanite	6,339	1,835	--	716	870
Lithium minerals, gross weight	8,050	16,688	13,197	21,030	16,444
Magnesite	54,204	65,756	84,495	78,217	60,194
Mica	3,670	2,764	1,275	1,022	1,406
Nitrogen: N content of ammonia[e] thousand tons	70	60	60	60	60
Phosphate rock, marketable concentrate do.	105	107	136	130	122
Pigments, iron oxide[e]	100	100	500	1,000	1,200
Pyrite, gross weight thousand tons	53	56	66	68	65
Quartz[5]	166,208	95,588	143,688	166,407	142,174
Stone: Limestone thousand tons	1,299	1,087	1,057	1,218	1,409
Sulfur:					
S content of pyrite do.	22	24	28	29	25
Byproduct of coal and metallurgy[e] do.	5	5	5	5	5
Total[e] do.	27	29	33	34	30
Talc	1,415	758	1,170	456	386

See footnotes at end of table.

Table 1.—Zimbabwe: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous ---------- thousand tons--	3,029	3,065	3,188	3,134	2,867
Coke, metallurgical[6] ---------- do----	194	179	201	235	200

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through July 7, 1982.

[2]Smelter copper includes impure cathodes produced by electrowinning in nickel processing. Output of fire-refined copper by Messina (Transvaal) Development Corp. apparently was terminated in 1972. Refined copper output from that date to 1980 includes only electrolytic copper output by Corsyn Consolidated Mines at the Inyati Mine. Output in 1981 includes electrolytic copper from the new refinery at Messina.

[3]Includes Ni content of nickel oxide and nickel fonte.

[4]Other gem stones produced in 1981 are as follows, in kilograms: Beryl, 327; chrysoberyl, 2.

[5]Includes rough and ground quartz as well as silica sand. Quartz crystal was also produced in the amount of 3 metric tons in 1979.

[6]Data represent output by the Wankie Colliery for years ending Aug. 31 of that stated; additional output by the Radcliff plant of Risco Ltd. may total 250,000 metric tons per year of metallurgical coke and coke breeze.

TRADE

Comprehensive official trade data covering exports and imports by destination in terms of quantity and value were not available. Only quantity and value of some exported mineral items and major mineral imports by value were available. Other data on trade were provided from industry and press reports and from customs agencies of trading partner countries.

Zimbabwe has maintained a positive trade balance except for 1968. However, reduced revenue from gold sales and high import levels resulted in a negative trade balance in the period through September 1981 of $77.4 million. The export value of minerals and mineral-related products in 1980 was $723.4 million out of a total export value of $1,338.2 million. Gold sales accounted for $170.4 million in 1980. Trade data available through September 1981 indicated a mineral export value of $408 million out of a total export value of $995 million. The value of mineral-related import trade in 1980 was $385.4 million out of a total import value of about $1,200 million. For the period through September 1981, $340.1 million out of $1,074 million was mineral related. Liquid fuels continued to be the largest import item in terms of value.

The Government held talks with China, Hungary, North Korea, and Japan regarding trade agreements. Ferrochrome was the principal mineral commodity of interest in the discussions. The preferential trade agreement with the Republic of South Africa was to expire in March 1982. Discussions were held regarding a continuation of the agreement subject to renegotiation of certain elements.

Exports by rail experienced inefficiencies owing to shortages of workers, engines, and rolling stock. A rail priorities committee made decisions as to the number and destination of rail wagons to be used for exporter needs. Priority was given to exports of commodities earning the highest foreign exchange. At midyear, the country was estimated to be losing $7 million per week because of rail transport inefficiencies. Heavy backlogs of agricultural and iron and steel products occurred. At yearend 1981, the Government banned all strikes by employees of the National Railway of Zimbabwe (NRZ), including trade union action. The provisions of the Emergency Powers Act compelled all employees to place the whole of their time at the disposal of the NRZ. Only about 10% of Zimbabwean trade passed through the Mozambique ports of Beira and Maputo. The remainder was transhipped by rail and exported from ports in the Republic of South Africa. Sabotage of the rail link to Beira disrupted traffic for 3 weeks in November.

Table 2.—Zimbabwe: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Cobalt oxides[2] value, thousands	$3,423	$4,224	--	NA.
Copper metal including alloys, all forms[2]	26,635	22,735	--	NA.
Iron and steel metal:				
Ferroalloys	[2]170,951	[2]257,306	18,260	West Germany 57,804; France 40,602; Japan 19,899.
Steel, primary forms	[2]237,891	[2]305,545	--	Sri Lanka 12,943; Thailand 4,000.
Semimanufactures:				
Bars, rods, angles, shapes, sections	[2]255,397	[2]215,948	--	United Kingdom 8,473; Belgium-Luxembourg 3,875.
Universals, plates, sheets	430	6	6	
Wire[2]	17,773	18,660	--	NA.
Unspecified[2] value, thousands	$19,164	$30,825	--	NA.
Lithium ores[2] do	$1,479	$2,549	--	NA.
Nickel metal including alloys, all forms	[2]13,891	[2]14,449	1,304	West Germany 2,056; France 932; Netherlands 761.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	NA	$40	--	All to West Germany.
Silver:				
Waste and sweepings[3] do	[2]$2,670	[2]$5,159	--	West Germany $520.
Metal including alloys, unwrought and partly wrought do	NA	$83	--	Spain $35; Switzerland $28.
Tantalum ores do	[2]$2,772	[2]$4,214	$362	NA.
Tin metal including alloys, all forms	[2]865	[2]891	68	United Kingdom 50; West Germany 40.
Tungsten ore and concentrate[2] value, thousands	$1,909	$1,856	--	NA.
Other: Ores and concentrates	NA	70	68	West Germany 2.
NONMETALS				
Asbestos, crude	[2]285,021	[2]274,258	1,141	Japan 14,828; Spain 8,344.
Cement[2]	41,595	62,687	--	NA.
Clays, crude	NA	1	1	
Diamond, gem, not set or strung value, thousands	NA	$15	$15	
Precious and semiprecious stones do	[2]$1,872	[2]$2,208	$91	Switzerland $1,046; West Germany $112.
Stone, dimension:				
Crude and partly worked	NA	36	--	All to Australia.
Worked	NA	7	(4)	West Germany 3; United Kingdom 3.
Other: Crude	NA	1,297	--	Japan 1,259; West Germany 38.
MINERAL FUELS AND RELATED MATERIALS				
Coal, all grades[2]	195,952	229,498	--	NA.
Coke and semicoke[2]	131,629	113,388	--	NA.

NA Not available.

[1]Owing to a lack of official trade data published by Zimbabwe, this table should not be taken as a complete presentation of this country's mineral exports. These data have been compiled from various sources, which include United Nations information, data published by the partner trade countries, and partial official trade sources of Zimbabwe. Unless otherwise specified, data are compiled from official trade statistics of individual trading partners.

[2]Source: Monthly Digest of Statistics, April 1981, Central Statistical Office, Salisbury, Zimbabwe.

[3]May include waste and sweepings of other precious metals.

[4]Less than 1/2 unit.

Table 3.—Zimbabwe: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	NA	14	--	All from West Germany.
Metal including alloys:				
Unwrought	NA	49	--	All from Norway.
Semimanufactures				
value, thousands	[2]$3,720	[2]$7,779	$23	West Germany $399; Switzerland $183.
Copper metal including alloys, semimanufactures	2	46	6	United Kingdom 23; West Germany 11.
Iron and steel metal:				
Pig iron	NA	51	--	All from Sweden.
Ferroalloys value, thousands	[2]$2,020	[2]$2,211	--	NA.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	[2]$4,176	[2]$6,824	--	Japan $73; West Germany $52.
Universals, plates, sheets do	[2]$31,506	[2]$42,369	--	Japan $1,068; France $82.
Hoop and strip	NA	[3]9	1	Switzerland 8.
Rails and accessories				
value, thousands	[2]$147	[2]$3,913	--	NA.
Wire	NA	[4]75	--	Belgium-Luxembourg 55; Japan 11.[4]
Tubes, pipes, fittings	NA	193	--	Japan 189.
Lead metal including alloys, semimanufactures				
value, thousands	[2]$1,285	[2]$1,015	--	United Kingdom $26.
Manganese oxides	NA	9	--	All from Greece.
Nickel metal including alloys, semimanufactures	NA	4	--	All from United Kingdom.
Platinum-group metals including alloys, unwrought and partly wrought				
value, thousands	NA	$1	--	All from West Germany.
Silver metal including alloys, unwrought and partly wrought do	NA	$16	$6	West Germany $6; Switzerland $4.
Zinc:				
Oxides and peroxides	NA	19	--	Italy 14; United Kingdom 5.
Metal including alloys, unwrought	NA	3	--	All from Italy.
Other:				
Ores and concentrates	NA	8	--	All from United Kingdom.
Metalloids	NA	390	--	France 356; Netherlands 20.
Base metals	NA	1	--	All from United Kingdom.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	NA	14	([5])	West Germany 5; Austria 5.
Boron materials: Oxides and acid	NA	6	--	All from France.
Cement	NA	21	--	United Kingdom 18.
Chalk	NA	107	--	All from France.
Clays and clay products:				
Crude clays	NA	1,033	1,014	United Kingdom 19.
Clay products:				
Nonrefractory	NA	36	--	All from West Germany.
Refractory including nonclay brick value, thousands	[2]$6,954	[2]$6,747	$44	United Kingdom $102; Austria $94.
Diamond:				
Gem, not set or strung do	NA	$3	--	All from United Kingdom.
Industrial do	NA	$21	--	Do.
Diatomite and other infusorial earth	NA	5	--	All from Kenya.
Fertilizer, materials:				
Manufactured:				
Nitrogenous				
value, thousands	[2]$1,946	[2]$7,104	--	Netherlands $3,048.
Potassic[2] do	$3,889	$7,071	--	NA.
Ammonia[2] do	$2,031	$6,262	--	NA.
Graphite, natural	NA	3	--	All from West Germany.
Gypsum and plaster	NA	21	1	West Germany 20.
Magnesite	NA	2	--	All from West Germany.
Mica, worked	NA	1	--	Do.
Precious and semiprecious stones:				
Natural value, thousands	NA	$110	$10	Switzerland $93; United Kingdom $5.
Synthetic do	NA	$12	--	All from Switzerland.
Salt[2] do	$1,529	$1,526	NA	NA.
Sodium and potassium compounds:				
Caustic potash	NA	50	--	All from France.
Caustic soda	NA	279	--	Do.
Soda ash	NA	190	--	Do.
Other: Crude	NA	2	--	All from West Germany.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	NA	57	--	West Germany 40; Japan 17.
Hydrogen, helium, rare gases	NA	14	--	All from Japan.

See footnotes at end of table.

Table 3.—Zimbabwe: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Gasoline 42-gallon barrels	NA	76,093	9	France 76,084.
Kerosine do	NA	29,326	--	All from France.
Distillate fuel oil do	NA	131,468	--	Do.
Lubricants do	NA	2,100	56	West Germany 1,925; United Kingdom 70.
Other:				
Mineral jelly and wax do	NA	2,668	1,015	West Germany 1,558.
Bitumen and other residues do	NA	42	--	All from Belgium-Luxembourg.
Bituminous mixtures do	NA	6	--	All from Netherlands.
Total, crude petroleum and refinery products value, thousands	[2]$218,096	[2]$257,803	$196	France $8,956; West Germany $379.

NA Not available.

[1]Owing to a lack of official trade data published by Zimbabwe, this table should not be taken as a complete presentation of this country's mineral imports. These data have been compiled from various sources, which include United Nations information, data published by the partner trade countries, and official trade sources of Zimbabwe. Unless otherwise specified, data are compiled from official trade statistics of individual trading partners.

[2]Source: Monthly Digest of Statistics, April 1981, Central Statistical Office, Salisbury, Zimbabwe.

[3]Excludes Japanese exports valued at $9,000.

[4]Excludes part of Japanese export valued at $2,000.

[5]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Cesium.—Zimbabwe was one of the few world producers of cesium. Output was 88 tons of pollucite in 1980 from small pegmatite ore bodies scattered throughout the country. Bikita Minerals (Pvt.) Ltd. was the principal producer with output from its deposit at Bikita. Production has been intermittent over the past 20 years because of low demand and reached a high of 281 tons in 1976.

Chromite.—The activities of the two ferrochrome producers in Zimbabwe, Union Carbide and Anglo American Corp., were in contrast during a period of higher costs, lower product prices, and uncertain market conditions.

Zimbabwe Mining and Smelting Co., a Union Carbide subsidiary, completed expansion of its ferroalloy plant at Que Que. Two new 24-megawatt furnaces, each with capacity to produce 45,000 tons per year of high-carbon ferrochrome, were added to the existing facility. Four furnaces of 7.5 to 15 megawatts with a total capacity of 90,000 tons per year and employing 1,100 people represented existing capacity. The company was deepening the shafts of the Peak and Railway Block Mines. Three small mines were being brought into operation near Selukwe, and production capacity at the Mtoroshanga Mine was expanding. When completed, the company will have five main chromite mining operations, employing over 3,500 people, located at Mtoroshanga, Darwendale, Ngesi, Lalapanzi, and Selukwe.

Rhodall, Ltd., an Anglo American subsidiary, abandoned plans to add three new ferrochrome furnaces at Gwelo because of high production costs, principally wages. Rhodall, Ltd., operated at a loss on production compared with marginal profitability at the Union Carbide plant. The company also suffered from a strike by 1,300 employees in March over the pay structure. Higher ferrochrome prices, if occurring, were expected to be offset by planned increases in wages and transportation and electricity costs. In September 1981, the Government of Zimbabwe made a request for the granting of duty-free status for shipment of low-carbon ferrochrome and ferrosilicon chrome to the United States.

Copper.—M.T.D. (Mangula) Ltd. successfully commissioned a new electrolytic refinery at Mangula. The plant had little effect on the financial position of the company, which had a loss for the first time in its history. Mining costs increased 29%, and no dividend was declared. Production declined sharply because of ore grade dilution

and lower operating efficiency. Low metal prices for copper and silver made mining operations unprofitable. The necessity to reduce the mine's dependency on borrowing may preclude payment of dividends over an extended period.

The Norah Mine, operated by M.T.D., produced mainly chalcopyrite and bornite by sublevel mining. All crushing to minus 76 millimeters was performed underground. Mill throughput was 43,000 tons per month. Main levels were set 44 meters apart with a 15° incline ramp from 5 level to the mine bottom. A conveyor system with an 18° incline moved ore from below 9 level to 850 level at 20 tons per hour.

Coronation Syndicate Ltd. produced copper at the Inyati and Muriel Mines through Corsyn Consolidated Mines Ltd. The Muriel Mine was a primary gold producer yielding 345 tons of byproduct copper in the year ending September 30, 1981. Inyati Mine, the primary copper producer, had a decline in output of almost 9% to 2,674 tons of copper. The decline was attributed to shortages of skilled personnel and spare parts, which led to plant stoppages and lower ore grades. Working costs were up 41%, mainly from higher salaries, wages, and equipment replacement. Development work in the Era section was stopped, and output was to be terminated upon depletion of payable ore grades. Only the Inyati section of the mine will be worked, which had ore reserves of 486,000 tons grading 2.38% copper. Mill throughput was 159,000 tons in 1981 compared with 193,000 tons in 1980. A further decline in throughput to 11,000 tons per month was anticipated to minimize financial losses.

Gold.—Of the 280 gold mines estimated to have operated in 1981, over 250 were small workings employing less than 20 workers. Falcon Mines, Ltd., operated the largest producer, Dalny Mine. Mill throughput for the year ending September 1981 was 242,045 tons compared with 241,550 tons in 1980. A decline in head grade from 0.198 troy ounce of gold per ton to 0.182 troy ounce per ton resulted in production of 44,111 troy ounces of gold. Working costs at the Dalny plant increased 39% to $59 per ton of ore milled. The increased costs were primarily due to a 48% rise in wages and salaries and a 29% increase in the cost of consumable supplies. Ore reserves were about 2 million tons with a gold content of 0.289 troy ounce per ton. Production from the Venice Mine, also operated by Falcon Mines, Ltd., of 5,000 tons per month was treated at the Dalny plant. An increase to 7,000 tons per month was planned for January 1982, and a new mill at the Venice Mine was to be commissioned in April. The Venice mill would treat an additional 5,000 tons of ore per month. Reserves at the Venice Mine contained 0.228 troy ounce of gold per ton, and the operation was considered marginally profitable if the price of gold fell to $385 per ounce. An increase in total mill throughput of 15% was expected in 1982. A thorough discussion of the ore characteristics, plant equipment, mill procedures, and metal recoveries at the Dalny plant was published.[3]

The annual report of Corsyn Consolidated Mines Ltd. reported a total mill throughput of 422,000 tons for the company's mills in the year ending September 30, 1981. Throughput was from four operating mines. Total gold production of 50,734 troy ounces was achieved from the following individual mines: Arcturus, 16,493 troy ounces; Mazoe, 13,696 troy ounces; Muriel, 18,615 troy ounces; and Inyati, 1,929 troy ounces. Gold content of millfeed was as follows, in troy ounces per ton: Muriel, 0.289; Arcturus, 0.151; Mazoe, 0.148; and Inyati, 0.013. Ore reserves at the Muriel Mine were 278,000 tons containing 0.440 troy ounce per ton. Airborne geophysical prospecting in the mine's vicinity yielded several anomalies for further investigation. Mill throughput at the Arcturus plant of 106,000 tons included 14,000 tons of tailings from the Mashona Kop Mine for retreatment. Ore reserves were 550,000 tons with 0.257 troy ounce of gold per ton. A new cyanide plant was commissioned at Arcturus Mine and resulted in marked improvement in recoveries. Three new shafts were completed and their commissioning was expected to reduce hoisting problems. A shaft was being sunk at the Viceroy deposit, 12 kilometers from the Arcturus Mine. Ore from the new mine will be milled at Arcturus. Reserves at the Mazoe Mine continued to decline and the production rate was reduced. Ground surveys and airborne geophysical work continued for new ore.

The Shamva Mine, operated by Attica Mines (Pvt.) Ltd., was the second largest gold-producing mine in Zimbabwe. Mill throughput was 150,000 tons per year at 0.145 troy ounce of gold per ton, yielding 17,400 troy ounces. Gold was located in tuffaceous sediments derived from the reworking of pyroclastic materials in a shallow water environment. The gold and associated sulfide mineralization were then con-

centrated in the old channels. Shamva Mine had the lowest cost per ton of ore milled of nine gold mines in the Lonrho Investment Group (Lonrho) at $30 per ton. Lonrho scheduled the opening of the Legion and Tiger Reef gold mines in 1982.

Rio Tinto Zimbabwe Ltd. (RTZ) continued infrastructure and mine development at the Renco Mine. RTZ was providing electricity, telephone service, sewage, schools, and a medical clinic. Separate housing was to be made available to all miners with families, including the lowest paid. Full operation of the mine was planned for early 1982 with a throughput of 15,000 tons per month of ore yielding over 48,000 troy ounces per year of gold. RTZ had a 56% equity in the mine; the remainder was traded on the Salisbury Stock Exchange and held by private stockholders.

Union Carbide had an expanded exploration program for gold underway and was to start up its fourth gold mine. The Sun Yat Sen Mine was put back into production following a hiatus of several years because of the Civil War.

Iron and Steel.—Production and marketing by the Zimbabwe Iron and Steel Co. Ltd. (ZISCO), formerly Rhodesia Iron and Steel Co., Ltd., also known as RISCO, were curtailed in 1981, mainly because of low market demand. Plans for installation of a continuous bloom caster and a new sinter plant to treat Ripple Creek Mine and Buchwa Mine iron ore were postponed because of cash shortages. The company requested Government approval to mothball a blast furnace. ZISCO was about 50% owned by the Zimbabwean Government. Other principal shareholders included British Steel Corp. and Tanks Consolidated Investment Ltd., both of the United Kingdom; M.T.D.; and Anglo American. Klockner and Co. Ltd. was sales agent for sales outside the home market. The home market included both domestic sales and sales to members of the Southern African Development Coordination Conference.[4] Domestic deliveries were estimated at 180,000 tons in 1981 compared with 133,545 tons in 1980. Lancashire Steel Co. received 5,000 tons of billets per month for drawing to wire products. Exports were about 210,000 tons compared with 515,297 tons in 1980. In addition to low market demand, a backlog of cargo at Maputo and sabotage of the Beira rail and bridge connection slowed exports.

Nearly all raw materials for pig iron and steel production were produced in Zimbabwe. About 2,400 tons per year of high-carbon ferromanganese was supplied by Anglo American from its plant at Gwelo.

Kew Engineering (Pvt.) Ltd. opened a new foundry in Gwelo under a subsidiary, Kew Precision Casting Co. Products included aluminum, copper, brass, mild steel, and wear-resistant steel castings. Production should replace imports of products such as drill-core bits for the mining industry.

Nickel.—Output from the smelter of Bindura Nickel Corp. in Gatooma was suspended for 8 weeks because of a furnace explosion. Sales were adversely affected by low nickel prices and unfavorable exchange rates.

Efforts were made to maintain the financial solvency of Shangani Mining Corp., Ltd., which operated the Shangani Mine. The company's cash requirement of $10.4 million was provided by its joint owners, Johannesburg Consolidated Investment Co. Ltd. and Bindura Nickel Corp. The company suffered a loss of $8.8 million in the year ending June 30, 1981. Shareholders of the company's stock were asked to exchange their holdings for shares in Bindura Nickel Corp. Ltd. In the year ending June 30, 1981, mill throughput was 746,000 tons averaging 0.55% nickel. Nickel in concentrate was 3,025 tons. Operations in the West Pit of Shangani Mine were terminated, and underground production was slowed because of complex geology and poor ground conditions. Initial planned capacity of 60,000 tons per month was reached in July. The cost per ton of ore milled was up 58% and was attributed to higher mining costs and a threefold increase in labor costs. Proved reserves were 1.23 million tons averaging 0.61% nickel. Probable and possible reserves were 15.1 million tons averaging 0.69% nickel.

Rio Tinto Zimbabwe Ltd. was drilling a nickel prospect adjacent to the inactive Lanninhurst Asbestos Mine. No indication of new ore was made.

Platinum.—Platinum-group metals (PGM) were produced as a byproduct of nickel mining. Rio Tinto Zimbabwe Ltd. developed an extraction process for Empress Mine nickel ore in 1979. Output

commenced in 1980, mainly from stockpiled material. In 1975, Rio Tinto Zimbabwe Ltd. acquired the Zinca prospect on the Great Dyke near Hartley. A pilot plant valued at $2 million was placed in operation in August 1981 to test and evaluate recovery processes. Primary recovery would be for PGM, with nickel, copper, and gold produced as byproducts. An evaluation of mining methods was underway and trial stoping was in progress. A production rate of 2 million tons per year of ore containing 3 to 5 grams per ton of PGM has been suggested. The decision to commence with the project was planned for 1982 and was dependent upon technical feasibility and the expected impact of new investment and tax codes affecting the industry.

Union Carbide operated a pilot mine at Makwira, the current site of the Zinca prospect, from 1968 to 1972, when it closed because of severe mining problems. The plant was moved to the Mimosa property on the Great Dyke near Shabani in 1974, where drilling was undertaken and a pilot shaft sunk. Because of low world metal prices and high development costs, the mine was put on a care and maintenance basis. A production rate of 2,000 tons per day of ore grading 3 to 5 grams of PGM per ton was considered necessary for profitability.

Tantalum.—Past production has included output from about 300 claims generally concentrated in 5 source areas: Kamativi, Urungwe, Mazoe, Odzi, and Victoria. Most production has been in the form of concentrates of microlite, tantalite, and simpsonite from small pegmatite ore bodies by small-workers and local syndicates. Tantalum from Kamativi was contained in tin slags. Data from small producers have generally not included concentrate grades, and byproduct from tin production was reported as Ta_2O_5 in tin slags.

The Wanroo Mine near Shamva consisted of 16 pegmatites 3 to 5 meters in width and up to 600 meters in length in a greenstone belt 700 meters wide. Albite, quartz, and lepidolite were the principal pegmatite minerals with minor quantities of fluorite, apatite, amblygonite, microlite, and cassiterite. The pegmatites were worked opencast and with shallow adits. Concentrates containing 55% to 60% Ta_2O_5 were produced. Proved ore reserves were estimated at 3,800 tons containing 0.88 kilogram of combined tantalum minerals and cassiterite per ton. Unproved reserves were estimated at 75,000 tons containing 0.88 kilogram of tantalite and cassiterite per ton.

Tungsten.—Underground development on the Bulldog claims near Umtali by Corsyn Consolidated Mines Ltd. intersected scheelite mineralization averaging 0.9% WO_2 over a 7-meter width. Determination of limits of the strike length were underway.

Uranium.—The Government announced that it intended to take equity participation at the production stage of any uranium exploitation venture. Union Carbide, Prospecting Ventures Ltd., Corsyn, and Saarberg Interplan Uran GmbH were granted prospecting rights. Saarberg Interplan Uran GmbH, under the sponsorship of the Government of the Federal Republic of Germany, had the most extensive exploration planned. Survey area was 34,000 square kilometers in northern Zimbabwe.

NONMETALS

Asbestos.—The Pangani, Vanguard, and Boss Mines, operated by Pangani Asbestos Mine (Pvt.), Ltd., were closed in May 1981. Pangani Mine depleted its ore reserves, while the Vanguard and Boss Mines were uneconomic because of high costs. Approximately 1,300 people had been employed at the mines and the blending plant.

Shabani and Mashaba Mines (Pvt.) Ltd. (SMM), the largest producer of asbestos in Zimbabwe with about 95% of total output, replaced its truck transport system at Shabani Mine with a monocable aerial ropeway. Capacity of the system was 125 tons per hour using bottom-opening buckets traveling at 185 meters per minute over 2,122 meters of ropeway.

Turnall A.C. (Pvt.), Ltd., which shut down its 25-year-old asbestos pipe plant in 1980, completed construction on a new facility. Capacity to handle and finish asbestos pipe was doubled while production capacity increased 35%. Cost of the plant was $3.22 million, and all fiber was supplied from SMM.

Barite.—Chiroswa Minerals (Pvt.) Ltd. acquired the Dodge Mine in 1978 and has held it on a care and maintenance basis. The company was actively seeking to develop the mine for production of barite and associated limestone and talc. Reserves of 650,000 tons containing 62.8% barite discovered prior to 1976 have since been estimated to be understated.

Several small-scale producers of barite sold their products to the paint and glass

industries. G & W Industries (Pvt.), Ltd., extracted small quantities from vein and stratabound deposits near Que Que.

Cement.—Two companies produced cement at two plants in Zimbabwe. Salisbury Portland Cement, Ltd. (SPC), a subsidiary of Blue Circle Ind. of the United Kingdom, had a plant at Salisbury with a 400,000-ton-per-year capacity. Output of 200,000 tons per year was from two coal-fired kilns. Limestone was supplied from a company-owned quarry at Sternblick Farm, 4 kilometers from the plant. Three types of cement were marketed: PC15 containing 15% blast furnace slag, PDFC containing 50% blast furnace slag, and portland cement. Bulk shipments of portland cement were $61 to $67 per ton, ex-plant.

The United Portland Cement Co. (Pvt.), Ltd., located in Bulawayo District, had a capacity of 400,000 tons per year and an output of 200,000 tons per year. Limestone was obtained from the Cleveland Mine in the Coleen Bawn deposit southeast of Gwanda, and clay was from the Korbut Mine near Gwanda. Production was only about 50% of capacity at both plants because of low demand.

Fertilizer Materials.—Sable Chemical Industries, located in Que Que, was the sole producer of nitrogen fertilizer. The locally owned company produced 34.5% ammonium nitrate. An ammonia synthesis plant having a 52,000-ton-per-year capacity was installed in 1972, replacing ammonia imports. Hydrogen for synthesis was produced by water electrolysis using Lurgi high-pressure water-electrolysis cells. Production was suspended briefly in February and March because of a truck shortage, and the plant was shut down in November because of boiler breakdown. Supplies to two companies producing mixed fertilizers, RFC Ltd. and Windmill (Pvt.), Ltd., were adversely affected.

The importation of 45,000 tons of nitrogenous fertilizer was authorized to make up for a shortfall caused by the addition of new farm acreage to productivity. Total combined fertilizer demand was estimated at 560,000 tons per year. The Ministry of Trade and Commerce approved an average price increase of 14% for fertilizer products. Ammonium nitrate increased from $234 per ton, ex-plant, to $260, and single superphosphate was up $37 to $163 per ton, ex-plant.

Iron Oxide Pigments.—Iron oxide pigment was produced from the Zoe Mine near Hunters Road. G & W Industrial Minerals was the principal processor of the oxide, which was hematite located in massive quartzites in faulted zones. Iron oxide content was 79%, and reserves were estimated at 25,000 tons. After grinding, the product was exported to the Republic of South Africa for staining concrete slabs and roofing tiles. Ex-plant price was $174 per ton for shipments in excess of 4 tons.

Limestone.—In addition to production of limestone at the Sternblick and Cleveland Mines for cement use, nine other mines supplied limestone and dolomite for the manufacture of lime, for use in metallurgy, or for use as a filler. The Rushinga dolomite deposit was worked by G & W Industrial Minerals (Pvt.) Ltd. at a rate of 6,000 tons per year for use as a filler. Production by Alaska Dolomite (Pvt.) Ltd. from the Springbok Mine was for agricultural use and output by Van Wyk Ventures (Pvt.) Ltd. was for use in copper smelting.

Mica.—Mitmar (Pvt.) Ltd. was the sole producer of flake and waste mica and held 100 of 300 pegmatite claims over a 500-square-kilometer area in northern Zimbabwe. The Last Hope, Turning Point, and Hendron Mines were in production. About 35,000 tons of mica dumps left in the area has been reprocessed, and several thousand tons remained. Total reserves were 47,500 tons, and production capacity was about 1,250 tons per year. Production at the Turning Point mill was designed for 150 tons per month of flake mica with two shifts. However, 75 tons was normally from mica waste dump.

Quartz (Silica).—Production was from vein, pegmatite, and alluvial quartz quarrying operations. The Lome Kop Mine near Gatooma, operated by Todoma Silica (Pvt.), Ltd., was the largest deposit with reserves of 10 million tons of high-quality quartz. Zimbabwe Base Metals Producing (Pvt.) Ltd. processed two silica grades from the Patronage Mine. Silica for use as flux in ferroalloying operations was produced by Zimbabwe Mining and Smelting Co. (Pvt.) Ltd. at the Duzi Mine near Que Que and Rhodesia Quarries Ltd. at the Broadside Mine near Gwelo. Industrial Sands Ltd. operated the Industrial Sands Mines in the Somabulla Flats at Gwelo. About 1,000 tons per month was produced for the glass industry, and 1,500 tons per month was for use in foundries and as flotation media.

The Crystal Mine in the vicinity of

Urungwe and a small mine northeast of Miami provided several tons of crystal quartz valued at $2 million. The clear, flawless, untwinned crystals were used for communications components.

Talc.—Output was mainly from two mines: The Tritan claims south of Que Que with reserves of 25,000 tons, and the Hawkshead Mine near Umtali. G & W Industrial Minerals was the principal processor, supplying three grades of ground talc for local use in filler applications, fertilizer and insecticide manufacture, and also in lump form for carving.

MINERAL FUELS

Coal.—The Government approved a coal price increase at yearend to Wankie Colliery Co. Ltd. after having denied the increase in May. The terms of the original agreement stipulated that a pretax return of 12.5% was allowed on domestic sales. All coal in Zimbabwe was owned by the Government except for Wankie, in which it was a minor shareholder. The new prices per ton of coal were as follows, ex-mine or plant: unwashed, $15.90, up 27%; washed, $21.81, up 25%; coking coal, $24.70, up 28%; and low-phosphorus coal, $81.05, up 17%.

Although total coal output declined, mine development continued and overburden removal expanded. About 7.46 million cubic meters of overburden was removed in the financial year ending August 31, 1981, compared with 7.37 million cubic meters in the previous comparable period. Production of individual mines and disposition of coal as reported in the Wankie Colliery Annual Report for 1981 is listed in the following tabulation, in tons:

	1980[r]	1981
Underground mines:		
No. 3	1,126,430	1,008,378
No. 4	--	100,006
Total	1,126,430	1,108,384
Opencast mines:		
No. 1	164,668	178,185
No. 2	259,656	254,971
No. 2A	384,689	261,757
No. 3A	--	71,669
No. 4	1,324,194	1,100,316
Total	2,133,207	1,866,598
Total mined	3,259,637	2,975,282
Discards	491,655	613,651
Salable products	2,767,982	2,361,631
Used internally	385,783	379,343
Total coal sales	2,382,199	1,982,288

[r]Revised.

Total coke production at Wankie was 193,360 tons in 1981 and 195,118 tons in 1980. Coke sales were 209,928 tons compared with 232,984 tons in 1980. Breeze coke sales were 781 tons compared with 2,179 tons in 1980. Byproducts produced were crude tar, 8,600 tons; ammonia liquor, 1,107 tons; and crude Benzol, 7,914 gallons.

New mining equipment for coal expansion was ordered, including a new walking dragline that was due for delivery and setup in April 1982.

[1]Physical scientist, Division of Foreign Data.
[2]Where necessary, values have been converted from Zimbabwean dollars (Z$) to U.S. dollars at the rate of Z$1.00=US$1.48 in 1980 and Z$1.00=US$1.39 in 1981.
[3]Bambridge, G. F. Dalny. 1981—A Review of Metallurgical Operations. Chamber of Mines J., v. 24, No. 1, January 1982, p. 23.
[4]Consists of Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia, and Zimbabwe.

The Mineral Industry of Other Central African Countries

By Suzann C. Ambrosio[1]

CONTENTS

CAMEROON

Crude petroleum, the only commercially exploited mineral resource in Cameroon, continued to dominate developments in the mineral industry sector. International mining concerns have expressed interest in developing Cameroon's bauxite and iron and steel potentials. Domestically, the mineral industry focused on production of fertilizers for agricultural development, infrastructure construction, and hydrocarbon development, through the nearly self-sufficient production of fertilizer materials, cement, and crude oil.

The mineral sector contributed 5.5% to the estimated 1981 gross domestic product (GDP) of $6.5 billion.[2] Petroleum exports accounted for approximately 4.5% of the 1981 GDP and exceeded coffee and cocoa exports for the second consecutive year. The trade gap widened during the fiscal year ending on July 30, 1981, owing to a 21% increase in exports and a 25% increase in imports. Offsetting these balance-of-payments difficulties, typical of developing countries' early economic stages, were increases in foreign exchange reserves to $71 million by May 1981.

The national budget for the fiscal year ending July 30, 1982, the first year of Cameroon's fifth 5-year national development plan (1981-86), increased 26% to $1.1 billion. Rising revenues from oil royalties and increased income taxes assisted financing the 25% increase in public investments, the majority of which were slated for capital works. Increasing emphasis was expected to be placed on development of the infrastructure and of the agriculture and mineral resource industries in forthcoming budgets of the 5-year plan. Although Cameroon's debt-service ratio was one of the lowest in Africa during 1981, debt-service payments increased 19% over those of 1980, representing approximately 10% of export earnings and 8% of the budget.

Europe remained Cameroon's major trading partner, importing 59% of Cameroon's exports and supplying 66% of Cameroon's imports by value. Trade with North and South America increased to 27% in 1979-80, owing primarily to rising U.S. purchases of Cameroon crude oil. The United States imported approximately 15.3 million barrels of crude oil, equivalent to just under

1% of total U.S. crude supplies during 1981. Cameroon exported nearly one-half of its petroleum output to the United States in 1981.

Systematic exploration of Cameroon's mineral resources was facilitated through aid from the European Development Fund, bilateral technical assistance agreements, and a $4.2 million multiyear effort funded by the United Nations Department of Technical Cooperation for Development. During 1981, the United Nations was investigating mineral resources in southeast Cameroon, the French Government was involved in tin and other nonferrous metals exploration in the southwestern part of the country, and the Federal Republic of Germany was lending assistance to explore uranium prospects in northern Cameroon. The World Bank expressed interest in lending petroleum exploration credits, but the Cameroon Government initially declined the offer in an effort to keep foreign debt low.

The aluminum smelter located at Edea and operated by Compagnie Camerounaise de l'Aluminium Pechiney Ugine Kuhlman underwent a 30% annual capacity expansion to 80,000 tons. Bauxite was imported from Guinea and subsequently smelted and milled into aluminum ingots and products at Edea. The plant utilized 65% of the hydroelectric power generated at Edea. Indigenous bauxite resources, located at Minim-Martap, were estimated at 1 billion tons. Studies continued to be made, but large transportation costs hindered development.

Plans were underway to expand cement output of the two existing facilities at Bonaberi and Figiul. Production capacities were expected to increase to 850,000 and 100,00 tons, respectively, by 1983. The national cement company, Les Cimenteries du Cameroun (Cimencam), projected domestic demand increases of approximately 65% to nearly 1 million tons between 1981 and 1990. The cost of the two expansion projects was estimated at $30 million.

A new company was formed, Société d'Etudes de Fer Du Cameroun (SEFERCAM), among the Cameroon Government (35%), the Bureau de Recherches Géologiques et Minières (BRGM) of France (31%), an unspecified U.S. company (24%), and Krupp GmbH of the Federal Republic of Germany (10%). The group combined efforts to conduct an 18-month prefeasibility study to exploit Cameroon's iron and steel resources. The proposed study, including technical, financial, economic, and commercial aspects, was estimated to cost $1.5 million.

A technical assistance contract was concluded by SEFERCAM and BRGM for the latter to provide technical supervision during the design and implementation phases. BRGM, in cooperation with the Cameroon Government and Krupp, was also in the process of reviewing the full potential of the 130-million-ton iron ore deposit located at Kribi. Aside from the reported valuable iron deposits, there were indications of associated titanium and uranium, and possibly cassiterite and antimony resources.

Société Nationale d'Investissement du Cameroun, the Government holding company through which the Government participated as a shareholder in roughly 80 commercial and industrial enterprises, was seeking partners to help finance and operate an 11,000-ton-per-year rebar mill. The possibility of setting up a new galvanizing plant was also under discussion. The terms of the partnership would require a 50% investment share, design and construction of the industrial unit, industrial management, and technical staff training.

In the hydrocarbon sector, Cameroon produced an average of 84,000 barrels per day of crude oil from a measured reserve base of 140 million barrels. Existing and prospective oil reserves were projected to last 25 years at current levels and allowed for a doubling of output by 1985. Crude production increased approximately 20% between 1980 and 1981. Measured natural gas reserves were reported at 7 million cubic feet. Mobil Oil Corp. and a consortium of European hydrocarbon subsidiaries identified 4 trillion cubic feet of prospective natural gas resources during 1980-81. The majority of Cameroon's oil and gas resources were offshore in the Gulf of Guinea; the northern fields were located near the town of Victoria, and the southern fields were near the town of Kribi.

A 2-year feasibility study for a proposed liquefied natural gas plant near Kribi was undertaken. SEGAZCAM, a group of five national and international hydrocarbon firms, was expected to reveal information on plant design, technical processes, construction cost, financing, and markets for export by 1983. The group consisted of the Government-owned Société Nationale des Hydrocarbures (SNH), Mobil Exploration Equatorial Africa, Total Exploration and Production Cameroon, Société Nationale

Elf Aquitaine (SNEA), and the Pecten Group. Large infrastructure and capital costs estimated at $2.7 billion have inhibited development.

Cameroon opened its first oil refinery on May 16, 1981. The 24,000-barrel-per-day facility was constructed near Victoria. Full production was expected to occur in mid-1982, and potential capacity was designed for 40,000 barrels per day. The refinery, constructed by Procon Inc. of France, was owned by SNH (66%), Total-Cíe. Française des Petroles, France (10%), and Mobil Oil Corp., Shell Oil Co., and SNEA (8% each). SNH was expected to supply 100% of the plant feedstock. The supply was expected to originate from approximately 50% of Cameroon's offshore oil entitlements, primarily from the Rio del Rey Oilfield. Cameroon's projected refined oil product surplus of mostly heavy fuel oils was expected to be exported to the Central African Republic and Chad.

Table 1.—Other countries of Central Africa: Production of mineral commodities[1]

Country[2] and commodity[3]	1977	1978	1979	1980[p]	1981[e]
CAMEROON					
Aluminum metal, primary ... metric tons	55,593	48,620	43,200	43,160	4,300
Cement, hydraulic ... do.	362,953	[e]350,000	489,560	227,071	270,000
Gold, mine output, metal content ... troy ounces	182	[e]200	147	72	50
Petroleum, crude ... thousand 42-gallon barrels	277	4,700	12,482	20,045	30,000
Pozzolana ... metric tons	[e]17,880	17,500	NA	NA	NA
Stone:					
Limestone ... do.	91,135	79,180	80,000	39,962	35,000
Marble ... do.	678	[e]700	665	NA	NA
Tin ore and concentrate:					
Gross weight ... do.	21	[e]20	12	15	15
Metal content ... do.	14	14	8	10	10
CENTRAL AFRICAN REPUBLIC					
Diamond:					
Gem[e] ... carats	178,145	198,953	220,500	194,940	177,785
Industrial[e] ... do.	118,764	85,266	94,500	147,060	134,118
Total ... do.	296,909	284,219	315,000	342,000	[4]311,903
Gold ... troy ounces	[e]100	[e]965	2,181	2,000	1,500
Uranium ore, metal content ... kilograms	--	750	1,500	1,500	--
CHAD					
Sodium carbonate, natural (natron), slabs (plaques) and broken ... metric tons	[e]11,000	11,000	[e]11,000	8,000	5,000
CONGO					
Cement, hydraulic ... do.	[e]50,000	[e]50,000	[e]50,000	34,000	[4]49,298
Copper, mine output, metal content ... do.	1,011	800	1,000	1,300	[4]245
Gas, natural:					
Gross[e] ... million cubic feet	7,600	7,500	9,000	10,000	13,000
Marketed ... do.	310	[e]300	[e]350	350	350
Gold, mine output, metal content[e] ... troy ounces	7,000	7,000	7,000	7,000	7,000
Lead, mine output, metal content ... metric tons	2,368	4,235	[r e]3,500	[r e]3,500	[4]7,682
Petroleum, crude ... thousand 42-gallon barrels	12,045	4,500	19,546	19,861	26,300
Potash, crude K_2O equivalent ... metric tons	135,500	--	--	--	--
Zinc, mine output, metal content ... do.	5,266	4,800	[r e]4,000	[r e]3,500	3,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Includes data available through Sept. 27, 1982.

[2]In addition to the countries listed, Equatorial Guinea and São Tomé e Principe, covered textually in this chapter, presumably produce modest quantities of a variety of crude construction materials (clays, stone, and sand and gravel) and may produce minor amounts of other mineral commodities (most notably gypsum, lime, and salt), but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.

[3]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, stone, and sand and gravel) presumably are produced, but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.

[4]Reported figure.

Table 2.—Cameroon: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	--	51	--	All to Yugoslavia.
Unwrought	30,518	9,625	--	France 9,624.
Semimanufactures	10,011	5,890	--	Ivory Coast 5,264; Guinea 386; Togo 76.
Copper metal including alloys:				
Scrap	210	397	(1)	Belgium-Luxembourg 161; Spain 146; Italy 54.
Unwrought	--	20	--	All to France.
Semimanufactures	--	1	--	Do.
Iron and steel:				
Scrap	2,552	9,630	--	Italy 5,708; Yugoslavia 1,919; Egypt 1,717.
Semimanufactures:				
Bars, rods, angles, shapes, sections	(1)	9	--	Chad 8; France 1.
Universals, plates, sheets	359	7	--	Togo 4; Nigeria 3.
Rails and accessories	--	1	--	All to France.
Tubes, pipes, fittings	229	13	--	Chad 7; Netherlands 3; France 1.
Lead metal including alloys, unwrought	38	173	--	France 115; Italy 58.
Nickel metal including alloys, unwrought	--	3	--	All to Belgium-Luxembourg.
Tin ore and concentrate	16	15	--	Spain 13; Switzerland 1.
Zinc metal including alloys:				
Unwrought	30	285	--	All to Belgium-Luxembourg.
Semimanufactures	11	--		
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	--	1	--	Mainly to France.
Cement	2,742	271	--	Chad 171; Equatorial Guinea 100.
Fertilizer materials:				
Crude	--	9	--	All to Chad.
Manufactured	61	--		
Ammonia	2	--		
Salt and brine	741	1,023	--	Chad 976; Niger 33.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	118	76	--	All to Chad.
Stone, sand and gravel:				
Dolomite, chiefly refractory-grade	6	--		
Gravel and crushed rock	162	--		
Sulfur: Sulfuric acid	4	--		
Other: Crude	8	17	--	All to Chad.
MINERAL FUELS AND RELATED MATERIALS				
Coal and briquets: Briquets of coal	--	35	--	All to France.
Petroleum:				
Crude thousand 42-gallon barrels	r13,304	11,769	9,616	France 876; Netherlands 438; United Kingdom 438.
Refinery products:				
Gasoline 42-gallon barrels	9,716	212	--	Nigeria 204.
Kerosine and jet fuel do.	5,936	2,496	--	Chad 2,216; Equatorial Guinea 248.
Distillate fuel oil do.	4,073	1,223	--	Chad 1,208; Nigeria 15.
Lubricants do.	14,805	3,241	--	Chad 2,870; Nigeria 287; France 84.
Other:				
Liquefied petroleum gas do.	58	23	--	All to Guinea.
Mineral jelly and wax do.	39	--		
Bitumen and other residues do.	139	--		

rRevised.
1Less than 1/2 unit.

Table 3.—Cameroon: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	67,366	86,833	--	Guinea 86,445; France 384.
Metal including alloys:				
Scrap	14	5	NA	NA.
Unwrought	755	13	--	All from Netherlands.
Semimanufactures	1,234	1,336	12	France 748; United Kingdom 75; Spain 40.
Chromium oxides and hydroxides	3	5	--	West Germany 4.
Cobalt oxides and hydroxides value, thousands	$5	$4	--	All from France.
Copper:				
Ore and concentrate do.	--	$1	--	Do.
Matte and speiss do.	$1	$1	--	Do.
Metal including alloys, semimanufactures	423	428	1	France 414; United Kingdom 6; Italy 2.
Iron and steel:				
Ore and concentrate	42	--		
Metal:				
Scrap	8	13	--	NA.
Pig iron, powder, shot	616	317	--	Mainly from France.
Ferroalloys	8	54	--	All from France.
Steel, primary forms	18,836	25,005	--	East Germany 8,619; West Germany 7,325; Poland 4,759.
Semimanufactures:				
Bars, rods, angles, shapes, sections	32,487	28,472	1	France 17,628; West Germany 2,769; Belgium-Luxembourg 2,741.
Universals, plates, sheets	20,881	21,487	236	Japan 9,154; France 8,654; Belgium-Luxembourg 1,722.
Hoop and strip	790	1,309	203	France 527; West Germany 335; Belgium-Luxembourg 166.
Rails and accessories	1,734	1,338	--	France 1,226; China 61; Belgium-Luxembourg 28.
Wire	6,134	6,421	--	France 6,077; China 94; West Germany 89.
Tubes, pipes, fittings	35,165	26,660	467	France 17,937; West Germany 1,795; Spain 760.
Lead:				
Oxides and hydroxides	80	121	--	All from France.
Metal including alloys, unwrought and semimanufactures	11	48	--	Belgium-Luxembourg 30; France 17.
Magnesium metal including alloys, unwrought	269	NA		
Manganese:				
Ore and concentrate	2,516	4	--	France 3.
Oxides and hydroxides	3	220	--	All from France.
Nickel metal including alloys, semimanufactures	30	17	--	United Kingdom 11; France 6.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$21	$3	--	All from France.
Silver metal including alloys, unwrought and partly wrought do.	$16	$13	--	France $9; China $4.
Tantalum metal including alloys, all forms do.	$1	--		
Tin metal including alloys, unwrought and semimanufactures	42	31	--	United Kingdom 28; France 2.
Titanium oxides and hydroxides	61	81	--	West Germany 31; France 25; Belgium-Luxembourg 15.
Zinc:				
Ore and concentrate	--	1	--	All from France.
Oxides and hydroxides	32	48	--	Do.
Metal including alloys:				
Unwrought	--	100	--	Mainly from Canada.
Semimanufactures	31	39	1	France 26; Italy 1; Nigeria 1.
Other:				
Ores and concentrates	139	--		
Base metals including alloys, unwrought and semimanufactures	(1)	99	96	France 1; Sweden 1; United Kingdom 1.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	18	5	--	France 3; West Germany 1.
Artificial: Corundum	23	42	--	Mainly from France.
Grinding and polishing wheels and stones	55	67	--	France 45; Italy 19; Austria 1.
Asbestos, crude	43	2	--	Mainly from Austria.
Barite and witherite	25,903	21,416	--	Morocco 11,440; Ireland 2,975; Netherlands 2,750.

See footnotes at end of table.

Table 3.—Cameroon: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Boron materials:				
Crude natural borates	108	313	--	Turkey 300; France 9; West Germany 3.
Acid and oxide	14	17	--	All from France.
Cement	361,253	293,336	--	France 252,146; China 25,499; Belgium-Luxembourg 10,166.
Chalk	5,199	1,383	--	All from France.
Clays and clay products:				
Crude	5,336	3,116	1,041	Spain 841; Senegal 606; France 474.
Products:				
Nonrefractory	4,831	2,112	2	Italy 1,057; France 333; West Germany 178.
Refractory including nonclay brick	3,701	6,152	--	France 5,637; West Germany 266; Italy 141.
Diamond:				
Gem, not set or strung value, thousands	$1	--		
Industrial do	$7	--		
Diatomite and other infusorial earth	685	807	79	France 397; Belgium-Luxembourg 259.
Feldspar, fluorspar, similar materials	50	144	--	All from France.
Fertilizer materials:				
Crude:				
Potassic	9,000	5,000	--	All from Spain.
Other including mixed	12	8	6	Nigeria 2.
Manufactured:				
Nitrogenous	36,588	58,296	1,070	Belgium-Luxembourg 19,098; Netherlands 13,500; West Germany 10,994.
Phosphatic	5,012	5,882	--	France 2,086; Spain 1,300; Belgium-Luxembourg 1,220.
Potassic	4,820	8,297	--	West Germany 5,295; France 2,000; Spain 1,000.
Other including mixed	688	32	--	All from France.
Ammonia	146	2,268	--	Netherlands 2,145; France 72.
Graphite, natural	7	1	--	All from France.
Gypsum and plasters	12,284	15,648	--	Spain 13,995; France 1,070; Morocco 545.
Lime	2,771	3,492	--	France 2,966; Belgium-Luxembourg 308; Spain 91.
Mica:				
Crude including splittings and waste	35	35	--	France 25; United Kingdom 10.
Worked including agglomerated splittings value, thousands	$8	$4	--	France $3.
Pigments, mineral:				
Crude, natural	41	--		
Iron oxides, processed	85	54	--	West Germany 41; France 7; United Kingdom 5.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$27	$1	--	All from France.
Synthetic do	$1	--		
Salt and brine	43,296	23,048	--	Senegal 10,742; Italy 7,818; Netherlands 3,769.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	217	262	--	United Kingdom 200; France 51; Belgium-Luxembourg 10.
Caustic soda	7,316	7,384	--	France 2,912; Italy 1,711; West Germany 1,330.
Stone, sand, and gravel:				
Dimension stone:				
Crude and partly worked	200	273	--	All from Italy.
Worked	724	816	3	Italy 568; France 75; Greece 45.
Dolomite, chiefly refractory-grade	881	936	--	All from France.
Gravel and crushed rock	126	4,637	--	France 4,576; Italy 54; China 6.
Limestone other than dimension	593	431	--	France 430.
Quartz and quartzite	23	74	--	France 50; Belgium-Luxembourg 24.
Sand other than metal-bearing	461	556	207	France 314; West Germany 13.
Sulfur:				
Elemental:				
Other than colloidal	11,206	10,374	--	All from France.
Colloidal, sublimated, precipitated	5	--		
Sulfuric acid	394	311	--	Netherlands 164; Belgium-Luxembourg 91; France 30.
Talc, steatite, soapstone, pyrophyllite	297	387	--	France 302; Italy 73; Norway 12.

See footnotes at end of table.

Table 3.—Cameroon: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other:				
Crude	1,044	419	--	Chad 363; France 36; Netherlands 20.
Slag, ash, dross, not metal-bearing	2	--		
Oxides, hydroxides, peroxides of barium, magnesium, strontium	2	1	--	All from France.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	728	1,090	--	France 909; Switzerland 55; United Kingdom 43.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	389	2	--	All from Netherlands.
Carbon black	370	--		
Coal and briquets:				
Anthracite and bituminous coal	80	--		
Briquets of anthracite and bituminous coal	--	72	--	France 40; Poland 32.
Lignite including briquets	242	--		
Coke and semicoke	10	--		
Petroleum:				
Crude, 42-gallon barrels	15	15	--	All from Nigeria.
Refinery products:				
Gasoline, thousand 42-gallon barrels	1,432	990	--	Togo 212; Netherlands Antilles 208; France 175.
Kerosine and jet fuel, do.	1,005	856	--	Netherlands 256; Togo 198; France 172.
Distillate fuel oil, do.	1,995	1,605	--	Netherlands 332; Netherlands Antilles 297; France 283.
Residual fuel oil, do.	--	20	--	Mainly from France.
Lubricants, do.	57	182	(2)	Spain 111; France 50; United Kingdom 9.
Other:				
Liquefied petroleum gas, do.	59	58	--	France 21; Nigeria 7; Belgium-Luxembourg 6.
Mineral jelly and wax, do.	4	3	(2)	Netherlands 1.
Bitumen and other residues, do.	192	232	85	West Germany 72; Netherlands Antilles 62; Italy 5.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	383	818	--	United Kingdom 700; France 96; Belgium-Luxembourg 16.

NA Not available.
[1]Unreported quantity valued at $13,000.
[2]Less than 1/2 unit.

CENTRAL AFRICAN REPUBLIC

Diamonds and gold were the only minerals exploited in the Central African Republic during 1981. Mineral production contributed approximately 4% to the estimated $745 million 1981 GDP.[3] Roughly two-thirds of the diamond output was gem quality, and total production was valued at approximately $25 million. Small workings of gold were valued at roughly $300,000 during the year.

Reported production of both diamond and gold declined nearly 10% betwen 1980 and 1981. It was estimated that roughly 50% of the diamond output was not reported and was illegally exported. This situation was attributed to both the Cameroon 20% diamond export tax compared with significantly lower taxes in adjacent countries, and the large number of intermediaries that resell the local prospectors' diamonds to marketing centers. This factor in combination with depressed world markets led to a 7% decline in diamond exports to approximately 24% of total exports, valued at $135.2 million in 1980. Timber and coffee were the next largest export earners, comprising another 50% of export revenues.

Investigations to develop the Nation's other mineral resources continued throughout the year. A pilot uranium plant located in France, utilizing ore from the Bakouma deposit in the Central African Republic, temporarily ceased production. Minemet, the French concern that operated the exper-

imental facility, closed operations because of low uranium prices. The Central African Republic was seeking partners to exploit the estimated 20,000 tons of uranium metal resources.

The creation of a cement facility through the development of the Fatima-Bobosa limestone deposit was one of the Government's mineral development priorities. The Nation's cement requirement, equivalent to roughly 50 million tons, was supplied by Zaire and various European countries. The indigenous limestone deposit, located south of the capital city of Bangui, was estimated to encompass a 25-kilometer stretch of limestone. Samples were taken from where the primary tributaries meet the Ubangi River. An initial sample analyzed in France indicated a 23% calcium content. Prefeasibility studies were conducted by the United Nations Development Program and a French company during the 1970's. Lack of investment capital hindered development, but the Central African Republic continued to search for and encourage foreign participation.

Small copper and iron prospects in the northwest part of the country have been periodically studied since 1962. The Romanian Government recently offered the Central African Republic additional technical assistance to evaluate the copper prospects. Both French and Romanian teams were evaluating mineralized lenses of iron in Bogoin. The French estimated iron reserves at 500,000 tons in 1962, and the Romanians, evaluating a larger area 10 years later, estimated iron reserves at 3.6 million tons. The grade ranged from 40% to 70% iron metal.

The Central African Republic Ministry of Energy and Mines continued to heavily depend on foreign assistance, since the Ministry lacked modern field and laboratory equipment. Primary ministerial responsibilities included granting diamond mining concessions and collecting mineral information. A Bureau of Statistics was created in 1981 to coordinate mineral reporting. The Government was interested in developing the analytical and research capabilities of the Ministry to further the development of mineral and energy resources.

Two hydroelectric plants with 12 megawatts of combined capacity provided electricity solely for the city of Bangui. Efforts were underway to develop additional small-scale hydroelectric potential to minimize gas and oil product imports utilized by small towns and villages. Approximately 500,000 barrels of refined products, primarily transportation-related gas, oil, and fuels, were imported. Tankers from Europe, the Middle East, and Caribbean refineries arrived at Pointe-Noire, Congo, and at Matadi, Zaire. Oil products from Pointe-Noire were hauled by train to Brazzaville, Congo, and then barged to Bangui. Products arriving at Matadi were pipelined to Kinshasa, Zaire, and then distributed by barges more than 1,000 kilometers up the Congo and Ubangi Rivers to landlocked Bangui.

Oil exploration continued in the northern part of the country near the borders with Chad. In November 1980, the Central African Hyrdocarbon Co. and the Total-Cie. Française des Petroles of France established Total Centrafricaine De Gestion (TOCAGES). The joint-venture firm was owned 51% by the Government and 19% by Total-Afrique; the remaining 30% was shared equally among Mobil Oil Corp. and Texaco Inc. of the United States and Purifna Oil Co. of Belgium. TOCAGES, with initial capitalization of nearly $700,000, started operating in 1981 as the Nation's oil-products distribution monopoly.

Table 4.—Central African Republic: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
Aluminum metal including alloys, semimanufactures -- value, thousands	--	$1	--	All to Chad.
Cement	--	30	--	Do.
Diamond:				
Gem, not set or strung value, thousands	$35,019	$28,898	$4,648	Belgium-Luxembourg $12,563; Israel $8,774; United Kingdom $2,534.
Industrial ---------- do	--	$216	--	All to Israel.
Salt and brine	--	81	--	All to Chad.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	47	--		

Table 5.—Central African Republic: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides value, thousands	--	$1	--	All from France.
Metal including alloys, semimanufactures	27	12	--	Netherlands 9; France 3.
Copper metal including alloys, semimanufactures	1	5	--	Netherlands 4; France 1.
Iron and steel:				
Pig iron, powder, ferroalloys	1	--		
Steel, primary forms value, thousands	--	$2	--	All from France.
Semimanufactures:				
Bars, rods, angles, shapes, sections	461	770	--	France 584; Belgium-Luxembourg 138; West Germany 31.
Universals, plates, sheets	301	485	--	France 236; Japan 234; Italy 14.
Hoop and strip	5	7	--	All from France.
Wire	30	25	--	Do.
Tubes, pipes, fittings	143	163	(1)	France 124; Greece 16; Japan 11.
Lead:				
Oxides and hydroxides	9	--		
Metal including alloys, semimanufactures value, thousands	--	$3	--	All from France.
Silver metal including alloys, unwrought and partly wrought do	$1	$3	--	Do.
Tin metal including alloys, semimanufactures	(1)	1	--	Do.
Titanium oxides and hydroxides	24	21	--	Do.
Zinc:				
Oxides and hydroxides	1	--		
Metal including alloys, semimanufactures	1	--		
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc value, thousands	--	$1	--	All from France.
Grinding and polishing wheels and stones	2	3	--	Mainly from France.
Barite and witherite	19	--		
Cement	8,193	14,519	--	Zaire 13,938; Republic of South Africa 564.
Chalk	35	106	--	Zaire 95; West Germany 11.
Clay products:				
Nonrefractory	294	135	--	Italy 52; Spain 33; France 22.
Refractory including nonclay brick	--	4	--	All from France.
Diatomite and other infusorial earth	52	90	--	Do.
Fertilizer materials:				
Crude	--	5	--	Do.
Manufactured	1,048	405	--	Belgium-Luxembourg 355; France 50.
Ammonia	3	2	--	All from France.
Gypsum and plasters	1	--		
Lime	25	104	--	France 39.
Pigments, mineral: Iron oxides, processed	2	1	--	All from France.
Salt and brine	4,204	5,716	--	Guinea-Bissau 4,404; Portugal 469; Senegal 260.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	91	113	--	All from France.
Stone, sand and gravel:				
Dimension stone, worked value, thousands	$77	$4	--	Do.
Dolomite, chiefly refractory-grade	32	37	--	Do.
Gravel and crushed rock	2	--		
Sulfur: Sulfuric acid	13	38	--	France 31; Netherlands 7.
Talc, soapstone, steatite, pyrophyllite	5	--		
Other:				
Crude	--	6	--	All from France.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	20	13	--	Do.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	5	9	--	Do.
Coal and briquets: Lignite including briquets value, thousands	$2	--		
Petroleum refinery products:				
Gasoline 42-gallon barrels	5,508	7,242	--	Nigeria 5,678; France 1,182; Togo 128.
Kerosine and jet fuel do	31	1,124	--	Togo 884; Netherlands Antilles 85; France 62.
Distillate fuel oil do	5,670	4,685	--	Togo 1,954; Nigeria 1,582; France 858.
Lubricants do	4,606	1,428	7	France 1,260; Netherlands 126.
Other:				
Liquefied petroleum gas do	1,520	1,868	--	France 1,183; Zaire 220; Brazil 151.
Mineral jelly and wax do	--	118	--	All from Netherlands.
Bitumen and other residues do	11,762	2,169	--	Spain 1,097; Netherlands 545; France 527.

[1] Less than 1/2 unit.

CHAD

The mineral industry of Chad, which previously consisted of petroleum, natron, salt, and clays, was stagnant during 1981. Natron is a hydrous sodium carbonate derived from brines and evaporite deposits at Lake Chad. War raged throughout the country, and most civilians evacuated to adjacent Central African countries. As a result, Conoco Chad (a consortium of five U.S. petroleum companies) halted exploratory oil drilling operations in the northern part of the country. The cessation of all productive industries, including agriculture, led to an economic tailspin. There was only one indication of economic normalization in Chad during 1981: The Bank of Central African States reopened its doors in August after a 17-month shutdown. The bank was a currency-issuing authority for its members of Chad, Cameroon, the Central African Republic, the Congo, and Gabon.

The 16-year Civil War tentatively ceased when in November 1981, approximately 10,000 Libyan forces withdrew from Chad and were replaced by an Organization of African Unity (OAU) peace force. The United States and France donated $12 million each in support of the OAU forces, which were projected to cost $100 million annually. A meeting was held in France during November to coordinate international reconstruction aid. Western industrialized nations and international banks focused on assistance to rehabilitate infrastructure facilities.

Discussions held at a United Nations meeting during August 1981 revealed that Chad's first 5-year plan included hydrocarbon exploration, hydroelectric potential feasibility studies at Ganthioot Falls and Legone Valley, geothermal feasibility studies in the northern part of the country, and evaluation of indigenous uranium resources.

CONGO

Increased petroleum revenues continued to support real economic growth rates in excess of 5% for the last 3 years. The share of oil receipts in the national budget increased from 41% to 70% between 1979 and 1981. The 1981 nominal GDP, estimated at $1.4 billion, and the $202 million trade surplus were largely attributed to the approximate 30% increase in petroleum output.[4] The Nation's 1981 foreign debt of $975 million consumed 20% of the budget receipts and 28% of the export earnings. The balance-of-payments situation improved owing to the growing trade surplus, increased capital account surplus, and a near doubling of foreign exchange reserves.

In the nonfuel minerals sector, output continued to be sluggish as production of copper, lead, zinc, and gold dropped off. Hydrocarbon and cement output increased during 1981. Renewed interests in the Holle potash mine and a review of the Nation's mineral resources were part of the Government's effort to diminish mineral import dependence.

Rehabilitation of the flooded Holle Mine continued to be discussed throughout 1981. United States and French firms were contemplating feasibility studies to solution-mine the carnallite. The market analysis and flow-sheet-preparation part of the study was estimated to cost $100,000. In general, the lack of capital and adequate infrastructure adversely affected even the most promising mineral resource areas.

The BRGM considered the financing and preparation of a mineral survey. An initial grant of $9,200 was set aside for a mining plan. The plan's objective was to gather, evaluate, and verify previous mineral studies. The final Holle potash report was expected to be completed in 1982. More immediate action on a cement factory proposal was also under consideration.

In April 1981, the Council of Ministers met to discuss previously completed geological and mining studies. Emphasis was placed on conducting more in-depth analyses and followup studies. Aside from hydrocarbon development, including the increased recovery of associated natural gas, the Council was interested in assessing the Nation's iron resources. Mounts Avima and Namemba, two known iron ore deposits located in the Western Sangha area, were targeted for additional investigation.

The volume of materials transported, including mineral fuels, manganese, cement, timber, and cotton, via the Congo Ocean Railway (CFCO) declined during 1981. The Compagnie Minière de l'Ogooue S.A. of Gabon (COMILOG) section of the CFCO

railroad traverses 285 kilometers from Mbinda, Gabon, through Loudima, to the Congolese coastal port Pointe-Noire. Approximately 1.5 million tons of manganese ore valued at $4.6 million was transported during 1981. The near 30% decline in volume from the previous year was due in part to a 2-week strike in Gabon by COMILOG workers in February 1981.

Five oilfields produced roughly 30 million barrels of oil during 1981. The three major producing areas were all marine fields including Loango, Emerande, and Lekouala. New reserve figures for the Lekouala and Emerande Fields were estimated at 2.2 billion and 3.7 billion barrels of oil, respectively. Other oilfields included the nearly depleted Pointe-Indienne Field, the Yanga Field which commenced production in 1981, and the newly discovered Mengo Field.

Approximately 13 million cubic feet of natural gas was produced in 1981, all of which was flared or consumed directly at the oil installations. Degassing units were added to the Lekouala Oilfield terminal late in 1981. Total potential natural gas resources were estimated at 1.7 trillion cubic feet. The Congo Government entered into a protocol agreement with Elf Congo, a subsidiary of Elf Aquitaine, France, and Azienda Generali Italiani Petroli S.p.A. (AGIP), Italy, to organize and promote natural gas exploration and development.

Natural gas was discovered 15 kilometers offshore in the Pointe-Noire deepwater section. Two test wells at Litchendjili Marine No. 2 struck gas at a depth of 2,300 meters that had a flow rate of 8.8 million cubic feet per day. The exploration permit was held by Elf Congo (65%) and AGIP (35%).

Elf Congo and AGIP have overlapping interests in both the permit areas and producing fields. Hydro-Congo, the state hydrocarbon agency, held a 20% share in each of the companies in return for granting exploration permits. Increasing levels of Government participation were indexed to production levels by means of free transfers of shares. In addition, the Congo Government joined as a minority participant in a 20% to 80% partnership with AGIP to form a research consortium called AGIP Recherches Congo (ARC). In the producing fields of Lekouala, Emerande, Pointe-Indienne, Mengo, and Yanga, Elf-Congo and AGIP were joint partners, holding respective shares of 65% to 35%. The ownership split between Elf Congo and AGIP was reversed in the Loango Field.

ARC signed an exploration agreement to prospect for oil in the southwest part of the Congo. Braspetro of Brazil signed an agreement in August 1981 with Hydro-Congo to explore for offshore liquid and gaseous hydrocarbons. A French firm, Bouygues Offshore Co., recently discovered marketable quantities of oil offshore in the Mengo Field within the Loeme permit area. The French company incorporated a company in Congo, called BOS-Congo, which was expected to install drilling platforms in Mengo during 1981. U.S. oil firms participated as minority shareholders in joint-venture exploration with Hydro-Congo and AGIP.

Large investments by Elf Congo and AGIP continued to drive exploration and production targets higher. Elf Congo invested approximately $350 million and AGIP invested $150 million during 1980-81. Congo's annual oil production targets were set at 35 million barrels for 1982 and 52 million barrels for 1984.

Table 6.—Congo: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, scrap	4	--	--	
Copper metal including alloys, scrap	37	33	--	West Germany 21; Egypt 12.
Iron and steel:				
Scrap	87	17	--	Italy 14; Egypt 3.
Semimanufactures:				
Universals, plates, sheets	2	1	--	All to Zaire.
Tubes, pipes, fittings	131	--	--	
Lead ore and concentrate	1,546	4,018	--	All to U.S.S.R.
Other: Base metals including alloys, all forms, value, thousands	--	$9	--	All to France.

Table 6.—Congo: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
NONMETALS				
Cement value, thousands	$2	--		
Diamond: Gem, not set or strung do.	$8,824	$24,587	--	Belgium-Luxembourg $21,408; France $2,609; Netherlands $570.
Fertilizer materials: Manufactured, potassic	37	--		
Salt and brine	--	41	--	All to Zaire.
Sodium and potassium compounds, n.e.s.: Caustic soda	40	--		
MINERAL FUELS AND RELATED MATERIALS				
Petroleum: Crude thousand 42-gallon barrels	8,208	27,826	5,294	Italy 9,449; Brazil 4,246; Bahamas 3,906.
Refinery products:				
Gasoline 42-gallon barrels	--	17	--	All to Zaire.
Kerosine and jet fuel do.	26,017	63,891	--	All to Netherlands.
Lubricants do.	--	252	--	Bunkers 175; Zaire 77.
Bitumen and other residues do.	--	302,436	302,436	

Table 7.—Congo: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	--	5	--	All from France.
Metal including alloys:				
Scrap value, thousands	--	$1	--	Do.
Semimanufactures	70	42	(1)	Netherlands 18; France 13; Angola 6.
Chromium oxides and hydroxides	(1)	5	--	All from France.
Copper metal including alloys, unwrought and semimanufactures	16	17	--	France 12; Zaire 3.
Iron and steel:				
Ore and concentrate value, thousands	--	$1	--	All from Zaire.
Metal:				
Scrap	938	(1)	--	Mainly from Belgium-Luxembourg.
Pig iron, powder, ferroalloys	78	6	--	France 5; Senegal 1.
Steel, primary forms	1	(1)	--	All from France.
Semimanufactures:				
Bars, rods, angles, shapes, sections	4,594	5,530	--	France 3,386; Italy 1,621; Mozambique 270.
Universals, plates, sheets	3,619	3,953	(1)	France 2,613; Japan 1,199.
Hoop and strip	41	232	--	France 173; West Germany 54.
Rails and accessories	1,315	298	--	France 231; Italy 63.
Wire	376	107	--	France 60; Mozambique 30; Italy 10.
Tubes, pipes, fittings	1,572	8,927	22	France 8,408; Italy 429; China 14.
Castings and forgings, rough	(1)	--		
Lead:				
Oxides and hydroxides	3	13	--	France 12; Italy 1.
Metal including alloys, unwrought and semimanufactures	1	5	--	All from France.
Manganese oxides and hydroxides	--	7	--	France 4; Netherlands 3.
Nickel metal including alloys, semimanufactures	1	(1)	--	All from United Kingdom.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$3	--		
Silver metal including alloys, unwrought and partly wrought do.	$3	--		

See footnotes at end of table.

Table 7.—Congo: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS —Continued				
Tin metal including alloys, unwrought and semimanufactures	17	3	--	France 2.
Titanium oxides and hydroxides	48	59	--	France 38; Netherlands 21.
Zinc:				
Oxides and hydroxides	--	1	--	All from France.
Metal including alloys, unwrought and semimanufactures	5	9	--	France 8; Zaire 1.
Other: Base metals including alloys, unwrought and semimanufactures value, thousands	$1	$7	--	Ivory Coast $4; Hong Kong $3.
NONMETALS				
Abrasives, n.e.s.:				
Artificial: Corundum value, thousands	$1	--		
Grinding and polishing wheels and stones	27	20	--	France 11; Switzerland 8.
Asbestos, crude	--	1	--	All from France.
Barite and witherite	65	2,043	--	France 1,597; Morocco 446.
Cement	15,594	28,742	--	Zaire 11,486; France 7,703; Angola 7,000.
Chalk	309	205	--	France 163; Zaire 42.
Clays and clay products:				
Crude	802	986	--	France 626; Senegal 260; Spain 100.
Products:				
Nonrefractory	798	557	--	France 343; Spain 79; Italy 77.
Refractory including nonclay brick	333	20	--	Mainly from France.
Diamond: Gem, not set or strung value, thousands	--	$104	--	All from Belgium-Luxembourg.
Diatomite and other infusorial earth	152	67	--	All from France.
Fertilizer materials:				
Crude	123	1	--	Do.
Manufactured:				
Nitrogenous	440	1	--	All from Zaire.
Phosphatic	400	--		
Potassic	--	40	--	All from East Germany.
Other including mixed	400	2	--	Belgium-Luxembourg 1; France 1.
Ammonia	8	17	--	France 14; Netherlands 2.
Graphite, natural value, thousands	--	$1	$1	
Gypsum and plasters	203	2	--	All from France.
Lime	127	137	--	Do.
Magnesite	--	1	--	All from Belgium-Luxembourg.
Mica: Worked including agglomerated splittings value, thousands	--	$5	--	All from France.
Pigments, mineral: Iron oxides, processed	13	14	--	France 9; Netherlands 5.
Pyrites, unroasted	--	50	--	All from France.
Salt and brine	4,285	6,982	--	Senegal 3,747; West Germany 1,632; Netherlands 1,450.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	7	5	--	France 2; East Germany 1; Senegal 1.
Caustic soda	1,404	820	--	France 625; Belgium-Luxembourg 110; Poland 50.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	4	8	--	Spain 5; Zaire 3.
Worked	28	1	--	Mainly from Italy.
Gravel and crushed rock	3	2	--	All from France.
Quartz and quartzite	--	19	--	Do.
Sand other than metal-bearing	123	--		
Sulfur:				
Elemental: Colloidal, precipitated, sublimed value, thousands	$1	--		
Sulfuric acid	68	28	--	France 19; Netherlands 6; Italy 2.
Talc, steatite, soapstone, pyrophyllite	69	2	--	All from France.
Other:				
Crude	203	3	NA	NA.
Slag and dross, not metal-bearing	--	3	--	Mainly from France.
Halogens	12	--		
Oxides, hydroxides, peroxides of barium, magnesium, strontium	--	1	--	All from France.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	58	30	--	Do.

See footnotes at end of table.

Table 7.—Congo: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	4	12	--	France 9; Zaire 3.
Carbon black value, thousands	$1	--		
Coal and briquets: Briquets of coal	4	2	--	All from France.
Coke and semicoke	100	23	--	France 15; West Germany 8.
Petroleum:				
Crude 42-gallon barrels	601,038	--		
Refinery products:				
Gasoline do	106,632	147,348	--	Netherlands 63,232; Brazil 42,968; Italy 11,024.
Kerosine and jet fuel do	90,760	126,511	--	Netherlands 72,842; Brazil 29,566; Republic of South Africa 17,034.
Distillate fuel oil do	213,199	188,022	--	Brazil 78,651; Italy 59,464; Netherlands 40,165.
Residual fuel oil do	17,862	28,172	--	Netherlands 17,569; Brazil 3,750; Republic of South Africa 3,250.
Lubricants do	16,163	19,208	294	United Kingdom 9,856; France 2,506; Netherlands 651.
Other:				
Liquefied petroleum gas do	14,198	21,379	--	France 17,087; Italy 4,280.
Mineral jelly and wax do	150	63	--	Netherlands 55.
Bitumen and other residues do	842	6,793	--	Spain 3,636; Italy 2,527; U.S.S.R. 558.
Mineral tar and other coal-, gas-, and petroleum-derived crude chemicals	1	21	--	All from France.

NA Not available.
[1]Less than 1/2 unit.

EQUATORIAL GUINEA

Economic stagnation continued throughout 1981 owing largely to the drastic declines in production and export of basic raw materials. Combined timber and cocoa exports dropped from approximately 40,000 tons in 1968 to 8,000 tons in 1981. The poor economic condition was boosted by assistance from the International Monetary Fund and Spanish bilateral aid programs. Plans were underway for a United Nations-sponsored International Donors Conference in April 1982. Since the 1979 coup, the new military government has encouraged Western nations to return. Promulgation and implementation of a new constitution providing for free elections was expected during 1983.

Activities in the mineral industry focused on exploration and establishing the groundwork for future exploitation. The French Government conducted 3 months of mineral research in the area of Rio Muni. Initial exploration results indicated that the majority of minerals collected were radioactive.

A new mining law, Decree No. 9, was passed on June 12, 1981. All mineral deposits whether located onshore or offshore in territorial waters were declared property of the state. Mineral substances were divided into three groups: Quarries, mines, and radioactive and strategic minerals. Foreign participation was limited through the issuance of permits for a maximum area of 150,000 hectares and a maximum time of 25 years. A model contract was attached to the decree for those interested in applying for a mining permit.

A draft petroleum law was written by Petroconsultants Inc., Switzerland, with financing provided by the International Bank for Research and Development. The final version of the law, Decree No. 7, was issued in July 1981. The new law identified areas and parameters for exploration and exploitation. Contract provisions and a seismic survey were expected to become available to bidders at a cost of approximately $350,000. Decree No. 7 was made more liberal than comparable laws in other Central African countries to attract foreign investments. Open auctions for various concessions were expected to commence late in 1982.

Empressa Guineo Española de Petróleos,

the 50:50 joint venture between Spain's Hispanoil and the Equatorial Guinean Government, obtained the Nation's first exploration lease in 1981. The 12,872-square-kilometer area was located north of the Island of Bioko, near the Nigerian and Cameroon marine oilfields. Plans were underway to operate drilling facilities by 1983-84.

Various international oil companies also expressed interest in exploring the promising Rio Del Ray area. The French firm Total-Cie. Française des Petroles, the U.S. firms Mobil Oil Corp. and Gulf Oil Co., and a small unnamed firm were considering applying for concessions.

SAO TOME E PRINCIPE

Since independence in 1979, the two islands of São Tomé e Principe have been preoccupied with establishing Government infrastructure and political stability, and pursuing agricultural development. Little progress was made in any of these areas during 1981. The Nation continued to rely heavily on assistance from the U.S.S.R., Cuba, and the German Democratic Republic, and both Western and Eastern European aid programs. The centrally planned economy countries provided mostly military and technical assistance, while the Western European agencies were involved in agricultural, health, and educational assistance for the islands. No new developments were reported in the oil and gas exploration sector by yearend 1981.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Communauté Financière Africaine francs (CFAF) to U.S. dollars at the rate of CFAF271.73=US$1.00 for 1981.

[3]See footnote 2.

[4]See footnote 2.

The Mineral Industry of Other East African Countries

By Kevin Connor[1]

CONTENTS

BURUNDI

The mineral industry in Burundi was a minor contributor to the country's gross domestic product (GDP), which was estimated at just $1 billion for 1981.[2] Coffee and tea continued as the Nation's major export commodities. Mineral exports consisted of small tonnages of wolframite, cassiterite, and bastnäsite. Burundi's trade balance of payments situation worsened in 1981, with import payments more than double export revenues. Petroleum imports alone equaled 46% of the export revenue total. By yearend, the only indigenous fossil fuel source to have been found in Burundi was peat, which the Government had been attempting to develop to alleviate some of the petroleum import requirements. In June 1981 the Irish Peat Development Authority, Bord na Mona, signed a 4-year contract with the Burundian Government to supply technical staff for the ongoing peat project work there. Funding for the project was provided by the U.S. Agency for International Development and the Government of Ireland. The new contract, which was an extension of ongoing peat research there, represented Burundi's increased awareness of the value of its large peat reserves for both energy and agricultural uses.

At yearend, Burundi's Ministry of Public Works and Mines was close to selecting a contractor to study the feasibility of developing Burundi's phosphate deposits. The study would determine the potential for establishing fertilizer production facilities based on the country's phosphate reserves at Matongo-Bandaga. The study's specific objectives are to prove mineral reserve tonnage and grade, draw up mining and processing facility designs, estimate capital and production costs, and conduct a regional market and distribution survey. The cost of the study was estimated at slightly over $1 million, and it should take approximately 16 months to complete. The proposed project will mark the Burundian Government's first step in its plan to exploit on a large scale its natural mineral resources for advancing its agriculture-based economy. Burundi was dependent on imports, which are expensive to transport inland from coastal ports, to supply its domestic requirements for fertilizer. It was planned that part of the fertilizer production from the

proposed facilities would be marketed to neighboring countries like Rwanda and Zaire.

Previous technical studies estimated that the Musongati nickel deposits of central Burundi contained as much as 300 million tons of reserves of this metal. To further clarify this estimate and assess the economic viability of exploiting these deposits, the Burundian Government finalized an agreement in 1981 with the International Development Association (IDA) and Finland to conduct a detailed drilling program of the Musongati deposits. The program was valued at $7.3 million, with $4 million of this funding coming as a World Bank loan. A previous study proposed a project to produce and export some 30,000 tons of ferronickel per year, but in view of the current depressed world demand for nickel, coupled with Burundi's inadequate transportation facilities, infrastructure, and land-locked position, exploitation of these deposits will probably be delayed for some time.

An important find, the rare-earth mineral europium, was discovered in high concentrations near Gakaha, Burundi, 45 kilometers southeast of Bujumbura. Large deposits of bastnäsite and monazite, which contain the 14 rare-earth minerals, are located at the Gakaha site. The discovery was made by a team of exploration scientists from the Federal Republic of Germany, who were in Burundi as part of a 3-year technical assistance project to evaluate the mineral potential of the country. The Gakaha site had been mined in the past for cerium and lanthanite, but had been dormant since suspension of the Belgian mining operation there, following independence in 1962. Besides investigating the Gakaha site with its known rare-earth deposits, the German team is evaluating tin and tungsten deposits in northern Burundi.

Table 1.—Other countries of East Africa: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Country and commodity	1977	1978	1979	1980[p]	1981[e]
BURUNDI[2 3]					
Clays: Kaolin	[e]2,500	[e]2,750	[e]2,000	2,000	2,000
Columbium and tantalum ores and concentrates, kilograms	[e]4,000	--	2,100	2,100	2,000
Gold, troy ounces	[e]450	[e]450	133	130	100
Lime	[e]600	[e]200	[e]200	200	[4]283
Peat	--	2,000	9,000	9,000	9,500
Rare-earth metals: Bastnäsite concentrate, gross weight	[e]140	NA	30	30	30
Tin ore and concentrate:					
Gross weight	[e]30	[e]30	17	([5])	--
Metal content	[e]20	[e]20	8	([5])	--
Tungsten, metal content	[e]2	[e]2	--	--	--
ETHIOPIA[2]					
Cement, hydraulic	[e]73,000	86,000	92,757	180,000	[4]180,000
Clays: Kaolin	[e]40,000	31,750	30,000	55,235	[4]9,000
Coal: Lignite[e]	200	--	--	--	--
Gold, mine output, metal content, troy ounces	7,725	[e]8,000	7,970	9,000	[4]11,930
Gypsum and anhydrite, crude	6,552	932	925	900	[4]4,200
Petroleum refinery products:					
Gasoline, thousand 42-gallon barrels	733	782	683	706	[4]798
Jet fuel and kerosine, do	--	240	210	304	[4]230
Distillate fuel oil, do	1,586	1,470	1,095	1,176	[4]1,344
Residual fuel oil, do	1,498	1,698	2,021	1,598	[4]2,224
Other, do	152	152	114	125	[4]37
Refinery fuel and losses, do	601	453	265	813	[4]696
Total, do	4,570	4,795	4,388	4,722	[4]5,329
Platinum, mine output, metal content, troy ounces	[e]100	123	108	113	100
Pumice, cubic meters	5,000	NA	4,590	1,724	[4]30,300
Salt:					
Rock[e]	5,000	10,000	15,000	15,000	NA
Marine	[e]75,000	50,000	92,737	100,000	[4]110,000
Stone, sand and gravel:					
Limestone	[e]8,500	[e]7,000	7,308	1,800	[4]5,500
Sand, cubic meters	219,471	[e]90,000	97,200	407,421	[4]665,000
Other	959,180	[e]280,000	383,940	402,085	[4]1,970,000

See footnotes at end of table.

Table 1.—Other countries of East Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1977	1978	1979	1980[p]	1981[e]
LESOTHO[2]					
Diamond:					
Gem ——— carats	7,576	[e]14,333	[e]10,484	10,743	10,921
Industrial ——— do	34,514	[e]57,332	[e]41,937	42,971	42,000
Total ——— do	42,090	71,665	52,421	53,714	[4]52,921
Stone ——— cubic meters	18,572	25,000	[e]25,000	25,000	25,000
MALAWI[2]					
Cement, hydraulic ——— thousand tons	94	103	103	[4]92	[4]78
Gem and ornamental stone: Agate[e] ———	4	4	6	7	7
Kyanite ———	250	100	--	--	--
Stone: Limestone ———	116,653	155,229	168,604	122,814	[4]116,118
MAURITIUS[2]					
Lime ———	7,500	8,000	[e]8,000	7,000	[4]7,000
Salt ———	6,000	6,000	[e]6,000	6,000	[4]6,000
Stone: Basalt, not further described ———	1,574,000	1,154,885	970,000	1,400,000	[4]1,083,500
RWANDA[2]					
Beryllium: Beryl concentrate, gross weight ———	[e]55	58	46	108	[4]59
Columbium and tantalum ores and concentrates: Columbite-tantalite, gross weight ———	64	48	47	60	[4]57
Gas, natural:					
Gross ——— million cubic feet	7	7	--	--	--
Marketed ——— do	7	7	--	--	--
Gold, mine output, metal content ——— troy ounces	1,814	1,125	472	944	[4]1,200
Lithium minerals: Amblygonite[e] ———	30	28	28	30	NA
Tin, mine output, metal content ———	1,598	1,502	1,910	2,069	[4]1,790
Tungsten, mine output, metal content ———	568	385	505	431	[4]521
SEYCHELLES[2]					
Guano ———	5,277	5,505	[6]6,583	[6]4,285	4,500
SOMALIA[2]					
Salt, marine[e] ———	2,000	2,000	30,000	30,000	30,000
SWAZILAND[2]					
Asbestos: Chrysotile ———	38,046	36,957	34,294	32,833	[4]35,264
Coal: Anthracite ———	128,990	165,874	168,409	175,984	[4]163,780
Iron ore, direct-shipping grade, gross weight ——— thousand tons	1,441	1,266	--	--	--
Stone: Quarry product ——— cubic meters	93,490	452,494	247,090	74,045	[4]82,053
Tin, mine output, metal content ———	2	1	--	--	--
UGANDA					
Beryllium: Beryl concentrate, gross weight[e] ———	45	NA	--	--	--
Bismuth, mine output, metal content[e] kilograms	3,000	1,000	5,000	NA	NA
Cement, hydraulic ———	80,000	[e]80,000	50,000	10,000	40,000
Columbium and tantalum ores and concentrates, gross weight[e] ——— kilograms	2,100	2,058	2,260	--	--
Copper:					
Mine output, metal content ———	4,000	--	--	--	--
Metal, blister, primary ———	3,277	--	--	--	--
Iron and steel: Crude steel ———	15,000	15,000	--	--	--
Lime, hydrated and quicklime[e] ———	20,000	25,000	28,000	15,000	15,000
Phosphate minerals: Apatite ———	5,000	5,000	--	--	--
Salt, evaporated[e] ———	500	500	500	515	20,000
Tin, mine output, metal content[e] ———	120	120	60	30	30
Tungsten, mine output, metal content ———	110	110	20	20	20

[e]Estimated. [p]Preliminary. NA Not available.

[1]Table includes data available through Oct. 11, 1982.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, stone, and sand and gravel) presumably are produced, but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.

[3]Limited quantities of other pegmatite minerals may also be produced, but output is not reported.

[4]Reported figure.

[5]Revised to none.

[6]Data represent sales; actual production is not reported.

DJIBOUTI

The Republic of Djibouti, formerly the French Territory of Afars and Issas, gained its independence in June 1977. As in previous years, the economy of Djibouti in 1981 was based on entrepot trade through the port city of Djibouti, and along the Chemin de Fer Franco-Ethiopian railroad. Customs duties were the major contributor to the 1981 GDP. Although some mineral deposits have been identified in Djibouti, exploitation had been limited to some small sand and gravel pits for domestic construction. Based on a 1980 Iraqi loan of $25 million, engineering phase I studies were completed in 1981 on the construction of a cement plant at Mount Arrey, close to substantial limestone deposits. With both financial and technical assistance from France, geothermal wells were drilled in the Lake Assal area and were under extensive testing during 1981. No appreciable fossil fuel deposits have been found in Djibouti to date, and all petroleum product requirements were imported. Negotiations were underway in late 1981 for an estimated $25 million loan from the Saudi Fund for Development, to be used for financing highway construction projects.

ETHIOPIA

The total mineral production of Ethiopia in 1981 was estimated at a value of $44 million,[3] equal to aproximately 1% of the reported GDP of $4.25 billion. Cement production alone accounted for 50% of the mineral value, salt production for 25%, and gold for 11%. Throughout 1981, Ethiopia's balance of trade problems continued to worsen, with import costs for the country almost twice the total value of exports. In particular, petroleum import costs, which were $320 million in 1980 and represented 37% of the total value of exports, increased to $350 million in 1981, equivalent to 46% of export revenues.

Bilateral aid programs continued with various foreign governments during the year. Most notably a new multiyear agreement with Libya was finalized in August 1981, whereby Libya could contribute up to $2.5 billion in assisting Ethiopia in developing its mineral resources. According to the agreement, $500 million was to be allocated for developing the potash deposits of the Danakil Depression in northern Ethiopia. Based on a feasibility study conducted in the early 1970's, the Danakil Depression has measured high-grade reserves of 60 million tons of potash with indicated reserves estimated at 150 million tons. The tentative project was scheduled to begin in 1983, with mine production of 1.5 million tons per year of potash rock starting in 1990.

Ethiopia's gold production in 1981 was almost identical to that of 1980, which was slightly over 11,900 troy ounces. Recent installation of new hydraulic washing equipment at the Adola Goldfield should substantially increase production in 1982. Apart from gold and platinum, no other metallic mineral production was reported for the year. The copper deposit at Debarwa near Asmara, previously estimated as having 600,000 tons of high-grade ore with significant quantities of gold, silver, and zinc, remained unexploited. As part of the resource development plans of the recent Libya agreement, an updated feasibility study of this deposit was to be conducted. In Ethiopia's Sidamo region, the Canadian Javelin Co. had substantial mining concessions and concentrated in 1981 on exploration activities on proving out the nickeliferous laterite deposits in the region.

No new petroleum oil or gas finds were reported in Ethiopia in 1981. With assistance from the Soviet Union, plans were well underway in late 1981 for three exploratory well holes to be drilled in the Shilabo area in 1982. The value of the project was estimated at $21 million. Negotiations were also underway with Chevron International Oil Co., regarding Chevron's recent proposal to conduct exploration activities in western Ilubador and northern Gondor near the Sudanese border. The proposed project would begin with extensive aeromagnetic and seismic surveys, and it was estimated that no drilling would occur within the first 2 years.

LESOTHO

Lesotho, which gained its independence in 1966, is a small landlocked country surrounded by the Republic of South Africa. Lesotho's mining industry was limited in 1981 to the exploitation of diamond-bearing kimberlite pipes high in the Maluti Mountains. The industry was centered around the Letseng-la-terai operation managed by the De Beers Lesotho Mining Co., 25% of which was owned by the Lesotho Government and the remainder by De Beers Consolidated Mines Ltd. of South Africa. During 1981 the tonnage of kimberlite material mined and milled at the operation was approximately 1.9 million tons, down slightly from the 1980 figure. The recovery grade, which was already considered marginal in previous years, fell to 2.8 carats per 100 tons during 1981, for a yearly total of 52,921 carats. Production of diamonds larger than 10 carats represented 12% of the total production, compared with 13% in 1980. Because of extremely poor market conditions for diamonds in 1981 and projected for 1982, De Beers Consolidated announced late in 1981 its intention to shut down the Letseng mining operation in 1982.

Other kimberlite pipes near the Letseng operation were exploited on a smaller scale by manual labor during 1981. At two of these operations, the Liqhobong and Lemphane pits, the mine personnel were organized into cooperatives. Earnings from the diamond sales were split among the miners on a monthly basis. Early in 1981 the Lesotho Government received an approximately $500,000 foreign aid grant from the Canadian Government for purchasing additional equipment to improve and expand these two operations and others like them, in order to increase the country's diamond production. The funds will not be used to purchase industrial-type mining equipment, but will be used to continue with what are basically pick and shovel mining operations.

Outside the diamond industry, very little mineral exploitation takes place in Lesotho. The few other mineral developments are for domestic building materials and comprised small clay, sand and gravel, and stone operations. As of the end of 1981, the outlook for any other minerals exploited in Lesotho seemed poor. Coal has been found in low-grade and thin-seam conditions and uranium in trace amounts. None of the occurrences meet commercial size or grade conditions.

MALAWI

The Malawi Government enacted a new Mines and Minerals Act in March 1981 which the Government hoped will stimulate foreign interest in mineral exploration and development in the country. The only major mineral production activity for the year was the quarrying of marble and the manufacture of cement by the Portland Cement Co. Malawi Ltd. at its Changalume quarry and cement plant. The 1981 production levels of 116,000 tons of marble and 78,000 tons of cement were approximately 15% lower than 1980's reported figures. Under the new act a mining license is valid for 25 years and carries a right of renewal for 15 years under certain specified conditions. The Government recognized that major prospecting and mining ventures would involve large capital investments and provided, in the act, that at the time of granting an exclusive prospecting license, the parties involved could enter into a mining agreement. With the enactment of the new mineral legislation, the restriction on exploration for uranium in Malawi by private companies was suspended.

Malawi's migrant work force employed in Republic of South Africa mines is expected to drop to approximately 10,000 people in 1982. This figure is one-half the number of Malawians employed in that industry during 1980, and is only a fraction of the 176,000 Malawians that worked for the South African mining industry in 1974. Once a 25% portion of the mining labor force in South Africa, Malawian migrant mine workers represented less than 2% of that industry's work force in 1981 and contributed only slightly over 1% to Malawi's GDP for the year. The major reason given for the decline was that the higher unemployment rates in South Africa were leading more South Africans to apply for mining-related jobs, leaving fewer vacancies for migrants.

A 1981 Duke University geophysical study confirmed the presence of somewhat favorable conditions for the formation of oil

or gas deposits below Lake Malawi. The study findings have created an air of cautious optimism within the Malawi Government for the future prospects for indigenous energy developments in Malawi. The Shell Oil Co. of the United States has planned followup aeromagnetic surveys of the Lake Malawi area starting sometime in 1982. Core drilling in the Kapembe Hills, Ngama Coalfield, was completed in 1981, and indicated reserves are estimated at 9 million tons of coal. British Gypsum Ltd. of Great Britain registered a subsidiary company in Malawi during the year to begin mining vermiculite at Kaphirikamodzi, about 30 kilometers west-northwest of Blantyre. The plant was completed in 1981, but production rates will be well below capacity until transportation route problems for moving the vermiculite to the coast are solved.

Table 2.—Malawi: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	10	43	NA	Republic of South Africa 23; Zimbabwe 14.
Semimanufactures	3	2	NA	NA.
Copper metal including alloys, scrap	18	33	--	Zimbabwe 17; Republic of South Africa 16.
Iron and steel metal:				
Pig iron including cast iron value, thousands	--	$9	--	All to Republic of South Africa.
Semimanufactures:				
Bars, rods, angles, shapes, sections	20	44	NA	Zimbabwe 12.
Universals, plates, sheets	--	503	NA	Mozambique 16; Zambia 3.
Hoop and strip	--	1	--	All to Mozambique.
Rails and accessories	71	52	NA	NA.
Wire	--	19	NA	Mozambique 1.
Tubes, pipes, fittings	91	--		
Castings and forgings, rough	--	17	NA	NA.
Lead metal including alloys, scrap	68	17	--	All to Republic of South Africa.
Other: Slag, ash, other residue containing nonferrous metals	--	4	NA	NA.
NONMETALS				
Cement	--	57	NA	NA.
Salt	172	49	NA	NA.
Other: Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	--	10	NA	NA.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline, 42-gallon barrels	128	76	NA	NA.
Distillate fuel oil, do	1,537	7,803	NA	NA.
Lubricants, do	(1)	112	NA	NA.
Mineral jelly and wax, do	--	283	NA	NA.

NA Not available.
[1]Less than 1/2 unit.

Table 3.—Malawi: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Unwrought	39	8	--	All from Republic of South Africa.
Semimanufactures	190	185	--	Republic of South Africa 77; West Germany 28; Zimbabwe 26.
Copper metal including alloys:				
Unwrought	--	1	--	All from Republic of South Africa.
Semimanufactures	86	84	(1)	United Kingdom 53; Republic of South Africa 20; Japan 7.
Iron and steel metal:				
Pig iron including cast iron value, thousands	$12	--		
Powder, shot, grit	26	2	--	All from United Kingdom.
Semimanufactures:				
Bars, rods, angles, shapes, sections	13,598	8,509	29	Republic of South Africa 5,128; Zimbabwe 2,977; United Kingdom 300.
Universals, plates, sheets	17,432	15,372	27	Republic of South Africa 7,692; Japan 7,052; Zimbabwe 537.
Hoop and strip	113	111	--	Republic of South Africa 83; United Kingdom 27.
Rails and accessories	3,041	251	--	Republic of South Africa 123; United Kingdom 74; Canada 38.
Wire	2,184	2,174	--	Zimbabwe 1,254; Republic of South Africa 847; United Kingdom 72.
Tubes, pipes, fittings	4,694	5,978	1	Republic of South Africa 3,802; France 776; India 605.
Castings and forgings, rough	17	165	(1)	Belgium-Luxembourg 89; Republic of South Africa 24; Zimbabwe 20.
Lead metal including alloys, unwrought and semimanufactures	3	10	--	Republic of South Africa 8; Zimbabwe 2.
Nickel metal including alloys, semimanufactures	(1)	1	--	Mainly from West Germany.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	--	$1	--	All from United Kingdom.
Silver metal including alloys, unwrought and partly wrought ---do---	$6	$2	--	All from Republic of South Africa.
Tin metal including alloys:				
Scrap	110	(1)	--	Do.
Unwrought and semimanufactures	1	--		
Zinc metal including alloys:				
Unwrought	33	--		
Semimanufactures	--	9	--	All from Republic of South Africa.
Other: Ores and concentrates kilograms	2	--		
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	35	15	(1)	Republic of South Africa 10; Switzerland 2; India 1.
Cement	22,305	30,629	--	Zambia 24,081; Zimbabwe 6,284; Republic of South Africa 245.
Clay products:				
Nonrefractory	608	425	--	Republic of South Africa 288; Zimbabwe 74; Japan 44.
Refractory including nonclay brick	132	385	--	Republic of South Africa 122; United Kingdom 114; Israel 64.
Fertilizer materials:				
Crude:				
Nitrogenous	700	2,300	--	Mainly from Belgium-Luxembourg.
Phosphatic	292	555	18	Republic of South Africa 238; United Kingdom 187; Zambia 90.
Manufactured:				
Nitrogenous	55,152	54,062	304	Netherlands 29,301; West Germany 7,730; Portugal 5,252.
Phosphatic	11,828	14,876	--	Republic of South Africa 12,766; Israel 1,660; West Germany 450.
Potassic	13,542	9,553	--	France 3,450; Israel 2,750; Belgium-Luxembourg 2,353.
Other including mixed	--	9	--	All from Republic of South Africa.
Lime	2,630	3,143	--	Zambia 2,862; Republic of South Africa 253.
Mica: Worked including agglomerated splittings	(1)	8	--	Republic of South Africa 7; Zimbabwe 1.

See footnotes at end of table.

Table 3.—Malawi: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Precious and semiprecious stones value, thousands	$3	$2	--	All from Zambia.
Salt and brine	16,582	13,226	14	Republic of South Africa 10,860; West Germany 1,234; Mozambique 965.
Stone, sand and gravel:				
Dimension stone, worked	31	(2)	--	NA.
Sand other than metal-bearing	60	5	--	United Kingdom 2.
Sulfur: Elemental, refined	364	14	--	Republic of South Africa 8; Zambia 6.
Other:				
Crude	6,452	4,632	9	Republic of South Africa 2,382; Zambia 2,231.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals value, thousands	$2,053	$2,057	$4	Republic of South Africa $928; Zambia $743; Mozambique $279.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	28	2	--	Republic of South Africa 1; West Germany 1.
Coal, all grades excluding briquets	33,759	65,383	--	Mozambique 35,496; Republic of South Africa 29,887.
Coke and semicoke	40	20	--	All from Republic of South Africa.
Petroleum:				
Crude and partly refined 42-gallon barrels	29	9,374	--	Republic of South Africa 9,308; West Germany 66.
Refinery products:				
Gasoline do	367,378	344,845	--	Republic of South Africa 261,350; France 19,380; Italy 15,011.
Kerosine and jet fuel do	122,605	83,080	--	Republic of South Africa 82,305; United Kingdom 566; Zimbabwe 202.
Distillate fuel oil do	570,533	597,777	552	Republic of South Africa 411,867; Bahrain 74,249; Iran 51,780.
Residual fuel oil do	21,898	15,165	--	Republic of South Africa 12,587; Bahrain 2,051.
Lubricants do	45,227	26,250	1,022	Republic of South Africa 15,925; Netherlands 6,559; United Kingdom 1,071.
Other:				
Liquefied petroleum gas do	3,886	3,921	--	Zimbabwe 3,654; Republic of South Africa 197; Zimbabwe 70.
Mineral jelly and wax do	65,848	51,966	3,604	Republic of South Africa 35,698; Bahrain 5,784; France 3,793.
Bitumen and other residues do	2,321	188	12	Republic of South Africa 145; United Kingdom 30.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	485	717	1	United Kingdom 694; Zimbabwe 20.

[1]Less than 1/2 unit.
[2]Unreported quantity valued at $2,000, of which $1,000 came from Italy and $1,000 came from the United Kingdom.

MAURITIUS

The island of Mauritius gained its independence from Great Britain in 1968. The island's economy, which supports a population of approximately 1 million people, was dominated by the agricultural sector in 1981 as sugar production contributed over one-half of annual foreign exchange earnings. Tourism was also a major factor in the economy, and the manufacturing industry continued to grow rapidly throughout the year. Mining and mineral processing operations were all small and were limited to the production of lime and basalt stone during 1981, all of which is used for domestic purposes. In the past decade, Mauritius has become the world's third largest exporter of certain types of knitwear. Knitwear valued at $51 million was shipped to European markets in 1981. Exports of other types of manufactured goods were also rap-

idly increasing. The continued growth of the manufacturing sector was considered vital as unemployment continued to be a growing problem in Mauritius, having reached 20% by the end of 1981. The island remained dependent on imports for petroleum fuel and products, iron and steel products, cement, and a significant volume of food.

Table 4.—Mauritius: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	66	63	--	Madagascar 25; Republic of South Africa 16; Belgium-Luxembourg 15.
Semimanufactures	(1)	1	--	All to Seychelles.
Copper metal including alloys:				
Scrap	141	35	--	India 15; Republic of South Africa 15; Belgium-Luxembourg 5.
Semimanufactures	5	(1)	--	All to Seychelles.
Iron and steel metal:				
Scrap	--	397	--	Pakistan 300; Republic of South Africa 96.
Steel, primary forms value, thousands	$1	$1	--	All to France.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	$2	--		
Universals, plates, sheets	(1)	3	--	All to Seychelles.
Tubes, pipes, fittings value, thousands	$1	$4	--	Madagascar $2; Seychelles $2.
Lead metal including alloys, scrap	103	106	--	All to Republic of South Africa.
Silver metal including alloys, unwrought and partly wrought value, thousands	$1	--		
Tin metal including alloys, scrap	--	24	--	All to Republic of South Africa.
Zinc metal including alloys:				
Scrap	55	6	--	Do.
Semimanufactures	--	60	--	Do.
NONMETALS				
Cement	25	--		
Clay products: Nonrefractory value, thousands	--	$8	--	All to Seychelles.
Diamond: Gem, not set or strung do	$3,017	$7,716	--	Belgium-Luxembourg $7,422; Italy $292.
Fertilizer materials: Manufactured	15	--		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$9	$4	--	Italy $3; Reunion $1.
Synthetic do	$194	$443	--	All to Switzerland.
Salt and brine	--	12	--	All to Seychelles.
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	1	1	--	All to Italy.
Worked	1	18	--	All to Reunion.
Sulfur: Sulfuric acid value, thousands	$1	--		
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Kerosine and jet fuel 42-gallon barrels	814	170	--	All to Seychelles.
Distillate fuel oil do	1,649	--		
Nonlubricating oils do	70	--		
Lubricants value, thousands	$1	$34	--	Republic of South Africa $24; United Kingdom $3; Reunion $2.

[1] Less than 1/2 unit.

Table 5.—Mauritius: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1977	1978	Sources, 1978	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Unwrought	1	--		
Semimanufactures	916	465	(1)	Republic of South Africa 151; Australia 71; Hong Kong 68.
Copper metal including alloys, semimanufactures	58	104	(1)	Japan 47; Republic of South Africa 37; United Kingdom 16.
Iron and steel metal:				
Pig iron, ferroalloys, similar materials	11	60	--	United Kingdom 48; France 2.
Steel, primary forms	9,439	18,860	--	Republic of South Africa 18,448; India 412.
Semimanufactures:				
Bars, rods, angles, shapes, sections	15,104	20,328	1	Republic of South Africa 14,039; India 2,762; Japan 1,728.
Universals, plates, sheets	7,229	8,198	--	Japan 4,443; Republic of South Africa 2,295; Australia 728.
Hoop and strip	57	67	--	Japan 54; Republic of South Africa 11.
Rails and accessories	27	6	--	West Germany 4; France 2.
Wire	1,364	1,638	--	Republic of South Africa 934; China 268; West Germany 221.
Tubes, pipes, fittings	12,585	6,789	1	United Kingdom 2,076; West Germany 1,313; Japan 1,283.
Castings and forgings, rough	3	--		
Lead metal including alloys:				
Scrap	9	38	--	Republic of South Africa 23; Reunion 15.
Unwrought	24	10	--	All from Republic of South Africa.
Semimanufactures	42	52	--	Republic of South Africa 39; United Kingdom 8.
Nickel metal including alloys, unwrought and semimanufactures value, thousands	$5	$2	--	Australia $1; United Kingdom $1.
Platinum-group metals including alloys, unwrought and partly wrought do	$11	$2	--	All from United Kingdom.
Silver metal including alloys, unwrought and partly wrought do	$56	$46	--	United Kingdom $38; West Germany $8.
Tin metal including alloys, unwrought and semimanufactures	4	14	--	India 6; United Kingdom 6; Malaysia 2.
Zinc metal including alloys:				
Scrap	10	--		
Unwrought	--	45	--	All from Australia.
Semimanufactures	110	748	--	Republic of South Africa 277; Austria 179; Thailand 129.
Other:				
Slag and ash containing nonferrous metals	3	9	--	All from United Kingdom.
Oxides and hydroxides	61	98	--	Republic of South Africa 70; United Kingdom 14; West Germany 10.
Metals including alloys, all forms value, thousands	--	$1	--	All from Hong Kong.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	37	1	--	Mainly from France.
Dust and powder of precious and semiprecious stones value, thousands	$31	$25	--	Republic of South Africa $19; Belgium-Luxembourg $3.
Grinding and polishing wheels and stones	76	61	--	West Germany 24; Switzerland 15; United Kingdom 6.
Asbestos, crude	--	1	--	All from Republic of South Africa.
Cement	245,293	294,644	--	Kenya 139,364; Spain 70,847; Japan 51,628.
Chalk	119	78	--	United Kingdom 55; Belgium-Luxembourg 23.
Clays and clay products:				
Crude	181	111	--	United Kingdom 42; Republic of South Africa 38; China 27.

See footnotes at end of table.

Table 5.—Mauritius: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	Sources, 1978	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products —Continued				
Products:				
Nonrefractory value, thousands	$703	$756	--	Italy $437; United Kingdom $128; Japan $71.
Refractory including nonclay brick ---do---	$156	$193	--	Republic of South Africa $156; United Kingdom $36.
Diamond:				
Gem, not set or strung ---do---	$2,606	$7,298	--	Switzerland $2,614; Belgium-Luxembourg $2,493; United Kingdom $1,785.
Industrial ---do---	$233	$14	--	All from Switzerland.
Diatomite and other infusorial earth	199	501	15	Kenya 358; Japan 126.
Fertilizer materials:				
Crude:				
Phosphatic	28	159	--	Republic of South Africa 140; India 19.
Potassic	1	--	--	
Other including mixed	5,276	5,963	--	All from Seychelles.
Manufactured:				
Nitrogenous	15,026	5,054	--	Italy 5,000; West Germany 50.
Phosphatic	10,325	11,050	8,697	Republic of South Africa 2,353.
Potassic	22,674	20,589	--	Israel 20,586; United Kingdom 2; West Germany 1.
Other including mixed	5	32	--	Belgium-Luxembourg 22; Republic of South Africa 4.
Ammonia	11,698	8,146	--	Iran 5,609; Trinidad and Tobago 2,500.
Graphite, natural	--	3	--	India 2; United Kingdom 1.
Gypsum and plasters	53	18	--	West Germany 10; Belgium-Luxembourg 5.
Lime	284	160	--	All from Republic of South Africa.
Mica: Worked including agglomerated splittings value, thousands	$42	$24	--	United Kingdom $18; India $5.
Pigments, mineral: Natural, crude	211	233	--	United Kingdom 125; China 57; West Germany 45.
Precious and semiprecious stone other than diamond:				
Natural value, thousands	$7	$26	--	Switzerland $24; Republic of South Africa $1.
Synthetic ---do---	$144	$171	--	Switzerland $159; West Germany $11.
Salt and brine	797	941	--	Netherlands 411; United Kingdom 259; China 163.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	1,340	968	--	United Kingdom 914; Belgium-Luxembourg 26.
Soda ash	208	156	--	China 66; United Kingdom 49; Bulgaria 30.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	21	316	--	Mainly from Republic of South Africa.
Worked	14	19	--	Republic of South Africa 7; Italy 5; China 2.
Dolomite, chiefly refractory-grade	1,392	1,891	--	All from Republic of South Africa.
Gravel and crushed rock	174	196	--	China 150; India 30; Italy 15.
Limestone other than dimension	32	2	--	All from Republic of South Africa.
Quartz and quartzite	--	4	--	Mainly from India.
Sand other than metal-bearing	20	13	--	Republic of South Africa 8; United Kingdom 5.
Sulfur:				
Elemental, crude	17	5	2	Japan 1; Republic of South Africa 1.
Sulfuric acid	104	98	--	Republic of South Africa 73; United Kingdom 12; Netherlands 7.
Talc, steatite, soapstone, pyrophyllite	126	79	--	United Kingdom 53; China 15; India 8.
Other: Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	1,204	426	--	Republic of South Africa 371; Italy 21; France 20.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	6,160	4,644	--	Republic of South Africa 4,640; United Kingdom 4.
Carbon:				
Carbon black	1	2	--	All from Republic of South Africa.
Gas carbon	--	37	--	All from France.

Table 5.—Mauritius: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	Sources, 1978	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal, all grades including briquets	950	902	--	All from Republic of South Africa.
Coke and semicoke	161	593	--	Republic of South Africa 300; United Kingdom 293.
Petroleum:				
Crude and partly refined 42-gallon barrels	7,723	8,373	--	All from Republic of South Africa.
Refinery products:				
Gasoline thousand 42-gallon barrels	394	417	--	Bahrain 287; Iran 129.
Kerosine and jet fuel do.	468	512	--	Bahrain 370; Iran 142.
Distillate fuel oil do.	785	843	--	Bahrain 593; Iran 250.
Residual fuel oil do.	599	548	--	Iran 237; Kenya 189; Bahrain 122.
Lubricants value, thousands	$2,480	$2,877	$29	Republic of South Africa $2,601; United Kingdom $135.
Other:				
Liquefied petroleum gas 42-gallon barrels	12,308	14,175	--	Singapore 13,897; Republic of South Africa 162.
Mineral jelly and wax do.	7,807	6,084	110	China 3,305; France 1,086; West Germany 456.
Nonlubricating oils do.	931	714	7	United Kingdom 420; Japan 189; China 70.
Bitumen and other residues do.	582	4,678	--	Republic of South Africa 4,575; United Kingdom 97.
Bituminous mixtures do.	1,782	2,527	6	France 1,485; Republic of South Africa 745.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	25	17	--	All from United Kingdom.

[1]Less than 1/2 unit.

REPUBLIC OF COMOROS

The Republic of Comoros, an archipelago between Madagascar and the Mozambique coast of Africa, had negligible mineral production in 1981. Small sand and gravel operations were maintained for local construction purposes, but as of yearend 1981, no significant exploitable mineral deposits had been discovered on any of the islands. Financed by the Islamic Development Bank and the French Government, plans were being finalized in 1981 for a major expansion project for the Port of Mutsamudu on Anjouan Island. The port's jetty was to be extended to 250 meters, and the port bay was to be deepened to handle ship drafts of 9 meters, expanding the port's capability to accommodate heavy-tonnage oceangoing vessels. Under another aid agreement signed with the French Government early in 1981, funds had been allocated to improve and expand the runways of the Moroni-Hahaia International Airport on Grande Comore Island. The Republic of Comoros, like many of the developing nations of Africa, had a serious balance of trade problem in 1981, owing in large part to the high costs of petroleum imports and devaluation of the local currency against other currencies.

REUNION

Located approximately 640 kilometers east of Madagascar, Reunion is a small island of one-half million inhabitants which has been ruled as a French Overseas Department since 1946. Agriculture was the basis of Reunion's economy in 1981, with sugar production as the main activity. Tourism was also an important foreign exchange earner. Outside of sand and gravel operations for local construction, the only mineral-related activity on the island was a 200,000-ton-per-year cement clinker grinding plant at Saint Denis. Planning continued in 1981 for the construction of a new harbor and port in the Bay of Possession. If initiated, this will be the largest construction project in the island's history, with an estimated cost of $110 million.[4] Construction was planned to begin in the latter half of 1982.

Table 6.—Reunion: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	33	41	--	All to France.
Semimanufactures	3	1	--	Mainly to Mauritius.
Copper metal including alloys:				
Scrap	120	215	--	France 291; Republic of South Africa 124.
Semimanufactures value, thousands	$1	--		
Iron and steel metal:				
Scrap	1,613	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	202	324	--	Comoros 224; Guadeloupe 99.
Universals, plates, sheets	43	72	--	Comoros 60; Madagascar 12.
Wire	--	1	--	Mainly to Mauritius.
Tubes, pipes, fittings	68	40	--	Comoros 39; Mauritius 1.
Castings and forgings, rough	--	2	--	All to Comoros.
Lead metal including alloys:				
Scrap	276	160	--	Republic of South Africa 122; France 37.
Semimanufactures value, thousands	--	$1	--	All to Comoros.
Silver: Waste and sweepings ---do---	$7	--		
Tin metal including alloys, semimanufactures ---do---	--	$6	--	All to Comoros.
NONMETALS				
Cement	848	720	--	Madagascar 712; Comoros 8.
Chalk	4	3	--	All to Mauritius.
Clay products:				
Nonrefractory	22	9	--	Comoros 8; Madagascar 1.
Refractory including nonclay brick	2	(1)	--	All to Comoros.
Lime	22	10	--	Do.
Precious and semiprecious stones other than diamond value, thousands	--	$2	--	All to Mauritius.
Salt	15	--		
Stone, sand and gravel: Dimension stone, worked	--	5	--	All to Mauritius.
Sulfur: Sulfuric acid	7	1	--	Mainly to Madagascar.
Other: Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	5	19	--	All to Comoros.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline ---42-gallon barrels---	8	--		
Lubricants ---do---	735	742	--	Mainly to Comoros.
Other:				
Liquefied petroleum gas ---do---	615	441	--	All to Comoros.
Bitumen and other residues ---do---	18,228	10,763	--	Mainly to Madagascar.

[1]Less than 1/2 unit.

Table 7.—Reunion: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, semimanufactures	258	292	--	France 218; Sweden 70; Italy 2.
Copper metal including alloys, semimanufactures	95	115	--	France 102; Republic of South Africa 8.
Iron and steel metal:				
Scrap	9	11	--	All from France.
Pig iron, ferroalloys, similar materials	12	50	--	Do.
Steel, primary forms	--	173	--	Do.

Table 7.—Reunion: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel metal —Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections	17,618	12,491	--	France 7,413; Republic of South Africa 3,010; West Germany 1,481.
Universals, plates, sheets	10,851	11,424	--	France 7,490; Japan 2,418; Republic of South Africa 1,086.
Hoop and strip	17	46	--	All from France.
Rails and accessories	28	13	--	Do.
Wire	403	289	--	Republic of South Africa 137; France 127.
Tubes, pipes, fittings	5,777	5,680	(1)	France 4,569; Republic of South Africa 997.
Castings and forgings, rough	186	275	--	France 220; Belgium-Luxembourg 55.
Lead:				
Oxides and hydroxides	5	10	--	All from France.
Metal including alloys:				
Unwrought	--	1	--	Do.
Semimanufactures	18	17	--	Do.
Mercury 76-pound flasks	(1)	29	--	Do.
Nickel metal including alloys, semimanufactures -- value, thousands	$3	$2	--	All from West Germany.
Silver metal including alloys, unwrought and partly wrought do	$9	$14	--	All from France.
Tin metal including alloys, unwrought and semimanufactures	--	1	--	Do.
Titanium:				
Oxides and hydroxides	178	189	--	Republic of South Africa 135; West Germany 54.
Metal including alloys, semimanufactures	7	--		
Zinc:				
Oxides and hydroxides	2	4	--	All from France.
Metal including alloys, semimanufactures	1	2	--	Do.
Other:				
Alkali, alkaline-earth, rare-earth metals value, thousands	$1	--		
Base metals including alloys, unwrought and semimanufactures do	$3	$11	--	All from France.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1	30	--	Do.
Grinding and polishing wheels and stones	20	23	--	France 22; West Germany 1.
Asbestos, crude value, thousands	$4	--		
Boron materials: Acid	25	--		
Cement	149,599	181,715	--	Republic of South Africa 114,546; Kenya 50,197; France 16,972.
Chalk	552	1,137	--	All from France.
Clays and clay products:				
Crude	127	135	--	France 108; United Kingdom 20; Madagascar 7.
Products:				
Nonrefractory	6,615	8,243	--	Italy 4,881; France 1,918; Spain 855.
Refractory including nonclay brick	508	974	--	France 829; Republic of South Africa 143; Italy 1.
Diamond: Gem, not set or strung value, thousands	$88	$93	--	France $88; India $5.
Diatomite and other infusorial earth	22	40	--	All from France.
Fertilizer materials:				
Crude:				
Phosphatic	10	--		
Other including mixed	3	26	--	Republic of South Africa 18; France 8.
Manufactured:				
Nitrogenous	2,520	2,819	--	Belgium-Luxembourg 1,719; Mauritius 400; West Germany 297.
Phosphatic	690	543	--	All from France.
Potassic	160	204	--	East Germany 104; Belgium-Luxembourg 100.
Other including mixed	30,303	28,440	--	Italy 11,938; Netherlands 7,622; Mauritius 5,100.
Ammonia	10	8	--	France 7; Republic of South Africa 1.

See footnotes at end of table.

Table 7.—Reunion: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Gypsum and plasters	7,319	10,263	--	All from France.
Lime	1,759	1,260	--	Do.
Magnesite	154	248	70	Netherlands 178.
Mica: Crude including splittings and waste	5	10	--	All from France.
Pigments, mineral: Iron oxides, processed	36	89	--	West Germany 45; France 43.
Precious and semiprecious stones other than diamond -- value, thousands	$50	$106	--	France $41; West Germany $33; Madagascar $27.
Salt and brine	2,680	2,170	--	West Germany 1,045; Madagascar 479; Republic of South Africa 404.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	3	1	--	All from France.
Caustic soda	203	260	--	France 223; East Germany 15; West Germany 15.
Soda ash	2	--		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	11	(1)	--	All from France.
Worked	169	204	--	France 150; Italy 27; Mauritius 22.
Gravel and crushed rock	8	14	--	Republic of South Africa 8; France 6.
Quartz and quartzite value, thousands	$2	--		
Sand other than metal-bearing	217	122	--	France 121; West Germany 1.
Sulfur:				
Elemental, refined	(1)	2	--	All from France.
Sulfuric acid	101	116	--	France 89; Republic of South Africa 17; Netherlands 10.
Talc, steatite, soapstone, pyrophyllite	20	22	--	All from France.
Other:				
Crude	46	--		
Slag, dross, similar material, not metal-bearing	3	12	--	All from France.
Building materials of asphalt, asbestos and fiber cements, unfired non-metals	2,671	3,187	(1)	France 3,175; Netherlands 11.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	40	--	All from France.
Carbon black	1	1	--	Do.
Coal and briquets: Briquets of coal	--	3	--	Do.
Coke and semicoke	5	--		
Peat including briquets and litter value, thousands	--	$1	--	All from France.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	1,067	3	--	France 2.
Kerosine and jet fuel do	217	228	--	Bahrain 177; People's Democratic Republic of Yemen 51.
Distillate fuel oil do	587	(1)	--	All from France.
Residual fuel oil do	424	108	--	All from Madagascar.
Lubricants do	28	22	4	France 12; Republic of South Africa 5.
Other:				
Liquefied petroleum gas do	149	158	--	Singapore 129; Bahrain 18.
Mineral jelly and wax 42-gallon barrels	394	142	--	France 118; Belgium-Luxembourg 24.
Bitumen and other residues do	60,012	54,516	--	Republic of South Africa 54,425; France 91.
Bituminous mixtures do	642	594	6	France 581.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	3	10	--	All from France.

[1]Less than 1/2 unit.

RWANDA

Mineral production in 1981 accounted for approximately 1% of Rwanda's estimated $1.25 billion GDP.[5] Mineral exports remained Rwanda's third biggest foreign exchange earner, behind coffee and tea. Overall mineral production and exports declined in 1981 with the exception of gold, for which production and exportation increased 25%. Other minerals mined were cassiterite, wolframite, columbite-tantalite, and beryl.

Transportation services and infrastructure were improved during 1981 as part of a major Government construction and expansion program. Surface paving work was well underway by yearend on the roads from the capital city of Kigali south to Butare and north to Ruhengeri and on the Ruhengeri-to-Cyanika road linking Rwanda and Uganda. The total cost of the roadwork on the Kigali-Ruhengeri-Cyanika span was estimated at $40 million. As of yearend 1981, there were approximately 1,000 Belgian nationals working within Rwanda, with 20% of them involved in the mining sector.

The national tin mining company, Société Minière du Rwanda (Somirwa), reported completing construction on its 3,000-ton-per-day tin smelter complex at Kururuma during the year. Somirwa is managed and 51% owned by the Compagnie Géologique et Minière des Ingenieurs et Industriels Belges of Belgium, and 49% owned by the Rwandan Government.

As of the end of 1981 there were no facilities in Rwanda for the production or processing of petroleum or natural gas. The country imports all of its limited requirements for petroleum products in their refined form. There was no prospect in the near future that Rwanda's situation will change with respect to production of oil and natural gas, although large reserves of natural gas have reportedly been found in the vicinity of Lake Kivu. An agreement between the Governments of Rwanda, Zaire, and Burundi was reached in 1981 regarding a cooperative effort to further evaluate the development potential of these gas resources. Rwanda was involved in a preliminary feasibility study in 1981 aimed at developing large peat resources for domestic heating needs. Also in the energy sector, an agreement was reached in principle between the Governments of Rwanda, Zaire, and Burundi for constructing a 140-megawatt hydroelectric dam on the Ruzizi River. Project financing had been promised by the European Development Bank, the African Development Bank, and the Organization of Petroleum Exporting Countries.

SEYCHELLES

The Seychelles, a group of 92 coral islands 1,600 kilometers off the coast of Kenya, is a former British colony which achieved independence in 1976. The only mineral commodity to be exploited on the island in 1981 was guano. The guano is high in phosphorus and is used domestically as a fertilizer. The mineral industry contributed considerably less than 1% to the GDP, which was estimated for 1981 at $120 million.[6] The Nation's balance of payments deficit almost doubled during the year, increasing from $10.2 million in 1980 to $19.4 million in 1981. The sharp increase was attributed to a major slump in the tourist industry, the country's major foreign exchange earner, and a revaluation of the local currency by 15%. Foreign aid grants and loans amounted to $13.9 million in 1981.

After expending $35 million on three dry offshore drill holes, the AMOCO Seychelles Petroleum Co. ceased searching for oil in the Seychelles in June 1981. The exploration drilling was conducted offshore of Mahe, the Seychelles' largest island. During December 1981, U.S. AMOCO and the Seychelles Government entered into negotiations for a new oil exploration agreement, to resume active exploration operations in the Seychelles waters. In the past 2 years, AMOCO has been the only petroleum company involved in active oil exploration in Seychelles, which is forced to import all of its petroleum needs.

Table 8.—Seychelles: Exports and reexports of mineral commodities

(Metric tons)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
Aluminum metal including alloys, unwrought	--	47	--	All to Mauritius.
Copper metal including alloys, scrap	26	10	--	All to Pakistan.
Fertilizer materials: Crude	6,383	4,285	--	All to Mauritius.
Stone, sand and gravel: Gravel and crushed rock	--	10	NA	NA.
Other nonmetals: Crude	3	--		

NA Not available.

Table 9.—Seychelles: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, unwrought and semimanufactures	(1)	67	1	United Kingdom 29; Belgium-Luxembourg 28.
Copper metal including alloys, unwrought and semimanufactures	5	6	--	United Kingdom 3; Canada 1; Republic of South Africa 1.
Iron and steel metal:				
Steel, primary forms	(2)	4	--	Mainly from United Kingdom.
Semimanufactures:				
Bars, rods, angles, shapes, sections	541	1,370	--	Republic of South Africa 484; United Kingdom 142; West Germany 120.
Universals, plates, sheets	708	542	--	Japan 290; Singapore 94; Malaysia 76.
Hoop and strip value, thousands	$4	$24	--	Republic of South Africa $23.
Wire do.	--	$6	--	Republic of South Africa $3; Kenya $2; United Kingdom $1.
Tubes, pipes, fittings do.	$1,140	$394	--	United Kingdom $280; Republic of South Africa $45; Singapore $22.
Castings and forgings, rough do.	$2	$50	--	United Kingdom $29; Republic of South Africa $13; Singapore $8.
Lead metal including alloys, unwrought and semimanufactures	1	--		
Silver metal including alloys, unwrought and partly wrought value, thousands	--	$21	--	Republic of South Africa $16; United Kingdom $4.
Zinc metal including alloys, unwrought do.	$5	--		
Other:				
Oxides and hydroxides do.	--	$31	--	France $19; United Kingdom $12.
Metals including alloys, unwrought and semimanufactures do.	$13	$252	$5	United Kingdom $88; Mauritius $85.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	$2	$13	--	United Kingdom $10; Australia $1.
Cement	2,135	22	--	Kenya 20; Republic of Korea 1.
Clay products: Nonrefractory value, thousands	$206	$217	--	Italy $93; United Kingdom $62; Republic of South Africa $46.
Fertilizer materials:				
Crude	--	1	--	All from United Kingdom.
Manufactured	--	10	--	Mainly from West Germany.
Ammonia value, thousands	$4	$1	--	Mainly from United Kingdom.
Gypsum and plasters	--	2	--	All from Republic of South Africa.
Lime	--	23	--	Do.
Mica: Worked including agglomerated splittings value, thousands	$4	--		
Precious and semiprecious stones do.	$1	--		
Salt and brine	271	285	--	Republic of South Africa 248; Singapore 30.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	54	37	--	West Germany 36; United Kingdom 1.

See footnotes at end of table.

Table 9.—Seychelles: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand, and gravel:				
Dimension stone:				
Crude and partly worked	3	--		
Worked	8	--		
Sand other than metal-bearing	--	3	--	United Kingdom 2.
Sulfur: Sulfuric acid	--	5	--	Netherlands 2; United Kingdom 2.
Other:				
Crude	2	53	--	Netherlands 21; Republic of South Africa 21; China 3.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	178	113	--	Republic of South Africa 66; United Kingdom 20; Singapore 19.
MINERAL FUELS AND RELATED MATERIALS				
Coal, all grades excluding briquets	6	3	--	All from Republic of South Africa.
Petroleum refinery products:				
Gasoline—42-gallon barrels	46,869	5,338	--	Bahrain 5,287; Arab Republic of Yemen 51.
Kerosine and jet fuel—do	235,073	241,304	--	Bahrain 241,288.
Distillate fuel oil—do	306,054	259,496	--	All from Bahrain.
Residual fuel oil—do		206	--	Mainly from Bahrain.
Lubricants—do	3,759	1,792	42	Singapore 574; Republic of South Africa 546; Kenya 308.
Other:				
Liquefied petroleum gas—do	1,798	([3])		NA.
Mineral jelly and wax—do	24	31	--	United Kingdom 15; West Germany 15.
Bituminous mixtures—do	2,182	2,963	--	Singapore 1,491; Republic of South Africa 1,224.
Nonlubricating oils—do	$19	--		
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	148	([2])	--	All from United Kingdom.

[1]Unreported quantity valued at $145,000.
[2]Less than 1/2 unit.
[3]Unreported quantity valued at $175,000, of which $118,000 came from the Republic of South Africa, $23,000 came from the United Kingdom, $12,000 came from France, and $6,000 came from the United States.

SOMALIA

The mineral industry sector continued to be an extremely small contributor to the Somalian economy during 1981. The GDP was $425 million for the year.[7] Mineral production in the Somali Democratic Republic was confined to small-scale mining of cassiterite tin deposits, sea salt, stone, limestone, and meerschaum. Increasing mineral development within the country was given a high priority by the Government in 1981, and a $1.5 million contract was awarded to a Brazilian state firm, Companhia de Pesquisa de Recursos Minerais, to survey the country's mineral resources.

To supply the increasing domestic market for cement and avoid increased cement imports, the Somalian Government in 1976 contracted with the Korean Government for the construction of a cement plant at Berbera in northwest Somalia. During construction of this plant, major design and contractual changes were made. The Koreans designed the plant to use a wet process with an output of 100,000 tons per year of cement. Construction of the plant was transferred to French contractors, and the plant was redesigned to use a dry process with a capacity of 300,000 tons per year of cement. Construction of the plant was scheduled for completion by the end of 1982. Near the city of Bardera in southern Somalia, a feasibility study was completed in 1981 which proposed construction of a second cement plant within the country. The additional cement capacity is needed for the construction of the $630 million hydroelectric dam on the nearby Juba Valley River. Construction activities for both of these projects were scheduled to begin in the latter half of 1982.

At the end of 1981, there were six U.S. oil companies either actively exploring for petroleum in Somalia or planning to get exploration programs underway. Oil explo-

ration efforts to date had not resulted in any positive finds. Having no known fossil fuel resources, Somalia has been heavily dependent on imported oil, with fuel imports in 1980 costing over $76 million. Late in 1981 negotiations were underway between the Governments of Somalia and Saudi Arabia for extending Somalia a grant of crude oil for the country's 1982 consumptive needs. Owing to a lack of foreign exchange capital, Somalia has had problems securing crude petroleum for its only oil refinery, Iraqsoma, located at Mogadishu. The refinery was shut down late in 1980 owing to a lack of crude oil feedstock and was dormant throughout 1981. If restarted and operated near capacity, the refinery could produce a considerable amount of fuel oil for exportation, as only 60% of the refinery's production would be needed for domestic purposes. The fuel exports could result in an estimated $25 million in revenues, which would help alleviate the country's critical shortage of foreign exchange.

International trade and trading partners did not change appreciably for Somalia in 1981. Livestock exports remained the country's greatest foreign exchange earner, comprising over 90% of the export revenues reported in 1981. The livestock exports were valued at $181 million, which was approximately 43% of the country's GDP. There was a positive change in 1981 regarding Somalia's balance of payments problems. In July 1981 Somalia officially established a two-tier exchange rate system whereby imports in categories considered nonessential were inflated 100% exchange-rate-wise to discourage their entry and purchase. Total imports for 1981 were only 87.5% of total exports, which is a considerable improvement over the 1980 figure of 170%.

Table 10.—Somalia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
Coal, coke, briquets	--	30	--	All to Djibouti.
Fertilizer materials:				
Crude	10	1,011	--	United Arab Emirates 920; Saudi Arabia 91.
Manufactured	958	--		
Iron and steel metal, semimanufactures:				
Tubes, pipes, fittings value, thousands	--	$5	--	All to Kenya.
Petroleum refinery products:				
Kerosine 42-gallon barrels	7,626	31	--	Kenya 16; Saudi Arabia 8.
Distillate fuel oil do	768	40,321	37,300	People's Democratic Republic of Yemen 1,917; Saudi Arabia 746; Sudan 172.
Liquefied petroleum gas do	--	12	--	All to Italy.
Salt and brine	18	7	--	All to Djibouti.
Uranium and thorium: Ore and concentrate value, thousands	$1	--		

Table 11.—Somalia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms value, thousands	$180	$76	--	Djibouti $23; Netherlands $18; Saudi Arabia $2.
Copper metal including alloys, all forms	1	NA	NA	NA.
Iron and steel:				
Ore and concentrate	--	52	--	All from Italy.

See footnotes at end of table.

Table 11.—Somalia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal:				
Scrap	--	57	--	All from Italy.
Steel, primary forms value, thousands	$734	$8	--	Do.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	$690	$1,182	--	Italy $1,075; West Germany $51.
Universals, plates, sheets do	$955	$1,875	--	Italy $504; Djibouti $339; United Arab Emirates $304.
Hoop and strip do	$2	--		
Rails and accessories do	$1	--		
Wire do	$213	$1,559	$3	Italy $569; Kenya $388; United Kingdom $212.
Tubes, pipes, fittings do	$1,012	$1,584	$31	Italy $1,005; United Kingdom $290; France $75.
Castings and forgings, rough do	$573	$208	--	Italy $178; Djibouti $15; Kenya $12.
Lead metal including alloys, all forms do	$16	$7	--	United Kingdom $6; France $1.
Nickel metal including alloys, all forms	12	NA	NA	NA.
Tin metal including alloys, all forms	22	NA	NA	NA.
Zinc metal including alloys, all forms	11	NA	NA	NA.
Other: Base metals including alloys, all forms value, thousands	$189	$11,539	$406	Italy $5,008; United Kingdom $1,966; Pakistan $1,011.
NONMETALS				
Cement do	$3,623	$2,222	$3	Kenya $1,474; Italy $245; United Arab Emirates $191.
Clays and clay products:				
Crude	--	2	--	All from Italy.
Products:				
Nonrefractory value, thousands	$22	$281	--	Do.
Refractory including nonclay brick do	$137	$52	--	Do.
Fertilizer materials:				
Crude	77	73	--	Kenya 70; United Kingdom 2; Italy 1.
Manufactured	--	103	--	All from Italy.
Lime value, thousands	$102	$3,446	--	China $2,357; Kenya $932; West Germany $57.
Salt and brine	20	143	--	United Arab Emirates 116; Saudi Arabia 20; Iran 6.
Stone, sand and gravel:				
Crude	170	402	--	All from Italy.
Dimension stone, worked	177	--		
Other:				
Crude	82	642	--	Italy 428; Kenya 132; Netherlands 38.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals value, thousands	$2,053	$2,291	--	Italy $1,686; United Kingdom $496.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,099	--		
Petroleum:				
Crude 42-gallon barrels	--	153	--	All from China.
Refinery products:				
Gasoline thousand 42-gallon barrels	323	196	--	Italy 157; Iraq 34; Kenya 3.
Kerosine and jet fuel do	113	--		
Distillate fuel oil do	670	80	--	Mainly from Iran.
Residual fuel oil do	--	18	--	Italy 9; Iraq 5; Iran 3.
Lubricants do	17	6	--	Iran 3; Kenya 1.
Other:				
Liquefied petroleum gas do	(1)	7	--	Italy 5; Iraq 1.
Mineral jelly and wax value, thousands	--	$1	--	All from Italy.
Bitumen and other residues thousand 42-gallon barrels	(1)	6	--	Mainly from Italy.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	44	--		

NA Not available.
[1]Less than 1/2 unit.

SWAZILAND

Since the cessation of active iron ore mining in Swaziland during 1977, the mining sector's importance in the economy has declined. The mining sector has averaged an annual 2.2% negative growth rate since the beginning of fiscal year 1978 although it did experience a 2% positive growth in 1981 owing to expansions in coal and asbestos output. The value of mineral production in Swaziland for 1981 was approximately $23 million, which was almost 5% of the country's GDP.

In general the Swaziland economy experienced an exceptionally good year in 1981, having grown by an estimated 6.5% in real terms. The growth was due mainly to increased agricultural production, combined with increased exports of woodpulp, chemicals, and electronic equipment. Swaziland's economy was also well diversified in 1981, manufacturing contributing 25% to the country's GDP, agriculture and forestry 23%, the public sector 13%, and several other areas the remaining 39%.

The number of migrant mine workers from Swaziland working in the Republic of South Africa increased to approximately 10,000 in 1981, which was a 15% increase over 1980's total figure. However, the 1981 figure is still less than 40% of the 26,000 Swazi citizens who were employed in South African mining ventures in 1976. This downward trend is similar throughout the migrant-worker-exporting countries that have supplied laborers to the South African mines through the years. It was assumed that even though the drop in employment of Swazi migrant mine workers to the Republic of South Africa has been somewhat erratic, the decreasing employment trend will continue in the early 1980's owing to the depressed state of the mining sector there and the willingness of more South Africans to work in the mines.

Asbestos remained the main mineral foreign exchange earner in 1981 with reported revenues of almost $19 million. However, the remaining reserves at the Havelock asbestos mine, the sole asbestos mining operation in Swaziland, were almost depleted and the property will probably shut down within the next few years. Coal offered the best potential in the longer term, with reserves estimated at approximately 1 billion tons, of which 200 million tons are considered good-quality steam coal. The major coal mine in Swaziland is the Anglo American Corp. Ltd.'s Mpaka Colliery, which produced 149,000 tons of anthracite coal, or 91% of Swaziland's total production for 1981. About 30% of the coal mined during 1981 was exported to Kenya and Mozambique, with the rest consumed domestically. There is considerable expansion potential for Swaziland's export coal market. However, there are currently serious capacity problems in transporting the coal, particularly with the rail line to Mozambique's port of Maputo and the operation of the port itself. In 1981 the Swaziland Railroad Co. announced plans to build a new rail link from the Mpaka Colliery to the existing South African rail line at Komatipoort, which would take the coal to Richards Bay Port on South Africa's east coast.

UGANDA

In June 1981, the Government of Uganda took strong measures in an attempt to revitalize its economy. Actions included floating the Uganda shilling against other currencies, raising prices of agricultural crops such as coffee and cotton, and lifting restrictive price controls. The net result of these measures by yearend was some regained confidence within the international community for Uganda's ability to correct the ills of its economy, and the first signs of progress towards its economic recovery. In the mining sector the most important development during 1981 was the Government's establishment of a task force for evaluating proposals for a National Mining Corp. (Namico). Once formed, Namico was to take charge of all mining activities in the country. A bill to approve the proposed corporation was drawn up in 1981 for presentation to the 1982 session of the Ugandan Parliament.

The European Investment Bank (EIB) entered into an agreement with Kilembe Mines Ltd. in August 1981 to finance a feasibility study which will examine the prospects of rehabilitating the Kilembe copper-cobalt mine, mill, and smelter. Only a skeleton force of miners was employed during 1981, and only a minor amount of

ore was produced. Both ore and copper-cobalt concentrates were stockpiled, as the milling equipment was barely operable and the smelter required a complete rebuilding of the electric furnace before it could be expected to operate. The contract for the feasibility study was to be awarded by the spring of 1982, and once underway, the study was estimated to take 1 year to complete. A stipulation of the EIB agreement required that the study contractor must be from a European Economic Community country.

Considerable progress was reported in 1981 towards the rehabilitation of two Ugandan cement manufacturing facilities. The Federal Republic of Germany agreed in 1981 to assist with the reconstruction of the Hima cement plant. It was estimated that the plant would produce cement at near its capacity of 600 tons per day by late 1982. Part of the reconstruction work was completed by the end of 1981. The Tororo cement plant, situated on Uganda's eastern border with Kenya, produced an average of 1,000 tons per month of cement after completion of some reconstruction work in 1980 and early 1981. An agreement was signed during 1981 with the Turkish Cement Corp. to continue with rebuilding and expansion work on the plant. The rated capacity of the finished plant is 550 tons per day of cement.

The asbestos cement plant, which is part of the Tororo cement complex, produced asbestos sheets and accessories, along with pipes and pipe accessories, at about 40% of the plant's rated capacity during 1981. Production was curtailed because of a shortage of raw materials, which had to be imported into the country. Limestone, which is used in cement production, occurs in large reserves nearby the Hima and Tororo plant sites. The newest development in the cement industry during 1981 was the initiation of the Bududa cement project in Mbale district in eastern Uganda. An agreement covering the project was signed between the Ugandan Government and the Turkish Cement Corp. during the last half of 1981.

Negotiations were in the final stages at the end of 1981 for World Bank financing of a feasibility study for rehabilitating Uganda's phosphate industry. The study will examine the viability of establishing a phosphate plant and a sulfuric acid plant based on the phosphate deposits in the Sukulu Hills, 200 kilometers east of Kampala. The deposits are of high grade and close to the surface, with reserves estimated at about 200 million tons. The study is expected to take approximately 30 months to complete. The phosphate fertilizer plant at Tororo remained inoperative throughout 1981. In other mineral areas, the Bjordal Mine facilities in the Kigezi area, operating at partial capacity during 1981, produced some wolfram concentrates. However, no tungsten production figures were reported for the year. The majority of small mine operations, located mainly in western Uganda, remained shut down in 1981 owing to a lack of supplies and laborers. In past years these mines have produced gold, tungsten, tin, and beryl. The reactivation of the small mines will probably depend on the establishment and effectiveness of Namico, which would be in a much better position to mobilize the funds necessary for acquiring the supplies.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Burundi francs (FBu) to U.S. dollars at the rate of FBu90.0=US$1.00.

[3]Where necessary, values have been converted from Ethiopian birr (B) to U.S. dollars at the rate B2.07=US$1.00.

[4]Where necessary, values have been converted from Reunion francs (F) to U.S. dollars at the rate of F4.22=US$1.00.

[5]Where necessary, values have been converted from Rwanda francs (RF) to U.S. dollars at the rate of RF93=US$1.00.

[6]Where necessary, values have been converted from Seychelles rupees (SR) to U.S. dollars at the rate of SR6.25=US$1.00.

[7]Where necessary, values have been converted from Somali shillings (SSh) to U.S. dollars at the rate of SSh6.3=US$1.00.

The Mineral Industry of Other West African Countries

By George A. Morgan[1]

CONTENTS

BENIN

Output of minerals was insignificant in 1981 and made a negligible contribution to the gross national product (GNP), estimated at $1.2 billion.[2] Agriculture accounted for 40% of GNP and manufacturing accounted for 10%. The chief source of income was indirect taxes levied on traffic through the Port of Cotonou, an entrepôt.

Trade statistics for Benin were incomplete and dated. Major trading partners were France and other members of the European Communities. Benin was a member of the West African Monetary Union and as such must coordinate its foreign currency, reserves, interest rate structure, and fund transfer with other member countries. Its currency, the Communauté Financière Africaine franc (CFAF), was fixed to the French franc.

Wage controls remained in effect. Private-sector minimum wages had been frozen since 1974 but were raised 15% in 1980. Public sector wages have been frozen since 1966 and were due to increase about 10% to 15%.

COMMODITY REVIEW

Cement.—Two cement plants were in operation using imported clinker. The plant of Société des Ciments du Benin (SCB) has been in operation since 1970. SCB was 80% Government controlled; the remainder was controlled by private French interests. Capacity was 240,000 tons per year, and production was about 150,000 tons in 1981.

The Société Nationale des Ciments (SONACI) was 100% Government owned. Production began in 1979 with output of 107,000 tons compared with a capacity of 200,000 tons. The company continued to experience difficulty in 1981. Output by both SCB and SONACI was distributed by the quasi-public Société Beninoise des Materiaux de Construction and the Société Provinciale de Commercialisation des Produits Manufactures.

A $125 million joint Nigerian-Benin cement project continued in the Pobe region. A clinker plant was under construction and was to utilize local limestone. Planned ca-

pacity was 500,000 tons per year.

Electric Power.—About 92% of all electric power consumed was imported through Togo from the Akasambo-Volta River hydroelectric complex in Ghana. Communauté Electrique du Benin, a joint Togolese-Benin company, provided for the transmission. Agreements permitted Benin to draw up to 25 megawatts per year for a period of 25 years.

Benin had a total generating capacity of 19.5 megawatts, consisting of two 8-megawatt diesel generators at Cotonou, a diesel generator of about 3-megawatt capacity at Parakou, and a 0.5-megawatt generator at Bohicon-Abomey.

Petroleum.—Oil was discovered in the Seme Oilfield in 1968 about 15 to 20 kilometers offshore in 30 to 50 meters of water. Exploitation of the field was being financed by a guarantee from the Norweigan Guarantee Institute for Export Credits. The guarantee required that most equipment and services be purchased in Norway.

Two storage tanks with 40,000-cubic-meter capacity each were being constructed. They will be filled with oil via a 14-kilometer, 6-inch crude oil pipeline. A 3-kilometer, 20-inch pipeline will be used for a tanker boarding facility offshore. Output of 15,000 barrels per day was planned.

Other Minerals.—Phosphate resources amounting to 4.5 million tons were located at Mekrou. No exploitation was underway. Gold, chromite, and iron mineralization have also been found in Benin.

Table 1.—Other countries of West Africa: Production of mineral commodities[1]

Country[2] and commodity[3]	1977	1978	1979	1980[p]	1981[e]
BENIN					
Cement, hydraulic[4] metric tons	200,000	200,000	151,000	160,000	160,000
Salt, marine[e] do.	300	300	350	400	400
Stone: Gravel[e] do.	18,000	20,000	21,000	22,000	22,000
CAPE VERDE ISLANDS					
Cement, hydraulic[e] do.	4,000	15,000	15,000	15,000	16,000
Pumice and related volcanic materials do.	15,000	15,000	16,000	16,000	16,000
GUINEA					
Aluminum:					
Bauxite, gross weight thousand metric tons	10,841	10,456	13,700	10,330	10,000
Alumina do.	562	610	660	708	700
Diamond:					
Gem[e] thousand carats	25	25	27	12	12
Industrial[e] do.	55	55	58	26	26
Total do.	[e]80	[e]80	[e]85	38	38
IVORY COAST					
Diamond:					
Gem[e] do.	7	--	5	(5)	--
Industrial[e] do.	11	10	32	(5)	--
Total do.	18	10	37	(5)	--
Petroleum:					
Crude oil thousand 42-gallon barrels	--	--	--	90	90
Refinery products:					
Gasoline do.	2,166	2,210	[e]2,200	2,091	2,091
Kerosine and jet fuel do.	1,388	1,117	[e]1,100	1,248	1,248
Distillate fuel oil do.	3,235	3,678	[e]3,600	2,768	2,768
Residual fuel oil do.	4,482	4,344	[e]4,300	4,995	4,995
Liquefied petroleum gas do.	[e]122	182	[e]180	93	93
Refinery fuel and losses do.	[e]451	521	[e]500	482	482
Total do.	[e]11,844	12,052	[e]11,880	11,677	11,677
MALI					
Cement, hydraulic metric tons	35,174	34,400	26,758	20,000	20,000
Gold, mine output, metal content troy ounces	[e]932	965	[e]1,000	[e]1,500	1,500
Salt[e] metric tons	4,500	4,500	4,500	4,500	4,500
Stone:					
Granite square meters	8,088	6,000	415	--	--
Marble do.	217	400	400	500	500
Limestone metric tons	394	495	500	4,600	4,600
NIGER					
Cement, hydraulic do.	40,000	[e]40,000	38,000	[e]38,000	38,000
Gypsum do.	3,000	2,720	2,720	[e]2,720	2,720
Salt[e] do.	1,000	900	900	3,000	3,000

See footnotes at end of table.

Table 1.—Other countries of West Africa: Production of mineral commodities[1] —Continued

Country[2] and commodity[3]	1977	1978	1979	1980[p]	1981[e]
NIGER —Continued					
Stone, sand and gravel:					
Limestone, not further described metric tons	60,000	NA	NA	NA	NA
Gravel cubic meters	[e]180,000	[e]180,000	180,000	180,000	180,000
Sand do.	[e]6,000	[e]6,000	6,000	6,000	6,000
Tin, mine output, metal content metric tons	130	125	125	56	50
Uranium concentrate, U_3O_8 content do.	1,440	2,060	3,740	4,100	4,500
SENEGAL					
Cement, hydraulic do.	330,000	357,000	380,688	386,234	385,000
Clays: Fuller's earth (attapulgite) do.	3,405	6,930	13,000	3,978	3,900
Gold troy ounces	--	[e]250	--	NA	NA
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	[e]1,038	502	1,141	1,057	1,057
Jet fuel and kerosine do.	[e]666	616	1,095	1,101	1,101
Distillate fuel oil do.	[e]1,551	2,248	1,319	1,178	1,178
Residual fuel oil do.	[e]2,148	1,883	2,121	1,985	1,985
Other do.	[e]58	57	102	87	87
Refinery fuel and losses do.	[e]216	[e]256	235	188	188
Total do.	[e]5,677	[e]5,562	6,013	5,596	5,596
Phosphate rock and related products:					
Crude:					
Aluminum phosphate thousand metric tons	275	204	184	224	224
Calcium phosphate do.	1,596	1,555	1,651	1,408	1,408
Manufactured:					
Aluminum phosphate, dehydrated do.	69	48	78	132	132
Other[6] do.	6	6	10	8	8
Salt metric tons	140,000	140,000	140,000	140,000	140,000
Stone:					
Basalt cubic meters	[e]168,500	100,000	NA	NA	NA
Marble (cipoline) do.	[e]250	[e]150	NA	NA	NA
TOGO					
Phosphate rock, beneficiated product thousand metric tons	2,857	2,827	2,920	2,933	2,900
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	--	[e]435	673	544	544
Kerosine and jet fuel do.	--	[e]280	432	347	347
Distillate fuel oil do.	--	915	1,417	621	621
Residual fuel oil do.	--	[e]290	440	725	725
Minor products, refinery fuel and losses do.	--	[e]130	[e]200	99	99
Total do.	--	[e]2,050	3,162	2,336	2,336
Salt metric tons	--	650	650	600	600
Stone: Marble, dimension square meters	NA	23	NA	NA	NA

[e]Estimated. [p]Preliminary. NA Not available.

[1]Includes data available through Oct. 12, 1982.

[2]In addition to the countries listed, The Gambia, Guinea-Bissau, and Upper Volta, which are covered in the text of this chapter, presumably produce modest quantities of a variety of crude construction materials (clays, stone, and sand and gravel) and may produce minor amounts of other mineral commodities (most notably gypsum, lime, and salt), but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.

[3]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, stone, and sand and gravel) presumably are produced, but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.

[4]Output apparently based entirely on imported clinker.

[5]Revised to zero.

[6]Products marketed under the trade names "Balifos," "Phospal," and (in 1980 only) "P 125" (the latter described as crushed aluminum phosphate).

CAPE VERDE ISLANDS

Output of mineral-related commodities in 1981 was confined to salt and construction materials. The Banque Africaine de Développment (BAD) provided $37.2 million[1] in aid for six projects involving infrastructure development. BAD was also interested in construction of a cement plant on the island of Maio. Limestone and pozzolana available locally would supply the plant.

THE GAMBIA

No mineral production of significance occurred in The Gambia in 1981. Known deposits of ilmenite, rutile, and zircon in beach sands were not mentioned for exploitation. Agriculture accounted for most of the estimated $200 million[4] GNP.

There was no oil and gas exploration activity. Chevron Overseas Petroleum Co. (United States) and Compagnie Française des Pétroles S.A. (Total) continued to hold their concessions. Their Jemmah 1 well was plugged as dry in 1979.

GUINEA

The mining sector accounted for 20% of a GNP of $1.5 billion[5] in 1981, and about 95% of export earnings. Bauxite was the principal mineral produced. Several large-scale mining projects were either proposed for study or progressed further in their realization.

Foreign exchange for the purchase of food and gasoline and for financing state-controlled industries and agricultural projects was provided by the export of mineral-related products. Foreign debt was over $1.5 billion. Approximately 50% of foreign debt was from bilateral clearing accounts with other centrally planned economies. The remainder was mainly short- and medium-term debt. The Government derived its revenue through taxes on mineral exports and gross profits. In addition, it received a share in the net profit as a joint venture partner in both Compagnie des Bauxites de Guinée (CBG) and the Société d'Économie Mixte Friguia. CBG alone provided about 75% to 80% of foreign exchange earnings.[6]

The Government attempted to reduce inefficiences in various sectors through several measures. In October, it eliminated state-holding companies and provided for separate earnings and loss statements for each company. Formerly, such reports from all companies were combined. It also created the Ministry of Small and Medium Sized Enterprises for local private enterprises, particularly those involved in diamond extraction. Credit to the private sector was increased for the first time in several years. However, the state continued to set both producer and retail prices in all sectors. It also planned to make the syli fully convertible. Currently a parallel exchange rate exists for the syli.

COMMODITY REVIEW

Bauxite and Alumina.—CBG exported about 9.3 million tons of ore in 1981 plus 113,000 tons of calcined bauxite for use in abrasives. A feasibility study was underway for increasing calcined bauxite capacity from 120,000 to 240,000 tons per year.

Exports of alumina by the Société d' Économie Mixte Friguia were about 700,000 tons. Capacity for alumina production may be increased to 1.3 million from 700,000 tons per year. Participation by foreign investors was critical to the plan.

About 90% of production by the Office des Bauxite de Kindia was exported to the U.S.S.R. under long-term agreement. The remainder was shipped to Eastern Europe to settle arrears on bilateral clearing accounts. The Soviet financed and operated company suffered power supply interruptions and materials shortages, which resulted in the loss of 3 months' output in 1981.

Diamond.—Output of diamonds was by individually licensed artisanal miners. The miners were permitted to lease small plots and to employ up to 50 workers. Output was turned over to the Central Bank for marketing through the Guinea Diamond Exchange.

The Association pour la Récherche et l'Exploitation du Diamont et de l' Or (AREDOR) was established for exploiting diamond-bearing alluvial gravels in the Kissendongou region near Sierra Leone. Participation in the company was by the Government of Guinea, 50%; Bridge Oil Ltd., 45%; Simonius Vischer, 2.5%; and Industrial Diamond Co., 2.5%. Construction of the main plant for treating 400,000 cubic meters per year by 1983 was begun. Capital requirements were $59 million. The current agreement permits Bridge Oil to purchase 70% of production and the Government 30%. If the Government does not exercise its right, the remaining partners can purchase the Government's share of output.

Iron Ore.—Agreement was reached between the Government of Guinea and United States Steel Corp. in which United States Steel would be responsible for management, operations, and engineering of the Miferguí-Nimba iron ore project near the border with Liberia.

A Kaiser Engineers and Constructors Co.

feasibility study of the project envisioned 15 million tons per year of output of natural sinter feed containing 66.5% iron. Cutoff grade from an opencast operation was to be 60% iron. A below-ground crusher would yield a minus 200-millimeter product. Secondary crushing at the surface would produce a minus 35-millimeter product. A 6.5-kilometer-long conveyor would transport crushed ore to a storage and tertiary crushing facility for final product reduction to minus 6 millimeters. Transport was to be through Liberia via a 265-kilometer-long railroad. The loading quay and ore-handling facilities at Buchanan in Liberia were being enlarged to handle the additional tonnage. An 8,000-ton-per-hour shiploader was included in the port expansion.

Cost of the project was estimated at $990 million. Canada and the International Bank for Reconstruction and Development (World Bank) were each contributing $250 million. Potential ore purchasers included Nigeria, 5 million tons; Algeria, 1.75 million tons; and Libya, 2.5 million tons.

Petroleum.—Bridge Oil reached agreement with Guinea to explore for oil and gas onshore and offshore commencing in 1983 for 3 years. The company was to invest $15 million annually, according to the terms of the agreement.

Uranium.—Exploration by the Compagnie Générale des Matières Nucléaires (COGEMA), a subsidiary of the French Bureau de Récherches Géologiques et Minières (BRGM), on sediments in the northern part of the country was completed in 1981. No commercially interesting deposits were found. Crystalline rock in the same area was to be studied by a group composed of Davy McKee Corp., Soarberg Interplan, and the Nigerian and Moroccan Governments.

GUINEA-BISSAU

Excluding some clay, stone, and gravel, there was no mineral production in Guinea-Bissau in 1981. The country had a GNP estimated at $180 million.[7] Seafood was the main export item while foodstuffs and fuel were the main import items. Few Government-controlled firms operated at a profit. Companies were asked to review their wage scales, which were considered high in view of the poor productivity. Foreign assistance for research on several minerals was underway. Libya agreed to provide petroleum technicians for training supervisory personnel in Guinea-Bissau's national oil company.

COMMODITY REVIEW

Bauxite.—Soviet assistance was to be provided for a technical-economic study of bauxite at Boe. The program was to commence in early 1982.

Petroleum.—The Government completed an assessment of possible offshore drilling zones. The decision to proceed with a request for exploration bids was based on data from research conducted between 1958 and 1973 and on a recent seismic study. The study was financed by a World Bank loan of $6.8 million. A petroleum law and tax law was to be in effect by April 1982.

Phosphate Rock.—BRGM confirmed a phosphate find in northern Guinea-Bissau and reported that it warranted further exploration. The Fonds d'Aide de Cooperation of France financed BRGM's research.

IVORY COAST

There was no nonfuel mineral production of significance in the Ivory Coast in 1981. However, a number of exploration and research programs were in progress, and several projects for exploitation of gold and diamond were likely. Oil production, which commenced in August 1980, increased, and additional oil production facilities were being built.

The overall economy continued to be depressed because of low agricultural prices and exports, increased debt, and inefficiencies in public sector companies. Both imports and exports declined. Gross domestic product (GDP) was estimated at $9.8 billion.[8] The debt service ratio continued to increase and reached 34.2% in 1981. An International Monetary Fund loan of $560 million was granted to the Ivory Coast in return for an economic readjustment program.

The Government initiated measures to either sell or abolish parastatal corporations. Other state companies were operated by private concerns on Government contract. There were no restrictions of capital

and profits of foreign companies. The investment code was liberal, and incentives of tax privileges and customs exemptions could be negotiated on a case-by-case basis.

COMMODITY REVIEW

The Société pour le Developpement Minière de la Côte d'Ivoire (SODEMI) explored for metallic sulfides, gold, and uranium in the regions of Toulepleu and Aboisso. Anomalies detected by airborne electromagnetic survey were selected for drilling. Prospecting in the vicinity of Seguela located gold and tungsten mineralization. Copper and molybdenum anomalies found by geochemical surveys in the region of Guehielbi were reported to be from disseminated sulfides, mainly pyrrhotite, with subordinate chalcopyrite and pyrite.

The Uranium Department, formerly in the Société Nationale d'Operation Petroliére de la Côte d'Ivoire, was transferred to SODEMI. The department conducted uranium prospecting in the Bouake and Boundiole regions, but with negligible results. Thorium and uranium were found in the region of Odienne. The uranium was in association with granite.

BRGM had three exploration permits. Exploration was for massive sulfides of copper, lead, zinc, and silver, as well as gold and uranium in the Birimmian volcanosedimentary basins.

Diamond.—The Compagnie des Mines et des Materiaux (COMIMAT S.A.) discovered a diamond deposit in the region of Tortiya. COMIMAT S.A. was issued a permit for exploration and was expected to commence development during 1982.

Gold.—The cost of development of a gold deposit at Ity was under study. A consortium was to exploit the deposit, commencing in 1985. The Compagnie Minière de Côte d'Ivoire (COMICI) obtained three permits to explore for gold. COMICI's primary interest was quartz veins and elluvial and alluvial material, particularly in Nero.

Petroleum.—Production from the small Belier Field commenced in August 1980 from a single offshore platform. Current capacity was not expected to exceed 15,000 barrels per day. However, the possibility of reinjection of associated natural gas may modify future recovery. Most of the oil went directly to the Ivorian Refining Co. for refining.

The Espoir Field was discovered in April 1980. It was larger than the Belier Field and would have a number of recovery wells. Output was scheduled to commence in 1982.

Table 2.—Ivory Coast: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	1,300	1,624	--	Niger 685; Upper Volta 435; Cameroon 179; Togo 113.
Copper metal including alloys:				
Scrap	r1,046	1,023	--	Hungary 343; Belgium-Luxembourg 245; United Kingdom 122.
Semimanufactures	(1)	38	NA	NA.
Iron and steel metal:				
Scrap	19,031	21,714	--	Italy 9,864; Spain 9,660; France 2,120.
Unwrought and semimanufactures	1,649	2,499	--	Mali 386; Niger 287; Upper Volta 265; Cameroon 142; France 131.
Lead:				
Oxides and hydroxides	1	3	NA	NA.
Metal including alloys:				
Scrap	547	776	NA	France 274; United Kingdom 168; Belgium-Luxembourg 90.
Unwrought and semimanufactures	270	375	94	United Kingdom 173.
Nickel metal including alloys:				
Scrap	--	22	NA	NA.
Semimanufactures	(1)	1	NA	NA.
Tin metal including alloys, scrap	--	10	NA	NA.
Titanium: Oxides and hydroxides	2	1	NA	NA.
Zinc metal including alloys:				
Scrap	5	966	NA	France 961.
Semimanufactures	--	1	NA	NA.
Other:				
Ash and residue, metal-bearing value, thousands	--	$1	NA	NA.

See footnotes at end of table.

Table 2.—Ivory Coast: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS —Continued				
Other —Continued				
Alkali, alkaline-earth, rare-earth metals	--	29	NA	NA.
Metalloids	--	101	NA	NA.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones value, thousands	$5	$23	NA	NA.
Barite and witherite	--	1,628	--	All to Niger.
Cement	2,996	25,344	NA	Upper Volta 14,344; Mali 10,720.
Chalk	5	2	NA	NA.
Clays:				
Crude	3	168	NA	NA.
Products:				
Nonrefractory	243	57	NA	NA.
Refractory including nonclay brick	4	18	--	Congo 10.
Diamond: Industrial value, thousands	--	$38	NA	NA.
Diatomite and other infusorial earth	5	--		
Fertilizer materials:				
Crude	--	416	NA	NA.
Manufactured	289	541	NA	Upper Volta 403.
Ammonia	15	36	NA	NA.
Gypsum and plasters	--	34	NA	NA.
Lime	207	235	NA	NA.
Magnesite value, thousands	--	$5	NA	NA.
Pigments, mineral:				
Natural, crude	1	--		
Iron oxides, processed	--	1	NA	NA.
Salt and brine	53	1,013	--	Upper Volta 1,000.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	--	9	NA	NA.
Caustic soda	54	49	NA	NA.
Soda ash	10	29	NA	NA.
Stone, sand and gravel	1,071	234	NA	NA.
Sulfur:				
Elemental, all forms	2	40	NA	NA.
Sulfuric acid	129	85	NA	NA.
Talc, steatite, soapstone, pyrophyllite	2	1	NA	NA.
Other:				
Crude	13	28	NA	NA.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	--	16	NA	NA.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	13	NA	NA.
Carbon black	5	9	NA	NA.
Coal and briquets: Briquets	4	--		
Coke and semicoke	--	5	NA	NA.
Hydrogen, helium, rare gases	1	NA	NA	NA.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	688	782	--	Mali 438; Upper Volta 341.
Kerosine and jet fuel do.	203	237	--	Mali 129; Upper Volta 107.
Distillate fuel oil do.	1,272	841	15	France 240; Mali 151; Spain 130.
Residual fuel oil do.	1,328	1,457	29	France 250; Greece 249; Upper Volta 211.
Lubricants do.	104	138	--	Ghana 33; Upper Volta 22; Niger 19; Mali 16.
Other:				
Liquefied petroleum gas do.	13	16	--	Upper Volta 7; Niger 4; Mali 3.
Unspecified do.	12	22	NA	Upper Volta 11; Mali 4; Niger 4.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	10	7	NA	NA.

[r] Revised. NA Not available.
[1] Less than 1/2 unit.

Table 3.—Ivory Coast: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	3	(1)	NA	NA.
Metal including alloys, all forms	8,564	7,581	14	Cameroon 5,888; France 721; Spain 421.
Chromium: Oxides and hydroxides	23	15	NA	NA.
Copper:				
Matte and speiss	--	2	NA	NA.
Metal including alloys, all forms	1,500	1,659	NA	France 1,341; Belgium-Luxembourg 271.
Iron and steel metal:				
Scrap	209	(1)	NA	NA.
Pig iron, sponge iron, powder, shot	138	24	NA	NA.
Ferroalloys:				
Ferromanganese	15	17	NA	NA.
Unspecified	7	11	NA	NA.
Steel, primary forms	10,874	9,446	NA	France 9,444.
Semimanufactures:				
Bars, rods, angles, shapes, sections	78,325	54,244	NA	France 37,271; Spain 7,463; Italy 5,031.
Universals, plates, sheets	59,189	70,298	NA	France 47,367; Japan 15,590; Belgium-Luxembourg 5,722.
Hoop and strip	1,737	1,842	131	France 1,321; Japan 147; Sweden 80.
Rails and accessories	2,766	1,928	NA	France 1,920.
Wire	3,577	2,683	NA	France 1,384; Belgium-Luxembourg 479; Senegal 414.
Tubes, pipes, fittings	48,438	16,433	22	West Germany 6,288; France 5,732; Malaysia 1,526.
Castings and forgings, rough	16	2,017	--	Canada 767; France 644; Italy 489.
Lead:				
Oxides and hydroxides	204	146	--	All from France.
Metal including alloys, all forms	187	326	NA	France 300.
Magnesium metal including alloys, all forms value, thousands	$1	$1	NA	NA.
Manganese:				
Ore and concentrate	1,078	1,103	NA	Mexico 1,101.
Oxides and hydroxides	1,102	1,353	NA	France 543; Ireland 310; United Kingdom 210.
Mercury 76-pound flasks	145	29	NA	NA.
Nickel metal including alloys, all forms	11	299	44	France 149; Israel 48; Italy 36.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$7	$7	NA	NA.
Silver metal including alloys, unwrought and partly wrought do.	$1,063	$1,057	NA	France $923; Hong Kong $74.
Tin metal including alloys, all froms	24	29	NA	France 25.
Titanium: Oxides and hydroxides	404	427	NA	Australia 129; United Kingdom 74; France 71.
Tungsten metal including alloys, all forms	--	3	NA	NA.
Uranium and thorium ores and concentrates value, thousands	--	$1	NA	NA.
Zinc:				
Oxides and hydroxides	70	37	NA	NA.
Metal including alloys, all forms	4,080	5,294	NA	Belgium-Luxembourg 2,960; France 2,292.
Other:				
Ores and concentrates	3	27,293	NA	France 27,283.
Alkali, alkaline-earth, rare-earth metals	7	2	NA	NA.
Metalloids	8	14	NA	NA.
Base metals including alloys, all forms	10	5	NA	NA.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	22	79	NA	France 53.
Artificial: Corundum	59	41	NA	NA.
Dust and powder of precious and semi-precious stones value, thousands	--	$1	NA	NA.
Grinding and polishing wheels and stones	154	93	NA	France 28; Italy 17; West Germany 3.
Asbestos, crude	6	7	NA	NA.
Barite and witherite	3,505	345	186	France 159.
Boron materials:				
Crude natural borates	412	302	200	NA.
Oxide and acid	1	3	NA	NA.

See footnotes at end of table.

Table 3.—Ivory Coast: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
NONMETALS —Continued				
Cement thousand tons	1,069	1,018	NA	France 580; Spain 245; Poland 142.
Chalk	3,337	3,036	NA	France 2,650.
Clays:				
Crude	873	882	NA	Senegal 209; France 206; United Kingdom 134.
Products:				
Nonrefractory	10,453	13,238	NA	Italy 4,845; France 4,783; West Germany 1,715.
Refractory including nonclay brick	777	860	NA	France 743; Belgium-Luxembourg 27.
Diatomite and other infusorial earth	384	238	NA	France 117; West Germany 71.
Feldspar, fluorspar, similar materials	5	10	NA	NA.
Fertilizer materials:				
Crude, phosphatic	9,314	6,207	NA	Senegal 6,100.
Manufactured:				
Nitrogenous	16,786	21,758	NA	France 8,702; Romania 6,268; Poland 3,000.
Phosphatic	4,559	1,750	NA	Senegal 905; France 800.
Potassic	52,868	42,487	NA	Spain 19,425; Belgium-Luxembourg 15,300; Israel 5,500.
Other including mixed	9,748	23,385	15,975	United Kingdom 5,400; Belgium-Luxembourg 1,990.
Ammonia	5,410	4,969	NA	France 3,585; United Kingdom 1,350.
Graphite, natural	3	--		
Gypsum and plasters	73,163	53,547	--	Spain 43,905; France 4,945; Morocco 4,696.
Lime	6,124	7,471	NA	France 3,862; Belgium-Luxembourg 3,457; United Kingdom 30.
Magnesite	1	13	NA	NA.
Mica:				
Crude including splittings and waste	9	5	NA	NA.
Worked including agglomerated splittings	1	--		
Pigments, mineral:				
Crude, natural	135	--		
Iron oxides, processed	139	15,189	NA	France 15,070; West Germany 75.
Precious and semiprecious stones value, thousands	--	$13	NA	NA.
Salt and brine	38,852	43,850	NA	Senegal 40,776; West Germany 2,721.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	140	110	NA	NA.
Caustic soda	10,081	9,654	NA	France 2,129; Italy 1,800; Belgium-Luxembourg 1,599.
Soda ash	949	1,521	NA	France 1,127; West Germany 166.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3,968	2,342	NA	Italy 2,337.
Worked	2,795	2,246	NA	Italy 2,048.
Dolomite, chiefly refractory-grade	5,178	4,768	NA	France 4,483.
Gravel and crushed rock	4,329	3,244	NA	Italy 2,566; West Germany 445.
Quartz and quartzite	33	162	NA	Hong Kong 159.
Sand excluding metal-bearing	189	145	NA	NA.
Sulfur:				
Elemental, all forms	8,750	7,803	NA	France 7,722.
Sulfuric acid	31	4	NA	NA.
Talc, steatite, soapstone, pyrophyllite	1,030	917	NA	France 862.
Other:				
Crude	5,491	6,890	NA	West Germany 6,806.
Slag, dross, similar waste, not metal-bearing	38,336	39,796	NA	France 39,795.
Oxides and hydroxides of barium, magnesium, strontium	1,114	5	NA	NA.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	4,104	2,577	NA	France 2,423.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen natural	34	300	--	Mainly from France.
Carbon black	252	258	NA	France 249.
Coal, briquets, coke	110	114	NA	NA.
Hydrogen, helium, rare gases	7	NA	NA	NA.
Peat including briquets and litter	91	--		
Petroleum:				
Crude thousand 42-gallon barrels	11,955	10,418	--	Venezuela 3,904; Nigeria 2,410; Iraq 2,107; Saudi Arabia 1,275.

See footnotes at end of table.

Table 3.—Ivory Coast: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products:				
Gasoline				
thousand 42-gallon barrels	467	687	--	Romania 187; France 161; Canada 149.
Kerosine and jet fuel ---do---	99	106	--	Venezuela 33; France 27; Italy 18.
Distillate fuel oil -----do---	622	434	--	Italy 161; Venezuela 92; Canada 62.
Residual fuel oil -----do---	(1)	96	--	Liberia 45; France 20; Netherlands 20.
Lubricants ---------do---	240	364	24	France 146; Trinidad and Tobago 126; Netherlands 28.
Other:				
Liquefied petroleum gas do---	19	35	--	France 8; Nigeria 7; Brazil 6; Italy 5.
Mineral jelly and wax do---	9	10	--	West Germany 6; France 2.
Bituminous mixtures do---	34	2	1	France 1.
Unspecified-----do---	267	9	--	France 4; Italy 3.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals---	1,874	2,122	NA	Netherlands 1,700; France 399.

NA Not available.
[1]Less than 1/2 unit.

MALI

Production of stone, gold, and phosphate rock made a small contribution to a GNP of about $1.2 billion[9] in 1981. Exploration was targeted at several minerals, and mine production capacity increases for gold and phosphate rock were underway.

The availability and reliability of timely statistical data for Mali was poor. The latest trade data covered 1978 and indicated a trade deficit of $103 million. France was the principal trading partner followed by the Ivory Coast, Senegal, and the Federal Republic of Germany. Drought and limited water resources resulted in continued high imports of foodstuffs. Imports of oil products were a high-cost item and were transshipped through Senegal and the Ivory Coast. In conjunction with energy requirements, the World Bank allocated a loan of $3.7 million for financing research on bituminous shales in the Taodeni Basin.

COMMODITY REVIEW

Gold.—Technical assistance, which was begun in 1963 by the U.S.S.R. for gold exploration and development, resulted in the reactiviation of the Kalana Mine in the Sikasso region. An agreement signed in October between the Société Nationale de Récherches Minières (Sonarem) and the U.S.S.R. provided for a loan of about $4.35 million, payable in 10 years at 4% interest with a deferral period of 2 years. The U.S.S.R. also was to assist in the construction of a 120-kilometer-long electric transmission line linking Selingue with Kalana.

Reserves at the Kalana Mine were estimated at about 1 million troy ounces located 250 meters deep. Average grade was 0.96 to 1.28 troy ounces of gold per ton. Mine life was 15 years at a production rate of 64,300 troy ounces of gold per year. Initial production would be about 13,000 troy ounces of gold per year with byproduct silver.[10]

The Sindicat Franco-Maliende Récherches Minières, a joint-venture company including Sonarem and BRGM, was involved in gold exploration in the southeast of the country, as well as in the Kangola and Bongouni-Sikasso region.

Petroleum.—A 5-year permit to explore for oil over a 140,000-square-kilometer area in the Taodeni Basin in the north of the country was granted to Esso Oil Co.

The International Development Association (IDA) was to monitor exploration programs for oil and the evaluation of oil shale deposits. In the event exploitable oil deposits were located, IDA would establish a framework for agreement on their development.

Phosphate Rock.—The Federal Republic of Germany granted $1 million to Mali for financing a phosphate rock crushing plant

at mining operations in the Tilemsi Valley, north of Gao. Sonarem was increasing output to 10,000 tons per year and anticipated a possible future production level of 240,000 tons per year.

Table 4.—Mali: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodtiy	1976	1977	Destinations, 1977	
			United States	Other (principal)
Clays, crude	--	11	--	All to Ivory Coast.
Iron and steel metal:				
Scrap	1,001	--		
Steel, primary forms	25	--		
Petroleum refinery products:				
Gasoline 42-gallon barrels	--	442	85	Iran 178; United Kingdom 110; France 34.
Kerosine and jet fuel do	--	4,797	--	Ivory Coast 3,216; United Kingdom 651; Sweden 512.
Distillate fuel oil do	--	134	--	All to Ivory Coast.
Mineral jelly and wax do	--	8	--	All to Upper Volta.
Salt and brine	226	400	--	Upper Volta 353; Ivory Coast 42; Ghana 5.
Zinc metal including alloys: Semimanufactures	--	30	--	All to France.

Table 5.—Mali: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1976	1977	Sources, 1977	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	321	113	--	France 100; Nigeria 13.
Unwrought	37	11	--	All from India.
Semimanufactures	76	22	--	France 14; Nigeria 5.
Arsenic: Natural sulfides	15	--		
Beryllium metal including alloys, all forms	--	1	--	All from France.
Copper metal including alloys, semimanufactures	18	6	--	Mainly from France.
Iron and steel metal:				
Scrap	16	28	--	Ivory Coast 24.
Pig iron, ferroalloys, similar material	4	1	--	All from France.
Steel, primary forms	2	14	--	Do.
Semimanufactures:				
Bars, angles, shapes, sections	4,946	4,769	57	France 4,488; U.S.S.R. 142; West Germany 54.
Universals, plates, sheets	4,042	3,029	--	France 2,222; Belgium-Luxembourg 272; Japan 241.
Hoop and strip	1	54	--	Canada 39; France 15.
Rails and accessories	649	64	--	France 58; U.S.S.R. 6.
Wire	592	316	2	France 224; Belgium-Luxembourg 67.
Tubes, pipes, fittings	5,421	8,128	13	U.S.S.R. 6,325; France 1,424; West Germany 281.
Castings and forgings, rough	r3	12	--	France 5; East Germany 4; U.S.S.R. 3.
Lead:				
Oxides and hydroxides	1	--		
Metal including alloys, all forms	96	1	--	Mainly from France.
Magnesium metal including alloys, all forms	--	1	--	All from France.
Manganese: Oxides and hydroxides	49	174	--	Do.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$2	--		
Silver metal including alloys, unwrought and partly wrought do	--	$2	--	All from France.
Tin metal including alloys, all forms	(1)	1	--	Do.
Titanium: Oxides and hydroxides	2	12	--	Mainly from France.
Zinc:				
Oxides and hydroxides	2	(1)	--	All from U.S.S.R.
Metal including alloys:				
Unwrought	--	40	--	All from Belgium-Luxembourg.

See footnotes at end of table.

Table 5.—Mali: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1976	1977	Sources, 1977	
			United States	Other (principal)
METALS —Continued				
Zinc —Continued				
Metal including alloys —Continued				
Semimanufactures	--	156	--	All from France.
Other: Metalloids	--	4	--	Do.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	40	432	--	China 400; Ivory Coast 30; France 2.
Artificial: Corundum	4	--		
Grinding and polishing wheels and stones	79	7	--	France 6; West Germany 1.
Asbestos, crude	3	--		
Barite and witherite	--	4	--	All from France.
Cement	23,889	58,835	--	U.S.S.R. 22,644; Ivory Coast 16,491; Spain 9,514.
Chalk	2	1	--	All from France.
Clays:				
Crude	21	12	--	All from Senegal.
Products:				
Nonrefractory	1,448	442	--	France 254; Italy 106; Spain 40.
Refractory including nonclay brick	10	79	--	France 73; United Kingdom 4.
Fertilizer materials:				
Crude	3	--		
Manufactured:				
Nitrogenous	3,500	5,485	--	Netherlands 5,000; Niger 480.
Phosphatic	6,000	18,961	--	Netherlands 12,573; Senegal 6,342.
Potassic	--	51	--	Belgium-Luxembourg 50.
Other including mixed	12,616	2,846	15	Denmark 1,500; Netherlands 1,331.
Ammonia	8	15	--	France 14.
Gypsum and plasters	1,103	54	--	Morocco 32; France 22.
Lime	97	380	--	France 295; Ivory Coast 85.
Magnesite	2	--		
Pigments, mineral:				
Natural, crude	10	--		
Iron oxides, processed	--	5	--	Mainly from France.
Salt and brine	32,608	20,430	--	Senegal 19,409; Ivory Coast 600; Niger 411.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	100	(1)	--	All from France.
Caustic soda	1,314	535	--	West Germany 432; Netherlands 60; Belgium-Luxembourg 32.
Soda ash	44	57	--	France 49; East Germany 8.
Stone, sand and gravel	r333	84	--	Belgium-Luxembourg 30; China 27; France 20.
Sulfur:				
Elemental, all forms	83	70	--	All from West Germany.
Sulfuric acid	142	46	--	France 31; Ivory Coast 8; Belgium-Luxembourg 4.
Talc, steatite, soapstone, pyrophyllite	32	--		
Other:				
Crude	--	39	--	West Germany 30; France 9.
Oxides and hydroxides of barium, magnesium, strontium	--	1	--	All from China.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	324	142	--	U.S.S.R. 106; France 18; Senegal 17.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	34	130	--	Spain 100; Senegal 29.
Coal excluding briquets	1	--		
Coke and semicoke	--	130	--	All from West Germany.
Petroleum refinery products:				
Gasoline—42-gallon barrels	363,919	463,420	--	Ivory Coast 417,690; Senegal 34.
Kerosine and jet fuel—do	67,596	70,936	--	Ivory Coast 34,828; Senegal 31,356.
Distillate fuel oil—do	336,118	265,024	--	Ivory Coast 147,148; Senegal 92,855.
Residual fuel oil—do	41,405	171,422	--	Senegal 116,004; Ivory Coast 54,912.

See footnotes at end of table.

Table 5.—Mali: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1976	1977	Sources, 1977	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products —Continued				
Lubricants ----------42-gallon barrels--	18,648	27,951	84	Ivory Coast 13,664; Senegal 10,766.
Other:				
Liquefied petroleum gas-------do----	2,598	3,341	--	Ivory Coast 2,123; France 1,218.
Mineral jelly and wax ---------do----	16	236	--	Netherlands 173; France 63.
Bitumen and other residues ----do----	6,748	897	--	Venezuela 869; France 28.
Bituminous mixtures ---------do----	3,345	8,248	--	Venezuela 8,211; France 36.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals ----------	30	4	--	Belgium-Luxembourg 2; China 2.

[r]Revised.
[1]Less than 1/2 unit.

NIGER

Despite a loss in export earnings in 1981 due to a decline in price for uranium, the country's principal mineral product, a number of new mineral development projects were underway. These projects were expected to diversify and broaden the country's mineral industry base.

The mining sector accounted for about 12% of an estimated GDP of $2.1 billion[11] in 1981. External debt was estimated at $503.3 million. A negative balance of trade of almost $200 million was realized, and inflation was 15% to 70% in the year ending June 1981.

Planning for economic development has been based on anticipated revenue from sales of uranium. Uranium sales accounted for Niger's first 80% of total export earnings and 40% of Government revenue. The 5-year plan covering 1979-83 was released in March 1980 but was rearranged because of the shortfall in revenue, and a 10-year Program for Development of Niger was issued. The program's intent was to emphasize investment in the rural sector and the attainment of self-sufficiency in food production. The role of foreign investors and private enterprise was expanding to meet these goals.

An investment code has been in effect since 1974 and provides tax relief and tariff protection for foreign investors. Government participation in commercial ventures was common but not required by law. The country's currency was fixed against the French franc. Profits after taxes were available for full repatriation.

COMMODITY REVIEW

Cement.—A single cement plant was in operation at Malbaza near the border with Nigeria and had a total capacity of 40,000 tons per year. Limestone was supplied from a local quarry estimated to have reserves of 3.5 million tons. No firm commitment had been made for a new plant with a planned capacity of 200,000 tons per year. Local cement production was reported to supply a small percentage of domestic consumption.

Coal.—The Société Nigérienne du Charbon d'Anou Araren (SONICHAR) was created in 1977 with responsibility for developing a coal deposit at Anou Araren, about 50 kilometers east of Agadès. SONICHAR was 66% Nigerian Government owned with the remainder held by the Islamic Development Bank and domestic uranium mining companies. Production and stockpiling of coal at Anou Araren commenced in 1980. Total recoverable reserves were about 1 million tons of coal out of an estimated 6 million tons of proven reserves. Output was being consumed at a nearby powerplant. Coal production capacity was planned to be about 100 tons per day with full utilization of two turbines at the plant.

Electric Energy.—The country's first coal-fired plant went into operation in 1981. First-stage capacity was 16 megawatts and was fired by coal supplied from the nearby Anou Araren deposit. Electricity produced was consumed mainly by domestic uranium mining companies. An $11 million loan was made by the European Investment Bank for

a period of 16 years at 8% interest to complete the second stage of the powerplant. When completed total electric generating capacity would be 32 megawatts.

Iron Ore.—The United Nations Industrial Development Organization funded a study of iron ore located at Soy. About 650 million tons of oolitic hematite, grading between 48% and 53% iron, and containing about 0.5% to 0.8% phosphorus was at the deposit. Nigeria expressed some interest in the reserve, which would require complete development of a transport network for shipment to Nigeria.

Molybdenum.—Molybdenum output commenced in 1979 as a byproduct of uranium production by Compagnie Minière d'Akouta (COMINAK). The total capacity for production of molybdenum by COMINAK was 400 tons of metal in concentrates.

Phosphate Rock.—Production of phosphate came from hand operators near Takoua. A crushing plant recently installed at Takoua was capable of producing 15 tons per day of fertilizer-grade phosphate but was poorly managed and rarely operated at optimum level.

Phosphate mineralization in the vicinity of Tapoa has been the object of study for the past 10 years. A feasibility study for production from the area neared completion. Reserves were reported at 1.25 billion tons of phosphate, of which 500 million tons was considered economically exploitable. Of three ore horizons in the deposit, the uppermost averaged 22.4% P_2O_5, while the two lower horizons ranged from 27.8% to 34% P_2O_5. Nigeria expressed interest in possible development of the deposit.

Uranium.—The Government maintained its interest in uranium exploration, development, and exploitation in Niger through the Office National des Ressources Minière (ONAREM). Two companies produced uranium in 1981, COMINAK and Société des Mines de l'Aïr (SOMAIR). Participating shareholders in these two companies each had the right to export uranium in proportion to their capital participation. ONAREM had a 31% interest in COMINAK; COGEMA, France, had 34%; Overseas Uranium Resources Development, Japan, had 25%; and Empresa Nacional del Uranio, Spain, had 10%. ONAREM also had a 33% interest in SOMAIR, while COGEMA had 26.96%; Compagnie Française des Minerais de l'Uranium had 11.79%; Minatome had 7.58%; Compagnie Minière de Mokta had 7.56%; Urangesellschaft, Federal Republic of Germany, had 6.58%, and Agip Nucléaire, Italy, had 6.53%.

SOMAIR has produced uranium from the Arlit deposit in the Agadiz Basin since 1971. Uranium, as the minerals coffinite and pitchblende, was located in a 20- to 25-meter-thick horizon of clay and sandstone, grading, 0.25% U_3O_8, with overburden ranging from 35 to 50 meters thick. Production was by acid heap leaching to produce 70% uranium contained in sodium uranite. Mill throughput was about 3,000 tons per day, with a total production capacity of 2,300 tons per year of uranium.

COMINAK commenced production in 1978 from the Akouta deposit, about 20 kilometers from Arlit. Production was from an underground operation 250 meters deep in ore grading 0.4% U_3O_8. Capacity was about 2,200 tons per year of uranium in a 70% uranium-in-magnesium uranate product.

Participation in a third company, the Société Minière de Tassa N'Taghalgue (SMTT) was shared equally by ONAREM, COGEMA, and Kuwait's Foreign Trading, Contracting and Investment Co. SMTT was established in 1978 to develop the Arni deposit near Arlit. Reserves were reported at 20,000 tons of uranium in ore, grading 0.35% U_3O_8. A feasibility study was completed for an opencast operation producing 1,000 tons per year of U_3O_8.

Exports of uranium in 1981 were estimated to be as follows in tons of uranium: France, 2,293; Libya, 1,212; Japan, 816; Spain, 300; the Federal Republic of Germany, 125; and Iraq, 100.

Table 6.—Niger: Trade of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity		1976	1977[p]
EXPORTS			
Uranium ore and concentrate		1,477	1,895
IMPORTS			
Metals:			
Aluminum metal including alloys, semimanufactures		438	288
Iron and steel metal, semimanufactures:			
Bars, rods, angles, shapes, sections		8,282	8,676
Universals, plates, sheets		2,467	1,899
Tubes, pipes, fittings		2,467	2,606
Nonmetals:			
Fertilizer materials: Natural, nitrogenous		1,150	1,412
Lime		345	368
Salt and brine		6,762	16,216
Sodium and potassium compounds, n.e.s.:			
Caustic soda		1,969	2,364
Soda ash		1,600	9,395
Sulfur: Elemental, refined		1	28,140
Mineral fuels and related materials:			
Petroleum refinery products:			
Gasoline:			
Aviation	42-gallon barrels	15,157	7,218
Motor	do.	154,003	226,992
Kerosine and jet fuel	do.	21,282	25,443
Distillate fuel oil	do.	333,865	452,151
Residual fuel oil	do.	76,457	42,458
Other:			
Liquefied petroleum gas	do.	3,457	5,556
Nonlubricating oils, n.e.s	do.	66,045	45,983
Bitumen and other residues	do.	3,333	16,192
Bituminous mixtures	do.	73,526	10,272

[p]Preliminary.
[1]Destinations and sources are not available.

SENEGAL

The mining sector was relatively unchanged in 1981. Mining and manufacturing accounted for about 20% of an estimated GDP of $2 billion[12] in 1981. The economy was in stagnation mainly because of the poor performance of the agricultural sector. Fish products became the largest export earner at 27% of total exports.

COMMODITY REVIEW

Cement.—Plant prices for cement increased 32% to $110 per ton. The new price included a value-added tax and a special tax.

Expansion of capacity by the Société Ouest Africaine des Ciments at Rufisque was planned. Capacity would increase to 875,000 tons per year compared with a current capacity of 360,000 tons per year. Cost of the expansion was estimated at $6.7 million.

Iron.—A feasibility study was underway regarding infrastructure and marketing requirements for development of the iron deposits located in the southeast near Faleme. The Société des Mines de Fer du Senegal Oriental was formed in 1975 to exploit the reserves. An exploration program completed in 1980 proved additional reserves. Primary magnetite ores from Farangalis and Goto may be used for production of acid and basic blast furnace pellets and direct-reduction pellets. Oxidized ores from Kondekouron, Kouroudiako, and Karakaene can be used for direct charging into blast furnaces and for sintering.

Reserves of proved magnetite ore at Farangalis and Goto were 135 million tons each, grading 45% iron. Magnetic separation was shown to yield a 68% iron ore concentrate. High-grade hematite ore reserves at Kondekouron and Kouroudiako were confirmed at 56 million tons and 26 million tons, respectively. An annual output of 12 million tons was recently estimated to be necessary for efficient utilization of rail and port capacity. Initial output would be for hematite for direct shipping and sinter feed.

Peat.—The Compagnie des Tourbieres du Senegal (CTS) was established with an initial capital of $370,000 for exploiting peat resources estimated at 50 million cubic meters. The central region of Niayes between Mboro and Lompoul has about 80% of the total peat resources. Peat was also

located at Casamome, the Sine-Saloum Rivers, and the delta region. Output was to supply two thermal powerplants of 30 megawatts capacity.

Petroleum.—Oil exploration continued in the Longo and Kafountine areas of Cassamance. The refinery at Mbou was to have an increase in capacity from 900,000 to 1,380,000 tons per year. A desulfurization unit was to be installed for utilization of lower cost, high-sulfur crude oil.

Phosphate Rock.—Production and export of phosphate has been mainly in the form of phosphate rock. Long-range plans for product upgrading were finalized with the letting of contracts for construction of sulfuric acid and phosphoric acid plants at Taiba. The sulfuric acid plant was to have a maximum capacity of 2,100 tons per day and the phosphoric acid plant was to have a maximum capacity of 800 tons per day.

A mixed fertilizer plant with a capacity of 680 tons per day of diammonium phosphate and 900 tons per day of granulated triple superphosphate was to be constructed at M'boo. Product markets were to be in West Africa and India. Exports of calcium phosphate in 1981 were mainly to the United Kingdom, France, Greece, and India. Production of aluminum phosphate was mainly for local use, although France received about 51,000 tons in 1981.

Table 7.—Senegal: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	--	12	--	All to Ivory Coast.
Semimanufactures	--	1	--	All to Gambia.
Copper metal including alloys:				
Scrap	816	797	--	France 395; United Kingdom 352; Spain 35.
Unwrought and semimanufactures value, thousands	$3	--		
Iron and steel:				
Ore and concentrate	--	45	--	All to France.
Metal:				
Scrap	14,430	9,632	--	Yugoslavia 6,500; Spain 3,048; Mali 60.
Ferroalloys	--	1	--	NA.
Semimanufactures:				
Bars, rods, angles, shapes, sections	7	78	--	Gambia 56; Mauritania 11.
Universals, plates, sheets	5	9	--	Guinea-Bissau 4; Gambia 2; Mauritania 2.
Wire	140	329	--	Ivory Coast 80; Mauritania 76; Cameroon 40.
Tubes, pipes, fittings	95	27	--	Gambia 7; Mauritania 7; Guinea 4.
Castings and forgings, rough	7	5	--	Guinea 1; Mali 1.
Lead metal including alloys:				
Scrap	255	36	--	All to France.
Unwrought and semimanufactures	47	1	--	Mainly to Mauritania.
Magnesium metal including alloys, scrap	5	--		
Nickel metal including alloys:				
Scrap	3	18	--	All to France.
Semimanufactures value, thousands	--	$2	--	All to Ivory Coast.
Zinc metal including alloys:				
Scrap	--	30	--	France 24; Ivory Coast 5.
Unwrought	56	--		
Other: Metalloids	9	10	--	Gambia 9.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones value, thousands	$1	$4	--	France $3; Mali $1.
Cement	5,979	3,548	--	Mauritania 2,609; Guinea-Bissau 665; Mali 262.
Clays:				
Crude	4,335	5,929	--	France 5,907; Mauritania 22.
Products:				
Nonrefractory	26	27	--	Mauritania 18; Guinea 6.
Refractory including nonclay brick	40	55	--	All to Upper Volta.

See footnotes at end of table.

Table 7.—Senegal: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials:				
Crude:				
Phosphatic thousand tons	1,817	1,443	--	United Kingdom 394; Finland 200; France 192; Greece 170.
Potassic	1,100	--		
Manufactured:				
Nitrogenous	858	815	--	Mali 400; Guinea-Bissau 355; Mauritania 60.
Phosphatic	86,881	148,130	--	France 81,645; China 27,015; United Kingdom 14,790.
Potassic	250	2	--	All to Mali.
Other including mixed	25,648	38,611	--	Guinea-Bissau 17,098; Mali 15,313; Gambia 6,185.
Ammonia	23	30	--	Gambia 20; Ghana 5; West Germany 3.
Gypsum and plasters	55	533	--	Ivory Coast 394; Mali 132; Mauritania 6.
Lime	--	101	--	All to Mauritania.
Salt and brine	112,924	125,846	--	Ivory Coast 45,896; Cameroon 20,449; Niger 17,164.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	9	3	--	Gabon 1.
Caustic soda	171	79	--	Mali 62; Mauritania 16.
Soda ash	--	76	--	Ivory Coast 72; Mali 4.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	4,377	9,464	--	All to Gambia.
Worked	--	1	--	All to Guinea-Bissau.
Gravel and crushed rock	6,089	1,510	--	All to Gambia.
Quartz and quartzite value, thousands	$20	--		
Sand other than metal-bearing	13	167	--	Mali 164.
Sulfur: Sulfuric acid	23	12	--	Mali 6; Mauritania 6.
Other:				
Crude	3	--		
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	390	376	--	Mauritania 180; Gambia 125; Guinea-Bissau 72.
MINERAL FUELS AND RELATED MATERIALS				
Coal and briquets: Briquets	--	10	--	All to Mali.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	254	280	--	Mauritania 136; Mali 37; Guinea-Bissau 36.
Kerosine and jet fuel do	1,115	777	--	Mauritania 47; Mali 28; Guinea-Bissau 15.
Distillate fuel oil do	358	1,946	--	Mali 1,558; Guinea-Bissau 117.
Residual fuel oil do	145	128	--	Mali 94.
Lubricants do	85	85	--	Nigeria 36; Mali 14; Mauritania 11.
Other:				
Liquefied petroleum gas 42-gallon barrels	7,157	2,900	--	Mauritania 1,984; Gambia 592; Guinea 186.
Mineral jelly and wax do	16	8	--	Mainly to Ivory Coast.
Bitumen and other residues do	270	(1)	--	All to Mauritania.
Bituminous mixtures do	48	(1)	--	Do.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals value, thousands	$1	--		

NA Not available.
[1]Less than 1/2 unit.

Table 8.—Senegal: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	200	577	--	West Germany 567; France 10.
Metal including alloys:				
Scrap	8	--		
Unwrought	--	39	--	All from France.
Semimanufactures	251	258	(1)	Cameroon 68; France 61; Italy 57.
Chromium: Oxides and hydroxides	8	--		
Copper metal including alloys:				
Unwrought	2	15	--	Italy 10; France 5.
Semimanufactures	1,109	71	--	France 67; Italy 2.
Iron and steel metal:				
Pig iron, ferroalloys, similar material	8	37	--	All from France.
Steel, primary forms				
value, thousands	$11	$1	--	Do.
Semimanufactures:				
Bars, rods, angles, shapes, sections	28,769	20,872	--	France 11,856; Italy 4,135; United Kingdom 2,047.
Universals, plates, sheets	11,882	8,312	(1)	France 6,812; United Kingdom 1,051; Japan 223.
Hoop and strip	96	71	--	West Germany 20; France 18; United Kingdom 15.
Rails and accessories	94	1,133	--	France 1,011; Norway 90; United Kingdom 21.
Wire	1,395	942	--	France 822; United Kingdom 74; China 24.
Tubes, pipes, fittings	5,313	4,883	50	France 2,898; China 1,067; Netherlands 174.
Castings and forgings, rough	367	148	(1)	France 145; Italy 2.
Lead:				
Oxides and hydroxides	54	44	--	France 33; Netherlands 6; West Germany 5.
Metal including alloys, unwrought and semimanufactures	5	45	--	All from France.
Manganese:				
Ore and concentrate	2	2	--	Do.
Oxides and hydroxides	322	314	--	All from Gabon.
Nickel metal including alloys, semimanufactures	203	3,169	(1)	United Kingdom 3,044; Italy 87; France 34.
Silver metal including alloys, unwrought and partly wrought				
value, thousands	$854	$41	--	France $34; Switzerland $6; United Kingdom $1.
Tin metal including alloys, unwrought and semimanufactures	9	5	--	France 4; United Kingdom 1.
Titanium: Oxides and hydroxides	104	145	--	West Germany 73; France 26; United Kingdom 15.
Zinc:				
Oxides and hydroxides	38	18	--	France 15; United Kingdom 3.
Metal including alloys:				
Unwrought	34	--		
Semimanufactures	71	1	--	All from France.
Other:				
Alkali, alkaline-earth, rare-earth metals	15	5	--	Do.
Metalloids	6	9	(1)	West Germany 7; France 1; Italy 1.
Metals including alloys, unwrought and semimanufactures	20	9	--	Mainly from Spain.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	3	43	--	France 42.
Artificial: Corundum	9	--		
Grinding and polishing wheels and stones	19	24	--	France 15; Italy 5; West Germany 2.
Asbestos, crude	1,459	1,177	--	U.S.S.R. 599; Canada 575.
Barite and witherite	54	2	--	All from France.
Boron materials:				
Crude, natural borates	454	700	700	
Oxide and acid	6	3	--	All from France.
Cement	13,673	4,591	--	France 4,101; Poland 435; Spain 55.
Chalk	2,253	1,452	--	France 1,422; West Germany 30.
Clays:				
Crude	718	488	--	France 271; Togo 96; Benin 76.
Products:				
Nonrefractory	5,119	2,891	--	Italy 1,597; France 1,086; Spain 109.
Refractory including nonclay brick	954	964	--	France 536; West Germany 218; Morocco 176.

See footnotes at end of table.

Table 8.—Senegal: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Diamond: Industrial value, thousands	$14	$3	--	All from Brazil.
Diatomite and other infusorial earth	170	39	--	All from France.
Fertilizer materials:				
Natural	22	--		
Manufactured:				
Nitrogenous	21,776	6,174	--	France 2,920; United Kingdom 2,500; West Germany 754.
Phosphatic	100	103	--	United Kingdom 100; West Germany 2.
Potassic	19,938	15,374	--	France 8,102; East Germany 7,077; United Kingdom 122.
Other including mixed	5	5	--	West Germany 3; France 2.
Ammonia	10,676	8,514	--	Ireland 3,322; Netherlands 1,762; United Kingdom 1,694.
Graphite, natural	(1)	1	--	All from France.
Gypsum and plasters	6,426	4,824	--	Morocco 4,810; France 14.
Lime	2,264	1,734	--	France 1,000; West Germany 660; United Kingdom 74.
Magnesite	3	--		
Mica:				
Crude including splittings and waste	--	5	--	All from France.
Worked including agglomerated splittings	2	2	--	Mainly from France.
Pigments, mineral: Iron oxides, processed	64	109	--	West Germany 89; Spain 10; United Kingdom 8.
Precious and semiprecious stones:				
Synthetic value, thousands	$1	--		
Salt and brine	144	464	--	Italy 300; Netherlands 65; France 46.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	16	4	--	All from France.
Caustic soda	9,802	6,166	--	East Germany 2,949; West Germany 1,209; France 892.
Soda ash	810	712	--	France 347; West Germany 277; United Kingdom 59.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	400	22	--	Italy 20; West Germany 1.
Worked	569	417	--	Italy 300; France 114.
Gravel and crushed rock	8	65	--	West Germany 34; France 28.
Quartz and quartzite	2	11	--	All from France.
Sand other than metal-bearing	56	42	--	Do.
Sulfur:				
Elemental:				
Crude	6	9	--	Do.
Refined	18,209	14,293	--	Poland 14,291; France 2.
Sulfuric acid	103	65	--	Netherlands 45; United Kingdom 19.
Talc, steatite, soapstone, pyrophyllite	180	115	--	France 111; Italy 3.
Other:				
Crude	95	114	--	All from France.
Oxides and hydroxides of barium, magnesium, strontium	4	5	--	All from West Germany.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	1,650	1,102	2	France 680; United Kingdom 196; Morocco 168.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	21	--	All from France.
Carbon black	67	15	--	France 14; West Germany 1.
Coal, all grades including briquets	25	20	--	All from Poland.
Coke and semicoke	711	356	--	France 276; United Kingdom 80.
Petroleum:				
Crude thousand 42-gallon barrels	5,616	5,582	--	Nigeria 2,047; Iraq 1,853; Algeria 779.
Refinery products:				
Gasoline do.	218	599	--	United Kingdom 312; Saudi Arabia 64.
Kerosine and jet fuel do.	239	293	--	United Kingdom 71; France 55; Netherlands 44.
Distillate fuel oil do.	354	212	--	Saudi Arabia 96; Venezuela 40.
Residual fuel oil do.	1	65	--	Trinidad and Tobago 5.
Lubricants do.	11	10	(1)	United Kingdom 1.

See footnotes at end of table.

Table 8.—Senegal: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Other:				
Liquefied petroleum gas thousand 42-gallon barrels	15	21	--	United Kingdom 10; Algeria 4.
Mineral jelly and wax do	7	7	(1)	United Kingdom 5; West Germany 1.
Bitumen and other residues do	35	37	--	Venezuela 33; France 2.
Bituminous mixtures do	29	18	(1)	Venezuela 12; Spain 6.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	174	123	--	Netherlands 61; United Kingdom 44; France 13.

[1]Less than 1/2 unit.

TOGO

Phosphate remained the principal mineral material produced in Togo in 1981. Poor market conditions led to a sharp reduction in production.

COMMODITY REVIEW

Cement.—Ciment du Togo's production of cement was mainly marketed locally, but about 15% was exported to neighboring countries. Cement prices, exfactory, increased to $86.42 from $73.32 per ton.[13]

The cement clinker plant at Tabligbo, jointly owned by Ghana, the Ivory Coast, and Togo, produced about 600,000 tons of clinker for cement production.

Marble.—The Société Togolaise de Marbrerie et de Materiaux, partly Government owned, mined marble from two deposits at Gnawoulou and Pagala. Operational and financial difficulties prevented full operational capacity. The company also produced burnt brick, floor brick, and tiles.

Phosphate Rock.—Output was at about 69% of capacity in 1981 because of exceptionally poor sales. Production was intentionally limited to only that quantity that could be marketed. A credit of $5.7 million was approved by the World Bank to finance engineering work on a 1,000-ton-per-day phosphoric acid plant.[14]

Salt.—Production was by the Government-owned Société des Salines du Togo. All output was sold domestically at $128 per ton.

Table 9.—Togo: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	Destinations, 1979	
		United States	Other (principal)
METALS			
Aluminum metal including alloys, semimanufactures	5	--	All to Niger.
Copper metal including alloys, semimanufactures -- value, thousands	$1	--	All to Benin.
Iron and steel metal: Semimanufactures:			
Bars, rods, angles, shapes, sections	34	--	Niger 26; Benin 8.
Universals, plates, sheets value, thousands	$1	--	All to Niger.
Rails and accessories	4	--	Do.
Tubes, pipes, fittings	25	--	West Germany 16; France 3; Netherlands 3; Nigeria 3.
NONMETALS			
Abrasives, n.e.s.: Grinding and polishing wheels and stones value, thousands	$1	--	All to Netherlands.

See footnotes at end of table.

Table 9.—Togo: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	Destinations, 1979	
		United States	Other (principal)
NONMETALS —Continued			
Cement	36,389	--	Upper Volta 35,772; Ghana 498; Mali 115.
Clays:			
Crude	65	--	All to Senegal.
Products: Nonrefractory	19	--	Niger 17; Upper Volta 2.
Diamond: Gem, not set or strung value, thousands	$527	--	Switzerland $420; Netherlands $107.
Fertilizer materials: Crude, phosphatic thousand tons	2,692	14	France 599; Netherlands 596; Yugoslavia 407.
Gypsum and plasters	15	--	All to Niger.
Salt and brine	51	--	All to Ghana.
Stone, sand and gravel:			
Dimension stone, crude	32	--	Niger 20; Ghana 8.
Gravel and crushed rock	26	--	All to Congo.
Other:			
Crude	99	--	All to Upper Volta.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	70	--	All to France.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	102	--	All to Benin.
Petroleum refinery products:			
Gasoline 42-gallon barrels	196,988	--	West Germany 99,374; Nigeria 93,007.
Kerosine and jet fuel do.	92,364	--	All to Nigeria.
Distillate fuel oil do.	209,992	--	Nigeria 64,924; West Germany 56,703.
Residual fuel oil do.	153,260	153,180	NA.
Lubricants do.	819	--	Ivory Coast 756; Niger 42.
Other: Liquefied petroleum gas do.	46	--	All to Ghana.

NA Not available.
[1]Data for 1978 are not available.

Table 10.—Togo: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	Sources, 1979	
		United States	Other (principal)
METALS			
Aluminum metal including alloys, semimanufactures	156	10	France 77; Ivory Coast 34; Belgium-Luxembourg 24.
Copper:			
Matte and speiss value, thousands	$2	--	All from France.
Metal including alloys:			
Unwrought	1	--	Do.
Semimanufactures	26	1	France 24.
Iron and steel metal:			
Scrap	437	--	Benin 237; France 200.
Ferroalloys	350	--	Mainly from Portugal.
Steel, primary forms	34	--	Sweden 18; China 14.
Semimanufactures:			
Bars, rods, angles, shapes, sections	8,203	--	France 6,881; West Germany 894; Italy 202.
Universals, plates, sheets	4,117	--	Japan 2,338; France 1,589; Belgium-Luxembourg 74.
Hoop and strip	96	23	France 43; West Germany 30.
Rails and accessories	245	--	Switzerland 105; West Germany 80; France 58.
Wire	282	--	France 157; Senegal 85; Belgium-Luxembourg 26.
Tubes, pipes, fittings	2,307	(2)	France 1,963; Spain 81; Czechoslovakia 62.
Castings and forgings, rough	68	--	West Germany 49; France 19.
Lead metal including alloys, semimanufactures	5	--	France 2; West Germany 2.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$52	--	Ghana $47; France $5.

See footnotes at end of table.

Table 10.—Togo: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	Sources, 1979	
		United States	Other (principal)
METALS —Continued			
Silver:			
Waste and sweepings value, thousands	$7	--	All from United Kingdom.
Metal including alloys, unwrought and partly wrought do	$6	--	France $3; Ireland $2; West Germany $1.
Tin metal including alloys, semimanufactures	1	--	Mainly from Honduras.
Titanium: Oxides and hydroxides	18	--	United Kingdom 10; France 8.
Zinc metal including alloys, semimanufactures	1	--	Mainly from Ivory Coast.
Other:			
Metalloids	27	5	France 21.
Base metals including alloys, unwrought and semimanufactures value, thousands	$1	--	All from France.
NONMETALS			
Abrasives, n.e.s.:			
Artificial: Corundum	5	--	Do.
Grinding and polishing wheels and stones	2	--	France 1.
Asbestos, crude	100	--	All from China.
Barite and witherite	21	--	All from France.
Cement	76,878	--	France 38,096; United Kingdom 36,804; China 1,450.
Chalk	84	--	All from France.
Clays:			
Crude	20	--	France 19.
Products:			
Nonrefractory	1,301	10	France 552; Italy 392; Belgium-Luxembourg 168.
Refractory including nonclay brick	159	--	West Germany 148; France 11.
Diamond: Industrial value, thousands	$30	--	All from Venezuela.
Diatomite and other infusorial earth	37	--	France 22; Netherlands 15.
Fertilizer materials:			
Manufactured:			
Nitrogenous	30	--	West Germany 20; France 10.
Potassic	3	--	All from France.
Other including mixed	1,501	--	Netherlands 1,500; France 1.
Ammonia	9	--	France 5; West Germany 2.
Graphite, natural value, thousands	$1	--	All from France.
Lime	688	--	France 668; Nigeria 15; West Germany 5.
Precious and semiprecious stones other than diamond value, thousands	$50	--	All from France.
Pyrites, unroasted	4,530	--	Morocco 3,940; France 544; Ivory Coast 29.
Salt and brine	4,544	--	Ghana 4,018; West Germany 411; Upper Volta 59.
Sodium and potassium compounds, n.e.s.:			
Caustic potash	123	--	Nigeria 113; Switzerland 9.
Caustic soda	953	--	West Germany 865; France 58.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	285	--	China 202; France 25; Spain 25.
Worked	32	--	France 18; Belgium-Luxembourg 14.
Dolomite, chiefly refractory-grade	84	--	All from France.
Sand other than metal-bearing	3	--	Do.
Sulfur: Sulfuric acid	60	--	Belgium-Luxembourg 40; Netherlands 12.
Talc, steatite, soapstone, pyrophyllite	59	--	All from France.
Other:			
Crude	1,180	--	United Kingdom 1,019; France 159.
Oxides and hydroxides of barium, magnesium, strontium	32	--	West Germany 31.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	1,213	--	France 782; Ghana 279; China 74.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	23	--	All from China.
Coal and briquets:			
Coal, all grades excluding briquets	10	--	All from West Germany.
Briquets of all grades of coal	175	NA	NA.
Petroleum:			
Crude thousand 42-gallon barrels	3,424	--	All from Nigeria.
Refinery products:			
Gasoline do	407	--	Netherlands 125; Venezuela 110; Saudi Arabia 66.
Kerosine and jet fuel do	92	--	Netherlands 25; Saudi Arabia 21; Venezuela 14.

See footnotes at end of table.

Table 10.—Togo: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	Sources, 1979	
		United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued			
Petroleum —Continued			
Refinery products —Continued			
Distillate fuel oil thousand 42-gallon barrels	359	--	Venezuela 122; Netherlands 112; Saudi Arabia 30.
Residual fuel oil do	374	--	Saudi Arabia 339; Italy 23.
Lubricants do	22	(2)	France 7; Ivory Coast 7; Netherlands 4.
Other:			
Liquefied petroleum gas 42-gallon barrels	5,464	--	Ghana 4,605; Ivory Coast 754; France 93.
Mineral jelly and wax do	409	--	West Germany 346; Nigeria 63.
Bitumen and other residues do	1,364	--	Ghana 484; Nigeria 407; Belgium-Luxembourg 314.
Bituminous mixtures do	25,022	--	Spain 17,568; Netherlands Antilles 6,121.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	61	--	Mainly from France.

NA Not available.
[1]Data for 1978 are not available.
[2]Less than 1/2 unit.

UPPER VOLTA

Excluding production of building materials for local use, output of mineral-related commodities was negligible in 1981. A small antimony mine was operated during the year but closed at yearend because of unprofitability. Output was insignificant.

The GDP was estimated at $1.216 billion in 1981, down from $1.358 billion[15] in 1980. A negative trade balance of $252 million was reported in 1981. Petroleum product imports accounted for $50.3 million out of a total import value of $326 million. Iron and steel imports were valued at $9.1 million.

Lead, Zinc, and Silver.—A massive sulfide deposit, averaging 4% zinc, 0.6% lead, and 2.6 troy ounces of silver per ton, was discovered in the Boromo greenstone belt, about 30 kilometers northwest of Kondougou. Discovery was by a joint United Nations and Bureau Voltaique de la Geologie et des Mines exploration team.

Manganese.—The Mining Society of Kiere was formed at Bobo-Dioulasso with a capital of $300,000 for the purpose of extracting and marketing manganese from Kiere.

[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Communauté Financière Africaine francs (CFAF) to U.S. dollars at the rate of CFAF295.90=US$1.00 for 1981.
[3]Where necessary, values have been converted from Cape Verde escudos (CVEsc) to U.S. dollars at the rate of CVEsc39=US$1.00 for 1981.
[4]Where necessary, values have been converted from Gambian delasi (GD) to U.S. dollars at the rate of GD2.2=US$1.00 for 1981.
[5]Where necessary, values have been converted from Guinean syli (GS) to U.S. dollars at the rate of GS21.348=US$1.00 for 1981.
[6]U.S. Embassy, Conakry, Guinea. State Department Airgram 10, May 12, 1982, 14 pp.
[7]Where necessary, values have been converted from Guinean-Bissau pesos (GBP) to U.S. dollars at the rate of GBP35=US$1.00 for 1981.
[8]Where necessary, values have been converted from Communauté Financière Africaine francs (CFAF) to U.S. dollars at the rate of CFAF250=US$1.00 for 1981.
[9]Where necessary, values have been converted from Mali francs (MF) to U.S. dollars at the rate of MF513=US$1.00 for 1981.
[10]U.S. Embassy, Bamako, Mali. State Department Telegram 6731, Oct. 30, 1981, 1 p.
[11]Where necessary, values have been converted from Communauté Financière Africaine francs (CFAF) to U.S. dollars at the rate of CFAF275=US$1.00 for 1981.
[12]Where necessary, values have been converted from Communauté Financière Africaine francs (CFAF) to U.S. dollars at the rate of CFAF280=US$1.00 for 1981.
[13]Where necessary, values have been converted from Communauté Financière Africaine francs (CFAF) to U.S. dollars at the rate of CFAF313=US$1.00 for 1981.
[14]U.S. Embassy, Lome, Togo. State Department Airgram 7, Apr. 29, 1982, 3 pp.
[15]Where necessary, values have been converted from Communauté Financière Africaine francs (CFAF) to U.S. dollars at the rate of CFAF211=US$1.00 for 1980 and CFAF272=US$1.00 for 1981.

Table 11.—Upper Volta: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Principal destinations, 1979
METALS			
Aluminum metal including alloys, semimanufactures	(1)	3	Cameroon 1; Ivory Coast 1.
Copper metal including alloys, scrap	8	7	All to Ivory Coast.
Iron and steel metal:			
Ferroalloys	21	33	Mainly to Ivory Coast.
Semimanufactures:			
Bars, rods, angles, shapes, sections	18	297	Niger 278; Mali 16; Ivory Coast 3.
Universals, plates, sheets	--	35	Niger 24; Ghana 10.
Tubes, pipes, fittings	3	12	Mali 6; Niger 5.
Manganese: Oxides and hydroxides	--	20	All to Ivory Coast.
Zinc metal including alloys, scrap	44	20	Do.
NONMETALS			
Abrasives, n.e.s.: Grinding and polishing wheels and stones value, thousands	--	$1	Do.
Cement	10	168	Mali 153; Ghana 15.
Clays: Products, nonrefractory	--	1	All to Niger.
Fertilizer materials: Manufactured	35	--	
Salt and brine	27	--	
Sulfur: Sulfuric acid value, thousands	$1	--	
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline 42-gallon barrels	136	178	All to Ivory Coast.
Kerosine and jet fuel do.	1,992	16,608	Ivory Coast 13,392; Ghana 62.
Lubricants do.	49	7	All to Ghana.

[1]Less than 1/2 unit.

Table 12.—Upper Volta: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides value, thousands	$1	--		
Metal including alloys:				
Scrap	300	395	--	Nigeria 72; Ghana 64.
Unwrought	6	--		
Semimanufactures	428	534	--	Cameroon 429; France 91; Finland 1.
Chromium: Oxides and hydroxides	(1)	1	--	Mainly from France.
Copper:				
Matte and speiss	1	1	--	Do.
Metal including alloys:				
Scrap value, thousands	--	$1	--	All from Belgium-Luxembourg.
Unwrought and semimanufactures	28	54	(1)	West Germany 36; France 12; United Kingdom 6.
Iron and steel metal:				
Pig iron, cast iron, powder, shot	(1)	35	--	Mainly from France.
Ferroalloys	67	179	--	France 107; Ivory Coast 7; Ghana 6.
Steel, primary forms	58	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	5,778	4,992	1	France 4,162; West Germany 315; Belgium-Luxembourg 234.
Universals, plates, sheets	4,778	9,259	--	France 6,333; Belgium-Luxembourg 2,767.
Hoop and strip	60	198	--	France 177; Belgium-Luxembourg 10; Netherlands 10.
Rails and accessories	(1)	1,338	--	West Germany 1,176; France 162.
Wire	347	425	--	France 196; Ivory Coast 118; Belgium-Luxembourg 99.
Tubes, pipes, fittings	962	1,344	1	France 852; Japan 177; Romania 114.
Lead:				
Oxides and hydroxides	--	1	--	All from West Germany.
Metal including alloys, unwrought and semimanufactures	3	2	--	All from France.
Magnesium metal including alloys, semimanufactures	12	--		
Manganese: Oxides and hydroxides	503	1,178	--	All from France.

See footnotes at end of table.

Table 12.—Upper Volta: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS —Continued				
Mercury ____ value, thousands	$1	$3	--	All from France.
Nickel metal including alloys, unwrought and semimanufactures ____ do	$1	$2	$2	
Silver metal including alloys, unwrought and partly wrought ____ do	$1	$4	--	All from West Germany.
Tin metal including alloys, unwrought and semimanufactures	2	3	--	All from France.
Titanium: Oxides and hydroxides	--	30	--	France 24; Belgium-Luxembourg 6.
Tungsten metal including alloys, all forms ____ value, thousands	--	$5	$5	
Zinc:				
Oxides and hydroxides	45	36	--	All from France.
Metal including alloys, semimanufactures	271	321	--	Do.
Other:				
Alkali, alkaline-earth, rare-earth metals	2	(1)	--	Do.
Base metals including alloys, unwrought and semimanufactures	1	3	--	Mainly from Nigeria.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	10	1	--	All from France.
Grinding and polishing wheels and stones	13	41	(1)	Denmark 31; France 4; Ghana 4.
Barite and witherite	29	45	--	All from France.
Boron materials:				
Crude natural borates	--	1	--	Do.
Oxide and acid ____ value, thousands	--	$1	--	Do.
Cement	70,812	103,836	--	Togo 44,134; Poland 18,500; U.S.S.R. 12,526.
Chalk	211	259	--	All from France.
Clays:				
Crude	83	71	--	Do.
Products:				
Nonrefractory	932	1,017	--	France 740; West Germany 197; China 47.
Refractory including nonclay brick	50	32	--	All from France.
Diatomite and other infusorial earth	142	86	--	France 81; Belgium-Luxembourg 5.
Fertilizer materials:				
Crude	26	228	--	All from France.
Manufactured:				
Nitrogenous	4,079	2,394	127	Nigeria 828; France 667; Netherlands 470.
Phosphatic	1,023	168	130	Netherlands 37.
Potassic	174	91	--	France 60; Belgium-Luxembourg 30.
Other including mixed	11,053	20,504	--	Belgium-Luxembourg 16,076; Nigeria 2,513; Netherlands 1,007.
Ammonia	11	15	--	France 14.
Gypsum and plasters	23	52	--	All from France.
Lime	1,178	404	--	France 335; Spain 63; Ivory Coast 5.
Magnesite	2	--		
Mica:				
Crude including splittings and waste	4	8	--	All from France.
Worked including agglomerated splittings	--	6	--	Do.
Pigments, mineral: Iron oxides, processed	28	37	--	France 24; United Kingdom 12.
Salt and brine	13,573	14,439	--	Ghana 10,455; Senegal 3,228; Belgium-Luxembourg 300.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	87	243	--	West Germany 180; France 40; Italy 10.
Caustic soda	1,182	1,213	--	West Germany 849; Netherlands 143; Spain 130.
Soda ash	45	77	--	West Germany 20; France 17; East Germany 15; Ireland 15.
Stone, sand and gravel:				
Dimension stone, crude and partly worked	72	53	--	Ghana 44; France 7.
Dolomite, chiefly refractory-grade	34	28	--	All from France.
Gravel and crushed rock	--	29	--	Ghana 24; France 5.
Limestone other than dimension	10	--		
Sand other than metal-bearing	--	3	--	France 2; Nigeria 1.

See footnotes at end of table.

Table 12.—Upper Volta: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
NONMETALS —Continued				
Sulfur:				
Elemental:				
Crude	12	39	--	All from France.
Refined	2	4	1	France 3.
Sulfuric acid	30	47	--	France 39; Ivory Coast 7.
Talc, steatite, soapstone, pyrophyllite	131	85	--	France 82; West Germany 3.
Other:				
Crude	9	84	--	All from France.
Slag and ash, not metal-bearing	--	5	--	Mainly from France.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	109	143	--	All from France.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	101	145	--	Do.
Coal, all grades including briquets	1	--		
Coke and semicoke	--	1	--	All from France.
Petroleum refinery products:				
Gasoline—42-gallon barrels	417,902	426,700	--	Ivory Coast 9,588; Gabon 8,959; Venezuela 7,948.
Kerosine and jet fuel—do	101,502	98,216	--	Venezuela 8,486; Italy 7,200; Ivory Coast 5,262.
Distillate fuel oil—do	166,358	273,088	448	Ivory Coast 7,132; Venezuela 6,908; Italy 6,647.
Residual fuel oil—do	203,896	265,821	--	Ivory Coast 18,661; Italy 9,257; France 7,872.
Lubricants—do	8,848	23,310	7	Ivory Coast 18,494; France 1,890.
Other:				
Liquefied petroleum gas—do	2,854	5,626	--	Ivory Coast 824; France 186.
Mineral jelly and wax—do	1,047	1,873	--	Netherlands 1,133; France 346; West Germany 236.
Petroleum coke—do	22	--		
Bitumen—do	533	273	--	All from Netherlands.
Bituminous mixtures—do	18,186	13,259	--	Venezuela 3,103; France 103.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	40	22	--	Netherlands 21.

[1]Less than 1/2 unit.

The Mineral Industry of the Islands of the Caribbean

By Doris M. Hyde[1]

CONTENTS

To a greater or lesser extent, the economies of the smaller Caribbean Island countries continued to have common problems. These included unemployment, inflation, foreign exchange shortages, trade deficits, and unstable world prices for their exports. Declining prices for petroleum provided some relief from scarce foreign exchange.

Overall, the mineral sector remained stable. The Amerada Hess Corp. crude oil transshipment terminal on St. Lucia was completed during 1981. However, there were no shipments during the year. No official reason was offered for the delay in opening the terminal, but it may have been related to the world surplus of crude oil that occurred in 1981. There has been no further action on the refinery, which was to complete the island's petroleum complex. During the first half of 1981, an announcement was made that a second oil transshipment terminal would be built on St. Lucia. The report indicated that the terminal was to be financed by Saudi Arabia and include underground storage. After the original announcement, no further information was made available. This terminal, like the Hess petroleum complex, may have been temporarily postponed because of the crude oil surplus.

In December 1981, there was a dedication ceremony for the opening of the small 16,000-barrel-per-day crude oil refinery on Antigua. The refinery was to undergo a 2-month breaking-in period, but it was subsequently closed by strike action.

BAHAMAS

The Bahamian gross domestic product (GDP) in 1980 was estimated at $2.1 billion at current prices. The value added by the mineral sector was reported at $222.2 million, or 11% of the total. The mineral sector was not expected to have any increased impact on the GDP in 1981. Recent Government efforts to encourage foreign investment and industrial diversification were not expected to influence the minerals sector because of resource and market limitations.

In 1980, the cost of an estimated 3.6 million barrels of imported crude oil for

local consumption (excluding bunkers) was estimated at $126 million, a 34% increase over the cost in 1979. Petroleum represented 15% of total import costs in 1980 and has been one of the factors contributing to an increasing trade deficit. In 1981, the Bahamas was accepted into the Mexico-Venezuela San Jose oil financing agreement. When final details are resolved, the Bahamas will be eligible to benefit from the low-interest loans amounting to 30% of the crude oil purchase price.

Lone Star Industries, Inc., terminated its bid to acquire a 50% interest in the Bahamas Cement Co. As announced previously, in September the Diamond Crystal Salt Co. ceased operating their salt facility on Long Island.

A 200-mile offshore economic zone was declared by the Bahamas in 1977 to protect mining and fisheries resources. This area could overlap territorial claims of the United States and other countries.

The geophysical survey conducted in the Bahamian offshore area between Andros Island, Cuba, and southern Florida was concluded. A five-member consortium composed of Getty Oil Co., British Petroleum Co. Ltd. (BP), Standard Oil Co. of California, Shell Oil Co., and Arco Oil Producing Inc. has been examining the data obtained from the survey. It was expected that portions of this area might be opened for bidding in the near future.

In late 1981, Bahamas California Oil Co. Ltd. was granted a 1-year permit to conduct geophysical surveys in parts of the Great Bahama Bank area. Natomas Petroleum Bahamas Ltd. has also applied for a permit to conduct surveys in other portions of this area.

Shortly after World War II and during the years of 1968-71, test drilling conducted off Andros, Cay Sal, Long Island, and Bimini, encountered some evidence of oil. The producing potentials were not considered great enough to justify further exploration under the prevailing economic conditions. Whether or not sufficient oil exists for commercial development today remains conjecture; although by some optimistic estimates, oil reserves of the south Florida-Bahamas Basin could amount to between 1.5 billion and 3 billion barrels.

Table 1.—Islands of the Caribbean: Production of mineral commodities[1]

Area,[2] commodity, unit of measure	1977	1978	1979	1980[p]	1981[e]
BAHAMAS[3]					
Cement, hydraulic thousand metric tons	r70	330	450	520	600
Petroleum refinery products:[e]					
Jet fuel thousand 42-gallon barrels	9,935	9,160	3,500	3,500	3,500
Distillate fuel oil do.	21,452	9,885	10,500	13,000	13,000
Residual fuel oil do.	53,032	34,565	25,500	18,000	18,000
Other do.	15,939	11,080	11,705	14,715	15,000
Refinery fuel and losses do.	888	900	1,500	1,600	1,600
Total do.	101,246	65,590	52,705	50,815	51,100
Salt thousand metric tons	1,670	1,633	440	684	[4]970
Stone:					
Aragonite do.	2,454	3,200	3,629	3,266	3,000
Limestone for cement manufacture do.	NA	524	508	600	700
Sulfur, byproduct of petroleum do.	[e]5	[e]5	[e]5	[e]5	5
BARBADOS[3]					
Gas, natural:					
Gross[e] million cubic feet	197	444	548	584	600
Marketed do.	[e]130	152	266	300	320
Petroleum:					
Crude thousand 42-gallon barrels	124	272	285	204	250
Refinery products:					
Gasoline do.	328	333	348	347	350
Kerosine do.	62	60	59	48	50
Distillate fuel oil do.	229	267	283	319	320
Residual fuel oil do.	518	496	551	583	590
Other do.	30	35	31	42	40
Refinery fuel and losses do.	137	18	23	25	20
Total do.	1,304	1,209	1,295	1,364	1,370
CUBA[3 5]					
Cement, hydraulic thousand metric tons	2,657	2,712	2,613	2,940	3,250
Chromite do.	20	29	28	30	29
Cobalt[e] metric tons	1,600	1,600	1,700	1,700	1,790
Copper, mine output, metal content do.	2,583	2,821	2,840	3,300	3,600

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities[1] —Continued

Area,[2] commodity, unit of measure	1977	1978	1979	1980[p]	1981[e]
CUBA[3 5] —Continued					
Gas, natural:					
Gross[e] million cubic feet	1,330	1,500	1,500	1,560	1,500
Marketed do	599	374	614	750	800
Gypsum thousand metric tons	91	95	91	122	130
Iron and steel: Crude steel do	330	324	328	304	300
Nickel:					
Mine output, Ni content of oxide and sulfide metric tons	36,750	34,787	32,324	[e]37,000	40,500
Metallurgical products, Ni content:[6]					
Oxide and powder do	[r]8,893	[r]8,634	8,095	[e]9,440	9,880
Sinter do	[r]9,512	[r]9,456	10,730	[e]10,180	9,880
Sulfide do	[r]16,754	[r]15,234	12,269	[e]16,950	18,950
Nitrogen: N content of ammonia thousand metric tons	58	39	155	136	140
Petroleum:					
Crude thousand 42-gallon barrels	1,705	1,918	1,917	2,000	1,850
Refinery products:					
Motor gasoline do	7,083	7,537	7,412	6,936	7,000
Kerosine do	3,220	3,308	3,213	[e]3,200	3,300
Distillate fuel oil do	7,428	8,080	8,163	8,119	8,100
Residual fuel oil do	21,376	20,650	21,400	20,102	20,000
Lubricating oils do	841	885	930	[e]900	900
Liquefied petroleum gas do	1,124	1,179	1,069	[e]1,100	1,100
Other do	5,095	4,782	4,325	[e]5,880	5,500
Total do	46,167	46,421	46,512	46,237	45,900
Pyrites, gross weight thousand metric tons	82	54	29	53	50
Salt do	129	131	122	124	125
Sulfur:					
S content of pyrite[e] do	34	23	12	22	21
Byproduct of petroleum[e] do	8	8	8	8	8
Total do	[r]42	31	20	30	29
DOMINICA					
Stone, sand and gravel: Pumice and volcanic ash do	109	109	109	109	109
DOMINICAN REPUBLIC[3]					
Aluminum: Bauxite, dry equivalent, gross weight do	576	568	524	510	405
Cement, hydraulic do	862	867	886	1,015	980
Copper, mine output do	--	--	3	3	3
Gold thousand troy ounces	343	343	353	370	413
Gypsum:					
For cement manufacture thousand metric tons	224	170	173	185	180
Other do	2	[e]2	[e]2	2	2
Iron and steel ferroalloys: Ferronickel[7] metric tons	[r]66,516	37,631	66,072	43,019	49,658
Lime do	21,108	[e]25,000	37,935	40,000	40,000
Mercury 76-pound flasks	495	500	500	500	500
Nickel:[7]					
Mine output, metal content metric tons	[e]24,899	[e]14,302	[e]25,111	16,347	18,570
Metal, smelter, Ni content of ferronickel shipments do	[r]20,628	[r]19,759	24,553	16,552	[4]18,679
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	2,738	2,814	2,568	2,497	2,500
Kerosine and jet fuel do	353	425	505	542	500
Distillate fuel oil do	2,665	2,690	2,472	2,945	2,900
Residual fuel oil do	2,643	2,830	2,708	2,636	2,500
Other do	613	730	782	869	800
Refinery fuel and losses do	423	272	289	352	350
Total do	9,435	9,761	9,324	9,841	9,550
Salt metric tons	34,428	37,877	[e]38,000	55,556	60,000
Silver metal thousand troy ounces	1,852	1,848	2,276	1,642	[4]2,062
Stone, sand and gravel:					
Limestone thousand metric tons	302	353	288	264	270
Sand and gravel do	1,228	1,393	[e]1,400	1,400	1,400
GUADELOUPE					
Abrasives, natural: Pumice do	190	200	200	250	250
Cement do	[r]137	162	143	183	200
Stone:					
Crushed and broken do	[r]1,300	[e]700	[e]700	450	450
Limestone do	110	NA	NA	NA	NA
Sand do	310	NA	NA	1,175	1,200

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities[1] —Continued

Area,[2] commodity, unit of measure	1977	1978	1979	1980[p]	1981[e]
HAITI[3]					
Aluminum: Bauxite, dry equivalent, gross weight thousand metric tons	588	580	584	312	400
Cement, hydraulic do	242	249	270	243	250
Clays do	67	60	65	70	70
Gypsum for cement manufacture metric tons	(5)	--	--	--	--
JAMAICA					
Aluminum:					
Bauxite, dry equivalent, gross weight thousand metric tons	r11,390	r11,739	11,618	12,054	11,664
Alumina do	r2,051	r2,117	2,094	2,478	2,550
Cement, hydraulic do	333	294	226	144	150
Clays for cement manufacture do	160	99	99	94	90
Gypsum metric tons	214,824	134,500	58,000	95,477	96,000
Lime thousand metric tons	144	157	204	159	160
Lead, refined (secondary) metric tons	2,000	2,000	2,000	1,000	1,000
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	1,879	1,998	1,745	1,440	4 1,259
Kerosine do	349	349	379	275	210
Jet fuel do	480	560	847	822	494
Distillate fuel oil do	1,858	1,977	1,954	1,465	1,030
Residual fuel oil do	2,391	2,498	4,164	3,533	2,084
Liquefied petroleum gas do	255	233	413	361	366
Other do	140	301	99	92	98
Refinery fuel and losses do	1,504	1,170	321	213	217
Total do	8,856	9,086	9,922	8,201	5,758
Sand and gravel:					
Glass sand thousand metric tons	28	14	11	6	5
Common sand and gravel do	9,558	9,558	11,000	6,850	7,000
Stone:					
Limestone do	717	614	370	403	400
Other do	e914	1,128	8,200	6,280	6,300
MARTINIQUE					
Cement, hydraulic do	r131	r144	144	180	200
Clays do	27	38	45	55	60
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	1,149	1,176	1,269	1,167	1,200
Kerosine do	177	126	121	105	110
Jet fuel do	798	893	706	775	780
Distillate fuel oil do	454	561	581	629	630
Residual fuel oil do	935	990	1,093	1,093	1,100
Liquefied petroleum gas do	NA	242	241	221	220
Total do	NA	3,988	4,011	3,990	4,040
Pumice:					
As reported thousand cubic meters	477	261	277	256	260
Converted[e] thousand metric tons	287	166	156	128	130
Stone, sand and gravel:					
Stone, crushed and broken thousand cubic meters	349	471	396	565	600
Sand do	261	149	228	306	300
MONTSERRAT					
Sand and gravel, natural cubic meters	3,161	11,570	12,523	e12,500	12,500
Other quarry products[9] do	3,393	702	e1,000	e1,000	1,000
NETHERLANDS ANTILLES[3]					
Nitrogen: N content of ammonia metric tons	30,705	--	--	--	--
Petroleum refinery products:					
Gasoline:					
Aviation thousand 42-gallon barrels	1,202	1,530	e1,600	e1,600	1,600
Motor do	17,223	18,172	e19,000	e19,000	20,000
Kerosine do	353	432	e500	e500	500
Jet fuel do	12,908	15,317	e16,000	e16,500	16,000
Distillate fuel oil do	24,660	28,055	e29,000	e30,000	29,000
Residual fuel oil do	100,265	110,996	e115,000	e116,000	115,000
Lubricants do	3,355	3,355	e3,400	e3,500	3,500
Other do	25,280	26,961	e27,000	e27,000	27,000
Refinery fuel and losses do	12,264	9,928	e10,000	e10,000	10,000
Total do	197,510	214,746	e221,500	e224,100	222,600
Phosphate rock thousand metric tons	79	81	49	--	--
Salt[e] do	400	400	400	400	400
Sulfur, byproduct of petroleum do	94	95	91	91	90

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities[1] —Continued

Area,[2] commodity, unit of measure	1977	1978	1979	1980[p]	1981[e]
ST. VINCENT					
Salt—thousand metric tons	50	50	50	50	50
Sand and gravel, natural—thousand cubic meters	413	[e]410	400	400	400
Other quarry products—do.	764	[e]760	750	750	750
TRINIDAD AND TOBAGO					
Asphalt, natural—thousand metric tons	44	[r]62	55	40	40
Cement, hydraulic—do.	215	220	214	183	200
Clays:					
Argillite—thousand cubic meters	121	[e]130	--	--	--
Other—do.	89	[e]90	109	104	100
Gas, natural:					
Gross—million cubic feet	149,590	157,958	169,740	197,900	193,000
Marketed—do.	[r]81,400	[r]96,300	113,000	130,000	139,000
Iron and steel:[10]					
Iron, sponge—thousand metric tons	--	--	--	[e]20	180
Steel, crude—do.	--	--	--	--	45
Semimanufactures (wire rod)—do.	--	--	--	--	29
Lead, refined (secondary)—metric tons	1,500	2,000	2,000	2,000	2,000
Natural gas liquids—thousand 42-gallon barrels	[e]50	60	50	50	50
Nitrogen: N content of ammonia—metric tons	176,454	400,772	388,654	459,498	396,900
Petroleum:					
Crude—thousand 42-gallon barrels	83,950	83,773	78,249	77,616	69,112
Refinery products:					
Gasoline:					
Aviation—do.	361	354	271	375	284
Other—do.	18,355	16,795	14,827	15,241	12,822
Kerosine—do.	5,802	4,501	3,245	3,247	2,145
Jet fuel—do.	2,462	2,219	2,538	3,216	1,264
Distillate fuel oil—do.	10,705	10,134	11,741	13,991	10,279
Residual fuel oil—do.	56,296	45,478	43,521	42,286	29,613
Lubricants—do.	926	725	686	1,012	787
Other:					
Liquefied petroleum gas—do.	465	610	759	869	901
Asphalt—do.	201	173	275	273	403
Unspecified—do.	3,415	2,045	2,091	2,409	2,150
Refinery fuel and losses—do.	3,010	2,848	2,910	1,681	2,696
Total—do.	101,998	85,882	82,864	84,600	63,344
Sand and gravel:					
Pitch sand—thousand cubic meters	46	[e]45	68	86	90
Other sand and gravel—do.	642	[e]500	529	482	500
Stone:					
Andesite—do.	881	NA	15	8	10
Diorite—do.	NA	NA	498	3	3
Limestone:					
For cement manufacture—thousand metric tons	323	[e]350	295	252	270
Other—thousand cubic meters	445	[e]450	1,056	520	550
Porcelanite—do.	[e]27	[e]27	94	75	75
Sulfur, byproduct of petroleum[11]—thousand metric tons	34	54	77	80	80

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through June 23, 1982.

[2]In addition to the countries listed, Antigua, Bermuda, Grenada, and St. Lucia presumably produced crude construction materials (clays, sand and gravel, and stone), but output is not reported and available information is inadequate to make reliable estimates of output levels. Antigua also has a petroleum refinery that was closed in 1976 but may be operational again in 1981.

[3]In addition to the commodities listed, other crude construction materials (lime, salt, and sand and gravel) may also be produced, but data on such production are not collected and available information is inadequate to make reliable estimates of output levels.

[4]Reported figure.

[5]In addition to the commodities listed, iron ore and manganese ore, both produced in significant quantities prior to the termination of publication of official statistics, presumably were produced during the period covered by this table, but available information is inadequate to make reliable estimates of output levels.

[6]Annario Estadistico de Cuba 1979 and Cuba en Cifras 1980, provide figures on nickel-cobalt content of oxide, sinter, and sulfide production using an average cobalt content in these individual products of 0.9% in total oxide, 1.1% in total sinter, and 4.5% in total sulfide, the cobalt content of reported nickel-cobalt production was determined as being 1.16% of oxide, 1.21% of sinter, and 7.56% of sulfide. The remainder of reported figures would represent the nickel content.

[7]The Dominican Republic reports gross weight of ferronickel production. When official data are not available, figures for nickel content of mine production are determined from an average of 37.4% nickel contained in ferronickel production. Nickel content of ferronickel shipments is obtained from Falconbridge Dominicana C. por A. annual reports.

[8]Revised to none.

[9]Includes crushed volcanic rock, limestone, diorite, and quartzite used for building stone, aggregate, road construction, etc.

[10]Trinidad and Tobago initiated production of pig iron and sponge iron near yearend 1980 and may also have produced a small quantity of steel, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[11]Limited quantities of sulfur as a byproduct of natural gas may also be produced.

BARBADOS

In 1981, the real GDP was expected to be slightly over $4 billion,[2] indicating a 1% rate of real growth, declining from the 5% expansion experienced in 1980. The value added by the mineral sector has consistently remained well below 1%, and there is no basis for assuming more than minor fluctuations in the future.

In 1981, Barbados became one of the beneficiaries of the Mexico-Venezuela San Jose accord, which allows crude oil importing countries in the Caribbean to receive low-interest 5-year loans equivalent to the cost of 30% of the oil purchased. These loans may be converted to a 2% rate of interest, 20-year loan, if the money is used to enhance approved energy projects within the country. In addition to actively exploring and developing its own limited crude oil reserves, Barbados has strongly supported the development of alternative energy sources, especially solar. Solar energy is extensively employed for water heating in homes, and solar air-conditioning is under experimentation.

In 1981, Barbados was reported to be negotiating the exchange of limestone for steel billets from the Iron and Steel Co. of Trinidad and Tobago (ISCOTT).

The new Arawak Cement Co. plant project is jointly owned by the Governments of Barbados (51%) and Trinidad and Tobago (49%). Credit and loans totaling $80 million have been obtained to finance the construction of this 1,000-ton-per-day facility. The plant is located on the west coast of Barbados and is scheduled for completion by 1983. At full operation it is expected to produce a surplus for export.

Onshore petroleum exploration during 1981 was concentrated on deep drilling. This program did not prove successful, and shallow drilling is expected to be resumed in 1982. Some deeper drilling may also continue.

BERMUDA

Bermuda has no known official mechanism for registering production from its mineral sector. Any production would probably be in the form of small volumes of construction-oriented materials for local consumption and not of sufficient magnitude or value to warrant specific Government recordkeeping procedures.

Table 2.—Bermuda: Foreign trade in mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations/sources, 1980	
			United States	Other (principal)
EXPORTS				
Petroleum refinery products:[1]				
Gasoline:				
Aviation thousand 42-gallon barrels	926	1,213	--	Bermuda 287.
Motor 42-gallon barrels	269	10,448	--	All to Bermuda.
Jet fuel do	8,607	1,420	--	Do.
Distillate fuel oil do	410,822	306,770	7	Aruba and Curaçao 287,135; Bermuda 19,627.
IMPORTS				
METALS				
Aluminum metal including alloys, all forms	31	37	18	United Kingdom 17; Canada 1; Italy 1.
Copper metal including alloys, all forms	5	4	4	
Gold bullion value	$220,279	$386,740	$257,303	United Kingdom $69,426; Italy $46,745; Canada $13,266.
Iron and steel:				
Pig iron, sponge iron	1	2	2	
Steel, primary forms	r5	7	7	
Common steel:				
Semimanufactures:				
Bars, rods, angles, shapes, sections	36,557	86,269	245	United Kingdom 85,650; Canada 374.
Universals, plates, sheets	r68,258	8,599	8,599	
Wire	550	15	15	
Tubes, pipes, fittings	13,627	65,401	65,396	United Kingdom 5.
Castings and forgings, rough	58	3	3	

See footnotes at end of table.

Table 2.—Bermuda: Foreign trade in mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity		1979	1980	Destinations/sources, 1980	
				United States	Other (principal)
IMPORTS					
METALS —Continued					
Lead metal including alloys, all forms	kilograms	664	462	218	France 244.
Nickel metal including alloys, all forms	do	132	30	30	
Platinum-group metals including alloys, unwrought and partly wrought	troy ounces	1	92	29	United Kingdom 63.
Silver metal including alloys, unwrought and partly wrought	do	28	49	10	United Kingdom 35; Canada 3.
Tin metal including alloys, all forms	kilograms	21,954	482	410	United Kingdom 72.
Zinc metal including alloys, all forms	do	835	328	328	
Other metals including alloys, all forms	do	1,023	251	195	United Kingdom 56.
NONMETALS					
Abrasives, n.e.s.: Grinding and polishing wheels and stones	kilograms	610	507	394	Switzerland 69; Canada 34.
Cement		7,986	9,872	49	Bahamas 9,790; United Kingdom 33.
Clays and clay products:					
Crude clays and other refractory materials		65	66	57	United Kingdom 9.
Products		820	1,192	524	Italy 217; Canada 207; Brazil 107.
Diamond, gem, not set or strung	carats	179	569	383	United Kingdom 186.
Fertilizer materials:					
Crude		19	88	85	United Kingdom 3.
Manufactured:					
Nitrogenous		35	4	4	
Phosphatic	kilograms		35	35	
Other including mixed		757	739	459	Canada 243; United Kingdom 37.
Gypsum and plasters		317	314	53	Canada 261.
Lime		356	687	670	Canada 17.
Precious and semiprecious stones except diamond:					
Natural	value	$77,313	$31,469	$19,749	France $8,547; Canada $1,793; Thailand $1,380.
Synthetic	do	$2,032	$9,525	$7,477	Denmark $1,946; Canada $102.
Salt and brines		132	135	36	Canada 85; United Kingdom 14.
Stone, sand and gravel:					
Dimension stone, crude		r7	1	1	
Gravel and crushed rock		15,164	11,967	11,514	Canada 453.
Sand excluding metal-bearing		62,471	25,489	25,489	
Other building materials of asphalt, asbestos and fiber cements, unfired nonmetals		95	186	70	Canada 73; United Kingdom 42.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		3	15	10	Canada 5.
Coal, all grades including briquets		22	1,752	1,751	Mainly from Canada.
Petroleum refinery products:					
Duty paid:					
Gasoline	42-gallon barrels	175,715	182,538		All from Aruba and Curaçao.
Kerosine	do	1,946	1,606	[2]	Mainly from Aruba and Curaçao.
Distillate fuel oil	do	835,475	662,583		Venezuela 588,684; Aruba and Curaçao 73,899.
Residual fuel oil	do	401,678	496,791		Aruba and Curaçao 342,048; Venezuela 154,743.
Lubricants	do	4,612	5,323	1,912	Jamaica 2,404; Canada 434; Netherlands 342.
Liquefied petroleum gas	do	37,098	26,845	296	Venezuela 21,536; United Kingdom 4,998.
Bituminous mixtures	do	10,660	8,335	574	Venezuela 7,242; United Kingdom 308.
Bonded:					
Gasoline	do	219,930	186,072		All from Aruba and Curaçao.
Kerosine	do	385,267	302,936		Do.
Distillate fuel oil	do	382,735	639,404		Do.
Residual fuel oil	do	533,806	325,707		Do.
Lubricants	do	501,431	35,532	18,046	Jamaica 17,486.
Bituminous mixtures	do	8	13,993		All from Venezuela.

rRevised.

[1]Bunkers originating with the Armed Forces of the United Kingdom, the North Atlantic Treaty Organization, and the United States and not listed with imports of petroleum refinery products.

[2]Less than 1/2 unit.

CUBA

Cuba entered the period of its second 5-year plan (1981-85) showing an impressive recovery from the poor economic performance experienced in 1980. In 1981, the gross national product (GNP) reached $27.4 billion,[3] indicating an overall economic growth of 12% as performance in all sectors improved. To curb import demand, maintain the balance of payments position, and decrease budgetary deficits, Cuba has planned to keep economic growth below 3% during 1982.

Administrative reforms initiated in 1980 were credited as being contributory to 1981's economic improvement. More efficient management was encouraged by keying performance measurements to profitability. Managers were judged by whether or not their enterprises were productive and profitable. Performance has been aided by other innovations, such as a new accounting system, a new salary system, a new labor law, farmer's markets, and a growing private service sector. The offering of material incentives was credited for increased labor productivity.

The trade balance during the first half of 1981 was reported as substantially positive, but it evidently deteriorated during the remainder of the year and resulted in a deficit of $1 billion. In June, Cuba and the Soviet Union signed a new Trade Turnover and Payment Protocol for the period 1981-85. The agreement provides for a 42% increase in trade volumes between the two countries compared with the previous 5-year period. Trade with market economy countries decreased 10% from 1980 as Cuba pursued its policy of maintaining a close relation between income and expenditure in convertible currencies.

In 1980, petroleum imports supplied through the U.S.S.R. accounted for almost 27% of Cuba's total import trade with that country and provided about 98% of Cuba's total oil requirements. In 1980, nickel concentrate made up 4% of Cuba's exports to the U.S.S.R.

During 1981, Cuba continued its policy of seeking investors for profit-sharing ventures. To support this policy, Cuba may take legislative action permitting the establishment of joint partnerships with foreign interests.

Czechoslovakia signed an agreement with Cuba to supply machinery and other equipment for extracting and processing chrome ores. Cuba expects to pay for the equipment by exporting chrome ore to Czechoslovakia. Chrome ore production capacity has been estimated at 100,000 tons per year, although actual production has been considerably less than this. At present, production consists mainly of refractory chrome ore containing about 38% chromic oxide. Some upgraded ore containing about 44% chromic oxide is also produced. Most of Cuba's chrome ore output is shipped through the port at Moa Bay.

Chrome podiform deposits are mined in northeastern Oriente Province in the Moa-Baracoa area. Assessed ore reserves in this area have been reported at about 6.5 million tons, and potential resources may reach 10 million tons. Another 42 million tons of lateritic deposits containing 1% to 3% chromium must await technological advances in metallurgy before development.

Cuba's nickel industry performed well in 1981, despite ongoing rehabilitation and expansion activity. Construction of the long-planned new nickel oxide plant at Las Camariocas in Holquín Province in northeast Cuba may begin in 1982. A cooperative agreement to build this plant is expected to follow an early 1982 meeting between the Council for Mutual Economic Assistance planning committee and Cuba. Construction work continued at the new Punta Gorda nickel oxide plant. This 30,000-ton-per-year plant will reportedly cost over $500 million and be operational at the end of 1983 or early 1984.

In April 1981, unconfirmed reports were widely circulated that Petróleos Mexicanos (PEMEX) had discovered crude oil about 15 miles off the Cuban coast near Havana. These reports were later denied, and no reliable information has been available as to the progress of the joint PEMEX-Cuban offshore exploration efforts.

Table 3.—Cuba: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	277	NA		
Metal including alloys:				
Scrap	725	2,072	--	All to Netherlands.
Semimanufactures	r43	2 1	--	Do.
Chromium: Chromite	16,045	20,031	--	Poland 10,067; Czechoslovakia 5,000; Austria 4,939.
Copper: Metal including alloys:				
Scrap	539	823	--	All to Netherlands.
Semimanufactures	207	1	--	All to Jamaica.
Iron and steel:				
Scrap	29	2,458	--	Spain 2,333; Netherlands 125.
Steel, primary forms	1,627	NA		
Semimanufactures:				
Bars, rods, angles, shapes, sections	--	8	--	All to Jamaica.
Universals, plates, sheets	r740	NA		
Hoop and strip	286	NA		
Wire	114	NA		
Tubes, pipes, fittings	r152	12	--	All to Jamaica.
Castings and forgings, rough	--	201	--	Colombia 196.
Lead metal including alloys:				
Scrap	r19	27	--	All to Netherlands.
Unwrought	--	12	--	All to Costa Rica.
Nickel:				
Matte and speiss	r 3 35,400	10,835	--	Netherlands 3,587; West Germany 2,753; Japan 1,797.
Metal including alloys:				
Unwrought	3,788	3,887	--	Czechoslovakia 1,963; Spain 1,547; Belgium-Luxembourg 315.
Semimanufactures	35	NA		
Silver:				
Waste and sweepings value, thousands	--	$82	--	All to Spain.
Metal including alloys, unwrought or partly wrought do.	$1,980	$29	--	All to Italy.
Zinc metal including alloys:				
Scrap	80	148	--	All to Netherlands.
Semimanufactures	413	NA		
Other:				
Ores and concentrates	5,000	4,877	--	All to Hungary.
Ash and residue containing nonferrous metals	569	993	--	Netherlands 909; Spain 84.
Oxides, hydroxides, peroxides	3,220	2,400	--	Italy 2,238; France 63; Netherlands 50.
NONMETALS				
Cement	r105,351	221,517	--	French Guiana 138,911; Venezuela 67,219.
Clays and clay products:				
Crude	677	NA		
Products:				
Refractory including nonclay brick	--	2,286	--	All to Venezuela.
Nonrefractory	941	19	--	United Kingdom 12; Jamaica 7.
Lime	18	NA		
Precious and semiprecious stones value, thousands	--	$51	--	All to United Kingdom.
Salt and brines	--	1	--	All to Nicaragua.
Stone, sand and gravel:				
Dimension stone	r423	2,377	--	Hungary 1,931; Venezuela 256; Colombia 150.
Gravel and crushed rock	3	NA		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	186	NA		
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	1,436	2,799	--	United Kingdom 857; Netherlands 817; Belgium-Luxembourg 596.
Residual fuel oil 42-gallon barrels	11,442	NA		
Lubricants do.	1,988	NA		
Other:				
Nonlubricating oil do.	42	NA		
Bitumen and other residues do.	--	6	--	All to Jamaica.

See footnotes at end of table.

Table 3.—Cuba: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	--	213	--	All to Venezuela.

[r]Revised. NA Not available.

[1]Owing to the lack of official trade data published by Cuba, this table should not be taken as a complete presentation of this country's mineral exports. These data have been compiled from various sources that include United Nations information and data published by the partner trade countries. Unless otherwise specified, data are compiled from official trade statistics of individual trading partners.

[2]Excludes imports by Malta valued at $21,000.

[3]Source: Statistical Yearbook of the Member States of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

Table 4.—Cuba: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	356	2,383	--	U.S.S.R. 2,250; Japan 78; West Germany 43.
Metal including alloys:				
Unwrought	1,581	1,090	--	United Kingdom 989; Hungary 97.
Semimanufactures	4,559	2,979	--	Hungary 1,464; Belgium-Luxembourg 1,063; Spain 340.
Chromium: Oxides and hydroxides	2	--		
Cobalt metal including alloys, all forms	1	--		
Copper:				
Sulfate	23	149	--	All from Yugoslavia.
Metal including alloys:				
Unwrought	--	157	--	All from Japan.
Semimanufactures	3,823	3,018	--	Japan 1,802; Canada 500; Spain 429.
Iron and steel:				
Ore and concentrate	231	410	--	Netherlands 305; United Kingdom 105.
Metal:				
Scrap	72,347	86,601	--	All from U.S.S.R.
Pig iron	[2]195,500	NA		
Ferroalloys	950	3	--	All from Italy.
Steel, primary forms	--	125	--	Spain 111; West Germany 14.
Semimanufactures:				
Bars, rods, angles, shapes, sections	53,186	[3]52,035	--	Czechoslovakia 23,000; Poland 7,881; Spain 5,716.
Universals, plates, sheets	[r 2]577,600	18,478	--	Japan 5,332; Spain 4,104; Hungary 2,773.
Hoop and strip	350	78	--	West Germany 76.
Rails and accessories	917	1,581	--	All from France.
Wire	12,998	[4]7,328	--	Japan 355;[4] Spain 2,001; Belgium-Luxembourg 978.
Tubes, pipes, fittings	[r 2]71,200	12,096	--	Japan 4,236; Spain 4,105; West Germany 2,265.
Unspecified	[5]72,299	NA		
Lead:				
Oxides	350	599	--	France 598.
Metal including alloys:				
Unwrought	599	2,429	--	Japan 1,313; Belgium-Luxembourg 1,116.
Semimanufactures	407	99	--	All from Belgium-Luxembourg.
Magnesium metal, including alloys, semimanufactures	1	NA		
Manganese:				
Ores and concentrates	--	184	--	All from Netherlands.
Oxides	419	183	--	All from Japan.
Mercury, 76-pound flasks	29	151	--	All from West Germany.
Nickel metal including alloys, semimanufactures	5	4	--	West Germany 3; Japan 1.
Platinum-group metals including alloys, unwrought and partly wrought, value, thousands	$2	NA		
Silver metal including alloys, unwrought and partly wrought, do.	$97	$1,318	--	Spain $1,314.

See footnotes at end of table.

Table 4.—Cuba: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Tin metal including alloys:				
Unwrought	1	16	--	All from Denmark.
Semimanufactures ---- kilograms	--	300	--	All from Japan.
Titanium metal including alloys, all forms ---- do	48	NA		
Zinc:				
Oxides and peroxides	30	1,272	--	United Kingdom 1,266.
Metal including alloys:				
Unwrought	200	50	--	All from Belgium-Luxembourg.
Semimanufactures	4	[6]4	--	All from Spain.
Other:				
Oxides, hydroxides, peroxides	32	85	--	West Germany 51; Belgium-Luxembourg 13.
Metalloids	--	532	--	France 527; Japan 4.
Base metals including alloys, all forms	10	24	--	Italy 23.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	11	120	--	Italy 70; Japan 30; France 20.
Artificial corundum	10	79	--	Spain 78.
Grinding and polishing wheels and stones	203	20	--	Spain 15; Austria 5.
Asbestos, crude	1,832	2,345	--	All from Canada.
Barite and witherite	100	180	--	All from Spain.
Boron materials: Oxides and acids	24	65	--	France 60; West Germany 5.
Cement	r [5]134,000	103,786	--	U.S.S.R. 63,000; Poland 40,637.
Clays and clay products:				
Crude	412	840	--	Spain 581; United Kingdom 259.
Products:				
Refractory including nonclay brick	43,251	38,414	--	U.S.S.R. 27,395; Spain 5,946; United Kingdom 3,451.
Nonrefractory	119	82	--	Italy 43; France 39.
Diamond, gem, not set or strung value, thousands	$3	NA		
Diatomite and other infusorial earth	251	325	--	Japan 315; Italy 9.
Feldspar and fluorspar	447	34	--	All from United Kingdom.
Fertilizer materials:				
Crude, phosphatic	[7]8,000	NA		
Manufactured:				
Nitrogenous	509,694	528,999	--	U.S.S.R. 528,943; Bulgaria 55.
Phosphatic	261,866	334,156	--	U.S.S.R. 308,981; Morocco 20,195.
Potassic	136,966	243,136	--	U.S.S.R. 228,600; Finland 9,211; West Germany 5,004.
Other including mixed	10	NA		
Ammonia	10	4	--	All from West Germany.
Graphite, natural	--	2	--	All from Japan.
Gypsum and plasters	93	149	--	All from West Germany.
Iodine	4	3	--	All from Netherlands.
Lime	15	32	--	All from Japan.
Magnesite	52	504	--	Austria 480; Netherlands 20.
Mica, all forms	140	65	--	France 64.
Pigments, mineral: Iron oxides, processed	381	332	--	Spain 272; West Germany 42.
Precious and semiprecious stones value, thousands	$18	NA		
Salt and brines	2,005	4,051	--	Canada 4,001; West Germany 30.
Sodium and potassium compounds:				
Caustic potash	74	70	--	All from France.
Caustic soda	r [5]37,600	4,003	--	France 4,000.
Soda ash	21,006	7,699	--	Bulgaria 7,680; West Germany 19.
Stone, sand and gravel:				
Quartz and quartzite	30	106	--	Spain 93; France 10.
Sand excluding metal-bearing	11	15	--	All from Belgium-Luxembourg.
Sulfur:				
Elemental:				
Other than colloidal	r [5]129,000	19,946	--	All from Canada.
Colloidal	--	127	--	Japan 115; France 10.
Sulfuric acid, oleum	7	4	--	Japan 2; United Kingdom 2.
Talc	NA	3,553	--	Spain 3,400; Belgium-Luxembourg 95.
Other:				
Crude	12	11	--	Austria 6; Italy 3.
Slag, dross and similar waste value, thousands	--	$30	--	All from Canada.
Oxides and hydroxides of barium, magnesium, strontium	3	3	--	All from Japan.

See footnotes at end of table.

Table 4.—Cuba: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	4,142	6,782	--	U.S.S.R. 3,577; West Germany 3,197.
Coal, anthracite and bituminous	r [5]76,100	1,696	--	Japan 1,694.
Coke and semicoke	r [5]45,700	3,354	--	All from Japan.
Hydrogen, helium, rare gases	--	4	--	All from Netherlands.
Petroleum and refinery products:				
Crude thousand 42-gallon barrels	[2]44,756	NA		
Refinery products:				
Gasoline do	r [5]1,921	68	--	All from Italy.
Kerosine do	--	([8])	--	All from Yugoslavia.
Distillate fuel oil do	r [5]6,326	([8])	--	Mainly from Yugoslavia.
Residual fuel oil do	r [5]66,573	4,453	--	All from France.
Lubricants do	r [5]635	[9]47	--	Portugal 21; Netherlands 16.
Other:				
Liquefied petroleum gas do	21	NA		
Mineral jelly and wax do	3	5	--	Japan 4; Netherlands 1.
Bituminous mixtures do	--	([8])	--	Mainly from Japan.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	378	[10]468	--	All from United Kingdom.

rRevised. NA Not available.

[1]Owing to a lack of official trade data published by Cuba, this table should not be taken as a complete presentation of this country's mineral imports. These data have been compiled from various sources that include United Nations information and data published by the partner trade countries. Unless otherwise specified, data are compiled from official trade statistics of individual trading partners.

[2]Source: Official Trade Statistics of Cuba.

[3]Excludes part of Japanese export valued at $576,000.

[4]Excludes part of Japanese export valued at $268,000.

[5]Source: Statistical Yearbook of the Member States of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[6]Excludes Japanese export valued at $2,000.

[7]Source: Statistical supplement, The British Sulphur Corp. Ltd., London, United Kingdom.

[8]Less than 1/2 unit.

[9]Excludes Japanese export valued at $166,000.

[10]Excludes Canadian export valued at $22,000.

DOMINICAN REPUBLIC

A combination of adverse economic conditions resulted in a 3% real growth rate of the 1981 GDP, estimated at $3 billion. This was less than the 5% projected early in the year. The mining sector accounted for over 5% of the GDP in 1979 and over 4% in 1980. Preliminary data indicate another reduced contribution from the mining sector in 1981.

A general downtrend in the world market prices for traditional exports reduced Government revenue and foreign exchange earnings. As it became evident that 1981 income would be less than projected, the Government introduced budgetary cutbacks. The rate of inflation was held to about 8% during 1981, primarily because of stable petroleum prices and firm economic control measures.

The export value of the three major minerals, bauxite, doré, and ferronickel are shown in the following table, in millions of dollars.

Commodity	1978	1979	1980	1981[p]	1982[e]
Bauxite	$23	$21	$19	$16	$16
Doré	77	128	260	208	135
Ferronickel	75	123	101	110	70
Total	175	272	380	334	221
Share of total exports	26%	31%	39%	28%	24%

[e]Estimated. [p]Preliminary.

There was a 50% drop in the price of doré between late 1980 and mid-1981. This was partly offset by increased production. Depressed world market conditions led to lower than expected production of both ferronickel and bauxite.

In 1981, the Government imposed tight monetary and import control measures that could have a considerable impact on the economy. Overall import cost levels were down slightly in 1981, leading to an esti-

mated 10% reduction in real cost when inflation is considered. An unofficial estimate of the U.S. share of Dominican exports in 1981 was about 78%. About 53% of the Dominican Republic's imports originate in the United States.

In 1981, petroleum import costs were estimated at $558 million, an 11% increase over that of 1980. Petroleum accounted for 39% of total imports. Nevertheless, this cost was still less than projected earlier owing to reduced fuel oil requirements by the ferronickel plant and a decrease in the price of fuel oil.

The acceptance of the Dominican Republic into the Mexico-Venezuela San Jose crude oil concessional financing accord has afforded the Government some relief from energy's drain on foreign exchange. The introduction of the higher sulfur and salt content of Mexican crude oil into the refinery resulted in a lower yield of higher priced products, such as kerosine, jet fuel, gasoline, diesel oil, and liquefied petroleum gas (LPG). Yields of low-value products, such as fuel oil, were higher. Consequently, import levels of higher priced products, such as LPG and to some extent diesel fuel, were increased.

Production from the bauxite mines decreased significantly, reflecting a weak demand for aluminum in world markets and a continuing reduction in stockpiled ore. Aluminum Co. of America ships the low-grade monohydrate Dominican ore to its Point Comfort, Tex., refinery.

Expanded production at the Government-owned Rosario Dominicana S.A.'s Pueblo Viejo gold mine at Cotuí, 40 kilometers north of Santo Domingo, significantly increased the volume of doré available for export. Production in 1982 was expected to decrease, partly because of low gold and silver prices.

In early 1981, the Government signed a contract with the British firm, Davy McKee Ltd., to construct a gold and silver refinery next to the Pueblo Viejo Mine. The $5 million refinery was scheduled to open in mid-1982 with a capacity to refine 75 tons of doré annually (2.4 million troy ounces). Davy McKee will provide training and technical assistance for plant operation.

Rosario Dominicana continued gold and copper exploration work in the area south of Pueblo Viejo and north of Maimon. Rosario Dominicana also conducted gold exploration near Altagracia in the Haina River Valley, and around areas near Miches. None of these locations have been determined to have commercially exploitable gold deposits. Indications of copper have encouraged a continuation of exploration for this metal, although no deposits have been identified.

The ferronickel operation of Falconbridge Dominicana C. por A. (Falcondo) continued to operate at a loss in 1981. The company denied reports that it contemplated closing down or phasing out its plant. By the end of June, the company was operating only one of its three furnaces. Fuel requirements are estimated to account for 64% of the overall costs. In 1981, operating cash costs were estimated to be about $3.14 per pound of nickel. This does not include charges for overhead, depreciation, and other noncash costs. Full capacity operation could reduce cash costs to about $2.72 per pound of nickel. Falcondo reported a sizable net loss of about $28 million for 1981. The Government has demanded $5.4 million in back taxes due on undeclared profits in 1972 and 1973. As nickel prices continued to fall during the last half of 1981, the prospect of another complete plant shutdown became more probable. The last complete shutdown occurred during the latter half of 1980. This outlook is not encouraging for the Dominican economy from the standpoint of lost revenue, decreased availability of foreign exchange, and increased unemployment.

Falcondo reported the discovery of base metal mineralization within the Cerro Maimon concession area. Additional exploration efforts, geological studies, and drilling were underway. The area is adjacent to the Rosario Dominicana mining concession. Prospecting has identified traces of copper, lead, zinc, gold, and silver.

Douglas-Robertson and Associates of Colorado completed preliminary studies on lignite deposits in a 22-kilometer area from Sánchez to Arroyo Barril in the Samaná Peninsula. A resource base of 86 million tons was identified along with indications of some associated natural gas deposits. The Government announced that studies of 133 samples revealed that some 45 million tons of lignite having an average calorific value of 4,682 British thermal unit (Btu) per pound could be recovered. West of the Sanchez area in the Cibao region there was evidence of vast lower grade deposits.

On the southern peninsula in the eastern part of the country, evidence has been found of high-grade lignite deposits. In 1982, Rosario Dominicana, which funded the

Douglas-Robertson studies, expected to spend $1.5 million for additional exploration and studies. This work was expected to continue for 3 or 4 years.

A French Government organization and the Dominican Government have agreed to prospect for basic minerals in the western regions of the Cordillera Central adjacent to the Haitian border near Dajabon and Santiago Rodriguez. The Federal Republic of Germany's Institute of Geosciences and Natural Resources shifted its exploration from the Cordillera Central to the Cordillera Septentrional (northern range). The institute has been searching for base minerals such as copper, zinc, and lead.

A West German firm has been conducting mineral exploration for iron and titanium in the northwest, near Monte Cristi. The joint exploration by the Spanish firm Hullera Vasco-Leonesa S.A. and the Government continued in the Yujo River Basin, near Jarabacoa. The group has been searching for base metals, including gold and silver.

The United Nations has funded a petroleum resources development project and has provided technical expertise to assist the Government in establishing a laboratory and documentary library.

Canadian Superior Oil Ltd. spudded its first wildcat well, the Charco Largo No. 1, in their 735,000-acre concession in the Barahona Basin near Lake Enriquillo in the southwest region of the country. In midyear, rumors of a discovery were circulated, but a few months later a joint Government-Canadian Superior announcement revealed that commercially exploitable oil had not been found. Canadian Superior was not expected to drill again in the immediate future.

Other petroleum exploration efforts were underway in 1981. In November, Cariboil Dominicana S.A. was drilling the Candelon No. 1 well in the San Juan Basin near Elías Piña. The well has a projected total depth of 20,000 feet. This site was thought to be geologically more promising than Charco Largo. The well was not completed by year-end. Weeks Petroleum Co. reentered the Dominican exploration scene with an agreement to join a local firm, Quisqueya Oil Co., to explore the Cibao region in the north-central portion of the island. Seismic work was undertaken in 1981 and was expected to continue in 1982. Western Geophysical Co. has begun a $1 million offshore seismic exploration program in the south and southeastern areas, as well as around the Samana Peninsula.

Concessions for oil exploration have been granted on an ad hoc basis, largely free of institutional and legal guidelines. The identification of lignite reserves in the northeast and the possibility that commercial deposits of oil may be found have increased pressure on the Government to amend the 11-year-old mining law. However, action on any new mining legislation was not expected in the immediate future.

Table 5.—Dominican Republic: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	634,729	585,828	585,828	
Oxides and hydroxides	3	--		
Metal including alloys, all forms kilograms	289,910	222	222	
Copper:				
Matte	20	--		
Metal including alloys:				
Scrap	--	77	38	Belgium-Luxembourg 39.
Semimanufactures kilograms	40	--		
Gold metal including alloys, unwrought, partly wrought, doré bullion thousand troy ounces	2,694	2,039	--	All to Switzerland.
Iron and steel:				
Scrap	1,349	2,528	1,468	Italy 430; Netherlands 380.
Pig iron, spiegeleisen, powder, shot	48	--		
Ferroalloys: Ferronickel	64,500	46,581	21,403	Netherlands 20,002; Japan 4,000.
Semimanufactures	144	46	5	Haiti 41.

Table 5.—Dominican Republic: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides and hydroxides	83	--		
Metal including alloys, all forms	12	--		
Manganese oxides and hydroxides	164	--		
Mercury 76-pound flasks	640	213	213	
Zinc metal including alloys:				
Scrap	--	9	9	
Blue powder	153	--		
Semimanufactures	105	--		
Other: Ash and residue containing nonferrous metals	191	426	74	Venezuela 130; Japan 73; Netherlands 73.
NONMETALS				
Cement	30,852	46,107	500	Guadeloupe 26,250; French Guiana 2,747.
Clays and clay products:				
Crude	35	7	7	
Products:				
Refractory including nonclay brick	175	86	58	Guadeloupe 20.
Nonrefractory	714	529	507	St. Thomas 22.
Diatomite	55	--		
Fertilizer materials:				
Crude, phosphatic	--	7	--	All to Haiti.
Manufactured:				
Nitrogenous	61,736	83,078	1,237	Venezuela 20,000; Martinique 13,576; Haiti 8,350; Togo 6,625.
Phosphatic	60	100	--	All to Costa Rica.
Potassic	911	1,685	--	Costa Rica 1,500; Barbados 90; St. Lucia 65.
Other including mixed kilograms	184	--		
Gypsum and plasters	190,794	185,849	77,077	Colombia 58,064; Venezuela 31,877; Panama 18,000.
Lime	90	54	54	
Magnesite	--	20	--	All to Haiti.
Pigments, mineral, natural	20	--		
Salt and brines	1,758	--		
Sodium and potassium compounds, n.e.s.	40	--		
Stone, sand and gravel:				
Dimension stone, unworked kilograms	81	46	39	Curaçao 7.
Gravel and crushed rock	90	--		
Limestone other than dimension	244,199	296,768	126,129	Suriname 170,639.
Sand excluding metal-bearing	--	26	26	
Other:				
Crude: Meerschaum, amber, jet kilograms	47	--		
Slag and dross from the manufacture of iron and steel	70	15	15	
MINERAL FUELS AND RELATED MATERIALS				
Carbon black and gas carbon	--	5	--	All to Haiti.
Petroleum refinery products:				
Lubricants 42-gallon barrels	196	--		
Bitumen and other residues do.	394	126	126	

Table 6.—Dominican Republic: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Alumina	118	110	96	West Germany 10.
Metal including alloys:				
Unwrought	912	1,594	240	Canada 876; Venezuela 477.
Semimanufactures	r2,146	2,551	824	West Germany 504; Canada 458; Austria 334.
Arsenic anhydride and acid	5	--		
Chromium:				
Ore and concentrate kilograms	49	181	181	
Oxides and hydroxides do.	13,000	125	--	All from Italy.
Cobalt oxides and hydroxides do.	1,187	823	823	
Copper metal including alloys, all forms	1,702	1,756	285	Canada 883; Chile 477.
Gold metal, unwrought or partly wrought value	$873	$7,361	$7,361	
Iron and steel:				
Scrap	13,566	29,566	29,566	
Pig iron, spiegeleisen, powder, shot	r134	55	18	Japan 37.
Ferroalloys	757	938	199	Brazil 360; Taiwan 360.
Steel, primary forms	r4,726	5,516	472	Japan 4,509; North Korea 454.
Semimanufactures	r76,340	99,834	14,098	Japan 41,034; Republic of South Africa 10,193; West Germany 7,547; North Korea 7,360.
Lead:				
Oxides and hydroxides	470	793	4	Mexico 750; Canada 30.
Metal including alloys, all forms	108	42	34	West Germany 7.
Manganese:				
Ore and concentrate	782	1,042	792	Mexico 250.
Oxides and hydroxides	7	119	17	Brazil 100.
Mercury 76-pound flasks	4	--		
Nickel metal including alloys, all forms	12	70	70	
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	161	--		
Selenium, elemental kilograms	220	--		
Silicon, elemental	5	7	5	Mexico 2.
Silver metal including alloys, unwrought and partly wrought troy ounces	1,415	579	32	Panama 547.
Tin metal including alloys, all forms	41	53	32	Netherlands 17; West Germany 4.
Titanium oxides and hydroxides	1,837	1,911	953	Netherlands 399; Colombia 200; Japan 200.
Zinc:				
Oxides, hydroxides, peroxides	205	399	254	Mexico 92; West Germany 28.
Metal including alloys:				
Unwrought	1,838	1,863	259	Canada 1,604.
Scrap	--	40	40	
Semimanufactures	500	190	81	Mexico 70; Canada 39.
Other:				
Ores and concentrates kilograms	149	--		
Oxides, hydroxides, peroxides	80	42	21	Netherlands 13; West Germany 6.
Pyrophoric alloys	2	1	(1)	West Germany 1.
Alkali, alkaline-earth, rare-earth metal	1,004	236	1	West Germany 230; Israel 5.
Metalloids	28	37	16	West Germany 12; United Kingdom 9.
Base metals including alloys, all forms	27	112	7	Taiwan 100.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, natural corundum, etc	78	97	52	Brazil 18; West Germany 13.
Artificial corundum	--	7	--	Canada 5; Italy 1.
Grinding and polishing wheels and stones	28	43	6	Brazil 16; United Kingdom 9; West Germany 6; Italy 2.
Asbestos, crude	485	1,180	31	Canada 1,048; Republic of South Africa 100.
Barite and witherite kilograms	500	--		
Boron materials:				
Borax, natural	65	116	105	United Kingdom 10; West Germany 1.
Oxide and acid	84	55	48	West Germany 7.
Other	18	--		
Cement	5,431	6,655	201	Spain 5,097; Colombia 1,300.
Chalk	1,188	221	21	Colombia 200.
Clays and clay products:				
Crude	2,780	2,798	1,664	United Kingdom 873; Mexico 180.
Products:				
Refractory including nonclay brick	7,584	7,648	5,858	Mexico 970; Canada 567.
Nonrefractory	r4,164	3,303	338	Spain 1,458; Italy 1,181.
Cryolite and chiolite	3	--		
Diamond, gem, not set or strung carats	30,000	5,075	--	All from Spain.

See footnotes at end of table.

Table 6.—Dominican Republic: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Diatomite	760	702	440	Mexico 262.
Feldspar, fluorspar, leucite, nepheline	854	197	197	
Fertilizer materials:				
Crude, phosphatic rock	3	17	17	
Manufactured:				
Nitrogenous	126,657	137,845	135,545	Venezuela 1,814; West Germany 456.
Phosphatic	19,508	27,140	27,015	Switzerland 125.
Potassic	17,451	43,434	43,434	
Other including mixed	14,574	35,537	30,526	West Germany 5,011.
Ammonia	155	140	109	West Germany 26; Netherlands 5.
Graphite, natural	2	53	53	
Gypsum and plasters	192	200	58	United Kingdom 72; West Germany 69.
Magnesite	--	176	73	Colombia 100; Italy 2.
Mica, worked, including agglomerated splittings kilograms	3,334	4,939	202	Japan 3,214; Taiwan 460; West Germany 411.
Pigments, mineral:				
Natural, crude	203	280	150	Belgium-Luxembourg 125; Italy 5.
Iron oxides, processed	114	101	6	United Kingdom 49; Mexico 35; West Germany 3.
Precious and semiprecious stones except diamond, natural and synthetic value	$91	$1,142	--	All from Spain.
Salt	39	27	18	Canada 7; Switzerland 1; West Germany 1.
Sodium and potassium compounds, n.e.s.:				
Soda ash	548	1,711	691	United Kingdom 452; Colombia 200; West Germany 153.
Unspecified	13,454	17,725	17,094	Netherlands 400; Belgium-Luxembourg 200.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	6	41	41	
Worked	1	42	(1)	Canada 41.
Dolomite, chiefly refractory grade	261	194	194	
Gravel and crushed rock	53	10	10	
Limestone, other than dimension	(1)	5,018	--	All from Spain.
Quartz and quartzite	59	109	109	
Sand, not metal-bearing	1,942	4,214	4,214	
Strontium minerals	10	--		
Sulfur:				
Elemental:				
Colloidal kilograms	r7	8	(1)	Mainly from West Germany.
Other than colloidal	r32	537	529	West Germany 6; Belgium-Luxembourg 2.
Sulfuric acid including oleum	1,391	1,415	1,379	Norway 35.
Talc, steatite, soapstone	812	827	597	Italy 195; United Kingdom 22.
Other:				
Oxides, hydroxides, peroxides of strontium, magnesium, barium	155	388	380	West Germany 6; United Kingdom 2.
Slag, dross, and similar waste:				
From iron and steel manufacture kilograms	--	816	816	
Unspecified do	1,365	2,203	2,203	
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	825	1,060	1,031	Canada 18; Spain 7.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	77	115	77	United Kingdom 38.
Carbon black and gas carbon:				
Carbon black	r121	168	68	Canada 100.
Gas carbon	r67	128	79	Colombia 49.
Coal, all grades, including briquets	288	73	23	Colombia 50.
Coke and semicoke	1,039	810	563	Colombia 247.
Hydrogen, helium, rare gases	27	17	17	
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	12,137	10,277	(1)	Venezuela 8,565; Curação 2,990.
Refinery products:				
Gasoline 42-gallon barrels	149,654	30,578	--	All from Trinidad and Tobago.
Kerosine and jet fuel do	9,232	189	(1)	Mainly from the Netherlands.
Distillate fuel oil do	48,000	--		
Residual fuel oil do	524,187	18,274	--	Venezuela 9,057; Aruba 6,227; Curação 2,990.
Lubricants do	r121,542	163,818	77,075	Curação 53,893; Venezuela 20,143; Jamaica 8,481.

See footnotes at end of table.

Table 6.—Dominican Republic: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products —Continued				
Refinery products —Continued				
Other:				
Liquefied petroleum gas 42-gallon barrels	17	(1)	(1)	
Mineral jelly and wax do	27,841	23,036	8,167	Japan 12,003; Taiwan 1,583; West Germany 1,117.
Naphtha and white spirit do	13,843	19,526	8,401	Curaçao 7,253; Netherlands 3,872.
Nonlubricating oils do	2,475	3,006	2,511	United Kingdom 345; Italy 134.
Bitumen, petroleum coke, other residues do	207,851	135,112	13,516	Venezuela 52,641; Curaçao 52,176; Aruba 15,609.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	87	283	267	West Germany 10; United Kingdom 5.

[r] Revised.
[1] Less than 1/2 unit.

HAITI

In real terms, the economy grew by about 1% to an estimated $2 billion[4] in current prices. The value added by mining represented about 1% of the GNP in both 1980 and 1981. Both import and export levels were down in 1981, but higher prices for imports and lower earnings from exports widened the trade deficit to $133 million. Throughout the year, foreign exchange shortages occurred that strained Haiti's ability to import some essential products, such as petroleum.

Early in 1981, the Government enacted decrees prohibiting or restricting the importation of certain products and also increased the wholesale price of some items. This action along with other fiscal reforms and a proposed new investment code were expected to curb imports and improve overall future economic performance.

Haiti has not yet finalized agreements with Mexico and Venezuela for participation in the San Jose accord for financing of crude oil imports.

Reynolds Metals Co. was expected to close their Miragoâne bauxite operation by the end of 1982. Reynolds claimed the high silica content of any remaining ore has made further mining impractical, especially in view of the depressed aluminum market. Haiti has appealed to other members of the International Bauxite Association (IBA) for assistance should Reynolds leave. The IBA agreed to send a team of investigators to assess the remaining bauxite reserves in an attempt to develop some alternative options for Haiti in the event of full closure.

Under a 1980 contract with the United Nations Development Program, the gold potential of volcanic deposits in northern Haiti has been under investigation. The areas include Milot, south of Cap Haitien; and Mont Organisé and Boise de Laurence, near the border with the Dominican Republic. The $2 million evaluation project is scheduled for completion early in 1983.

In cooperation with the Institute of Geosciences and Natural Resources of the Federal Republic of Germany, a coal exploration project was initiated in September. The program is scheduled to terminate early in 1982 following the investigation of lignite deposits in the Maissade region in west-central Haiti.

Anschutz Corp. planned to commence drilling a petroleum exploration well in late 1981 or early 1982. The selected site lies in the eastern Plateau Centrale area near Lake Saumarie, directly west of an abandoned well drilled during 1981 in the Dominican Republic by Canadian Superior Oil Ltd.

JAMAICA

In real terms, the 1980 GDP decreased 5.4% from that of 1979 and represented the seventh consecutive year of economic decline. The Government initiated an economic recovery program designed to secure balance of payments assistance, increase

foreign exchange earnings, and increase new investments from domestic and foreign sources. There was a slight recovery in 1981 as the GDP reached about $3 billion,[5] and real growth was estimated at 1.5%.

In 1980, bauxite and alumina activities represented 14% of the GDP at current prices, and other mining activities accounted for less than 1%. In that year, bauxite and alumina sales were valued at $732 million and represented over 76% of total exports. Although exports of bauxite and alumina increased during the first half of 1981 over those during the same period of 1980, the industry announced a series of production cutbacks that left total 1981 bauxite production and export volumes well behind those for 1980. Alumina, on the other hand, showed a slight increase in export volume because cutbacks were not expected to have a pronounced effect until 1982.

Reduced bauxite production during 1981 and 1982 was expected to lower Government revenues from the bauxite levy and royalty payments to $198 million in 1981 and $167 million in 1982. Earlier estimates of these revenues were $222 million for fiscal year 1981 and $247 million for fiscal year 1982. If the announced sale of 1.6 million tons of bauxite to the United States for its stockpile is finalized in 1982, the bauxite revenues for that year could increase from the $167 million figure to about $211 million. Nevertheless, the prospect of losses in revenues and foreign exchange earnings caused Jamaica to undertake budgetary readjustments. The financial losses could be of sufficient magnitude to throttle Jamaica's economic recovery program.

The Government continued its efforts to secure agreements for alumina and bauxite sales. At yearend, negotiations were pending on the possible sale of 1 million tons per year of bauxite to the U.S.S.R., starting in 1982. The 1979 agreement with the U.S.S.R. for the sale of 50,000 tons of alumina per year at $180 per ton c.i.f. has undergone several contract renegotiations. The price was finally set at $205 per ton c.i.f. for the 1980 delivered volumes. The alumina price was again negotiated to $245 per ton c.i.f. in 1981.

In November 1981, it was announced that the United States would acquire a total of 1.6 million tons of bauxite from Jamaica for the National Defense Stockpile. The bauxite, valued at about $56 million, would reportedly be paid for through a combination of cash, the exchange of surplus U.S. stockpile materials, and by the barter of agricultural commodities from the U.S. Department of Agriculture stockpile. Final details were expected to be completed early in 1982. This was an auspicious sale for Jamaica in view of the production cutbacks scheduled for 1982.

In 1980, petroleum imports were valued at $418 million and accounted for 37% of total imports. In 1981, petroleum costs rose to $497 million, but their share of total imports decreased because of an overall increase in imports. Total petroleum import volumes decreased slightly in 1981, primarily because of lower domestic consumption. Consumption by the international sector—the alumina, aviation, and shipping industries—increased slightly over that of 1980. Jamaica maintained its ongoing energy conservation programs and the development of alternative energy sources.

Company contracts with the National Workers Union, which represents the bauxite workers, expired on January 31, 1981. Strikes were threatened several times throughout the year as negotiations repeatedly failed to resolve differences regarding wage increases and benefits. The year ended without settlement, and the likelihood of strike action during 1982 became a strong possibility.

Plans for doubling the 550,000-ton-per-year capacity at Jamalco's Clarendon alumina refinery were revised following the withdrawal of the three Norwegian firms from partnership negotiations. The Government subsequently announced it would reduce the proposed increase in capacity to 340,000 tons per year at a cost of $210 million. It was reported that one of the three Norwegian firms, possibly Norsk Hydro, may rejoin the venture at a later date.

The possible use of coal as an alternative energy source to petroleum continued to be considered. In 1981, the United States signed an agreement with Jamaica to finance studies on the feasibility of converting some industries from petroleum to coal. The study will include the conversion of the major energy consumers, such as the bauxite, alumina, cement, and electrical generating plants. It has been suggested that U.S. coal could be imported at a cost of about $50 per ton. One method of transportation suggested was the use of empty bauxite ore carriers returning to Jamaica.

Another opportunity to lessen petroleum dependence would be the development of domestic peat deposits. A study of these deposits indicated that they could provide

up to 40% of Jamaica's energy needs for as long as 30 years. An environmental study was underway to assess any possible ecological damage to fish-spawning areas and other forms of wildlife that might be caused by peat mining.

The best peat deposits were reported to occur in the upper Black River area in St. Elizabeth Parish, and in the swamps near Nagril along the western coast in Westmoreland Parish. The deposits were described as averaging 30 feet in thickness with the potential of yielding about 20 million tons of dried peat. Samples sent to Ireland for testing were reported to have generated 6,000 to 8,500 Btu per pound.

Jamaica's drilling program for domestic petroleum resources began in November after favorable seismic studies by the state-owned Petroleum Corp. of Jamaica and the Norwegian Government. The search is financed by a $23.5 million loan from the Inter-American Development Bank and a $7.5 million loan from the International Bank for Reconstruction and Development (World Bank). Conducted under the supervision of Petro-Canada and Parker Drilling Co., onshore drilling was underway in the western region of Jamaica. Two more onshore sites have been targeted for drilling, one in the central region and one in the eastern. Drilling was expected to reach a depth of 12,000 feet.

Table 7.—Jamaica: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite and concentrate thousand tons	6,469	6,146	6,146	
Oxides and hydroxides do	2,061	2,437	469	United Kingdom 531; Norway 458; U.S.S.R. 213.
Sulfate	10,254	9,261	1,427	Dominican Republic 3,473; Trinidad and Tobago 2,138; Venezuela 1,351.
Metal including alloys:				
Scrap	357	2,585	2,554	United Kingdom 31.
Unwrought	12	--	--	
Semimanufactures	3,355	582	--	Trinidad and Tobago 492; Guyana 52; Haiti 10.
Copper metal including alloys, scrap	75	148,055	97	United Kingdom 147,844; Belgium-Luxembourg 82.
Gold:				
Waste and sweepings value	$38,328	--		
Metal including alloys, unwrought and partly wrought do	$48	--		
Iron and steel:				
Scrap	123	(1)	--	All to Canada.
Semimanufactures:				
Bars, rods, angles, shapes, sections	72,932	1,005	--	Trinidad and Tobago 1,002.
Universals, plates, sheets	5,714	5,374	--	Trinidad and Tobago 3,275; St. Lucia 566; Grenada 391.
Rails and accessories	--	1	1	
Tubes, pipes, fittings	1,391	600	--	Trinidad and Tobago 312; Barbados 132; Guyana 94.
Castings and forgings, rough	14	8,386	--	Trinidad and Tobago 7,436; Cuba 950.
Lead:				
Oxides and hydroxides	18	--		
Metal including alloys, unwrought and semimanufactures	4	--		
Silver:				
Waste and sweepings value	$32,777	$36,182	$36,182	
Metal including alloys, unwrought and partly wrought troy ounces	5,723	225	225	
Tin metal including alloys:				
Scrap	302	85,398	85,398	
Unwrought and semimanufactures	279	145	145	
Zinc metal including alloys, scrap	34	19,679	--	United Kingdom 19,639; Spain 40.
Other: Oxides and hydroxides of chromium, manganese, cobalt	15	--		
NONMETALS				
Cement	3,425	--		
Chalk value	$543	--		
Clays and clay products:				
Crude	--	245	--	All to Barbados.
Products:				
Refractory including nonclay brick	--	24	--	Cayman Islands 23; Canada 1.
Nonrefractory value	$6,794	$1,286	--	Cayman Islands $950; Bermuda $336.
Gypsum and plasters	21,062	78,525	6,116	Trinidad and Tobago 29,982; Haiti 13,066; Colombia 12,220.

See footnotes at end of table.

Table 7.—Jamaica: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Lime	1,813	925	--	Trinidad and Tobago 921; St. Lucia 4.
Salt and brines	554,531	3,902	--	Trinidad and Tobago 2,384; Barbados 991; Haiti 392.
Sodium and potassium compounds, n.e.s.:				
Soda ash	445	400	--	All to Dominica.
Stone, sand and gravel:				
Dimension stone, crude and worked[2]	315	18	--	All to Canada.
Gravel and crushed stone	4	36,341	2,961	Cayman Islands 33,375; St. Lucia 5.
Sand excluding metal-bearing	--	6,259	--	All to Cayman Islands.
Sulfur: Sulfuric acid, oleum	188	143	--	Trinidad and Tobago 112; Haiti 23; Barbados 8.
Other:				
Crude, natural kilograms	705	--		
Slag, dross and similar waste, not metal-bearing	--	500	--	All to Guatemala.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	209	349	--	Cayman Islands 220; Netherlands Antilles 104.
Hydrogen, helium, rare gases	1	2	--	Mainly to Cayman Islands.
Petroleum and refinery products:				
Crude and partly refined 42-gallon barrels	780	1,408	--	All to Cuba.
Refinery products:				
Gasoline:				
Aviation do	32,952	--		
Motor do	r272,424	34,292	--	All to Guadeloupe.
Jet fuel do	3,799	6,598	6,598	
Distillate fuel oil do	296,816	24,574	214	West Germany 8,158; Singapore 5,164; United Kingdom 3,340.
Residual fuel oil do	533,803	109,418	(3)	Panama 96,089; Norway 6,548; Argentina 3,598.
Lubricants do	166,024	110,428	(3)	Guyana 14,238; Suriname 13,726; Dominican Republic 12,458; Netherlands Antilles 9,286.
Other:				
Liquefied petroleum gas do	3	13	13	
Mineral wax do	2	--		
Bitumen and other residues do	22,592	23,840	--	Bermuda 12,805; Cayman Islands 8,745; Canada 1,751.

rRevised.
[1]Unreported quantity valued at $168.
[2]Totals exclude an unreported quantity valued at $986 in 1979 and an unreported quantity shipped to Bermuda valued at $281 in 1980.
[3]Less than 1/2 unit.

Table 8.—Jamaica: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	18	45,268	2,272	West Germany 42,979.
Metal including alloys:				
Unwrought	50,615	839	5	Canada 832; United Kingdom 2.
Scrap	--	195	--	All from Canada.
Semimanufactures	2,136	1,274	715	United Kingdom 230; Canada 189.
Copper:				
Sulfate	6	2	2	
Metal including alloys:				
Scrap value	$596	--		
Unwrought	8	1	(1)	Mainly from United Kingdom.
Semimanufactures	6,222	35,943	35,250	United Kingdom 561.
Gold:				
Waste and sweepings value	$10,221	--		
Metal including alloys, unwrought and partly wrought troy ounces	6,623	31,058	32	Canada 30,897.

See footnotes at end of table.

Table 8.—Jamaica: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Scrap value	$562	$31,124	$5,782	Hong Kong $25,342.
Pig iron, cast iron, powder, shot do	$6,936	$6,832	$5,315	United Kingdom $1,517.
Ferroalloys	209	45	(1)	Mainly from Canada.
Steel, primary forms	12,986	3,093	84	Canada 2,923.
Semimanufactures:				
Bars, rods, angles, shapes, sections	11,685	3,481	1,038	United Kingdom 1,218; Belgium-Luxembourg 530.
Universals, plates, sheets	23,644	74,589	1,610	Japan 66,823; United Kingdom 2,860.
Hoop and strip	379	340	191	United Kingdom 137; Japan 12.
Rails and accessories	217	570	568	United Kingdom 2.
Wire	77,335	32,164	946	United Kingdom 30,481; Belgium-Luxembourg 392.
Tubes, pipes, fittings	18,136	3,699	2,673	United Kingdom 435; Canada 291.
Castings and forgings, rough	117	264	11	Canada 164; United Kingdom 89.
Lead:				
Oxides and hydroxides	40	227	35	Mexico 188; Venezuela 2.
Metal including alloys:				
Scrap	52	--		
Unwrought	20	39	--	All from United Kingdom.
Semimanufactures	26	3,330	3,330	
Manganese: Ores and concentrates	139	189	--	United Kingdom 134; Belgium-Luxembourg 35; West Germany 20.
Molybdenum metal including alloys, unwrought kilograms	1	--		
Nickel metal including alloys:				
Unwrought value	$71	--		
Semimanufactures	13	23	22	Canada 1.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	2,636	707	289	Canada 225; United Kingdom 193.
Silver:				
Ore and concentrate value	$449	$14	$14	
Waste and sweepings do	$1,981	--		
Metal including alloys, unwrought and partly wrought troy ounces	166,927	13,921	8,453	United Kingdom 5,401.
Tin metal including alloys:				
Scrap	4	--		
Unwrought	105	11	--	Mainly from Denmark.
Semimanufactures	11,081	6,856	2,404	United Kingdom 3,222; Japan 1,161.
Titanium oxides and hydroxides	201	172	38	Canada 80; United Kingdom 54.
Tungsten metal including alloys, unwrought kilograms	--	25	25	
Uranium and thorium metals including alloys, all forms do	12	--		
Zinc:				
Oxides and peroxides	80	4	3	West Germany 1.
Metal including alloys:				
Scrap	49	1,019	--	All from Canada.
Unwrought	1,210	458	--	Do.
Blue powder	11	50	--	All from United Kingdom.
Semimanufactures	199	32	32	
Other:				
Ores and concentrates	2,661	2	--	All from United Kingdom.
Oxides of chromium, manganese, cobalt kilograms	544	1,704	1,685	West Germany 19.
Ash and residue containing nonferrous metals	33	--		
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	7	14	14	
Dust and powder of precious and semi-precious stones value	--	$492	--	All from the United Kingdom.
Grinding and polishing wheels and stones	74	17	12	United Kingdom 3.
Asbestos, crude	370	4	(1)	Mainly from Canada.
Boron materials: Crude, natural borate	3	--		
Cement	5,985	8,412	554	Cuba 7,732; United Kingdom 117.
Chalk	13	20	(1)	Mainly from West Germany.
Clays and clay products:				
Crude	447	365	323	United Kingdom 39.
Products:				
Refractory including nonclay brick	40,311	12,099	11,717	Canada 252; United Kingdom 130.
Nonrefractory value	$884,790	$560,332	$111,158	Trinidad and Tobago $300,113; United Kingdom $136,413.

See footnotes at end of table.

Table 8.—Jamaica: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Cryolite and chiolite	100	--		
Diamond:				
Gem, not set or strung ... value	--	$11,162	$11,162	
Industrial ... do	--	$4,542	--	All from Sweden.
Diatomite and other infusorial earth	1,005	3	1	United Kingdom 2.
Feldspar, leucite, nepheline	3	4	4	
Fertilizer materials:				
Crude:				
Nitrogenous	--	1,433	--	All from Canada.
Phosphatic	1,016	--		
Manufactured:				
Nitrogenous	28,644	28,871	3,459	Trinidad and Tobago 21,468; St. Lucia 2,883.
Phosphatic	13,799	11,760	1,119	Netherlands 10,641.
Potassic	8,780	2,869	2,869	
Other including mixed	1,508	795	5	Trinidad and Tobago 774; United Kingdom 16.
Ammonia	261	148	35	United Kingdom 111.
Graphite, natural	16	19	19	
Gypsum and plasters	[2]509	39	35	United Kingdom 4.
Lime	18	--		
Magnesite, crude	1	13	9	Do.
Mica:				
Crude including splittings and waste	89	37	--	Norway 36; Belgium-Luxembourg 1.
Worked including agglomerated splittings ... kilograms	344	75	73	United Kingdom 2.
Pigments, mineral:				
Natural, crude	10	([3])	--	All from United Kingdom.
Iron oxides, processed	7	68	--	Mainly from West Germany.
Precious and semiprecious stones except diamond ... value	$46,126	$2,007	--	All from Australia.
Salt and brines	27,904	28,702	28,677	Canada 24.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	301,830	404,314	403,791	Netherlands 228; Belgium-Luxembourg 191.
Caustic potash	26	29	29	
Soda ash	[r]3,176	3,215	2,494	France 514; Netherlands 135.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,888	5	3	Italy 2.
Worked	8,157	1,595	1,586	Italy 8.
Gravel and crushed rock	64	24	24	
Limestone except dimension ... value	$454	--		
Sand excluding metal-bearing	230	103	103	
Sulfur:				
Elemental:				
Colloidal	59	5,251	5,251	
Other than colloidal	5,766	5,516	5,516	
Dioxide ... kilograms	41	737	16	United Kingdom 721.
Sulfuric acid, oleum	1,306	2,018	2,013	Netherlands 3.
Talc, steatite, soapstone, pyrophyllite	18,482	210	209	United Kingdom 1.
Other:				
Crude	2,661	4	4	
Slag dross, and similar waste, not metal-bearing	--	8	8	
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	337	56	50	Cuba 4; United Kingdom 2.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	201	82	30	United Kingdom 52.
Carbon black	1,186	764	59	Venezuela 455; Mexico 220.
Coal: Briquets of anthracite and bituminous coal	5	--		
Coke and semicoke	118	175	68	West Germany 96; United Kingdom 11.
Hydrogen, helium, rare gases	58	82	41	United Kingdom 41.
Peat including briquets and litter ... value	--	$404	$404	
Petroleum and refinery products:				
Crude and partly refined ... thousand 42-gallon barrels	8,353	6,775	138	Venezuela 6,629.
Refinery products:				
Gasoline:				
Aviation ... do	310	18	--	All from Netherlands Antilles.
Motor ... do	1,056	--		
Kerosine and jet fuel ... do	828	51	1	Mainly from Netherlands Antilles.
Distillate fuel oil ... do	277	64	--	All from Netherlands Antilles.
Residual fuel oil ... do	10,037	7,648	47	Netherlands Antilles 6,815; Trinidad and Tobago 662.
Lubricants ... do	301	34	12	Netherlands Antilles 16; Trinidad and Tobago 4.

See footnotes at end of table.

Table 8.—Jamaica: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products —Continued				
Refinery products —Continued				
Other:				
Liquefied petroleum gas thousand 42-gallon barrels	228	156	8	Venezuela 147.
Mineral jelly and wax do	12	13	7	United Kingdom 3; West Germany 1.
Nonlubricating oils do	20	--		
Bitumen and other residues do	2	2	1	Mainly from United Kingdom.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	22	37	5	Netherlands Antilles 32.

rRevised.
[1]Less than 1/2 unit.
[2]Excludes unreported quantity valued at $468.
[3]Unreported quantity valued at $649.

MARTINIQUE AND GUADELOUPE

Martinique and Guadeloupe are Overseas Departments of France. Their economies have been supported by that country.

Guadeloupe's mineral industry has been limited to the production of construction-oriented materials and pumice. There is also a small clinker grinding plant with a capacity of 250,000 tons of cement per year.

Martinique's mineral industry has been similar to that of Guadeloupe, except that it has a small petroleum refinery located at Fort de France. Crude oil has usually been imported from Venezuela and Saudi Arabia. Refinery products have been used domestically and exported to Guadeloupe.

Table 9.—Martinique: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	29	49	8	West Germany 26; France 9; Belgium-Luxembourg 6.
Unwrought	(1)	5	--	All to Netherlands.
Copper metal including alloys:				
Scrap	182	255	--	France 170; West Germany 80; Belgium-Luxembourg 5.
Semimanufactures	2	(1)	--	All to Guadeloupe.
Iron and steel:				
Scrap	6,615	(1)	--	All to France.
Semimanufactures:				
Bars, rods, angles, shapes, sections	8	2	--	All to Guadeloupe.
Universals, plates, sheets	30	3	--	Grenada 2.
Tubes, pipes, fittings	288	32	--	Guadeloupe 28; French Guiana 3.
Lead metal including alloys, scrap	42	37	--	France 19; West Germany 18.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$1	--		
Other: Alkali, alkaline-earth, rare-earth metals do	$3	--		
NONMETALS				
Cement	6,279	9,486	--	All to French Guiana.
Clay products: Nonrefractory	58	110	3	Guadeloupe 76; Montserrat 31.
Fertilizer materials:				
Crude, phosphatic	--	20	--	All to Guadeloupe.
Manufactured, mixed	128	--		
Ammonia	--	1	--	Do.
Stone, sand and gravel:				
Gravel and crushed rock	1	--		
Sand excluding metal-bearing	--	21	--	All to French Guiana.
Other: Crude	--	4,570	--	All to Colombia.

See footnotes at end of table.

Table 9.—Martinique: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline _ thousand 42-gallon barrels	420	512	--	All to Guadeloupe.
Kerosine and jet fuel_____do____	440	361	--	Do.
Distillate fuel oil _____do____	265	238	--	Do.
Residual fuel oil _____do____	315	348	--	Do.
Liquefied petroleum gas ___do____	94	80	--	Mainly to Guadeloupe.
Lubricants____42-gallon barrels__	70	56	--	All to Guadeloupe.

[1]Less than 1/2 unit.

Table 10.—Martinique: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides value, thousands__	--	$2	$2	
Metal including alloys, semimanufactures _____	171	208	123	France 82; United Kingdom 2.
Chromium: Oxides and hydroxides value, thousands__	$2	--		
Copper metal including alloys, semimanufactures _____	76	104	3	France 93; Belgium-Luxembourg 6; United Kingdom 2.
Iron and steel:				
Pig iron, ferroalloys, powder, shot___	--	1	--	All from France.
Semimanufactures:				
Bars, rods, angles, shapes, sections	14,936	15,875	3	France 12,126; Belgium-Luxembourg 2,395; West Germany 1,351.
Universals, plates, sheets _____	4,625	6,493	[1]	France 6,332; Barbados 68.
Hoop and strip_____	6	3	--	All from France.
Rails and accessories _____	107	3	--	Do.
Wire_____	208	465	--	France 389; Belgium-Luxembourg 71; Guadeloupe 3.
Tubes, pipes, fittings _____	6,229	10,852	11	France 10,470; Belgium-Luxembourg 328; Spain 27.
Castings and forgings, rough ___	82	144	--	France 112; Belgium-Luxembourg 32.
Lead:				
Oxides and hydroxides _____	6	6	--	West Germany 5; France 1.
Metal including alloys, unwrought and semimanufactures _____	7	16	--	All from France.
Mercury _____ value, thousands__	--	$3	--	Do.
Platinum-group metals including alloys, unwrought and partly wrought do____	$1	$1	--	Do.
Silver metal including alloys, unwrought and partly wrought _____do____	--	7	--	Do.
Tin metal including alloys, semimanufactures _____	1	1	--	Do.
Titanium: Oxides and hydroxides _____	216	210	--	Do.
Zinc:				
Oxides and hydroxides _____	17	14	--	Do.
Metal including alloys, semimanufactures _____	11	24	--	Do.
Other:				
Alkali, alkaline-earth, rare-earth metals _____ value, thousands__	$2	$1	--	Do.
Metals including alloys, unwrought and semimanufactures ___do____	$30	$38	--	France $37; Switzerland $1.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc _____	10	28	--	All from France.
Artificial corundum _____	6	12	--	Do.
Grinding and polishing wheels and stones _____	29	26	--	France 25; West Germany 1.
Asbestos, crude _____	33	53	--	Italy 49; France 4.
Barite and witherite _____	3	--	--	
Cement_____	37,866	11,361	--	France 11,320; Italy 41.
Chalk_____	104	89	--	All from France.
Clays and clay products:				
Crude_____	62	121	--	Do.

See footnotes at end of table.

Table 10.—Martinique: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products —Continued				
Products:				
Refractory including nonclay brick	167	89	19	France 70.
Nonrefractory	8,607	10,970	5	France 4,548; Italy 4,269; Haiti 350; Spain 310.
Diamond, industrial value, thousands	--	$5	--	France $3; Belgium-Luxembourg $2.
Diatomite and other infusorial earth	16	6	--	All from France.
Fertilizer materials:				
Crude	52	(1)	--	Do.
Manufactured:				
Nitrogenous	2,738	6,899	--	Trinidad and Tobago 5,899; Dominican Republic 750; Netherlands 249.
Phosphatic	221	68	--	Netherlands 50; France 18.
Potassic	1,098	648	--	All from Dominican Republic.
Other including mixed	17,033	22,564	1	Dominican Republic 13,269; Netherlands 6,675; France 1,579.
Ammonia	21	23	--	All from France.
Graphite, natural	--	1	--	Do.
Gypsum and plasters	4,473	4,412	--	Do.
Lime	433	230	--	Do.
Mica, worked including agglomerated splittings value, thousands	--	$1	--	Do.
Pigments, mineral, processed iron oxides	17	23	--	Do.
Precious and semiprecious stones value, thousands	$11	$28	--	France $15; Brazil $13.
Salt and brines	2,400	2,526	--	West Germany 1,024; France 723; United Kingdom 661.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	113	95	--	All from France.
Soda ash	22	15	--	Do.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	20	--		
Worked	49	56	--	France 30; Italy 25.
Dolomite, chiefly refractory grade	5,632	2,389	--	All from France.
Gravel and crushed rock	25	47	--	Do.
Sand excluding metal-bearing	327	292	--	Mainly from France.
Sulfur:				
Elemental, other than colloidal	13	11	--	All from France.
Sulfuric acid, oleum	166	162	3	France 159.
Talc, steatite, soapstone, pyrophyllite	48	32	--	All from France.
Other:				
Crude	126	169	29	West Germany 72; Netherlands 54; France 14.
Slag, dross, and similar waste, not metal-bearing	1	--		
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	2,217	2,372	--	France 2,356; Barbados 14; Guadeloupe 2.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	118	31	--	All from France.
Carbon black value, thousands	$1	--		
Coal: Briquets of coal	NA	18	--	Do.
Hydrogen, helium, rare gases	8	13	11	France 2.
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	1,433	1,100	--	All from Saudi Arabia.
Refinery products:				
Gasoline 42-gallon barrels	9,979	13,558	26	Netherlands Antilles 10,710; Trinidad and Tobago 2,618.
Kerosine and jet fuel do	124	16,329	--	Trinidad and Tobago 16,290; France 39.
Distillate fuel oil do	2,111	477	--	Trinidad and Tobago 462; France 15.
Lubricants do	2,476,614	1,388,688	3,108	Venezuela 1,015,203; Netherlands 100,023.
Other:				
Liquefied petroleum gas do	5,614	17,864	(1)	France 14,210; Netherlands Antilles 2,216; Trinidad and Tobago 1,404.
Mineral jelly and wax do	378	220	181	France 24; Jamaica 8.
Bitumen and bituminous mixtures do	42,178	61,000	118	Netherlands Antilles 38,893; Trinidad and Tobago 19,925; France 1,987.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	81	100	--	Trinidad and Tobago 90; France 10.

NA Not available.
[1]Less than 1/2 unit.

Table 11.—Guadeloupe: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	21	20	6	France 8; West Germany 5.
Semimanufactures	11	10	10	
Copper metal including alloys, scrap	91	95	--	Belgium-Luxembourg 42; West Germany 27; France 25.
Iron and steel metal, semimanufactures:				
Bars, rods, angles, shapes, sections	28	1	--	All to Martinique.
Universals, plates, sheets	20	4	--	Martinique 2; Montserrat 2.
Wire	--	15	--	Martinique 14; Montserrat 1.
Tubes, pipes, fittings	3	90	--	France 85; Montserrat 4; French Guiana 1.
Lead metal including alloys, scrap	25	5	--	France 4; Belgium-Luxembourg 1.
Zinc metal including alloys, scrap	20	--		
NONMETALS				
Abrasives, n.e.s.: Natural: Pumice, emery, corundum, etc	--	18	--	All to Martinique.
Cement	3,770	10,978	--	U.S. Virgin Islands 8,150; Afghanistan 1,350; Montserrat 600.
Clay products:				
Refractory including nonclay brick	--	9	--	All to Martinique.
Nonrefractory	--	5	--	Do.
Other:				
Crude	23,269	41,238	--	All to Colombia.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	1	--		
MINERAL FUELS AND RELATED MATERIALS				
Carbon black value	$4,000	--		
Petroleum refinery products:				
Gasoline 42-gallon barrels	(1)	7,599	--	Martinique 5,882; France 323.
Distillate fuel oil do.	--	515	--	France 75.
Residual fuel oil do.	--	13	--	NA.
Lubricants do.	644	266	--	Martinique 259; Montserrat 7.
Bitumen and other residues do.	61	--		

NA Not available.
[1]Less than 1/2 unit.

Table 12.—Guadeloupe: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate value	--	$1,000	--	All from France.
Oxides and hydroxides	3	--		
Metal including alloys, semimanufactures	630	713	555	France 134; Netherlands 4.
Chromium, oxides and hydroxides	6	1	--	All from France.
Cobalt, oxides and hydroxides	--	5	--	Do.
Copper metal including alloys, semimanufactures	127	139	3	France 134; Belgium-Luxembourg 2.
Iron and steel:				
Pig iron, ferroalloys, similar materials	3	1	--	All from France.
Steel, primary forms value	$2,000	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	12,934	13,976	--	France 10,607; Belgium-Luxembourg 1,829; West Germany 1,268.
Universals, plates, sheets	4,482	6,510	2	France 6,317; Belgium-Luxembourg 191.
Hoop and strip	7	21	--	All from France.
Rails and accessories	50	10	--	Do.

Table 12.—Guadeloupe: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Semimanufactures —Continued				
Wire	1,235	1,208	(1)	France 1,184; Belgium-Luxembourg 23.
Tubes, pipes, fittings	8,319	7,201	11	France 7,127; Switzerland 23; Netherlands 16.
Castings and forgings, rough	72	199	--	France 162; Belgium-Luxembourg 37.
Lead:				
Oxides and hydroxides	1	6	--	All from France.
Metal including alloys, semimanufactures	18	23	--	Do.
Molybdenum metal including alloys, all forms value	$4,000	--		
Nickel metal including alloys, semimanufactures	--	4	--	Mainly from France.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$42	$32	--	All from France.
Tin metal including alloys, semimanufactures	1	1	--	Do.
Titanium, oxides and hydroxides	5	5	--	Do.
Zinc:				
Oxides and hydroxides	4	1	--	Do.
Metal including alloys, semimanufactures	6	7	--	Do.
Other:				
Alkali, alkaline-earth, rare-earth metals	1	--		
Base metals including alloys, all forms value	$2,000	$9,000	--	Do.
NONMETALS				
Abrasives, n.e.s.:				
Artificial corundum	--	2	--	Do.
Grinding and polishing wheels and stones	12	7	(1)	Mainly from France.
Barite and witherite	--	19	--	All from France.
Cement	120,418	164,968	--	France 164,931; Spain 37.
Chalk	178	146	--	All from France.
Clays and clay products:				
Crude	30	63	--	Do.
Products:				
Refractory including nonclay brick	356	197	--	Do.
Nonrefractory	7,493	8,080	--	Italy 3,552; France 2,568; West Germany 1,662.
Diatomite and other infusorial earth	20	11	--	All from France.
Fertilizer materials:				
Crude	18	38	--	Do.
Manufactured:				
Nitrogenous	3,248	1,851	--	Dominican Republic 1,005; Netherlands 597.
Phosphatic	87	82	--	France 72; Belgium-Luxembourg 10.
Potassic	2,530	3,617	--	West Germany 2,600; France 1,000; Belgium-Luxembourg 17.
Other including mixed	10,225	11,717	--	Netherlands 10,638; Belgium-Luxembourg 726.
Ammonia	50	42	--	All from France.
Gypsum and plasters	8,304	6,122	--	Do.
Lime	1,034	766	--	Do.
Magnesite	381	181	--	Netherlands 180.
Mica:				
Crude including splittings and waste	8	13	--	All from France.
Worked including agglomerated splittings	--	1	--	Do.
Pigments, mineral, including processed iron oxides	2	3	--	Do.
Precious and semiprecious stones other than diamond, natural value, thousands	$7	$21	--	Brazil $13; Colombia $8.
Salt and brines	2,704	2,360	--	Netherlands Antilles 845; Netherlands 492; West Germany 384.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	223	140	--	France 139; West Germany 1.
Soda ash	11	--		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3	18	--	France 17; Brazil 1.
Worked	26	25	--	Italy 20; France 5.
Dolomite, chiefly refractory-grade	944	1,326	--	All from France.
Gravel and crushed rock	8,158	14	--	France 7; United Kingdom 7.
Limestone except dimension	30	7	--	All from France.

See footnote at end of table.

Table 12.—Guadeloupe: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Quartz and quartzite	2	--		
Sand excluding metal-bearing	11,061	12,457	--	Montserrat 7,395; Antigua 4,787; France 275.
Sulfur:				
Elemental:				
Other than colloidal	--	1	--	All from France.
Colloidal	2	--		
Sulfuric acid, oleum	142	145	--	France 119; Belgium-Luxembourg 25.
Talc, steatite, soapstone, pyrophyllite	19	--		
Other:				
Crude	37	3	--	All from France.
Slag, dross, and similar waste, not metal-bearing	101	--		
Halogens excluding chlorine	2	--		
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	2,505	3,287	12	France 2,975; Canada 182.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	24	8	--	All from France.
Carbon black	14	14	--	Do.
Coke and semicoke	5	3	--	Do.
Peat including briquets and litter	14	(1)	--	Do.
Petroleum refinery products:				
Gasoline----42-gallon barrels	427,822	98,166	--	Trinidad and Tobago 43,843; Jamaica 34,306; Italy 12,699.
Kerosine and jet fuel ----do----	594,774	58,885	16	Trinidad and Tobago 32,232; France 16,694; Italy 9,230.
Distillate fuel oil ----do----	614,316	6,475	--	Trinidad and Tobago 4,886; Netherlands Antilles 970.
Residual fuel oil ----do----	437,609	386,793	--	All from Martinique.
Lubricants ----do----	32,480	29,617	2,149	France 14,945; Netherlands Antilles 5,117; Jamaica 3,780.
Other:				
Liquefied petroleum gas----do----	109,365	127,496	--	Martinique 91,918; Venezuela 9,315; France 9,222.
Mineral jelly and wax ----do----	63	32	24	West Germany 7.
Petroleum coke ----do----	28	--		
Bitumen and other residues ----do----	69,017	58,909	2,697	Netherlands Antilles 36,905; Trinidad and Tobago 17,113.
Bituminous mixtures ----do----	327	618	12	France 515; West Germany 91.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	10	11	--	All from France.

[1]Less than 1/2 unit.

NETHERLANDS ANTILLES

In 1981, some provisions of the pending Petroleum Protocol continued to cause disagreement within the Netherlands Antilles Cabinet. The Protocol was to be the basis for legislation to establish procedures for forming a company on each island to regulate petroleum exploration and exploitation of areas surrounding that island.

Tentative agreement had been reached by ministers on the Government-Island proportionate share of ownership and earnings of the regulating company formed by each island. Ownership of any island company would be Island Government, 90%; and Central Government, 10%. Revenues and profits would be shared 75% by the Island Government and 25% by the Central Government for a general development fund.

Disagreement surfaced when the ministers from Aruba insisted that Aruba should have full authority to decide which foreign oil companies would receive drilling rights in its territory. This was in anticipation of the decentralization expected to eventually take place under the roundtable discussions working toward full independence. The Netherlands Antilles Central Government maintained that according to the Kingdom of the Netherlands Statute all mineral wealth in the Netherlands Antilles belongs

to all the islands in common. Accordingly, one island cannot claim, while it is still a member of the group, that all of the mineral wealth in and around it is that island's patrimony only. The petroleum potential of offshore Aruba is considered the most promising because of its proximity to the Gulf of Venezuela.

Meanwhile, the Curação Island Council and the Central Government signed an agreement with BP for an option covering 50 blocks of approximately 74 square kilometers each around the Island of Curação. The option was signed under Curação Island Council legislation establishing Petrocuraçao, N.V. The company is presently wholly owned by the Curação Island Council. After Protocol passage, Petrocuraçao ownership is supposed to be adjusted to correspond with the expected 90% to 10% split on shares and the 75% to 25% division of profits with the Central Government.

BP has scheduled a series of seismic tests, after which a suitable drilling site could be selected. BP's production-sharing contract with Petrocuraçao provided for the drilling of two wells within 4 years of the agreement.

Saba Bank Resources N.V. is a state-owned corporation created to administer petroleum exploration and development in the Saba Bank area. The company has a production-sharing agreement with a group headed by Petrofina, S.A. Other members of this consortium are Cities Service Co. (50%) and Weeks Petroleum Co. (10%). The Petrofina concession area includes 14 contiguous blocks of 92 square kilometers each. After seismic testing the area in 1980, Petrofina decided to drill a wildcat well in 1982. Total depth may approach 13,500 feet as an attempt is made to penetrate buried pinnacle reefs. If a commercial deposit of oil is found, the Petrofina Group would receive 40% of total annual production. The remaining 60% of production would be divided as follows: From 0 to 24,999 barrels of oil per day, 50% to both the Government company and to the Petrofina Group; for production of more than 24,999 barrels per day, the Government would receive 80% and the consortium 20%.

In mid-December, the consortium of Union Texas Petroleum Corp. and Azienda Generali Italiana Petroli S.p.A., a subsidiary of the Italian state oil company, began their offshore exploration drilling program on Pedro Banks. Their first well was expected to reach a total depth of about 11,600 feet and cost $12 million.

TRINIDAD AND TOBAGO

Revised data indicate that in 1979, growth in the real GDP increased 17% over that of 1978. In 1980, another high growth rate of 10% was achieved as the GDP reached an estimated $6.7 billion[e] at current prices.

A decline in petroleum activities has been of considerable concern to the Government. In 1980, the petroleum sector accounted for 35% of the GDP. Petroleum also comprises the bulk of total exports—over 90% in 1980. At the end of the third quarter of 1981, many sectors of the economy were showing increases compared with the same period in 1980. The petroleum sector, which has been primarily responsible for Trinidad and Tobago's past strong economic performance, weakened as both production and refining declined. Natural gas production and consumption, on the other hand, have increased steadily. The fertilizer industry, which suffered decreased performance because of labor problems earlier in 1981, was recovering during the third quarter. New industrial developments in the iron, steel, and fertilizer industries were expected to extend future trading opportunities.

In April 1981, new legislation retroactive to January 1980 was enacted amending the Petroleum Act of 1974. The major thrust of the amendment was to provide tax relief to the oil companies. There were four major policy objectives in the bill: To promote further petroleum industry development; to enhance Government administrative control over the petroleum industry; to ensure that the state receives the maximum benefit from petroleum production and sale; and to establish a taxation policy that would be harmonious with international tax systems and allow equitable treatment for all petroleum companies operating in Trinidad and Tobago.

The tax reference price system introduced in 1974 has been replaced by a system for computing profits on the basis of realized prices. Should the Trinidad and Tobago Board of Inland Revenue determine that actual or realized prices are not realistic, it will make a determination of fair market value. Petroleum companies will now pay the normal Trinidad and Tobago corpora-

tion tax rate of 45% instead of 50%. A supplemental petroleum tax (SPT) was introduced to assure that the Government receives maximum benefit from international market price increases. The SPT, however, was declared a deductible item in computing corporate taxes. For land operations, the SPT was set at 35% of gross income. For marine operations, the SPT was established at 60% of gross income.

A system of production allowances was introduced to enhance production in smaller as well as larger fields. The percent of production allowance decreases as productive capacity of the field increases. The allowance is deductible from gross income prior to the imposition of the SPT. Other changes involved allowances for depreciation, capital expenditures, direct drilling costs, and refining investment.

The new legislation was expected to decrease Government revenues by $40 million in 1980 and 1981. This sum actually represents about 2% of taxes collected annually from the oil companies. By 1983, the incentives were expected to generate increased production, which in turn should increase Government revenues by $200 million.

COMMODITY REVIEW

Metals.—*Aluminum.*—Throughout 1981, no firm decision was made to proceed with the construction of a proposed 180,000-ton-per-year aluminum smelter. Additional engineering studies and cost analyses have been undertaken to assure the Government that the smelter will be a viable project, especially in view of the large investment required. The identification of downstream industries that could be established locally to consume part of the smelter's output was of particular interest. The U.S. companies that have been involved in the aluminum project are National Steel Corp. and Southwire Co. These two companies jointly own the National Southwire Aluminum Co. in Kentucky. Equity interests in the aluminum plant were still under negotiation, but the Government was expected to assume a 60% to 80% majority control. Alumina feedstock of about 360,000 tons per year would probably come from Jamaica and/or Guyana.

Iron and Steel.—ISCOTT continued to work toward full capacity production from its 420,000-ton-per-year direct-reduction iron (DRI) MIDREX plant.

A formal inauguration of the ISCOTT complex was held on June 27, 1981, although the first of two DRI MIDREX plants was brought onstream in the latter half of 1980. The second 420,000-ton-per-year DRI plant is scheduled to start operating in April 1982. ISCOTT estimated its total DRI output in 1982 would reach 465,000 tons, most of which would be used in the steel melt-cast shop to produce 265,000 tons of billets. The melt-cast shop's startup was in December 1980, and the wire rod mill came onstream in June 1981. The design and operation of ISCOTT facilities have been adequately described in trade magazines.[7]

Nonmetals.—*Fertilizer Materials.*— Fertilizers of Trinidad and Tobago Ltd. (FERTRIN) completed its two 272,000-ton-per-year nitrogen ammonia plants in late 1981. The inauguration of these plants brought Trinidad and Tobago's total ammonia capacity to about 1.3 million tons per year of nitrogen equivalent. FERTRIN is a joint venture of the Government (51%) and Amoco International Oil Co. (49%). FERTRIN'S investment has been estimated at $350 million.

In early 1981, construction started on a methanol plant and a urea plant, both to be located at the Point Lisas industrial center. The projects are expected to initiate production in late 1983.

The $160 million methanol plant was expected to consume about 35.3 million cubic feet of natural gas and 403 tons of carbon dioxide per day to produce 132 million gallons per year of chemical-grade methanol. A sales agreement with a West German company has already been signed, and other contracts were under final negotiation with Japanese and United States firms.

The urea plant was expected to utilize 940 tons of ammonia and 1,240 tons of carbon dioxide per day to produce 1,620 tons of urea per day. The project cost was estimated at $155 million. Final negotiations were underway for the sale of urea to Agrico Chemical Co., which also holds a 49% interest in the urea project.

Mineral Fuels.—*Natural Gas and Petroleum.*—The latest available estimate for proven natural gas reserves was 10.5 trillion cubic feet.

After 7 years of negotiations, in September the Government and Amoco Trinidad Oil Co. Ltd. reached an agreement on the sale of natural gas to the National Gas Transmission Co. (NGTC) and the Trinidad

and Tobago Electricity Commission (TTEC). Both users were paying about $0.17 per 1,000 cubic feet. Under the new agreement TTEC was to continue to pay this amount until 1983, after which it has been scheduled to pay the same rate as NGTC. The exact NGTC rate was undisclosed, but was estimated between $0.70 and $1.00 per thousand cubic feet. The agreement was to remain effective until 1990.

Amoco, the major producer of petroleum and natural gas, also agreed to renew gas exploration efforts in its Galeota concession where it has decided to install a 20-slot drilling platform.

Successful field delineation wells were drilled about 50 miles off Galeota Point by Texaco-Trinidad, Inc. Originally discovered in 1977, the gasfield is located in block 6 where water depths range between 300 and 550 feet.

The Trinidad and Tobago Oil Co., Ltd., drilled a successful wildcat, the Hibiscus No. 1, off the north coast of Trinidad and Tobago, which tested at 12 million cubic feet of natural gas per day. The well was a south offset of an earlier discovery well, the Chaconia No. 1. The area north of Trinidad and west of Tobago has been considered as having a high-risk potential because of limited information. It is also subject to the resolution of sovereignty rights between Trinidad and Tobago and neighboring island countries.

Projections for crude oil production have not been especially bright. Production has been declining in many of the offshore wells and no significant new fields have been discovered since 1972. The Government hopes that the new petroleum legislation will foster increased exploration and secondary recovery operations. The Government also has commissioned an outer ring offshore geophysical survey of Trinidad and Tobago, where water depths reach over 1,000 feet. Information from this survey may be made public in 1982.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Barbadian dollars (BD$) to U.S. dollars at the rate of BD$2.01=US$1.00.

[3]Where necessary, values have been converted from Cuban pesos (CP$) to U.S. dollars at the rate of CP$0.78=US$1.00.

[4]Where necessary, values have been converted from Haitian gourdes (HG$) to U.S. dollars at the rate of HG$5.00=US$1.00.

[5]Where necessary, values have been converted from Jamaican dollars (J$) to U.S. dollars at the rate of J$1.78=US$1.00.

[6]Where necessary, values have been converted from Trinidad and Tobago dollars (TT$) to U.S. dollars at the rate of TT$2.397=US$1.00.

[7]Iron and Steel Engineer. First Caribbean Area Direct Reduction Plant—ISCOTT. October 1981, pp. 25-28.

Metal Bulletin Monthly. ISCOTT: Caribbean's First Integrated Plant. October 1981, pp. 111-117.

Table 13.—Trinidad and Tobago: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	4	15	--	Jamaica 7; Guyana 3.
Copper metal including alloys, all forms	541	478	--	West Germany 229; United Kingdom 205.
Iron and steel:				
Waste and scrap	1,001	18	--	United Kingdom 15; West Germany 2.
Pig iron, ferroalloys, similar materials	(1)	18,000	--	All to Spain.
Steel, primary forms	1	[2]1	--	NA.
Semimanufactures	5,468	[3]2,041	239	NA.
Lead:				
Ore and concentrate	60	20	--	Barbados 10; Guyana 10.
Oxides and hydroxides	3	5	--	NA.
Metal including alloys, all forms kilograms	NA	913	913	
Molybdenum metal including alloys, all forms	24	--		
Silver metal including alloys, unwrought and partly wrought troy ounces	--	5,466	--	All to Canada.
Tin metal including alloys, all forms kilograms	NA	[4]98	--	All to Jamaica.
Zinc:				
Oxides and hydroxides	--	2	--	All to Guyana.
Metal including alloys, all forms	11	2	--	Mainly to Guyana.
Other: Oxides, hydroxides, peroxides kilograms	726	1,527	NA	NA.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones kilograms	195	53	NA	NA.
Asbestos, crude value	$266	$40	NA	NA.
Barite and witherite	527	1,037	--	All to Barbados.

See footnotes at end of table.

Table 13.—Trinidad and Tobago: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Cement	16	120	--	Barbados 107.
Chalk value	$2,411	$2,061	--	All to Guyana.
Clays and clay products:				
Crude	40	72	--	All to Barbados.
Products:				
Refractory including nonclay brick	39	NA		
Nonrefractory value	$30,025	$261,814	--	NA.
Diamond, gem, not set or strung carats	2	--		
Fertilizer materials:				
Natural, phosphates	5	--		
Manufactured:				
Nitrogenous	100,994	119,147	25,257	Guyana 25,725; Jamaica 22,556.
Potassic	549	17	NA	NA.
Other including mixed	9	78	--	All to St. Vincent.
Ammonia	394,678	569,724	331,259	United Kingdom 112,964; Sweden 60,526.
Gypsum and plasters value	--	$550	--	Barbados $125.
Lime do	$1,168	$441	--	Dominica $190.
Mica	2	7	--	Mainly to Guyana.
Salt and brines	25	295	(5)	Barbados 200; Grenada 90.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	26	31	--	NA.
Soda ash	6	1	--	Mainly to Barbados.
Stone, sand and gravel:				
Dimension stone:				
Crude	NA	2	--	All to Grenada.
Worked value	$284	$367	--	All to Italy.
Gravel and crushed rock	NA	7	--	Grenada 6.
Quartz and quartzite value	--	$343	NA	NA.
Sand excluding metal-bearing	20	9	--	Barbados 8.
Sulfur:				
Elemental, colloidal	--	15,932	15,932	
Sulfuric acid, oleum	13	5	--	Mainly to Barbados.
Talc	3	3	--	All to Barbados.
Other:				
Crude value	$1,083	$833	NA	NA.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	r213	2	--	Dominica 1.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	9,823	6,167	22	Guadeloupe 3,509; United Kingdom 1,082; Martinique 1,038.
Coal, all grades value	$229	--		
Hydrogen, helium, rare gases	7	1	NA	NA.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	54,282	49,601	45,678	Netherlands 375.
Refinery products:[6]				
Gasoline, motor and aviation do	8,570	9,386	3,242	Suriname 343; Guyana 299.
Kerosine do	1,598	717	--	Guyana 46; Barbados 17.
Jet fuel do	2,624	4,494	482	Barbados 308.
Distillate fuel oil do	10,452	11,612	1,340	Netherlands 1,591; Suriname 850; Guyana 597.
Residual fuel oil do	41,288	45,083	20,327	Suriname 3,139; Guyana 1,540.
Lubricants do	404	767	453	Jamaica 3.
Other:				
Liquefied petroleum gas 42-gallon barrels	388,733	509,735	29,172	Panama 134,538; Barbados 61,945; Guyana 53,508.
Mineral jelly and wax do	593	766	--	NA.
Nonlubricating oils do	92,560	86	2	NA.
Bitumen and other residues do	38,298	18	NA	St. Lucia 6.
Bituminous mixtures, n.e.s. do	11,429	6,508	--	Barbados 133.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	62,326	r91,090	19,988	Netherlands 52,896; Netherlands Antilles 11,629.

rRevised. NA Not available.
[1]Unreported quantity valued at $107.
[2]Excludes quantity valued at $100.
[3]Excludes quantity valued at $8,041.
[4]Excludes quantity valued at $37.
[5]Less than 1/2 unit.
[6]Includes bunkers.
[7]Excludes quantity valued at $158.

Table 14.—Trinidad and Tobago: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Bauxite	76	--		
Oxides and hydroxides	12	80	4	Jamaica 76.
Metal including alloys, all forms	r2,408	30,503	24,669	Netherlands 3,647; Sweden 1,112; Jamaica 389.
Chromium oxides and hydroxides	38	10	3	West Germany 4.
Copper:				
Sulfate	29	12	1	United Kingdom 10.
Metal including alloys, all forms	754	18,875	1,203	United Kingdom 11,529; Grenada 6,002.
Iron and steel:				
Ore and concentrate including roasted pyrites	--	63,255	27,725	Brazil 35,530.
Metal:				
Waste and scrap	127	5	5	
Pig iron, ferroalloys, equivalent materials	71	42	26	West Germany 13; Netherlands 3.
Steel, primary forms	r8,211	18,964	16,131	Japan 2,833.
Semimanufactures:				
Bars, rods, angles, shapes, sections	149,287	156,694	13,199	Japan 84,703; Belgium-Luxembourg 26,052; United Kingdom 22,521.
Universals, plates, sheets	91,866	292,415	730	Japan 262,776; United Kingdom 12,623.
Hoop and strip	197	270	54	United Kingdom 216.
Rails and accessories	7	39	--	All from United Kingdom.
Wire	6,082	96,592	183	United Kingdom 93,401.
Tubes, pipes, fittings	101,791	195,404	84,887	United Kingdom 46,244; France 28,632; Japan 20,644.
Castings and forgings, rough	--	25	23	Denmark 2.
Lead:				
Oxides and hydroxides	320	588	--	United Kingdom 387; Mexico 170.
Metal including alloys, all forms	460	1,656	528	Canada 1,093; United Kingdom 12; Guyana 10.
Magnesium metal including alloys, all forms	4	3	2	United Kingdom 1.
Manganese ores and concentrates	--	2	--	All from United Kingdom.
Nickel metal including alloys, all forms	6	4	3	NA.
Platinum-group metals including alloys, unwrought and partly wrought, troy ounces	3,279	4,469	--	United Kingdom 3,472.
Silver:				
Waste and sweepings, value	$25,748	$10,021	$10,021	
Metal including alloys, unwrought and partly wrought, troy ounces	81,213	39,995	--	Canada 24,209; United Kingdom 5,980.
Tin metal including alloys, all forms	420	2,084	1,710	Netherlands 360; United Kingdom 13.
Titanium oxides and hydroxides	185	5,884	5,654	United Kingdom 161; Belgium-Luxembourg 26.
Tungsten metal including alloys, all forms, kilograms	852	342	342	
Zinc:				
Oxides and hydroxides	163	156	2	United Kingdom 111; Belgium-Luxembourg 40.
Metal including alloys, all forms	429	558	18	Canada 498; United Kingdom 29.
Other:				
Ores and concentrates, value	$20,281	$68,117	--	All from Jamaica.
Ash and residue containing nonferrous metal	--	5	NA	NA.
Oxides, hydroxides, peroxides	541	286	158	United Kingdom 41; West Germany 33.
Pyrophoric alloys: Ferrocerium, kilograms	5,111	573	543	United Kingdom 30.
Base metals including alloys, all forms	20	35	--	Denmark 30; United Kingdom 5.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	3	2	NA	NA.
Dust and powder of precious and semiprecious stones, value	$397	--		
Grinding and polishing wheels and stones	66	99	11	Venezuela 36; United Kingdom 22; West Germany 19.
Asbestos, crude	159	31	--	Canada 30; United Kingdom 1.
Barite and witherite	r35,662	31,864	--	Peru 25,035; Brazil 6,770.
Boron materials: Crude borates, natural, value	$2	$151	NA	NA.
Cement	133,260	232,517	949	United Kingdom 19,611; Denmark 18,571.
Chalk	6,581	629	36	United Kingdom 433; Colombia 120.
Clays and clay products:				
Crude	2,196	2,769	2,114	United Kingdom 164.
Products:				
Refractory including nonclay brick	1,869	82,295	1,978	Canada 48,481; Denmark 30,088.
Nonrefractory	2,494	2,317	288	United Kingdom 1,859.
Diamond:				
Gem, not set or strung, carats	10,245	550	23	Canada 80.
Industrial, do	20,000	130,000	130,000	
Diatomite and other infusorial earth	6	600	2	United Kingdom 594.
Feldspar, fluorspar, leucite	262	27	--	Netherlands 20; United Kingdom 4; Portugal 3.

See footnotes at end of table.

Table 14.—Trinidad and Tobago: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials:				
Crude	346	385	296	West Germany 89.
Manufactured:				
Nitrogenous value	$44,370	$58,452	$11,502	West Germany $37,400.
Phosphatic	1,227	1,237	1,065	United Kingdom 100; West Germany 72.
Potassic	1,782	6,327	1,309	West Germany 2,448; Belgium-Luxembourg 2,268.
Other including mixed	182	[1]617	69	West Germany 516.
Ammonia	18,186	6	([2])	West Germany 2; Netherlands 1; United Kingdom 1.
Graphite, natural value	$77	$353	--	United Kingdom $351.
Gypsum and plasters	7,717	6,132	109	Venezuela 5,950; United Kingdom 73.
Lime	48,425	7,756	--	United Kingdom 5,296.
Magnesite	9	3	--	United Kingdom 2; Japan 1.
Mica, all forms	175	202	21	United Kingdom 125; Norway 33.
Pigments, mineral: Iron oxides, processed	62	122	10	West Germany 38; United Kingdom 26.
Precious and semiprecious stone except diamond:				
Natural carats	1,015	930	NA	NA.
Synthetic do	38	4,531	NA	United Kingdom 394; West Germany 10.
Pyrites, unroasted	4,164	([3])	--	All from United Kingdom.
Salt and brines	25,041	28,694	2,582	Netherlands Antilles 12,263; United Kingdom 11,547.
Sodium and potassium compounds, n.e.s.:				
Caustic potash, sodic and potassic peroxides	19	38	8	United Kingdom 21; Canada 4.
Caustic soda	4,343	5,867	5,378	Canada 266; United Kingdom 117.
Soda ash	4,678	9,931	9,537	United Kingdom 311; Canada 54; Bulgaria 10.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked value	$76,052	$2,739	$2,739	
Worked	183	138	102	China 17; Italy 16.
Dolomite, chiefly refractory grade value	--	$183	--	All from United Kingdom.
Gravel and crushed rock	1,793	1,140	232	China 564; Colombia 125; Venezuela 100.
Limestone excluding dimension	6,290	13,282	124	Barbados 13,158.
Quartz and quartzite	22	119	109	Netherlands 10.
Sand excluding metal-bearing	517	309	289	United Kingdom 11; Canada 9.
Sulfur:				
Elemental, all forms	14,986	3,062	([2])	Mainly from United Kingdom.
Dioxide	([2])	12	NA	NA.
Sulfuric acid, oleum	1,135	1,666	6	United Kingdom 872; Norway 665.
Talc, steatite, soapstone	3,642	[4]619	508	Norway 93; Austria 10.
Other:				
Crude	15	25	--	Mainly from United Kingdom.
Slag, dross, and similar waste, not metal-bearing	--	1	1	
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	[r]1,278	2,219	1,848	Canada 172; United Kingdom 68.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	24	161	161	
Carbon black and gas carbon	123	708	4	Canada 677; United Kingdom 12.
Coal, all grades including briquets	142	732	31	United Kingdom 701.
Coke and semicoke	183	163	--	United Kingdom 122.
Hydrogen, helium, rare gases	6	41	32	West Germany 2.
Peat including briquets and litter	56	42	2	United Kingdom 34; Ireland 4; Norway 2.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	42,187	50,221	--	Saudi Arabia 37,694; Indonesia 9,154.
Refinery products:				
Gasoline 42-gallon barrels	27,430	[5]88	--	United Kingdom 63.
Kerosine and jet fuel do	([6])	--		
Distillate fuel oil do	6	--		
Residual fuel oil do	125,299	--		
Lubricants do	44,451	36,818	3,961	Curaçao 9,326; United Kingdom 7,162.
Other:				
Liquefied petroleum gas do	10,735	27,782	1,508	NA.
Mineral jelly and wax do	3,517	4,620	480	United Kingdom 2,699; West Germany 346.
Nonlubricating oils do	14,834	19,870	1,644	NA.
Unspecified do	[r]2,836	196,089	88,748	United Kingdom 106,911.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	50	[7]1,331	1,193	United Kingdom 103.

[r]Revised. NA Not available.
[1]Excludes an unreported quantity valued at $100.
[2]Less than 1/2 unit.
[3]Unreported quantity valued at $17.
[4]Excludes an unreported quantity valued at $1,321.
[5]Excludes an unreported quantity valued at $596.
[6]Unreported quantity valued at $1,375.
[7]Excludes an unreported quantity valued at $115.

The Mineral Industry of Central American Countries

By H. Robert Ensminger[1]

CONTENTS

BELIZE

The Belizean economy registered a modest real growth of 1.3% during 1981. The gross domestic product (GDP), based on current prices, was $121 million[2] with an inflation rate of 10%. The country received $19 million in economic aid during 1981.

In early 1981, Belize's four commercial banks raised the interest on deposits to 15% in an effort to curb capital outflow. During 1981, the financial situation deteriorated somewhat, particularly the balance of payments. For the year the total value of imports exceeded exports by almost $38 million, while the Government continued to maintain a fairly free trade policy. Import duties and taxes averaged about 8% on essential items and 40% on nonessential ones.

The mineral activity in 1981 was limited to the production of limestone, sand and gravel, and marl.

Placid Oil Co. of Dallas, Tex., and the Anschutz Corp. of Denver, Colo., were actively engaged in oil drilling and exploration in 1981. In September, Placid began drilling off North Highway near Rancho Creek. Anschutz completed seismic exploration off the coast of the Stann Creek district. During 1981, no oil was discovered; however, at yearend, interest was undiminished.

Table 1.—Central American countries: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
BELIZE					
Stone, sand and gravel:					
Limestone	197,500	456,000	455,513	440,640	479,700
Marl	914,000	3,900,000	3,851,340	2,690,000	548,900
Sand and gravel	666,000	960,000	959,720	817,500	589,300
COSTA RICA					
Cement	405,907	[r]490,074	527,893	553,699	500,000
Clays: Kaolin	460	530	480	500	450

See footnotes at end of table.

Table 1.—Central American countries: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
COSTA RICA —Continued					
Diatomite	680	610	590	600	550
Gold[e] troy ounces	12,200	15,900	16,718	16,000	16,000
Lime	6,300	7,200	9,000	7,500	7,000
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	[e]757	1,807	1,900	742	740
Kerosine and jet fuel do.	[e]285	233	230	285	275
Distillate fuel oil do.	[e]444	3,824	4,000	1,091	1,085
Residual fuel oil do.	[e]976			1,432	377
Other do.	[e]172	--	220	186	65
Refinery fuel and losses do.	[e]122	212		45	45
Total do.	[e]2,756	6,076	6,350	3,781	2,587
Pumice	1,272	1,446	1,260	[e]1,200	1,100
Salt, marine	27,000	34,200	46,000	40,000	39,000
Silver[e] troy ounces	1,350	1,640	2,000	1,600	1,500
Stone, sand and gravel:					
Crushed rock and rough stone cubic meters	518,000	559,500	602,000	600,000	550,000
Limestone and other calcareous materials	57,000	55,100	[e]53,000	55,000	50,000
Sand and gravel cubic meters	224,000	238,900	260,000	250,000	200,000
EL SALVADOR					
Aluminum metal including alloys, semimanufactures	1,950	2,268	2,313	1,587	1,000
Cement	375,000	[r]455,000	582,468	519,892	500,000
Gold, fine troy ounces	2,156	3,619	2,720	2,492	1,000
Gypsum[e]	7,000	7,000	7,000	9,000	6,000
Iron and steel metal:					
Steel, crude	13,600	[e]13,600	[e]14,000	14,000	10,000
Semimanufactures	27,575	37,907	27,198	30,959	25,000
Limestone	560,000	750,000	900,000	850,000	500,000
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	1,213	1,236	1,303	1,270	1,200
Jet fuel do.	85	93	--	--	--
Kerosine do.	372	385	391	390	385
Distillate fuel oil do.	1,601	1,665	1,435	1,500	1,400
Residual fuel oil do.	1,678	1,412	1,713	1,600	1,500
Liquefied petroleum gas do.	316	294	315	300	290
Asphalt do.	134	163	136	150	135
Refinery fuel and losses do.	84	106	[e]110	100	100
Total do.	5,483	5,354	5,403	5,310	5,010
Salt[e]	25,000	27,000	27,000	27,000	20,000
Silver, fine troy ounces	112,245	185,060	151,582	146,202	110,000
GUATEMALA					
Antimony, mine output, metal content	916	230	660	556	510
Barite	--	1,330	3,600	4,610	5,200
Cement	490,848	515,079	573,643	568,875	568,012
Clays:					
Bentonite	--	2,593	[e]2,700	2,600	2,500
Other	104,830	124,991	131,036	169,861	165,641
Copper, Cu content of concentrates	2,500	2,060	1,768	842	726
Feldspar	13,071	15,377	10,601	21,530	10,044
Gypsum, crude:					
For cement manufacture	13,324	15,213	18,323	19,310	18,588
Other	18,835	22,559	7,086	13,939	10,134
Iron ore, gross weight	3,166	4,755	2,895	3,500	4,025
Lead:					
Mine output, metal content	100	[e]100	[e]100	100	41
Metal including secondary	127	119	90	92	70
Lime	45,581	44,292	40,575	35,580	24,655
Nickel, mine output, metal content[2]	298	1,079	6,199	6,744	5,000
Petroleum:					
Crude thousand 42-gallon barrels	110	[r]221	571	1,513	1,800
Refinery products:					
Gasoline do.	1,111	1,225	1,153	919	1,050
Jet fuel do.	265	321	359	250	230
Kerosine do.	233	243	271	286	290
Distillate fuel oil do.	1,474	1,886	1,876	1,751	2,010
Residual fuel oil do.	2,009	2,160	2,032	2,070	2,610
Liquefied petroleum gas and unspecified do.	43	51	31	19	25

See footnotes at end of table.

Table 1.—Central American countries: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
GUATEMALA —Continued					
Petroleum —Continued					
Refinery products —Continued					
Refinery fuel and losses thousand 42-gallon barrels	63	72	73	86	130
Total do	5,198	5,958	5,795	5,381	6,345
Pumice and related materials:					
Pumice	NA	19,387	18,000	18,000	15,000
Volcanic ash	26,000	35,000	36,581	12,721	5,451
Salt	10,610	10,797	14,493	9,526	13,679
Silver, mine output, metal content[e] troy ounces	NA	[e]10,000	[e]10,000	10,000	8,000
Stone, sand and gravel:					
Crushed and broken:					
Limestone thousand tons	941	825	815	920	896
Unspecified (ballast, etc.) do	903	[e]900	[e]900	900	700
Marble cubic meters	1,492	1,171	441	1,353	1,226
Quartz	2,600	2,500	[e]2,400	2,500	35,582
Sand and gravel:					
Silica sand	40,074	43,370	40,320	70,000	50,000
Other cubic meters	844,223	788,605	788,494	640,000	[3]269,844
Tungsten, mine output, W content of concentrate	--	--	--	50	--
Zinc, mine output, metal content[4]	1,024	1,000	[e]1,000	1,000	[3]2,996
HONDURAS					
Antimony, mine output, metal content	70	78	46	23	20
Cadmium, mine output, metal content	263	260	204	229	200
Cement	250,000	271,000	621,000	636,000	500,000
Copper, Cu content of lead and zinc concentrates	535	600	1,390	269	250
Gold troy ounces	2,481	[e]2,500	1,501	2,027	3,000
Gypsum	18,144	[e]22,600	[e]22,600	22,600	20,000
Iron and steel semimanufactures	26,308	25,000	[e]24,000	24,500	20,000
Lead, mine output, metal content	20,600	21,800	16,400	15,171	14,000
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	713	690	730	685	408
Jet fuel do	76	74	99	138	130
Kerosine do	299	289	358	329	288
Distillate fuel oil do	1,251	1,211	1,356	1,437	847
Residual fuel oil do	616	596	685	841	815
Liquefied petroleum gas and unspecified do	60	58	39	32	36
Refinery fuel and losses do	273	264	218	186	101
Total do	3,288	3,182	3,485	3,648	2,625
Salt[e]	32,600	32,600	32,600	32,600	30,000
Silver thousand troy ounces	2,819	2,788	2,434	1,766	2,400
Stone:					
Limestone	496,457	[e]500,000	[e]500,000	500,000	450,000
Marble	42,184	43,000	[e]43,000	43,000	40,000
Zinc ore and concentrate, metal content	26,542	24,300	22,000	19,558	18,000
NICARAGUA[5]					
Cement	226,322	199,000	86,158	153,926	100,000
Copper, mine output, metal content	300	[e]100	--	--	--
Gold, mine output, metal content troy ounces	65,764	73,947	61,086	60,000	70,000
Gypsum and anhydrite, crude[e]	36,000	36,000	36,000	40,000	30,000
Lead ore and concentrate, metal content	956	400	--	--	--
Lime[e]	36,000	37,000	36,000	40,000	30,000
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	1,207	1,421	1,030	1,108	1,075
Jet fuel do	225	214	115	147	140
Kerosine do	117	124	103	106	100
Distillate fuel oil do	1,388	1,328	947	1,255	1,200
Residual fuel oil do	1,762	1,695	777	966	950
Liquefied petroleum gas do	185	186	143	163	150
Asphalt do	112	[e]110	49	101	90
Unspecified do	58	[e]59	38	45	40
Refinery fuel and losses do	122	122	162	196	180
Total do	5,176	5,259	3,364	4,087	3,925
Salt, marine[e]	16,000	18,000	18,000	20,000	18,000
Sand cubic meters	[e]76,038	[e]80,000	[e]80,000	NA	NA
Silver, mine output troy ounces	[r]167,184	[r]482,261	389,023	164,000	167,000
Zinc ore and concentrate, metal content	10,142	3,600	--	--	--
PANAMA					
Cement	270,672	300,000	510,000	565,000	600,000

See footnotes at end of table.

Table 1.—Central American countries: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1977	1978	1979	1980[p]	1981[e]
PANAMA —Continued					
Clays and clay products:					
Crude	207,611	183,019	206,892	183,182	99,000
Products, cubic meters	34,159	27,160	31,497	40,603	52,000
Petroleum refinery products:					
Gasoline, thousand 42-gallon barrels	[e]2,500	2,372	2,555	1,974	1,457
Jet fuel, do	[e]1,850	1,146	1,095	1,000	NA
Kerosine, do	[e]250	83		49	658
Distillate fuel oil, do	[e]4,500	4,563	4,745	3,000	2,300
Residual fuel oil, do	[e]10,100	7,426	7,300	7,009	5,600
Liquefied petroleum gas, do	--	312		256	140
Asphalt, do	[e]50	91	730	5	56
Unspecified, do	[e]1,350	221		NA	160
Refinery fuel and losses, do	[e]800	723	730	[e]356	120
Total, do	[e]21,400	16,937	17,155	[r]13,649	10,491
Salt, marine	21,021	15,233	18,805	18,583	15,000
Stone, sand and gravel:					
Limestone[6]	307,371	416,363	478,322	536,250	394,000
Other, thousand cubic meters	371	945	722	724	828

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Includes data available through Oct. 4, 1982.

[2]Ni content of sinter.

[3]Reported figure.

[4]Exports.

[5]In addition to the commodities listed, Nicaragua produces a small but undetermined quantity of cadmium contained in zinc concentrates for export.

[6]Refinery fuel is apparently included as a part of the products listed above; subtraction of the reported detail from the reported total gives a result of -7, indicating a net gain as a result of refining operations, but this cannot allow for refinery fuel.

[7]Detail adds to 7 more than this reported total (see footnote 6).

[8]Excludes approximately 8,000 cubic meters per year, apparently dimension stone.

COSTA RICA

During 1981, the GDP declined by 3.6% to an estimated $4.7 billion[3] based on current prices. A further decline in economic performance was forecast for 1982. The foreign debt for 1981 stood at $2.7 billion, an increase of approximately $700 million over the 1980 figure. The balance of payments registered a deficit of $416 million, about $237 million less than the amount for 1980. The inflation rate for 1981 was 65%, while the unemployment rate was approximately 20% of the work force.

The mineral industry was of minor significance in Costa Rica. In 1981, it contributed less than 1% to the GDP. Mineral production was limited to small amounts of gold and silver, as well as limestone and cement.

The gold was produced from the Santa Clara Mine, 40 miles from San José in Puntarenas Province. United Hearne Resources Ltd. owned 60% of the mine while Canadian Barranca Corp. owned 40%. The mine, using open pit mining on the main Mondongo zone and a cyanidation-leaching process, has been operating since February 1981. The ore reserve figure of 4.1 million tons with an average grade of 1.6 grams of gold per ton was the same as that for 1980.

Petroleum imports accounted for about 15% of the total import bill. Priority status has been given to the search for and the development of energy resources that would reduce the need for imported oil. Oil imports have been restricted to the level of the country's earnings from coffee exports.

Mexico's state oil agency, Petróleos Mexicanos, provided technical assistance to Refinadora Costarricense de Petróleo for oil exploration. Work was principally in the Baja Talamanca region, Llanuras de Santa Clara, and the Limón Basin.

The Instituto Costarricense de Electricidad announced plans to increase hydroelectric generating capacity by 60% by the end of the decade. The assessment of the geothermal resources continued around the Ricón de la Vieja and Miravalles volcanoes in the Province of Guanacaste.

Aluminios Nacionales, S.A., a subsidiary of Costarricense de Desarrollo, officially inaugurated the largest aluminum processing plant in Central America. The $28

million plant was to process annually 10,000 tons of aluminum ingots imported from the United States and Europe. An estimated 10% of the production was for domestic consumption, with the remainder destined for exportation to other Central American countries, the Caribbean, and Venezuela.

Table 2.—Costa Rica: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	126	170	14	Nicaragua 41; Netherlands 35; Guatemala 32.
Copper metal including alloys, all forms	34	7	7	
Iron and steel:				
Metal:				
Scrap	19	NA	NA	NA.
Semimanufactures:				
Bars, rods, angles, shapes, sections	394	949	--	Nicaragua 472; El Salvador 283; Panama 139.
Universals, plates, sheets	13,074	19,174	--	Nicaragua 10,955; El Salvador 3,696; Panama 2,907.
Wire	254	457	13	Guatemala 207; Honduras 143; Nicaragua 49.
Tubes, pipes, fittings	3,962	4,145	--	Panama 1,692; Nicaragua 1,323; El Salvador 747.
Lead metal including alloys, all forms	39	14	--	Panama 7; Nicaragua 6.
Silver metal including alloys, unwrought and partly wrought				
value, thousands	$371	$96	$85	Panama $11.
Zinc metal including alloys, all forms	21	6	--	All to Colombia.
Other: Base metals including alloys, all forms	203	82	--	All to Panama.
NONMETALS				
Abrasives, n.e.s.:				
Natural	695	26	--	All to Nicaragua.
Grinding and polishing wheels and stones	89	209	--	Mainly to Nicaragua.
Cement	961	NA	NA	NA.
Clays and clay products including nonclay refractory brick	90	310	--	Panama 155; Honduras 107; Nicaragua 48.
Diatomite and other infusorial earth	1	NA	NA	NA.
Fertilizer materials, manufactured:				
Nitrogenous	151	173	--	Guatemala 100; Honduras 73.
Other including mixed	61,113	55,639	--	Panama 19,008; El Salvador 15,721; Honduras 3,855.
Lime	1,895	16,898	--	Honduras 16,560; Panama 194; El Salvador 77.
Sodium and potassium compounds, n.e.s.:				
Soda ash	10	NA	NA	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	116	34	--	Guatemala 31; Panama 2; West Germany 1.
Worked	36	NA	NA	NA.
Calcareous stone	1,590	1,958	--	Panama 1,844; Honduras 60; Nicaragua 33.
Sulfur:				
Elemental, all forms	5	NA	NA	NA.
Sulfuric acid	209	1,629	--	Nicaragua 914; Guatemala 300; El Salvador 213.
Other: Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	863	985	59	Nicaragua 771; Panama 114; Honduras 37.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline, 42-gallon barrels	697	NA	NA	NA.
Distillate fuel oil, do.	26,923	115	(1)	Netherlands Antilles 90.
Lubricants, do.	--	1	--	
Liquefied petroleum gas, do.	--	NA	NA	NA.
Unspecified, do.	798	NA	NA	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	18	NA	NA	NA.

NA Not available.
[1]Less than 1/2 unit.

Table 3.—Costa Rica: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	3,856	4,493	1,558	France 657; Venezuela 601; El Salvador 397.
Copper metal including alloys, all forms	2,544	2,977	1,589	Peru 1,060; Chile 167; Japan 60.
Iron and steel metal:				
Scrap	192	247	17	Panama 118; United Kingdom 107.
Pig iron, cast iron, related materials	951	666	12	West Germany 390; Mexico 220.
Steel, primary forms	25,515	25,051	24,383	Japan 504; Spain 84.
Semimanufactures:				
Bars, rods, angles, shapes, sections	17,757	18,290	1,339	Japan 8,239; Belgium-Luxembourg 1,619; West Germany 1,078.
Universals, plates, sheets	89,897	87,875	3,551	Japan 73,861; North Korea 1,253.
Hoop and strip	582	609	251	Japan 197; Italy 56; West Germany 40.
Rails and accessories	5,783	1,249	118	West Germany 831; Panama 127; Japan 78.
Wire	5,854	4,705	325	Japan 1,671; Brazil 701; Nicaragua 517.
Tubes, pipes, fittings	4,016	5,276	1,665	Japan 1,050; Panama 489; France 477.
Castings and forgings, rough	103	19	6	Colombia 11; West Germany 2.
Lead metal including alloys, all forms	271	281	8	Peru 150; Mexico 82; Belgium-Luxembourg 21.
Silver and platinum-group metals including alloys, unwrought and partly wrought value, thousands	$409	$879	$822	France $52.
Tin metal including alloys, all forms	16	11	1	El Salvador 4; Peru 3; Mexico 2.
Zinc metal including alloys, all forms	4,967	5,479	527	Canada 2,593; Peru 1,332; Mexico 1,027.
Other:				
Ores and concentrates	1,129	1,163	58	Mexico 1,102.
Base metals including alloys, all forms	28	30	24	Bolivia 2.
NONMETALS				
Abrasives, n.e.s	108	33	17	Brazil 14; West Germany 2.
Asbestos, crude	1,167	1,318	4	Canada 952; Australia 362.
Boron materials: Oxides and acids	66	19	17	West Germany 2.
Cement	5,999	6,487	236	West Germany 2,870; Belgium-Luxembourg 2,382; Japan 925.
Clay products including nonclay refractory brick	11,129	6,750	862	Italy 1,571; Nicaragua 1,455; Spain 1,225.
Diatomite and other infusorial earth	407	255	54	Mexico 198; West Germany 3.
Fertilizer materials:				
Crude	211	1	NA	NA.
Manufactured:				
Nitrogenous	26,518	24,061	1,097	West Germany 8,963; Hungary 6,150; Trinidad and Tobago 4,903.
Phosphatic	22,941	36,602	36,074	Netherlands 504.
Potassic	52,863	63,106	32,599	West Germany 15,257; Canada 13,041; Netherlands 527.
Other including mixed	5,639	16,222	2,766	Mexico 6,003; Hungary 4,435; West Germany 2,408.
Lime	705	815	19	Nicaragua 493; Panama 301.
Salt and brine	7,756	15,894	2,068	Chile 10,425; El Salvador 3,196.
Sodium compounds, n.e.s.:				
Caustic soda	5,017	5,311	611	Nicaragua 3,968; United Kingdom 317.
Soda ash	7,307	2,894	2,065	United Kingdom 589; West Germany 126.
Stone, sand and gravel	37,642	41,116	12,549	Nicaragua 13,859; Honduras 13,774; West Germany 135.
Sulfur: Sulfuric acid	308	116	49	Panama 54; Belgium-Luxembourg 5; West Germany 4.
Other:				
Crude	7,654	25,256	5,129	Chile 10,425; El Salvador 3,539; Guatemala 3,422.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	378	3,541	526	Canada 2,921; Panama 37; Honduras 30.
MINERAL FUELS AND RELATED MATERIALS				
Coal, coke, peat	604	461	121	Mexico 103; Colombia 84; West Germany 74.

See footnotes at end of table.

Table 3.—Costa Rica: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Hydrogen, helium, rare gases	10,904	11,295	3,910	Mexico 6,928; Nicaragua 159; West Germany 108.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	2,631	3,932	--	Mexico 1,791; Venezuela 1,639; Netherlands Antilles 502.
Refinery products:				
Gasoline do	617	730	16	Netherlands Antilles 562; Venezuela 102.
Kerosine do	36	26	14	Venezuela 12.
Distillate fuel oil do	2,453	1,953	--	Netherlands Antilles 994; Venezuela 959.
Residual fuel oil do	--	NA	NA	NA.
Lubricants do	150	155	68	El Salvador 24; Netherlands Antilles 18; Venezuela 15.
Mineral jelly and wax do	25	17	5	West Germany 9; Japan 2.
Liquefied petroleum gas do	157	161	(1)	Venezuela 160.
Other do	190	355	37	Venezuela 307; Mexico 10.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	4,678	2,932	1,917	Netherlands Antilles 921; Mexico 72; West Germany 10.

NA Not available.
[1]Less than 1/2 unit.

EL SALVADOR

The civil strife during 1981 continued to severely undermine the El Salvadorean economy. The high political uncertainty has resulted in the GDP falling to $3.4 billion,[4] in current prices. This represented an approximate decrease of 12% in real terms from the 1980 GDP. The balance of payments for 1981 showed a deficit of $132 million. The inflation rate was 15%, which was one-half of the 1980 rate.

The mineral industry, including production of gold, silver, cement, and limestone, contributed less than 1% to the GDP. Gold production fluctuated from about 8,700 troy ounces in 1975 to about 2,500 troy ounces in 1980. In the last decade, annual silver production varied between 112,530 and 184,870 troy ounces.

Gold was primarily produced from the San Cristobal Mine by the local company Minas San Cristobal, S.A., a wholly owned subsidiary of Javelin International Ltd., formerly Canadian Javelin Ltd.

Government involvement in the mineral industry was through the Instituto Salvadoreno de Desarrollo Industrial and the Comisión Nacional de Petróleo. Jointly they have undertaken a $1.5 million geological survey designed to locate mineral deposits of economic interest.

El Salvador's 1981 imports of crude oil declined by 2.2% from that of 1980. The country relied entirely on imported oil. The share of oil as an energy source has decreased over the last decade. The easing of this large economic burden has been achieved through agreements with the Governments of Venezuela and Mexico. Venezuela guaranteed to return 30% of the oil import costs and may help with the financing of the San Lorenzo hydroelectric project.

On March 18, 1981, the Governments of El Salvador and Mexico signed an agreement whereby El Salvador need pay only 70% of the cost of imported Mexican oil in cash. El Salvador would retain the remaining 30% due on the oil bill as a 5-year loan at 4% interest and will not need foreign exchange to cover this portion. These terms were an improvement over those granted by Venezuela, which was to supply the remaining one-half of El Salvador's petroleum and insisted on full payment 7 days in advance of shipment. Subsequently, Venezuela would return 30% of the oil bill in the form of a loan on the same repayment terms as offered by Mexico.

El Salvador had an aggressive geothermal development program underway to boost its electrical power output. During the 1970's, two 30-megawatt powerplants in the Ahuachapán Field were brought online, and a third was scheduled.

Table 4.—El Salvador: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	2,947	2,939	31	Guatemala 2,082; Costa Rica 398; Nicaragua 272.
Copper metal including alloys, all forms	23	(1)	NA	NA.
Iron and steel metal, all forms	32,286	13,695	--	Guatemala 7,231; Nicaragua 4,312; Ecuador 1,423.
Lead metal including alloys, all forms	22	43	--	Mainly to Guatemala.
Silver metal including alloys, unwrought and partly wrought ---troy ounces	151,816	(2)	--	All to Switzerland.
Tin metal including alloys, all forms	4	14	--	Guatemala 7; Nicaragua 4; Costa Rica 2.
Other: Ash and residue containing nonferrous metals	482	950	489	Netherlands 138; West Germany 118; Belgium-Luxembourg 82.
NONMETALS				
Cement	119,569	92,706	--	Guatemala 90,438; Mexico 2,251; Belize 17.
Clays and clay products:				
Crude	475	816	--	Costa Rica 386; Guatemala 238; Panama 192.
Products including nonclay refractory brick	415	143	--	All to Guatemala.
Fertilizer materials:				
Crude	91	NA	NA	NA.
Manufactured	57,211	169	--	Nicaragua 129; Guatemala 25; Costa Rica 15.
Lime	57	152	--	All to Guatemala.
Salt and brine	21,703	24,980	--	Guatemala 20,911; Costa Rica 3,810; Nicaragua 207.
Stone, sand and gravel:				
Dimension stone	308	NA	NA	NA.
Sand, gravel, crushed rock	7	26	--	Guatemala 26.
Sulfur: Sulfuric acid	1,083	NA	NA	NA.
Other:				
Crude	283	25,926	--	Guatemala 21,278; Costa Rica 4,196; Nicaragua 207.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	7,379	8,759	--	All to Guatemala.
MINERAL FUELS AND RELATED MATERIALS				
Coal, all grades	11	NA	NA	NA.
Petroleum refinery products:				
Gasoline---42-gallon barrels	935	425	--	All to Guatemala.
Distillate fuel oil---do	212,610	438,819	--	Guatemala 370,493; Panama 68,326.
Lubricants---do	76,909	99,036	--	Costa Rica 48,566; Nicaragua 25,046; Guatemala 24,290.
Liquefied petroleum gas---do	2,529	NA	NA	NA.
Unspecified---do	65,765	65,968	--	Guatemala 57,995; Nicaragua 7,966; Costa Rica 7.

NA Not available.
[1]Less than 1/2 unit.
[2]Unreported quantity valued at $3,079,000.

Table 5.—El Salvador: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Unwrought	390	3,108	1,952	Canada 652; France 504.
Semimanufactures	3,617	1,824	991	Guatemala 155; Costa Rica 35.
Copper metal including alloys, all forms	2,674	1,107	497	Peru 400; Costa Rica 106; Japan 70.
Iron and steel metal:				
Scrap	28,091	4,611	--	Guatemala 3,156; Nicaragua 1,249; Panama 160.
Pig iron, ferroalloys, similar materials	6,239	1,829	296	Guatemala 1,071; Mexico 282.
Steel, primary forms	4,691	NA	NA	NA.

See footnotes at end of table.

Table 5.—El Salvador: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel metal —Continued				
Semimanufactures	69,267	57,200	3,632	Japan 21,191; Guatemala 14,652; West Germany 4,473.
Lead metal including alloys, all forms	509	234	8	Mexico 202; Guatemala 20.
Nickel metal including alloys, all forms	2	2	--	All from West Germany.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	NA	$24	$1	West Germany $1.
Silver metal including alloys, unwrought and partly wrought do.	NA	$110	$76	West Germany $27; Netherlands $7.
Tin metal including alloys, all forms	23	22	2	United Kingdom 16; Canada 2; Netherlands 2.
Zinc metal including alloys, all forms	260	400	28	Mexico 237; Peru 63; Republic of Korea 50.
Other:				
Ores and concentrates	2	261	181	Guatemala 80.
Ash and residue containing nonferrous metals	5	4	--	All from Guatemala.
Base metals including alloys, all forms	3	2	--	All from West Germany.
NONMETALS				
Abrasives: Grinding stones	1,530	89	7	Brazil 16; Guatemala 16; West Germany 14.
Asbestos, crude	3,312	3,324	--	Canada 2,744; Australia 550.
Cement	1,915	997	11	United Kingdom 567; West Germany 174; Japan 101.
Clays and clay products:				
Crude	5,584	NA	NA	NA.
Products including nonclay refractory brick	4,328	2,442	1,056	Guatemala 652; Brazil 247; Mexico 169.
Diamond, industrial thousand carats	570	NA	NA	NA.
Diatomite and other infusorial earth	359	310	23	Mexico 270; Guatemala 12; Costa Rica 5.
Feldspar and fluorspar	47	NA	NA	NA.
Fertilizer materials:				
Crude	8,055	NA	NA	NA.
Manufactured:				
Nitrogenous	118,155	145,627	69,073	Italy 27,866; Finland 22,105; Belgium-Luxembourg 14,401.
Phosphatic	24,929	NA	NA	NA.
Potassic	13,991	140	10	NA.
Other including mixed	72,311	36,616	35,109	Belgium-Luxembourg 1,436; Guatemala 55.
Graphite, natural	152	NA	NA	NA.
Gypsum and plasters	20,428	14,551	23	Guatemala 14,469; West Germany 56.
Lime	5,810	1,918	--	All from Guatemala.
Mica, all forms	10	4	4	
Pigments, mineral, crude	3,694	NA	NA	NA.
Salt and brine	66	134	21	Nicaragua 90; Canada 19; West Germany 3.
Sodium compounds, n.e.s.:				
Caustic soda	6,143	5,308	1,069	Nicaragua 2,572; Mexico 596; Guatemala 528.
Soda ash	2,113	1,302	48	Guatemala 366; West Germany 272; Denmark 243.
Stone, sand and gravel:				
Dimension stone	6,456	2,238	--	Guatemala 2,202; Mexico 36.
Gravel and crushed rock	1,273	571	16	Guatemala 555.
Sulfur:				
Elemental, other than colloidal	14,781	NA	NA	NA.
Sulfuric acid	504	1,188	145	Mexico 714; Costa Rica 226.
Talc, soapstone, pyrophyllite	231	175	56	Guatemala 82; West Germany 27; Italy 10.
Other:				
Crude	461	11,640	1,256	Guatemala 6,493; Canada 2,763; Australia 550.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	5,012	228	77	Guatemala 102; Mexico 28; Colombia 10.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	NA	NA	NA.
Coal and coke including briquets	530	286	156	Colombia 125; Guatemala 5.

See footnotes at end of table.

Table 5.—El Salvador: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	4,507	4,920	--	All from Venezuela.
Refinery products:				
Gasoline 42-gallon barrels	31,389	19,346	697	Guatemala 11,220; Netherlands Antilles 7,412.
Kerosine do	12,726	7,688	1,457	Nicaragua 5,247; Netherlands Antilles 543; Netherlands 441.
Lubricants do	53,906	41,867	22,582	Netherlands Antilles 8,939; Nicaragua 8,806; United Kingdom 15.
Mineral jelly and wax do	14,324	19,352	3,691	West Germany 3,462; Japan 818; France 810.
Liquefied petroleum gas do	11,601	NA	NA	NA.
Unspecified do	1,151	819	595	Nicaragua 133; Panama 14.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	25	1,310	474	Netherlands Antilles 358; Guatemala 343; Nicaragua 133.

NA Not available.

GUATEMALA

For a number of years Guatemala enjoyed one of the highest growth rates in Latin America; however, the GDP for 1981 increased less than 1% to an estimated $3.15 billion[5] in current prices. Exports for 1981 increased by about 14% over those of 1980, while imports increased only about 4%.

The small mining industry suffered a major setback with the decision to close permanently the nickel plant at El Estor, located at the western end of Lake Izabal. The reasons given for closing the plant were the depressed state of the world nickel market and the sharp increase in operating costs. The decision to close the plant was made near the end of 1981 by Inco Ltd., which held an 80% interest in the former operating company, Exploraciones y Explotaciones Mineras Izabal (Exmibal). The remaining 20% was owned by the Hanna Mining Co. of the United States. The El Estor plant had been closed on a standby basis since September 1980. The major change in operating conditions was the marked increase in the cost of oil, which accounted for approximately 60% of direct operating costs. In the laterite treatment process it was found that for each $1-per-barrel increase in the price of oil there was a corresponding increase of about $0.05 per pound of nickel produced. The El Estor plant, which was built at a total cost of $224 million, produced approximately 6,940 tons of nickel matte during the first 9 months of 1980.

With the closure of the Exmibal nickel mine, the only remaining metal mining operation of any significance in Guatemala was the Oxec underground copper mine operated by Transmetales Ltda. in Alta Verapaz Department. Underground development work was also being undertaken on the lead, zinc, and silver Ballena Montenegro and Penasco Mines in southeast Guatemala in the State of Chiquimula. The majority interest in the mines was held by Minas de Oriente S.A. (Minorsa), a 60% subsidiary of Lacana Mining Corp. of Ontario, Canada. The minority interests were held by Toho Zinc Co., Ltd., and C. Itoh & Co., Ltd., of Japan, which advanced $600,000 to fund an exploration program on Minorsa's property. The recoverable ore reserves were estimated at 2.2 million tons, averaging 2.77 troy ounces of silver per ton, 0.58% lead, and 4.28% zinc.

Stone, sand and gravel, and sulfur were produced on a limited scale in 1981. It was reported that antimony and tungsten were being mined at Ixtahuacan by Minas de Guatemala S.A.

Oil represented a valuable export commodity for Guatemala. Production from the Rubelsanto and West Chinaja Fields was about 6,600 barrels per day during 1981. It was confidently expected that this production could be raised to 10,000 to 12,000 barrels per day by the end of 1982. Société Nationale Elf Aquitaine, the French oil concern, which had been providing finan-

cial and technical assistance, was the operator of the producing fields for the Petromaya Consortium in a joint venture with Basic Resources International S.A. The Yalpemech 1 well, drilled by Hispanoil in a joint operation with Braspetro International of Brazil and Elf Aquitaine, at a final depth of 4,600 meters, was the deepest well of record drilled in Guatemala.

The Guatemalan Petroleum Bureau has estimated the probable oil reserves at 2 billion barrels compared with the previous estimate of 800 million barrels. If the estimate proves correct, Guatemala can be assured of a domestic supply of oil for many years. Most of the output of crude oil was shipped to Louisiana refineries in the United States, and the refined products were imported.

HONDURAS

The GDP for 1981 was $2.7 billion[e] at current prices, which was a slight increase over that of 1980. Honduras had a deficit in its trade balance of $139 million, while the inflation rate was 9%.

The mineral industry contributed from 2% to 3% to the country's GDP in 1981. The great bulk of the precious and base metals was produced from the El Mochito Mine near Santa Bárbara. The mine was operated by the Rosario Resources Corp. of AMAX Inc.

The El Mochito Mine was converted to a 50% open pit operation to increase profitability, while average ore grades continued to decline. During 1981, 378,000 tons of ore, grading 4.3% lead and 6.1% zinc, was mined and milled to produce 13,880 tons of lead, 17,846 tons of zinc, 1,667,000 troy ounces of silver, and 1,242 troy ounces of gold. Only zinc showed an increase over the 1980 production. Further progress was made on expanding the mine, and when completed, perhaps in 1983, the capacity could be increased from 1,200 to 2,500 tons per day.

The Texaco Inc. petroleum refinery at Puerto Cortés on the Caribbean coast was shut down from mid-September through the remainder of 1981. This action resulted from changes in refining costs due to the heavier Mexican crude oil.

The new cement plant at Piedras Azules began production in August with an annual production capacity of 400,000 tons. It was one of the country's largest projects to date, costing approximately $80 million. Firms from Japan and Spain participated in the plant's construction, while $15 million for financing came as a loan from the Venezuelan Trust Fund. The plant was expected to enable Honduras to save more than $13 million annually in imports of cement, while it generated about 350 jobs. The construction of the El Cajón hydroelectric project alone was expected to require at least 350,000 tons of cement, which would otherwise have to be imported. For its raw material, the plant utilized nearby limestone and marl deposits where measured reserves will last an estimated 40 years. In addition, the plant used a material called pozzolana, a siliceous volcanic ash, to produce a more resistant cement used in building dams and bridges.

The high cost of energy, due to the dependence on imported oil, had a very inflationary effect on the Honduran economy. The El Cajón hydroelectric powerplant under construction was expected to permit a decrease in oil imports when completed in 1983.

Exploration drilling for oil continued to be unsuccessful. A program was proposed to reevaluate the country's hydrocarbon potential with International Bank for Reconstruction and Development (World Bank) funding.

Table 6.—Honduras: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1978	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Antimony ore and concentrate, gross weight	--	NA	NA	NA.
Iron and steel metal, all forms	2,701	4,156	--	Guatemala 2,107; Costa Rica 1,255; Nicaragua 729.
Lead:				
Ore and concentrate, gross weight	33,656	20,698	5,698	United Kingdom 10,000; Australia 5,000.
Metal including alloys, all forms	31	NA	NA	NA.
Silver:				
Ore and concentrate value, thousands	$10,771	$31,779	$11,182	United Kingdom $10,951; Australia $5,890.
Metal including alloys, unwrought and partly wrought do	$129	NA	NA	NA.
Zinc:				
Ore and concentrate, gross weight	50,491	(2)	(3)	Mostly to Italy and Belgium-Luxembourg.
Metal including alloys, all forms	24	NA	NA	NA.
Other:				
Ores and concentrates	2,640	NA	NA	NA.
Ash and residue containing nonferrous metals	--	27	--	All to Brazil.
NONMETALS				
Abrasives, n.e.s.: Natural	4	20	--	All to Costa Rica.
Cement	5,059	12,569	--	Cayman Islands 6,767; Belize 5,802.
Clays and clay products:				
Crude	24	NA	NA	NA.
Products including nonclay refractory brick	--	NA	NA	NA.
Fertilizer materials:				
Crude	47	34	7	Guatemala 27.
Manufactured	(4)	600	--	Guatemala 495; Belize 105.
Gypsum and plasters	2	13,630	--	Costa Rica 13,586; Nicaragua 22; West Germany 21.
Lime	--	NA	NA	NA.
Precious and semiprecious stones value, thousands	$4	$3	$3	
Salt	62	18	--	All to Costa Rica.
Stone, sand and gravel: Dimension stone, crude and partly worked	16	NA	NA	NA.
Other: Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	206	116	33	Belize 65; Costa Rica 18.
MINERAL FUELS AND RELATED MATERIALS				
Hydrogen and rare gases	1	NA	NA	NA.
Petroleum refinery products:				
Residual fuel oil thousand 42-gallon barrels	--	148	3	Panama 135; Belize 10.
Lubricants do	(5)	(5)	(5)	

NA Not available.
[1]Data for 1979 are not available.
[2]Unreported quantity valued at $9,964.
[3]Unreported quantity valued at $3,962.
[4]Unreported quantity valued at $1,000.
[5]Less than 1/2 unit.

Table 7.—Honduras: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1978	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	984	1,261	512	Guatemala 171; Nicaragua 51; Hong Kong 16.
Copper:				
Sulfate	NA	NA	NA	NA.
Metal including alloys, all forms	211	195	84	Costa Rica 41; Japan 32; West Germany 5.
Iron and steel metal:				
Scrap	--	NA	NA	NA.
Other	65,892	89,971	20,976	NA.
Lead metal including alloys, all forms	374	602	180	Mexico 360; Belgium-Luxembourg 55; Denmark 5.
Nickel metal including alloys, all forms	1	2	2	
Silver metal including alloys, unwrought and partly wrought[2] value, thousands	$4	$15	$14	West Germany $1.
Tin metal including alloys, all forms	66	44	9	Chile 15; Costa Rica 12; West Germany 6.
Zinc metal including alloys, all forms	1,776	847	212	Belgium-Luxembourg 300; Mexico 199; Japan 51.
Other:				
Ores and concentrates	42	87	82	Costa Rica 2; United Kingdom 2.
Metals including alloys, all forms	7	14	9	Bolivia 3; Mexico 2.
NONMETALS				
Abrasives, n.e.s.:				
Natural	14	7	3	Norway 4.
Grinding and polishing wheels and stones	70	68	9	West Germany 21; Austria 14; Brazil 9.
Asbestos, crude	2,062	2,102	--	Canada 1,148; Australia 952; West Germany 2.
Cement	27,085	18,814	292	Peru 8,950; Nicaragua 4,770; Panama 1,566.
Clays and clay products:				
Crude: Kaolin and other clays or earth	12,477	8,045	1,053	Guatemala 6,867; Jamaica 114; Mexico 7.
Products including nonclay refractory brick	2,608	8,225	4,518	Japan 619; Colombia 572; Italy 399.
Diamond, industrial kilograms	--	NA	NA	NA.
Diatomite and other infusorial earth	262	302	222	Mexico 58; Guatemala 17; West Germany 4.
Fertilizer materials:				
Crude, phosphatic	(3)	294	294	
Manufactured	50,615	72,301	52,908	West Germany 10,518; Costa Rica 4,333; Japan 4,223.
Graphite, natural kilograms	(3)	10	--	All from Guatemala.
Gypsum and plasters	29	85	81	NA.
Lime	1,822	2,741	504	Canada 1,263; United Kingdom 911; Mexico 50.
Mica, worked kilograms	1,000	NA	NA	NA.
Pigments, mineral, natural crude	20	NA	NA	NA.
Precious and semiprecious stones except diamond value, thousands	$12	$6	$2	Switzerland $2; West Germany $1.
Salt	210	881	551	Canada 167; Guatemala 163.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	4,927	3,413	2,614	Belgium-Luxembourg 518; Mexico 80; Guatemala 51.
Soda ash	1,034	2,122	223	Bulgaria 716; Switzerland 329; Italy 311.
Caustic potash	--	NA	NA	NA.
Stone, sand and gravel:				
Dimension stone, all forms	113	101	--	All from Guatemala.
Sand including ground quartz	--	NA	NA	NA.
Gravel and crushed rock	24	102	70	Mexico 24; Guatemala 6.
Quartz and quartzite	160	351	36	Mexico 282; West Germany 33.
Calcareous stone	5,894	24,179	89	Costa Rica 16,520; Peru 5,300; Nicaragua 1,818.
Sulfur:				
Elemental, all forms	13	2	--	West Germany 1.
Sulfuric acid	287	561	179	Netherlands 234; West Germany 36; Costa Rica 24.
Talc, natural steatite	152	134	74	China 37; Republic of Korea 10; Costa Rica 7.
Other:				
Crude	--	137	74	China 37; Republic of Korea 10; Costa Rica 7.

See footnotes at end of table.

Table 7.—Honduras: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other —Continued				
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	1,201	524	229	Costa Rica 216; Guatemala 56; Japan 23.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt, natural	1	1	1	
Coal and coke including briquets	179	482	333	Mexico 75; Belgium-Luxembourg 30; Guatemala 24.
Hydrogen and rare gases	1,097	1,219	278	West Germany 361; Belgium-Luxembourg 250; Nicaragua 201.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	3,009	3,220	--	Venezuela 2,894; Trinidad and Tobago 326.
Refinery products:				
Gasoline do	159	153	5	Trinidad and Tobago 92; British Virgin Islands 29; Nicaragua 21.
Kerosine and jet fuel do	73	33	2	Trinidad and Tobago 21; British Virgin Islands 8; Nicaragua 1.
Distillate fuel oil do	438	373	21	Trinidad and Tobago 271; Netherlands Antilles 31; British Virgin Islands 28.
Residual fuel oil do	200	105	86	Trinidad and Tobago 19.
Lubricants do	77	83	50	Nicaragua 10; Venezuela 8; Netherlands Antilles 7.
Mineral jelly and wax do	17	10	1	Japan 4; West Germany 3.
Liquefied petroleum gas do	63	84	(4)	Venezuela 81.
Unspecified do	81	108	8	Netherlands Antilles 60; Nicaragua 40.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	6,053	7,335	3,569	Mexico 527; Guatemala 84; Nicaragua 63.

NA Not available.
[1]Data for 1979 not available.
[2]Includes platinum-group metals.
[3]Excludes unreported quantity valued at $1,000.
[4]Less than 1/2 unit.

NICARAGUA

The Nicaraguan GDP for 1981 was an estimated $2.9 billion[7] at current prices, to which the mining industry contributed less than 1%. Exports rose by about 12%, and imports rose by about 1%. The trade deficit increased by approximately 4% to $393 million. The inflation rate for 1981 was about 25%. In 1981, substantial loans and grants were negotiated, notably with Mexico and Libya, but also with Venezuela, the Federal Republic of Germany, and Bulgaria.

Immediately following the revolution of 1979, the new Government nationalized the four largest gold mines, owned by two U.S. companies and one Canadian company. The U.S. companies were Rosario Resources, a subsidiary of AMAX, and ASARCO Incorporated. Negotiations for compensation to the U.S. companies were continuing. Despite predictions to the contrary, the state mining company, Nicaraguan Corp. for Mining Development (Codemina), has managed to maintain historic production levels.

In 1981, domestic mining was dominated by the production of gold and silver. The increase of 1981 gold and silver production over that of 1980 reflected the Government's determination to maximize its revenue from the extraction of these precious metals. Most of the production was from Codemina's Rosita-Siuna underground mining complex in Zelaya Department formerly operated by Rosario Mining of Nicaragua Inc., a wholly owned subsidiary of Rosario Resources Corp. The Siuna Mine, which has yielded about 50,000 ounces of gold per year, has measured and indicated reserves of

about 3.3 million tons, grading 0.095 ounce of gold per ton.

In November, the Nicaraguan Ministry of Mines and Hydrocarbons signed a cooperative agreement with the Swedish Geological Service. The agreement, worth $2.5 million, included technical assistance, creation of a mining chemical laboratory, and two mineral prospecting centers.

The Nicaraguan Government nationalized the Compañia Maritima Mundial and Oleoductos but has recognized as valid those permits for petroleum exploration held by foreign companies. However, new petroleum legislation imposing a different taxation system and modifying some of the terms of existing contracts was to have been introduced in 1981. No details were available at yearend.

Because of the political situation, there has been only limited petroleum exploration activity in Nicaragua, except for a joint offshore seismic program on the Caribbean shelf carried out in 1980 by the Chevron International Oil Co., Ltd., and Phillips Petroleum Co.

Considering the lack of any indigenous resources of oil and natural gas, priority has been given to the possible development of alternative sources of energy in the country. However, it appeared that the planned development of geothermal energy at Momotombo at Lake Managua was going to be abandoned. The project, which had been undertaken by Empresa Nacional de Luz y Fuerza at a total cost of $7.5 million, included the construction of a 35-megawatt powerplant capable of meeting about 20% of the current maximum demand for electricity.

Table 8.—Nicaragua: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, semimanufactures	147	109	--	Guatemala 50; Honduras 50; Costa Rica 9.
Copper:				
Ore and concentrate	--	NA	NA	NA.
Metal including alloys, unwrought	81	NA	NA	NA.
Iron and steel:				
Ore and concentrate	37	NA	NA	NA.
Metal:				
Scrap	3,387	1,627	--	El Salvador 1,481; Guatemala 141.
Semimanufactures	2,414	3,979	--	Costa Rica 2,582; Honduras 760; Guatemala 314.
Lead:				
Ore and concentrate	39	NA	NA	NA.
Metal including alloys, semimanufactures	--	NA	NA	NA.
Silver metal including alloys, unwrought and partly wrought value, thousands	$1,511	$3,478	$2,678	Canada $724; West Germany $76.
Zinc:				
Ore and concentrate	--	NA	NA	NA.
Metal including alloys, unwrought	--	NA	NA	NA.
Other:				
Ores and concentrates	3	NA	NA	NA.
Other nonferrous base metals	--	NA	NA	NA.
NONMETALS				
Cement	19,024	6,885	--	Honduras 6,592; Guatemala 288.
Clays and clay products:				
Crude	18	74	--	Costa Rica 59; Guatemala 15.
Products:				
Refractory including nonclay brick	1,113	911	--	Costa Rica 476; Guatemala 94; El Salvador 77.
Nonrefractory	1,255	1,475	1	Costa Rica 955; Honduras 251; Guatemala 176.
Diatomite and other infusorial earth	20	NA	NA	NA.
Feldspar and related materials	--	NA	NA	NA.
Fertilizer materials, manufactured:				
Nitrogenous	7	NA	NA	NA.
Phosphatic	23	NA	NA	NA.
Potassic	9	NA	NA	NA.
Other including mixed	80	NA	NA	NA.
Gypsum and plasters	13,341	13,424	--	Mainly to Costa Rica.

See footnotes at end of table.

Table 8.—Nicaragua: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Lime	630	862	--	All to Costa Rica.
Salt	4,904	320	--	Guatemala 160; El Salvador 153; Honduras 5.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	15,199	9,652	--	Costa Rica 4,059; Guatemala 3,005; El Salvador 2,527.
Soda ash	13	NA	NA	NA.
Stone, sand and gravel:				
Dimension stone	50	NA	NA	NA.
Quartz and quartzite	--	NA	NA	NA.
Sulfur: Sulfuric acid	--	NA	NA	NA.
MINERAL FUELS AND RELATED MATERIALS				
Hydrogen, helium, rare gases	718	NA	NA	NA.
Petroleum refinery products:				
Gasoline—42-gallon barrels	272	247	--	All to Costa Rica.
Kerosine—do	27,768	25,605	--	Costa Rica 18,430; El Salvador 2,377; Guatemala 2,145.
Lubricants—do	43,736	66,899	--	Guatemala 17,612; Costa Rica 14,903; Panama 12,285.
Other:				
Liquefied petroleum gas—do	3,248	465	--	El Salvador 302; Honduras 163.
Unspecified—do	47,125	84,546	--	Honduras 49,077; Costa Rica 35,154; Guatemala 315.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	1,049	411	--	Guatemala 317; Costa Rica 74; Honduras 19.

NA Not available.

Table 9.—Nicaragua: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Unwrought	163	315	315	
Semimanufactures	309	482	45	El Salvador 272; West Germany 89; Netherlands 12.
Copper:				
Sulfate	NA	NA	NA	NA.
Metal including alloys:				
Unwrought	1	6	--	United Kingdom 6.
Semimanufactures	43	53	41	NA.
Iron and steel metal:				
Pig iron	19	414	2	Honduras 412.
Ferroalloys	13	1	--	NA.
Steel, primary forms	931	10,372	8,552	Canada 1,650; El Salvador 150; Guatemala 20.
Scrap	--	NA	NA	NA.
Semimanufactures	21,357	78,742	11,835	NA.
Lead metal including alloys:				
Unwrought	198	196	60	Mexico 130; Costa Rica 6.
Semimanufactures	13	2	--	Costa Rica 1.
Nickel metal including alloys, all forms value, thousands	$6	NA	NA	NA.
Silver metal including alloys, unwrought and partly wrought—do	$17	$45	$39	United Kingdom $5; West Germany $1.
Tin metal including alloys:				
Unwrought	9	9	--	United Kingdom 9.
Semimanufactures	1	4	1	United Kingdom 3.
Zinc metal including alloys:				
Unwrought	236	980	--	Canada 680; Peru 300.

See footnotes at end of table.

Table 9.—Nicaragua: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc metal including alloys —Continued				
Semimanufactures	33	41	41	
Other: Base metals including alloys, all forms, value, thousands	$11,142	$7	$7	
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	2	599	104	Mexico 254; Costa Rica 237.
Grinding and polishing wheels and stones	100	95	3	Costa Rica 76; West Germany 10; Mexico 3.
Asbestos, crude	2	848	557	Australia 290; West Germany 1.
Boron oxides and acids	5	9	2	France 3; West Germany 3; United Kingdom 1.
Cement	177	336	1	Belgium-Luxembourg 334; Hungary 1.
Clays and clay products:				
Crude	1,346	1,551	786	Mexico 523; Guatemala 194; United Kingdom 22.
Products:				
Refractory including nonclay brick	403	782	621	Mexico 60; Costa Rica 38; Italy 25.
Nonrefractory	5	27	14	Costa Rica 12; Mexico 1.
Diatomite and other infusorial earth	344	427	96	Mexico 254; Costa Rica 73; Guatemala 3.
Feldspar and related materials	--	734	131	Guatemala 288; Costa Rica 279; Mexico 31.
Fertilizer materials:				
Manufactured:				
Nitrogenous	13,995	77,302	31,418	Netherlands 17,807; Venezuela 8,845; West Germany 8,596.
Phosphatic	14,230	20,309	20,256	Costa Rica 43; Netherlands Antilles 10.
Potassic	18	12,932	6,903	Canada 6,029.
Other including mixed	2,864	14,878	13,369	Netherlands 984; Costa Rica 510.
Graphite, natural	14	22	--	Mexico 14.
Gypsum and plasters	171	223	12	Guatemala 193; West Germany 16; Costa Rica 1.
Lime	1	319	--	All from United Kingdom.
Mica, all forms, value, thousands	$3	$4	$3	Honduras $1.
Pigments, natural, crude	2	NA	NA	NA.
Precious and semiprecious stones, value, thousands	$1	NA	NA	NA.
Salt	16,513	28,165	94	Mexico 27,852; El Salvador 134; Guatemala 82.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	768	1,496	1,496	
Caustic potash	--	NA	NA	NA.
Soda ash	524	672	55	West Germany 464; East Germany 109.
Stone, sand and gravel	527	540	52	Guatemala 224; Costa Rica 223; Mexico 25.
Sulfur:				
Elemental, all forms	381	487	208	West Germany 279.
Sulfuric acid	501	932	7	Costa Rica 921; West Germany 3.
Talc	160	188	59	Guatemala 35; Hong Kong 25; China 23.
Other: Crude	--	188	59	Guatemala 35; Hong Kong 25; Italy 25.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	--	NA	NA	NA.
Coal and coke including briquets	28	58	34	Mexico 10; West Germany 8; Guatemala 5.
Hydrogen, helium, rare gases	102	140	100	West Germany 16; Mexico 10; Netherlands 2.
Petroleum:				
Crude, thousand 42-gallon barrels	3,074	4,113	44	Venezuela 4,069.
Refinery products:				
Gasoline, 42-gallon barrels	120,373	81,379	2,601	Netherlands Antilles 53,507; Panama 14,629.

See footnotes at end of table.

Table 9.—Nicaragua: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Kerosine ___42-gallon barrels__	29,923	3,650	108	Panama 2,030; Trinidad and Tobago 1,163.
Distillate fuel oil _____do____	6,155	442,422	75	Netherlands Antilles 335,267; Venezuela 107,006.
Residual fuel oil_____do____	186,380	155,418	8,891	Panama 139,187; Netherlands Antilles 7,299.
Lubricants _____do____	27,846	48,839	34,181	El Salvador 9,989; Netherlands Antilles 2,968.
Mineral jelly and wax __do____	7,240	11,663	1,794	Japan 5,517; China 2,385; Spain 944.
Liquefied petroleum gas _do____	3,028	974	974	
Unspecified _____do____	826	728	630	France 28; Panama 28; United Kingdom 28.
Mineral tar and other coal-, petroleum- and gas-derived crude chemicals ____	2,771	2,741	1,098	Netherlands Antilles 1,497; Honduras 58; Netherlands 46.

NA Not available.

PANAMA

After 3 years of relatively high economic growth, economic activity slowed in 1981, largely owing to the worldwide recession. In 1981, the GDP at current prices was $3.8 billion,[8] which represented a real growth rate of 3.6% over that of 1980. Inflation during 1981 was in the 7% to 10% range. The balance of payments was a negative $355 million, the highest figure recorded in recent years.

Mineral production in Panama continued to be extremely limited in 1981 and was confined almost wholly to limestone and clays.

The one mineral project considered capable of transforming the mining industry of Panama was related to the Cerro Colorado copper deposits in Chiriqui Province; however, this project had not progressed significantly by yearend. The conditions set by Río Tinto Zinc Corp. Ltd. relating to changes in the labor law have proved difficult for the Panamanian Government to accept, and by the end of 1981 no agreement had been reached. The project plans included the construction of a pilot plant and the driving of a 2,000-meter adit, followed by the development of an open pit mine and the construction of a concentrator with a capacity exceeding 100,000 tons per day of ore.

Because of the continued uncertainty over the future of the Cerro Colorado Project, the possibility for development of the extensive porphyry copper deposits farther to the northeast of Cerro Colorado near Petaquilla was of particular interest. An exploration program completed in 1976 by Panama Resources Development, a joint venture of Mitsui Mining & Smelting Co., Ltd., Dowa Mining Co., Ltd., and Mitsubishi Metal Corp., all of Japan, indicated potential reserves of 200 million tons of low-grade copper ore.

Work on the 130-kilometer transisthmian oil pipeline between Chiriqui on the Pacific coast and Bocas del Toro on the Caribbean coast started in August 1981 and was expected to be completed in late 1982, barring complications. The total estimated cost of the pipeline project was $250 million. The pipeline, located 300 kilometers west of the canal, was planned to have a throughput capacity of 700,000 barrels per day. The Panamanian Government expected to acquire 40% of the shares in the project through Corporación Financiera Nacional. The operating company would be Petroterminal Panama, S.A., a joint venture with U.S. interests. A subsidiary of Atlantic Richfield Co. has signed a 3-year agreement for the delivery of 100,000 barrels per day of Alaskan crude oil beginning in 1983.

In 1981, consumption of petroleum products for internal use declined slightly, mainly because less fuel oil was used to generate electric power. Because of higher-than-normal rains in 1981, hydroelectric generation rose from 53.1% to 70.3% of total energy consumption. In 1975, hydropower accounted for less than 10% of the total.

This pattern of declining dependence on thermal generation was expected to continue and accelerate as the large Fortuna Dam comes online in 1985 and additional alternate energy projects are carried out in future years.

[1]Physical scientist, Division of Foreign Data.
[2]Where necessary, values have been converted from Belizean dollars (Bz$) to U.S. dollars at the rate of Bz$2.00=US$1.00 (the average rate for 1981).
[3]Where necessary, values have been converted from Costa Rican colónes (c) to U.S. dollars at the rate of c21.76=US$1.00 (the average rate for 1981).
[4]Where necessary, values have been converted from Salvadorean colónes (c) to U.S. dollars at the rate of c2.50=US$1.00 (as of Dec. 31, 1981).
[5]Where necessary, values have been converted from Guatemalan quetzals (q) to U.S. dollars at the rate of q1.00=US$1.00 (as of Dec. 31, 1981).
[6]Where necessary, values have been converted from Honduran lempiras (l) to U.S. dollars at the rate of l2.00=US$1.00 (as of Dec. 31, 1981).
[7]Where necessary, values have been converted from Nicaraguan cordobas (c$) to U.S. dollars at the rate of c$10.05=US$1.00 (as of Dec. 31, 1981).
[8]Where necessary, values have been converted from Panamanian balboas (b) to U.S. dollars at the rate of b1.00=US$1.00 (as of Dec. 31, 1981).

Table 10.—Panama: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
Aluminum metal including alloys, all forms	577	489	158	Costa Rica 236; Japan 70; Honduras 13.
Cement	93,620	1,996	746	Belize 1,250.
Clay products including nonclay refractory brick	101	20	15	Costa Rica 5.
Copper metal including alloys, all forms	40	NA	NA	NA.
Iron and steel metal:				
Scrap	900	115	--	Costa Rica 35.
Iron and steel, primary forms	181	283	--	All to Costa Rica.
Semimanufactures:				
Bars, rods, angles, shapes, sections	205	4	--	Do.
Universals, plates, sheets	12	7	--	All to Honduras.
Lead metal including alloys, all forms	688	428	18	Ecuador 410.
Petroleum refinery products:				
Lubricants, 42-gallon barrels	28	NA	NA	NA.
Unspecified, do.	165	NA	NA	NA.
Sulfur, elemental, colloidal	2	NA	NA	NA.
Other: Base metals including alloys, all forms	1,835	1,143	1,129	Japan 14.

NA Not available.

Table 11.—Panama: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	3,219	2,631	1,885	Costa Rica 238; Belgium-Luxembourg 170; Austria 109.
Copper metal including alloys, all forms	785	603	88	Chile 350; Mexico 95; Costa Rica 28.
Iron and steel metal:				
Scrap	263	468	--	Costa Rica 347.
Pig iron	15,447	22,978	15,780	Netherlands 2,966; Japan 156; Belgium-Luxembourg 142.
Ferroalloys	116	33	3	Brazil 30.
Steel, primary forms	8,382	5,131	1,404	Costa Rica 1,601; Canada 823; Japan 664.
Semimanufactures:				
Bars, rods, angles, shapes, sections	8,094	13,315	3,320	Japan 4,717; Belgium-Luxembourg 1,677; Republic of Korea 1,127.
Universals, plates, sheets	30,947	35,888	5,609	Japan 17,016; Costa Rica 2,914; France 1,701.
Hoop and strip	1,558	1,178	55	Japan 892; Italy 206.
Rails and accessories	691	666	302	Italy 364.
Wire	6,363	6,591	153	Republic of Korea 2,317; Japan 885; France 574.
Tubes, pipes, fittings	--	5,131	1,404	Costa Rica 1,601; Canada 823; Japan 664.
Castings and forgings, rough	96	32	20	Colombia 7; Costa Rica 5.
Lead metal including alloys, all forms	75	54	8	Colombia 19; Denmark 15; Costa Rica 7.

See footnotes at end of table.

Table 11.—Panama: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Nickel metal including alloys, all forms	2	2	--	West Germany 1.
Silver metal including alloys, unwrought and partly wrought value, thousands	$33	$62	$42	West Germany $10; Italy $9.
Tin metal including alloys, all forms	15	4	1	United Kingdom 1.
Zinc metal including alloys, all forms	NA	340	1	Canada 247; Peru 35; Mexico 31.
Other: Base metals including alloys, all forms	NA	38	16	Canada 15; Bolivia 5; Mexico 2.
NONMETALS				
Abrasives: Grinding and polishing stones	22	34	14	Italy 9; Brazil 5; United Kingdom 1.
Asbestos, crude	445	283	3	Canada 280.
Cement	4,847	5,090	47	Colombia 2,946; Denmark 1,464; Belgium-Luxembourg 391.
Clays and clay products:				
Crude	870	1,031	768	El Salvador 191; Guatemala 71; West Germany 1.
Products:				
Refractory including nonclay brick	697	532	499	Spain 20; West Germany 6; Costa Rica 4.
Nonrefractory	541	779	17	Spain 277; Italy 221; Costa Rica 118.
Diamond, industrial value, thousands	$1	$10	$9	Costa Rica $1.
Diatomite and other infusorial earth	399	380	37	Mexico 343.
Feldspar and fluorspar	117	1,583	423	Guatemala 1,080; Costa Rica 80.
Fertilizer materials, manufactured:				
Nitrogenous	29,187	36,386	17,525	West Germany 11,200; Costa Rica 3,963; Venezuela 1,400.
Phosphatic	2,000	4,819	4,818	NA.
Potassic	8,743	4,976	1,862	West Germany 3,100; Costa Rica 14.
Other including mixed	30,947	22,275	4,142	Costa Rica 9,520; West Germany 7,902; Netherlands 625.
Graphite, natural	4	NA	NA	NA.
Gypsum and plasters	16,204	18,196	148	Dominican Republic 18,000; United Kingdom 5; West Germany 4.
Lime	2,284	1,760	2	Peru 1,519; Costa Rica 238.
Mica, crude including splittings and waste	21	9	9	
Pigments, natural, crude	40	51	7	Mexico 24; China 20.
Precious and semiprecious stones except diamond value, thousands	$283	$186	$54	United Kingdom $101; Hong Kong $18; Israel $3.
Salt	688	2,389	361	Peru 1,375; United Kingdom 342; Netherlands 292.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	2,470	2,579	1,881	Mexico 295; France 200; Belgium-Luxembourg 100.
Soda ash	116	2,625	2,024	Netherlands 218; West Germany 159; France 120.
Unspecified	--	NA	NA	NA.
Stone, sand and gravel:				
Dimension stone, crude	766	666	10	Italy 317; Canada 286; France 17.
Limestone	1,721	NA	NA	NA.
Quartz and quartzite	79	1,515	94	Peru 1,320; Mexico 90; Italy 10.
Sand excluding metal-bearing	4,382	8,828	8,813	Italy 14.
Sulfur, elemental:				
Other than colloidal	10	NA	NA	NA.
Colloidal	56	15	10	Belgium-Luxembourg 5.
Talc	488	554	449	Hong Kong 50; China 25; Colombia 10.
Other: Halogens	3	NA	NA	NA.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1	NA	NA	NA.
Coal, all grades including briquets	73	105	96	West Germany 8.
Coke and semicoke	143	63	63	--
Petroleum:				
Crude thousand 42-gallon barrels	19,547	13,435	--	Saudi Arabia 8,962; Venezuela 3,553; Ecuador 920.
Refinery products:				
Gasoline do	280	171	(1)	Trinidad and Tobago 151.
Kerosine do	31	52	2	Venezuela 47; Netherlands Antilles 2.
Distillate fuel oil do	(1)	(1)	(1)	
Residual fuel oil do	5	103	--	Trinidad and Tobago 103.
Lubricants do	77	67	37	Netherlands Antilles 12; Nicaragua 10.

See footnotes at end of table.

Table 11.—Panama: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Other:				
Liquefied petroleum gas thousand 42-gallon barrels	227	NA	NA	NA.
Mineral jelly and wax do	15	15	7	Japan 2.
Unspecified do	3	50	1	Netherlands Antilles 48.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	467	NA	NA	NA.

NA Not available.
[1]Less than 1/2 unit.

The Mineral Industry of Other Areas of the Far East and South Asia

By E. Chin, Gordon L. Kinney, and John C. Wu

CONTENTS

BANGLADESH[1]

The only economically significant mineral exploited in Bangladesh during 1981 was natural gas. Nitrogenous fertilizer production was important to the agricultural sector and was totally dependent on the natural gas for fuel and raw material. Domestic cement plants were also fueled by natural gas. The flat river-delta terrain for most of Bangladesh makes the potential for discovering major mineral deposits poor. No large deposits of metal ores have been found and only in the small hilly southeastern section of the country is there even much chance of finding any. Heavy mineral sand deposits may eventually be exploited along the Chittagong coastline. There is a good potential for crude oil discoveries.

The Bangladesh economy has been heavily subsidized by billions of dollars of foreign aid since the country's inception. A World Bank report recommended total aid needs of over $2.6 billion in fiscal year (FY) 1980-81. It received commitments for barely over one-half that amount.

The Government's ambitious second 5-year development plan began in July 1, 1980, and called for a rather optimistic series of social and economic reforms that included lowering the population growth rate, cutting unemployment, greatly increasing the food supply, and accelerating the pace of economic development.

As part of the means of achieving the 5-year plan goals, the Government stated that measures had been taken to liberalize the investment incentives to both local and foreign industries. Policy has swung around in recent years to one of actively encouraging the participation of the private sector in economic development.

Despite the optimistic industrial development plans, Bangladesh's continuing extremely large trade deficit forced unwanted but necessary economic adjustments. By the end of December 1981, the original $15.5 billion plan, adopted in July 1980, had been revised to $10.9 billion.[2] The industrial sector was to drop from 18% to 15%, while the agriculture sector would be increased from 32% to 35%. The target for food production

had been 20 million tons but that was reduced to 17.5 million tons.

Another adjustment made during the year was a series of small currency devaluations. By yearend 1981, the Bangladesh currency stood devalued to the extent of nearly 19%. The spot selling rate of the dollar finished the year at taka 20.1512 against the dollar.

The electric power situation continued to hinder industrial progress. A Government official stated that industrial units suffered $5.8 million direct losses owing to power failures and load shedding during FY 1980-81. In addition, over 1 million worker hours were lost for the same reason.

Compared with that of previous years, however, the situation was relatively better and improving steadily. The Government was making every effort to increase the generating capacity and to improve the reliability and distribution of the power that was available. The official installed capacity increased to 822 megawatts in June 1980 from 718 megawatts in November 1979.[3] New units were brought online and others were refurbished during 1981 bringing the new capacity even higher, assuming none of the older obsolescent plants were withdrawn from service.

Several new projects were under construction or in late stages of design at yearend 1981. A 50-megawatt unit was to go online at the Kaptai hydroelectric plant (also referred to as Karnaphuli) by yearend 1981. Its completion would bring the plant to a capacity of 130 megawatts.

The Government has signed an agreement with the U.S.S.R. for design and technical assistance worth about $75 million for a gas-fired 210-megawatt thermal station at Ghorasal, about 50 kilometers north of Dacca. The Ghorasal powerplant had a reported capacity of 110 megawatts. One Bangladesh newspaper stated that the U.S.S.R. had signed a similar agreement last year for the same sized unit at the same plant. A 210-megawatt unit would be the largest in the country, and it is doubtful if the Soviet technicians would attempt to erect and finance two such sophisticated units simultaneously. A second 210-megawatt unit may be planned but construction probably would not begin until the first unit was installed.

The United Kingdom was to finance an expansion of the Ashuganj powerplant, about 100 kilometers northeast of Dacca. The project is to be a 90-megawatt combined cycle powerplant. This type of plant uses a natural gas fueled gas turbine to turn the generator and a conventional boiler and turbogenerator powered by the hot exhaust gases from the gas turbine.

Coal-fired units of 110 megawatts at Khulna and 60 megawatts at Chittagong were reportedly under construction with Czechoslovakian aid.

To increase efficiency and lower the overall cost of generation, a foreign contractor was constructing a 239-kilovolt double circuit transmission line for the Government. It will interconnect the gas-fueled eastern transmission network with the oil- and coal-fueled western network. The line will initially operate at 132 kilowatts and will run 153 kilometers from Tongi to Ishurdi and cost about $100 million.

The Government continued the planning for a nuclear powerplant at Roopur in Pabna District. Apparently it has decided on a capacity of 300 megawatts. The French Technocatome reactor was reportedly favored over United States, Canadian, Swedish, or Soviet plants. The restraint was financing, which Bangladesh was requesting from friendly countries and international aid agencies.

The Ministry of Finance estimated exports for FY 1980-81 would hit $758 million. This would represent a 5.5% increase over that of FY 1979-80, but a realistic comparison was difficult because of the currency changes during the year. Minerals contributed no significant part in the export earnings (less than 0.01%). Jute, jute products, tea, leather, and seafood accounted for nearly all of the exports. The export target for FY 1981-82 was proposed at $803 million.

Again in FY 1980-81, the cost of imports far exceeded the value of the exports. Total imports were expected to be about $2,424 million. Raw materials, fuel, and manufactured goods were the major imports. Most of the widening trade deficit was expected to be met by foreign aid.

COMMODITY REVIEW

Japan, the Organization of Petroleum Exporting Countries, and the International Development Bank agreed to help Bangladesh develop the Bakhrabad Gasfield just southeast of the capital city of Dacca. The project-implementing authority will be the newly formed Government-owned Bakhrabad Gas Systems Ltd., a subsidiary of the Bangladesh Oil and Gas Corp. (Petrobangla).

Under the $164 million project, four production wells will be drilled, and the original exploration well will be completed for production as well. As a result of the agreement, the first production well was spudded in May 1981. In addition to the wells, the project includes the following: gas gathering and conditioning facilities; a 177-kilometer, 61-centimeter-diameter pipeline from Bakhrabad to Chittagong; a 60-kilometer distribution system in Chittagong; and a 16-kilometer branch line to a proposed urea fertilizer plant.

At the old Titas Gasfield, the fifth production well was completed in June 1981, bringing the field's production capacity to about 150 million cubic feet per day. Three additional new production wells were to be completed by 1984. The foreign exchange component of the expansion will be financed by a loan from the Asian Development Bank.

In April 1981, the Government commissioned the 30.5-centimeter-diameter, 58-kilometer pipeline connecting the Habiganj Gasfield with the Ashuganj Fertilizer and Chemical Co. The $13 million pipeline was built by the Titas Gas Transmission and Distribution Co., a subsidiary of Petrobangla. It will supply 50 million cubic feet of gas per day to the plant at peak load. A branch pipeline connects with the Titas Gasfield distribution network and will supplement the Titas network with an additional 70 million cubic feet of gas per day. The new Habiganj pipeline complements a 25.4-centimeter branch line already existing from the Titas network to the fertilizer plant.

In addition to the developments described above, Petrobangla has been engaged in a relatively ambitious program of exploration for additional gas reserves and the hope that there is oil in some of the gas-prone geologic structures.

Petrobangla has drilled the most exploration wells in Sylhet and Comilla Districts, but seismic surveys and other exploration were being done throughout the country.

To date, 13 locations have been referred to as gasfields in the Bangladesh press, and four are actually in production. Total reserves have been quoted over a wide range of figures, often on the basis of only one exploration well per field. Over 4.5 trillion cubic feet of gas were generally considered proved, and the figure could go up above 10 trillion if Petrobangla's prognostications turn out to be correct.

The country has consumed increasing amounts of natural gas each year since 1974. Despite the steady increase, the ratio of gas consumed to total recoverable reserves is one of the lowest in the world. On a global basis about 3% of known reserves are consumed each year. In Bangladesh, however, that figure is only 0.01% of the proved reserves.

Bangladesh has been slow to utilize this valuable resource mainly because of a lack of investment captial to develop the fields and distribution network, but also because of the limited number of industries in the country that need gas for their operations.

The Government has now given priority to the development of an expanded pipeline transmission system to bring the gas to market. Through increased exploitation and improved delivery, Dacca hopes to cut back its crude oil and petroleum product import bill by as much as 75% from its present $700 million per year.

Unlike the U.S. use of gas, very little consumption is by the domestic and commercial sectors. The breakdown of gas consumption during FY 1980-81 was as follows: electric power generation, 39%; fertilizer production, 35%; other industrial users, 16%; domestic customers, 7%; and commercial users, 3%. Power, fertilizers, and new industrial users will increase consumption a great deal in the next few years as new projects are completed and begin using relatively more of the natural gas resources.

Currently there is no gas service to the western section of the country, forcing that region to rely on expensive imported oil or coal. Petrobangla was planning a $300 million project to take gas across the Jamuna River, a distributary of the Brahmaputra River, to feed the northwestern region of the country. No starting date has been announced for this project, which would require financing from abroad.

During 1981, there was no progress on a proposal to build an export-oriented liquefied natural gas (LNG) plant or to sell natural gas to India via a large pipeline.

The most important development in the fertilizer industry during 1981 was the long delayed commissioning of the Ashuganj nitrogen fertilizer plant on December 7, 1981. The plant has a design capacity of 242,000 tons per year nitrogen content of urea and cost approximately $400 million. The plant was mainly financed by foreign aid.

Production of urea fertilizer, which was scheduled to increase during the year, was adversely affected by severe mechanical

problems late in 1981 at the old 156,000-ton-per-year nitrogen urea plant at Ghorasal. The urea shortfall had to be covered by increased fertilizer imports.

In a move to gain self-sufficiency in nitrogen fertilizer production, the Government has obtained financing for two ammonium-urea complexes to be located at Chittagong. They will be based on the natural gas reserves being developed at the Bakhrabad Gasfield and will each have a capacity of 262,000 tons per year nitrogen content of urea.

The first unit, with completion planned for yearend 1983, will be financed by the International Finance Corp. and by export credits from Sweden and Denmark. Swedyards Corp. of Sweden will prefabricate the plant, which will be floated to Chittagong for erection. The Karnaphuli Fertilizer Co. has been set up to operate the plant. Formal contracts are to be signed by June 1982. Output is intended for the export market.

The second unit, to be operated by Chittagong Urea Fertilizer Ltd., was expected to be completed 2 years later with output intended for the domestic market. Cost was estimated to be $467 million with the Asian Development Bank supplying most of the foreign exchange credit.

The state-owned Bangladesh Chemical Industries Corp. contracted with a Netherlands company for construction of triple superphosphate granulation equipment at its Chittagong phosphate plant. Construction was scheduled to begin in early 1982. The 25-ton-per-hour unit will be the first such equipment in the country. The plant currently produces fertilizer in powder form which allows a high rate of waste from blowing and from washing by rain.

Plans to build a direct-reduction steel plant at Chittagong made some headway during the year. Talks between the Bangladesh Government and a group of companies led by Metallurgical and Engineering Consultants (Indian Government owned) were reportedly in final stages near yearend.[4] The plant would have a design capacity of 660,000 tons per year and was estimated to cost $180 million. India would supply the iron ore under a 50% buyback arrangement. The Indian company would supply the equipment and construct the plant, while Austrian and Japanese members would provide the technical expertise and much of the capital.

Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities[1]

Area and commodity	1977	1978	1979	1980[p]	1981[e]
BANGLADESH[2]					
Cement, hydraulic[3] ---- metric tons	307,666	338,614	322,473	301,493	[4]344,830
Clays: Kaolin[3] ---- do	[r]4,120	[r]5,778	7,305	10,278	[4]9,825
Gas, natural, marketed[3 5] ---- million cubic feet	[r]32,360	34,294	39,265	45,364	[4]49,936
Iron and steel:[3]					
Crude steel (ingots only) ---- metric tons	107,715	116,916	126,371	137,557	[4]139,343
Mild steel products ---- do	138,140	138,277	200,415	169,327	[4]186,013
Nitrogen: N content of ammonia ---- do	107,100	105,100	167,132	139,361	150,000
Petroleum refinery products:					
Gasoline ---- thousand 42-gallon barrels	491	523	473	440	NA
Jet fuel ---- do	60	55	60	18	NA
Kerosine ---- do	2,021	2,289	2,529	2,499	NA
Distillate fuel oil ---- do	1,317	746	1,005	1,168	NA
Residual fuel oil ---- do	3,031	2,742	3,380	2,574	NA
Lubricants ---- do	209	--	--	--	NA
Naphtha ---- do	832	1,174	585	785	NA
Unspecified ---- do			267	312	NA
Refinery fuel and losses ---- do	375	278	[e]306	287	NA
Total ---- do	8,336	7,807	8,605	8,083	NA
Salt, marine[3] ---- metric tons	345,600	785,517	674,074	700,000	700,000
Stone: Limestone, industrial[3] ---- do	61,303	60,059	56,738	44,764	[4]37,943
BRUNEI[2]					
Gas, natural:					
Gross ---- million cubic feet	346,011	[e]342,000	344,000	386,900	342,000
Marketed ---- do	314,253	307,600	310,000	NA	NA

See footnotes at end of table.

Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities[1] —Continued

Area and commodity	1977	1978	1979	1980[p]	1981[e]
BRUNEI[2] —Continued					
Natural gas liquids:					
Condensate thousand 42-gallon barrels	3,062	[e]2,900	3,000	NA	NA
Natural gasoline do.	816	890	900	NA	NA
Liquefied petroleum gas do.	166	175	180	NA	NA
Total do.	4,044	[e]3,965	4,080	NA	NA
Petroleum:					
Crude do.	76,650	76,535	84,000	87,600	64,240
Refinery products:					
Gasoline do.	141	141	[e]150	NA	NA
Distillate fuel oil do.	219	219	[e]210	NA	NA
Residual fuel oil do.	1	1	[e]2	NA	NA
Other do.	32	32	[e]37	NA	NA
Refinery fuel and losses do.	1	1	[e]1	NA	NA
Total do.	394	394	[e]400	NA	NA
CHRISTMAS ISLAND[2]					
Phosphate rock thousand metric tons	1,186	[r]1,386	1,367	1,713	[4]1,423
HONG KONG[2]					
Cement, hydraulic do.	1,029	1,236	1,279	1,489	[4]1,503
Clays: Kaolin metric tons	2,466	25,655	2,841	748	[4]8,216
Feldspar do.	3,378	3,157	742	2,974	[4]194
Feldspar sand do.	--	--	--	12,964	[4]6,176
Iron and steel: Crude steel[e] do.	75,000	75,000	90,000	90,000	120,000
Quartz do.	2,063	665	2	12	--
KAMPUCHEA[e 2]					
Cement, hydraulic do.	50,000	10,000	--	--	--
Gold, mine output, metal content troy ounces	1,000	--	--	--	--
Salt metric tons	30,000	12,000	26,500	30,000	32,000
LAOS[e 2]					
Gypsum do.	--	--	--	[4]20,000	[4]40,500
Salt, rock do.	10,000	15,000	18,000	20,000	20,000
Tin, mine output, metal content do.	600	400	300	350	400
MONGOLIA[2 6]					
Cement, hydraulic thousand metric tons	100	166	183	178	180
Coal:					
Anthracite and bituminous[e] do.	240	250	250	250	250
Lignite and brown[e] do.	3,084	3,548	3,864	[r]4,126	4,350
Total do.	3,324	3,798	4,114	4,376	4,600
Copper, mine output, metal content metric tons	--	[e]4,000	21,700	44,000	[4]71,800
Fluorspar, all grades thousand metric tons	[e]320	455	567	580	[4]604
Gypsum do.	[e]28	[e]28	28	30	30
Lime, hydrated and quicklime do.	[e]50	36	46	50	50
Petroleum refinery products:[e 7]					
Kerosine thousand 42-gallon barrels	23	23	23	NA	NA
Residual fuel oil do.	20	20	20	NA	NA
Salt metric tons	[e]15,000	[e]15,000	15,000	15,000	15,000
NEPAL[8]					
Beryllium: Beryl, industrial-grade (10%-12% BeO) kilograms	777	320	120	140	[4]102
Cement, hydraulic metric tons	42,036	35,850	21,364	30,744	[4]30,574
Clay for cement manufacture do.	NA	3,000	4,000	4,000	[4]2,000
Coal: Lignite do.	1,956	1,700	37,530	3,461	[4]8,174
Copper ore:					
Gross weight do.	6	[e]35	--	6	[4]6
Cu content do.	[e]1	7	--	1	[4]2
Gem stones:					
Beryl kilograms	5	2	--	NA	NA
Garnet do.	29,600	12,000	4,000	[9]41,295	[4]105,925
Tourmaline do.	75	50	25	NA	[4]13
Lime, agricultural metric tons	NA	NA	10,054	10,000	10,000
Magnesite, crude do.	--	--	--	15,000	20,000
Salt do.	NA	7	7	8	[4]8
Stone:					
Limestone do.	54,391	50,000	62,400	32,400	[4]83,565
Marble:					
Chips do.	67	131	66	343	[4]366
Cut square meters	761	1,370	863	3,083	[4]3,561
Craggy cubic meters	NA	2,320	799	NA	[4]963
Talc metric tons	77	510	325	1,460	[4]71

See footnotes at end of table.

Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities[1] —Continued

Area and commodity	1977	1978	1979	1980[p]	1981[e]
SINGAPORE[2]					
Cement, hydraulic[e] thousand metric tons	1,350	1,350	1,350	[r]1,952	2,000
Iron and steel metal: Crude steel do	206	280	297	300	350
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	13,152	10,679	17,664	19,144	NA
Jet fuel do	21,194	35,970	31,221	32,914	NA
Kerosine do	21,173	18,094	20,322	20,610	NA
Distillate fuel oil do	51,189	59,775	62,304	63,321	NA
Residual fuel oil do	69,436	78,424	85,705	81,309	NA
Lubricants do	3,278	3,964	4,316	4,269	NA
Other do	28,110	33,131	35,538	30,453	NA
Refinery fuel and losses do	9,086	9,953	6,741	10,404	NA
Total do	216,618	249,990	263,811	262,424	NA
Stone: Granite, broken thousand cubic meters	2,572	2,235	2,507	3,185	[4]4,478
Sulfur, byproduct of petroleum metric tons	23,043	25,000	26,000	25,000	25,000
SRI LANKA					
Cement, hydraulic thousand metric tons	356	575	592	571	600
Clays:					
Ball clay metric tons	1,590	2,309	13,291	11,457	10,000
Kaolin do	5,182	5,541	5,870	6,614	7,000
Brick and tile clay do	132,621	86,000	[e]90,000	62,518	60,000
Clay for cement manufacture do	34,617	103,232	90,988	21,148	20,000
Feldspar, crude and ground do	3,679	3,160	3,790	3,955	4,000
Gem stones, precious and semiprecious, except diamond value, thousands	$28,828	$33,718	$31,919	$42,819	NA
Graphite, all grades metric tons	8,875	10,506	9,402	7,794	5,150
Iron and steel semimanufactures do	[e]28,000	[e]30,000	[e]30,000	NA	NA
Mica, scrap do	[e]100	140	369	145	200
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	858	1,098	782	910	NA
Jet fuel do	580	276	248	270	NA
Kerosine do	1,423	1,632	1,449	1,600	NA
Distillate fuel oil do	2,722	2,681	2,410	3,550	NA
Residual fuel oil do	3,608	3,646	3,563	4,800	NA
Other do	1,071	1,069	[e]1,100	1,450	NA
Refinery fuel and losses do	651	390	[e]387	520	NA
Total do	10,913	10,792	9,939	13,100	NA
Phosphate rock metric tons	--	--	9,063	5,000	5,000
Rare-earth metals: Monazite concentrate, gross weight do	[e]5	[r]213	213	63	60
Salt do	51,923	149,825	121,443	114,279	110,000
Sand, glass do	NA	[e]1,500	2,370	--	--
Stone:					
Limestone thousand metric tons	566	975	1,132	1,261	1,200
Quartz, massive metric tons	768	803	676	741	800
Titanium concentrates, gross weight:					
Ilmenite do	34,092	33,041	55,370	33,956	[4]80,011
Rutile do	978	11,497	14,675	12,789	[4]13,301
Zirconium: Zircon concentrate, gross weight do	[e]10	3,297	1,510	3,031	[4]3,266
VIETNAM[10]					
Cement, hydraulic thousand metric tons	845	843	729	641	650
Chromium: Chromite metric tons	[e]12,400	13,100	[e]14,000	15,000	15,000
Clays: Kaolin[e] do	1,000	1,100	1,200	1,250	1,250
Coal: Anthracite thousand metric tons	6,200	6,000	5,300	5,300	5,900
Gypsum[e] metric tons	12,000	13,600	14,000	15,000	15,000
Iron and steel metal:					
Ingot steel thousand metric tons	88	98	[e]110	120	110
Semimanufactures, rolled[e] do	40	50	[r]106	[r]62	65
Nitrogen: N content of ammonia[e] metric tons	10,000	20,000	25,000	NA	NA
Phosphate rock[e] do	1,500	1,800	400	500	550
Salt thousand metric tons	580	530	[e]525	520	500

See footnotes at end of table.

Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities[1] —Continued

Area and commodity	1977	1978	1979	1980[p]	1981[e]
VIETNAM[10] —Continued					
Tin:					
Mine output ____ metric tons	[e]250	[e]250	[e]200	370	550
Metal, smelter[e] ____ do	200	200	160	350	500
Zinc:					
Mine output, metal content[e] ____ do	10,000	8,000	6,000	6,500	6,000
Metal, smelter, primary[e] ____ do	9,000	7,200	5,400	5,500	5,500

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Aug. 16, 1982.

[2]In addition to the commodities listed, other crude construction materials such as sand and gravel and other varieties of stone presumably are produced, but available general information is inadequate to make reliable estimates of output levels.

[3]Data are for years ending June 30 of that stated.

[4]Reported figure.

[5]Gross production is not reported; the quantity vented, flared, or reinjected is believed to be negligible.

[6]In addition to the commodities listed in the body and footnote 2, molybdenum production was initiated in October 1978, but output is not reported and no basis is available for reliable estimates of output levels.

[7]As reported by Statistical Office of the United Nations in 1979 Yearbook of World Energy Statistics, p. 557.

[8]Data are for the Nepalese fiscal year ending mid-July of that stated.

[9]Figure includes both gem- and industrial-grade garnet; 4,295 kilograms gem quality and 37,000 kilograms industrial quality.

[10]In addition to the commodities listed, iron ore was mined in the past and pig iron was produced at industrial facilities, but the status of these industries under prevailing conditions is not sufficiently clear to allow formulation of reliable estimates of output levels. Similarly, data on output of crude construction materials are not available, and no basis is available to make reliable estimates of output levels.

BRUNEI[5]

Brunei, little known to the world's business community, is one of the world's smallest but wealthiest states. Brunei will become independent from Britain at the end of 1983 and is expected to become a member of the Association of Southeast Asian Nations (ASEAN) by the end of 1984.

The total area of the state is only 5,765 square kilometers bordering on the northern part of Malaysia's Sarawak Province, northwest of Indonesia's Kalimantan (Borneo). The area is 3% cultivated; 22%, industry, urban, pasture, and waste; and 75%, forested. In 1981, the population was estimated at 213,000. Among them, about 52% are native Malays; 24%, Chinese; and 23%, other ethnic minorities. The labor force of the private sector totaled about 32,200 persons, of which about 30.5% were in agriculture; 32.8% in industry, manufacturing, and construction; 33.8% in trade, transport, and service; and 2.9% in other.

Brunei's gross national product (GNP) at current dollars was estimated at about $1.9 billion in 1979.[6] Its per capita GNP was the highest among the Far East and South Asian countries. The Government of Brunei imposes no personal income tax on its residents. The wealthy status of Brunei was derived mainly from its rich oil and natural gas resources.

Brunei's economy is dominated by the oil and gas industry. Over the past years, Brunei's production of oil and natural gas has helped the state to accumulate about $9 billion in foreign reserves and a surplus revenue of $2.8 billion in 1981. The output of oil and natural gas accounted for 88% of Brunei's gross domestic product (GDP), and export earnings of oil and LNG were about 98% of Brunei's total export earnings.[7] In 1981, Brunei was the world's third largest LNG exporter following Indonesia and Algeria. The Government of Brunei, in an effort to control the inflation rate, was using surplus revenues to subsidize the cost of essential foodstuffs as well as gasoline. In addition, salaries and wages were being held steady by the Government, while no tax increases on public utilities were sought.

Brunei imported about 80% of its food requirements. It also imported most of the plant equipment, capital goods, and consumer goods. As a result, most of Brunei's inflation rate was caused by imported goods. In 1981, the inflation rate in Brunei was about 10%. Because of the reduced exports of oil and LNG owing to the lower oil prices, Brunei's real GDP in constant dollars declined 20.9% in 1981.[8]

According to the state financial officer, the export earnings from oil and gas were estimated at $3.5 billion for the state in 1981. Exports of crude oil and LNG were mainly to Japan, while Brunei's imports of foods, capital goods, and consumer goods were principally from Japan, the United States, the United Kingdom, and Singapore.

COMMODITY REVIEW

Petroleum and Natural Gas.—Brunei's production of crude oil and natural gas declined in 1981. The total output of crude oil averaged 176,000 barrels per day in 1981 compared with 240,000 barrels per day in 1980, while the output of natural gas also dropped from 1,060 million cubic feet per day in 1980 to 937 million cubic feet per day in 1981. The sharp drop in the output of oil in 1981 was partially owing to the world oil glut but was largely owing to a depletion policy implemented by the Government of Brunei and the oil producer to reconcile the level of oil production with the economic needs of the Government.

Production of crude oil in Brunei was by Brunei Shell Petroleum Co., Ltd. (BSP). To increase the ultimate recovery of Brunei's oil and gas resource as well as to accelerate its program of nonassociated gas production from the West Fields and the new Gannet Field, BSP has invested a total of about $518 million in 1981 compared with $340 million in 1980 and about $260 million in 1979. Of this total expenditure in 1981, $225 million was for operation and maintenance of the company's production system, and $293 million was for enhanced oil recovery projects in the Southwest Ampa, Seria, and Champion Fields. During 1981, the company also spent about $26 million on exploration and discovered only one new oil well called Ampa West. According to the latest estimates by BSP, Brunei's recoverable oil reserves are about 1.5 billion barrels.[9]

Brunei's production of LNG was by Brunei Liquefied Natural Gas Ltd. at Lumut using the natural gas produced from the fields of the Southwest Ampa, Seria, and Champion Seven offshore complex. Under a long-term contract, Brunei is committed to supplying to Japan about 5.1 million tons of LNG annually. The Japanese importers of Brunei's LNG are Tokyo Electric Power Co., Tokyo Gas Co., and Osaka Gas Co.

According to BSP officials, the company's output will be dominated by gas rather than oil for the coming years. This is because of a long-term commitment to supply LNG to Japan for a 20-year period. To meet this export commitment, the company was accelerating its development program on nonassociated gasfields offshore in the West Fields and the new Gannet Field.

Table 2.—Brunei: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS				
Aluminum metal including allloys, all forms	40	20	--	Malaysia 13; Singapore 7.
Copper metal including alloys, all forms	51	187	--	Malaysia 182.
Iron and steel:				
Scrap	4,020	6,533	--	Thailand 2,439; Singapore 1,544; Other Asia, n.e.s. 2,449.
Semimanufactures:				
Bars, rods, angles, shapes, sections	250	265	--	Malaysia 261.
Universals, plates, sheets	310	46	--	Malaysia 45.
Wire	5	8	--	All to Malaysia.
Tubes, pipes, fittings	1,182	2,051	--	Singapore 1,376; Malaysia 675.
Castings and forgings, rough	77	40	--	Malaysia 37.
Lead metal including alloys, all forms	--	13	--	Singapore 9; Malaysia 4.
Tin metal including alloys, all forms	(1)	7	--	Singapore 5.
Zinc metal including alloys, all forms	9	18	--	All to Malaysia.
Other: Nonferrous metal scrap	278	197	--	Singapore 177.
NONMETALS				
Abrasives: Grinding and polishing wheels and stones	2	(2)	--	All to Malaysia.
Cement	952	1,944	--	Do.
Clay products, nonrefractory[3]	28	31	--	Malaysia 20; Singapore 11.
Fertilizer materials:				
Crude:				
Phosphatic	--	2	--	All to Malaysia.
Potassic	--	3	--	Do.
Manufactured: Phosphatic	--	2	--	Do.
Ammonia	--	1	--	All to Singapore.
Salt	9	2	--	All to Malaysia.
Sodium compounds: Caustic soda	23	--	--	
Sulfur: Sulfuric acid	--	1	--	All to Malaysia.
Stone, sand and gravel:				
Dimension stone, worked	--	1	--	Do.
Gravel and crushed stone	408	204	--	Do.

See footnotes at end of table.

Table 2.—Brunei: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Sand excluding metal-bearing	--	17	--	All to Malaysia.
Other:				
Crude	125	1	--	NA.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	42	2	--	All to Malaysia.
MINERAL FUELS AND RELATED MATERIALS				
Gas, natural value, thousands	$570,862	$676,564	--	All to Japan.
Hydrogen and rare gases do.	$17	$38	--	Malaysia $37.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	82,148	89,761	9,521	Japan 54,437; Singapore 8,184; Republic of South Africa 4,844.
Refinery products:				
Gasoline do.	4,823	5,690	1,301	Japan 4,128.
Kerosine and white spirit do.	6	6	--	All to Malaysia.
Distillate fuel oil do.	4	2	--	Singapore 1.
Unspecified do.	7	9	--	Mainly to Malaysia.

NA Not available.
[1]Unreported quantity valued at $2,000.
[2]Unreported quantity valued at $1,000.
[3]Excludes unreported quantity valued at $13,000 in 1978 and $111,000 in 1979.

Table 3.—Brunei: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	2	2	--	Netherlands 1.
Metal including alloys, all forms	523	494	20	Japan 205; Singapore 161.
Copper metal including alloys, all forms	375	550	38	Singapore 402.
Iron and steel:				
Metal:				
Pig iron including cast iron, powder, shot	--	1	1	
Steel, primary forms	(1)	231	--	Hong Kong 128; Singapore 103.
Semimanufactures:				
Bars, rods, angles, shapes, sections	11,213	29,716	40	Japan 11,685; Singapore 3,978; China 2,916.
Universals, plates, sheets	4,023	2,944	40	Japan 1,487; Singapore 965; United Kingdom 148.
Hoop and strip	3	2	1	China 1.
Rails and accessories	3	163	--	Australia 112; Singapore 51.
Wire	623	620	67	Singapore 297; China 131.
Tubes, pipes, fittings	51,619	32,985	5,337	Japan 20,404; Singapore 2,804; West Germany 2,556.
Castings and forgings, rough	418	338	53	Singapore 89; Malaysia 44; United Kingdom 42.
Lead metal including alloys, all forms	62	49	NA	Singapore 22; Japan 10; United Kingdom 9.
Mercury value, thousands	$2	--		
Nickel metal including alloys, semimanufactures	49	21	10	Singapore 6; Japan 4.
Silver metal including alloys, unwrought and partly wrought value, thousands	--	$148	--	All from United Kingdom.
Tin metal including alloys, all forms	24	27	4	Japan 16.
Uranium ore and concentrate value, thousands	$6	$2	$2	
Zinc metal including alloys, all forms	29	7	2	Japan 3.
Other:				
Ash and residue containing nonferrous metals	264	315	--	All from Singapore.
Oxides, hydroxides, peroxides	184	38	1	Singapore 23; Netherlands 10.
Alkali, alkaline-earth, rare-earth metals	(2)	2	--	All from Singapore.

See footnotes at end of table.

Table 3.—Brunei: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	3	2	--	All from Singapore.
Grinding and polishing wheels and stones	7,710	6,248	1	United Kingdom 3,083; China 118; Singapore 1,063.
Cement	99,576	66,122	--	Japan 22,796; Philippines 10,516; Singapore 6,418.
Clays and clay products:				
Crude	618	1,412	914	Singapore 437.
Products:				
Nonrefractory[3]	3,543	3,236	--	China 1,739; Singapore 461; Malaysia 123.
Refractory	5	21	1	Singapore 16.
Diatomite and other infusorial earth	--	26	--	All from Singapore.
Fertilizer materials:				
Crude	986	196	6	West Germany 130; Singapore 31; Thailand 20.
Manufactured:				
Nitrogenous	259	585	--	West Germany 473; Japan 102.
Phosphatic	22	580	--	West Germany 279; Singapore 177; Japan 124.
Potassic	10	259	--	All from Zaire.
Other including mixed	4	31	2	Singapore 20.
Ammonia	28	13	2	Malaysia 5; Singapore 4.
Gypsum and plasters	91	33	9	Thailand 10; Australia 7.
Lime	41	27	--	Singapore 23.
Magnesite	356	--		
Mica:				
Crude including splittings and waste	11	94	13	Singapore 64; Netherlands 17.
Worked including agglomerated splittings value, thousands	--	$4	--	Austria $2; India $2.
Pigments, mineral:				
Crude	2	4	--	All from Singapore.
Iron oxides, processed	(4)	1	--	Mainly from Singapore.
Salt	1,026	556	--	Singapore 408; Thailand 130.
Sodium and potassium compounds:				
Caustic potash	13	16	--	Hong Kong 6; Singapore 6.
Caustic soda	262	144	--	Netherlands 100.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	374	1,093	--	Malaysia 1,089.
Worked	172	138	--	Singapore 121.
Dolomite, chiefly refractory-grade	26	10	--	All from Malaysia.
Gravel and crushed stone	11,884	29,786	2,584	Malaysia 23,885; Singapore 3,317.
Limestone excluding dimension	29	5	--	All from Singapore.
Sand excluding metal-bearing	443	1,546	1,273	Singapore 165.
Sulfur: Sulfuric acid	40	52	--	Singapore 46.
Other:				
Crude	11,698	1,679	--	Thailand 1,150; Singapore 442.
Slag, dross similar waste, not metal-bearing	4	5	--	All from Singapore.
Building materials of asphalt, asbestos and fiber cements, unfired non-metals	7,830	2,134	11	Singapore 1,483; Malaysia 567.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	10	55	--	All from Singapore.
Coal excluding briquets	10	--		
Coke and semicoke	2	--		
Hydrogen, helium, rare gases value, thousands	$58	$121	$25	Singapore $63; United Kingdom $32.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	289	310	--	All from Singapore.
Kerosine and jet fuel ---do---	(5)	(5)	--	Mainly from Australia.
Lubricants ---do---	24	25	(5)	Singapore 21.
Unspecified ---do---	6	6	(5)	Singapore 5.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals value, thousands	$4	$6	$1	Singapore $4.

NA Not available.
[1]Unreported quantity valued at $5,000.
[2]Unreported quantity valued at $1,000.
[3]Excludes unreported quantity valued at $15,000 in 1978 and $27,000 in 1979.
[4]Unreported quantity valued at $1,000.
[5]Less than 1/2 unit.

CHRISTMAS ISLAND[10]

Christmas Island is in the Indian Ocean. It is located 360 kilometers south of Java Head. The British Government sovereignty in the island was transferred to the Australian Government on October 1, 1958. The area of the island is only about 135 square kilometers. Estimated population in 1980 was 3,184. The population comprises Chinese, 1,834; Malays, 847; Europeans, 382; and others, 121.

The island's economy has been dominated for decades by the phosphate rock industry. Christmas Island was the second largest producer of phosphate rock in Asia, following China. Its output of phosphate rock accounted for 1% of the world's total in 1981. Production of phosphate rock was formerly by a shared operation between Australia and New Zealand, and the British Phosphate Commission. In 1981, a new company, the Phosphate Mining Co. of Christmas Island, was established to supersede the old British Phosphate Commission for mining and shipping the phosphate. New Zealand, reportedly, is to withdraw from the share operation, but will be allowed to import phosphate from Christmas Island in the future.

The output of phosphate ore peaked in 1974 with 1.8 million tons; since then the annual production has remained steady at about 1.3 to 1.4 million tons. The average P_2O_5 content of phosphate ore produced in 1981 was about 35.1%. In 1981, Christmas Island exported about 1.36 million tons of phosphate rock mainly to Australia and New Zealand. About 150,000 tons of phosphate dust was shipped to Malaysia and Singapore.

The Phosphate Mining Co. of Christmas Island reportedly was considering a $4.5 million[11] investment for further exploration of phosphate on the island. The phosphate reserves on the island were estimated to last for 7 more years at the current rate of production.[12]

Table 4.—Christmas Island: Exports of phosphate rock, by destination

(Thousand metric tons)

Destination	1979	1980
Australia	632	853
Indonesia		7
Malaysia	111	157
New Zealand	612	602
Singapore	5	19
Total	1,360	1,638

HONG KONG[13]

Economic performance of Hong Kong as measured by the growth in real GDP was strong and impressive in 1981. Its real GDP grew 10.4% in 1981 compared with 9.8% in 1980.[14] The accelerated growth in Hong Kong's economy in 1981 was stimulated mainly by a 10.5% expansion in domestic demand and by a 7.6% real growth in exports. However, Hong Kong's economy suffered a high inflation rate of 15.5% in 1980-81 compared with a 5% average inflation rate in the 1976-79 period.

Hong Kong's GDP in 1973 constant dollars was estimated at $12.5 billion in 1981 compared with $12.7 billion in 1980.[15] In 1981, the mining and quarrying industry contributed less than 0.1% to Hong Kong's GDP. Services and manufacturing remained the dominant sectors, contributing about 85% to the total output of the economy. In 1981, out of a 2.5 million labor force in Hong Kong, only 870 persons were engaged in mining and quarrying. The overall unemployment rate of Hong Kong was at a modest 4.3% in 1981 compared with 3.8% in 1980.[16]

Feldspar, kaolin, feldspar sand (derived from washing kaolin), and cement were the mineral products produced by the mining and quarrying industry in 1981. Opencast methods were used to mine feldspar and kaolin. Most of the feldspar was exported to Taiwan, while kaolin was consumed by local industries. Cement production was by Green Island Cement Co., Ltd., owned 27.6% by the Cheung Kong Holdings, Ltd.; and Hong Kong Cement Manufacturing Co., Ltd. Green Island Cement operated a cement plant at Kowloon Bay with an annual capacity of about 2 million tons. To boost cement output by 14%, the company was building new production facilities that were scheduled for completion by the first half of 1982. Hong Kong Cement operated a 220,000-ton-per-year grinding plant in Hong Kong. A 1.5-million-ton-per-year grinding plant near Tuen Mun, to be operated by

China Cement Corp., was scheduled to come onstream in September 1982. China Cement is owned 60% by Cheung Kong Holdings, 37% by Kaiser Cement Corp. of the United States, and 3% by Japan's Onoda Cement Co.

Hong Kong's steel production was by Shun Fung Iron Works, Ltd., at Junk Bay in Kowloon with an annual capacity of about 100,000 tons. Shiu Wing Steel, Ltd., and Fuji Marden & Co., Ltd., were also locally important steel producers. The annual rolled steel capacity of Shiu Wing Steel was about 29,000 tons; and Fuji Marden, about 10,000 tons. Scrap, pig iron, and steel ingots were imported from China and Taiwan for producing iron and steel manufactures in Hong Kong.

Hong Kong imported most of its requirements for raw materials and semimanufactures to support the export-oriented light and heavy industries. In 1981, Hong Kong's merchandise imports totaled about $25 billion, of which 51.0% was raw materials and food, 26.7% was manufactured consumer goods, 14.6% was plant and capital equipment, and 7.7% was petroleum and petroleum products. In 1981, Hong Kong's total exports including reexports were about $22 billion, of which 97.6% were manufactured goods, and 2.4% were food and agricultural products. Because of the slower growth in total earnings as a result of the worldwide economic recession, Hong Kong's deficit increased to $2.9 billion in 1981 from $2.7 billion in 1980.

Based on the total trade value, Japan, China, the United States, Taiwan, Singapore, and the United Kingdom were the major trading countries for Hong Kong's imports in 1981; while the United States, China, Japan, the Federal Republic of Germany, and the United Kingdom were the major trading countries for Hong Kong's domestic exports and reexports.

Table 5.—Hong Kong: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	8,760	17,440	--	Taiwan 14,825; Republic of Korea 1,300; Indonesia 964.
Oxides and hydroxides	1,396	2,576	--	Indonesia 1,939; Taiwan 500; Malaysia 52.
Metal including alloys, all forms	23,929	31,626	891	Japan 9,892; North Korea 4,382; Indonesia 2,142.
Arsenic: Trioxide, pentoxide, acid	7	38	--	Mainly to Vietnam.
Chromium oxides, hydroxides, acids	61	258	--	Indonesia 153; Taiwan 49; Republic of Korea 36.
Cobalt oxides and hydroxides	7	5	--	Taiwan 3; Singapore 2.
Copper:				
Sulfate	32	34	--	Indonesia 31; Singapore 2; Taiwan 1.
Oxides and hydroxides	3	4	--	All to Malaysia.
Metal including alloys, all forms	15,447	19,115	50	Japan 14,957; Taiwan 1,576; China 638.
Gold:				
Waste and sweepings value, thousands	$2,232	$1,258	$426	Japan $410; Switzerland $190; Italy $118.
Metal including alloys, unwrought and partly wrought, troy ounces	299,612	959,666	1,575	United Kingdom 542,832; Switzerland 157,217; Canada 101,243.
Iron and steel metal:				
Scrap	r344,285	329,649	--	Taiwan 278,689; Japan 27,857; Thailand 20,351.
Pig iron, cast iron, ferroalloys	1,418	594	100	Malaysia 162; Australia 80; Fiji 65.
Steel, primary forms	9,692	13,975	--	Philippines 7,649; Taiwan 5,840; Indonesia 486.
Semimanufactures	91,965	102,005	5	China 26,304; Indonesia 24,810; Macau 15,726.
Lead:				
Oxides and hydroxides	33	121	--	Mainly to Indonesia.
Metal including alloys, all forms	1,838	2,273	--	Taiwan 1,729; Japan 277; China 149.
Magnesium metal including alloys, all forms	140	93	--	North Korea 64; Japan 28.
Manganese:				
Ore and concentrate	--	295	--	All to Taiwan.
Oxides	74	500	50	Republic of South Africa 228; Israel 50; North Korea 50.
Mercury, 76-pound flasks	1	895	--	Republic of South Africa 550; India 265; Indonesia 80.

See footnotes at end of table.

Table 5.—Hong Kong: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Nickel:				
Oxides and hydroxides	38	59	--	Taiwan 33; Republic of Korea 14; Singapore 9.
Metal including alloys, all forms	1,830	2,546	--	North Korea 846; Taiwan 740; Japan 228.
Platinum-group metals:				
Waste and sweepings value, thousands	$585	$1,271	$34	United Kingdom $779; Switzerland $310; Australia $148.
Metal including alloys, unwrought and partly wrought troy ounces	19,483	14,178	--	Taiwan 6,237; Japan 4,212; Switzerland 2,058.
Silver:				
Waste and sweepings value, thousands	$13,210	$120,729	$1,629	United Kingdom $82,010; Switzerland $12,236; West Germany $11,721.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,455	1,974	310	United Kingdom 859; Switzerland 430; Belgium 74.
Tin:				
Oxides and hydroxides kilograms	--	881	--	North Korea 641; Taiwan 240.
Metal including alloys, all forms	1,818	2,405	255	Taiwan 738; China 414; Japan 212.
Titanium oxides and hydroxides	1,878	2,529	--	Indonesia 1,753; Taiwan 541; China 96.
Tungsten:				
Ore and concentrate	--	425	--	Republic of South Africa 310; United Kingdom 115.
Metal including alloys, all forms	3	2	--	United Kingdom 1.
Zinc:				
Oxides and hydroxides	89	31	--	Indonesia 8; Nigeria 8; Madagascar 7.
Metal including alloys, all forms	2,979	6,834	--	U.S.S.R. 2,003; Netherlands 1,104; Japan 974.
Other:				
Ash and residue containing nonferrous metals	540	737	(1)	China 493; Taiwan 196; Japan 47.
Oxides, hydroxides, peroxides	239	242	--	Republic of Korea 190; Republic of South Africa 51.
Metals:				
Metalloids	16	11	5	Indonesia 5; Thailand 1.
Base metals including alloys, all forms	909	888	209	Belgium 366; Republic of South Africa 108; North Korea 77.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	95	7	--	Indonesia 4; Japan 1; Malaysia 1.
Artificial: Corundum	440	188	--	Japan 169; Taiwan 10.
Dust and powder of precious and semiprecious stones value	$4,099	$61,298	$50,559	Taiwan $10,739.
Grinding and polishing wheels and stones	620	1,180	9	Indonesia 873; Nigeria 121; Philippines 44.
Asbestos, crude	1,844	8,492	--	United Arab Emirates 5,300; Indonesia 2,740; Republic of Korea 300.
Barite and witherite	98	679	--	Taiwan 492; Republic of Korea 141; Indonesia 45.
Boron materials: Oxide and acid	46	331	32	Philippines 200; Republic of Korea 85; Indonesia 9.
Cement	7,624	22,318	--	China 19,917; Macau 1,354; Vietnam 1,010.
Clays and clay products:				
Crude	59,968	78,748	150	Taiwan 63,625; Indonesia 10,494; Republic of Korea 3,700.
Products:				
Nonrefractory[2]	4,399	4,275	7	Macau 3,092; China 629.
Refractory including nonclay brick value, thousands	$801	$1,276	--	Indonesia $698; Nigeria $396; Philippines $63.
Diamond:				
Gem, not set or strung carats	371,004	292,034	35,338	Israel 59,079; Belgium 50,747; Japan 50,307.
Industrial do	12,355	26,102	4,275	Australia 8,954; China 5,000; Japan 3,000.
Diatomite and other infusorial earth	40	37	--	India 34; Taiwan 3.
Feldspar and fluorspar	13,249	15,406	--	Indonesia 10,495; Taiwan 4,893; Philippines 18.

See footnotes at end of table.

Table 5.—Hong Kong: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Fertilizer materials:				
Crude	805	738	6	Taiwan 535; Thailand 92; China 86.
Manufactured	32,306	43,586	4	China 35,973; Vietnam 5,253; Malaysia 1,604.
Ammonia	20	7	--	Vietnam 3; China 2.
Graphite, natural	817	161	--	Taiwan 128; Indonesia 17; Republic of Korea 14.
Gypsum and plasters	31,433	1,423	1	Indonesia 1,325; United Kingdom 77; Philippines 8.
Lime	47	39	--	Nigeria 25; Macau 10; China 4.
Magnesite	1,320	5,074	--	Taiwan 3,744; Nigeria 820; Indonesia 310.
Mica:				
Unworked including splittings and waste	104	36	--	Taiwan 34; Chile 1.
Worked including agglomerated splittings	27	15	(1)	China 4; Italy 3; Sweden 3; Sri Lanka 2.
Pigments, mineral:				
Natural, crude	260	476	--	Indonesia 456; Philippines 20.
Iron oxides, processed	696	299	--	Indonesia 284; Malaysia 6.
Precious and semiprecious stones excluding diamond:				
Natural value, thousands	$172,908	$143,740	$34,431	Japan $47,082; Singapore $29,238; Switzerland $10,508.
Synthetic and reconstructed do.	$1,508	$1,143	$432	Republic of Korea $171; Taiwan $143; Canada $71.
Salt and brine	52	21	--	Bahrain 18; China 2; Indonesia 1.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	5	170	--	Philippines 150; Taiwan 18; Indonesia 2.
Caustic soda	750	319	--	Philippines 129; China 56; Netherlands 53; Macau 41.
Soda ash	74	7,615	--	Indonesia 7,000; China 246; Taiwan 235.
Stone, sand and gravel:				
Dimension stone, crude and worked	3,043	2,520	13	Taiwan 1,286; Philippines 541; Indonesia 355.
Gravel and crushed rock	110	1,205	--	Indonesia 1,090; China 98; Nigeria 17.
Limestone excluding dimension	85	1	--	All to Canada.
Quartz and quartzite	668	224	--	Thailand 110; Ivory Coast 61; Nigeria 30.
Sand, not metal-bearing	16	48	--	Philippines 39; Republic of Korea 5; China 4.
Sulfur:				
Elemental, all forms	--	15	--	Macau 12; China 3.
Sulfuric acid	21	26	--	Indonesia 11; Philippines 6; China 3.
Talc, steatite, soapstone, pyrophyllite	8,908	5,302	--	Indonesia 4,166; Taiwan 910; Kampuchea 107.
Other:				
Crude	603	212	--	Taiwan 206; China 6.
Ash, slag, dross, not metal-bearing	--	3,400	--	All to Taiwan.
Halogens kilograms	--	281	--	Indonesia 126; Singapore 100.
Oxides, hydroxides, peroxides of strontium and barium	10	2	--	Mainly to Indonesia.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	653	473	--	Macau 228; Indonesia 102; China 66.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	373	23	--	All to Macau.
Carbon black and gas carbon	298	779	--	China 400; Indonesia 326; Singapore 51.
Coal, all grades including briquets	--	100	--	All to Macau.
Coke and semicoke	3	10	--	All to China.
Hydrogen, helium, rare gases value	$13,236	$14,532	--	Singapore $12,166; Vietnam $1,194; China $802.

See footnotes at end of table.

Table 5.—Hong Kong: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Gasoline				
thousand 42-gallon barrels	70	81	--	All to Macau.
Kerosine and jet fuel do.	151	16	--	Do.
Distillate fuel oil do.	430	271	--	Macau 178; North Korea 93.
Residual fuel oil do.	431	869	--	Macau 470; China 399.
Lubricants do.	265	207	1	Taiwan 74; Indonesia 52; China 13.
Mineral jelly and wax do.	23	37	--	Philippines 11; Madagascar 8; Singapore 8.
Liquefied petroleum gas do.	33	25	--	Mainly to Macau.
Unspecified do.	12	27	--	Indonesia 17; Macau 5; Republic of Korea 2.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	6	4	--	Thailand 3; Philippines 1.

[r] Revised.
[1] Less than 1/2 unit.
[2] Excludes unreported quantity valued at $137,749 in 1979 and $352,364 in 1980.

Table 6.—Hong Kong: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	9,400	15,092	102	China 14,987.
Oxides and hydroxides	1,665	3,079	128	China 2,622; Japan 184; West Germany 146.
Metal including alloys, all forms	45,633	61,780	10,128	Canada 9,116; New Zealand 8,575; China 6,885.
Arsenic:				
Sulfides, natural	--	1	--	All from China.
Trioxide, pentoxide, acid	18	46	--	France 43; China 3.
Chromium:				
Ore and concentrate	--	5	--	All from Italy.
Oxides, hydroxides, acids	447	706	163	West Germany 291; China 151; Japan 64.
Cobalt oxides and hydroxides	18	18	--	China 9; United Kingdom 5; Belgium 4.
Copper:				
Sulfate	229	112	3	United Kingdom 49; China 36; France 18.
Oxides and hydroxides	181	167	29	West Germany 103; United Kingdom 18.
Metal including alloys, all forms	37,734	47,210	2,335	Japan 32,732; China 5,718; Taiwan 3,148.
Gold:				
Waste and sweepings				
value, thousands	$1	$1,290	$490	Papua New Guinea $693; Taiwan $93; Malaysia $8.
Metal including alloys, unwrought and partly wrought				
thousand troy ounces	3,395	1,153	16	Singapore 360; Switzerland 347; United Kingdom 305.
Iron and steel:				
Scrap	105,260	93,297	2,690	Japan 72,410; United Kingdom 5,031; Macau 4,140.
Pig iron, ferroalloys, similar materials	22,247	21,205	246	China 11,318; Australia 2,986; Japan 2,419; North Korea 2,407.
Steel, primary forms	257,267	156,083	52,524	Austria 52,487; Spain 30,400; Taiwan 8,219; China 4,421.
Semimanufactures thousand tons	1,214	1,496	17	Japan 770; China 200; Taiwan 163.

Table 6.—Hong Kong: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides and hydroxides	284	308	17	China 155; West Germany 72; Australia 38.
Metal including alloys, all forms	2,441	2,745	109	Canada 781; Taiwan 749; North Korea 512.
Magnesium metal including alloys, all forms	88	51	45	Canada 5.
Manganese:				
Ore and concentrate	1,000	374	--	China 265; Thailand 109.
Oxides and hydroxides	2,939	2,558	--	China 1,630; Japan 531; Singapore 360.
Mercury 76-pound flasks	2,153	2,660	(1)	China 2,586; Singapore 62.
Nickel:				
Oxides and hydroxides	82	254	--	Canada 193; Netherlands 45; France 12; China 4.
Metal including alloys, all forms	2,864	3,978	77	Canada 2,539; Republic of South Africa 477; Norway 295.
Platinum-group metals:				
Waste and sweepings value	$38,802	--		
Metals including alloys, all forms troy ounces	64,141	49,641	1,608	United Kingdom 14,146; West Germany 11,510; Australia 5,048.
Silver:				
Waste and sweepings value, thousands	$1,299	$142	$31	Taiwan $89; India $18.
Metal including alloys, unwrought and partly wrought thousand troy ounces	850	1,353	8	Thailand 785; Singapore 134; Australia 106.
Tantalum metal including alloys, unwrought kilograms	--	20	--	All from China.
Tin metal including alloys, all forms	2,416	2,065	24	Malaysia 1,118; China 634; Singapore 153.
Titanium:				
Ore and concentrate[2]	141	481	27	Australia 382; Japan 51; Singapore 21.
Oxides and hydroxides	6,077	5,406	719	Japan 1,968; United Kingdom 617; Australia 564.
Tungsten:				
Ore and concentrate	--	425	--	All from China.
Metal including alloys, all forms	4	4	1	Japan 1.
Uranium and thorium compounds	4	6	1	France 5.
Zinc:				
Oxides and hydroxides	688	470	7	West Germany 113; Canada 108; China 78; France 78.
Metal including alloys, all forms	27,874	29,962	42	Australia 17,438; North Korea 7,772; Canada 2,010.
Other:				
Ash and residue containing nonferrous metals	440	60	(1)	China 59.
Oxides, hydroxides, peroxides	287	273	2	China 257; Japan 9.
Metals:				
Metalloids	60	34	3	China 30.
Base metals including alloys, all forms	1,239	1,253	60	China 288; Malaysia 236; Philippines 165; Taiwan 143.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	666	1,396	400	Japan 484; China 421; Italy 75.
Artificial: Corundum	506	305	48	India 169; West Germany 48; China 20; Japan 19.
Dust and powder of precious and semiprecious stones value	$16,975	$150,977	$13,885	Japan $104,947; Belgium $13,055; United Kingdom $6,732.
Grinding and polishing wheels and stones	2,696	2,405	44	China 1,333; Japan 561; Taiwan 292.
Asbestos, crude	1,844	8,776	--	Australia 5,800; China 2,779; Canada 177.
Barite and witherite	335	1,169	--	China 662; Taiwan 367; United Kingdom 80.
Boron materials: Oxide and acid	307	242	120	China 118; United Kingdom 2.
Cement thousand tons	2,575	3,220	(1)	Japan 1,080; China 843; Republic of Korea 794.

See footnotes at end of table.

Table 6.—Hong Kong: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products:				
Crude	50,613	89,499	1,370	China 72,336; Japan 9,888; Macau 4,530.
Products, nonrefractory and refractory including nonclay refractory brick value, thousands	$44,646	$63,311	$346	Italy $17,947; China $16,976; Japan $9,732.
Cryolite and chiolite	11	9	--	All from Denmark.
Diamond:				
Gem, not set or strung thousand carats	1,055	1,291	73	India 499; Israel 323; Belgium 158.
Industrial do	57	145	--	Australia 82; Belgium 37; Japan 23.
Diatomite and other infusorial earth	242	364	362	Singapore 2.
Feldspar and fluorspar	13,838	16,373	--	China 15,213; Indonesia 600; Japan 300.
Fertilizer materials:				
Crude	1,269	1,020	12	China 705; Canada 102; Belgium 54.
Manufactured:				
Nitrogenous	56,166	37,066	75	Republic of Korea 25,800; Japan 6,234; West Germany 3,784.
Other including mixed	8,039	8,454	43	West Germany 6,876; United Kingdom 893; Taiwan 420.
Ammonia	1,032	1,029	8	Japan 700; China 253; United Kingdom 36.
Graphite, natural	1,325	214	22	Sri Lanka 100; China 90; Switzerland 2.
Gypsum and plasters	132,726	86,119	45	West Germany 36,776; Japan 21,139; United Kingdom 19,829.
Lime	45,611	29,858	--	China 24,834; Taiwan 4,815.
Magnesite	2,672	8,493	1	China 7,500; Japan 825; Austria 102.
Mica:				
Crude including splittings and waste	65	31	--	India 21; United Kingdom 5; Republic of South Africa 4.
Worked including agglomerated splittings	520	437	4	Japan 405; India 11; Belgium 9.
Pigments, mineral:				
Natural crude	288	475	--	China 466; United Kingdom 8.
Iron oxides, processed	1,675	997	105	Japan 465; China 202; West Germany 126.
Precious and semiprecious stones excluding diamond:				
Natural value, thousands	$79,447	$97,901	$7,942	Singapore $27,072; Thailand $19,471; Sri Lanka $7,791.
Synthetic do	r$3,982	$4,028	$889	Japan $1,156; West Germany $1,032; Panama $251.
Salt and brine	73,207	73,410	30	China 52,500; Taiwan 9,900; Thailand 3,659.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	141	316	6	China 182; West Germany 49; Italy 36.
Caustic soda	17,066	20,284	743	China 7,268; United Kingdom 3,229; Republic of Korea 3,002.
Soda ash	25,932	29,126	712	East Germany 8,978; Japan 8,480; Kenya 4,217; China 3,221.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,328	2,765	--	China 1,928; Italy 402; Pakistan 225.
Worked	15,745	21,699	10	Italy 13,345; China 4,524; Taiwan 1,120.
Dolomite, chiefly refractory-grade	10	210	--	All from Taiwan.
Gravel and crushed rock	186,889	162,788	123	Macau 150,547; China 9,716; Japan 1,140.
Limestone except dimension	35,813	136,634	--	China 130,485; Japan 5,979; Taiwan 170.
Quartz and quartzite	2,130	2,475	--	China 2,350; Belgium 47; West Germany 35.
Sand excluding metal-bearing thousand tons	1,239	1,196	5	China 1,188.
Sulfur:				
Elemental, all forms	1,123	1,213	--	Japan 1,000; West Germany 177; Taiwan 35.
Sulfuric acid	3,006	2,692	17	Taiwan 1,471; China 932; West Germany 98.
Talc, steatite, soapstone, pyrophyllite	10,793	7,488	193	China 6,955; Norway 100; Taiwan 100.

See footnotes at end of table.

Table 6.—Hong Kong: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Other:				
Crude:				
Meerschaum, amber, jet	--	2	--	All from Burma.
Unspecified	9,960	7,428	78	China 7,144; Republic of South Africa 125.
Slag, dross, similar wastes, not metal-bearing	929	689	--	China 407; Macau 145; Thailand 91.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	5	9	2	Japan 7.
Halogens	(1)	1	(1)	Mainly from Japan.
Building materials of asphalt, asbestos and fiber cements, unfired non-metals	19,683	18,787	1,307	United Kingdom 6,671; China 3,496; Australia 1,847.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,215	576	23	Republic of Korea 390; Taiwan 100; United Kingdom 53.
Carbon black and gas carbon	1,360	749	99	China 205; Japan 191; France 173.
Coal, all grades including briquets	5,814	2,851	10	China 1,445; Vietnam 1,000; Japan 387.
Coke and semicoke	6,749	5,571	--	Japan 4,646; Taiwan 601; United Kingdom 324.
Hydrogen, helium, rare gases value, thousands	$274	$263	$6	Japan $81; Singapore $70; Republic of South Africa $52.
Petroleum refinery products:				
Gasoline including natural thousand 42-gallon barrels	1,605	1,707	--	Singapore 1,279; China 411; Bahrain 17.
Kerosine and jet fuel do	6,878	6,752	(1)	Singapore 4,480; China 2,110.
Distillate fuel oil do	9,419	8,470	--	China 5,603; Singapore 2,655; Australia 153.
Residual fuel oil do	26,393	27,904	--	Singapore 23,751; China 1,928; Iran 1,037.
Lubricants do	r568	505	52	Japan 181; Singapore 123; China 65.
Mineral jelly and wax do	126	110	4	China 93; Japan 7.
Other:				
Liquefied petroleum gas do	1,252	1,224	--	Singapore 783; Taiwan 183; Japan 156.
Bitumen and other residues do	136	178	3	Singapore 127; China 22; Republic of Korea 21.
Unspecified do	2	40	1	China 32; Japan 4.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	878	1,672	98	China 1,285; Japan 178; United Kingdom 83; Denmark 28.

rRevised.
1Less than 1/2 unit.
2Includes ores and concentrates of vanadium and columbium (niobium).

KAMPUCHEA[17]

Kampuchea had no significant mineral production during 1981, and given the prevailing political, economic, and military situation, there was little likelihood of major development for several years to come.

Except for the main urban center of Phnom Penh and a few other provincial centers, the economic system of the country was reduced to subsistence agriculture and barter.

Military conflict continued with sufficient frequency and vehemence to preclude any realistic plans for industrial rebuilding or the undertaking of new projects of any significant importance.

The goals for 1982 set forth by the Government reflected almost total lack of industrial or mineral production. The only nonagricultural items even mentioned were a planned catch of 60,000 tons of fish, restoration of 1,000 weaving looms, the transport of 385,000 tons of goods, and the generation of 114 million kilowatt-hours of power. The electric power plan for the entire country would equate to one powerplant of 20,000 to 25,000 kilowatts, operat-

ing at normal power factors.

The most significant mineral production may have been salt. In the first quarter of 1981, 10,700 tons of salt was produced, mostly from the evaporation pans in Kampot Province. Yearly production probably increased over the 1980 output.

One small phosphate plant was reported operational in 1981. This was the Mongkol Borei grinding plant, which had produced 700 tons of fertilizer by midyear. The plant grinds the phosphate ore for direct application to crops.

There was a small gem stone mining industry along the Thai-Kampuchea border where it meets the Gulf of Thailand. People from Thailand reportedly were crossing the border to dig for rubies in a gravel deposit. The practice was discouraged in October when a reported 30 Thai gem stone miners were killed by Vietnamese troops.

Some local production of construction materials was underway, but no estimates of production were available.

NORTH KOREA[18]

During 1961-80, Pyongyang claimed that industrial output grew at an average annual rate of 14.5% while output had jumped to 15% to 17% for the 1978-80 period. Based on projections for the 1981 budget, overall economic growth for 1981 was expected to be about 7% compared with an estimated rate of growth of 9.5% for 1980. In the first 3 years of the current economic plan, most of the objectives for industrial construction were completed. By the end of the plan period, there was to be annual production of 56 to 60 billion kilowatt-hours of electricity, 70 to 80 million tons of coal, 16 million tons of iron ore, 7.4 to 8.0 million tons of steel, 1.0 million tons of nonferrous metals, 12 to 13 million tons of cement, and 5 million tons of chemical fertilizers.[19]

The Government of North Korea has never published figures on mineral output; thus, all figures published by the U.S. Bureau of Mines and other organizations concerned with world mineral production are estimates and should generally be regarded as indicative only of the order of magnitude of production of the commodities, not as precisely computed estimates. Estimates for 1977-80 are unaltered from those published in the 1980 edition of this chapter except as noted in the following summary of 1981 production levels; the figures presented are in thousand metric tons unless otherwise specified: aluminum, primary ingot—10; cadmium, smelter output (metric tons)—150; copper, mine output, metal content—15; copper, smelter, primary and secondary—18; copper, refined, primary and secondary—22; gold, mine output, metal content (troy ounces)—160,000; iron ore, marketable, gross weight—8,000 (iron content, 3,200); pig iron—3,000; ferroalloys—120; crude steel—3,500; steel semimanufactures—3,300; silver, mine output, metal content (troy ounces)—1,550,000 (1980 revised to 1,600,000); tungsten, mine output, metal content (metric tons)—2,200; zinc, mine output, metal content—140; zinc, primary metal—120; barite—110; cement—8,000; fluorspar—40; graphite—25; lime—400; magnesite, crude—1,900; magnesite, calcined—800 (1980 revised to 800); nitrogen content of ammonia—450; phosphate rock—550; pyrites—620; salt—570; sulfur—265 (including 255 from pyrites and 10 from metallurgical byproduct); talc—170; coal—45,000 (including 36,000 anthracite, 8,800 bituminous, and 200 lignite); coke—3,000.

North Korea's leading mineral commodity mined is coal, mostly anthracite. The leading metal ore mined is magnetite. Kim Chaek is the largest iron and steel works in North Korea. The country is a significant producer of lead and zinc from mine ore and refined metal from smelters at Munpyong and Nampo. Mine production of magnesite is of world significance. Barite, mined from several locations in the western part of the country, has been exported on a long-term barter basis. Status of a 20,000-ton-per-year aluminum reduction plant installed in the 1970's remains unknown. Official data on mineral and metal production in North Korea are not available from the Pyongyang Government.[20]

The Pyongyang Government does not disseminate trade transaction data. The country's trade data were constructed from data published by North Korea's trading partners that publicly distribute their own trade information.

North Korea's foreign trade was estimated to be as follows, in million dollars:

	Exports	Imports
1970	315	395
1971	316	552
1972	386	617
1973	482	779
1974	700	1,300
1975	755	1,075
1976	555	825
1977	675	781
1978	1,027	950
1979	1,270	1,300

Starting in the mid-1970's, Pyongyang became delinquent in loan payments for plant purchases and, in some cases, was simply unable to make payments. Negotiations with creditors deferred repayment of the outstanding debts to 1983-84, with current installments covering only those loans in arrears and the interest. The country's biggest problem was to earn foreign currency to meet its obligations. In addition, Government trade representatives reportedly have approached foreign companies on setting up joint ventures in North Korea in return for a portion of the goods manufactured.[21]

To attain the output goals of the current economic plan, the Government continued the education and training of personnel in geologic expertise to insure prospecting for expanding the country's mineral reserve base, to discover new mineral deposits, and to develop new mining operations. Special efforts were to be directed to find deposits of metal ores necessary for the iron and steel industry.

Musan iron ore mines, one of the largest iron mines in North Korea, was being expanded to an annual output of 10 million tons. Experimental blasting techniques were being employed at the time to remove overburden to expose the underlying ore body. A long-distance belt-conveyor transport line was constructed, and a new ore dressing plant installed, raising ore dressing capacity 60%.

By 1984, Government plans called for an annual steel output of 7.4 to 8.0 million tons, later to be expanded by the end of the decade to 15 million tons. North Korea's largest integrated steel works are Kim Chaek and Hwanghae. Kim Chaek has two 1,000-cubic-meter blast furnaces and one 1,500-cubic-meter blast furnace. The No. 2 blast furnace was being enlarged to 1,500 cubic meters. Remodeling of the sintering furnace and modernization of the chemical shop was in progress. Conservation techniques were introduced at Kim Chaek to reduce coke consumption and overall fuel consumption. Hwanghae has three 1,000-cubic-meter blast furnaces; overhaul of furnaces Nos. 2 and 3 were completed in 1981. Production of thick plate was increased 1.3 times by changes to the rolling process. Quality control in the thin plate and wire shops raised the product utilization rate. Also, adjustments in the heating cycle reportedly reduced coke consumption per ton of steel produced while raising the fuel utilization level.

The Government's planned objective by the mid-1980's was to produce 1.5 million tons of nonferrous metals annually. North Korea was a prominent producer of lead and zinc; Komdok Mine in Tanchan was the country's largest producer. Both ore and concentrates and refined metals have been exported. Because of higher values, increased tonnages of lead and zinc metal have been exported more recently rather than concentrate. Smelter-refining facilities at Hamhung, Munchon, and Nampo produce lead and zinc metals as well as copper. Additional copper smelter facilities were at Haeju and Tanchon.

The 1984 target for annual cement production was projected at 12 to 13 million tons, which was to be expanded to 20 million tons by the end of the decade. North Korea's largest cement plants were at Chonnaeri, Madong, and Sunchon. Construction of a new plant using modern calcining technology was nearing completion. Size of plant and location were not disclosed.

The Government's target for chemical fertilizer output was projected at 5 million tons per year by 1984. Hungnam Combined Fertilizer Enterprise was the largest producer in North Korea, producing primarily nitrogenous and phosphatic fertilizers.

Lacking oil and natural gas, North Korea had coal as its chief fuel source. The country has coal resources estimated at nearly 10 billion tons; anthracite comprises 70% of the country's resources. The largest anthracite deposit, identified as the Northern Coalfield, is in South Pyongan Province, while 70% of the lignite occurrence is in the east coast district, North Hamgyong Province.

Lignite production was from wholly mechanized mines, while anthracite mines were mechanized to the extent of about 40% to 50%. The mines around Anju in the western coalfield account annually for

about 15 million tons of total production. Numerous small mines account for 20 million tons, and the remainder from mines with annual output capacity over 21 million tons in South Pyongan, North Hwanghae, North Hamgyong, South Hamgyong, and Kowon. Most of the country's output was for domestic consumption; however, some coal was exported. The bulk of the coal consumed was for steam generation and space heating.

The 1984 target output for coal was 70 to 80 million tons, to be increased to 120 million tons by 1989. To attain these goals, Government allocations to the coal sector increased 22% in 1978, 33.3% in 1979, 30% in 1980, and 25% in 1981. During this time, the mining complexes particularly at Anju, Sunchon, Tokchon, and Kujang were expanded, construction of a large colliery at Inpo was completed, and several new coal mines were commissioned.

Table 7.—North Korea: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	--	7	--	All to Italy.
Unwrought	--	73	--	All to Saudi Arabia.
Semimanufactures	316	2,706	--	Do.
Cadmium metal including alloys, all forms	83	55	--	All to West Germany.
Copper metal including alloys:				
Scrap	--	79	--	Do.
Unwrought	23	5	--	All to Japan.
Semimanufactures	11	5	--	All to Saudi Arabia.
Iron and steel:				
Scrap	62	1,727	--	All to Indonesia.
Pig iron, cast iron, powder, shot	51,508	66,018	--	Japan 49,349; Saudi Arabia 14,262.
Ferroalloys	3,117	7,118	--	U.S.S.R. 5,613; Japan 1,505.
Steel, primary forms	113,709	82,947	--	Greece 32,914; Thailand 29,083; Indonesia 13,584.
Semimanufactures:				
Bars, rods, angles, shapes, sections	39,149	92,256	--	Saudi Arabia 90,481; Singapore 655; Colombia 550.
Universals, plates, sheets	41,492	62,782	--	Japan 34,431; Hong Kong 8,691; Dominican Republic 5,793.
Hoop and strip	80	200	--	Sri Lanka 151; Indonesia 30; Saudi Arabia 12.
Rails and accessories	998	1	--	All to Saudi Arabia.
Wire	2,566	1,929	--	Saudi Arabia 1,769; Sri Lanka 100.
Tubes, pipes, fittings	17,398	[2]16,756	--	Saudi Arabia 15,212; Hungary 962; Dominican Republic 522.
Castings and forgings, rough	1,498	180	--	Saudi Arabia 125; Sweden 55.
Lead metal including alloys:				
Scrap	682	NA	--	NA.
Unwrought	27,355	40,719	--	Japan 22,485; West Germany 8,883; France 4,486.
Semimanufactures	4	NA	--	NA.
Silver metal including alloys, unwrought and partly wrought value, thousands	$34,099	$58,373	--	West Germany $49,573; Italy $8,783.
Tin metal including alloys, semimanufactures	--	10	--	All to Indonesia.
Tungsten metal including alloys, all forms	--	1	--	All to Japan.
Zinc:				
Ore and concentrate	64,704	54,488	--	Japan 50,717; Yugoslavia 3,771.
Metal including alloys, unwrought	51,511	49,247	--	Japan 32,110; Hong Kong 7,772; France 4,574.
Other, n.e.s.:				
Ash and residue containing nonferrous metals	4,068	4,955	--	Japan 4,835; Spain 120.
Oxides, hydroxides, peroxides	--	13	--	All to Japan.
NONMETALS				
Abrasives: Grinding and polishing wheels and stones	26	42	--	All to Saudi Arabia.
Barite and witherite	9,521	3,842	--	All to Algeria.
Cement	304,264	571,587	--	U.S.S.R. 481,000; Saudi Arabia 45,227; Hong Kong 24,233.

See footnotes at end of table.

Table 7.—North Korea: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Clays and clay products:				
Crude:				
Chamotte earth	--	189	--	All to Hungary.
Kaolin	26,400	20,100	--	All to Japan.
Other, unspecified	101	64	--	West Germany 63.
Products:				
Nonrefractory	313	136	--	Saudi Arabia 120; Sweden 12.
Refractory	754	(3)	--	All to Malta.
Diamond:				
Gem, not set or strung value, thousands	--	$18	--	All to Spain.
Industrial do	$43	NA	--	NA.
Feldspar, fluorspar, etc	3,561	7,899	--	All to Poland.
Fertilizer materials, manufactured:				
Nitrogenous	26,815	26,004	--	U.S.S.R. 20,469; Singapore 5,505.
Other including mixed	2	500	--	All to Malta.
Graphite, natural	24,478	10,684	--	Japan 8,926; Austria 1,758.
Gypsum and plasters	102	NA	--	NA.
Lime	299	NA	--	NA.
Magnesite including powder	757,787	793,955	--	U.S.S.R. 500,608; Poland 141,641; Japan 105,323.
Precious and semiprecious stones:				
Natural value, thousands	$12	$84	--	Singapore $82.
Synthetic do	--	$1	--	All to Japan.
Pyrites, unroasted	15	NA	--	NA.
Salt and brine	58	113	--	All to Saudi Arabia.
Sodium and potassium compounds, caustic soda	--	252	--	Indonesia 250.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	11,573	9,559	--	All to Japan.
Worked	172	63	--	All to Saudi Arabia.
Dolomite, chiefly refractory-grade	--	300	--	All to Indonesia.
Gravel and crushed rock	3,038	192	--	All to Japan.
Quartz and quartzite	1,565	1,833	--	Do.
Sand excluding metal-bearing	--	2	--	All to Saudi Arabia.
Sulfur, elemental, other than colloidal	--	100	--	All to Indonesia.
Talc and steatite	74,546	45,210	--	Japan 33,538; Poland 11,672.
Other, n.e.s.:				
Crude	1,000	3,500	--	Hungary 2,000; Japan 1,500.
Slag, dross, similar waste, not metal-bearing	--	5	--	All to Saudi Arabia.
MINERAL FUELS AND RELATED MATERIALS				
Coal, anthracite and bituminous	56,782	100,233	--	Japan 100,223.
Petroleum refinery products:				
Kerosine and jet fuel 42-gallon barrels	132	NA	--	NA.
Residual fuel oil do	--	130,389	--	All to Japan.
Lubricants do	147	1,274	--	All to Saudi Arabia.
Other:				
Liquefied petroleum gas do	35	NA	--	NA.
Bitumen and other residues do	1,297	NA	--	NA.
Bituminous mixtures do	418	NA	--	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	182	602	--	All to Japan.

[p]Preliminary. NA Not available.

[1]Owing to a lack of official trade data published by North Korea, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2]Excludes part of Canadian imports valued at $137,000.

[3]Reported value of imports by Malta was $33,000.

Table 8.—North Korea: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	2	11	--	All from Japan.
Metal including alloys:				
Unwrought	810	2,158	--	Hungary 1,204; Singapore 531; Yugoslavia 423.
Semimanufactures	493	704	--	Japan 548; Austria 109.
Antimony metal, elemental	2	NA	--	NA.
Chromium:				
Chromite	7,000	19,426	--	U.S.S.R. 15,000; Japan 4,426.
Oxides and hydroxides	70	37	--	All from Japan.
Cobalt:				
Oxides and hydroxides	25	1	--	Do.
Metal including alloys, all forms	2	4	--	Singapore 3; France 1.
Copper:				
Ore and concentrate	4,307	7,702	--	All from Philippines.
Matte	110	NA	--	NA.
Metal including alloys:				
Scrap	83	NA	--	NA.
Semimanufactures	187	59	--	Japan 53; Switzerland 6.
Iron and steel:				
Ore and concentrate	--	111,246	--	All from Brazil.
Metal:				
Pig iron, cast iron, powder, shot	--	11,011	--	Indonesia 11,000.
Ferroalloys	5,409	11,505	--	Japan 11,376.
Steel, primary forms	--	65	--	All from Japan.
Semimanufactures:				
Bars, rods, angles, shapes, sections	3,351	[2]15,310	--	Japan 7,820;[2] Italy 7,380.
Universals, plates, sheets	19,776	17,733	--	Japan 17,722.
Hoop and strip	117	[3]148	--	All from Japan.[3]
Rails and accessories	932	4,956	--	Do.
Wire	1,049	[4]100	--	Japan 53;[4] Austria 47.
Tubes, pipes, fittings	6,833	10,521	--	Japan 9,749; West Germany 351; Singapore 207.
Lead metal including alloys:				
Unwrought	--	[5]50	--	All from Mexico.
Semimanufactures	149	4	--	All from Japan.
Magnesium metal including alloys:				
Unwrought	12	30	--	Do.
Semimanufactures	157	NA	--	NA.
Manganese:				
Ore and concentrate	21,000	29,100	--	U.S.S.R. 29,000.
Oxides and hydroxides	252	350	--	Singapore 250; Japan 100.
Molybdenum:				
Ore and concentrate	--	43	--	All from Singapore.
Metal including alloys, all forms kilograms	--	284	--	All from Japan.
Nickel:				
Ore and concentrate	60,067	NA	--	NA.
Metal including alloys:				
Unwrought	82	NA	--	NA.
Semimanufactures	7	3	--	All from Japan.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$49	$233	--	West Germany $173; Japan $60.
Silver:				
Ore and concentrate do	$246	NA	--	NA.
Metal including alloys, unwrought and partly wrought do	--	$34	--	France $27; Japan $7.
Tantalum metal including alloys, all forms kilograms	15	5	--	All from Japan.
Tin metal including alloys:				
Unwrought	12	52	--	All from Singapore.
Semimanufactures	2	5	--	Singapore 3; Japan 2.
Titanium:				
Oxides	56	52	--	All from Japan.
Metal including alloys, all forms	2	6	--	Do.
Tungsten metal including alloys, all forms	--	[6]40	--	All from Singapore.

See footnotes at end of table.

Table 8.—North Korea: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Vanadium ore and concentrate	--	45	--	All from Singapore.
Zinc:				
Ore and concentrate	20,419	[5]9,661	--	All from Peru.
Oxides and hydroxides	--	1	--	All from Japan.
Metal including alloys, semimanufactures	533	141	--	Japan 111; Singapore 30.
Other, n.e.s.:				
Oxides, hydroxides, peroxides	98	34	--	Japan 18; Singapore 12.
Metalloids	1	7	--	All from Japan.
Base metals including alloys, all forms	--	10	--	All from Singapore.
NONMETALS				
Abrasives:				
Dust and powder of precious and semiprecious stones value, thousands	$27	$20	--	All from Japan.
Grinding and polishing wheels and stones	12	12	--	Do.
Boric oxide and acid	--	19	--	Do.
Clays and clay products:				
Crude	300	NA	--	NA.
Products:				
Nonrefractory	91	[7]60	--	Italy 52.
Refractory	4,132	4,137	--	All from Japan.
Diamond, industrial value, thousands	$28	NA	--	NA.
Diatomite and other infusorial earth	3	2	--	All from Japan.
Fertilizer materials:				
Crude, phosphatic thousand tons	[8]325	80	--	All from Algeria.
Manufactured:				
Nitrogenous	100	NA	--	NA.
Potassic	83,474	82,901	--	All from U.S.S.R.
Other including mixed	--	2	--	All from Japan.
Ammonia	--	6	--	Do.
Mica:				
Crude including splittings and waste	(9)	3	--	Do.
Worked including agglomerated splittings	--	2	--	Do.
Pigments, mineral: Iron oxides and hydroxides, processed	--	(9)	--	Do.
Precious and semiprecious stones:				
Natural value, thousands	$12	$6	--	Do.
Synthetic do.	$72	$12	--	Do.
Salt and brine	338	21,113	--	Egypt 21,000; Japan 113.
Sodium and potassium compounds:				
Caustic potash	1	1	--	All from Japan.
Caustic soda	48	3	--	Do.
Soda ash	2	(9)	--	Do.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	30	NA	--	NA.
Worked	175	211	--	All from Italy.
Gravel and crushed rock	--	37	--	Do.
Sand excluding metal-bearing	4	NA	--	NA.
Sulfur:				
Elemental:				
Other than colloidal	4	22,975	--	Poland 21,000; Singapore 1,972.
Colloidal	--	2,420	--	All from Singapore.
Sulfuric acid	3	6	--	All from Japan.
Other, n.e.s.:				
Crude	3	87	--	Do.
Halogens	--	5	--	Do.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	9	1	--	Do.
Carbon black	544	2,452	--	West Germany 1,936; Japan 516.
Coal, anthracite and bituminous	15,400	NA	--	NA.
Coke and semicoke	185,536	246,181	--	Japan 150,181; Poland 96,000.
Hydrogen, helium, rare gases	--	4	--	All from Japan.
Peat including briquets	12	NA	--	NA.

See footnotes at end of table.

Table 8.—North Korea: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Kerosine and jet fuel 42-gallon barrels	3,736	729	--	Yugoslavia 380; Madagascar 349.
Distillate fuel oil ---do---	7,475	89,595	--	Singapore 89,274; Yugoslavia 298.
Residual fuel oil ---do---	148,105	4,156	--	Yugoslavia 4,123.
Lubricants ---do---	17,745	[10]13,062	--	Singapore 12,733; Belgium-Luxembourg 126; Japan 126.[10]
Other:				
Mineral jelly and wax ---do---	--	1,865	--	All from Japan.
Nonlubricating oils ---do---	--	133	--	All from Singapore.
Bitumen and other residues ---do---	--	91	--	All from Japan.
Bituminous mixtures ---do---	--	970	--	Do.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals ---	--	100	--	Do.

[p]Preliminary. NA Not available.

[1]Owing to a lack of official data published by North Korea, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2]Excludes part of Japanese exports valued at $289,000.

[3]Excludes part of Japanese exports valued at $168,000.

[4]Excludes part of Japanese exports valued at $516,000.

[5]Metallgesellschaft Aktiengesellschaft (Metallstatistics), Frankfurt am Main, West Germany.

[6]Excludes exports from Japan valued at $6,000.

[7]Excludes exports from Japan valued at $184,000.

[8]Statistical supplement, British Sulphur Corp. Ltd., London, United Kingdom.

[9]Less than 1/2 unit.

[10]Excludes part of Japanese exports valued at $1,149,000.

LAOS[22]

The year 1981 marked the beginning of a new 5-year plan in the Lao People's Democratic Republic. Some signs of economic growth and agricultural and industrial progress were seen. For the first year in more than a decade, the Laotians were self-sufficient in food supplies. Some surplus agricultural goods were available for export, and some raw materials for industrial production were also produced. There remained an imbalance of trade, however, with the continuing necessity of exporting only raw materials and importing finished goods. The Government reported an overall increase of 8.6% in national production compared with that in 1980.

At yearend, Government officials announced that efforts to develop new mineral deposits would be stepped up. Repair and establishment of industrial enterprises would be increased, including rehabilitation of the remaining equipment at the Nam Ngum hydroelectric plant with the view toward expanding the electric power network. They further stated that repair and development of the tin mining industry at Phontiou would be continued.

Though several industrial plants encountered difficulties, including shortages of raw materials and spare parts, and lack of experience in production management, overall industrial production reportedly increased more than 13% compared with that of the previous year. Production targets for 1981 were fulfilled in the areas of electricity, coal, gypsum, and brick. It was predicted that overall national production in 1982 would increase by 16% with electric power output increasing 1%; tin production, 100%; and construction materials, by 44%.

The problem of inadequate transportation facilities continued throughout 1981. One of the main objectives of the new 5-year plan was the restoration and improvement of most of the old highway system that was destroyed or allowed to become impassible over the past decade. To this end, an agreement was signed in October 1981 between Vietnam and Laos regarding transport issues and goods exchange and payments. Highway No. 9 between Vietnam and the Phin District of Savannakhet Province was being reconstructed and was expected to eventually meet international standards.

The 250-kilometer road should greatly facilitate the transportation of exported minerals and other goods when completed.

The hydroelectric powerplant project at Nam Ngum Dam north of Vientiane continued to be one of the few foreign exchange earners for Laos. The electricity generated reportedly was 807 million kilowatt-hours during 1981, over three-fourths of which was exported to Thailand under a long standing trade agreement. During October 1981, the Electricity Generating Authority of Thailand and Lao State Electricity Enterprise concluded an agreement on a new price for the electricity exported. The new price reportedly was triple the former charges.

For many years, the Nam Ngum powerplant has operated with two functioning generators, Nos. 3 and 4, each with a 40,000-kilowatt capacity. At yearend, it was reported that generators Nos. 1 and 2, each with a 15,000-kilowatt capacity, were ready to be restarted. A fifth generator, previously believed to be under construction, was contracted for during September 1981 with the Southeast Asian affairs division of Switzerland's Motor Columbus Enterprises.[23]

COMMODITY REVIEW

During 1981, the Soviet-assisted survey and exploration of tin resources in the Pa Then Basin continued. The old established tin mine at Phontiou was known to be operating, although production figures have been unavailable for many years. Other tin deposits being surveyed included Mong Seun, Neng, and Boneng. According to the senior Soviet scientist, the occurrences were very rich, the tin content in some places reportedly being as high as 85% cassiterite. By yearend 1981, 70% of the Pa Then Basin had been surveyed. The Soviet survey was scheduled for completion in 1983.[24]

Minerals other than tin have been reported throughout the country and several were believed rich enough to be exploited if capital funding and an assured market were available. Iron deposits were known in several places, the most important being at Lalbouak and Phonlek in Xiang Khoang Province.

Gold deposits were scattered throughout the country. Copper deposits were surveyed in several locations, most notably in the Sing District, Louang Province. Gem stones were reported in Honei Sai District, including a sapphire deposit reportedly being mined with Czechoslovakian assistance. The salt farms, drilled brine wells, in the Thonlaakhom District of Vientiane Province continued in operation and supplied domestic needs.

Construction materials for local use were produced during 1981. The production of brick reportedly was increased 133% over 1980 levels. A protocol and memorandum on the construction of a brick plant, funded by the Soviet Union, were signed in Vientiane in July 1981. According to the agreement, the Soviets were to build a plant with a capacity of 7 to 12 million bricks per year.

The gypsum mining operation at the Dong Hen Quarry in southern Savannakhet Province completed its first full year of operation. The mine, run jointly by Laos and Vietnam, produced 40,500 tons during 1981. Most of the output was exported to Vietnam for use in its cement industry.

Petroleum and gas deposits were reported as being located in the Se Pon District of Savannakhet Province as a result of recent mineral surveying. Also reported were occurrences of oil shale. No plans had been made at yearend to drill or exploit these resources. Laos continued to import the small amount of petroleum products needed from Thailand and Vietnam.

In October 1981, Laos signed an agreement with the U.S.S.R. for the construction of a petroleum pipeline between the Vietnamese districts of Vinh and Vientiane. The Soviets will assist in the technical aspects of the 465-kilometer pipeline.

MONGOLIA[25]

Mongolia covers a land area of 1,564,619 square kilometers; about 89% is pasture or desert wasteland, 10% forested, and less than 1% arable. The population was estimated at 1.7 million in 1981. The total work force was about 315,000, 21.4% was in commerce and services, 21% in manufacturing, 11.9% in agricultural and fishing, 7.2% in construction, and 38.5% in government and public authorities. Mongolia is a member of the Council for Economic Mutual Assistance (CEMA). It is also a member of the Economic and Social Commission for Asia and the Pacific.

The Mongolian economy, traditionally an agrarian economy, was to transform into an

agricultural-industrial economy under the sixth 5-year plan (1976-80). During this period, Mongolia reportedly had invested over $4 billion[26] into its national economy. The Mongolian major industrial center is in Ulan Bator (the national capital) area. Three additional new industrial areas are in Darhan, Erdenet, and Choybalsan. Mongolian main industries include processing of animal products such as leather, woolen textiles, and processed meat, and mining of copper, molybdenum, fluorspar, limestone, construction aggregates, and coal. Most industries in Mongolia remained small in scale, but their share of the country's GNP has increased substantially over the past years. The output of industry accounting for 14% of the country's national income in the 1960's rose to about 30% in 1980.

Under the seventh 5-year plan (1981-85), Mongolia was to accelerate the development of the fuel and power, mining, and building industries; to extend further development of light and food industries; and to emphasize the development of state farms and the extension of the arable area. Under a new agreement signed between Mongolia and the U.S.S.R. in June 1981, the Soviet Union was to continue its technical and economic assistance to Mongolia. In the mining sector, special emphases were placed on the continuing expansion of the Erdenet copper-molybdenum mining and concentrating combine, the continuing exploration of zinc deposits in Salkhit, and the development of fluorspar mining and concentrating capacities at Boro-ondor, in southeastern Mongolia. During the 1981-85 period, Mongolia was also to complete exploration works for the copper-molybdenum deposit at Tsagaan-suvraga, coking coal deposit at Tavan-tolgoy, and the phosphate deposit at Burenhaan.

In 1980, Mongolian merchandise exports were valued at $364.7 million, and imports were valued at $495.9 million. Mongolian exports of food and agricultural products accounted for about 63.3% of total exports, while exports of minerals accounted for about 26.4%. Mongolian imports of machines and equipment, spare parts, and manufactured consumer goods accounted for over 60% of total imports. About 98% of merchandise trade was with the CEMA countries. The U.S.S.R. alone accounted for 80% of Mongolian total exports and accounted for 90% of Mongolian total imports. Mongolia has been suffering from a chronic trade deficit. However, the trade deficit decreased to about $131.2 million in 1980 from $137.4 million in 1979 because of the increased export earnings from minerals in 1980.[27]

COMMODITY REVIEW

Metals.—Mongolian mine production of copper and molybdenum at Erdenet increased substantially in 1981. The copper and molybdenum complex, initiated in 1974, is a 50-50 Soviet-Mongolian venture project. The total investment in the project was estimated at 1 billion rubles (about US$1.5 billion). The output of ore increased to about 8 million tons in 1981 from about 4 million tons in 1979. The output of ore was projected to reach 16 million tons at full capacity when the fourth phase construction work is completed in 1985.[28] The estimated mine output of contained copper and molybdenum in concentrates at Erdenet for 1979 to 1981 and projected 1985 at full capacity is as follows in tons:[29]

	1979	1980	1981	Projected 1985
Copper	21,700	44,000	71,800	118,000
Molybdenum	222	487	661	1,000

The ore reserves at Erdenet were estimated at 300 million tons, averaging 0.85% copper and 0.012% molybdenum. The existing complex at Erdenet comprised an open pit mine, a concentrator, a machine repair plant, and auxiliary shops. The complex employed about 2,600 workers; about 55% of the employees are Mongolian and the remainder are specialists from the U.S.S.R.

Nonmetals.—Mongolian cement production at Darhan was expected to increase by 18% from 177,900 tons reported in 1980. The mine production of fluorspar at Berh and two other mines continued to increase in 1981. All fluorspar produced in Mongolia was exported to the U.S.S.R. Under the seventh 5-year plan, a large fluorspar mining and concentrating combine was expected to be built at the Boro-ondor area, where a promising fluorspar deposit was discovered in recent years. To export the future output of fluorspar from the area to the U.S.S.R., a new branch line from Dalanjargalau to Boro-ondor on the Trans-Mongolian railway will also be constructed.

According to the Mongolian Planning

Commission, the Government planned to undertake further exploration work of the Burenkhan phosphate deposit discovered around Lake Khubsugul in northern Mongolia in 1964. The phosphate ore reserves in the area were estimated at 400 million tons in 1970.[30]

Mineral Fuels.—Coal production in Mongolia remained at the 4.5-million-ton level. Major coal-producing areas are around the Ulan Bator area and in Darhan. During the sixth 5-year plan (1976-80), the Nalayha Kapitalnaya Mine was expanded in the Shariyn Gol area, and a new open pit coal mine with an annual capacity of 2 million tons was being developed at Baga-Nuur. Other promising coal deposits in Mongolia include Tavan-tolgoy, Adunchulun, and Uvdun-khudag. Most of the Mongolian coal is of Permian age. About 80% of the existing coal reserves are black coal, of which about 50% can be used in the coking industry, and about 20% is brown coal.

Table 9.— Mongolia: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commmodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
Cement	[2]27,800	[2]6,800	--	All to U.S.S.R.
Iron and steel metal:				
Scrap	20,000	20,007	--	Do.
Semimanufactures:				
Tubes, pipes, fittings	188	1	--	All to Saudi Arabia.
Castings and forgings, rough	211	2	--	Do.

[p]Preliminary.
[1]Owing to a lack of official trade data published by Mongolia, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.
[2]Statistical yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

Table 10.—Mongolia: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS				
Iron and steel metal:[2]				
Pig iron, cast iron, powder, shot	2,400	2,100	--	NA.
Semimanufactures:				
Tubes and pipes	10,400	8,600	--	NA.
Other	39,600	38,400	--	NA.
NONMETALS				
Cement	[2]47,300	[2]36,400	--	All from U.S.S.R.
Clay products, nonrefractory	1,164	248	--	All from Italy.
Fertilizer materials, manufactured:				
Nitrogenous, N content	[2]24,000	[2]13,400	--	U.S.S.R. 7,600; undetermined 5,798.
Phosphatic, P_2O_5 content	[2]20,200	[2]37,200	--	All from U.S.S.R.
Precious and semiprecious stones, natural value, thousands	--	$1	--	All from West Germany.
Salt and brine	1,458	2,094	--	All from U.S.S.R.
Sodium and potassium compounds:				
Caustic soda[2]	500	1,000	--	NA.
Soda ash	--	[2]100	--	Japan 4; undetermined 96.
Stone, dimension, worked	15	18	--	All from Italy.
Sulfuric acid	[2]1,300	[2]1,300	--	U.S.S.R. 910.
MINERAL FUELS AND RELATED MATERIALS				
Coal, anthracite and bituminous[2]	1,500	--		
Petroleum and refinery products:[2]				
Crude, 42-gallon barrels	44,100	--		

See footnotes at end of table.

Table 10.—Mongolia: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products:[2] —Continued				
Refinery products:				
Lubricants				
42-gallon barrels	151,900	159,600	--	NA.
Other				
thousand 42-gallon barrels	4,066	4,428	--	NA.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	1,080	608	--	All from U.S.S.R.

[p]Preliminary. NA Not available.

[1]Owing to a lack of official trade data published by Mongolia, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2]Statistical yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

NEPAL[31]

The mineral industry of Nepal played virtually no part in the country's economy in 1981, employing a total of only 1,200 persons. Nepal's entire industrial sector employed only about 1% of the labor force and contributed about 5% of the GDP. Most industry was oriented to the agricultural sector. The country was highly agricultural in nature and over 90% of the population was dependent on subsistence farming for its survival. Population density on the arable land was very high.

The insignificant mineral production was a reflection of the primitive state of the country's mineral development. There has been very little detailed geological exploration done in the country. However, it has a high potential for both metallic and nonmetallic mineral deposits.

High-grade copper veins have been mined since ancient times by primitive methods. Some of these mines were still worked by individuals or families and produced up to 1 ton of crudely smelted copper each year. The output went to make domestic brass utensils.

The most likely minerals for development in the near term were magnesite, lead-zinc, limestone for cement, and dimension stone. Petroleum deposits were a possibility. Exploration activity and the exploitation of any discoveries could provide employment for a substantial number of workers in the rural areas. Much of the population was only partly employed because the crowded agricultural conditions did not provide full employment on the farms.

GNP at current prices was estimated at $2.4 billion[32] for FY 1980-81.[33]

At constant 1977 prices, the economy grew about 5.5% in FY 1980-81 compared with the small decline experienced the previous year. The rise in GDP was attributable to the good food grain harvest and a generally good yield in the small cash crop harvest.

Inflation continued to be a serious problem, although moderating petroleum prices and easing of the prices of some other basic commodities dispelled thoughts that the economy was out of control. Even so, the official statistics show an increase in the cost of living of over 18%, which, though probably low, was far more realistic than previous official estimates.[34]

To increase industry and commerce, the Government turned more toward the private sector for their development. The Government rice-exporting monopoly was abolished, and trade was restored to private entrepreneurs. A new investment policy was put forth in 1981 by the Ministry of Industry, which would accord a range of generous concessions to foreign investors. Implementing legislation was pending in the National Assembly.

Future industrialization will be controlled by availability of power and the need for a ready market for the products turned out. Since the subsistence farmers have virtually no cash income, there was very little purchasing power to support import-substitution industries. Export-oriented industry faced stiff competition with the Indian market.

One bright spot for Nepal was its huge hydroelectric potential, about 80 million kilowatts of power. This amounts to 2.6% of the world total for a country occupying only 0.09% of the world land area.

During the last several years, demand for electric power, though small by any normal criterion, was well ahead of the installed capacity. Shortages have become acute, and load shedding was common during 1980 and 1981.

Work on several projects was underway during the year, and plans were progressing on others. The Government's main priority in 1981 was to complete construction on the 114-meter-high Kulekhani rockfill dam and powerplant. The dam was completed in June, and the reservoir began filling at that time. An underground powerhouse with two 30,000-kilowatt turbogenerators was completed in September, and the 6-kilometer-long headrace tunnel to the powerhouse was completed in October 1981. Power was generated on a trial basis in November. Commercial power was scheduled to be generated in the first quarter of 1982. Completion of the plant will end load-shedding in the Kathmandu-Hetauda area and also allow long needed overhauls to be performed on the major hydroelectric and diesel powerplants of the system. Total cost of the Kulekhani project was $129 million, mostly financed with foreign aid. A total of 3.5 million workdays of labor were expended on the construction.

The bulk of Nepal's current 68,000 kilowatts of installed generating capacity came from three hydroelectric plants: Trisuli, 21,000 kilowatts; Sunkosi, 10,050 kilowatts; and also the new Gandok, 15,000 kilowatts.

Several other projects have been planned and detailed feasibility studies conducted. The most promising of many was the Marsyangdi project in Tanahu District of Gandaki zone. It was first proposed seriously in 1978. The Federal Republic of Germany completed a feasibility study in 1979, but the plan was delayed until 1981 when the Government decided to go ahead with the design and survey work. Preliminary site preparation work was expected to be started early in 1982. The original capacity was set at 30,000 kilowatts but was later increased to 66,000 kilowatts. Plans called for completion in 1986.

A number of hydroelectric miniplants were being installed in the outlying districts, beyond the planned coverage of the main electric power distribution lines. The plants were engineered for the local stream conditions and range in capacity from a few tens to a few thousand kilowatts. The immediate intention was to furnish power for pumped irrigation wells. Another important purpose was to furnish an alternate domestic source of energy to the nearly universal practice of burning locally cut firewood. In the last few decades, the depletion of the forest cover on hilly terrain has led to serious runoff and soil erosion problems.

Site clearing work got underway on an Indian-aided 14,100-kilowatt hydroelectric plant at Devighat. The Prime Minister laid the cornerstone to the powerhouse in February 1981, and excavation for the headrace tunnels was underway at yearend.

At a more ambitious level, talks were proceeding favorably between India and Nepal on two major hydroelectric power projects—Pancheshwar and Karnali. These multimillion-kilowatt plants have been planned for many years, but progress in arranging for financing, construction, and control of the $1 billion projects has been slow. These plants would not only open up prospects for industrialization of Nepal but also help to tide it over the adverse balance of trade with India by exporting scores of millions of dollars worth of excess power at mutually agreed rates.

COMMODITY REVIEW

Cement.—There was a shortage of cement in Nepal again during 1981. Local production met only 15% to 20% of the domestic demand. The Himal cement plant was the only operating facility and had a capacity to produce about 160 tons per day. In recent years, the actual production has been nowhere near the rated capacity.

The Himal plant received about a $3 million loan from the Government of the Federal Republic of Germany to renovate the equipment and expand the daily capacity to 400 tons by 1984.

A modern 750-ton-per-day dry-process rotary-kiln cement plant has been under construction at Hetauda since mid-1978. It was originally scheduled for completion in 1981, but construction has been very slow and cost overruns very large. Completion of the plant was tentatively rescheduled for mid-1984.

Limestone will be supplied by a quarry at Bhaines in Makwanpur District. The stone will be transported via an aerial tramway to the plant.

In September 1978, India and Nepal agreed to set up a joint-venture company to construct a 1,500-ton-per-day cement plant at Udaypur in southeast Nepal. Plans for the project have progressed unusually slow-

ly. Feasibility studies were completed during 1979, and the findings were being studied during 1980. Construction had not begun at yearend 1981.

Magnesite.—Development work continued on the magnesite mining project. Nepal Orind Magnesite Private Ltd. (50% Nepal Government, 50% Orissa Industries Ltd. of India) was formed to exploit the large, high-grade magnesite deposit at Khari Dhunga 87 kilometers northeast of Kathmandu. Manual mining was underway during 1981, and preparations for large-scale blasting and mechanization were being carried out. Crude ore requires beneficiation by flotation to lower the silica content below 0.3%. Output of the mine will be carried via aerial tramway to Lamo Sangu where a 50,000-ton-per-year dead-burnt magnesite plant was probably already under construction. A planned 20,000-ton-per-year refractory products plant at Birganj had not been started at yearend.

Petroleum and Natural Gas.—Nepal was completely dependent on imports of refined products for its petroleum needs. Funding for petroleum exploration has been included in the Government's 5-year plans, but results have been uncertain or inconclusive until recently. In 1979 and 1980, preliminary aeromagnetic surveys were conducted by French technicians for the Nepal Department of Mines and Geology. The survey indicated the possibility of petroleum deposits in Karnali, Dhaulagiri and Gandaki zones in the hilly western regions.

As a followup in 1981, the Government was reportedly preparing to have a reconnaissance seismic survey conducted in the favorable areas. Should the surveys prove encouraging, exploration drilling would be considered for the 1984-85 period.

Japanese experts have investigated the occurrence of natural gas seeps in water wells in the Kathmandu Valley. About 1,500 million cubic feet of gas was reported in a 4-square-kilometer area at a very shallow depth—300 to 600 meters. A test hole was drilled and was yielding 6,600 cubic feet of gas per day. Tender notices for two additional wells were offered by the Department of Mines and Geology in 1981 but no qualified offers were received. A re-tender notice was published in November.

The projected flow of 21,000 cubic feet per day would meet the fuel requirements of 1,000 to 1,200 households. Even this small amount would be economically significant to the valley where the high cost of petroleum limits its use to a relatively small portion of the population.

SINGAPORE[35]

Singapore remained the most impressive country in economic performance in 1981 among the five members of ASEAN. Singapore's GDP, at 1968 factor cost, grew 9.9% in 1981 compared with 10.2% in 1980. The slower growth in 1981 was caused primarily by the reduced demand for Singapore's exports from overseas, especially from the European Economic Community. In 1981, trade, manufacturing, transport and communication, and finance and business services remained the dominant industries in the Singapore economy. Despite the continuing improvements in productivity, the country's inflation rates remained at the 8% to 8.5% level in 1980-81.

Singapore's mining industry was comprised of a small quarrying sector, several small mineral processing sectors, a very large mineral fuel refining sector, and a rapidly growing offshore oil exploration supporting sector. The activities of petroleum refining alone not only dominated the activities of the mineral industry, but also contributed substantially to the country's economy.

The activity of the quarrying sector was limited to the production of broken granite. In 1981, granite production increased sharply, reflecting strong demand for the product by the domestic construction industry. In 1981, the quarrying activity in Singapore involved 20 firms employing less than 900 workers. Its value added, estimated at $58 million,[36] accounted for 1.2% of Singapore's total value added of industrial production, which was estimated at $4.7 billion in 1981.

In Singapore, mineral processing included production of steel, nonferrous metals, and nonmetallic mineral products. In 1981, there were 17 firms engaged in ironmaking and steelmaking activities with about 1,900 workers. The value added by the iron and steel sector was estimated at $63.1 million and accounted for 1.3% of the total industrial production. The nonferrous metals sector with 12 firms employed about 390 workers. Its value, estimated at $7.8 million, accounted for less than 0.2% of the total industrial production. Nonmetallic mineral production was by 29 firms employing 1,300 work-

ers. Its value, estimated at $28.2 million, accounted for 0.6% of total industrial production.

Singapore's petroleum refining sector is the second largest after electronic products manufacturing, in terms of the value added of industrial production. The sector employed about 3,500 workers. Its value added in 1981, estimated at $841.1 million, accounted for 18% of the total industrial production. Petroleum refining in Singapore was by five refineries with a combined total capacity of 1.1 million barrels per day, which makes Singapore the third largest refining center in the world.

Singapore is the world's second largest offshore drilling rig builder, following the United States. There were five rig building yards operated in 1981. The total revenue from rig building in Singapore was estimated at about $160 million in 1981. During the 1979-80 period, of the total rig orders placed in the world, Singapore won one in every four orders. Singapore is also the leading oil tanker and rig repair and maintenance center in East Asia. In 1980, the total estimated earnings of the five repair yards in Singapore was $440 million, of which about 50% was from repair of oil tankers.

In 1981, Singapore's total export earnings were valued at $21 billion, 8.3% above that of 1980. Total imports were valued at $27.6 billion in 1981, an increase of 15% from that of 1980. As a result, the merchandise trade deficit increased to $6.6 billion in 1981 from $4.6 billion in 1980. The higher trade deficit in 1981 was due mainly to a 37.6% increase in imports of mineral fuels. Imports of mineral fuels valued at $9.4 billion accounted for 34% of Singapore's total imports, while imports of machinery and transport equipment, valued at $7.8 billion, accounted for 28.3%. Exports of mineral fuels, valued at $6.7 billion, accounted for 32% of Singapore's export earnings, while exports of machinery and transport equipment, valued at $5.6 billion, accounted for 26.6%. In 1981, based on the value of two-way trade, the major trading partners of Singapore were Japan, Malaysia, the United States, Hong Kong, the United Kingdom, and the Federal Republic of Germany.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Singapore's crude steel production was mainly by the National Iron and Steel Mills Ltd. (NISM). Its steelmaking plant at Jurong has five electric arc furnaces. The annual crude steel output capacity was about 380,000 tons. During 1981, the plant was operating near full capacity, and its output of crude steel reached 350,000 tons. The steel products by the company (bars, plate, and angles) were sold mainly to the construction industry. To meet the growing demand for the steel products from the construction industry, the company was ordering a new bar and rod mill from Danieli and Co., an Italian plant designer and builder. NISM was also undertaking a revamp of its melting works by turning the three 40- to 50-ton electromelt furnaces into an ultrahigh power unit and adding water-cooled panels and oxygen burners. As a result, the company's raw steel output capacity is expected to increase to about 550,000 tons per year by mid-1983.[37]

Nonmetals.—*Cement.*—Cement production in Singapore is basically a grinding operation using imported clinker. Combined total annual capacity of the five cement companies was 2.75 million tons at the end of 1980. During the 1980-81 period, the total annual output of cement in Singapore remained at the 1.8-million-ton-per-year level. Annual cement capacity by company and plant location was summarized as follows, in thousand tons:

Company	Location	Capacity at end of 1980
Asia Cement (Singapore) Pte., Ltd.	Jurong	450
Jurong Cement Ltd	do.	600
Pan Malaysia Cement Work (Singapore) Pte., Ltd.	do.	600
Singapore Cement Manufacturing Co.	PSA Gate 1	500
Ssangyong Cement Pte., Ltd	Jurong	600
Total		2,750

The five cement companies employed a total of 450 workers, and the value added in 1981 was estimated at $31 million.

Mineral Fuels.—*Petroleum.*—In 1980, Singapore became the world's third largest refining center and the world's second largest offshore rig building country. Most of Singapore's refineries are located on several small islands near Singapore's main island. In 1981, refining capacity by company and location was as follows, in barrels per day:

Company	Location	1981 capacity
Shell Eastern Petroleum Pte., Ltd.	Pulau Bukon	460,000
Singapore's Mobil Oil Pte., Ltd.	Singapore, Main Island.	200,000
Esso Singapore Pte., Ltd.	Pulau Ayer Chawan.	195,000
Singapore Refining Co. Pte., Ltd.	Pulau Merlimau	170,000
Singapore's BP Refinery Pte., Ltd.	Singapore, Main Island.	27,000
Total		1,052,000

The startup of a $150 million hydrocracker project of Shell Eastern Petroleum Pte., Ltd., to produce middle distillates at a 30,000-barrel-per-day capacity was postponed to the end of 1983, and the total cost of the project was revised to $280 million in 1981. Singapore Refining Co. Pte., Ltd., 40% owned by Singapore Petroleum Co. Pte., Ltd., 30% by Caltex Oil Corp. of the United States, and 30% by British Petroleum Corp., was planning to build a $65 million catalytic reformer unit to produce 12,000 barrels per day of gasoline. The unit was expected to come onstream by the end of 1982. In 1980, Esso Singapore Pte., Ltd., began a $150 million expansion and renovation program, which includes expansion of the lubricating oil plant, a product wharf handling vessels, a crude desalter, and a sulfur recovery plant. The program was expected to be completed in 1982. The $100 million visbreaker project of Singapore's Mobil Oil Pte., Ltd., was completed in 1981. The 50,000-barrel-per-day visbreaker was built by Chiyoda Chemical Engineering and Construction Co.[38]

In 1981, Compagnie Française de Petrol, a French company, joined Singapore's oil drilling and exploration supporting industry. Singapore's manufacture of oilfield equipment supply and drilling operation supporting activities were mainly by the U.S. firms Vetco Singapore Pte. Ltd., Hughes Tool Singapore Pte. Ltd., FMC Corp., Cameron Iron Works Singapore Pte. Ltd., Tri-State Oil Tool Singapore Pte. Ltd., Baker Oil (Far East) Pte. Ltd., Smith International Inc., and Hydnil Co. In oil rig construction, Bethlehem Singapore Pte. Ltd. and Marathon Letourneau Offshore Pte. Ltd. of the United States, Robin Shipyard Pte. Ltd. (Singapore-United States joint-venture company), and Far East-Lexington Shipbuilding Pte. Ltd. and Promet Pte. Ltd. of Singapore dominated the business activities. Repair and maintenance activities of oil tankers and oil rigs were by five repair yards. The Government of Singapore has a stake in four of the five repair yards. Sembawang Shipyard Pte. Ltd., Jurong Shipyard Pte. Ltd., Keppel Shipyard Pte. Ltd., and Mitsubishi Singapore Heavy Industries Pte. Ltd. are Singapore firms, while Hitachi Zosen Robin Dockyard Pte. Ltd. is a Singapore-Japanese private joint-venture company.

Table 11.—Singapore: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	882	1,789	--	Malaysia 1,764.
Metal including alloys:				
Scrap	22,517	6,438	4	Japan 3,560; Pakistan 1,143; Taiwan 875.
Unwrought and semimanufactures	7,083	8,371	(1)	Malaysia 5,383; Hong Kong 1,125.
Ore and concentrate	--	6	NA	NA.
Antimony metal including alloys, all forms	80	36	--	Malaysia 18; India 15.
Bismuth metal including alloys, all forms kilograms	--	11	NA	NA.
Cadmium metal including alloys, all forms do	113	1,000	NA	NA.
Chromium:				
Oxides and hydroxides	34	34	--	All to Malaysia.
Metal including alloys, all forms kilograms	250	120	NA	NA.
Cobalt:				
Oxides and hydroxides	24	1	--	All to Malaysia.
Metal including alloys, unwrought	2	7	--	North Korea 3; Taiwan 3.

See footnotes at end of table.

Table 11.—Singapore: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Copper:				
Ore and concentrate	--	1	--	All to Republic of Korea.
Matte	5	--		
Metal including alloys:				
Scrap	15,543	13,865	--	India 9,975; Japan 2,273; Taiwan 1,166.
Unwrought and semimanufactures	6,353	6,733	--	Malaysia 6,043.
Iron and steel:				
Ore and concentrate, value	$540	--		
Metal:				
Scrap	1,710	5,475	--	Hong Kong 2,050; Japan 1,364.
Pig iron, ferroalloys, similar materials	12,046	9,951	--	Malaysia 9,554.
Steel, primary forms	6,915	6,784	--	Malaysia 6,177.
Semimanufactures:				
Bars, rods, angles, shapes, sections	122,262	132,912	--	Malaysia 92,469; Hong Kong 11,268.
Universals, plates, sheets	111,598	120,490	--	Malaysia 99,231.
Hoop and strip	4,724	2,463	--	Malaysia 2,029.
Rails and accessories	9,285	6,621	--	Malaysia 6,574.
Wire	4,961	5,666	--	Malaysia 4,209; Brunei 908.
Tubes, pipes, fittings	63,059	98,066	--	Malaysia 18,714; Brunei 11,394; Thailand 10,726.
Castings and forgings, rough	412	651	98	Tunisia 212; Malaysia 184.
Lead:				
Ore and concentrate	62	123	--	West Germany 114.
Oxides and hydroxides	398	479	--	Malaysia 469.
Metal including alloys:				
Scrap	3,311	2,256	--	Taiwan 1,563; Malaysia 389.
Unwrought and semimanufactures	965	2,223	--	Malaysia 853; Thailand 802.
Magnesium metal including alloys, unwrought, kilograms	417	4,468	--	Republic of Korea 2,700.
Manganese:				
Ore and concentrate	20,706	32,788	--	India 7,719; Philippines 6,463; Malaysia 2,610.
Oxides and hydroxides	1,172	969	--	Malaysia 567; North Korea 250.
Mercury, 76-pound flasks	23	68	--	Mainly to Hong Kong.
Nickel:				
Ore and concentrate	1	5	--	All to Malaysia.
Metal including alloys:				
Scrap	379	561	48	Japan 448.
Unwrought and semimanufactures	334	1,443	--	India 1,334.
Platinum-group metals including alloys, unwrought and partly wrought, troy ounces	64	322	--	Australia 96; Malaysia 96.
Silver:				
Waste and sweepings[2], value, thousands	$1,394	$3,280	$889	Japan $1,150; Australia $743.
Metal including alloys, unwrought and partly wrought, thousand troy ounces	93	1,065	11	United Arab Emirates 286; Australia 262; United Kingdom 207.
Tin:				
Ore and concentrate	6,382	5,351	290	U.S.S.R. 1,851; Spain 1,717; Mexico 618.
Oxide and hydroxide, kilograms	936	907	--	Malaysia 904.
Metal including alloys:				
Scrap	131	139	2	Taiwan 99; Japan 34.
Unwrought and semimanufactures	11,002	14,830	7,967	U.S.S.R. 2,577; Iran 984; Netherlands 775.
Titanium:				
Ore and concentrate	55	59	NA	NA.
Oxides and hydroxides	630	542	--	Malaysia 541.
Metal including alloys, all forms, kilograms	280	14	NA	NA.
Tungsten:				
Ore and concentrate	397	849	--	North Korea 270; Netherlands 270; India 110.
Metal including alloys, all forms	85	119	50	North Korea 40.

See footnotes at end of table.

Table 11.—Singapore: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate ____ value__	$616	$2,335	__	All to Malaysia.
Oxides and peroxides excluding hydroxides ____	1,306	1,602	__	Japan 1,066.
Metal including alloys:				
Scrap ____	1,018	1,281	__	Taiwan 660; Japan 295.
Unwrought and semimanufactures ____	3,149	5,031	__	Malaysia 3,636; Netherlands 817.
Other:				
Ash and residue containing nonferrous metals ____	12,111	31,761	275	Malaysia 12,504; Brunei 10,074.
Oxides, hydroxides, peroxides ____	93	128	__	Malaysia 63; North Korea 12.
Metals:				
Metalloids ____	29	9	__	Malaysia 4; Taiwan 3.
Alkali, alkaline-earth, rare-earth metals ____ kilograms__	378	14,015	__	Mainly to Malaysia.
Pyrophoric alloys ____	3	6	__	Thailand 4.
Base metals including alloys, all forms ____	(1)	10	__	All to Republic of Korea.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc ____	111	60	__	Malaysia 29; India 11.
Artificial: Corundum __ kilograms__	470	136	__	All to Hong Kong.
Dust and powder of precious and semiprecious stones ____ value__	$11,155	$11,209	__	Malaysia $6,000; Japan $4,000.
Grinding and polishing wheels and stones[3] ____	431	374	__	Malaysia 295.
Asbestos, crude ____	9,535	10,461	__	Malaysia 10,407.
Boron materials:				
Crude natural borates ____	275	657	__	All to Malaysia.
Oxides and acids ____	85	204	NA	Malaysia 64; Brunei 20.
Cement ____	431,989	466,982	__	Malaysia 338,714; Sri Lanka 54,488.
Chalk ____	1,312	2,104	__	Brunei 1,811.
Clays and clay products:				
Crude:				
Bentonite ____	21,600	25,596	__	Philippines 6,972; Brunei 6,028; Thailand 3,395.
Fuller's earth ____	5,066	9,335	__	Malaysia 9,319.
Kaolin (china clay) ____	1,613	1,941	__	Malaysia 1,784.
Other ____	4,641	1,674	__	Malaysia 1,162.
Products:				
Nonrefractory[4] ____	r13,878	18,815	__	Malaysia 16,196.
Refractory including nonclay brick[5] ____	466	609	__	Malaysia 551.
Diamond:				
Gem, not set or strung value, thousands__	$6,322	$5,429	__	Hong Kong $1,866; Belgium-Luxembourg $1,079; Israel $1,072.
Industrial ____ do____	$345	$520	__	Saudi Arabia $138; Israel $136; Belgium-Luxembourg $112.
Diatomite and other infusorial earth ____	60	91	__	Malaysia 70; Philippines 19.
Feldspar and fluorspar ____	4,941	5,850	__	All to Malaysia.
Fertilizer materials:				
Crude:				
Nitrogenous ____	1	8	__	Malaysia 6; Sri Lanka 2.
Phosphatic ____	12,465	18,653	__	Malaysia 14,924; Taiwan 3,302.
Manufactured:				
Nitrogenous ____	36,701	61,916	__	Malaysia 44,035; Bangladesh 8,836.
Phosphatic ____	28,946	73,526	__	Bangladesh 30,426; China 20,300.
Potassic ____	234,167	188,654	__	Malaysia 136,676; Bangladesh 34,177.
Other including mixed ____	122,860	102,547	__	Malaysia 102,028.
Ammonia ____	381	377	__	Malaysia 290.
Graphite, natural ____	75	126	__	Malaysia 122.
Gypsum and plasters ____	1,405	1,251	__	Malaysia 952.
Lime ____	5,574	6,457	__	Malaysia 3,178; Sri Lanka 1,998.
Magnesite ____	102	337	__	Malaysia 256.
Mica, all forms ____	153	274	__	Malaysia 179; Brunei 40.
Pigments, mineral:				
Natural, crude ____	200	49	NA	NA.
Iron oxides, processed ____	427	449	__	Malaysia 424.
Precious and semiprecious stones, natural and synthetic, excluding diamond value, thousands__	$26,390	$27,847	$173	Hong Kong $25,706.
Salt and brine ____	14,131	13,695	__	Malaysia 12,699.

See footnotes at end of table.

Table 11.—Singapore: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Sodium and potassium compounds, n.e.s.:				
Caustic potash	258	249	--	Malaysia 149; United Arab Emirates 30.
Caustic soda	10,893	3,509	--	Malaysia 1,963; Bangladesh 580.
Soda ash	5,939	13,139	--	Malaysia 9,424; Bangladesh 3,561.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	426	191	--	Malaysia 116.
Worked[6]	1,726	710	--	Malaysia 406; Brunei 76.
Dolomite, chiefly refractory-grade	2,494	40	--	Papua New Guinea 30.
Gravel and crushed rock	4,315	2,985	--	Malaysia 2,383.
Limestone except dimension	666	627	--	Malaysia 515.
Quartz and quartzite kilograms	3,484	183	NA	NA.
Sand excluding metal-bearing	1,355	583	--	Australia 91; Philippines 91; Malaysia 50.
Sulfur:				
Elemental:				
Other than colloidal	5,190	3,130	--	North Korea 1,972; Malaysia 1,141.
Colloidal, sublimed and precipitated	16,068	17,451	--	Malaysia 14,170; North Korea 2,420.
Dioxide kilograms	420	292	NA	NA.
Sulfuric acid	804	782	NA	Sri Lanka 357; Malaysia 323.
Talc, steatite, soapstone, pyrophyllite	807	554	--	Malaysia 497.
Other:				
Crude	64,165	49,207	--	Malaysia 44,505.
Slag, dross, similar waste, not metal-bearing	13,858	13,247	--	Japan 11,400.
Oxides and hydroxides of magnesium, strontium, barium	14	11	--	Malaysia 10.
Bromine, iodine, fluorine value	$12,812	$16,813	--	Brunei $7,000; Malaysia $7,000; Burma $2,000.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	17,973	17,174	--	Malaysia 7,355; Sri Lanka 6,782.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	26,478	7,656	--	Malaysia 4,185; Burma 1,730.
Carbon black	690	687	--	Malaysia 436; Thailand 221.
Coal, all grades including briquets	1,038	1,588	--	Malaysia 991; Thailand 272.
Coke and semicoke	8,242	8,486	--	Malaysia 8,233.
Hydrogen, helium, rare gases value, thousands	$1,161	$1,498	--	Malaysia $461; Brunei $404; India $181.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	907	552	--	Malaysia 549.
Refinery products:				
Gasoline:				
Aviation do	390	511	--	Australia 133; New Caledonia 95; New Guinea 86.
Motor do	13,561	13,748	--	Malaysia 4,307; Thailand 1,889 New Zealand 1,564.
Jet fuel do	17,119	15,606	1,623	Japan 3,771; Hong Kong 2,387; New Zealand 1,747.
Kerosine and white spirits do	6,829	7,499	--	Hong Kong 2,192; Malaysia 1,435; India 1,410.
Distillate fuel oil do	30,435	33,282	--	Malaysia 8,229; Thailand 5,394; India 4,294.
Residual fuel oil do	56,929	62,108	1,827	Hong Kong 24,076; Japan 11,529; Australia 6,805.
Lubricants do	3,791	3,532	--	Thailand 830; Malaysia 804; Saudi Arabia 330.
Mineral jelly and wax do	345	263	--	Japan 54; Malaysia 25; Thailand 24.

See footnotes at end of table.

Table 11.—Singapore: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Other:				
Naphtha, thousand 42-gallon barrels	18,779	19,167	804	Japan 12,108; New Zealand 2,577; Taiwan 1,281.
Nonlubricating oils, do.	580	472	--	Sweden 239; Thailand 110; Malaysia 72.
Petroleum coke, do.	84	21	--	Malaysia 8; Brunei 7; Oman 6.
Liquefied petroleum gas, do.	r1,024	1,699	--	Hong Kong 586; Thailand 494; Malaysia 462.
Bitumen and bituminous mixtures, n.e.s., do.	1,423	1,192	--	Australia 261; Malaysia 217; Bangladesh 128.
Unspecified, do.	r6,531	978	--	Japan 357; Philippines 328; Malaysia 103.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r4,426	4,439	--	Taiwan 2,555; Kampuchea 1,000.

rRevised. NA Not available.
[1]Less than 1/2 unit.
[2]May include platinum-group metals.
[3]Excludes quantity valued at $14,565 in 1979 and $1,868 in 1980.
[4]Excludes quantity of ceramic building bricks valued at $60,488 in 1979 and $75,191 in 1980.
[5]Excludes quantity of refractory bricks valued at $32,093 in 1979 and $299,365 in 1980.
[6]Excludes quantity valued at $115 in 1979 and $467 in 1980.

Table 12.—Singapore: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	11,000	400	--	All from China.
Oxides and hydroxides	7,583	8,185	216	China 5,666; Japan 2,117.
Metal including alloys:				
Scrap	334	433	--	Malaysia 342; Brunei 78.
Unwrought and semimanufactures	28,739	29,567	4,406	Australia 3,990; Japan 3,725; Malaysia 3,109; Sweden 2,106
Antimony metal including alloys, all forms	14	51	--	China 50.
Arsenic: Natural sulfides	2	10	NA	NA.
Beryllium metal including alloys, all forms, kilograms	26	20	NA	NA.
Bismuth metal including alloys unwrought, do.	2,310	45	NA	NA.
Cadmium metal including alloys unwrought	5	3	--	All from Australia.
Chromium oxides and hydroxides	163	307	78	Japan 86; Netherlands 38; Finland 36.
Cobalt:				
Oxides and hydroxides	25	3	--	Japan 2.
Metal including alloys, unwrought	2	7	--	Netherlands 4; Japan 3.
Columbium and tantalum metals including alloys, all forms, kilograms	r140	34	NA	NA.
Copper:				
Ore and concentrate	1	NA	--	NA.
Matte, value	$40	--		
Metal including alloys:				
Scrap	3,060	5,026	--	Malaysia 4,652.
Unwrought and semimanufactures	23,832	31,716	1,000	Japan 18,000; Australia 5,075; New Zealand 798.

See footnotes at end of table.

Table 12.—Singapore: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Indium metal including alloys unwrought ---------- kilograms	20,027	20	--	All from United Kingdom.
Iron and steel:				
Ore and concentrate	6,781	9,605	--	Malaysia 9,590.
Metal:				
Scrap	109,055	172,028	47,231	Australia 114,419.
Pig iron including cast iron	79,862	31,490	16,532	China 6,887; Australia 6,492.
Sponge iron, powder, shot	1,266	1,694	1,065	Japan 206.
Ferroalloys:				
Ferromanganese	6,328	3,534	--	Australia 3,154.
Other	1,409	4,878	50	Australia 3,236; Taiwan 598.
Steel, primary forms	110,990	96,377	43	Spain 30,735; Australia 20,351; Japan 15,203.
Semimanufactures:				
Bars, rods, angles, shapes, sections	246,862	444,187	4,530	Japan 252,784; West Germany 35,150; Mozambique 31,110.
Universals, plates, sheets	611,132	656,724	5,218	Japan 473,828; Republic of Korea 84,009.
Hoop and strip	30,545	24,991	842	Japan 18,227; Republic of Korea 2,661; West Germany 1,323.
Rails and accessories	34,010	25,651	32	Poland 14,891; Japan 7,906.
Wire	18,122	18,858	137	Japan 7,711; China 7,079.
Tubes, pipes, fittings	291,030	338,602	14,627	Japan 280,750; Malaysia 7,899; India 6,652.
Castings and forgings, rough	10,246	10,691	3,020	Japan 5,848; Australia 1,401.
Lead:				
Ore and concentrate	114	190	--	Thailand 114; Australia 54.
Oxides and hydroxides	497	554	--	Australia 429; West Germany 86.
Metal including alloys:				
Scrap	235	214	--	Malaysia 80; Brunei 74.
Unwrought	4,373	8,095	1	Australia 4,435; Burma 1,861; Malaysia 725.
Semimanufactures	911	856	4	Australia 653.
Magnesium metal including alloys, all forms	22	15	9	Australia 3.
Manganese:				
Ore and concentrate	33,517	60,468	--	NA.
Oxides and hydroxides	2,767	3,319	13	Ireland 1,566; China 1,047.
Mercury ---------- 76-pound flasks	116	90	34	Japan 28.
Molybdenum metal including alloys, all forms	4	3	2	NA.
Nickel metal including alloys:				
Scrap	55	237	--	Malaysia 182.
Unwrought and semimanufactures	300	1,357	19	France 1,125.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	5,466	19,290	675	Australia 3,794; West Germany 2,283.
Silver:				
Ore and concentrate[1] -- kilograms	10	434	149	Taiwan 204; United Kingdom 54.
Waste and sweepings[1] value, thousands	$138	$146	--	All from Malaysia.
Metal including alloys, unwrought and partly wrought troy ounces	809,169	741,910	57,068	Australia 208,240; Switzerland 140,113; West Germany 133,297.
Tin:				
Ore and concentrate	4,227	3,370	--	Burma 1,496; Thailand 1,404.
Oxides and hydroxides	2	6	4	NA.
Metal including alloys:				
Scrap	156	1,032	--	Australia 901; Malaysia 75.
Unwrought and semimanufactures	2,013	2,782	5	Malaysia 2,100.
Titanium:				
Ore and concentrate	r1,176	541	--	Malaysia 400; Australia 141.
Oxides and hydroxides	4,338	3,768	256	Japan 1,544; West Germany 612; United Kingdom 551.
Metal including alloys, unwrought ---------- kilograms	1,423	684	314	Japan 162.
Tungsten:				
Ore and concentrate	486	1,346	2	Burma 947; Thailand 222.
Metal including alloys, all forms	76	160	19	Republic of Korea 56; Japan 21; Austria 19.

See footnotes at end of table.

Table 12.—Singapore: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	10	139	--	Burma 71; Australia 51.
Oxides and peroxides excluding hydroxides	397	531	18	United Kingdom 101; Canada 100; China 97.
Metal including alloys:				
Scrap	445	351	--	Malaysia 244; Canada 49.
Unwrought and wrought	18,038	18,482	303	Canada 8,490; Australia 4,246; China 1,362.
Zirconium ore and concentrate	377	1,102	--	Australia 1,021.
Other:				
Ash and residue containing nonferrous metals	104,240	114,052	--	Japan 100,935; Malaysia 12,501.
Oxides, hydroxides, peroxides	670	754	32	China 247; Norway 161; West Germany 94.
Metals:				
Metalloids	26	92	(2)	Japan 71; India 18.
Alkali, alkaline-earth, rare-earth metals	64	134	13	Japan 59; France 52.
Pyrophoric alloys	81	110	--	China 93; Hong Kong 10.
Base metals including alloys, all forms	8	13	--	United Kingdom 5.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	293	298	114	India 54; Australia 51; Japan 29.
Artificial: Corundum -- kilograms	--	68	NA	NA.
Dust and powder of precious and semi-precious stones -- value	$406,358	$8,874	$874	West Germany $8,000.
Grinding and polishing wheels and stones[3]	1,456	2,062	62	Japan 731; China 514; Italy 248.
Asbestos, crude	12,008	16,661	1,748	Australia 6,198.
Barite and witherite	50,774	66,343	--	Thailand 64,574.
Boron materials:				
Crude natural borates	628	748	748	
Oxides and acids	602	175	155	NA.
Cement -- thousand tons	1,682	1,831	(2)	Japan 1,232; Republic of Korea 377.
Chalk	3,741	8,854	--	Malaysia 6,242; United Kingdom 1,584.
Clays and clay products:				
Crude:				
Bentonite	46,377	46,778	46,288	China 250.
Fuller's earth	3,187	4,856	424	West Germany 3,870.
Kaolin (china clay)	5,983	5,286	20	Malaysia 2,861; Japan 1,423; United Kingdom 832.
Other	18,307	13,753	560	Malaysia 7,662; Japan 2,807; China 1,141.
Products:				
Nonrefractory[4]	76,866	96,682	27	Italy 46,333; Japan 12,257; Spain 6,366.
Refractory including nonclay brick[5]	7,067	13,181	487	United Kingdom 5,899; Australia 3,186.
Diamond:				
Gem, not set or strung value, thousands	$36,043	$69,415	$1,914	Israel $24,285; Belgium-Luxembourg $19,082; India $14,706.
Industrial -- do	$2,015	$4,579	--	Israel $2,027; Belgium-Luxembourg $1,602.
Diatomite and other infusorial earth	657	619	356	China 130; Philippines 69.
Feldspar and fluorspar	5,829	8,312	--	India 6,972.
Fertilizer materials:				
Crude, phosphatic	17,090	20,393	--	Christmas Island 18,208; India 683.
Manufactured:				
Nitrogenous	67,219	52,169	13	U.S.S.R. 16,629; Italy 9,000; Republic of Korea 7,253.
Phosphatic	53,217	36,977	36,157	Israel 360.
Potassic	297,644	307,627	--	Canada 126,290; West Germany 51,682; Israel 46,459.
Other including mixed	119,008	139,747	21,171	West Germany 75,575; Belgium-Luxembourg 25,589.
Ammonia	542	437	114	Malaysia 134; Netherlands 48; West Germany 44.
Graphite, natural	519	572	102	China 271; Republic of Korea 140.

See footnotes at end of table.

Table 12.—Singapore: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Gypsum and plasters	75,268	76,910	--	Australia 49,511; Japan 25,380.
Kyanite and sillimanite value	$145	--	--	
Lime	14,373	16,453	234	Malaysia 12,787; China 2,569.
Magnesite	288	638	21	China 368; Norway 116; West Germany 68.
Mica, all forms	309	1,455	401	India 542; China 370.
Pigments, mineral:				
Natural, crude	33	--	--	
Iron oxides, processed	2,266	2,422	207	West Germany 752; Japan 689; China 578.
Precious and semiprecious stones, except diamond, worked and unworked:				
Natural value, thousands	$26,971	$26,775	$442	Kenya $17,441; Sri Lanka $1,947.
Manufactured do	$105	$217	--	Thailand $80; Austria $79.
Salt and brine	47,139	48,064	1,515	Thailand 31,779; Australia 6,647; Israel 3,306.
Sodium and potassium compounds, n.e.s.:				
Caustic potash and sodic and potassic peroxides	592	482	36	Hong Kong 172; Spain 104; Japan 71.
Caustic soda	30,103	30,392	14,401	East Germany 6,015; Switzerland 2,964; Romania 2,296.
Soda ash	23,148	28,675	2,000	Kenya 18,098; Romania 6,450; Japan 1,161.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	17,121	3,099	--	Malaysia 1,482; Pakistan 589; Italy 512.
Worked	11,406	15,972	6	Italy 6,710; China 4,124.
Dolomite, chiefly refractory-grade	5,137	2,348	--	Malaysia 2,251.
Gravel and crushed rock	1,086,940	62,240	10	Malaysia 56,106.
Limestone excluding dimension	49,160	69,712	--	Malaysia 46,500; Japan 21,564.
Quartz and quartzite	948	635	4	China 580; United Kingdom 27.
Sand excluding metal-bearing	281,142	58,975	3,796	Malaysia 54,162.
Sulfur:				
Elemental:				
Other than colloidal	568	245	--	Taiwan 62; Canada 50.
Colloidal	168	596	145	Republic of Korea 323; Poland 115.
Dioxide	1	4	NA	NA.
Sulfuric acid	846	322	35	Malaysia 185; West Germany 54.
Talc, steatite, soapstone, pyrophyllite	4,885	5,143	177	China 3,607; Republic of Korea 894.
Other:				
Crude	101,436	5,288	--	West Germany 4,385; Malaysia 762.
Slag, dross, similar waste, not metal-bearing	9,590	7,746	--	Japan 6,302; United Kingdom 1,072.
Oxides and hydroxides of magnesium, strontium, barium	57	43	--	Japan 41.
Bromine, iodine, fluorine value	$39,618	$67,719	$37,362	West Germany $14,478.
Building materials of asphalt, asbestos and fiber cements, unfired non-metals	7,615	9,844	8	Thailand 4,201; Malaysia 4,089.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,022	1,246	121	Republic of Korea 1,001.
Carbon black	6,293	9,161	289	Malaysia 6,301; Japan 2,041.
Coal, all grades including briquets	1,148	2,298	1,830	Malaysia 258; Canada 105.
Coke and semicoke	9,261	11,778	--	Taiwan 6,050; Japan 5,500.
Hydrogen, helium, rare gases value, thousands	$530	$1,111	$118	Australia $303; United Kingdom $282; Japan $251.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	207,939	185,431	--	Saudi Arabia 103,735; Kuwait 39,968; Malaysia 19,194.
Refinery products:				
Gasoline:				
Aviation do	377	455	31	Netherlands Antilles 219; Netherlands 116.
Motor do	116	124	--	Australia 84; Philippines 36.
Jet fuel do	49	357	--	China 199; Greece 95.
Kerosine and white spirit do	289	347	(2)	Malaysia 280; China 48.
Distillate fuel oil do	2,147	4,288	173	China 819; Bahrain 742; Australia 479.
Residual fuel oil do	22,621	30,348	2,910	Bahrain 10,489; Iran 7,871; Kenya 2,794.
Lubricants do	r707	702	29	Australia 190; Netherlands Antilles 128; Malaysia 101.

See footnotes at end of table.

Table 12.—Singapore: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Other:				
Mineral jelly and wax thousand 42-gallon barrels	62	106	1	China 80.
Nonlubricating oils do	58	51	10	Malaysia 12; China 9.
Petroleum coke do	r28	22	16	United Kingdom 3.
Liquefied petroleum gas do	(2)	35	--	Thailand 22; Japan 13.
Bitumen and bituminous mixtures do	23	12	(2)	Thailand 6.
Unspecified do	2,444	1,642	5	Malaysia 1,154.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	r4,931	6,678	19	Australia 3,398; United Kingdom 1,484.

rRevised. NA Not available.
[1]May include platinum-group metals.
[2]Less than 1/2 unit.
[3]Excludes quantity valued at $43,656 in 1979 and $31,291 in 1980.
[4]Excludes quantity of bricks and baked clay valued at $524,865 in 1979 and $456,753 in 1980.
[5]Excludes quantity valued at $5,984,544 in 1979 and $8,297,684 in 1980.

SRI LANKA[39]

Sri Lanka was a major world producer of colored gem stones in 1981 and an important producer of heavy mineral beach sands. The only other minerals of local importance were graphite, mica, feldspar, apatite, limestone, and several of the clays. A copper-iron deposit was reported but not exploited. The mineral industry generally produced about 3% to 4% of the total value of exports; most of the mineral portion was from gems and surplus petroleum refinery products.

The Government that came to power in mid-1977 began a comprehensive program to reform the economy and to accelerate economic growth. It has taken steps to free the economy from excessive controls, to provide industries with increased incentives to produce, and to reduce consumer subsidies. The measures included unification and floating of the exchange rate; removal of exchange controls on imports; liberalization of import licensing; elimination of Government import monopolies; lifting of most price controls; guaranteed prices for certain agricultural commodities; reduction of consumer subsidies including those on rice, sugar, flour, and petroleum products; increased interest rates to promote savings; and encouragement of foreign and domestic investment.

The new fiscal program was initially very successful, but the rate of growth slowly declined. The real growth in GNP jumped from a range of 1% to 2% in the early 1970's to 8.2% in 1978, 6.3% in 1979, and 5.6% in 1980. The estimated growth had dropped to about 5.0% in 1981. The main problem apparently was that the Government was spending far more than its income, mostly on three big development projects that were turning out to be much more expensive than originally planned. By 1981, the total Government expenditures were running more than twice the total revenue.

Fiscal problems became acute as large amounts of imports were needed for the development projects, but exports, mainly agricultural products, failed to increase at the same rate. The trade deficit increased from $477 million in 1979 to $985 million in 1980. In the first 9 months of 1981 the deficit increased a further 10% over the 1980 level.

Various international funds, agencies, and individual countries have been supplying aid to finance the huge deficits and trade imbalances. The world economic situation, however, has made it more difficult to obtain the large aid grants needed to pay for the deficits. Funds that were available did not buy as much as world prices increased and the value of the Sri Lanka rupee dropped over 22% against the dollar and nearly 32% against the Japanese yen, from 1977 through 1981.

By the end of 1980, the Government had begun a series of changes and cutbacks designed to bring the economic situation back under control. Government expenditures were reduced significantly and domestic income was increased by the imposition of higher taxes. Capital expenditures on the huge Mahaweli River diversion project and the urban redevelopment project were scaled down in 1981, and the cutbacks continued in the planned fiscal year 1982 budget.

A possible indication of the effects of the new fiscal restraint was a reduction of the inflation rate from the 31% to 35% level in 1980 to about 18% in 1981.

The 147,000-ton-per-year nitrogen naphtha-based ammonia-urea plant at Sapugaskanda was finally commissioned in March 1981 after several months of trial production. The plant is to produce over 1,000 tons per day of urea for domestic consumption. It was designed and built by Kellogg Overseas Corp. and should relieve the country of the burden of importing all of its nitrogen fertilizer needs.

A large deposit of apatite was discovered in the early 1970's at Eppawala in North Central Province. Proved reserves are 25 million tons of ore grading between 34% and 38% P_2O_5. Although the ore is high in phosphorus content, its solubility is very low and it contains high levels of impurities, especially chloride. Normal methods of calcination and scrubbing do not produce a product suitable for making phosphoric acid. The search for a suitable process for economically removing the highly corrosive chloride continued during the year. A small grinding plant currently operates at the Eppawala deposit. The untreated ground apatite was used for direct crop application where farming conditions would tolerate the impurities. Only a few thousand tons was used in this manner each year.

Except for diamond, emerald, and opal, nearly all the other varieties of gem stones have been produced in Sri Lanka since ancient times. All mining is in riverbed gravels or former channels now covered by recent alluvium. The traditional mining method was for one or two workers to dig a pit in a likely looking deposit and manually pan for gem stones.

Major changes took place in the industry in 1981. Modern excavating equipment was brought into play by several companies that were awarded mining rights in the areas to be flooded by the Mahaweli River diversion program. Since about 13,000 hectares of potential gem-bearing gravels would be permanently inundated, the Government decided to invite foreign companies to bid for the mining rights and extract what gems could be obtained before the waters began to rise. The Government-owned State Gem Corp. had the option to buy all stones, and profits would be shared on an equal basis.

Neither weight of production nor value of the gem output was available in 1981. It was speculated, however, that over 1 million carats of rough stones may have been removed by the accelerated mining methods in 1981.

Sri Lanka was a major producer of high-grade natural graphite, ranking among the top 10 world producers. Total shipments of graphite in 1981 were valued at $4.5 million, a decrease of 6% in value compared with 1980 statistics. This was the third consecutive year that production has declined. To increase production, the Asian Development Bank approved technical assistance for a graphite mining project. The assistance was to formulate a program that would help produce an additional 17,000 tons of graphite ore annually. It will involve the rehabilitation and expansion of existing mines of the State Mining and Mineral Development Corp., the reopening of local abandoned mines, and the exploration and evaluation of the country's graphite potential.

Oil exploration activity was stepped up in Sri Lanka after the September 1980 Indian announcement of an oil strike in Cauvery Basin on the Indian side of Palk Strait. Gravity, magnetic, and seismic surveys were begun in late 1980 by Prakla Seismos GmbH of the Federal Republic of Germany. The surveys covered mostly Blocks 1, 2, 10, and 11 along the northwest quadrant of the island and were completed in January 1981.

Interpretation of the survey data resulted in Cities Service Sri Lanka Petroleum Corp. (Citco) choosing a drilling site, Pearl-1, in Block 11 south of Mannar Island. Drilling began on September 28, 1981, and proceeded to 3,048 meters before the well was abandoned as a dry hole. Citco then moved the jack-up drilling rig Apollo 1 to the Palk Strait, a few kilometers from the successful Indian well. The new well, Pedro 1, was drilled to 1,740 meters where it encountered what was believed to be basement rock. There was some question whether this meant no oil or whether the rock acted as a lid over a large oil reservoir. At yearend, rock samples were being analyzed to deter-

mine if the well should be drilled deeper.[40]

Several other companies hold exploration or production-sharing agreements with Ceylon Petroleum Corp. (CPC) for the offshore areas surrounding the island. Any of these could begin drilling operations in 1982 if the survey results show favorable conditions in their areas.

Discovery of even modest amounts of oil could be very important to the Sri Lanka economy. The country produced no oil or gas domestically. The cost of crude petroleum imports has become a major economic problem, increasing from $121 million in 1975 to $442 million in 1980. Expenditures for 1981 were expected to be about the same for crude oil, but refined product costs were projected to increase about 40% in 1981. In past years, some of the imported petroleum was exported in the form of bunker fuel oil, jet fuel, and naphtha. This changed in 1981 with the opening of the fertilizer plant, which uses naphtha as raw material. Increased amounts of fuel oil were scheduled for use in electric power generation as well.

Caltex Petroleum Corp. (United States) has proposed investing in a joint venture to take over the distribution of liquefied petroleum gas (LPG) in Sri Lanka. CPC produces 7,000 tons per year at its refinery in Sapugaskanda near Colombo, but demand exceeds current supply. Caltex felt that with increased storage facilities considerably more LPG would be distributed. The refinery capacity could be increased easily to 11,000 tons per year.

CPC reportedly let a contract to Ocean Resources Div. of Williams Bros. Engineering Co. (United States) for consulting services on installation of a single point mooring facility. The facility would transfer crude oil to the refinery at Sapugaskanda, which currently receives its crude oil supplies via transfer lightering barges.[41]

Coastal Corp., a Texas-based oil company, was to obtain a 25-year lease for the 1-million-ton oil storage tank farm at China Bay, Trincomalee. A new company, Coastal (Lanka) Ltd., is to be set up to recondition and operate the 99-tank facility, which was built by the British during World War II and had been unused probably since 1964. The facility would be used as a deepwater export terminal for crude and refined products.

Table 13.—Sri Lanka: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	7	[1]35	--	Mainly to Maldives.
Copper metal including alloys, all forms value	$3,117	$7,147	--	China $6,947; United Kingdom $200.
Iron and steel metal, all forms	7	[2]46	--	Mainly to Maldives.
Lead:				
Oxides and hydroxides	452	303	--	Republic of South Africa 290; Bangladesh 13.
Metal including alloys, all forms	334	379	--	Republic of South Africa 270; United Kingdom 50; Hong Kong 35.
Platinum-group metals including alloys, unwrought and partly wrought value	$535	--		
Silver metal including alloys, unwrought and partly wrought do	$281	$54,558	--	United Kingdom $46,872; Abu Dhabi $4,133; Singapore $3,502.
Tin metal including alloys, all forms do	$5	$305	--	Canada $287; United Kingdom $18.
Titanium ore and concentrate	32,640	23,970	--	All to Japan.
Uranium and thorium, depleted metal kilograms	--	15	--	All to Canada.
Zinc oxides and peroxides do	--	50	--	All to Maldives.
Other:				
Ores and concentrates	16,500	11,900	--	Netherlands 10,000; Japan 1,900.
Ash and residue containing nonferrous metals kilograms	9	--		
Base metals including alloys, all forms value	$556	$3,729	--	West Germany $1,995; Norway $1,275.

See footnotes at end of table.

Table 13.—Sri Lanka: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones value	$348	$34	--	Australia $20; United Kingdom $14.
Boron materials: Oxide and acid do	--	$81	--	All to Maldives.
Cement	308	200	--	Mainly to Maldives.
Clays and clay products:				
Crude	4	11	(3)	United Kingdom 9.
Products:				
Nonrefractory	11,566	13,344	1,682	Singapore 5,528; Hong Kong 2,530.
Refractory including nonclay brick	7	12	1	Iran 10.
Fertilizer materials:				
Crude and manufactured	275	6	--	Singapore 2; Abu Dhabi 2.
Ammonia kilograms	--	12	--	All to Maldives.
Graphite, natural	11,154	6,604	1,421	Japan 2,487; Taiwan 750; United Kingdom 582.
Mica:				
Crude including splittings and waste	555	630	(3)	Japan 609; Belgium 21.
Worked including agglomerated splittings kilograms	100	10	--	All to Switzerland.
Precious and semiprecious stone including diamond:				
Natural carats	590,000	275,562	18,022	Hong Kong 76,619; Japan 56,579; West Germany 42,195.
Synthetic and reconstructed do	10,577	58,814	58,439	Japan 322.
Salt and brine	210	6,180	--	Kenya 6,000; Maldives 180.
Sodium and potassium compounds, n.e.s kilograms	10	--		
Stone, sand and gravel excluding metal-bearing sand	339	53	3	Japan 31; Maldives 16.
Sulfur:				
Pyrites, unroasted kilograms	5	2	--	All to United Kingdom.
Sulfuric acid do	160	--		
Other:				
Activated natural minerals	855	668	346	United Kingdom 247; Republic of South Africa 45.
Halogens kilograms	144	--		
Building materials of asphalt, asbestos and fiber cements, unfired non-metals value	$53,387	$451	--	All to Maldives.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black and gas carbon kilograms	(3)	14	--	All to United Kingdom.
Coke and semicoke	20	--		
Hydrogen, helium, rare gases kilograms	890	470	--	All to Maldives.
Petroleum and refinery products:				
Partly refined petroleum 42-gallon barrels	708	2,104	--	Do.
Refinery products:				
Nonbunker:				
Gasoline do	1,608	418,136	--	People's Democratic Republic of Yemen 214,768; Netherlands 202,531.
Distillate fuel oil do	241	--		
Residual fuel oil do	371,432	1,248,454	--	India 868,525; Philippines 150,524; Egypt 122,421.
Lubricants do	(3)	15	--	All to Maldives.
Liquefied petroleum gas do	37	25	--	Do.
Other do	353	30	--	Mainly to Maldives.
Bunker:				
Jet fuel do	594,400	669,345		
Distillate fuel oil do	500,163	430,375		
Residual fuel oil do	2,188,476	2,080,244		
Lubricants do	4,040	5,292		
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	81,392	66,956	--	Taiwan 44,958; People's Democratic Republic of Yemen 21,998.

[1]Reported quantity exported valued at $122,817; unreported quantity valued at $114,515 also exported.
[2]Excludes unreported quantity valued at $1,462.
[3]Less than 1/2 unit.

Table 14.—Sri Lanka: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	--	210	--	All from India.
Oxides and hydroxides	205	17	(2)	Japan 13; India 3.
Metal including alloys:				
Scrap	--	7	--	Mainly from Hong Kong.
Unwrought	18	4	--	Hong Kong 2; United Kingdom 2.
Semimanufactures	6,698	7,834	(2)	Norway 2,685; India 2,338; Hong Kong 715.
Arsenic oxides and acids -- kilograms	2	1	--	All from United Kingdom.
Chromium:				
Ore and concentrate	--	54	--	All from Netherlands.
Oxides and hydroxides	8	10	--	United Kingdom 6; West Germany 3.
Cobalt oxides and hydroxides kilograms	--	750	--	United Kingdom 500; West Germany 250.
Copper:				
Matte	9	--		
Metal including alloys:				
Unwrought including scrap	52	3	(2)	United Kingdom 2; China 1.
Semimanufactures	8,040	1,500	2	Australia 686; United Kingdom 278; Japan 217.
Gold metal including alloys, unwrought and partly wrought[3] -- troy ounces	16,365	NA	--	All from United Kingdom.
Iron and steel:				
Ore and concentrate	118	--		
Metal:				
Scrap	50	(4)	--	Mainly from West Germany.
Pig iron, cast iron, spiegeleisen	122	322	136	United Kingdom 120; Singapore 35.
Ferroalloys	132	93	--	Australia 37; U.S.S.R. 21; China 10.
Steel, primary forms	50,834	56,642	--	Republic of South Africa 40,294; Zimbabwe 12,943; U.S.S.R. 3,404.
Semimanufactures	94,008	101,193	290	Japan 50,494; United Kingdom 20,355; Republic of South Africa 10,604.
Lead:				
Ore and concentrate	1	--		
Oxides	8	9	--	West Germany 5; United Kingdom 3.
Metal including alloys:				
Unwrought	500	[5]462	10	Australia 402; United Kingdom 143.
Semimanufactures	79	124	(2)	Australia 99; Belgium 15.
Magnesium metal including alloys, all forms -- value	$33,260	$3,027	$2,210	United Kingdom $817.
Manganese:				
Ore and concentrate	1,018	1,744	--	Singapore 1,679; United Kingdom 50; Belgium 15.
Oxides	408	534	--	United Kingdom 199; Japan 130; Singapore 120.
Mercury -- 76-pound flasks	46	13	--	United Kingdom 12; West Germany 1.
Molybdenum metal including alloys, all forms -- kilograms	826	60	--	United Kingdom 29; Japan 19; Sweden 12.
Nickel metal including alloys, all forms	15	10	(2)	United Kingdom 7; Belgium 2.
Platinum-group metals including alloys, unwrought and partly wrought troy ounces	[6]257	386	322	United Kingdom 64.
Silver metal including alloys, unwrought and partly wrought -- do	3,959	4,180	--	United Kingdom 2,186; Sweden 1,608.
Tin:				
Ore and concentrate	--	50	--	All from Singapore.
Oxides and hydroxides -- value	$44	$15,069	--	All from United Kingdom.
Metal including alloys:				
Scrap -- do	$88,546	$12,526	$12,526	
Unwrought	12	16	--	Malaysia 9; Hong Kong 3; Denmark 2.
Semimanufactures	41	34	--	Republic of South Africa 30; Malaysia 4.

See footnotes at end of table.

Table 14.—Sri Lanka: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Titanium oxides and hydroxides	81	48	(2)	United Kingdom 47.
Tungsten metal including alloys, all forms	1	15	(2)	Mainly from China.
Uranium and thorium:				
Compounds	7	69	66	China 3.
Depleted metal	11	--		
Zinc:				
Oxides and hydroxides	565	820	2	Republic of South Africa 365; West Germany 134; United Kingdom 130.
Metal including alloys:				
Scrap kilograms	3	5,000	--	Mainly from Australia.
Dust (blue powder) do.	460	302	--	All from United Kingdom.
Unwrought	551	672	--	Australia 305; Japan 221; China 100.
Semimanufactures	50	69	(2)	Australia 55; France 10.
Other:				
Ores and concentrates:				
Of precious metals value	--	$48,924	--	All from India.
Unspecified	2	2	--	Mainly from Sweden.
Oxides, hydroxides, peroxides	2	12	(2)	Belgium 10; United Kingdom 2.
Metals:				
Metalloids kilograms	6,379	99	(2)	United Kingdom 45; India 35; Singapore 11.
Alkali, alkaline-earth, rare-earth metals kilograms	4,015	88	4	Sweden 71; United Kingdom 13.
Pyrophoric alloys, ferrocerium value	$22	$42,597	--	All from Republic of Korea.
Waste and sweepings of precious metals do.	$91	--		
Base metals including alloys, all forms kilograms	9,935	153	--	Japan 150; United Kingdom 3.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	38	41	23	India 11; United Kingdom 3.
Artificial: Corundum	1	2	--	India 1; United Kingdom 1.
Dust and powder of precious and semi-precious stones including diamond value	r$3,233	$1,937	$878	India $535; Japan $373; West Germany $151.
Grinding and polishing wheels and stones	238	127	(2)	Belgium 26; United Kingdom 21; Japan 20; Netherlands 16.
Asbestos, crude	11,780	6,188	--	Canada 5,872; United Kingdom 200.
Barite and witherite	4	47	--	All from China.
Boron materials: Oxide and acid	42	13	10	India 3.
Cement	54,266	215,168	--	Philippines 56,863; Singapore 55,234; Japan 39,812.
Chalk	102	144	--	United Kingdom 137; Japan 6.
Clays and clay products:				
Crude	5,769	1,696	45	Japan 601; United Kingdom 571; India 334.
Products:				
Nonrefractory[3]	r4,534	2,382	--	India 2,041; United Kingdom 340.
Refractory including nonclay brick	1,449	4,529	1	U.S.S.R. 1,704; Japan 724; West Germany 596.
Diamond:				
Gem, not set or strung value	$1,357,894	$42,405	--	Belgium $42,133; United Kingdom $272.
Industrial do.	$127	$1,952	--	All from United Kingdom.
Powder and dust carats	NA	8,425	50	United Kingdom 8,070; India 175.
Diatomite and other infusorial earth	3,271	3,037	7	Thailand 3,000; India 24.
Feldspar, fluorspar, leucite, nepheline	370	1	--	All from Japan.
Fertilizer materials:				
Crude	9	27,502	--	Egypt 27,500.
Manufactured:				
Nitrogenous	213,723	201,164	8,075	Japan 68,165; Republic of Korea 39,204; Egypt 16,500.
Phosphatic	26,721	49,963	500	Singapore 11,000; Republic of South Africa 10,200; Tunisia 7,800.
Potassic	38,529	94,934	(2)	Canada 56,318; West Germany 33,115.
Other including mixed	11,599	29,883	12	Republic of Korea 16,000; Republic of South Africa 13,761.
Ammonia	291	133	(2)	United Kingdom 83; Netherlands 28.
Graphite:				
Natural kilograms	1	--		
Artificial do.	12	--		

See footnotes at end of table.

Table 14.—Sri Lanka: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Gypsum and plasters	4,909	198,965	--	India 198,489; West Germany 384.
Lime	3,361	324	--	Singapore 140; China 102; Republic of South Africa 54.
Magnesite	3	5	--	Mainly from Japan.
Mica:				
Crude including splittings and waste	11	21	(2)	India 20.
Worked including agglomerated splittings kilograms	119	41	(2)	United Kingdom 36; Singapore 5.
Pigments, mineral:				
Crude, natural	29	11	--	India 10; United Kingdom 1.
Iron oxides, processed	391	850	(2)	West Germany 662; India 65; United Kingdom 65.
Precious and semiprecious stones:				
Natural excluding diamond carats	2,624	717,206	--	West Germany 710,000; Thailand 7,003.
Synthetic and reconstructed including diamonds[3] do	7,391	11,866	10,000	Japan 1,866.
Pyrites, roasted kilograms	--	1	--	All from United Kingdom.
Salt and brine	5	6	--	United Kingdom 4; Singapore 1.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	9	35	--	United Kingdom 16; France 12; India 5.
Caustic soda	8,677	4,933	(2)	United Kingdom 3,251; West Germany 1,500.
Soda ash	5,532	2,714	--	United Kingdom 901; Kenya 685; Singapore 500.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	80	143	(2)	India 134; United Kingdom 6; Sweden 3.
Worked	146	60	--	China 54; United Kingdom 3.
Dolomite, chiefly refractory-grade	--	5	--	All from Norway.
Gravel and crushed rock	101	397	--	India 155; France 83; Italy 72; Japan 66.
Limestone excluding dimension kilograms	60	41	--	Mainly from India.
Quartz and quartzite value	$8,684	$161	$161	
Sand excluding metal-bearing	6	1	--	Mainly from United Kingdom.
Sulfur:				
Elemental:				
Other than colloidal	520	431	--	Thailand 250; Poland 50; India 27.
Colloidal	317	642	--	India 370; Thailand 145; Poland 100.
Dioxide kilograms	49,283	4	--	All from United Kingdom.
Sulfuric acid	518	697	(2)	Singapore 365; Thailand 275; Netherlands 35.
Talc, steatite, soapstone, pyrophyllite	1,585	1,215	228	China 837; India 135.
Other:				
Crude	4,846	3,229	--	West Germany 2,700; Singapore 499.
Oxides, hydroxides, peroxides of barium, magnesium, strontium	9	11	1	Japan 5; United Kingdom 2; Thailand 2.
Halogens kilograms	3,289	43	--	United Kingdom 31; West Germany 12.
Activated natural mineral products	199	185	--	Japan 125; India 35; United Kingdom 23.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	8,244	19,479	(2)	Indonesia 13,653; Singapore 3,970; Malaysia 1,830.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1	2	--	Singapore 1; United Kingdom 1.
Carbon black and gas carbon	3,426	3,310	660	India 1,392; Romania 716; Thailand 315.
Coal, all grades including briquets	247	288	--	Republic of South Africa 122; Thailand 100; United Kingdom 65.
Coke and semicoke	1,897	2,429	35	Japan 2,048; United Kingdom 165; Republic of South Africa 150.
Hydrogen, helium, rare gases	22	13	(2)	Singapore 11; Japan 2.

See footnotes at end of table.

Table 14.—Sri Lanka: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum and refinery products:				
Crude and partly refined thousand 42-gallon barrels	10,613	13,722	--	Saudi Arabia 6,968; Iraq 3,511; Iran 3,243.
Refinery products:				
Gasoline 42-gallon barrels	164	8,778	--	All from Italy.
Kerosine and jet fuel do	647,326	612,897	--	Singapore 310,577; Kuwait 302,320.
Distillate fuel oil do	809,549	223,372	--	Singapore 154,191; Kuwait 69,181.
Lubricants do	24,388	26,404	586	Singapore 12,570; Belgium 8,326; West Germany 1,670.
Other:				
Petroleum gases, liquefied and gaseous value	$46	$11,039	--	France $9,118; United Kingdom $1,860.
Mineral jelly and wax 42-gallon barrels	13,931	7,106	44	China 6,052; West Germany 489.
Petroleum coke, bitumen, other residues do	r35,881	60,620	--	Bahrain 34,675; Singapore 25,936.
Bituminous mixtures do	2,136	162	(2)	India 124; Singapore 24.
Unspecified do	214,683	53,153	(2)	Singapore 50,704; Belgium 1,249; West Germany 1,197.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	64	129	3	Republic of South Africa 50; United Kingdom 48; West Germany 11.

rRevised. NA Not available.

[1]The quantities reported in this table are the total quantities reported in the official trade statistics of Sri Lanka; however, additional, unreported quantities imported by Sri Lanka are indicated in the official trade statistics only by value and have generally not been reported in this table.

[2]Less than 1/2 unit.

[3]Excludes unreported quantity valued at $51,841 imported from the United Kingdom in 1979 and unreported quantity valued at $26,736 imported in 1980.

[4]Unreported quantity valued at $41,226.

[5]Excludes unreported quantity valued at $400,326.

[6]Excludes unreported quantity valued at $2,002.

[7]May include dust and powder of diamond.

[8]Excludes unreported quantity valued at $441,985 in 1979 and $210,746 in 1980.

[9]In 1979, the quantity reported imported was valued at $593, and an unreported quantity was valued at $4,224; in 1980, the quantity reported imported was valued at $1,451, and an unreported quantity was valued at $5,603.

VIETNAM[42]

In 1981, Vietnam produced a small amount of several minerals including coal, phosphate, tin, chromite, antimony, iron ore, clays, building stone, manganese, cement, salt, graphite, and zinc. Natural gas was produced and used industrially for the first time. Coal, phosphate, tin, and chromite were produced in sufficient amounts that a surplus was available for export. There were also known deposits of bauxite, lead, silver, and titanium minerals, but their status was unknown. In past years, the mining sector accounted for up to 5% of the GNP, but Vietnam releases official figures on only a few selected commodities and seldom gives sector totals. Vietnam was not an important world producer of any mineral commodity in 1981.

Economic conditions continued to decline in 1981. Press comments, both Vietnamese and foreign, paint a picture worse than 7 years ago when the United States ended its involvement. Apparently massive Soviet aid, estimated between $3 million and $6 million per day, has not been sufficient to maintain even a Spartan standard of living for most of the population. Several reasons have been given for the problems, with high Government officials admitting that corruption, bribery, and mismanagement were prominent contributors to the country's woes. The policy of maintaining a 1-million-person military force, many of them in active conflict in Kampuchea, was extremely expensive and consumed both workers and resources that could be used domestically to help in industrial and agricultural development.

Favorable weather and Government-granted economic incentives to farmers combined to produce a record food grain harvest of over 15 million tons in 1981. Despite the good crop, total food available was not enough to feed the 55 million population. Large amounts of food had to be imported during the year, and the monthly food ration remained at a bare subsistence level. The target for 1982 food production was set at 16 million tons.

In the industrial sector, the Government gave priority to projects directly benefiting agriculture such as electric power, irrigation, coal and fertilizer production, and the transportation system. The big Pha Lai thermal powerplant was being built with Soviet aid. Its planned first-stage completion date was late 1983, and if attained, its power output would help reduce critical shortages in the Hanoi area.

In mid-1981 the state bank devalued the dong. The new equivalence was dong-9.09=US$1.00. In addition the Government banned circulation of foreign currency and imposed stricter controls on gold, silver, platinum, and diamonds. The measures failed to strengthen the dong, and on the black market the U.S. dollar was reportedly worth dong60.[43]

Major economic and technical agreements were signed with the Soviet Union during 1981. The Soviets are to assist with more than 100 industrial projects designed to increase production of electricity, fertilizers, etc. Trade between the two countries would also be greatly increased.

Official trade figures were not available, but a partial list of exports to four market economy countries showed about $50 million in 6 to 10 months of 1981 versus $51 million in the same period in 1980. Imports from the same period and countries showed a considerable rise from $138 million in 1980 to $213 million in 1981. To cut down trade deficits, the Vietnamese were striving to increase their exports wherever possible. Agricultural products and handicrafts were to furnish most of the increase. The most likely areas in the mineral sector would be coal, phosphate, and tin.

COMMODITY REVIEW

Metals.—*Tin.*—The Vietnamese, with technical and economic aid from the Soviet Union, were in the middle of modernizing and expanding their small tin industry. At least two mining areas were operating, and one was in the earliest stages of construction during 1981.

A new mining area was nearly ready to open at the old Tinh Tuc Mine in Cao Bang Province, after 3 years of construction. The mining and concentrating system, formerly manual, was mechanized and automated, and a new ore separation plant was built. The old operation was continued without interrupting the normal production rate.

The new ore processing plant will be able to recover the finer grained ore particles, formerly lost, and will recover 96% of the tin present versus 83% from the old facility. The new mechanization at the mine will presumably allow an increase in the ore production rate was well.

In Ha Tuyen Province, the Son Duong mining area was nearly ready to produce ore at two mines designed by the nonferrous metallurgical institute of the Ministry of Engineering and Metals. The mines were referred to as Khuon Phay and Bac Lung and required a capital investment of about $6 million. It was believed that Khuon Phay would eventually have a capacity of 300,000 cubic meters of ore per year. The ore grade was not revealed, but that amount of ore in neighboring countries could yield over 1,000 tons of concentrate. Construction was apparently still underway at Bac Lung. The Vietnamese press stated that after completion the Bac Lung mining zone would have a tin ore output similar to that of the Tinh Tuc Mine.

Construction of support facilities was underway at Qui Hop tin mine, also spelled Quy Hop, in Nghe Tinh Province. Construction of the mine was planned to begin in 1982 as part of the Government's industrial goal. Completion and successful operation of these new projects could greatly increase the country's tin output. Vietnam's tin consumption is not large and most of the production would be exported to furnish much needed foreign exchange.

Nonmetals.—*Cement.*—One of Vietnam's most important industrial projects was partially completed during 1981. On December 22, 1981, the first of two rotary kilns was fired on a trial basis at the Bim Son cement plant, and a 70-ton test batch was ground and bagged before the end of the year. The No. 1 production line will have a capacity of 600,000 tons per year of high-quality cement, urgently needed by the Vietnamese economy. The plant had been a showpiece of Russian-Vietnamese industrial cooperation since construction began 46 months before. The December 1981 completion date was

only accomplished by many months of maximum round-the-clock effort on the part of thousands of laborers and virtually every skilled worker who could be pressed into service. The original planned startup date was in 1980.

Reading between the lines of the Vietnamese press communiques, it was apparent that progress on the No. 2 production line, a duplicate of the No. 1 kiln, was seriously affected by the catchup work on the first kiln. The No. 2 kiln's new planned completion date was set for November 7, 1982. In addition, it was by no means certain whether the system that will supply raw materials to the kilns was ready to begin to operate in a continuous and reliable manner.

As late as October 1981, top Government officials were referring to plans insuring adequate electric power supplies, and that plans must be drawn up for the timely delivery of raw materials and transport of finished cement from the factory. A lack of reliable transport facilities has plagued the country for years and has been a major constraint to the timely completion of ambitious industrial projects. Such candid remarks as were made in late 1981 could indicate that this plant is a long way from producing 600,000 tons of cement in 1982.

Two other large rotary kiln cement plants were under construction during 1981. Both were originally scheduled for completion before yearend 1981. One was a Danish- and Japanese-aided plant at Hoang Thach, southeast of Hanoi; the other was a French-aided expansion of the old Ha Tien cement plant, 240 kilometers west of Ho Chi Minh City. Each plant will have more than a 1-million-ton-per-year capacity.

There was virtually no publicity about either of these projects during 1981. It was very likely that skilled workers and possibly equipment were borrowed from these construction sites to complete the Bim Son plant. Construction progress was probably minimal during the year, and completion of the plants was not expected until well into 1983 or beyond. The same infrastructure constraints will be encountered for these plants when completed as were mentioned for the Bim Son plant.

The Government's planned cement production for 1985 was 2.0 million tons. This may reflect a realistic belief that only the Haiphong plant (500,000 tons per year), the old Ha Tien plant (300,000 tons per year), the mini-cement plants (200,000 tons per year), and the by then completed Bim Son (1 million tons per year), actually will be in production.

Fertilizer Materials.—Workers in Ho Chi Minh City completed an organic fertilizer plant with Danish aid. The plant will convert 300,000 tons per year of dry garbage from the urban area into composted organic fertilizer. Processed organic material and green manure was extensively used throughout Vietnam both because of tradition and because chemical fertilizers were in very short supply and expensive when available.

Parts of the Soviet-aided expansion project at the Lam Thao superphosphate fertilizer plant were completed during the year, and construction continued on remaining sections. The plant was 20 years old and apparently has been poorly maintained. A constant problem of corrosion and broken equipment has adversely affected the output of the plant. The plant expansion will increase the original 200,000-ton-per-year capacity and restore the old equipment to a more reliable operating condition.

The Lam Thao superphosphate plant and the apatite grinding plants around the country were supplied with raw material from the Lao Cai apatite mine near the border with China. Lao Cai was a major apatite producer before the border hostilities in March 1979. At that time, virtually all of the mechanized equipment at the mine and much of the infrastructure supporting the operation was destroyed. Repair work has gone slowly, and production during 1981 was probably more than that in 1980 but nowhere near the former production levels. Early in 1981, there was a problem with transporting the ore out of the mining district. By midyear, however, the ore was reportedly being transported as fast as it was being extracted at the time. No official figures were released for the Lao Cai Mine's output in either 1981 or 1980.

Mineral Fuels.—*Coal.*—Coal was Vietnam's major energy source and has been, in prior years, a main source of foreign exchange through sizable anthracite exports. After a very poor year in 1980, production made a modest gain in 1981. The production goals had been revised downward very substantially during 1980, and the production level achieved in 1981 actually represented a disastrous failure of the mid-1970's Government plan to reach 10 million tons of washed coal by 1980.

Despite the construction of several new mines and the modernization of older

mines, the production levels desired have not even been approached by most of the coal industry. Some problems have been solved, and enough new capacity has begun operating to allow the production gain shown in table 1.

Two major problems, transportation and worker motivation, have not been solved and until they are solved industry in general and coal production in particular will continue to have difficulty operating smoothly.

The problem of transportation was mentioned most frequently during 1981 by Government officials. In many cases the coal has been mined but cannot be efficiently moved to its destination. Workers have difficulty getting to the mines. Several local sections of railroad were critically important but either were not completed or were built long ago and were in such poor repair as to be only marginally operable. Spare parts were in short supply so that a high proportion of rail equipment was inoperable at any given time. To speed up the movement of coal and other products, Vietnam has recently imported over an estimated $50 million worth of Indian rail equipment. In June 1981, it was expected to sign an additional agreement to import 200 to 300 new coal cars.

Waterborne coal transport suffered from the same problems. Equipment was in short supply, new barges and tugs were not completed on schedule, and maintenance of equipment was neither adequately nor quickly performed. Again, spare parts were difficult to acquire and seldom available where they were needed.

The highway sector may have been in the worst shape of all. Maintenance of a poorly engineered road network was a constant problem. Truck traffic was forced to move at very low speeds because of deterioration of road surfaces, particularly in the hilly sections of the country. This increased the turnaround time for a given trip. In turn, a larger fleet of trucks was necessary to move the required coal quotas, further aggravating the already severe vehicle maintenance problems.

Another transport problem mentioned by industry leaders was that of incorrect or irrational delivering of coal. Plants needing lump coal were sent powdered coal, while those needing powdered coal received lump coal that then had to be crushed before it could be used. Poor quality coal was delivered to cement plants, degrading the output of the kilns. These types of administrative problems were very costly and apparently accounted for a considerable waste of resources, which could be put to better use by proper planning and management in the upper levels of the coal mining organization.

The second major problem discussed in the Vietnamese press was that of motivating the work force. Several types of problems were mentioned including relative pay scales, lack of food and medical supplies, safety conditions in the mines, workers' housing and recreational facilities, inadequate job training, and lack of spare parts resulting in the workers' inability to meet production norms and hence earn bonuses.

The above problems have resulted in an excessive amount of absenteeism and workers resigning their jobs. Those that continue to work have little incentive or opportunity to increase production. The Vice Minister of Mines and Coal stated that in one 3-month period up to 32% of the workers took leave of absence and a total of nearly 2,000 workers quit their jobs, many of them were the skilled quarry workers and vehicle drivers.

Although a number of changes have been made and the industry leaders are well aware of the problems, there appeared to be very little progress during 1981 toward effectively solving these problems at the workers' level. Until most of these transport and labor troubles are solved, the production goal of 10 million tons per year will be difficult, if not impossible, to achieve.

Natural Gas and Petroleum.—Soviet technicians have been helping in the exploration for gas and oil for the last 10 years. A total of 20 wells were believed drilled in that period, mostly in a geological trough between Hanoi and the coast.

The search finally resulted in a gas discovery well in the Tien Hai District of Thai Binh Province, 95 kilometers southeast of Hanoi. The 1,200-meter-deep well was completed for production. It was then decided that a gas turbine-powered electric generator system would be the best way to quickly and economically utilize the small gas discovery.

Table 15.—Vietnam: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Destinations, 1980	
			United States	Other (principal)
METALS				
Antimony metal	59	10	--	All to Japan.
Chromium: Chromite	13,516	9,105	--	Japan 9,055; France 50.
Tin metal including alloys:				
Unwrought	80	5	--	All to Japan.
Semimanufactures	1	NA	--	NA.
NONMETALS				
Clay products:				
Nonrefractory	173	56	--	Japan 29; Saudi Arabia 16; Italy 11.
Refractory	--	48	--	All to Italy.
Salt	2,020	249	--	All to Hong Kong.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	--	198	--	Hungary 150; Japan 48.
Worked	8	1	--	All to France.
Talc and steatite	--	100	--	All to Indonesia.
MINERAL FUELS AND RELATED MATERIALS				
Coal:				
Anthracite and bituminous coal	588,994	416,418	--	Japan 334,255; Sri Lanka 73,463.
Briquets of anthracite and bituminous coal	7,695	4,000	--	All to Thailand.
Petroleum refinery products:				
Kerosine, 42-gallon barrels	1,225	120,939	--	All to Spain.
Lubricants, do	1,239	NA	--	NA.

[p]Preliminary. NA Not available.

[1]Owing to a lack of official trade data published by Vietnam, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

Table 16.—Vietnam: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	--	(2)	--	All from Japan.
Metal including alloys, semimanufactures	786	781	--	Hungary 650; Japan 107; Sweden 19.
Chromium oxides and hydroxides	10	NA	--	NA.
Cobalt oxides and hydroxides	4	6	--	All from Japan.
Copper:				
Sulfate	30	NA	--	NA.
Metal including alloys, semimanufactures	73	39	--	France 33; Sweden 4.
Iron and steel metal:				
Pig iron, cast iron, powder, shot	3,200	NA	--	NA.
Ferroalloys	--	440	--	All from Japan.
Semimanufactures:				
Bars, rods, angles, shapes, sections	39,044	[3]23,474	--	Poland 16,077; Japan 2,877;[3] Italy 1,632.
Universals, plates, sheets	21,975	6,070	--	Hungary 3,137; Japan 1,294; U.S.S.R. 557.
Hoop and strip	1,444	501	--	Japan 352; France 115.
Rails and accessories	206	20	--	All from Sweden.
Wire	3,848	[4]646	--	Japan 279;[4] France 198; Belgium-Luxembourg 92.
Tubes, pipes, fittings	4,835	3,348	--	Singapore 1,533; Sweden 1,090.
Castings and forgings, rough	1,004	NA	--	NA.
Lead oxides and hydroxides	5	NA	--	NA.
Manganese oxides and hydroxides	200	200	--	All from Japan.
Mercury, 76-pound flasks	30	87	--	Do.
Molybdenum metal including alloys, all forms, kilograms	--	144	--	Do.
Nickel metal including alloys, semimanufactures	32	[5]2	--	All from West Germany.

See footnotes at end of table.

Table 16.—Vietnam: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Silver metal including alloys, unwrought and partly wrought value, thousands	--	$1	--	All from Sweden.
Tin metal including alloys, semimanufactures kilograms	--	22	--	All from Hong Kong.
Titanium oxides	(2)	100	--	All from Japan.
Tungsten metal including alloys, all forms kilograms	181	274	--	Do.
Zinc:				
Oxides and peroxides	2	NA	--	NA.
Metal including alloys:				
Unwrought	--	397	--	All from Japan.
Semimanufactures	--	1	--	All from Sweden.
Other, n.e.s.:				
Oxides, hydroxides, peroxides	62	45	--	Japan 37; Sweden 8.
Metalloids	--	2	--	All from Japan.
NONMETALS				
Abrasives:				
Natural: Pumice, emery, corundum, etc	150	1	--	All from Sweden.
Grinding and polishing wheels and stones	3	41	--	Japan 38.
Barite and witherite	1,170	3,705	--	All from Singapore.
Boric oxide and acid	--	40	--	All from Japan.
Cement	r78,213	76,300	--	U.S.S.R. 53,000; Singapore 17,484; Japan 5,115.
Clays and clay products:				
Crude:				
Bentonite	717	588	--	All from Singapore.
Kaolin	--	471	--	All from Sweden.
Other, unspecified	190	9	--	All from France.
Products:				
Nonrefractory	882	1,657	--	Italy 1,512; Singapore 36; West Germany 31.
Refractory	9,277	859	--	France 475; Hungary 171; Japan 170.
Diatomite and other infusorial earth	50	402	--	Japan 400.
Feldspar, fluorspar, etc	4	350	--	All from Japan.
Fertilizer materials:				
Manufactured:				
Nitrogenous	209,958	314,176	--	U.S.S.R. 225,328; Bulgaria 56,948; South Korea 29,400.
Potassic	44,683	51,211	--	All from U.S.S.R.
Ammonia	3	46	--	Singapore 44.
Gypsum and plasters	50	1	--	All from Thailand.
Lime	9	NA	--	NA.
Mica:				
Crude including splittings and waste	5	NA	--	NA.
Worked including agglomerated splittings	2	12	--	All from Japan.
Pigments, mineral: Iron oxides and hydroxides, processed	14	20	--	Do.
Sodium and potassium compounds:				
Caustic potash	--	17	--	Do.
Caustic soda	86	1,507	--	Belgium-Luxembourg 1,500.
Soda ash	8	NA	--	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	--	20	--	All from Pakistan.
Worked	--	40	--	All from Italy.
Sand excluding metal-bearing	750	2	--	All from Finland.
Sulfuric acid	1	4	--	France 2; United Kingdom 2.
Talc and steatite	50	352	--	All from Japan.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	360	1	--	All from Finland.
Carbon black	350	600	--	All from Japan.
Coal and briquets:				
Anthracite and bituminous coal	61,993	31,302	--	All from Australia.
Lignite including briquets	--	6	--	All from Singapore.
Coke and semicoke	5,000	7,500	--	All from Japan.
Hydrogen, helium, rare gases	--	2	--	Do.

See footnotes at end of table.

Table 16.—Vietnam: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980[p]	Sources, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Gasoline				
thousand 42-gallon barrels	1,056	166	--	All from Italy.
Kerosine 42-gallon barrels	174,965	6,402	--	Singapore 5,766; Thailand 620.
Distillate fuel oil do	734,124	NA	--	NA.
Residual fuel oil do	170,376	NA	--	NA.
Lubricants do	865,333	[6]134,484	--	Italy 104,804; Hungary 26,908.
Other:				
Liquefied petroleum gas do	10,984	NA	--	NA.
Mineral jelly and wax do	15,370	3,880	--	Japan 2,755; Hungary 905.
Nonlubricating oils do	42	NA	--	NA.
Bitumen and other residues do	110,637	111,565	--	Japan 79,992; Singapore 31,512.
Bituminous mixtures do	667	12	--	All from Belgium-Luxembourg.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	5,491	8,227	--	All from Japan.

[p]Preliminary. NA Not available.

[1]Owing to a lack of official trade data published by Vietnam, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2]Less than 1/2 unit.

[3]Excludes part of Japanese exports valued at $295,000.

[4]Excludes part of Japanese exports valued at $102,000.

[5]Excludes Japanese exports valued at $3,000.

[6]Excludes Japanese exports valued at $267,000.

In July 1981, the press announced that the first of five 17,000-kilowatt gas turbines had been completed and successfully tested. The plant reportedly was constructed with Soviet technical assistance in only 8 months. Commercial production of power was scheduled to begin in August 1981. Workers were making preparations for the second turbine during the same period.

Successful completion of this powerplant, the first commercial use of domestic hydrocarbons in the country, would reduce the power shortages in the Hanoi area. More importantly, it will encourage a more vigorous petroleum exploration effort on the part of Vietnam, which currently must import all of its petroleum products.

[1]By Gordon L. Kinney, physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Bangladesh takas to U.S. dollars at an average rate of taka16.5=US$1.00 for 1981.

[3]Bangladesh Bureau of Statistics, Dacca, Bangladesh. Monthly Statistical Bulletin of Bangladesh. November 1981, p. 178.

[4]Metal Bulletin. No. 6620, September 1981, p. 37.

[5]By John C. Wu, economist, Division of Foreign Data.

[6]Where necessary, values have been converted from Brunei dollars to U.S. dollars at the rate of 2.20 Brunei dollars=US$1.00.

[7]Far Eastern Economic Review (Hong Kong). Asia 1982 Yearbook. Pp. 8-11, 120-122.

World of Information (Hong Kong). Asia and Pacific. 1981, pp. 139-140.

[8]Standard Chartered Review (London). February 1982, p. 25.

[9]Borneo Bulletin (Kuala Belait). Oct. 3, 1981, p. 44.

[10]By John C. Wu, economist, Division of Foreign Data.

[11]Where necessary, values have been converted from Australian dollars ($A) to U.S. dollars at the rate of $A1.11=US$1.00.

[12]Industrial Minerals (London). No. 169, October 1981, p. 87.

———. No. 172, January 1982, p. 50.

[13]By John C. Wu, economist, Division of Foreign Data.

[14]The real economic growth rates are based on percentage changes in GDP in 1973 constant Hong Kong dollars.

[15]Where necessary, values have been converted from Hong Kong dollars (HK$) to U.S. dollars at the rate of HK$4.976=US$1.00 for 1980 and HK$5.593=US$1.00.

[16]Hong Kong Monthly Digest of Statistics. January 1982, p. 4.

Far Eastern Economic Review. V. 115, No. 11, Mar. 12, 1982, p. 72.

[17]By Gordon L. Kinney, physical scientist, Division of Foreign Data.

[18]By E. Chin, physical scientist, Division of Foreign Data.

[19]Far Eastern Economic Review Limited (Hong Kong). Asia 1982 Yearbook. 280 pp.

[20]Mining Annual Review (London). Korea (D.P.R.). 1981, p. 442.

[21]Richardson, R. Breaking the Shell. Far Eastern Econ. Rev. (Hong Kong), June 1981, pp. 72-74.

[22]By Gordon L. Kinney, physical scientist, Division of Foreign Data.

[23]Summary of World Broadcasts FE/W1155/A14 of Oct. 14, 1981, excerpt from KPL in English 0908 gmt, Sept. 28, 1981.

[24]Vientiane, Laos, SIANG PASASON in Lao. Initial Achievements of the Pa Then Basin Tin Mining Survey. Mar. 6, 1982, p. 2.

[25]By John C. Wu, economist, Division of Foreign Data.

[26]Where necessary, values have been converted from Mongolian tugriks to U.S. dollars at the rate of 3.11 tugriks=US$1.00 for 1978.

[27]ABECOR Country Report. Mongolian People's Republic. November 1981, a publication of the ABECOR group of banks.

Far Eastern Economic Review (Hong Kong). Asia 1982 Yearbook. Pp. 8-11.

Montsame Ulaanbaatar. Oct. 7, 1981 and Dec. 7, 1981.

[28]Vernet, D. Mongolia, Buffer or Link. Le Monde (Paris), Aug. 28, 1981, p. 5.

[29]Metal Bulletin (London). No. 6656, Jan. 19, 1982, p. 13.

American Metal Market. V. 90, No. 4, Jan. 7, 1982, pp. 1, 9.

[30]The British Sulphur Corp., Ltd. (London). Phosphorus and Potassium. No. 118, March-April 1982, p. 15.

[31]By Gordon L. Kinney, physical scientist, Division of Foreign Data.

[32]Where necessary, values have been converted from Nepal rupees (NPs) to U.S. dollars at the rate of NPs12.00 = US$1.00.

[33]Nepal fiscal year runs from mid-July to mid-July.

[34]U.S. Department of State, American Embassy, Kathmandu, Nepal. Foreign Economic Trends and Their Implications for the United States. November 1981, p. 6.

[35]By John C. Wu, economist, Division of Foreign Data.

[36]Monthly Digest of Statistics. Department of Statistics, Singapore. V. 21, No. 3, March 1982, and all other values have been converted from Singapore dollars (S$) to U.S. dollars at the rate of S$2.1127 = US$1.00 for 1981.

[37]Metal Bulletin (London). No. 6676, Mar. 20, 1982, p. 23.

[38]U.S. Embassy, Singapore. State Department Airgram A-20, Apr. 15, 1982, pp. 3-5.

[39]By Gordon L. Kinney, physical scientist, Division of Foreign Data.

[40]Petroleum News (Hong Kong). V. 12, No. 10, January 1982, p. 41.

[41]Oil and Gas Journal. V. 80, No. 3, Jan. 18, 1982, p. 64.

[42]By Gordon L. Kinney, physical scientist, Division of Foreign Data.

[43]Far Eastern Economic Review. 1982 Annual Yearbook. P. 263.

The Mineral Industry of Other Near East Countries

By Peter J. Clarke[1]

CONTENTS

AFGHANISTAN

Development of the mineral and energy resources of Afghanistan appeared to be a top priority of the Soviet-controlled Government in the country. In the Afghan Government's plan for 1980-81, the largest allocation in the development budget was for mines, industry, and energy (46.7%). In contrast, only 23.1% of the budget was allocated for agricultural development, despite the fact that the great majority of the population was dependent on farming.

The mineral industry of Afghanistan consisted of the production of natural gas, cement, coal, fertilizer materials, and rock salt. Production levels for all of these commodities were down an average of 45% from those of 1978, before the Soviet invasion. Prior to the invasion, small quantities of asbestos, barite, and talc had been produced along with about 6,000 to 7,000 kilograms per year of lapis lazuli, a semiprecious gem stone. Afghanistan had supplied about 80% of the world's output of lapis lazuli. Following direct Soviet intervention, production of these minerals declined to near zero.

Despite the drastic decline in production for most minerals, it was clear that the Afghan Government planned to exploit the country's vast array of hard rock minerals and mineral fuels. By the end of 1981, 167 Soviet-Afghan cooperation projects had been established, 76 of which, according to the Soviet News Agency, Tass, were already in operation. Soviet and Afghan geologists were also said to be conducting large-scale prospecting for petroleum and natural gas, iron ore, chrome, copper, beryl, fluorspar, lead, zinc, bauxite, lithium, tantalum, and columbium, all of which were thought to be present in the country.[2]

The largest Soviet-Afghan cooperative project in the mineral sector was a planned $600 million copper mine and smelter, to be located at Ainak, south of Kabul.[3] Reserves at the Ainak deposit were estimated at 280 million tons containing 0.7% to 1.5% copper. The feasibility study for development of the deposit was completed in mid-1981 by Machinoexport of the Soviet Union, and the project was subsequently approved by the Afghan authorities. The project was scheduled to begin operating in 1985. Soviet technicians were also examining the possibility of exploiting the Hajigak iron ore deposit, located in the Hindu Kush Mountains, 100 kilometers northwest of Kabul. Reserves at Hajigak were estimated at about 2 billion tons of 65% iron ore. The

Soviet Government was thought to be considering developing the Hajigak deposit to supply steel mills in the Tashkent region of the Soviet Union. Also being scrutinized were chromite deposits located in the southeastern portion of the country, near the Pakistan border, 200 kilometers south of Kabul. Two main deposits have been identified. The Heserak deposit in Nangarher Province contained high-grade chrome ore in a series of pockets in serpentinized rocks. The Mohammed Agha Kulanger deposit, located in the Lagor Valley in Kabul Province, contained approximately 180,000 tons of ore grading 36% to 58% Cr_2O_3 with a Cr:Fe ratio ranging from 2.52:1 to 3.57:1. Both of these deposits were being evaluated by Soviet technicians.[4]

Afghanistan's known energy resources included coal, natural gas, and crude oil. Coal production in Afghanistan came from the Karkar, Ishpushta, and Darra-i-Suf Mines. The Karkar and Ishpushta Mines were located in northeastern Afghanistan, near the towns of Pul-i-Khumri and Doab, respectively. These mines have been in continuous operation since the 1950's and were nearing depletion. The Darra-i-Suf Mine, located 160 kilometers south of Mazar-i-Sharif, and 640 kilometers by road from Kabul, was the country's largest producer. The mine, opened in 1966, contained an estimated 60 million tons of good-quality coal, some of which was suitable for coking coal. Production of coal from the Darra-i-Suf Mine has been as high as 100,000 to 150,000 tons per year, but output has declined considerably since the Soviet invasion. Whatever coal was produced in 1981 was consumed in electric-generating facilities in the Mazar-i-Sharif region.

Natural gas was Afghanistan's leading export, providing about 30% of the gross national income. About 95% of Afghanistan's production of natural gas was exported to the Soviet Union in 1981 with the remainder being used to generate electricity. The Soviet Union imported approximately 220 million cubic feet per day of natural gas from Afghanistan in 1981, worth about $114 million. Natural gas was produced from several fields, all located in northwest Afghanistan just south of the Soviet border, in Shibarghan Province. The main producing fields were the Khawaga Gogerdak Field and the Jarq-aduq Field, located within 20 kilometers of each other in southwestern Shibarghan Province. New gas treatment facilities were recently completed at both fields with Soviet technical assistance. Reserves at Gogerdak were estimated at 800 billion cubic feet of sweet gas from an upper horizon above 1,800 meters depth, and another 650 billion cubic feet of sour gas from a lower horizon at 2,200 meters depth. The gas was collected at two receiving plants, piped to a drying facility, and then exported to the Soviet Union through a 100-kilometer, 81-centimeter-diameter pipeline. Some of the gas from the Gogerdak Field had previously been used as feedstock for the Mazar-i-Sharif power and fertilizer plants. Since the Soviet invasion, however, all natural gas supplies have been diverted to the Soviet Union, and the power-plant fertilizer complex was forced to convert to coal.

The other gasfield under development in 1981 was at Jarq-aduq. The Russian firms, Technoexport and Mitpromexport orginally planned to drill 44 production wells in the field and to construct a desulfurization plant and two pipelines. One of the lines was for gas exports into the Soviet Union, and the other was to carry gas for industrial use within Shibarghan Province. Recent reports indicated that the treatment plant was completed and Jarq-aduq was producing significant quantities of gas, presumably for export into the Soviet Union. There were no indications that any gas was being diverted for consumption within the country.

Petroleum was discovered in Afghanistan as early as 1956, but it was not until the early 1970's that evaluation of the resources was carried out. Oil was encountered in exploratory wells at Angut, Aq-Darya, Bazarkami, and Oashq-oir, all in northwestern Afghanistan, in the Fariab, Jozjan, and Shibarghan Provinces. The International Bank for Reconstruction and Development (World Bank) placed Afghanistan's crude oil reserves at 70 million barrels in 1978, and the Afghan Government later revised that estimate to nearly 100 million barrels. No crude oil production was reported in 1981.

According to recent reports, Soviet and Afghan technicians were planning to construct a large refinery at Jarq-aduq.[5] Afghanistan has usually received its domestic requirements of petroleum products from the Soviet Union and Iran, but with war-related difficulties in Iran and the prominent role the Soviet Union was playing in the Afghan economy, nearly all of Afghanistan's supplies were derived from the Soviet Union. The latest figures on oil consump-

tion in the country were released in 1978, and were in the area of 250,000 tons per year of petroleum products. The chaotic situation of the country's economy and the necessity of maintaining the Soviet army have probably altered these figures significantly. The status of the planned refinery at Jarq-aduq was unavailable in 1981.

Table 1.—Other countries of the Near East: Production of mineral commodities[1]

Country and commodity	1977	1978	1979	1980	1981[p]
AFGHANISTAN[2]					
Asbestos metric tons	13,000	e13,000	4,000	--	--
Barite do.	12,100	12,930	3,000	--	--
Cement, hydraulic do.	136,000	127,000	140,000	e50,000	e60,000
Coal, bituminous do.	182,000	212,725	100,000	--	--
Gas, natural:					
Gross million cubic feet	90,000	90,000	70,000	e70,000	e80,000
Marketed do.	e84,000	81,824	60,000	e60,000	e70,000
Gem stones: Lapis Lazuli kilograms	6,310	1,984	6,000	--	--
Gypsum metric tons	NA	6,648	--	--	--
Natural gas liquids thousand 42-gallon barrels	e10	e10	10	e5	e5
Nitrogen: N content of ammonia[e] metric tons	35,000	25,000	25,000	10,000	10,000
Salt, rock do.	77,684	81,112	20,000	e5,000	e6,000
Talc do.	5,711	1,775	500	--	--
BAHRAIN					
Aluminum metal: Primary, smelter do.	121,356	122,800	126,000	126,152	141,000
Gas, natural:					
Gross million cubic feet	121,228	131,150	143,449	123,442	125,000
Marketed do.	83,392	91,805	102,950	97,468	90,000
Natural gas liquids:					
Butane and propane thousand 42-gallon barrels	NA	NA	485	1,876	1,950
Natural gasoline do.	NA	NA	NA	986	1,100
Petroleum:					
Crude do.	21,236	20,190	18,741	18,338	18,250
Refinery products:					
Gasoline do.	9,829	11,099	9,249	8,869	10,000
Jet fuel do.	11,743	11,756	11,803	13,797	14,000
Kerosine do.	3,265	912	868	547	2,000
Distillate fuel oil do.	23,571	23,988	23,574	20,586	22,500
Residual fuel oil do.	33,687	29,373	30,640	27,046	30,335
Lubricants do.	344	379	130	375	500
Other do.	10,523	10,939	13,201	e12,300	13,000
Refinery fuel and losses do.	2,271	1,507	2,245	e2,100	2,200
Total do.	95,233	89,953	91,710	e85,620	94,535
Sulfur, byproduct of petroleum metric tons	7,000	25,909	25,148	32,559	36,000
JORDAN					
Cement, hydraulic thousand metric tons	566	564	800	800	1,000
Clays do.	6	9	25	30	30
Gypsum do.	22	36	36	70	75
Iron and steel: Crude steel do.	42	60	90	90	90
Lime metric tons	3,000	3,000	3,500	e3,500	4,000
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	1,954	2,108	2,465	2,263	5,000
Jet fuel do.	872	1,152	1,104	1,759	2,200
Kerosine do.	829	1,146	1,062	1,314	2,000
Distillate fuel oil do.	2,604	3,109	3,499	3,509	6,000
Residual fuel oil do.	1,558	1,937	2,584	3,312	5,500
Liquefied petroleum gas do.	394	500	e565	475	650
Asphalt do.	497	643	e730	581	750
Unspecified including lubricants do.	--	49	e55	e50	60
Refinery fuel and losses do.	559	559	e635	e637	840
Total do.	9,267	11,203	12,699	e13,900	23,000
Phosphate rock thousand metric tons	1,782	2,303	2,825	3,911	4,200
Salt do.	30	30	30	30	30
Stone:					
Limestone do.	5,000	6,000	e6,000	4,182	4,200
Marble thousand square meters	(3)	160	200	200	200
LEBANON[2]					
Cement, hydraulic thousand metric tons	1,360	1,381	2,122	e2,200	2,390
Gypsum metric tons	15,000	11,000	9,750	10,000	10,000
Iron and steel:					
Crude steel thousand metric tons	7	6	--	--	--
Semimanufactures do.	--	250	220	e220	200

See footnotes at end of table.

Table 1.—Other countries of the Near East: Production of mineral commodities[1] —Continued

Country and commodity	1977	1978	1979	1980	1981[p]
LEBANON[2] —Continued					
Lime[e] thousand metric tons	162	101	120	120	120
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	2,809	4,019	3,498	[e]3,400	3,000
Jet fuel do.	964	1,019	923	[e]900	600
Kerosine do.	206	144	175	[e]150	100
Distillate fuel oil do.	2,432	2,354	2,609	[e]2,600	2,400
Residual fuel oil do.	4,595	4,367	5,237	[e]5,000	4,300
Liquefied petroleum gas do.	531	--	361	[e]300	300
Unspecified do.	--	151	212	[e]200	200
Refinery fuel and losses do.	1,011	724	887	[e]800	600
Total do.	12,548	12,778	13,902	[e]13,350	11,500
Salt[e] thousand metric tons	35	12	10	12	10
OMAN					
Gas, natural:					
Gross million cubic feet	139,868	[e]130,000	[e]122,000	[e]117,000	105,850
Marketed do.	4,745	[e]5,500	17,657	21,189	25,000
Natural gas liquids thousand 42-gallon barrels	--	500	1,275	[e]1,500	1,500
Petroleum, crude do.	123,626	114,975	107,845	103,528	119,808
Sand metric tons	NA	NA	NA	101,678	100,000
Stone, not further described do.	NA	NA	NA	329,748	350,000
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN					
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	[e]1,440	850	[e]1,000	[e]1,000	1,000
Jet fuel do.	[e]1,171	1,280	1,200	[e]1,200	1,200
Kerosine do.	[e]1,085	775	[e]800	[e]800	800
Distillate fuel oil do.	[e]2,922	[e]2,000	[e]2,500	[e]2,500	2,000
Residual fuel oil do.	[e]6,114	[e]6,000	[e]6,000	[e]6,000	6,500
Other do.	[e]860	[e]700	[e]800	[e]800	800
Refinery fuel and losses do.	[e]802	[e]869	[e]870	[e]870	700
Total do.	[e]14,394	12,474	13,170	[e]13,170	13,000
Salt[e] thousand metric tons	75	75	75	80	75
QATAR[2]					
Cement, hydraulic do.	[e]170	208	237	209	258
Iron and steel semimanufactures do.	--	86	350	450	455
Gas, natural:					
Gross million cubic feet	151,499	164,212	235,795	224,000	222,000
Marketed[4] do.	56,750	52,230	154,041	79,935	94,250
Natural gas liquids thousand 42-gallon barrels	--	--	77	[e]265	6,126
Nitrogen: N content of ammonia metric tons	105,000	166,000	303,400	418,000	617,000
Petroleum:					
Crude thousand 42-gallon barrels	162,316	176,537	184,772	172,554	146,370
Refinery products:					
Gasoline do.	764	796	921	[e]950	1,144
Jet fuel do.	449	455	512	450	480
Kerosine do.	36	38	31	33	33
Distillate fuel oil do.	927	908	939	[e]1,000	1,764
Other do.	61	72	[e]75	[e]75	75
Refinery fuel and losses and partly finished oil do.	362	1,439	[e]1,500	[e]1,500	1,500
Total do.	2,599	3,708	3,978	4,008	4,996
Stone: Limestone thousand metric tons	[e]2,500	3,103	3,000	2,036	2,500
Sulfur do.	--	--	--	--	5,600
SYRIA					
Asphalt, natural do.	99	35	83	89	90
Cement, hydraulic do.	1,395	1,433	1,847	1,995	2,150
Gas, natural:					
Gross[e] million cubic feet	69,400	56,500	60,000	60,000	55,000
Marketed do.	[e]9,000	[e]7,500	7,500	[e]7,000	8,000
Gypsum metric tons	85,643	[e]86,000	63,500	78,636	79,545
Iron and steel: Crude steel thousand metric tons	115	120	90	[e]100	100
Nitrogen: N content of ammonia metric tons	23,000	19,000	75,888	48,300	200,000

See footnotes at end of table.

Table 1.—Other countries of the Near East: Production of mineral commodities[1] —Continued

Country and commodity	1977	1978	1979	1980	1981[p]
SYRIA —Continued					
Petroleum:					
Crude ------ thousand 42-gallon barrels	63,620	62,500	68,709	60,656	58,990
Refinery products:					
Gasoline ------ do	4,599	4,675	4,745	e5,000	10,000
Kerosine and jet fuel ------ do	2,993	3,023	2,920	e3,500	6,000
Distillate fuel oil ------ do	8,067	8,355	6,935	e8,500	16,000
Residual fuel oil ------ do	9,125	8,924	10,585	e10,000	20,000
Liquefied petroleum gas ------ do	365	464	1,825	e500	1,000
Asphalt ------ do	1,022	1,889		e1,400	3,000
Refinery fuel and losses ------ do	1,570	--	730	e1,500	2,000
Total ------ do	27,741	27,330	27,740	e30,400	58,000
Phosphate rock ------ thousand metric tons	425	e750	1,272	1,319	1,350
Salt ------ do	106	e110	75	90	90
Stone, sand and gravel:					
Stone:					
Dimension: Marble ------ cubic meters	57,063	e50,000	71,562	84,860	85,000
Other ------ thousand cubic meters	985	e1,000	2,013	1,991	2,000
Sand and gravel ------ do	4,567	e5,000	7,870	7,787	7,800
Sulfur, byproduct of petroleum and natural gas thousand metric tons	e4	e6	e6	e5	8
YEMEN ARAB REPUBLIC[2]					
Cement ------ do	60	63	90	81	80
Salt[e] ------ do	75	30	90	65	65

[e]Estimated. [p]Preliminary. NA Not available.
[1]Table includes data available through Oct. 18, 1982.
[2]In addition to the commodities listed, a variety of other crude construction materials (common clays, stone, and sand and gravel) presumably is produced, but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.
[3]Less than 1/2 unit.
[4]Includes gas reinjected into reservoirs, if any.

BAHRAIN

Production of crude oil in Bahrain declined in 1981 for the fifth consecutive year, but the drop was more than compensated for by a large increase in exports of refined petroleum products. Total receipts from the petroleum sector reached $3.88 billion, up 23% from the previous year.[e] This represented 90% of the country's total export receipts, and over 70% of the gross domestic product (GDP), estimated at $5.5 billion in 1981. Despite the overwhelming dominance of petroleum revenues in the country's national income, Bahrain has, over the last decade, achieved remarkable success in its effort to diversify the economy away from petroleum dependence. Bahrain's crude oil production has long been the lowest of all the Organization of Petroleum Exporting Countries (OPEC), averaging about 50,000 barrels per day over the last 5 years. With crude oil reserves estimated at only 223 million barrels, Bahrain could expect to exhaust its main source of income within 15 years at current production levels. This diversification effort has led to the development of a variety of enterprises ranging from heavy industry including aluminum, iron and steel, and ship repair, to a financial sector that has become one of the most successful offshore banking operations in the world.

Bahrain's economic development is based on a combination of rigidly structured semiannual Government budgets, and a strong emphasis on free enterprise and free trade. The total Government budget for 1981 was $900 million, of which 60% was allocated for capital expenditures. Only 42.5% of the total allocation was consumed for these purposes; however, and the remainder was transferred into the long-term capital account and into the annual surplus. Capital expenditures were directed mainly at expansion of the country's infrastructure. The Government budgets for 1982 and 1983 were also announced in 1981, with revenues and expenditures totaling $1.5 billion in 1982, and $1.7 billion in 1983. The budgets anticipated an annual real growth rate in the economy of between 5% and 8% per year. Bahrain's long-term capital expenditures, which were usually not included in the

Government budget, were directed toward the planned 4-million-ton-per-year iron ore pelletizing plant and construction of the $600 million causeway linking Bahrain to Saudi Arabia.

Bahrain produced approximately 46,000 barrels per day of crude oil from the Awali Field, located onshore near the center of the island. Oil was discovered at Awali in 1939, and it has been the sole source of Bahrain's oil ever since. Its age requires that secondary and tertiary recovery techniques be employed for the field to remain productive, but even with the most advanced recovery methods, recent surveys have indicated that the island's measured oil reserves could be extended to a maximum of 15 years.

Bahrain derived about one-third of its petroleum revenues from the Abu Sa'fah Oilfield, located offshore, north of Bahrain. The field was owned and operated by the Saudi Arabian Petroleum and Minerals Organization, and its oil was exported from Saudi Arabia, but as part of a joint territory deal one-half of the revenues from Abu Sa'fah's oil production goes to Bahrain. Abu Sa'fah produced about 50,000 barrels per day of oil in 1981 after peaking at about 70,000 barrels in 1978.

Bahrain's only refinery, at Sitra, produced a record 95 million barrels of petroleum products in 1981, up 5.6% from the 1980 level. Input for the 250,000-barrel-per-day refinery was supplied from Bahrain's Awali Field, by supply agreements with Saudi Arabia, and by the California Texas Petroleum Co. (Caltex), a joint venture of Chevron U.S.A. Inc. and Texaco Inc. of the United States. Saudi Arabia and Caltex each supplied 100,000 barrels per day to the refinery. Caltex input was derived from Chevron's and Texaco's crude oil entitlements in Saudi Arabia. The refinery was operated by Bapco BSC, which was owned 60% by the Bahrain Government and 40% by Caltex. In November 1981, Bapco announced that it had awarded a $36.5 million contract to Ralph M. Parsons Co., United States, to build a light isomax production unit at the refinery. This plant was the single largest item in Bapco's investment program for 1981-82. The new unit was to be composed of a new isomax reactor and a vacuum-product recovery section to turn fuel oil into diesel oil, naphtha, and sulfur. The plant was to open in mid-1983.

Caltex had originally owned the entire oil industry in Bahrain, including all oilfield assets and the petroleum refinery. Over the past 3 years, ownership and control of all oil-related operations were gradually turned over to Bahrain. Beginning in 1975, the Government of Bahrain assumed 60% ownership of the oilfield assets, and in 1976 created the Bahrain National Oil Co. (Banoco) to market refined products to local customers. One year later, the Government formed the Bahrain National Gas Co. (Banagas) to process and export liquefied petroleum gas (LPG). In 1980, the Government negotiated a 60% takeover of the Sitra refinery, through Bapco. Finally, in 1981, the Supreme Petroleum Council was established under the chairmanship of the Prime Minister to supervise and direct development of the country's resources. By January 1, 1982, Banoco was to takeover direct management of all oilfield assets. Caltex had previously operated most of the fields under agreement with Banoco. Caltex remained responsible for marketing its 100,000-barrel-per-day share of the refinery's output. The Government of Bahrain also sold Caltex 112,000 barrels per day of its refined product share to be sold through the Caltex marketing organization. The buyback arrangement was to allow Banoco time to gradually build its own marketing organization. Meanwhile, Banoco marketed about 3% of the refinery's output domestically. The country consumed approximately 2.2 million barrels of refined products in 1981. Consumption was expected to rise to over 6 million barrels per year by 1990.

In addition to managing the country's oil-producing assets, Banoco also was responsible for directing all oil and gas exploration activities. Banoco was winding up a large-scale, 18-month, $17 million seismic survey undertaken throughout offshore Bahrain by Western Geophysical Co., United States. The most promising offshore areas were north of the island, where subeconomic shows of oil and gas were discovered about 20 years ago by Caltex. Banoco planned to drill four wells in the area by mid-1982. Union Texas Oil Co. of the United States was also exploring in three blocks offshore northeast Bahrain, and was planning a test well some time in 1982. The prospects for a major discovery offshore Bahrain did not appear good, but the Government planned to maximize its use of whatever hydrocarbon resources it could locate to at least maintain the current level of production for as long as possible.

With the progressive decline in oil production, Bahrain began to focus more attention on its reserves of both associated and

nonassociated natural gas. While the production of associated gas has declined in line with crude oil production, output of nonassociated gas has continued to grow. Nonassociated gas was derived from the Permian Khuff Formation, a gas-containing strata that extends throughout much of the Middle East. The Khuff Formation was beneath the oil-producing Bahrain Formation, and wells to tap the gas commonly extended beyond 3,660 meters deep. With associated gas production leveling off at about 330 million cubic feet per day, Khuff gas was becoming an important component of the country's energy supply. Average nonassociated gas production reached 400 million cubic feet per day late in 1981. Banagas was responsible for utilizing most of the country's gas production. Banagas was composed of Banoco, 75%; Caltex, 12.5%; and the Arab Petroleum Investment Corp., 12.5%. Banagas planned to drill six producing wells into the Khuff Formation in 1982 that were expected to produce 300 million cubic feet per day of gas.

Most of Bahrain's current output of natural gas was delivered to the recently completed Banagas natural gas liquids (NGL) processing plant at Jabal. The plant, built by Japan Gasoline Co. at a cost of $72 million, began exporting NGL in March 1980. The plant was designed to utilize 100 million cubic feet per day of associated gas in the production of 280,000 tons per year of NGL, 80,000 tons per year of propane, 79,000 tons per year of butane, and 125,000 tons per year of naphtha. Caltex was responsible for overseas sales of NGL and LPG, while Banagas handled domestic distribution. Tail gas or residue gas from the plant was supplied to Aluminum Bahrain's (ALBA) smelter. ALBA received 80% of its power requirement from this tail gas, with the remaining 20% supplied directly by the country's onshore nonassociated gasfields. Of the total volume of nonassociated gas produced, about 30 million cubic feet per day was supplied to ALBA, another 90 million cubic feet per day went to Bapco, and the remainder was delivered to the aluminum extrusion plant and local power stations.

Two new petroleum-related projects were established in 1980 and 1981, under the direction of two distinct companies. The first company established was the Gulf Petrochemical Industry Co. (GPIC), a joint venture of Bahrain, Kuwait, and Saudi Arabia, all of whom owned equal shares in the project. In 1980, a contract was awarded to Wimpey Laboratories of the United Kingdom for a site survey and soil analysis for the plant, to be located on a 600,000-square-kilometer tract to be reclaimed from the sea, near Sitra. Contracts were also awarded to King Wilkinson International of the United States for a $9 million feasibility study, and Uhde of the Federal Republic of Germany for engineering and process technology. In March 1981, GPIC awarded the $80 million construction contract to Snamprogetti S.p.A. of Italy. The complex was to produce 1,100 tons per day of methanol and 1,100 tons per day of ammonia, utilizing natural gas feedstock. The plant was scheduled to go onstream in 1984. Most of the output was to be exported.

Late in 1981, the Governments of Bahrain, Kuwait, and Saudi Arabia combined again to establish the Heavy Oil Conversion Co. The company was set up to construct and manage a 50,000- to 80,000-barrel-per-day hydrocracking plant designed to convert heavy refinery oils into lighter products. A feasibility study for the project was to be completed sometime in 1982. The company was owned 40% by Bahrain, and 30% each by Saudi Arabia and Kuwait.

Perhaps the centerpiece of Bahrain's goals of diversification and decentralization is the smelter of ALBA that began operating 10 years ago. The plant has produced at its rated capacity for over 5 years, and has firmly established itself on the international market. Production capacity was increased from 122,000 to 155,000 tons per year in 1981, and was to increase to 170,000 tons per year by 1982 through the addition of a fifth and sixth potline. Most of the new output was destined for the planned aluminum rolling mill in Bahrain.

Bahrain Aluminum Co. (Balco), the marketing agency for ALBA, began to feel the effects of the downturn in the industry worldwide in 1981. Balco's earnings peaked in 1979 at $53 million, then declined to $48.5 million in 1980, and were down again to $13.2 million in 1981. The company expected to post a loss for the first quarter of 1982. ALBA was owned 57.9% by the Bahrain Government, 20% by Saudi Arabia, 17% by Kaiser Aluminum Bahrain of the United States, and 5.1% by Breton Investments of the United Kingdom. The smelter produced approximately 1.2% of the world's aluminum output in the form of ingots, rolling slabs, billets for extrusion, and liquid metal in crucibles. The minority share-

holders either exported their share of the output directly or ran the metal through the Bahrain Atomiser International aluminum powder plant, in which Breton had an interest through Eckhardtwerke A.G. of the Federal Republic of Germany.

The Bahrain Aluminum Extrusion Co., owned by the Government, increased the capacity of its extrusion plant from 3,600 to almost 5,000 tons per year in 1981 through the installation of additional anodizing facilities. Meanwhile, six regional Arab Governments have collaborated to establish the Gulf Aluminum Rolling Mill Co. to be based near ALBA in Bahrain. The project was to be designed to produce 40,000 tons per year of semifabricated aluminum products, mostly for the local market. Shareholders in the project were Bahrain, Kuwait, Saudi Arabia, and Iraq with 20% each, and Oman and Qatar with 10% each. Kaiser Engineering of the United States won a $5.3 million consultancy contract for the plant in 1981, and tenders for building the mill were to be invited by the third quarter of 1982. Aluminum ingots for the plant were to be supplied by ALBA.

Bahrain's next major industrial project planned was the Arab Iron and Steel Co.'s (AISCO) 4-million-ton-per-day iron ore pelletizing plant. AISCO was formed in 1980 to ensure adequate supplies of pelletized iron ore for the three large direct-reduction steelworks in the gulf area, in Saudi Arabia, Iraq, and Qatar. The combined capacity of these steel plants was 2.7 million tons per year of steel, which required approximately 4 million tons of pellets.

AISCO was capitalized in 1980 at $150 million. Total cost of the project was expected to be $320 million. In November 1980, Kobe Steel Ltd. of Japan was awarded the major $207 million turnkey contract for construction of the pellet plant and ancillary facilities including a 100-megawatt powerplant and a 3,000-cubic-meter-per-day seawater desalinization plant. The overall project consultant was the Kuwait Engineering Operation and Management Co.

The pellet plant itself was to consist of an iron ore drying and grinding unit; a blending and prewetting unit; a ball mill and indurating unit; a product stockpiling, reclamation, and load-out unit; and a waste reclamation plant. The plant was expected to consume 35 million cubic feet of natural gas per day. India's Kudremukh Mine was to supply 1.5 million tons per year of iron ore to the plant along with 1 million tons from Mineração Brasilieras Reunidas S.A. of Brazil and unspecified amounts from Brazil's Companhia Vale do Rio Doce and Samarco Mineração S.A. Peru's Minero Perú Commercial also was to supply 500,000 tons of iron ore per year initially, rising to 1 million tons at a later date. Construction of the plant was to begin early in 1982, and it was to be ready for commissioning sometime in 1984. Bahrain, while not announcing any plans presently, did not rule out construction of a direct-reduction plant of its own to form an integrated iron and steel project within the country.

Table 2.—Bahrain: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	--	50	--	All to Pakistan.
Metal including alloys:				
Unwrought	130,234	77,546	--	Japan 17,193; Iraq 16,018; India 9,449.
Semimanufactures	787	3,711	--	Saudi Arabia 1,254; Kuwait 839; Qatar 239.
Copper:				
Ore and concentrate	--	120	--	All to Iran.
Metal including alloys, unwrought and semimanufactures	13	2	--	Saudi Arabia 1; ship stores 1.
Iron and steel:				
Scrap	36	2,056	--	Ship stores 1,396; Pakistan 630; Iran 30.
Pig iron, ferroalloys, similar materials	18	--		
Steel, primary forms	380	112	--	All for ship stores.
Semimanufactures	7,972	6,061	(1)	Ship stores 5,267; Oman 12; Saudi Arabia 4.
Lead metal including alloys, all forms	1	--		
Nickel metal including alloys, all forms	2	--		

See footnotes at end of table.

Table 2.—Bahrain: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS —Continued				
Zinc metal including alloys, unwrought and semimanufactures	12	1	--	All for ship stores.
Other: Base metals including alloys:				
Scrap	7	14	--	Iran 8; Ship stores 6.
Unwrought and semimanufactures	--	1	--	Mainly to United Arab Emirates.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	2	1	--	All for ship stores.
Cement	1,716	1,855	--	Do.
Clay products: Nonrefractory	--	48	--	Kuwait 37; Qatar 9.
Lime	521	578	--	Saudi Arabia 390; United Arab Emirates 155; Yemen Arab Republic 25.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	--	9	--	All for ship stores.
Worked	4	74	--	All to Kuwait.
Gravel and crushed rock				
value, thousands	--	$2	--	All for ship stores.
Limestone excluding dimension	1	2	--	All to Saudi Arabia.
Other:				
Crude	--	8	--	Do.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	391	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen	24	--		
Petroleum:				
Crude, thousand 42-gallon barrels	18,054	19,672	NA	NA.
Refinery products:				
Gasoline, do.	8,586	7,631	--	United Arab Emirates 3,298; New Zealand 838; Pakistan 608.
Kerosine and jet fuel, do.	20,170	24,731	--	Japan 7,672; Australia 1,174; Italy 492.
Distillate fuel oil, do.	23,399	23,892	--	United Arab Emirates 6,357; Japan 2,362; Zambia 1,346.
Residual fuel oil, do.	30,404	25,572	--	Singapore 9,324; New Caledonia 3,953; Philippines 3,096.
Lubricants, do.	296	234	--	India 171; Australia 40; Qatar 15.
Liquefied petroleum gas, do.	351	1,700	--	Japan 1,191; United Arab Emirates 406; Egypt 76.
Bitumen and other residues, do.	1,433	1,880	--	United Arab Emirates 1,080; Oman 377; Qatar 182.

NA Not available.
[1]Less than 1/2 unit.

Table 3.—Bahrain: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Unwrought	38	104	5	United Kingdom 71; United Arab Emirates 28.
Semimanufactures	975	97,812	309	Australia 60,855; Jamaica 31,829; Spain 1,075.
Copper:				
Ore and concentrate	--	500	--	Singapore 229.
Metal including alloys, unwrought and semimanufactures	1,246	1,336	28	United Kingdom 325; Australia 307; Japan 215.
Iron and steel:				
Scrap	7	2,410	425	Qatar 67; Netherlands 33; Japan 30.
Pig iron, ferroalloys, similar materials	105	771	(1)	United Kingdom 712; Italy 33; Spain 10.

See footnotes at end of table.

Table 3.—Bahrain: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Steel, primary forms	29,273	35,939	67	Japan 17,768; Republic of Korea 11,941; Qatar 2,986.
Semimanufactures:				
Universals, plates, sheets	11,896	17,193	366	Japan 6,778; France 6,000; Republic of Korea 1,490.
Wire	194	1,518	--	Japan 380; West Germany 150; Hong Kong 101.
Tubes, pipes, fittings	13,059	24,887	846	Japan 11,815; Saudi Arabia 3,277; Iran 2,255.
Lead metal including alloys, unwrought and semimanufactures	387	28	21	Republic of Korea 4; United Kingdom 3.
Nickel:				
Ore and concentrate value, thousands	$1	--		
Metal including alloys, unwrought and semimanufactures	3	13	(1)	West Germany 9; United Kingdom 3.
Platinum-group metals including alloys, unwrought and partly wrought value, thousands	$24	--		
Silver metal including alloys, unwrought and partly wrought ---do---	$7	$359	--	Saudi Arabia $281; United Kingdom $78.
Tin metal including alloys, unwrought and semimanufactures	17	4	(1)	Mainly from United Kingdom.
Zinc metal including alloys, unwrought and semimanufactures	44	76	1	United Kingdom 50; Netherlands 20; Saudi Arabia 3.
Other:				
Oxides and hydroxides	84	313	1	Thailand 171; West Germany 52; United Kingdom 25.
Base metals including alloys:				
Scrap	947	579	--	Singapore 350; Saudi Arabia 2.
Unwrought and semimanufactures	161	183	4	Norway 53; United Kingdom 44; Italy 34.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc value, thousands	$4	--		
Grinding and polishing wheels and stones	22	20	3	United Kingdom 4; Saudi Arabia 2; Switzerland 2.
Asbestos, crude	14	(1)	--	All from United Kingdom.
Cement	187,739	179,787	351	Australia 92,652; Spain 32,688; Japan 28,729.
Clays and clay products:				
Crude	--	40	8	Netherlands 14; Saudi Arabia 11; Hong Kong 3.
Products:				
Nonrefractory	7,985	9,406	63	Italy 3,225; United Kingdom 3,138; Spain 1,671.
Refractory including nonclay brick	1,691	4,636	14	West Germany 1,996; United Kingdom 1,263; Italy 688.
Diamond: Gem, not set or strung value, thousands	$56	$146	$12	United Kingdom $102; Belgium-Luxembourg $16; India $14.
Fertilizer materials:				
Crude	149	170	--	West Germany 100; Saudi Arabia 35; Vanuatu 18.
Manufactured	858	--		
Gypsum and plasters	130,079	3,588	(1)	Republic of Korea 2,042; Australia 1,144; Japan 261.
Lime	319	433	2	Saudi Arabia 228; Japan 176; India 20.
Mica: Worked including agglomerated splittings	590	--		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$13	$80	--	Austria $37; India $30; Spain $3.
Synthetic ---do---	$24	$46	--	Austria $18; Hong Kong $17; United Kingdom $9.
Salt and brines	1,110	1,433	35	Netherlands 982; Hong Kong 184; United Kingdom 55.

See footnotes at end of table.

Table 3.—Bahrain: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	16,980	824	--	Republic of Korea 59; Italy 37.
Worked	73,348	27,511	19	United Arab Emirates 23,718; Italy 3,203; India 210.
Gravel and crushed rock	112,094	284,765	--	United Arab Emirates 283,944; Iran 753; Spain 50.
Sand excluding metal-bearing	332	113	(1)	United Kingdom 55; India 51.
Other:				
Crude	56	117	--	West Germany 61; Netherlands 39; Hong Kong 16.
Slag, dross, similar waste, not metal-bearing	6,820	--		
Building materials of asphalt, asbestos and fiber cements, unfired non-metals	2,438	3,402	(1)	United Arab Emirates 1,040; India 826; Republic of Korea 796.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	33	11	9	Netherlands 2.
Coal, all grades including coke and briquets	32,795	34	--	United Arab Emirates 32; United Kingdom 2.
Petroleum:				
Crude thousand 42-gallon barrels	72,472	70,595	--	All from Saudi Arabia.
Refinery products:				
Gasoline 42-gallon barrels	85	536	--	United Arab Emirates 527.
Kerosine and jet fuel do.	326	341	62	Belgium-Luxembourg 163; West Germany 101.
Distillate fuel oil do.	112	1,015	15	United Arab Emirates 627; Kuwait 358.
Residual fuel oil do.	8,079	1,712	1,638	United Kingdom 67.
Lubricants do.	53,480	52,731	3,724	United Arab Emirates 30,345; Belgium-Luxembourg 3,780; United Kingdom 3,752.
Other:				
Liquefied petroleum gas do.	360	244	(1)	Mainly from India.
Mineral jelly and wax do.	8	31	23	Netherlands 7.
Bitumen and other residues do.	r676,872	574,015	324,289	West Germany 118,194; France 5,909.

rRevised.
1Less than 1/2 unit.

JORDAN

Jordan's economy continued to expand in 1981, boosted by increased production of phosphate rock and unusually high levels of reexports. Jordan's mineral industry consisted of the mining of phosphate rock, petroleum refining, and the production of cement. Production of phosphate rock alone provided 5% of the country's GDP estimated at about $3 billion in 1981.[7] Mineral production was to increase substantially in 1982, with production commencing from the Dead Sea potash project and the Aqaba phosphate fertilizer complex. Also in the planning stage was a project to exploit copper deposits in the Wadi Araba region in southwestern Jordan. Total mineral production, including refined petroleum products, was valued at about $690 million in 1981, representing 22% of the GDP.

In September, the Jordan Council of Ministers approved the country's second 5-year development plan (1981-85). Total expenditures in the plan period were to reach $10 billion, with emphasis being placed on continued resource development, industry, and agriculture. Industry and mining were to contribute the bulk of the growth in the private sector, with each averaging an 18% growth rate in all of the plan years, while receiving 25% of the total investment allocated. Overall GDP was expected to grow at a real annual rate of 11% per year, reaching $4.6 billion by 1985.

Despite the strong performance in the domestic economy, Jordan's trade deficit continued to grow from $1.55 billion in 1980

to $1.88 billion in 1981. A major aim of the 5-year plan was to trim the trade deficit by promoting rapid expansion in exports of goods and services. To achieve this, the Government was planning to allocate about 48% of the current GDP toward the productive sectors of the economy, notably in the production of chemical fertilizers, a potash extraction plant, an oil refinery, phosphate production, and a cement plant. These investments were to play a vital role in modifying the structure of the Jordanian economy in favor of the commodity-producing sector rather than dependence on the services sector.

Jordan's primary heavy industry and largest export commodity was phosphate rock. Production increased substantially in 1981 to 4.2 million tons from 3.9 million tons in 1980. Exports of phosphate rock fell marginally in 1981 to 3.5 million tons, from 3.61 million tons in 1980. This was partially a result of increased consumption of phosphate rock for fertilizer within the country, and also because of a generally weak demand for fertilizer worldwide. Exports of phosphate rock brought in about $150 million in foreign exchange earnings.

Three large deposits of phosphate rock were being exploited in Jordan in 1981, at Ruseifa, El-Hasa, and Wadi-El-Abyad. Ruseifa was the oldest of the mines, having been in continuous operation since 1937. Output from the deposits, located 14 kilometers north of Amman, has been maintained at 600,000 to 1 million tons per year since 1960. The average triphosphate of lime (TPL) content at Ruseifa was 62% to 72%. At Ruseifa, the Jordan Phosphate Mines Co. (JPMC) operated an opencast mine along with a simple screening and drying operation, which yielded 66% to 68% TPL rock as well as "Jorphos," a dust from the drying plant. This dust was sold domestically as direct-application fertilizer. In June 1981, JPMC decided to replace the existing beneficiation equipment with an $18 million calcining process in order to produce a higher grade, organic-free product. The new facilities were to come onstream in 1983 and be capable of processing 1 million tons of crude rock per year.

At El-Hasa, 138 kilometers south of Amman, the JPMC was mining five separate ore bodies, using contract labor to carry out stripping operations. Phosphate ore was ripped, bulldozed, and loaded into 20-ton trucks by bucket loaders, and hauled to one of the five mobile crushing stations. The average stripping ratio was 7:1. In 1981, JPMC stripped 2 million bank cubic meters of overburden and mined about 500,000 bank cubic meters of phosphate. At El-Hasa, JPMC operated five beneficiation plants; three with an annual capacity of 500,000 tons of 73% to 75% TPL with an 18% moisture content, and two others with an 800,000-ton-per-year capacity of 73% to 85% TPL. From these plants, phosphate was fed to any of eight dryers with a total combined capacity of 4 million tons per year. From El-Hasa, phosphate was loaded into either trucks or railcars for transportation to Aqaba for export.

JPMC's newest mine came onstream in 1980 at Wadi-El-Abyad, located 20 kilometers north of El-Hasa. Proven reserves at Wadi-El-Abyad were put at 72.5 million tons, with only one of three ore bodies being exploited at the current time. Output from the mine in 1981 averaged about 1 million tons of crude phosphate rock. Beneficiation facilities at Wadi-El-Abyad consisted of two crushers and screening units, a beneficiation plant, and three dryers. The beneficiation plant consisted of three process lines with a 113-ton-per-hour rock feed capacity, and an output rating of 500,000 tons per year of 73% to 75% TPL. Output from the dryer was loaded into trucks or railcars for shipment to Aqaba. The combined output of El-Hasa and Wadi-El-Abyad, currently running at about 3.2 million tons, was to increase over 5 million tons by 1983. Most of the increase was to come from El-Hasa, where a 30.6-cubic-meter-bucket walking dragline has been installed, the first dragline in the Middle East.

Phosphate production from Jordan was to be further supplemented by the development of a fourth deposit at Ash-Shidiya, located 75 kilometers south of Ma'an and 50 kilometers northeast of Aqaba. The Shidiya deposit was one of the largest and commercially most important deposits in the country, mostly because of its proximity to the new fertilizer plant and export terminal at Aqaba. The Jordan Ministry of Trade and Industry awarded the engineering contract for development of the deposit to a consortium of French companies, led by the Société Française d'Etudes Minières. Proven reserves at Shidiya were placed at over 300 million tons of phosphate rock. Production from Shidiya was expected to reach 3 million tons per year of concentrated ore by the late 1980's.[8]

One of the reasons that increased phos-

phate rock production was important was to supply the nearly completed Jordan Fertilizer Industry Co.'s (JFI) fertilizer complex at Aqaba. The $400 million complex is composed of two 450,000-ton-per-year sulfuric acid plants, one 450,000-ton-per-year phosphoric acid plant, designed to utilize 73 to 75 bone phosphate of lime-grade phosphate rock, and two fertilizer granulation units, each capable of producing 400,000 tons per year of monoammonium or diammonium phosphate (DAP). Included in the project was a plant designed to produce 20,000 tons per year of aluminum fluoride from fluorsilicic acid. This acid is a byproduct of phosphoric acid production. JFI was also constructing storage installations for materials and products, as well as bagging equipment for DAP. A 44-megawatt electric power station was to power the complex, utilizing waste heat from steam generated in the sulfuric plant. A new marine terminal was also under construction about 15 kilometers south of Aqaba. The port consisted of a 214-meter pier for double-sided berthing, and could accommodate freighters of 30,000 deadweight tons. Startup of the fertilizer plant was scheduled for mid-1982, with commissioning expected to take 5 months. The aluminum fluoride plant was to startup in 1984.[9]

Also nearing completion in 1981 was the single largest industrial project ever undertaken in the country, the Dead Sea potash project. The $425 million facility was built for the Arab Potash Co. (APC), a joint venture of the Jordan Government (51%), the Arab Mining Co. (25%), the Islamic Development Bank (7%), the Government of Kuwait (5%), the Libyan Government (5%), and other minority shareholders. Jacobs Engineering Ltd. of the United States was responsible for engineering, design, procurement, and construction management of the project. George Wimpey and Co. of the United Kingdom built the solar evaporation ponds and surrounding dikes for $131 million, Vöest Alpine of Austria built the potash processing refinery for $107 million, and R. A. Hanson Co. of the United States supplied four laser-controlled carnallite harvesting machines for $10 million.

The potash project was located at Ghor-al-Sufi, near the Lisan Peninsula on the banks of the Dead Sea in southern Jordan. The project utilizes solar energy to evaporate Dead Sea brines. The brines are pumped onshore into a 10-kilometer-long canal that empties into several salt pans. First, common salt (NaCl) is precipitated, leaving a saturated solution of carnallite. This solution is pumped into three carnallite harvesting pans, where carnallite, a potassium chloride-magnesium chloride double salt ($KCl\text{-}MgCl\text{-}6H_2O$) is precipitated along with 15% NaCl. The carnallite is recovered using four laser-controlled harvesting machines that crawl along, semisubmerged, on wide caterpillar tracks. The machines scoop up the solids and push them into a pipeline that leads to dewatering cyclones. In this manner, about 310 tons per hour of solids are to be recovered. These are then introduced into the refinery, where sodium and magnesium chloride ores are leached out, and KCl is recrystallized, dewatered, dried, and stored. The refinery is to produce about 1.2 million tons per year of potash.

Potash was to be trucked to Aqaba for export. Marketing of the endproduct was contracted to Mitsubishi Corp. of Japan for Asia at 600,000 tons per year, Woodward and Dickerson of the United States for North and South America at 275,000 tons per year, Enterprise Minière et Chemique S.A. of France for Western Europe and Africa at 250,000 tons per year, and IMIC Holdings for Eastern Europe at 40,000 tons per year. APC was to market its share of the output in the Middle East. APC was to start production by March 1982, with exports beginning in October 1982.

Jordan's production of metals was limited to small-scale iron and steel operations. The Jordan Iron and Steel Co. operated a small electric steelworks at Zarqa that produced about 50,000 tons per year of steel reinforcing bars, mainly from scrap. The Jordan Pipes Manufacturing Co., owned 10% by France's Vallourec Group and the remainder by Jordanian interests, also operated a 120,000-ton-per-year, small-diameter welded pipe plant. The Arab Aluminum Industry Co. in Amman operated an aluminum extrusion and anodizing plant with an annual capacity of 5,000 tons.

Jordan's newest and most promising metals project was a plan to exploit the copper deposits of the Jordan Rift Valley near Wadi Araba. According to the Natural Resources Authority (NRA), the deposit contains 5 million tons of 1.36% copper in oxide ore. Relics of an ancient Iron Age copper mine have been located near the town of Etzio-Geber, near Aqaba. The deposit has been examined by the NRA, the Bureau de Recherches Géologiques et Minières (BRGM), and most recently, Seltrust Engi-

neering of the United Kingdom, who completed a feasibility study in October 1979. Seltrust was awarded another contract to do additional feasibility studies, construct a pilot plant, and do sample testing on the ore. The pilot plant was to have a 3,000-ton-per-year ore processing capacity. Based on the results of the pilot plant operation, the NRA planned to gradually expand the operation to about 9,000 tons per year by 1985. Total cost of the pilot plant, economic studies, and testing operations was estimated at $25 million. No date was available for commissioning of the plant.

Jordan's cement industry continued to expand in 1981, through the increased capacity of the Fuheis cement plant, located 25 kilometers northwest of Amman. Production capacity at Fuheis was increased from 800,000 to 1.2 million tons per year through the addition of a fifth production line at the plant. Jordan's cement consumption averaged about 1.8 million tons per year in 1981, which forced the country to import about one-third of its domestic requirement. In May 1981, the Jordan Cement Factories Co., which owned the Fuheis plant, awarded a Mitsubishi-Kobe Steel consortium of Japan a $110 million contract to build a sixth production line at Fuheis that would be capable of producing another 1 million tons per year of cement. The plant was to be completed late in 1982.

Two other cement plants were also in the planning stage, one at Rashidiyah and the other at al-Dalil. Mitsubishi was responsible for constructing the Southern Cement Works at Rashidiyah at a cost of nearly $225 million. The plant, scheduled to come onstream late in 1983, was to produce 1 million tons per year of cement, mainly for export to Saudi Arabia and Iraq. Kobe Steel, the main contractor, was providing the process technology for the plant. The al-Abyad cement plant, located in the al-Dalil region, was to produce about 100,000 tons per year of cement from raw materials located close to the plant. The project was a joint venture of Jordan and Syria through the Syrian-Jordanian Co. The cost of the plant was estimated at $54 million. No date was available for starting construction or commissioning of the plant.

Despite many years of unsuccessful petroleum exploration, the NRA continued its exploration program, concentrating on the al-Azraq region of eastern Jordan. A wildcat well was drilled to a depth of 805 meters by the Yugoslav contractor Naftagas, on behalf of the NRA. The concession was owned completely by the NRA, who contracted Naftagas and several other companies to drill the well on its behalf. The well was part of Jordan's National Independent Oil Exploration Program, which up until 1981 has concentrated only on seismic surveys. Before 1981, only four wells had been drilled based on these surveys. By mid-1982, the entire country was to have been covered by seismic surveys, with new efforts being placed on sites where potential oil-bearing formations had been located. After the Naftagas well, the NRA planned to drill several other wells in the area.

All petroleum refining in Jordan was carried out by the Jordan Petroleum Refinery Co.'s 35,000-barrel-per-day refinery at Zarqa. Output from the refinery has been running at full capacity of over 12 million barrels per year of refined products since 1979. The entire output of the plant was sold domestically. Crude oil supplies for the refinery were supplied by Saudi Arabia, through the Trans-Arabian Pipeline (TAPline). The third phase of the refinery's expansion project was underway in 1981, which was to raise input capacity to 60,000 barrels per day of crude oil. New hydrocracker and distillation units were being added by Industrialexport of Romania, along with a new LPG production plant, at a total cost of about $175 million. Increased output from the refinery was to be more than adequate to meet the country's domestic needs. The expansion project was to be completed by the end of 1982.

Also under construction at Zarqa was a small petrochemical project attached to the refinery. The unit, being built under the overall engineering contract of Rio Rodano, was designed to produce 8,000 tons per year of polyester, 4,000 tons per year of plastisizer, and 5,000 tons per year of polyvinyl chloride. The plant was to use imported phthalic anhydride, glycols, styrene monomer, and oxo-alcohols as feedstock. The project was to be completed by the end of 1982. Other projects under consideration by the Jordan Petroleum Refinery included plans to increase the crude oil pipeline capacity into the refinery, construction of six new petroleum product distribution stations, and construction of an aviation fuel pipeline and distribution center at the Queen Alia International Airport.

In addition to its newly discovered crude oil potential, Jordan also possessed about 1.3 billion tons of good quality oil shale in

the Lajjun area, near Karak in central Jordan. Klöckner Werke A.G. and Lurgi of the Federal Republic of Germany was contracted to do a $630,000, 17-month prefeasibility study for a 50,000-barrel-per-day retorting plant at Lajjun. Results of the study were not available by the end of the year.

Other mineral projects being evaluated by the NRA were several phosphate mining support projects; a bromide products and caustic soda plant based on Dead Sea brines; a magnesium and porcelain clay plant, also utilizing the waters of the Dead Sea; a potassium sulfate project; and a feldspar mining project. A general geologic survey of the kingdom was also continuing in 1981 to pinpoint important geologic areas for specific purposes, such as for mining, location of wells, and planning industrial ventures.

Table 4.—Jordan: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, all forms	1,069	800	--	Lebanon 509; Syria 124; Kuwait 106.
Chromium: Oxides and hydroxides	--	23	--	All to Syria.
Copper metal including alloys, all forms	1,324	605	--	Lebanon 257; Belgium 91; Kuwait 72.
Iron and steel:				
Scrap	11,574	820	--	Lebanon 724; Syria 69.
Semimanufactures	7,994	7,437	--	Iraq 5,571; Saudi Arabia 1,540.
Lead:				
Oxides and hydroxides	36	--		
Metal including alloys, all forms	1,780	171	--	Lebanon 120; Saudi Arabia 33; Syria 17.
Tin metal including alloys, semimanufactures, kilograms	--	100	--	All to Belgium.
Zinc:				
Oxides and hydroxides	47	115	--	All to Saudi Arabia.
Metal including alloys, all forms	173	165	--	Saudi Arabia 137; Syria 28.
Other:				
Ash and residue containing nonferrous metals	766	150	--	All to Lebanon.
Alkali, alkaline-earth, rare-earth metals	--	30	--	All to Syria.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	12	--		
Grinding and polishing wheels and stones	4	40	--	Mainly to Saudi Arabia.
Cement	--	91	--	Iraq 60; Saudi Arabia 29.
Chalk	107	2,552	--	Saudi Arabia 1,428; Lebanon 719; Syria 354.
Clays and clay products:				
Crude	13,286	17,909	--	Lebanon 15,431; Kuwait 1,835; Syria 432.
Products:				
Nonrefractory	959	5,354	--	Saudi Arabia 5,221; Iraq 95.
Refractory including nonclay brick	3,107	3,509	--	Saudi Arabia 1,805; Iraq 1,704.
Fertilizer materials:				
Crude:				
Phosphatic thousand tons	2,755	3,623	--	India 628; Turkey 432; Romania 388; Poland 294.
Other including mixed	50	210	--	Lebanon 143; Abu Dhabi 50; Saudi Arabia 17.
Manufactured:				
Nitrogenous	122	--		
Phosphatic	68	57	--	All to Lebanon.
Ammonia	--	6	--	All to Syria.
Gypsum and plasters	129	--		
Lime	36	--		
Pigments, mineral: Natural, crude	--	341	--	Kuwait 220; Saudi Arabia 71; Iraq 50.
Pyrites, unroasted	--	85	--	All to Saudi Arabia.
Salt and brines	554	17,981	--	Syria 8,716; Iraq 6,895; Kuwait 2,194.
Sodium and potassium compounds, n.e.s.:				
Caustic potash	--	32	--	All to Netherlands.
Caustic soda	145	103	--	Syria 78; Saudi Arabia 25.
Sodic and potassic peroxides	24	74	--	Syria 58; Iraq 16.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	111,583	122,903	--	Syria 90,001; Iraq 14,959; Lebanon 7,595.

Table 4.—Jordan: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel —Continued				
Dimension stone —Continued				
Worked	62,227	62,887	--	Kuwait 45,184; Iraq 8,538; Saudi Arabia 7,196.
Gravel and crushed rock	2,604	372	--	Iraq 201; Kuwait 135; Syria 20.
Sand excluding metal-bearing	8,098	795	--	Kuwait 435; Saudi Arabia 358.
Sulfur: Sulfuric acid	217	264	--	All to Saudi Arabia.
Talc and natural steatite	--	1,055	--	Kuwait 779; Saudi Arabia 210; Lebanon 66.
Other:				
Oxides, hydroxides, peroxides of barium, magnesium, strontium	5	--	--	
Halogens	127	71	--	Syria 30; Lebanon 29; Kuwait 12.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	121	81	--	All to Saudi Arabia.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	14	--	--	
Coal, all grades including briquets	--	98	--	All to Saudi Arabia.
Coke and semicoke	--	17	--	Syria 14; Abu Dhabi 3.
Petroleum refinery products:				
Gasoline ---42-gallon barrels	2,391	4,333	--	Syria 3,144; Saudi Arabia 1,189.
Kerosine ---do---	142	--	--	
Lubricants ---do---	956	1,188	--	Syria 864; Iraq 184; Lebanon 119.

Table 5.—Jordan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	110	54	--	Mainly from United Kingdom.
Metal including alloys:				
Unwrought including waste and scrap	94	90	--	Canada 49; Saudi Arabia 25; West Germany 10.
Semimanufactures	4,610	4,611	124	Greece 1,962; Lebanon 614; Hong Kong 570.
Copper metal including alloys:				
Unwrought including waste and scrap	442	--	--	
Semimanufactures	626	495	37	Poland 260; United Kingdom 76; West Germany 33.
Gold metal including alloys, unwrought and partly wrought ---troy ounces	4,823	--		
Iron and steel:				
Scrap	5,852	4,471	--	Saudi Arabia 1,849; Kuwait 1,800; Lebanon 637.
Pig iron, ferroalloys, similar materials	20,545	24,643	--	India 16,900; Lebanon 6,866.
Steel, primary forms	69,199	60,425	11,732	U.S.S.R. 15,867; West Germany 10,040; Mozambique 9,998.
Semimanufactures:				
Bars, rods, angles, shapes, sections	190,859	114,075	359	Italy 12,253; Czechoslovakia 11,076; Romania 9,960.
Universals, plates, sheets	62,446	38,114	326	Japan 12,511; Czechoslovakia 4,023; West Germany 3,515.
Hoop and strip	515	149	--	Iraq 54; Czechoslovakia 30; Austria 21.
Rails and accessories	96	--	--	
Wire	4,998	3,312	--	Romania 957; Poland 600; U.S.S.R. 548.
Tubes, pipes, fittings	69,350	50,842	462	France 18,426; Japan 8,037; Italy 5,875.
Unspecified	384	900	--	Japan 449; Italy 197; West Germany 120.

Table 5.—Jordan: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides and hydroxides	302	1,142	(1)	United Kingdom 1,053; Bulgaria 40.
Metal including alloys, unwrought including waste and scrap	1,481	2,028	--	Saudi Arabia 1,801; Kuwait 172.
Tin metal including alloys:				
Unwrought including waste and scrap	--	10	--	All from West Germany.
Semimanufactures	10	2	--	All from United Kingdom.
Titanium: Oxides and hydroxides	2,188	963	232	United Kingdom 311; West Germany 190; Belgium 151.
Zinc:				
Oxides and hydroxides	185	77	--	West Germany 75; France 2.
Metal including alloys:				
Unwrought including waste and scrap	769	813	--	Belgium 799; Saudi Arabia 8.
Semimanufactures	358	418	--	Japan 271; Belgium 129.
Other:				
Ores and concentrates	168	--		
Ash and residue containing nonferrous metals	1,090	--		
Alkali, alkaline-earth, rare-earth metals, mercury	147	64	17	Turkey 36; Netherlands 7.
Base metals including alloys, all forms	22	10	--	Mainly from Turkey.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	560	63	--	Italy 45; Turkey 13; Syria 5.
Grinding and polishing wheels and stones	271	330	(1)	Italy 255; West Germany 37; Japan 13.
Asbestos, crude	2,332	936	--	Lebanon 650; Cyprus 285.
Cement	678,816	422,525	11	Spain 345,663; Republic of Korea 22,867; Japan 19,495.
Chalk	4,760	2,613	--	United Kingdom 1,146; Syria 968; France 132.
Clays and clay products:				
Crude	823	1,335	14	Greece 470; United Kingdom 362; Cyprus 200.
Products:				
Nonrefractory	11,857	11,798	40	Italy 5,540; Lebanon 1,888; Greece 773.
Refractory including nonclay brick	891	4,633	--	France 1,902; Austria 966; United Kingdom 451.
Cryolite and chiolite	67	--		
Diatomite and other infusorial earth	212	--		
Feldspar, fluorspar, similar materials	415	294	--	India 169; Italy 50; United Kingdom 50.
Fertilizer materials:				
Crude and manufactured:				
Nitrogenous	15,180	17,842	21	Iraq 8,358; Lebanon 4,801; Netherlands 2,726.
Phosphatic	19,784	16,101	15	Lebanon 13,967; Iraq 957; Austria 520.
Potassic	994	144	--	Lebanon 100; Netherlands 36.
Other including mixed	3,909	4,773	5	Netherlands 2,954; Austria 1,000; Iraq 518.
Ammonia	251	143	--	Syria 120; Kuwait 11.
Graphite, natural	--	14	(1)	Lebanon 9; France 5.
Gypsum and plasters	1,337	2,456	15	Lebanon 1,150; Syria 890; West Germany 400.
Lime	1,836	1,450	--	All from Lebanon.
Pigments, mineral:				
Natural, crude	167	226	--	Belgium 145; China 40; Syria 20.
Iron oxides, processed	1,108	448	--	Lebanon 292; West Germany 88; India 30.
Precious and semiprecious stones, natural and synthetic—value	$261,033	$388,961	--	United Kingdom $275,142; Belgium $111,867.
Pyrites, unroasted	--	412	--	Italy 400; Syria 12.
Salt and brines	1,739	1,422	14	Lebanon 613; Kuwait 336; Saudi Arabia 329.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	808	2,229	--	Italy 1,840; Lebanon 117; Kuwait 110.
Sodic and potassic peroxides	586	131	(1)	Denmark 50; Italy 50; West Germany 30.

See footnotes at end of table.

Table 5.—Jordan: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	8,034	9,001	--	Italy 3,727; France 3,000; Lebanon 1,194.
Worked	615	198	--	Lebanon 124; Italy 41; Spain 28.
Dolomite, chiefly refractory-grade	296	--	--	
Gravel and crushed rock	2,069	2,490	--	Lebanon 1,189; Italy 882; Saudi Arabia 220.
Limestone excluding dimension	--	43	--	Spain 22; Austria 21.
Sand excluding metal-bearing	1,340	1,260	--	Spain 512; Syria 400; United Kingdom 312.
Sulfur:				
Elemental:				
Other than colloidal	758	1,144	--	Iraq 588; France 320; West Germany 65.
Colloidal	644	334	--	Iraq 245; West Germany 71; United Kingdom 18.
Sulfuric acid	713	651	--	Greece 255; Lebanon 250; Belgium 100.
Talc, steatite, soapstone, pyrophyllite	218	746	28	China 235; France 177; India 120.
Other:				
Crude	--	76	30	Austria 20; United Kingdom 13; West Germany 10.
Halogens	--	55	(1)	India 20; United Kingdom 18; Saudi Arabia 15.
Slag, dross, similar waste from manufacture of iron and steel	--	73	--	India 41; China 32.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	2,662	2,475	68	Lebanon 1,510; France 297; Italy 130.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	262	3	Syria 132; United Kingdom 123.
Carbon black and gas carbon	--	241	--	Austria 210; France 20; West Germany 11.
Coal, all grades including briquets	733	183	28	West Germany 120; Taiwan 23; Italy 12.
Coke and semicoke	253	1,301	6	Lebanon 981; Syria 176; West Germany 88.
Hydrogen, helium, rare gases	51	46	--	Kuwait 31; Belgium 15.
Petroleum:				
Crude thousand 42-gallon barrels	12,700	12,868	--	Mainly from Saudi Arabia.
Refinery products:				
Gasoline 42-gallon barrels	r109,013	1,111	--	All from Saudi Arabia.
White spirit do	--	1,325	--	Syria 1,124; Lebanon 132.
Lubricants do	126,825	143,081	19,765	Netherlands 30,538; United Kingdom 30,314; Belgium 18,305.
Mineral jelly and wax do	1,714	314	--	All from West Germany.
Liquefied petroleum gas do	42,053	157,596	--	Iraq 80,597; Lebanon 50,308; Kuwait 24,568.
Bitumen and other residues do	--	302	--	All from Belgium.
Bituminous mixtures do	3,007	1,400	52	West Germany 467; United Kingdom 462; France 162.
Unspecified do	1,114	2,583	335	France 909; Saudi Arabia 587; Belgium 394.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	--	263	--	France 250; Lebanon 13.

rRevised.
1Less than 1/2 unit.

LEBANON

Lebanon's mineral industry did not fare particularly well in 1981, along with most of the other sectors of the economy. The period of economic expansion, which began in 1980, carried over into the first quarter of 1981, but with the outbreak of hostilities in April 1981, economic activity came to a standstill. As calm was reestablished in the third quarter, the economy began to recover as well, with industrial production increasing, spurred mostly by a miniboom in the construction sector and remittances from

Lebanese working abroad. Lebanon's GDP increased about 2.3% in 1981 from $4.08 billion in 1980 to $4.17 billion in 1981. Per capita income for 1981 was estimated at $2,200. Nearly one-half of the country's national income was supplied by Lebanese who fled during the Civil War to neighboring oil-rich Arab countries. It was estimated that remittances from these workers were averaging $150 to $200 million per month.[10]

Despite the poor security situation that prevailed during much of the year, Lebanon's exports rose about 30% in 1981 compared with that of 1980. Total exports for the year were valued at $1.3 billion. Exports, which were directed mainly toward Iraq, Saudi Arabia, Jordan, and Syria, were made up primarily of construction materials, vegetable products, chemicals, and textiles. Industrial exports were valued at $540 million, reflecting a 25% increase over that of 1980. Lebanon's industrial exports to Arab countries constituted 90% of its total industrial exports in 1981. The value of Lebanese imports declined in 1981 to $2.7 billion from $2.9 billion in 1980.

Even with exports up and imports down, Lebanon continued to run a deficit in the balance of trade, equivalent to $1.4 billion in 1981. Since the Civil War in 1975, however, the country has finished the year with a substantial surplus in the overall balance of payments. This surplus was created by remittances from Lebanese working abroad and both official and unofficial assistance to the Government, mainly from other Arab countries.

Lebanon's mineral sector consisted of refining imported petroleum and the production of cement, iron and steel products, gypsum, lime, and salt. Production of cement and salt increased in 1981, but output of refined products, iron and steel, and lime dropped considerably. The value of nonfuel mineral production in 1981 was $2.23 million.

Lebanon's two refineries at Zahrani and Tripoli operated intermittently during 1981 because of disruptions in crude oil supply and direct attacks on the refinery units or their supply lines. The Mediterranian Refining Co.'s (Medreco) refinery at Zahrani in southern Lebanon had a capacity of 17,000 barrels per day of crude oil input. The Medreco refinery was owned jointly by Caltex (50%) and Mobil Oil Corp. (50%), both U.S. companies. The refinery was shutdown in April 1981 as a result of damages sustained from air and rocket attacks around Sidon, which lies just a few kilometers north of the refinery. The refinery resumed operations in late May but was forced to shutdown several times again later in the year to repair damages or await crude oil shipments.

The Tripoli refinery, located in Tripoli in northern Lebanon, had a throughput capacity of 35,000 barrels per day of crude oil. The refinery was able to maintain fairly continuous operation, despite almost monthly interruptions in supply. The Tripoli facility was owned entirely by the Government, and its output was used to satisfy domestic requirements, while output from Medreco was either exported or sold within the country. The Government, which paid the bill for crude oil imported for the Tripoli refinery, incurred a deficit of $215 million in 1981, mainly owing to Government subsidies on petroleum products produced within the country. Also to blame was the failure of several Government departments to pay their oil bills, in particular, the Electricity Authority, which owed the Oil Ministry about $200 million. Lebanon's petroleum import bill, for both crude and refined products, reached $580 million in 1981.

One of the more interesting aspects of Lebanon's petroleum situation was its relations with the countries and companies that supply its oil. Most of the country's oil was supplied by Saudi Arabia through TAPline, which was owned and operated by TAPline Inc., a U.S. company. Late in the year, however, Iraq began to deliver oil through the Iraq Petroleum Co. (IPC) pipeline from Kirkuk, Iraq, through Bainyas, Syria, to Tripoli, Lebanon. The Tripoli spur of the pipeline had been closed since early 1976 because of disputes over transit fees. While the opening of the IPC pipeline marked a bright spot for Lebanon in 1981, its relations with TAPline were discordant. Four times in 1981, TAPline suspended deliveries of crude oil to Lebanon for unpaid bills. Saudi Arabia, at one point, stepped in to pay Lebanon's outstanding debt, but relations between TAPline and Lebanon did not improve, and the Government was constantly trying to maintain adequate supplies of crude oil and to prevent shortages of refined products within the country.

The cement industry in Lebanon fared better than most in 1981, with output reaching 2.39 million tons, an 8.6% increase over that of 1980. Cement consumption in the country averaged just over 2 million tons in 1981, leaving the balance of production

for export. Some of the cement sold locally was resold to neighboring Arab countries, however, and the total value of cement exports was estimated at $30 million. There were three cement plants operating in Lebanon in 1981, all located in Chekka. The plants were owned by private shareholders within the country. Production capacity at the Société des Ciments Libanais plant was 1.8 million tons per year. Capacity at the Cimenterie Nationale S.A.L. plant was 1 million tons per year, and at the Société Libanais des Ciments Blanc, 160,000 tons per year. Limestone and gypsum for clinker production was quarried in the country.

Lebanon also produced a small quantity of steel and fabricated aluminum, all from imported scrap and aluminum. The electric steelmaker, Lebanon Steel Mill Co. in Tripoli, had an annual capacity of 100,000 tons of reinforcing bars, and the Consolidated Steel Lebanon S.A.L. plant in Bablos-Amchit had a rerolling capacity of 180,000 tons per year of bars and 60,000 tons per year of sections. The Société Nationale des Tubes S.A.L. also produced a small quantity of galvanized steel pipe. The production of semimanufactured steel was below 200,000 tons in 1981. Two aluminum semifabricating plants also operated in Lebanon in 1981, with a combined capacity of 5,000 tons per year of extrusions and 15,000 tons per year of rolled products. The output for 1981 was estimated at 2,000 tons.

OMAN

Oman's mineral development plans centered around petroleum refining, natural gas production and processing, and copper and cement production. The most promising prospect in the nonfuel minerals sector was the copper mine and smelter complex at Sohar that was scheduled to begin production in 1982. Despite the Omani Government's attempt to diversify the economy away from petroleum dependence, revenues from oil exports remained as the single most important source of funds to drive the country's economic development. In fact, based on the most recent data available, Oman's economy was actually becoming more dependent on oil, with petroleum revenues accounting for about 72% of the 1981 GDP estimated at $5.86 billion.[11] This represented an increase of almost 4 percentage points above the 1980 level, and a full 10 percentage points above that of 1979 when oil revenues accounted for 62% of the GDP. This growing dependence on oil was because very few other commodities were produced in Oman in exportable quantities and oil production also registered its first increase in 4 years in 1981. Receipts from petroleum exports accounted for 90% of the country's export revenues.

Oman's second 5-year development plan (1981-85) was announced early in the year. The plan was expected to shape the course of economic development in the country by building upon the achievement of the first plan, which was devoted primarily to basic infrastructure. The top priorities of the second plan were to expand the network of public utilities and services to the less accessible regions of the country; to implement a large-scale program to increase the availability of water resources; to assist the private sector in promoting investment in income-generating sectors such as agriculture, fishing, mining, and heavy industry; to expand the existing low-cost housing program; to train and maximize the potential of Omani workers; and to continue to expand the country's roads, ports, and airports. The stimulation of the private sector involved the allocation of funds to small enterprises, provision of interest-free loans to joint stock companies engaged in manufacturing and mining, setting up an agriculture and fisheries credit bank, and giving direct support to farmers and fishermen. The Government also aimed at maintaining a ratio of gross fixed capital formation to GDP of 23.8%. About 65% of the investments were to be made by the Government and the remaining 35% were to be made by the private sector.

Petroleum production in Oman averaged 328,240 barrels per day in 1981, a 16% increase over the 1980 level, and the highest average annual output since 1977. This rise in production represented a significant turnaround in the country's oil industry, which, up until a few years ago, was expected to continue to produce less oil every year and exhaust its known reserves by 1995. Several moderate-sized discoveries in the late 1970's and early 1980's allowed Oman to revise its reserve estimate upward from 1.5 billion barrels in 1979 to 2.480 billion barrels in 1980, and up again to 2.484 billion barrels in 1981. Not less than five new commercial discoveries were made in 1981, which seemed likely to boost the

country's reserves even further.

The increase in production in 1981 was primarily a result of several new fields coming onstream in southern Oman, as well as the completion of a pipeline system to transport oil from the new production areas in the south into the existing network and on to the country's main export terminal at Mina-a-Fahal, just northwest of Muscat. Prior to 1980, the only oil-producing company in Oman was Petroleum Development Oman (PDO), which was owned 60% by the Oman Government, 34% by Royal Dutch/Shell of the Netherlands, 4% by Compagnie Française des Pétroles (CFP)-Total of France, and 2% by Participations and Explorations Corp. (Partex) of Portugal. PDO operated oilfields mainly in northern Oman, at Natih, Fahud, Lekhwair, and Qarn-Alam. The Qarn-Alam Field was PDO's largest, with extensions of the field reaching several kilometers to the northeast and southwest. Output from these northern fields, while still constituting the bulk of production, declined in 1981 to about 280,000 barrels per day from a high of about 370,000 barrels per day in the mid-1970's.

In 1980 and 1981, production from PDO's southern and central fields began to take up the slack in production, and a new field was brought onstream in central Oman by Essence et Lubrificants de France (Elf)-Aquitaine. Located in the Butabul region, 550 kilometers southwest of Muscat near the Saudi Arabian border, the Sahmah Field was discovered in 1979 by a consortium led by Elf-Aquitaine. Sahmah crude oil had an API gravity of 43.5°, and a sulfur content of 0.14%. Production from the field averaged 11,300 barrels per day in 1981.

The remainder of the country's production was from the southern Dhofar Province fields, most of which were discovered in the late 1970's. Production commenced in 1981 from the Marmul, Qaharie, and Birba Oilfields. Also nearing production were several small fields: Alpha, Beta, Gamma, Delta, and Rahab, all located within 20 kilometers of the main Marmul Field. These new fields in the south were connected to the main fields at Qarn-Alam by a 455-kilometer, 18-inch pipeline with a capacity of 70,000 barrels per day. Dodsal Private Ltd. of India built the line, which began operating in January 1981, under the engineering and construction management of Kellogg Continental BV. The pipeline connects with the main Qarn-Alam line, which in turn delivers oil to the main export terminal at Mina-a-Fahal.

Two other pipeline projects were underway in 1981. The Oman Construction Co. was laying a 325-kilometer-long gas pipeline to connect the Saih Nihayda Gasfield in central Oman with the main lines at Marmul. The company was also building a line to link the Rima Oilfield, which was discovered in 1980, to the main Marmul-Qarn-Alam crude line. The Rima Oilfield was located about 100 kilometers northeast of Marmul, and only about 10 to 15 kilometers east of the existing crude oil pipeline.

Exploration activity to Oman was booming in 1981, spurred by the recent success of many companies, especially in the south of the country. New exploration efforts focused mainly in blocks not held by PDO, usually in the northern and eastern part of the country. The Oman Petroleum Development Co. (OPDC), a joint venture of Nippon Oil, Teikoko Oil, Mitsui Oil Exploration, and Nissho-Iwai, all of Japan, was awarded a 15,000-square-kilometer concession in block III in central Oman in October 1981. The company was conducting a detailed geological and geophysical survey of the area, and planned to spud their first well in September 1982. OPDC pledged to spend $104 million on exploration over 6 years, and agreed to a production split of about 85:15 in favor of Oman. Elf-Aquitaine Oman, a subsidiary of Elf-Aquitaine of France was awarded a 27,000-square-kilometer onshore concession in eastern Oman. Elf-Aquitaine was to act as operator for a joint company composed of the Kuwait Petroleum Corp. and the International Energy Development Corp. and Sumitomo Petroleum Development Corp., both of Japan. Elf-Aquitaine was also active in two other concessions in eastern Oman, one of which contained the producing Sahmah Field.

Not far from Elf-Aquitaine's new concession in eastern Oman, Japex, a joint venture company composed of Japan Petroleum Exploration (85%) and C. Itoh Energy Development Corp. (15%), was awarded a 4,400-square-kilometer block by the Oman Government in July 1981. In November 1981, Indonesia Petroleum Ltd. purchased a 10% equity interest in Japex. The block is located in the Wadi Aswad region of northeastern Oman. The contract called for a minimum investment in the concession of $45 million over a 4-year period.

Amoco Oman Oil Co., a subsidiary of Standard Oil Co. of Indiana (United States) was also awarded a 49,000-square-kilometer concession in northeastern Oman, extending from the United Arab Emirates border to

Muscat. The tract was relinquished by PDO in 1970. Amoco agreed to spend $70 million on exploration over a 7-year period, with a production split of 85:15 in favor of Oman. Amoco also held an 85.5% interest with Deutsche Schachtbau (9.5%) and Wintershall A.G. of the Federal Republic of Germany in an offshore concession in southeastern Oman, extending from Masirah Island to Sauquirah Bay. Another consortium composed of the Gulf Oil Corp. (35%) and Quintana International Ltd. (35%), both of the United States, and Occidental Petroleum of Oman Ltd. (30%) spudded its fourth wildcat in the Sunaineh Concession in northwestern Oman in September 1981. One other wildcat was a gas well and the other two were dry.

While all of Oman's current production of crude oil was exported, the Government was in the process of building the country's first refinery at Mina-a-Fahal. The refinery, under construction by Mitsui of Japan, was to have a capacity of 50,000 barrels per day and was scheduled to start production in early 1983. Late in 1981, the Government established the Oman Refinery Co. Ltd. (ORC) to manage and operate the refinery. The company, owned 99% by the Ministry of Petroleum and Minerals and 1% by the Central Bank, would obtain its requirements of crude oil from PDO to meet the needs of the local market. Oman's consumption of petroleum products averaged about 11,000 barrels per day in 1981. The remainder of the refinery's output was to be exported. The Government also prohibited the importation of refined products as long as production from the refinery was sufficient to meet domestic demand. One of the first acts performed by the ORC was to contract Ashland Oil Co. of the United States to provide startup, management, and operational services for the refinery.

Oman's output of crude oil was marketed directly by the Government through PDO, by equity shareholders in the company, and by Elf-Aquitaine. Shell lifted about 165,000 barrels per day of Omani crude in 1981, 55,000 barrels per day of which was through a buyback agreement with PDO. The remaining 110,000 barrels per day was its equity share. CFP-Total and Partex lifted about 15,000 barrels per day between them, and the remaining output was sold through third party contracts to Transworld Oil Co. (90,000 barrels per day), C. Itoh and Co. (20,000 barrels per day), Gulf Oil Corp. (10,000 barrels per day), Nippon Oil through Nissho Iwai (10,000 barrels per day), Mitsui Bussan (7,000 barrels per day), and Fides Trust through Credit Suisse Banque (20,000 barrels per day). The price of Oman's crude oil started the year at $39.50 per barrel, declining to $34.50 by yearend.

Natural gas was also assuming a greater importance in Oman's economy in 1981. Associated gas produced at the country's oilfields was either used to upgrade the crude oil in the pipeline stream, used for local energy requirements, or flared. Nonassociated gas was derived primarily from the Yibal Field, located about 100 kilometers northwest of Qarn-Alam, where gas reserves were estimated at 5 trillion cubic feet. Yibal gas was liquefied at the Yibal NGL plant, the output from which was either delivered to the nearby LPG plant, or put into the Yibal-al-Ghubra pipeline. A second NGL plant was under construction at Fahud, 50 kilometers east of Yibal, and a third was planned for Lakhwair. The Yibal plant, completed in 1981, produced liquid propane and butane. The propane was utilized in cooling systems of various PDO gas plants, while the butane was purchased by the Oman National Gas Co. for bottling to meet domestic demands. Most of the output from the Yibal NGL plant was put into the 330-kilometer, 17-centimeter, Yibal-al-Ghubra pipeline. At Yibal-al-Ghubra, the gas was to fuel power generation and water desalination plants for the domestic network. The pipeline had a capacity of 130 million cubic feet per day of gas.

In December 1981, a branch of the main pipeline was completed that ran from Mureirat, which is along the Yibal-al-Ghubra pipeline, to Sohar, 250 kilometers north of Muscat. The gas pipeline, built by Dodsal of India, was designed to provide an energy source for the copper mine and refinery at Sohar and to provide gas for power generation to all the regions along the Batinah coast. Oman's effort to utilize its reserves of natural gas for domestic purposes, while saving crude oil and refined products for export, was expected to pay substantial dividends in the future. By 1985, gas consumption was expected to rise to 129 million cubic feet per day from increasing industrial demand. By that time, the savings in oil consumption was to be about 7.9 million barrels per year.

The Sohar copper mine and smelter complex was Oman's largest nonfuel mineral development project. The project was under construction by the Oman Mining Co.

(OMC), which was owned by the Government. Consultancy for the project was being handled by a team of experts from the Geological Survey division of the Australian Ministry of Trade and Resources. The company planned to mine three deposits, Lasail, Aarja, and Bayda, all located 25 kilometers west of Sohar. Reserves at the deposits were estimated at 8 million, 3 million, and 1 million tons, respectively, of 1% to 2% copper ore. The mining rate was to average 3,000 tons per day of ore, giving the mine a life of 11 to 12 years. The mining method to be used was trackless, sublevel caving, with access to the deposit by declines. Output from the mine was to be concentrated and smelted into blister copper, and then refined. OMC added the plans for the 20,000-ton-per-year electrolytic copper refinery in 1980 to allow for production of higher quality copper, and also to permit the extraction of precious metals in the anode slimes. The initial development work on the project was begun in 1979, and by 1981, several main shafts had been dug. The initial date for completion was mid-1982, but owing to time and cost miscalculations, the project would probably not commence production until mid-1983.

Oman's plans to build a steel plant have not been implemented. In 1980, Dastur Engineering of India carried out a feasibility study for a 120,000-ton-per-year rolling mill to produce bars, sections, and wire rods in the Rusayl industrial zone near Muscat. The mill was to be integrated with a gas-fired, direct-reduction sponge iron plant sometime later. Neither plan was acted upon in 1981, however, and Oman may have dropped the proposal in light of the rapid growth in regional steel production in the Middle East.

The Oman Government was also involved in the construction of a cement plant in the industrial area at Rusayl. The 600,000-ton-per-year plant was under construction by Krupp Polysius A.G. of the Federal Republic of Germany for the Oman Cement Co., a Government-owned company. Construction of the plant began in 1981, and was to be completed early in 1983. The Government also initiated a project to exploit a salt deposit at Quriyat, 60 kilometers southeast of Muscat. A $5.3 million refinery with an annual capacity of 8,000 tons of high-purity salt was to be completed in 1983.

Finally, the Oman Government, through the Ministry of Petroleum and Minerals, planned to conduct a general geological mapping program to inventory the country's mineral resource potential. Several mineral deposits have already been located in the country, including 5 to 10 million tons of podiform chromite in scattered deposits in the Oman Mountains, 8 to 10 million tons of asbestos, 10 million tons of coal, and deposits of iron, lead-zinc, and manganese. Large reserves of gypsum and limestone for possible use in the country's cement plant have also been located.

Table 6.—Oman: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, semimanufactures	--	4	--	All to United Arab Emirates.
Copper metal including alloys, semimanufactures	162	20	--	Do.
Iron and steel metal, semimanufactures:				
Bars, rods, angles, shapes, sections	2,831	979	--	Do.
Universals, plates, sheets	80	67	--	Do.
Wire	73	19	--	Do.
Tubes, pipes, fittings	360	269	--	United Arab Emirates 263; Qatar 6.
Other: Base metals including alloys, nonferrous scrap	--	5,251	--	Pakistan 4,456; United Arab Emirates 650; India 142.
NONMETALS				
Cement	32	3,290	--	All to United Arab Emirates.
Clays and clay products: Products, nonrefractory	27	18	--	Do.
Fertilizer materials:				
Crude	--	27	--	Do.
Manufactured	--	1	--	Do.
Gypsum and plasters	22	354	--	Do.
Lime	30	--		
Salt	--	9	--	All to United Arab Emirates.

Table 6.—Oman: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone, crude and partly worked	--	352	--	Mainly to United Arab Emirates.
Limestone excluding dimension	1,988	6,484	--	All to United Arab Emirates.
Other:				
Crude	2	--		
Building materials of asphalt, asbestos and fiber cements, unfired nometals	9,069	3,316	--	United Arab Emirates 3,063; Saudi Arabia 253.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline ---42-gallon barrels	--	60	--	All to United Arab Emirates.
Kerosine and jet fuel ---do	--	16	--	Do.
Distillate fuel oil ---do	955	15	--	Do.
Lubricants ---do	1,428	2,387	--	United Arab Emirates 2,282; Yemen Arab Republic 105.
Other:				
Liquefied petroleum gas ---do	58	1,914	--	All to United Arab Emirates.
Bitumen and other residues ---do	24	12	--	Do.

Table 7.—Oman: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, semimanufactures	489	1,415	4	Bahrain 785; India 158; Lebanon 92.
Copper metal including alloys, semimanufactures	144	161	3	United Kingdom 58; Japan 35; India 25.
Iron and steel metal, semimanufactures:				
Bars, rods, angles, shapes, sections	60,262	58,013	27	Japan 25,426; United Arab Emirates 14,964.
Universals, plates, sheets	8,399	10,717	36	Japan 5,784; United Arab Emirates 3,946.
Wire	972	1,209	92	Japan 382; Italy 265; India 227.
Tubes, pipes, fittings	11,467	30,306	456	West Germany 8,550; Japan 6,237; France 4,816.
Lead metal including alloys, unwrought and semimanufactures	(1)	21	--	United Kingdom 18; India 2.
Silver metal including alloys, unwrought and partly wrought[2] value, thousands	$70	$15	--	Australia $8; United Kingdom $6; India $1.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	3	2	--	Mainly from United Kingdom.
Cement	522,675	685,094	(1)	United Arab Emirates 264,005; Kenya 150,912; Romania 86,494.
Clays and clay products: Products, nonrefractory	5,038	3,861	34	Italy 1,398; United Kingdom 634; West Germany 625.
Fertilizer materials:				
Crude	103	1,112	--	West Germany 405; United Kingdom 293; India 100.
Manufactured	3,181	6,197	101	Italy 3,500; United Arab Emirates 1,152; West Germany 652.
Gypsum and plasters	211	250	--	India 89; United Arab Emirates 51; Italy 20.
Lime	1,173	1,448	(1)	United Arab Emirates 1,288; India 105.
Salt	1,831	2,335	4	United Arab Emirates 1,022; Netherlands 569; China 420.

See footnotes at end of table.

Table 7.—Oman: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Stone, sand and gravel:				
Dimension stone, crude and partly worked	1,205	2,402	--	United Arab Emirates 1,288; Italy 609; India 439.
Gravel and crushed rock	110	821	20	United Arab Emirates 662; India 138.
Limestone excluding dimension	831	1,430	3	India 1,210; United Arab Emirates 190.
Sand excluding metal-bearing	22	159	46	India 113.
Other: Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	4,751	6,067	46	United Arab Emirates 3,320; India 1,599; United Kingdom 535.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	1,573	1,338	--	United Arab Emirates 901; Bahrain 436.
Kerosine and jet fuel do	803	656	(1)	Bahrain 312; United Arab Emirates 312.
Distillate fuel oil do	840	1,140	--	United Arab Emirates 522; Bahrain 334; Singapore 234.
Residual fuel oil 42-gallon barrels	13	4,003	--	United Arab Emirates 3,996; United Kingdom 7.
Lubricants do	108,507	151,389	8,904	Singapore 53,907; United Kingdom 30,240; Bahrain 24,157.
Other:				
Liquefied petroleum gas do	61,805	53,221	(1)	United Arab Emirates 51,260; India 1,195.
Mineral jelly and wax do	--	409	409	
Bitumen and other residues do	116,200	270,785	--	Bahrain 149,730; Singapore 63,824; Kuwait 32,791.

[1]Less than 1/2 unit.
[2]May include platinum-group metals.

PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

Mineral resource development in the People's Democratic Republic of Yemen (PDRY) was only beginning in 1981. The mineral industry consisted of refining imported oil and production of salt from seawater. Still, unverified reports of a commercial oil discovery in PDRY held out the possibility of improving the country's standard of living, which was among the lowest in the region.

PDRY's economy, lacking any real industrial sector, was largely tied to agriculture and fishing. The country was a British Colony until 1967, when Yemeni nationalists wrested control of the Port of Aden and the surrounding land from the British and formed an independent nation. The withdrawal of British forces and the closure of the Suez Canal, for which Aden was a major oil-bunkering facility, left the country nearly penniless upon independence. Since that time, the Government of Aden has sought to promote the development of a balanced economy with agriculture providing a livelihood for most Yemeni, and the Port of Aden serving as the industrial center of the country. Still, with its paucity of domestic resources matched only by its shortage of a skilled work force, economic development in PDRY has been slow and difficult. PDRY's economy has remained fairly static over the past several years, due mostly to a lack of investment. Foreign trade in 1981 has been dominated by importation of crude oil, estimated at $850 million, and the export of refined products, valued at $750 million, leaving a deficit in petroleum trade of $90 million.[12] This deficit was incurred by the consumption of about 14% of the refinery's output within the country. Total exports from PDRY were valued at $800 million. About 75% of the nonoil exports were from the country's fisheries, with the remaining 25% accounted for by tobacco, coffee, and

salt. Salt was exported mostly to nearby African countries. PDRY's imports were valued at about $1.55 billion in 1981, mostly for food, cement and construction materials, and industrial raw materials. This import level left the country with a trade deficit of about $700 million. Aden's current accounts balance was rescued by remittances from Yemeni working abroad, which amounted to about $550 million in 1981, and an inflow of foreign aid, equivalent to about $90 million. This left the overall balance of payments with a deficit of about $60 million.

PDRY's short- and medium-term economic development plans were contained in the revised 1981-85 5-year economic development program. The plan was revised in October 1980 to replace the 1979-83 plan, the goals for which were considered too ambitious given the country's lack of a skilled work force. The new plan envisioned expenditures over the 5-year period of $1.68 billion. In 1981, the Government budget, through which development funds were allocated, registered expenditures of about $280 million based on revenues of about $260 million. Of the total investment spending targets of the plan, the industrial sector was to receive the largest share (32%), while transportation received 17%, agriculture 14%, fisheries 8%, building and construction 12%, and services 17%.

Recognizing the need for foreign expertise and capital for developing its resources, the centrally planned PDRY Government issued the Law for the Encouragement of Investment late in 1981. The new law was designed to encourage and protect all funds and fixed and movable property invested in the country by a foreign nation. Priorities were given to developing joint projects in cooperation with Yemeni investors. The law was developed and instituted to facilitate exploration and development of oil in the country. The urgency of law was due to the possible discovery of a commercial reservoir during the year.

Many years of exploration and prospecting may have paid off for PDRY. It was reported in Platts Oilgram that the Italian state company, Azienda Generale Italiani Petroli S.p.A. (AGIP), discovered relatively high-quality crude oil in Hadhramaut, PDRY, near the Oman border. A test well flowed at 3,000 barrels per day of light crude according to the report, and AGIP was conducting further tests to determine if the field was commercial.[13] In addition to these reports, a Kuwait newspaper reported that several Soviet companies and Braspetro, the international subsidiary of the Brazilian oil company, Petróbras Brasileira S.A., as well as AGIP, have shown that oil exists in commercial quantities in PDRY.[14] The Soviet Union, Brazil, and Italy were the only countries with companies actively exploring for oil in the country in 1981. Braspetro signed an agreement with the Yemen National Oil Co. late in the year, for sole oil and gas exploration rights over a 42,000-square-kilometer area between the Mahra and Hadhramaut Governorates. Braspetro was committed to drilling six wells in the concession area. While the news of AGIP's discovery was greeted with elation in the country, no confirmation from AGIP has been forthcoming. By the end of 1981, it was difficult to determine whether the discovery, if it actually occurred, represented the beginning of a new oil era for PDRY, as many of the country's nationals seemed to believe.

While most of the attention of the country has been focused on the development of crude oil reserves, the Aden refinery has been gradually increasing its output of refined products from an average value of $157 million in 1975-78 to about $760 million in 1981. The Aden refinery, which is owned by the Government, was originally owned and operated by British Petroleum (BP) until it was nationalized in 1977. The refinery has improved its capacity utilization factor from less than 30% to about 50% in 1981 by importing crude oil and processing it for domestic consumption and by processing oil on behalf of other customers. Throughput for the refinery in 1981 averaged about 75,000 barrels per day compared with its 150,000-barrel-per-day design capacity. Customers refining crude oil at Aden in 1981 were the Government for local consumption 10,000 barrels per day, supplied by Kuwait; the Kuwait National Petroleum Oil Co., 10,000 barrels per day; the Soviet Union, 10,000 barrels per day; Iran's National Iranian Oil Co., 40,000 barrels per day; and France's CFP-Total, 5,000 barrels per day.

Late in 1981, PDRY's Petroleum and Minerals Board (PMB) and Kuwait's Independent Petroleum Group (IPG) reached an agreement to increase the role of the Aden refinery in supplying petroleum products to the region, especially in East Africa, but also supplying any product shortages that might arise in the Middle East. The compa-

ny was to market middle distillates—heavy fuel oil, which, due to the oil hydroskimming process utilized at the refinery, represents over 50% of its output. The IPG was to also market LPG from the refinery in the same area. The agreement also called for construction of new storage tanks, cooperation on shipping services, and the preparation of a feasibility study for modernization of the refinery. The IPG also indicated its interest in undertaking petroleum exploration in PDRY.

The Aden refinery was originally intended to service East African and Middle Eastern markets, as well as to supply bunker fuel for ships transiting the Suez Canal. With the closure of the Suez Canal and the withdrawal of the British technicians, the refineries market was lost and the PDRY Government did not have the funds to modernize and stay competitive. IPG's plan, which was expected to take effect in 1982, seemed to be the first real hope of breathing new life into both the refinery and the country's economy.

PDRY's nonfuel mineral development plans have, for the most part, taken a back seat to oil exploration. The Soviet Union has been active for several years in assisting in geological exploration and mineral prospecting in the country. PDRY and the Yemen Arab Republic announced a joint geological venture late in 1981 to search for minerals and water resources. The joint project was to be financed by a $36 million grant from the Arab Fund for Social and Economic Development.

The two nonfuel mineral projects in the country that appear most likely to be undertaken involve salt and cement production. Unrefined marine salt was already produced by the General Salt Organization's facility at Khawr Maksior. The plant, located northeast of Aden, produced about 75,000 tons per year of unrefined marine salt by evaporating seawater. A small amount of this output was sold domestically, with the remainder being exported mainly to Africa. Under the 1981-85 5-year plan, the Government planned to upgrade the facility by either expanding production capacity or installing a facility to refine the salt. No definite timetable for either of these projects had been announced. The Government was also planning, within the next 5 years, to construct a 250,000- to 300,000-ton-per-year cement plant, utilizing locally quarried limestone and gypsum. The Government was in the process of locating and delineating limestone reserves in the country to supply the plant.

QATAR

The production of crude oil and natural gas continued to fuel the development of Qatar's economy in 1981, as petroleum revenues fostered an expanding nonoil industrial sector. Despite its overwhelming reliance on crude oil exports, Qatar has in the past few years become a leading regional producer of petrochemical products, fertilizer, steel, cement, and NGL. These industries were part of the Qatari Government's plan to diversify the economy away from total dependence on oil, and to develop productive industries capable of earning income on their own. Qatar's nonoil era was not expected to be as bleak as some OPEC nations, due to the presence of the huge North Field, one of the world's six largest nonassociated gasfields. This gas was to provide cheap energy to fuel Qatar's industries for many decades into the future.

Crude oil exports, valued at about $5.62 billion[15] in 1981, accounted for 94% of the country's total exports and 90% of the Government's revenues. Total revenues from oil exports declined by only 1% from 1980 to 1981, while total crude oil production declined by 14% over the same period. Qatar was able to maintain its revenues near the alltime high by holding out on price reductions for its onshore Dukhan (40° API) and offshore Marine (36° API) crude oil until about mid-1981. In January, Dukhan crude was selling for $43.92 per barrel while Marine crude was slightly lower at $43.73 per barrel. These prices reflected a $6.50 per barrel premium over the official Government sales price. As the market began to soften, Qatar eliminated the premium, and by October 1981, the official price was reduced to $35.45 for Dukhan and $35.30 for Marine.

About 90% of the country's development expenditures and domestic services were provided by the Government through the national budget. With revenues in excess of $5 billion in 1980, Government expenditures were about 60% of that level. In 1981, the Government spent even less, about $2.8

billion, while revenues were down slightly to $5.1 billion. Rather than being forced to maintain production at a certain level to fulfill budget requirements, as many other OPEC nations were, Qatar was more than happy to shut in some production and extend the life of its oil reserves. The main problem encountered by lower crude oil production was the consequent decline in associated gas output, which was used as fuel for industry, petrochemical feedstock, power generation, and water desalinization.

Crude oil production in Qatar was under the management of the Qatar General Petroleum Corp. (QGPC), which was owned by the Government. QGPC was responsible for directing oil exploration, oil and gas production, petroleum refining and marketing, and supervision of petroleum projects under construction at the Umm Said industrial zone. Total crude oil production in the country declined from an average of 473,000 barrels per day in 1980 to 402,000 barrels per day in 1981. About 97% of this output was exported, with the remainder being refined for domestic purposes. Qatar reduced its crude oil production about 18% in June 1981 in accordance with OPEC's decision to limit production to bring about equilibrium in the world oil market.

Oil was produced by QGPC from both onshore and offshore areas. All onshore oil production came from the Dukhan Field, which began producing in 1949. Production from the field declined from 228,000 barrels per day in 1980 to 210,000 barrels per day in 1981. Offshore production came from three main fields, Idd Al-Shargi, Maydan-Mahzam, and Bul Hanine. Average output from these fields averaged 192,000 barrels per day, down more than 21% from the 1980 level. QGPC contracted the operation of the onshore and offshore oilfields to service companies. The Dukhan Service Co. and a consortium composed of BP, Royal Dutch/Shell, CFP-Total, Mobil Oil, Exxon Corp., and Partex, were the main operators of the Dukhan Field, while Shell Service Co., a subsidiary of Shell Oil Co. (United States), was the main contractor for the offshore areas.

QGPC was also responsible for oil exploration within the country. In 1980, all open areas both onshore and offshore were assigned by the Government to QGCP. In 1981, QGCP began an extensive seismic survey aimed at defining new land and marine structures that show considerable oil potential. A total of 2,120 square kilometers of deep and shallow offshore areas, and 550 square kilometers of onshore areas were surveyed during the year. QGPC also drilled a total of 50 wells during the year, with the total footage drilled reaching 95,000 meters. The new well count was down three from the 1980 level. Of the wells drilled, 29 were for development purposes, 19 were for water injection, 1 was for exploration, and 1 was a gas well. An experimental project for powered water injection began in 1981 in the Dukhan Oilfield and was scheduled to run until 1983. At that time, results of the enhanced-recovery technique were to be analyzed, and a decision was to be made on whether to extend the project to the country's other fields. QGPC also announced a commercial oil strike close to the Bunduq Oilfield in the offshore area of Qatar. The Bunduq Field, which is shared jointly by Qatar and the United Arab Emirates, was shut down in 1979 owing to pressure maintenance problems. The new strike reportedly contained 40° API quality oil in commercial quantities, and the strike zone was located relatively close to the surface. No reserve figures were available by yearend. The find was made in the Arab-C zone on the Qatari side of the Bunduq Field. The Government indicated that the initial results were promising and the field was likely to add considerably to Qatar's current 4.6 billion barrels of proven oil reserves.

QGPC's crude oil output was sold mostly under quarterly contracts to the shareholders in the service companies and to Japanese contract buyers. Shareholders in Dukhan Service were entitled to lift approximately 130,000 barrels per day, while Shell Service was allocated 145,000 barrels per day. Japanese customers, Mitsubishi, Sumitomo, and Mitsui, lifted 45,000 barrels per day, 30,000 barrels per day, and 20,000 barrels per day, respectively, until spring 1981 when they reduced their liftings to 50,000 barrels per day total, owing to Qatar's high premium. Nissho-Iwai and C. Itoh each lifted 60,000 barrels per day in 1981. The remainder was sold on the spot market.

Qatar's refined product output was to be substantially increased when the country's second refinery comes onstream in 1983. The National Oil Distribution Co., which was owned by QGPC, operated an 11,000-barrel-per-day refinery at Umm Said. This refinery has been unable to satisfy Qatar's domestic requirement for petroleum products for several years, which meant substantial imports for a country that is a large

exporter of oil. To remedy the situation, Qatar awarded Technip of France a $138 million contract in October 1980 for construction of a 50,000-barrel-per-day refinery to be located at Umm Said. The contract included storage facilities for intermediate and refined products and new export facilities. The refinery was to leave a small surplus for export during the first few years of production. With the new refinery on-stream, Qatar was expected to be self-sufficient in refined products until the mid-1990's.

Qatar was beginning to rely more heavily on its reserves of natural gas rather than crude oil. Qatar produced associated and nonassociated gas from both onshore and offshore areas, and by 2000, Qatar was expected to derive 80% of its energy production from natural gas. Production of associated gas in 1981 averaged 297 million cubic feet per day, which was less than one-half the amount the Government planned to produce for use as fuel and feedstock for the industrial ventures at Umm Said. Gas from the Dukhan Field was gathered and fractionated at a central plant at Fahalil, pipelined to power generators, and then pipelined to Umm Said. Onshore gas was also earmarked for the NGL processing plant NGL I. Offshore associated gas was delivered to the parallel facility, NGL II, and also to the Qatar Petrochemical Co.'s stream crackers. Total demand for associated gas was nearly 600 million cubic feet per day, which included 150 million cubic feet per day for the Qatar Steel Co. (QASCO), 200 million cubic feet per day for the NGL plants, 100 million cubic feet per day for the fertilizer plant, and the remainder for power generation and water desalinization. The shortfall in production, which was due to Qatar's cutback in oil production, was made up by gas production from the nonassociated Khuff Field located onshore beneath the Dukhan Oilfield. While the Government of Qatar has tended to view the Khuff Field as a type of emergency energy reserve, it has been forced to tap the field in order to maintain production for the country's industrial projects. Proven reserves in the field were only 817 billion cubic feet in 1981, and at the current rate of extraction, could only be expected to last until 1990. In 1981, 150 million cubic feet per day of Khuff gas was allocated for direct use by Qatar Petrochemical Co. (QAPCO).

Qatar's two integrated NGL facilities (NGL I and NGL II) became fully operational in 1980, and produced about one-half of their rated capacity in 1981, owing mainly to inadequate supplies of associated gas. NGL I was originally commissioned in 1975 but was destroyed in an explosion in April 1977. The facility was rebuilt and commissioned in late 1980 at a cost of about $300 million. NGL I was designed to process associated gas produced onshore, while, NGL II, also completed late in 1980, was to process associated gas from offshore. NGL II was designed to process a maximum of 250 million cubic feet per day of gas from offshore, which was to be supplied by pipeline from the oilfields. Severe problems have been encountered since the gasline was commissioned in early 1980, owing to hydrogen-induced corrosion. The pipeline operated only intermittantly in 1981, and production and exports of LPG were adversely affected. LPG exports earned about $250 million during the year, which was less than one-half of the anticipated revenues. The actual full rated capacities of NGL I and II are as follows:

	NGL I	NGL II
Gas input, million cubic feet per day	340	250
Propane, tons per day	740	220
Butane, do.	470	730
Condensate, do.	370	73
Methane-enriched gas, million cubic feet per day	140	110
Ethane-enriched gas, do.	24	28

The propane, butane, and natural gasoline were for export, while ethane- and methane-enriched gas were for feedstock in the petrochemical plant. Some of the residual gas and methane was also used by the steel mill, the fertilizer plant, and other power stations. The petrochemical plant also suffered from inadequate supplies of gas during the year owing to the problems at the NGL plants.

Despite the rather dismal performance of the country's gas industry in 1981, the long-term picture appeared quite spectacular, owing to the presence of the huge North Field, formerly known as the Northwest Dome. The North Field was a nonassociated gasfield in the Permian Khuff Formation that contained measured reserves of 100 to 120 trillion cubic feet of gas and indicated reserves of 300 trillion cubic feet, which made the field possibly the largest single concentration of nonassociated gas reserves in the world. Given the size of the find, the economic progress of the entire country was to depend on the development of the field

over the next half century and beyond. With the enormous task of planning and developing the field still ahead, the Government was, understandably, moving quite cautiously. Its current shortage of gas for industry seemed somewhat ironic, however, with a field of that magnitude located just a few kilometers northwest of the country. The QGPC, which was responsible for developing the field, designed a two-phase plan. The first phase was to draw off 700 to 800 million cubic feet per day of gas to be processed for local consumption; that is, in industry, power generation, the NGL plants, and for petrochemical feedstock. The domestic requirements would eventually rise to about 1 billion cubic feet per day. The second phase of the plan would be to use another 1.0 to 1.4 billion cubic feet per day of gas to produce 6 to 7 million tons of LNG annually for export.

The initial Government plan was to have QGPC be the sole owner of the offshore production facilities, and allow foreign partners to take a 20% share in the LNG plant. The plant was to be located at Ras Laffan and connected to Umm Said by pipeline. Foreign companies, with experience in LNG plant construction, would be allowed a 15% share in the operation with the remaining 5% going to Japanese companies with experience in transportation and marketing.

QGPC estimated the cost of developing the field and processing plant at $5 to $6 billion. Foreign companies submitted proposals for developing the project in 1980, and QGPC evaluated them during the year. In 1981, the QGPC asked the interested companies to submit revised proposals that would conform to new guidelines set down by QGPC. The guidelines related to legal aspects of the partnership and project, the formation of an LNG company with its marketing and shipping costs, and the operator's fees. Companies who submitted proposals were Wintershall AG of the Federal Republic of Germany, who already held a production-sharing concession with QGPC covering the southern portion of the field; BP; Roy M. Huffington Co. of the United States; CFP; and Royal Dutch/Shell. The Japanese companies in the running for the 5% share were Mitsubishi, Mitsui, Sumitomo, C. Itoh, Marubeni, and Nissho-Iwai. Exxon was also a late comer to the main bidding when it reentered negotiations with QGPC after backing away in mid-1981.

Development of the field was not expected to begin until 1983-84, with the first gas production in phase one beginning in 1985-86. Given Qatar's expected extraction rate of 2 to 2.4 billion cubic feet per day, the measured reserve figure would give the North Field a productive life of 115 to 135 years. Using the indicated reserve figure, life of the field would range from 345 to 405 years, a statistic that is certainly not being ignored by either the oil-producing companies or oil-consuming nations of the world.

QAPCO's $770 million petrochemical complex at Umm Said came onstream in February 1981. QAPCO was a joint venture of QGPC (84%) and Charbonnages de Française (10%). The main plant was built by Technip of France under a $220 million lump-sum turnkey contract that was awarded in 1977. The main units of the plant were an ethylene steam cracker supplied by Technip; a $112 million polyethylene unit built by Coppee-Rust of Belgium; a $227 million, 50-megawatt power station supplied by Turbotechnica of Italy; and $81 million worth of storage, shiploading, and ancillary facilities built by Japan Gasoline Co. The complex utilized ethane-enriched feedstock from NGL I and II to produce a maximum of 280,000 tons per year of ethylene, 140,000 tons per year of low-density polyethylene, and 46,000 tons per year of sulfur. During the year, QAPCO produced about 110,000 tons of low-density polyethylene, 63,000 tons of ethylene, and an unspecified quantity of sulfur. About 30,000 tons of low-density polyethylene was exported. The low utilization factor was due to inadequate supplies of gas from the NGL plants.

In August 1981, QAPCO awarded Mitsui Shipbuilding of Japan a $50 million contract for process technology for a new 70,000-ton-per-year high-density polyethylene plant to be built alongside the other plant at Umm Said. The project, for which bids were invited in July 1980, was scheduled for completion in 1984. It was to use ethylene from the Umm Said complex as feedstock. Mitsui and Co. also signed a 3-year contract with QAPCO to purchase and market 35,000 tons per year of sulfur from the petrochemical project. Sulfur deliveries began in late August 1981.

The Qatar Fertilizer Co. (QAFCO) produced at about 85% of its capacity in 1981 owing to the lack of natural gas feedstock. The QAFCO complex, located at Umm Said, consisted of two twin trains for ammonia and urea production. QAFCO-1, which came onstream in 1976, could produce 900 tons

per day of ammonia and 1,000 tons per day of prilled urea. QAFCO-2 began producing in 1978, and effectively doubled the plant's capacity. Total annual output capacity of the complex, in contained nitrogen, was 488,000 tons (N) ammonia, and 304,000 tons (N) urea. The plant utilized associated gas from the Dukhan Oilfield and residual gases from the NGL plants. QAFCO was owned 70% by the Government of Qatar, 25% by Norsk Hydro AS of Norway, and 1% by Davy Powergas Ltd. and 2% by Hambros Bank, both of the United Kingdom. Qatar was also planning to build two organic fertilizer plants to be financed by an $84 million budget allocation for development in the industrial and agricultural sectors.

The Qatar National Cement Co. increased its cement production nearly 25% in 1981, to almost 200,000 tons. Demand for cement in the country was estimated at 750,000 tons annually, however, and the bulk of the country's supplies had to be imported. The Redco Cement Co. of Qatar purchased most of the country's import requirements from Arabian Bulk Trade of Saudi Arabia, who obtained most of their supplies from Japanese producers. Qatar increased its purchases of cement from 500 to 1,500 tons per day to meet the country's requirements. Current production was to increase 100,000 tons per year when a new grinding mill is installed at the National Cement plant at Umm Bab next year.

Qatar's Industrial Development Technical Center recently announced the discovery of large deposits of gypsum, celestite, and shale. The discoveries followed a comprehensive geologic survey of the country. Qatar already produced dolomitized limestone and chalk-limestone at Umm El-Afai for use in cement production at Umm Bab. Gypsum was also discovered near Al Nafkah. Building sand was also extracted and washed at a new plant near Almirkhiya.

QASCO has been one of the gulf region's prime examples of industrial diversification. QASCO was one of the first direct-reduction-based steelworks to come on-stream in the Middle East, bringing its 400,000-ton-per-year Midrex direct-reduction plant into production in 1978. The Midrex unit, located at Doha, serves two 70-ton electric arc furnaces at Umm Said. The furnaces were built by Nippon Kokan of Japan. The furnaces supplied two 4-strand continuous billet casters and a 20-strand bar mill. The billet casters and bar mill were built by Kobe Steel of Japan, which also owns a 20% share in the company. The Qatar Industrial Development Agency owned 70% of the company, and Tokyo Boeki owned the other 10%. In 1981, QASCO exceeded its rated capacity by producing 440,000 tons of direct-reduced iron and 455,000 tons of raw steel. About 12% of the plant's output was sold domestically, with about 50% exported to Saudi Arabia, 30% to the United Arab Emirates, and the balance to Iraq and other neighboring countries. Toyko Boeki was under a 10-year contract, which began in 1978, to market the plant's output. Iron ore for the plant was supplied by Brazil and Sweden, and scrap was imported from the United States.

Table 8.—Qatar: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
Fertilizer materials:				
Urea	394,600	NA	NA	NA.
Ammonia	77,100	NA	NA	NA.
Iron and steel metal, all forms	330,572	NA	NA	NA.
Petroleum: Crude thousand 42-gallon barrels	182,074	169,981	2,482	Japan 49,640; Netherlands 28,981; France 19,162; Thailand 15,220.

NA Not available.

Table 9.—Qatar: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, semimanufactures	608	806	54	Bahrain 292; Hong Kong 190; Egypt 70.
Copper metal including alloys, semimanufactures	195	276	5	United Kingdom 195; Australia 48.
Iron and steel:				
Ore and concentrate	496,154	720,281	--	Brazil 410,595; Norway 155,319; Sweden 154,307.
Metal:				
Scrap	130,827	129,875	29,433	Norway 98,770; Kuwait 1,332.
Pig iron, ferroalloys, similar materials	--	4,452	192	United Kingdom 1,806; Japan 642; India 442.
Steel, primary forms	13,701	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	13,314	14,260	28	Japan 11,155; United Kingdom 1,507; China 800.
Universals, plates, sheets	6,531	17,912	247	Japan 15,760; United Arab Emirates 476.
Wire	--	244	25	Japan 110; India 51; China 20.
Tubes, pipes, fittings	43,839	25,831	377	Japan 11,089; France 2,329; West Germany 1,721.
NONMETALS				
Barite and witherite	2,825	2,464	304	Netherlands 1,005; Italy 639; India 418.
Cement	143,836	208,945	665	United Arab Emirates 55,668; East Germany 20,300; West Germany 16,335.
Clay products:				
Nonrefractory	17,686	14,375	425	Italy 5,849; United Kingdom 2,321; United Arab Emirates 2,023.
Refractory including nonclay brick	1,695	1,698	--	Japan 862; West Germany 393; Austria 260.
Fertilizer materials: Manufactured	11	338	52	Lebanon 125; Netherlands 90; United Kingdom 33.
Lime	452	730	--	Belgium-Luxembourg 171; Japan 136; Pakistan 130.
Salt	1,406	1,039	--	Netherlands 834; China 57; Iran 54.
Stone, sand and gravel:				
Dimension stone, Crude and partly worked	--	1,435	--	India 528; Greece 330; Italy 223.
Gravel and crushed rock	1,610	1,151	--	India 450; Lebanon 309; Iran 273.
Sulfur: Sulfuric acid	460	NA		
Other: Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	3,438	9,234	405	United Kingdom 3,120; India 1,752; Netherlands 1,276.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Fuel oil and lubricants 42-gallon barrels	46,822	--		
Liquefied petroleum gas ---do---	8,467	81,374	128	France 77,384; United Arab Emirates 1,253.
Bitumen and asphalt value, thousands	$874	$405	$54	Singapore $140; United Arab Emirates $90, Netherlands $45.

NA Not available.

SYRIA

Syria's mineral industry continued to prosper in 1981, in contrast to most other sectors of the Nation's economy. Major developments in the mineral sector were a slight increase in crude oil production, the first full year of operation for the new Baniyas refinery, increased production of cement and phosphate rock, and the commissioning of two new fertilizer-producing facilities at Homs. The mineral industry in Syria contributed about 15% to the country's GDP, estimated at $14.5 billion in 1981.[16] The major foreign currency earners, in order of decreasing value, were crude petroleum and phosphates, which together accounted for nearly 70% of the country's

exports valued at $2.3 billion in 1981.

The country's overall economic performance did not match that of the mineral sector. Defense expenditures, equivalent to nearly 30% of the Government's budget, continued to put a considerable strain on the economy. In 1981, the Government of Syria announced the country's fifth 5-year development plan (1981-85). Under the previous plan (1976-80), the GDP grew at an annual rate of 8%, largely owing to a high level of capital investment, usually running at 50% of the Government's total nondefense expenditures. Political instability in the region, combined with the Government's attempts to reach the development targets set under the fourth plan, led to economic problems in 1979-80. The most serious of these problems were a shortage of foreign exchange, inflation of about 20% per year, and a widening trade deficit.

To deal with the trade deficit, estimated at $1.6 billion in 1981, the Government attempted to restrict the level of imports while at the same time establishing a two-tier exchange rate in April 1981. Oil, cotton, and phosphates, which together accounted for 83% of the exports, were to be governed by the official rate of US$1.00=LS3.925, while all other exports and receipts were subject to a parallel rate, which was established by the market.

Crude oil production in Syria increased slightly in 1981 to about 164,356 barrels per day from 157,450 barrels per day in 1980. This was the first increase in crude oil output since 1976, when production averaged 191,000 barrels per day. Recoverable reserves in Syria were estimated at 3.4 billion barrels of oil, or enough to sustain production at the current level until the year 2000, barring any new discoveries. Crude oil was produced from five oilfields, Suweidiyah, Rumeilan, Karachuk, Alayan, and Jebisseh. All of the fields except Jebisseh produced an average of 20° API gravity crude containing between 4.5% and 9.5% sulfur. Crude from Jebisseh was of higher quality 40° API and low in sulfur. Production was centered on the Suweidiyah Field, which accounted for about 90% of the country's output.

Petroleum exploration efforts continued in Syria, along with the gradual implementation of secondary recovery techniques to try to arrest the country's sagging output. A major proclamation was being prepared late in 1981 to encourage oil exploration by foreign companies. The Syrian Government was expected to sign a decree that would clarify the tax exempt status of foreign oil exploration companies and their non-Syrian subcontractors. The ambiguous tax laws in Syria had forced these foreign companies to pay upwards of $4 million in local taxes while awaiting clarification of the law. The decree was expected to result in substantial rebates to the foreign companies, most of which were U.S. operated.

The major oil companies operating in Syria were the state-owned Syrian Petroleum Co. (SPC); Pecten Syria Co., a subsidiary of United States Shell; Marathon Oil Co. (United States); and the Syrian American Oil Co. (SAMOCO), a subsidiary of Coastal States Corp. of Houston, Tex. Deminex of the Federal Republic of Germany was a partner in SAMOCO's Syrian operations, and Challenger Desert Oil Co. of Panama was also involved in exploration. SAMOCO was in the process of drilling an exploration well near Deir-el-Zar in central Syria. Marathon also began drilling at a newly acquired site off the Homs-Palmyra Road. Marathon acquired the 10,000-square-kilometer tract centered around Homs in 1980. The well was the company's second and last required under their current contract.

Syria's refining industry received a considerable boost in 1981 with the commissioning of the country's second refinery, at Baniyas, on the Mediterranean coast. The 120,000-barrel-per-day refinery was built by Industrialexport of Romania, and began its trial runs late in 1980. The refinery was able to process about 30 million barrels of crude oil during the year, which respresents about a 66% capacity utilization. At the close of the year, the Syrian Ministry of Oil and Mineral Resources announced that plans were being drawn up to modify the product yield from the refinery to increase the output of light products, improve the quality of all fractions, and reduce the sulfur content of the heavier fractions.

The country's older refinery, at Homs, was capable of processing about 38 million barrels per year of crude oil. The country's output of refined products in 1981 was approximately 9.22 million tons, of which 50% was fuel oil, 21% gas oil, 8% naphtha, 6% gasoline, and 1.3% LPG. The remaining output of heavier products included 360,000 tons of asphalt and 77,000 tons of sulfur. The Homs refinery processed about 51% of the country's total in 1981, with the Baniyas refinery producing the remainder. Syria's consumption of refined products was aver-

aging about 105,000 barrels per day in 1981 or about 58% of the country's total output of refined products. The remaining production of about 28 million barrels was exported.

Syria imported about 55% of the crude oil used in its refineries in 1981. About 100,000 barrels per day of crude was imported from Iraq through the Kirkuk-Baniyas-Tripoli pipeline, and combined with approximately 66,000 barrels per day of Syrian crude for use in the Homs and Baniyas refineries. Syria was unable to process all of its crude in the refineries because of the low API gravity and high sulfur content of its oil. About 89,000 barrels per day of Syrian crude was exported in 1981, 80% of which went to Western Europe, 10% to North America, 8% to Eastern Europe, and 2% to the Middle East. Baniyas also served as the main export terminal for both Syrian and Iraqi oil. In addition to the 100,000 barrels per day of Iraqi crude that Syria consumed in its refineries, another 300,000 barrels per day came through the same pipeline to be exported from Baniyas by Syria on behalf of Iraq. The Iraqis paid Syria about $40 million in transit fees for oil pipelined to and exported from Baniyas. The pipeline operated for all of 1981, despite the deteriorating political relationship between Iraq and Syria over the Iran-Iraq war.

Syria was only beginning to utilize its reserves of associated and nonassociated natural gas in 1981. In 1980, the Syrian Oil Ministry awarded Entrepose of France a $62 million contract to utilize associated gas from the oilfields in northeast Syria for the production of industrial solvents and condensates. The gas was to be collected from nine gathering stations and pumped through 52 kilometers of pipeline to a main treatment plant. The plant was to be capable of producing 58,000 tons per year of LPG from an input of 23.3 million cubic feet per day of gas. The project, whose status was unclear in 1981, was originally scheduled for completion in 1982.

Construction of a second gas project was to start in late 1982. The Oil Ministry stated that a 50,000-ton-per-year gas liquefaction plant was to be built in the Hasakah district at al-Jibsah. The plant was to utilize nonassociated gas from several wells to be drilled in the same area. Actual construction of the plant depended on the availability and amount of gas from the wells, as well as financing and technical assistance from countries or companies familiar with gas-processing project development. SPC was also participating in a 5,500-ton-per-year sulfur plant in Roumelan, Syria. The $2 million facility was to produce 15 tons per day of sulfur from sour gas. The plant was to be completed by 1982.

Syria's most important nonfuel mineral resource was phosphate rock. Production of phosphate rock increased about 2% in 1981 from 1.32 million tons in 1980. Exports of phosphate rock also increased from 823,000 tons in 1980 to 1.1 million tons in 1981. Syria's largest deliveries were to Lebanon, which received 26% of Syria's exports, Romania (17%), Bulgaria (9%), Italy (6%), and Czechoslovakia (2%). The remaining 40% was shipped to other countries in Asia and Eastern and Western Europe. Most of the increase in exports was due to a substantial rise in the deliveries of phosphate rock to Lebanon, which nearly tripled its imports from Syria from 98,000 tons in 1980 to 279,000 tons in 1981.

Phosphate rock was mined in three areas, Al-Tadmuria, Al-Shargiya, and Khunayfis, all located just south of Palmyra in central Syria. The mines produced an average of 66% to 68% TPL rock. All phosphate production was controlled by the state-owned General Co. for Phosphates and Mines. Phosphate rock was exported from the Port of Tartous, which was capable of loading 1.5 million tons of phosphate rock per year into ships of 25,000 to 40,000 deadweight tons.

Syria's first phosphate fertilizer complex at Homs was commissioned in March 1981 and began full production in October of that year. The $180 million facility was built by Industrialexport. The plant was designed to utilize 800,000 tons per year of concentrated ore to produce 150,000 tons of phosphoric acid and 450,000 tons of triple superphosphate annually. Exports of triple superphosphate were to begin in 1982. The plant received approximately 135,000 tons of 65% to 68% TPL rock from Syria's mines in 1981.

In addition to the new phosphate fertilizer plant, Syria's second ammonia-urea fertilizer plant began test runs in January 1981. The $250 million facility was built by Creusot Loire Enterprises of France. Pullman-Kellogg of the United States was responsible for design and engineering of the ammonia unit, and Heurtey Industries of the United Kingdom built the urea plant. The new plant was built adjacent to the existing ammonia-urea plant at Homs, which has been operating since the late

1960's. The older plant was capable of producing 110,000 tons per year of nitrogenous fertilizers, while the new plant was capable of producing 1,000 tons per day of ammonia and 1,050 tons per day of urea. Both plants utilized naphtha feedstock provided by the country's oil refineries. Both facilities were under the control of the state-owned General Establishment of Chemical Industries. The new production was to satisfy the country's domestic requirement for nitrogenous fertilizer, while also providing a substantial surplus for export. Ammonia and urea were to be shipped by rail to Tartous and exported from there.

Cement production in Syria was to increase dramatically in 1982 on the heels of a 16% increase from the 1980 to 1981 levels. The 1981 increase was related to the opening of the Chaba Cement Co.'s new 400,000-ton-per-year Sheikh Said plant at Aleppo, and a 150,000-ton-per-year plant at Adra. In 1982, the Middle East's largest cement plant at Tartous was scheduled to come onstream, changing Syria from a net importer to a net exporter of cement. The plant was to consist of four production lines, each capable of producing 1,600 tons per day of finished cement. The first two lines were to become operational in 1982, and the next two the following year. In 1981, Syria produced 2.3 million tons of cement and imported 850,000 tons. Output in 1982 was expected to reach 4.5 million tons, more than enough to satisfy the domestic consumption requirement of approximately 3.2 million tons. Cement production in Syria was under the control of the state-owned Syrian State Establishment for Cement Production. Syria was also expected to eliminate the need for building stone imports, with the completion of two marble dressing plants, at al-Zobar near Latakkia, and in Damascus. The plants were capable of producing 700,000 cubic meters of building stones from domestically quarried marble.

Steel production from Syria's General Co. for Iron and Steel Products (Gecosteel) plant at Hama increased 20% in 1981 to the design capacity of 120,000 tons per year. The ministeelworks, which was commissioned in 1977, produced steel billets from direct-reduced iron and imported scrap. The steelworks consisted of two electric arc furnaces and two 2-strand continuous steel billet casting machines. The works supplied billets to Gecosteel's merchant mill adjacent to the steelworks. The company produced merchant bars and black and galvanized welded gas and water pipes. The Government was planning to double the capacity of the Hama works by 1985, expand the output of the pipe mill, and begin production of pipe fittings, all under the fifth development plan. The Government also approved, in principle, plans for the construction of an integrated steelworks based on the country's Zabadani low-grade iron ore deposits. Reserves at Zabadani were estimated at 150 million tons of hematite containing 27% to 30% Fe_2O_3. The cost of the project was estimated at $2 billion, but it was expected that this project would be deferred.

Syria's General Establishment for Industrial Engineering brought into production a 2,500-ton-per-year copper cable plant in Aleppo in 1981. The plant utilizes imported copper for cable production, which was then manufactured into telephone wire at the Damascus cable factory. ALCOM, a 100% Syrian-owned company, brought onstream a continuous aluminum slab-heating furnace at Aleppo in 1981. ALCOM previously imported aluminum sheets for producing finished products for the Syrian market, but was now able to roll its own 200-millimeter-thick slabs for the same purpose. Slabs were imported from Eastern Europe. The furnace, supplied by Mechatherm Engineering of the United Kingdom, began operating in September 1981.

Table 10.—Syria: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS				
Aluminum metal including alloys: Semimanufactures	1	2	--	Jordan 1; Lebanon 1.
Chromium: Oxides and hydroxides	--	1	--	All to Libya.
Copper metal including alloys:				
Unwrought	--	1	--	All to Saudi Arabia.
Semimanufactures	33	98	--	Libya 97; Syria 1.

Table 10.—Syria: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Scrap	5,217	2,190	--	All to Lebanon.
Pig iron including cast iron	--	159	--	India 98; West Germany 49; United Arab Emirates 10.
Ferromanganese	8	--		
Steel, primary forms	11	48	--	Saudi Arabia 36; Iraq 9; Jordan 2.
Semimanufactures:				
Bars, rods, angles, shapes, sections	25	5	--	All to Saudi Arabia.
Universals, plates, sheets	3	1	--	Do.
Rails and accessories	6	3	--	All to Yemen Arab Republic.
Wire	29	14	--	Kuwait 11; Jordan 2.
Tubes, pipes, fittings	257	241	--	Saudi Arabia 210; Jordan 18.
Castings and forgings, rough	347	438	--	Saudi Arabia 224; Jordan 179; Yemen Arab Republic 23.
Lead metal including alloys:				
Unwrought	110	158	--	Lebanon 138; United Kingdom 20.
Semimanufactures	68	32	--	All to Saudi Arabia.
Magnesium metal including alloys:				
Unwrought	32	6	--	All to Lebanon.
Nickel metal including alloys, semimanufactures	(1)	6	--	All to Saudi Arabia.
Zinc metal including alloys, semimanufactures	1	--		
Other: Base metals including alloys, scrap	415	--		
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	3	13	--	Iraq 7; Saudi Arabia 6.
Grinding and polishing wheels and stones	9	1	--	NA.
Chalk	34	--		
Clays and clay products:				
Crude	314	1,034	--	Saudi Arabia 890; Lebanon 71; Jordan 32.
Products:				
Nonrefractory	737	199	--	Saudi Arabia 108; Iraq 60; Jordan 29.
Refractory including nonclay brick	211	774	--	Saudi Arabia 490; Lebanon 244.
Fertilizer materials:				
Crude: Phosphatic thousand tons	920	1,253	--	Romania 530; Lebanon 323; Republic of Korea 137.
Ammonia	--	187	--	All to Jordan.
Graphite, natural	--	2	--	All to Saudi Arabia.
Gypsum and plasters	42,003	--		
Lime	206	--		
Salt and brines	--	10	--	All to Somalia.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	16	70	--	Lebanon 40; Jordan 30.
Soda ash	--	78	--	Jordan 76.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	13,370	11,398	--	Lebanon 9,134; Kuwait 1,142; Saudi Arabia 861.
Worked	1,186	1,014	--	Saudi Arabia 366; Kuwait 269; Jordan 160.
Gravel and crushed rock	17,618	25,399	--	Lebanon 9,103; Saudi Arabia 8,419; Kuwait 7,590.
Sand excluding metal-bearing	2,779	1,066	--	Saudi Arabia 758; Lebanon 177; Kuwait 88.
Sulfur:				
Elemental, crude	--	21	--	Saudi Arabia 20.
Sulfuric acid	--	1	--	All to Libya.
Other:				
Crude	286	328	--	U.S.S.R. 109; Lebanon 106; Jordan 56.
Oxides and hydroxides of barium, magnesium, strontium	7	--		
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	--	1	--	All to Jordan.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	296	--	All to Lebanon.
Coke and semicoke	15	--		
Petroleum:				
Crude thousand 42-gallon barrels	56,256	53,418	NA	NA.
Refinery products:				
Gasoline do	1	(1)	--	All to Jordan.
Kerosine and jet fuel do	497	1,084	--	Greece 539; Romania 419; France 126.

See footnotes at end of table.

Table 10.—Syria: Exports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Destinations, 1979	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Distillate fuel oil thousand 42-gallon barrels	--	4	--	All to France.
Residual fuel oil do	756	1,540	--	West Germany 919; Greece 335; Turkey 166.
Lubricants 42-gallon barrels	238	203	--	All to Jordan.
Other:				
Liquefied petroleum gas do	--	(1)	--	All to Turkey.
Mineral jelly and wax do	354	--		
Petroleum coke do	86,504	53,625	--	Egypt 42,350; Cyprus 7,150; Lebanon 3,025.
Bitumen and other residues do	11,514	14,241	--	All to Egypt.
Bituminous mixtures do	2,563	3,145	--	Lebanon 2,200; Jordan 939.
Mineral tar and other coal-, gas-, and petroleum-derived crude chemicals	6	--		

NA Not available.
[1]Less than 1/2 unit.

Table 11.—Syria: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	961	1,064	--	Italy 1,000; West Germany 54.
Metal including alloys:				
Unwrought	1,508	1,289	10	Kuwait 411; Jordan 200; Saudi Arabia 171.
Semimanufactures	10,525	10,331	1	Lebanon 2,684; Italy 1,539; Turkey 1,242.
Chromium: Oxides and hydroxides	18	24	13	West Germany 10.
Cobalt: Oxides and hydroxides value, thousands	$2	$24	--	All from West Germany.
Copper metal including alloys:				
Unwrought	681	549	--	Iraq 225; Kuwait 177; Lebanon 61.
Semimanufactures	661	5,919	6	Italy 3,752; West Germany 1,053; Spain 257.
Iron and steel:				
Ore and concentrate	707	--		
Metal:				
Scrap	2,929	5,346	217	Kuwait 3,769; Saudi Arabia 518; Lebanon 282.
Pig iron, powder, shot	5,495	4,395	--	Bulgaria 2,758; France 562; U.S.S.R. 400.
Ferromanganese	878	810	--	West Germany 414; Norway 215; France 159.
Steel, primary forms	84,722	179,387	--	Bulgaria 35,151; Italy 35,102; West Germany 24,062.
Semimanufactures:				
Bars, rods, angles, shapes, sections	230,943	476,321	10,499	Italy 144,419; Spain 63,106; West Germany 51,777.
Universals, plates, sheets	119,344	105,902	2,110	West Germany 18,169; Hungary 17,618; Czechoslovakia 14,265.
Hoop and strip	10,454	11,679	--	Austria 5,020; Italy 1,966; West Germany 1,360.
Rails and accessories	11,263	27,170	(1)	U.S.S.R. 24,871; France 1,798; West Germany 262.
Wire	16,052	28,042	(1)	Romania 12,163; U.S.S.R. 4,024; Belgium-Luxembourg 2,563.
Tubes, pipes, fittings	98,917	34,927	1,916	France 14,051; Romania 5,620; Italy 2,907.
Castings and forgings, rough	3,609	3,241	6	Italy 1,561; France 533; Romania 446.

See footnotes at end of table.

Table 11.—Syria: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides and hydroxides	20	--		
Metal including alloys:				
Unwrought	3,711	6,312	--	Switzerland 2,456; Japan 1,553; Italy 900.
Semimanufactures	238	6	--	Yugoslavia 5; France 1.
Manganese: Oxides and hydroxides	1	--		
Mercury 76-pound flasks	29	(1)	--	All from West Germany.
Nickel metal including alloys, unwrought and semimanufactures	19	14	--	United Kingdom 9; West Germany 5.
Silver metal including alloys, unwrought and partly wrought				
value, thousands	$677	$698	$5	United Kingdom $440; Switzerland $245.
Tin metal including alloys:				
Unwrought	242	4,132	--	China 3,987; Belgium-Luxembourg 84; Malaysia 58.
Semimanufactures	14	27	--	Denmark 21; Spain 5.
Titanium: Oxides and hydroxides	54	16	--	United Kingdom 10; Belgium-Luxembourg 5.
Zinc:				
Oxides and hydroxides	93	53	--	Belgium-Luxembourg 20; Netherlands 15; France 13.
Metal including alloys:				
Unwrought	326	343	--	Jordan 120; Lebanon 84; China 55.
Semimanufactures	1,147	1,115	--	West Germany 709; Italy 157; Bulgaria 100.
Other:				
Ores and concentrates	13	--		
Metalloids	1	(1)	--	All from West Germany.
Alkali, alkaline-earth, rare-earth metals	1	34	--	Mainly from Austria.
Base metals including alloys, unwrought and semimanufactures	2	3	(1)	West Germany 2.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	921	1,127	2	Cyprus 761; Lebanon 195; Greece 90.
Artificial: Corundum	42	(1)	--	All from United Kingdom.
Dust and powder of precious and semi-precious stones				
value, thousands	--	$3	--	Spain $2; United Kingdom $1.
Grinding and polishing wheels and stones	467	631	(1)	Italy 471; Jordan 41; Romania 28.
Asbestos, crude	3,352	925	--	All from Canada.
Barite and witherite	2,326	--		
Cement thousand tons	584	1,515	--	Cyprus 633; Turkey 332; U.S.S.R. 262.
Chalk	2,817	1,484	--	France 645; United Kingdom 483; Kuwait 99.
Clays and clay products:				
Crude	940	3,127	1,161	East Germany 847; Cyprus 365.
Products:				
Nonrefractory	6,274	5,381	--	Italy 3,149; Lebanon 1,519; West Germany 180.
Refractory including nonclay brick	8,852	10,579	--	West Germany 2,564; Austria 2,344; Romania 2,139.
Diamond: Gem, not set or strung				
value, thousands	$9	$7	--	All from Ghana.
Diatomite and other infusorial earth	330	--		
Feldspar and fluorspar	1,017	--		
Fertilizer materials: Ammonia	8	48	--	Netherlands 23; Belgium-Luxembourg 10; West Germany 6.
Graphite, natural	48	15	--	All from China.
Gypsum and plasters	204	--		
Lime	6,082	5,161	--	All from Lebanon.
Magnesite	33	--		
Mica:				
Crude including splittings and waste	1	--		
Worked including agglomerated splittings	--	159	--	India 99; Lebanon 59.
Pigments, mineral: Iron oxides, processed	217	422	--	Spain 119; China 110; West Germany 95.
Precious and semiprecious stone other than diamond:				
Natural value, thousands	$203	$163	--	Belgium-Luxembourg $82; India $40; Thailand $30.
Synthetic do	$8	$1	--	NA.
Salt and brines	3	4	--	West Germany 2.

See footnotes at end of table.

Table 11.—Syria: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1978	1979	Sources, 1979	
			United States	Other (principal)
NONMETALS —Continued				
Sodium and potassium compounds, n.e.s.:				
Caustic potash	141	74	--	Spain 25; Italy 18; West Germany 12.
Caustic soda	2,618	3,217	47	Romania 1,605; Italy 1,091; West Germany 268.
Soda ash	7,373	14,036	2	Romania 8,349; Bulgaria 5,547; France 103.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	95,364	129,093	--	Jordan 80,140; Italy 29,300; Turkey 12,714.
Worked	1,272	1,211	(1)	Jordan 515; Italy 475; Lebanon 130.
Dolomite, chiefly refractory-grade	15	--		
Gravel and crushed rock	10,741	14,158	--	Jordan 11,614; Italy 2,394.
Limestone excluding dimension	3	160	--	All from West Germany.
Quartz and quartzite	147	121	--	Belgium-Luxembourg 36; Netherlands 35; Turkey 30.
Sand excluding metal-bearing	24	691	1	Belgium-Luxembourg 532; Romania 141.
Sulfur:				
Elemental:				
Crude	3,194	7,696	--	Iraq 5,007; Lebanon 1,688; Kuwait 1,000.
Refined	338	84	--	All from France.
Sulfuric acid	2,363	4,077	--	Lebanon 2,722; Greece 925; West Germany 176.
Talc, steatite, soapstone, pyrophyllite	3,892	--		
Other:				
Crude	380	5,402	--	Belgium-Luxembourg 3,950; France 1,221; Spain 100.
Halogens	121	172	--	Jordan 138; West Germany 23.
Oxides and hydroxides of barium, magnesium, strontium	10	18	--	Lebanon 10; West Germany 7.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	11,779	3,098	--	Lebanon 2,373; France 320; Romania 175.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	76	22	--	Mainly from Romania.
Carbon black	38	956	5	West Germany 604; Netherlands 347.
Coal and briquets:				
Coal, all grades	--	808	--	All from Belgium-Luxembourg.
Briquets of coal	1,059	--		
Coke and semicoke	5,690	2,002	--	Lebanon 1,108; Italy 894.
Petroleum:				
Crude thousand 42-gallon barrels	16,613	24,253	NA	NA.
Refinery products:				
Gasoline do	2,474	4,522	--	Italy 2,317; Iran 1,222; Romania 981.
Kerosine and jet fuel do	868	678	(1)	Italy 675; Hungary 2.
Distillate fuel oil do	2,488	10,447	--	Romania 6,933; Italy 2,539; Iran 639.
Lubricants do	322	199	(1)	United Kingdom 159; Belgium-Luxembourg 25.
Other:				
Liquefied petroleum gas do	(1)	1,075	--	Italy 599; Greece 186; Libya 186.
Mineral jelly and wax 42-gallon barrels	7,933	10,596	--	Iraq 6,760; Hungary 2,833; China 669.
Bitumen and other residues do	2,527	612	--	All from West Germany.
Bituminous mixtures do	43,171	30,639	12	Albania 27,809; United Kingdom 1,127.
Mineral tar and other coal-, gas-, and petroleum-derived crude chemicals	8	--		

NA Not available.
[1]Less than 1/2 unit.

YEMEN ARAB REPUBLIC

The Yemen Arab Republic was one of the most populous nations on the Arabian Peninsula, and also one of the 31 least-developed nations in the world, according to the United Nations. Despite the Government's efforts to promote the commercial and industrial sectors, the domestic economy remained largely dependent on subsis-

tence agriculture. Industry in Yemen is a relatively recent phenomenon. Ten years ago, there was no real manufacturing enterprise in the country. The Government has attempted to remedy this situation by forming public and semipublic companies to import materials for domestic consumption and to produce commodities such as cigarettes, cotton textiles, pharmaceuticals, cement, and salt. The most successful of the public companies was the Yemen Oil and Minerals Co. (Yominco), which has entered into joint ventures with several foreign companies including Hunt Oil Co. of the United States, Shell Oil, and France's BRGM. The mineral industry in the country consisted primarily of the production of gypsum, cement, and salt, with salt being the only mineral exported. Salt exports in 1981 totaled 54,000 tons.

In 1981, the Government of Yemen announced its second 5-year development plan (1981-85). Total expenditures in the plan period were predicted at $6.5 billion,[17] compared with about $3 billion allocated for the first plan. The new plan was to carry over many projects from the previous plan in the areas of infrastructure development, agriculture, education, and health care, while placing new and greater emphasis on development of the country's industrial and manufacturing sector. Allocations for public-sector industrial projects were to reach $431 million under the plan, which includes money for construction of a third cement plant, a glass factory, and a factory for producing concrete reinforcing bars.

The Yemeni economy depended on remittances from Yemenis working abroad to finance budgetary disbursements and most of the country's imports. These remittances were $950 million in 1981, which represents the second consecutive year of decline.

Another major source of Yemen's foreign exchange receipts was foreign aid, which was estimated at about $300 million. Most of the aid was supplied by Saudi Arabia, Kuwait, and other Arab states and development funds. Nearly $20 million was supplied by the United States. Yemen's exports rose slightly in 1981, but remained below $20 million. Imports, on the other hand, rose about 6% to 1.8 billion, creating a trade deficit of $1.77 billion. Remittances, foreign aid, and a small amount of capital inflows combined to reduce the overall balance of payments deficit to $150 million in 1981.

In the minerals sector, Yemen registered production of only three commodities—rock salt, gypsum, and cement. Production capacity for cement was increasing the most rapidly. The Soviet Union built a small cement plant at Banjil, north of Hodeida, in the 1960's. In 1981, the Soviets returned to expand the capacity of the plant from 80,000 to 300,000 tons per year. A second cement plant was also under construction at Amran, 50 kilometers north of the capital, Sana. The 500,000-ton-per-year plant was being built by Ishikawajima-Harima Heavy Industries, and Nissho-Iwai, both of Japan, at a cost of $110 million. The plant was due to commence production in the fall of 1982. The Government was planning to construct the country's third cement plant at Mafraq, 60 kilometers south of Ta'izz. The Government allocated money for the project in the second 5-year plan, but no tenders had been issued for construction, and no details or timetable was available by yearend. Yemen's apparent preoccupation with cement production was because local consumption had increased to over 1 million tons per year, nearly all of which had to be imported. The cost to the Government for cement imports reached $60 million in 1981.

The Yemen Salt Mining Corp. continued to mine its open pit rock salt deposit in the coastal plain adjacent to the Port of Salif. Reserves at Salif were estimated at 250 million tons of rock salt with a NaCl content of 98.23%. Salt production from the deposit generally expanded and contracted with the level of world demand, as 98% of the mine's output was exported. A private sector project was planned to refine rock salt from Salif into table salt, but no details were available as to the progress of the project. Gypsum was also recovered in association with rock salt at Salif. All of the gypsum produced was sold to the Government cement plant at Banjil. With cement capacity about to increase dramatically, output of gypsum was also expected to rise, which could in turn increase the production of rock salt.

In terms of future mineral development, BRGM was completing work on an 18-month mineral survey of much of the country. Fifteen mineral occurrences had been located by the organization including an ancient silver mine at Majma, west of Marib, that contained lead and zinc as well. A new contract was signed between BRGM and Yominco to focus new exploration efforts in areas with known mineral potential. The contract had an estimated value of $716,000. Yominco was also allocated money to develop a copper mining industry at Jamoura. The copper-cobalt-nickel deposit

had been examined by a team of Romanian geologists in 1977.

Petroleum exploration efforts continued in Yemen, despite the lack of a commercial discovery to date. Shell Oil conducted geophysical exploration operations on a 10,000-square-kilometer coastal concession on the Tihana coastal plain. Shell's exploration contract expired in 1981, and the data was given to Yominco to evaluate. The World Bank subsequently stepped in with a $9 million loan to help evaluate the data and to promote further exploration in the area. Yominco was preparing to invite bids from foreign oil companies to renew exploration at Tihana.

The other major development in the petroleum sector was the signing of a new exploration agreement between Yominco and Yemen Hunt Oil Co., a subsidiary of the Dallas-based Hunt Oil Co., of the United States. The agreement covered an area of 12,600 square kilometers in the Marib and Al-Jawf area of east-central Yemen. Hunt Oil was to spend at least $4.2 million in the first 2 years of the 6-year agreement. The company was to begin its work with a seismic survey, followed by exploratory drilling, if warranted. The Marib-Al-Jawf area was considered a promising area by both the Government and Hunt Oil, owing to the geologic character of the region, which contained salt domes and formations that correspond with oil-producing zones in other areas of the Middle East.

With no crude oil or refining capacity, the Yemen Arab Republic was forced to import all of its domestic requirements of petroleum products. Yemen imported about 6.4 million barrels of petroleum products and another 12,000 tons of LPG in 1981. All gasoline and petroleum gas was supplied by Saudi Arabia under an agreement signed in 1980, and all other refined products, including jet fuel, diesel oil, and fuel oil, were supplied by Kuwait. Late in 1981, the Islamic Development Bank supplied Yemen with a $10 million loan to purchase petroleum products from Iraq. The new supply agreement was to take effect at the beginning of 1982. Meanwhile, Yominco was planning to construct two pipelines to transport refined products around the country. The first was a 270-kilometer, 10-inch line to run from the Port of Salif, to Mabar, and then north to Sana. The other was a 105-kilometer, 8.5 centimeter line running from Mocha to Ta'izz. Both lines were still in the basic design stage. Omnium Technique des Transports of France was conducting feasibility studies for both lines, both of which were to cost $150 million.

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[1]Physical scientist, Division of Foreign Data.

[2]Economist Newspaper Ltd. (London). Exploiting Afghanistan. Feb. 4, 1982, p. 4.

[3]Where necessary, values have been converted from Afghanistan afghanis (Af) to U.S. dollars at the rate of Af50.00 = US$1.00.

[4]Rossi, G. The Mineral Potential of Afghanistan. Minerals Bureau of the Republic of South Africa. Internal Memorandum No. 22, April 1980, p. 4.

[5]Foreign report, op. cit., p. 4.

[6]Where necessary, values have been converted from Bahraini dinars (BD) to U.S. dollars at the rate of BD0.37 = US$1.00.

[7]Where necessary, values have been converted from Jordanian dinars (JD) to U.S. dollars at the rate of JD0.326 = US$1.00.

[8]Phosphorus and Potassium. No. 118, March-April 1982, p. 15.

[9]Arab Mining Journal, Amman, Jordan. V. 1, No. 4, July 1981, pp. 58-60.

[10]Where necessary, values have been converted from Lebanese pounds (LL) to U.S. dollars at the rate of LL4.31 = US$1.00.

[11]Where necessary, values have been converted from Riyals Omani (RO) to U.S. dollars at the rate of RO0.345 = US$1.00.

[12]Where necessary, values have been converted from Yemeni dinars (SYD) to U.S. dollars at the rate of SYD0.345 = US$1.00.

[13]Platt's Oil Gram News. Apr. 5, 1982.

[14]Al-Siyasah, Kuwait. Sept. 8, 1981, pp. 1, 13. (In Arabic).

[15]Where necessary, values have been converted from Qatari riyals (QR) to U.S. dollars at the rate of QR3.64 = US$1.00.

[16]Where necessary, values have been converted from Syrian pounds (LS) to U.S. dollars at the rate of LS3.925 = US$1.00.

[17]Where necessary, values have been converted from Yemeni riyals (YRls) to U.S. dollars at the rate of YRls4.56 = US$1.00.

Table 12.—Yemen Arab Republic: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, semimanufactures	--	29	--	All to Saudi Arabia.
Iron and steel, semimanufactures value, thousands	$27	$944	--	China $842; People's Democratic Republic of Yemen $16; Italy $4.
NONMETALS				
Cement do	$1,140	--		
Clay products: Refractory including nonclay brick do	--	$59	--	People's Democratic Republic of Yemen $58; Saudi Arabia $1.
Gypsum and plasters	--	1	--	All to Saudi Arabia.
Lime	--	24	NA	NA.
Salt and brines	210	22	--	Saudi Arabia 18; People's Democratic Republic of Yemen 4.
Stone, sand and gravel:				
Dimension stone, worked value, thousands	$9	--		
Gravel and crushed rock	--	10	--	All to Saudi Arabia.
Sulfur: Sulfuric acid	--	37	--	All to West Germany.
Other: Crude value, thousands	$6	--		
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline do	--	$17	--	All to Saudi Arabia.
Lubricants do	$6	$10	--	All to Italy.
Liquefied petroleum gas do	--	$4	--	All to People's Democratic Republic of Yemen.

NA Not available.

Table 13.—Yemen Arab Republic: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys:				
Scrap	45	172	--	Hong Kong 158; Saudi Arabia 14.
Semimanufactures value, thousands	$4,126	$3,660	$51	Greece $1,441; Italy $587; Hong Kong $437.
Chromium: Oxides and hydroxides	--	1	--	All from Spain.
Copper:				
Matte and speiss	11	--		
Metal including alloys, semimanufactures value, thousands	$31	$282	$70	Netherlands $70; United Kingdom $56; Japan $24.
Iron and steel:				
Scrap	637	2,160	--	France 2,138; Saudi Arabia 22.
Pig iron including cast iron value, thousands	$364	$6,509	--	China $2,476; Japan $2,394; U.S.S.R. $447.
Ferroalloys do	$6	$38	--	Singapore $9; Cuba $5; India $5.
Powder, shot, sponge iron	--	2,096	--	United Kingdom 2,070; Hong Kong 13; India 8.
Steel, primary forms	(1)	1,244	--	Italy 1,209; United Kingdom 16; Saudi Arabia 10.
Semimanufactures:				
Bars, rods, angles, shapes, sections value, thousands	$12,718	$37,680	--	Republic of Korea $15,018; China $7,253; Italy $2,068.
Universals, plates, sheets do	$23,310	$16,597	--	Japan $8,341; Republic of Korea $1,136; China $909.
Rails and accessories do	$22	$59	$8	Italy $34; Saudi Arabia $13; India $3.

See footnotes at end of table.

Table 13.—Yemen Arab Republic: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Semimanufactures —Continued				
Wire value, thousands	$1,195	$1,218	--	United Kingdom $434; ; China $261; Italy $112.
Tubes, pipes, fittings do	$17,983	$48,118	$15,356	France $5,673; West Germany $3,903; India $3,775.
Castings and forgings, rough do	$1,050	$3,509	--	Poland $1,136; India $622; West Germany $459.
Lead metal including alloys:				
Scrap	3	2	--	All from Saudi Arabia.
Semimanufactures value, thousands	--	$23	--	Do.
Magnesium metal including alloys, semimanufactures do	--	$47	--	Mainly from West Germany.
Mercury 76-pound flasks	--	29	--	Mainly from China.
Nickel metal including alloys:				
Scrap	95	--		
Semimanufactures value, thousands	$10	$51	--	West Germany $44; Saudi Arabia $6.
Tin metal including alloys, semimanufactures do	--	$295	--	Netherlands $223; Iraq $30; West Germany $20.
Zinc:				
Oxides and hydroxides	--	573	--	Netherlands 389; United Kingdom 184.
Metal including alloys:				
Scrap	90	--		
Semimanufactures value, thousands	--	$1,787	--	Japan $338; Saudi Arabia $48; United Kingdom $36.
Other:				
Alkali, alkaline-earth, rare-earth metals	(2)	8	--	Mainly from West Germany.
Base metals including alloys, unwrought and semimanufactures	--	8	--	All from Saudi Arabia.
NONMETALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones value, thousands	$97	$171	--	West Germany $54; Saudi Arabia $43; Denmark $30.
Boron materials: Oxide and acid	415	7	--	Mainly from West Germany.
Cement value, thousands	$42,705	$58,752	$440	Greece $27,454; Japan $3,687; China $2,430.
Chalk	--	50	--	All from India.
Clays and clay products:				
Crude	NA	418	NA	Cyprus 150; Saudi Arabia 41; India 5.
Products:				
Nonrefractory value, thousands	$12	$311	--	India $85; Italy $53; West Germany $41.
Refractory including nonclay brick do	$2,773	$5,282	$1	Italy $1,856; United Kingdom $1,001; West Germany $423.
Diamond: Gem, not set or strung do	--	$3	--	All from Hong Kong.
Diatomite and other infusorial earth	--	22	--	Saudi Arabia 21; France 1.
Fertilizer materials:				
Crude value, thousands	--	$634	--	Netherlands $495; United Kingdom $91; Saudi Arabia $31.
Manufactured:				
Nitrogenous do	$6,348	$1,613	--	Saudi Arabia $777; Japan $676; West Germany $136.
Phosphatic do	$547	$31	--	All from Saudi Arabia.
Potassic	9	22	--	Saudi Arabia 15; West Germany 7.
Other including mixed value, thousands	--	$89	--	Italy $51; Saudi Arabia $38.
Ammonia	--	12	--	United Kingdom 8; India 3; Netherlands 1.
Graphite, natural	--	3	--	All from Saudi Arabia.
Gypsum and plasters	--	179	--	France 153; Denmark 18; United Kingdom 3.
Lime value, thousands	--	$1,462	--	Italy $817; China $367; Romania $126.
Pigments, mineral: Iron oxides, processed	--	4	--	West Germany 3; United Kingdom 1.

See footnotes at end of table.

Table 13.—Yemen Arab Republic: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Sodium and potassium compounds, n.e.s.:				
Caustic potash	--	4	--	All from Belgium-Luxembourg.
Caustic soda	478	--		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked value, thousands	--	$288	--	Italy $147; Greece $62; West Germany $26.
Worked do	$754	$1,108	--	Italy $597; France $129; China $30.
Gravel and crushed rock do	--	$412	$15	Romania $168; China $125; Italy $59.
Sand excluding metal-bearing	--	14	--	Saudi Arabia 7; United Arab Emirates 7.
Sulfur:				
Elemental, refined	--	53	--	Netherlands 43; United Kingdom 7.
Sulfuric acid	3,030	207	--	Netherlands 164; United Kingdom 19; West Germany 17.
Other:				
Crude	1,052	592	--	Italy 302; United Kingdom 80; Greece 63.
Halogens other than chlorine	--	3	--	All from United Kingdom.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals value, thousands	$2,203	$468	--	United Kingdom $182; Greece $112; China $84.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black do	$219	$42	--	Saudi Arabia $25; Belgium-Luxembourg $9; China $5.
Petroleum:				
Crude and partly refined do	--	$8	--	Netherlands $6; Saudi Arabia $1.
Refinery products:				
Gasoline do	$7,405	$34,633	$13	Saudi Arabia $27,688; Kuwait $5,354.
Kerosine and jet fuel do	$4,314	$16,035	--	Saudi Arabia $8,657; Kuwait $3,000; West Germany $2,550.
Distillate fuel oil do	$8,696	$50,091	--	Saudi Arabia $30,595; West Germany $10,295; Kuwait $8,031.
Residual fuel oil do	$445	$3,230	--	Saudi Arabia $2,703; Kuwait $355; West Germany $133.
Lubricants do	$8,043	$15,353	$55	United Kingdom $6,242; Saudi Arabia $3,737; Netherlands $1,302.
Liquefied petroleum gas do	$1,759	$2,585	$1	Saudi Arabia $1,768; People's Democratic Republic of Yemen $658.
Bituminous mixtures do	$4,806	$11,588	--	Saudi Arabia $5,171; United Arab Emirates $3,890; Japan $1,065.

NA Not available.
[1]Unreported quantity valued at $5,472,000.
[2]Unreported quantity valued at $29,000.

The Mineral Industry of Other Areas of South America

By Travis Q. Lyday[1]

CONTENTS

ECUADOR

During 1981, Ecuador's gross domestic product (GDP) increased by a reported 4.8% in real terms, a slight improvement over that of 1980. In current prices, the GDP in 1981 was estimated at $13.7 billion.[2] The inflation rate increased to 15.6% according to official figures, above that of 1980.

Ecuador's production of petroleum increased 3% in 1981 compared with that of 1980. The consortium of Corporación Estatal Petrolera Ecuatoriana (CEPE), the state oil company, and Texaco, Inc., produced almost 98% of the total from their Putumayo Basin operations in Oriente, the eastern jungle region. In sharp contrast, output from the Santa Elena Peninsula Fields, where oil was first produced commercially in 1921, continued to decline, producing only 510,000 barrels, a decrease of almost 8% compared with that of 1980.

The volume of crude petroleum exports increased from 38 million barrels in 1980 to 45.7 million barrels in 1981. Although crude petroleum export revenues increased to $1.56 billion in 1981 from $1.39 billion in 1980, the average-per-barrel price declined to approximately $34.10 in 1981 from about $36.70 in 1980. Exports of crude petroleum and petroleum products accounted for about 68% of Ecuador's 1981 merchandise exports, up from 63% in 1980. The petroleum industry contributed approximately 10% to the GDP, a substantial decrease from the 16.7% in 1980.

After recording a negative growth rate in 1980 of 5%, the petroleum and mining sector increased an estimated 1% in 1981, owing, in large part, to increased petroleum production. The total production of nonfuel minerals in Ecuador was estimated to have declined in 1981, and this sector continued to be of negligible importance to the economy. Mineral industry developments continued to be constricted, in part because Ecuador has not been adequately explored but, more importantly, because the existing mining law, Ley de Fomento Minero, was considered by private sector Ecuadorean and foreign investors as offering insufficient incentives and guarantees. An early approval by Congress of the proposed mining law, under consideration for several years before being submitted in 1980 to the Office of the President, was not expected by the mining sector.

Geological and mineral reconnaissance work by various organizations and private agencies in collaboration with the Dirección General de Geología y Minas (DGGM) continued on a relatively modest scale. Development work by the DGGM continued at the Chaucha porphyry copper deposit, Loja Province, discovered a decade ago under a United Nations development program. The Chaucha represents a major potential source of copper in Ecuador, with estimated reserves of 72 million tons of ore averaging 0.7% copper and 0.02% to 0.04% molybdenum reported.

CEPE was proceeding with its ambitious program to increase, by 1988, Ecuador's petroleum refining capacity from 96,600 barrels per day to 210,000 barrels per day, the current level of crude petroleum production. Reportedly, the increase is to supply the rapidly expanding demand for gasoline, diesel fuel, and kerosine but could result in the availability for export of an estimated 50,000 barrels per day of No. 6 fuel oil.

The principal refinery, owned by CEPE and located at Esmeraldas, Esmeraldas Province, was to be increased from its current 55,600 barrels per day capacity through revamping, first to 70,000 barrels per day by 1983 and then to 90,000 barrels per day in 1987. CEPE was planning to construct a new 75,000-barrel-per-day refinery in Atahualpa, Guayas Province, scheduled for completion in 1983 or 1984. The designs for the expansion of the Esmeraldas refinery and the construction of the Atahualpa refinery were being done by UOP, Inc., of the United States. The two refineries located on the Santa Elena Peninsula, Guayas Province—the 32,000-barrel-per-day Anglo facility owned by Clyde Latino America, S.A. and CEPE, and the Petróleos Gulf del Ecuador 8,000-barrel-per-day facility owned by private sector Ecuadoreans—were to be expanded to a combined capacity of 44,000 barrels per day by 1988.

Not involved in current expansion plans was Ecuador's fourth operating refinery, located in Lago Agrio, Napo Province. Texaco, Inc., in its capacity as operator of the CEPE-Texaco consortium, operated the 1,000-barrel-per-day refinery; one-half of the output was used internally by the consortium.

Reportedly, the CEPE-Texaco consortium budgeted $133.3 million for their petroleum exploration activities in 1981, more than treble the $42.3 million spent in 1980. Offshore exploration drilling for oil began in December in the southern part of the Gulf of Guayaquil, where natural gas reserves, possibly as much as 670 million cubic feet, have been known to exist for many years. However, development of the fields has been hindered owing to disagreements between the Government and foreign consignees.

The quasi-Government Compañía Ecuadoriana de Siderúrgica S.A. (ECUASIDER) was planning the construction of a 400,000-ton direct-reduction steel mill near Puerto Bolívar, El Oro Province. The mill would use natural gas from wells in the Gulf of Guayaquil.

The long-awaited international call for tenders for the development of the San Bartolomé silver and zinc mine, located in Azuay Province, was announced in June. However, the bidding contest was declared null and void in October.

Empresa Industrias Guapán S.A.'s new 1,100-ton-per-day expansion of the Guapán cement plant in Azogues went into production late in the year. A plan to double the capacity of Cemento Selvalegre's new 345,000-ton-per-year plant near Otavalo was being considered at yearend following a feasibility study. La Cemento Nacional started a new production line at its Blanco plant, adding an additional 1,500 tons per day to its capacity. The Government increased the price of cement 50% in midyear to stimulate production to help alleviate periodic shortages.

Table 1.—Other Areas of South America: Production of mineral commodities[1]

Area, commodity, unit of measure	1977	1978	1979	1980[p]	1981[e]
ECUADOR[2]					
Cadmium, mine output, metal content kilograms	476	417	[e]480	[e]480	400
Cement, hydraulic thousand metric tons	623	834	1,099	1,389	1,450
Clays: Kaolin do	4,586	3,564	[e]4,000	4,000	4,000

See footnotes at end of table.

Table 1.—Other Areas of South America: Production of mineral commodities[1] —Continued

Area, commodity, unit of measure	1977	1978	1979	1980[p]	1981[e]
ECUADOR[2] —Continued					
Copper, mine output, metal content, metric tons	1,000	800	1,200	1,200	1,200
Gas, natural:					
Gross, million cubic feet	12,290	12,429	13,387	15,000	16,000
Marketable, do.	1,490	[e]1,500	[e]1,600	1,600	1,700
Gold, mine output, metal content, troy ounces	8,124	2,734	3,215	3,537	3,700
Gypsum (for cement), metric tons	41,491	34,209	[e]35,000	35,000	35,000
Lead concentrates, metal content, do.	220	220	[e]220	220	200
Natural gas liquids:					
Natural gasoline, thousand 42-gallon barrels	106	79	NA	NA	NA
Liquefied petroleum gas, do.	36	721	815	800	820
Total, do.	142	800	NA	NA	NA
Petroleum:					
Crude, do.	67,002	77,710	78,169	74,714	76,797
Refinery products:					
Gasoline, do.	6,144	7,293	8,119	9,000	[3]7,802
Jet fuel, do.	537	985	1,107	1,200	[3]1,118
Kerosine, do.	2,381	2,716	2,498	2,500	[3]2,205
Distillate fuel oil, do.	3,234	4,518	5,095	5,600	[3]5,046
Residual fuel oil, do.	6,602	13,018	13,775	14,500	[3]14,614
Lubricants, do.	194	234	267	300	[3]300
Other:					
Liquefied petroleum gas, do.	192	200	225	250	[3]733
Unspecified, do.	340	317	367	400	[3]417
Refinery fuel and losses, do.	721	1,016	554	1,000	[3]346
Total, do.	20,345	30,297	32,007	34,750	[3]32,581
Silica, metric tons	10,800	17,011	[e]13,130	13,200	13,200
Silver, mine output, metal content, troy ounces	57,108	28,617	[e]44,000	45,000	44,000
Stone, sand and gravel:					
Limestone (for cement manufacture), thousand metric tons	1,061	1,410	[e]1,300	1,300	1,250
Marble, metric tons	2,544	2,789	[e]2,700	2,800	2,800
Sulfur:					
Native, do.	4,688	4,500	[e]4,500	4,500	4,400
Byproduct:					
From petroleum[e], do.	5,000	5,000	5,000	5,000	5,000
From natural gas[e], do.	3,000	5,000	5,000	5,000	5,000
Total, do.	12,688	[e]14,500	[e]14,500	14,500	14,400
Zinc, mine output, metal content, do.	1,997	1,340	[e]1,600	1,600	1,600
FRENCH GUIANA					
Gold, mine output, metal content, troy ounces	4,823	[e]5,000	5,000	4,000	4,000
Stone, sand and gravel, metric tons	329,320	325,000	[e]337,000	330,000	320,000
GUYANA[2]					
Aluminum:					
Bauxite, dry equivalent, gross weight[e], thousand metric tons	2,731	2,425	2,312	1,800	1,700
Alumina, do.	271	250	200	220	210
Diamond:[4]					
Gem[e], thousand carats	7	7	6	4	4
Industrial[e], do.	10	10	10	6	6
Total, do.	17	17	16	10	[3]10
Gold, mine output, metal content, troy ounces	11,899	[r]15,404	10,593	11,003	[3]19,262
PARAGUAY					
Cement, hydraulic, thousand metric tons	200	166	155	177	190
Clays:					
Kaolin, metric tons	[e]22,000	35,380	40,000	50,000	55,000
Other, thousand metric tons	1,320	1,518	1,870	2,200	2,500
Gypsum, metric tons	14,000	9,000	11,000	12,000	14,000
Lime, do.	53,300	38,554	33,000	55,000	60,000
Petroleum refinery products:					
Gasoline, thousand 42-gallon barrels	648	805	662	906	800
Jet fuel, do.	69	75	94	101	100

See footnotes at end of table.

Table 1.—Other Areas of South America: Production of mineral commodities[1] —Continued

Area, commodity, unit of measure	1977	1978	1979	1980[p]	1981[e]
PARAGUAY —Continued					
Petroleum refinery products —Continued					
Kerosine thousand 42-gallon barrels	145	151	132	120	110
Distillate fuel oil do	1,390	1,710	1,705	1,931	1,800
Residual fuel oil do	333	371	384	371	370
Liquefied petroleum gas do	45	46	58	52	50
Refinery fuel and losses do	358	467	731	800	750
Total do	2,988	3,625	3,766	4,281	3,980
Pigments, mineral, natural: Ocher metric tons	120	150	200	200	200
Sand including glass sand thousand metric tons	1,401	1,900	2,300	2,600	2,700
Stone:					
Dimension do	144	197	224	258	260
Crushed and broken:					
Limestone (for cement and lime) do	415	370	300	350	390
Other do	3,500	5,140	5,450	6,400	6,600
Talc, soapstone, pyrophyllite metric tons	130	160	210	250	260
SURINAME					
Aluminum:					
Bauxite, gross weight thousand metric tons	4,805	5,188	5,010	4,646	3,800
Alumina do	1,172	1,310	1,325	1,316	1,200
Metal, primary[5] do	58	55	64	46	35
Cement, hydraulic do	48	60	62	69	65
Clays:					
Common metric tons	116,000	e115,000	e115,000	115,000	110,000
Kaolin[5] do	2,500	2,500	2,500	2,500	2,500
Gold, mine output, metal content troy ounces	r386	289	300	350	3823
Sand and gravel:					
Sand, common thousand metric tons	NA	160	150	155	150
Gravel metric tons	94,500	75,000	67,500	75,000	70,000
Stone, crushed and broken thousand metric tons	75	40	50	72	NA
URUGUAY					
Aluminum, secondary metric tons	52	45	69	35	30
Barite do	50	33	25	35	30
Cement, hydraulic thousand metric tons	682	674	687	685	690
Clays, type not specified metric tons	336,009	338,890	340,000	NA	NA
Coke, gashouse do	e11,685	e11,685	e11,685	12,000	NA
Corundum do	421	223	e227	225	220
Feldspar do	1,625	2,572	e2,700	2,600	2,500
Fluorspar do	75	113	e77	85	80
Gas, manufactured million cubic feet	e750	e750	e750	760	750
Gem stones, semiprecious:					
Agate metric tons	802	184	e200	190	180
Amethyst do	e2	32	e33	30	30
Iron and steel:					
Ferroalloys: Electric-furnace ferrosilicon do	105	--	--	NA	NA
Steel, crude do	17,200	8,700	17,000	14,000	10,000
Semimanufactures do	47,265	43,898	93,449	71,759	80,000
Lime thousand metric tons	70	85	81	20	50
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	1,940	2,211	2,136	1,953	31,768
Jet fuel do	269	219	312	234	3210
Kerosine do	1,199	1,243	1,119	1,032	3861
Distillate fuel oil do	3,355	3,812	3,413	3,510	33,514
Residual fuel oil do	5,170	4,993	5,137	5,780	35,387
Lubricants do	37	39	49	45	346
Other:					
Liquefied petroleum gas do	397	431	417	447	3396
Unspecified do	287	335	397	349	3221
Refinery fuel and losses do	228	235	(6)	43	3100
Total do	12,882	13,518	12,980	13,393	12,503
Sand and gravel:					
Sand:					
Common thousand metric tons	1,885	2,077	e2,200	2,300	2,000
Glass metric tons	2,210	1,698	e1,700	1,750	1,500
Gravel thousand metric tons	e865	341	e400	450	350
Stone:					
Dimension do	13	87	e80	85	80
Crushed and broken:					
Alum schist metric tons	2,483	11,392	e10,000	10,500	11,000
Dolomite thousand metric tons	95	110	e120	130	100
Limestone do	1,192	1,190	e1,100	1,200	1,250

See footnotes at end of table.

Table 1.—Other Areas of South America: Production of mineral commodities[1] —Continued

Area, commodity, unit of measure	1977	1978	1979	1980[p]	1981[e]
URUGUAY —Continued					
Stone —Continued					
Crushed and broken —Continued					
Marble ------ thousand metric tons--	4	5	[e]5	5	4
Marl ---------- metric tons--	900	11,553	[e]10,000	10,500	11,000
Quartz ---------- do----	200	(7)	(7)	(7)	NA
Other including ballast thousand metric tons--	1,758	1,488	[e]1,500	1,500	1,400
Sulfur, elemental, byproduct[e] ---- metric tons--	2,200	2,200	[e]2,200	2,200	2,000
Talc, soapstone, pyrophyllite ------- do----	1,659	1,724	[e]1,800	1,800	1,700

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Includes data available through Aug. 27, 1982.
[2]In addition to the commodities listed, a variety of crude construction materials (common clays, sand and gravel, and stone) undoubtedly were also produced, but output was not reported, and available information was inadequate to make reliable estimates of output levels.
[3]Reported figure.
[4]Gem and industrial diamond production was estimated based upon reported total production.
[5]Data represent exports.
[6]Refinery fuel apparently included with products for sale, mainly residual fuel oil and liquefied petroleum gas.
[7]Less than 1/2 unit.

FRENCH GUIANA

The mineral industry in French Guiana continued to be limited to the production of small quantities of construction materials—clays, crushed stone, and sand and gravel—used for domestic consumption and a minor amount of placer gold.

The minerals sector has not had a large role in the Nation's economy, although resources of bauxite, cinnabar, copper, low-grade iron ore, manganese, molybdenum, nickel, and tantalite are known.

No significant developments concerning the mineral industry of French Guiana during 1981 were reported.

GUYANA

The Guyanese economy continued to decline, registering a real growth of minus 0.5% in 1981. Although Guyana's economy is basically agrarian, depending mainly on sugar and rice, the production of bauxite and its processing into alumina accounted for about one-fifth of the GDP, estimated at $547 million,[3] and about 40% of total annual export earnings. However, total bauxite and alumina production not only fell almost 30% below the 1981 target of 2.3 million tons, but the 1.9 million tons produced was also below the 1980 production of 2.0 million tons.

The shortfall in output was due to several factors, including continued industrial disputes, weather difficulties, shortages of properly functioning equipment and spare parts, and technological deficiencies.

Home Oil Co. Ltd., a subsidiary of the Canadian firm Hiram Walker Resources Ltd., began drilling the first of a two-well wildcat drilling program in November on a 7,085-square-kilometer concession in the Takutu Basin. The well, the first to be drilled in the basin, is about 320 kilometers south of Georgetown near the border with Brazil. Home has a 72% interest in the concession, and Ranger Oil Ltd., of Canada, and Canadian and Oriental Oil Ltd. of Hong Kong, each own 14%. The target depth of the well was 2,440 meters.

During the year, the Government announced its intention to establish a national petroleum company to oversee exploration efforts.

Duncan Gold Resources Ltd. began exploratory drilling on its property at Omai in north-central Guyana. The Anaconda Copper Co. had explored and developed the

property previously in the late 1940's. The gold at Omai is associated with small quartz stringers in granite and has been exploited sporadically on a small scale.

Almost all of the gold produced in Guyana has been mined from alluvial or eluvial material, although there have been a few small underground operations, with working depths rarely exceeding 38 meters.

Reported gold production in 1981 increased to almost 20,000 troy ounces, 75% over that reported in 1980.

The small quantity of natural diamonds produced, reported to be 9,500 carats, was about the same as that of 1980. An estimated 40% was of gem quality. Alluvial diamonds were first discovered in Guyana in 1887, and total production since then has been in excess of 3 million carats. Peak production occurred in 1923 when 214,474 carats was recovered, but annual production has been declining almost steadily since. The diamonds, occurring in alluvial deposits within the Pakaraima Mountains in western Guyana, are recovered by hand or by suction dredging.

A comprehensive feasibility study was planned by the Bauxite Industry Development Co. to determine whether the kaolin occurring below the bauxite deposits could be mined economically. The study, focusing on the Topira bauxite mine, located near Ituni at the center of the 1,550-square-kilometer bauxite mining belt, was to be done by a consulting firm with technical assistance provided by the Inter-American Development Bank.

PARAGUAY

After decades of stagnation, Paraguay continued in 1981 to maintain an economic growth rate that is unrivaled by any other Latin American economy. The factors responsible for this unusual growth remain primarily the expansion of exportable surplus in the agricultural sector and the construction of large binational hydroelectric power projects on the Paraná River along the eastern frontier bordering Argentina and Brazil.

Paraguay's real GDP in 1981 was estimated to have increased 8.5% above that of 1980 to an estimated $5.5 billion at current prices.[4] Inflation decreased, owing to stable oil prices in 1981, to an annual rate of 15% from the 22% annual rate in 1980. The prospects for continued good growth in 1982 appeared favorable.

The construction of the Itaipú hydroelectric powerplant, located on the Paraná River approximately 8 miles upriver from the international bridge connecting Ciudad Presidente Stroessner with Foz de Iquazú, continued on schedule with about 80% of the civil works having been completed by yearend. The first electrical generation was expected to begin in mid-1983.

When the Itaipú Treaty was signed in 1973 with Brazil, the official estimated cost of the project was $2 billion. As construction of the dam progressed, the official estimated cost continued to increase at a rapid rate. In midyear, the latest official estimate of the cost was given as $12.7 billion. However, by the time the project is completed in 1988, the final cost is estimated, by sources close to the project, to be between $15 and $18 billion, owing, in part, to the burden of high interest rates that prevailed in world financial markets. Thus, the estimated cost, approximately 29 mils per kilowatt-hour, of the electrical power to be generated by Itaipú continued to rise, although still projected to be only about one-third of the cost of thermopower, approximately 96 mils per kilowatt-hour, generated in Brazil.

The plant will have an installed capacity of 14,000 megawatts, generating 80,000 gigawatt-hours of electricity per year. According to the terms of the treaty with Brazil, any power that Paraguay does not buy from Itaipú Binacional, the binational entity that will operate the Itaipú plant through joint ownership, must be sold to Brazil. Paraguay cannot sell any to a third country, and Brazil must buy all the power that is available for sale, including that portion of the share that Paraguay does not consume. Paraguay was expected to export, at least initially, almost all of its 50% share of the electricity generated at Itaipú, since the development of energy-intensive industries in Paraguay have not yet been constructed. Once completed, the energy provided by Itaipú will be equivalent to almost 500,000 barrels of fuel oil per day.

The construction of the Yacyretá hydroelectric plant, a binational project with Argentina located about 80 kilometers down the Paraná River from the towns of Encarnación and Posadas, was 3 years behind schedule by yearend. Its first power was expected to be generated in 1988, in lieu

of 1985 as originally planned. Besides providing hydroelectric energy, this project will improve navigation on the Paraná River by flooding the Apipé rapids, provide both Paraguay and Argentina with irrigation facilities, promote the fishery industry of the region, and increase tourism.

The plant will have an installed capacity of 4,000 megawatts, generating 26,000 gigawatt-hours per year. The estimated cost of the project was $10 billion.

The Yacyretá Treaty stipulates that the energy produced will be shared equally between Paraguay and Argentina, with preferential rights given to each on the purchase of the electrical energy not used by the other to meet domestic demand. Argentina must buy all of the power that is available for sale, including that portion of the share that Paraguay does not consume.

The feasibility study of the Corpus binational hydroelectric project with Argentina was scheduled to be completed in June of 1982. This project, similar to Itaipú although smaller, was to be located on the Paraná River at Itacuá, 8 miles upriver from the towns of Encarnación and Posadas. The planned installed capacity was 4,000 megawatts, the same as that of Yacyretá. However, the estimated cost for construction is only one-half, $5 billion, of that of Yacyretá owing to the more favorable condition of the damsite.

The Corpus project is almost a complement of the Yacyretá project, and its construction could depend upon Yacyretá's completion. According to preliminary estimates, Corpus could generate its first electrical power in 1992, if construction of the main civil works begins in 1986.

The Itati binational hydroelectric project, also to be executed with Argentina, was still in the prefeasibility stage in 1981. However, as it would help optimize the generating capacity at Yacyretá by regulating waterflow, it is almost certain to be built when Yacyretá is completed. The Itati project, to be located 210 kilometers downriver from Yacyretá, was projected to have an installed capacity of about 1,200 megawatts. The construction cost was estimated at $1.5 billion.

The prefeasibility study conducted by the World Bank on the possible expansion of the Petróleos Paraguayos S.A. petroleum refinery at Villa Elisa was not completed in 1981. However, construction of additional storage capacity at the refinery was awarded to Consorcio de Ingeniería Electromecánica, S.A., a private sector Paraguayan enterprise. The contract had not been signed by yearend.

The state-owned Industria Nacional del Cemento was authorized by the Government, based on feasibility studies completed in 1980, to increase the capacity of its only operating cement plant at Puerto Vallemi from 200,000 to 400,000 tons per year to meet the increasing demand of the construction industry. A contract was awarded to a French group, led by Bureau Central Pour Les Equipments Outre-Mer, for the construction of Paraguay's second cement plant. The plant, scheduled to be completed in 1984, was to be located 485 kilometers north of Asunción. Production was to be 600,000 tons of cement per year.

Aceros del Paraguay, S.A. (ACEPAR), continued its construction of Paraquay's first steel mill during 1981 at Villa Hayes, 20 kilometers north of Asunción, on the Paraguay River. The facility, consisting of one basic oxygen-process blast furnace, was scheduled to produce 100,000 tons of steel ingots, billets, bars, reinforcing rods, wire, light angles, and other construction materials beginning in 1983. ACEPAR is a joint venture comprised of Siderúrgia Paraguaya, a Paraguayan Government enterprise administered by the Ministry of Defense, 60% ownership; the Brazilian consortium Empresa Brazileña, F.L.M., 39%; and the Brazilian firm of Técnica Nacionál de Engenhariá, S.A., 1%. The latter is responsible for the construction and erection of the facility.

A mineral agreement between the Government and the U.S. firm UNC Teton Exploration Inc., a subsidiary of UNC Resources Inc., was formally accepted in late 1981. The agreement extends exclusive rights to explore and develop nonfuel minerals in the Chaco, the 24-million-hectare western region, to UNC Teton. Based on preliminary evaluations using satellite imagery, oil exploration data, and onsite geological observations, there is potential for uranium, bauxite, precious metals, and brine-associated minerals.

The Instituto de Pesquisas Tecnológicas, of São Paulo, Brazil, reportedly was contracted to survey all of Paraguay to identify valuable mineral deposits.

SURINAME

The bauxite industry continued to be the backbone of the Surinamese economy. Three companies were involved in the bauxite industry in Suriname during 1981, two of which, the Suriname Aluminum Co. (SURALCO), a wholly owned subsidiary of the Aluminum Co. of America, and Suriname N.V., Billiton Maatschappij, part of the Royal Dutch/Shell Group, have been established in the country for many years. The third company, N.V. Grassalco, the state-owned mining company, was charged with opening up the unexploited bauxite deposits in the Bakhuys region of western Suriname, although the development in that region was stymied throughout the year. SURALCO owns and operates the country's only alumina refinery and aluminum smelter, although plans have been under formulation for several years to construct a new alumina plant, to be owned by Grassalco, at Apoera on the Corantijn (Courantyne) River. The new plant would be part of the project to develop western Suriname. However, these development plans have apparently been abandoned for the near future.

Although Suriname was the world's sixth largest producer of bauxite, the worldwide recession in the aluminum industry, the growing production-cost competition from Australia, Brazil, and Guinea, and the demands for significantly higher wages by the bauxite labor union aided in decreasing the 1981 estimated production to 20% below the 1980 level. In spite of the cancellation of a 600,000-ton-per-year bauxite purchase contract by the Ormet Corp. of the United States on July 1, the United States continued to receive the major part of the bauxite mined in Suriname during 1981.

Production of alumina in 1981 was estimated to have decreased about 9% from that of 1980. However, shipments to the United States increased to 2.2 million tons, over 315% above the 1980 level, enabling the United States to replace Europe as the principal buyer of Suriname's alumina. About 90% of Suriname's alumina production was exported; the remainder was smelted at the SURALCO plant at Paranam. Production of aluminum metal decreased 24% from that of 1980 and was equal to about one-half of 1979 production.

Suriname's relatively minor gold production was mined exclusively by individual prospectors, using labor-intensive methods. Although gold mining in Suriname began more than a century ago, production has been steadily declining since about 1910, when the maximum production was about 32,000 troy ounces. The Lawa River gold deposits, discovered in 1885, have accounted for one-half of all the gold ever recovered in Suriname.

As a result of the agreement signed in 1980 between the Government of Suriname and Gulf Oil Co., Gulf began exploration drilling in the Saramaca district in mid-year. Suriname had no petroleum or natural gas production during the year. Imports of petroleum products were distributed by Esso Standard Oil, S.A., Ltd., Texaco, Inc., and Royal Dutch/Shell.

URUGUAY

Uruguay's economic growth, following the general recessionary trend that existed throughout Latin America, fell by only 1.3% in 1981, after sustaining an average annual real growth rate of 4.5% over the 6-year period ending in 1980. Owing to Uruguay's anti-inflationary policy of maintaining an overvalued exchange rate and progressive reductions in import tariffs, a further deceleration in overall economic activity was expected in 1982. The inflation rate declined again, for the third consecutive year, to 29% in 1981, according to official figures, somewhat lower than the 35% projection.

A reduction in the trade deficit to $346 million[5] in the first 10 months of 1981 from $567 million in the corresponding period of 1980 resulted from a 23% increase in exports to $994 million and a decline in imports of 2.5% to $1.34 billion. Expenditures on imported oil decreased 15% to an estimated $360 million in 1981. Crude oil imports accounted for about 27% of total imports. The Administración Nacional de Combustibles, Alcohol, y Portland (ANCAP) announced the signing of an annually renewable contract, effective on October 1, 1981, for the purchase of 10,000 barrels per day of crude petroleum from Mexico, an

estimated 25% of Uruguay's requirements.

The mineral industry was of minor importance to Uruguay's economy and continued to be concentrated in the nonmetallic sector in 1981.

Uruguay had four operating cement plants with a total production capacity of 845,000 tons per year. Two of the plants were owned by ANCAP, one located in Minas with a capacity of 240,000 tons per year and the other located in Paysandu with a capacity of 270,000 tons per year. The Paysandu plant had its annual capacity increased from 120,000 tons early in the year. The Cía. Uruguaya de Cemento Portland plant, owned by Lone Star Mining Corp. of the United States and located just outside of Montevideo, had an installed capacity of 300,000 tons per year. The fourth and smallest plant, with a capacity of 35,000 tons per year, was owned by Cía. Nacional de Cementos S.A.

Reportedly, no modification or additions to these plants were expected over the next few years.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Ecuadorean sucres (S/) to U.S. dollars at the rate of S/25=US$1.00.

[3]Where necessary, values have been converted from Guyanese dollars (G$) to U.S. dollars at the rate of G$3=US$1.00.

[4]Where necessary, values have been converted from the Paraguayan guarani (G) to U.S. dollars at the rate of G126=US$1.00.

[5]Where necessary, values have been converted from the Uruguayan peso (Ur$) to U.S. dollars at the rate of Ur$11.594=US$1.00 as of Dec. 31, 1981.

The Mineral Industry of Other South Pacific Islands

By Charlie Wyche[1]

CONTENTS

FIJI

Principal mineral products in the Dominion of Fiji were gold, silver, pit and quarry construction materials, and cement. In 1981, the combined value of these commodities accounted for about $11.6 million,[2] over 85% of the total value of mineral output. Production of cement, sand and gravel, and quarry products increased substantially above the 1980 level.

Mining based on gold production was decreasing, and employment in the industry was declining. The better grade deposits in the one active mine were worked out, and only another 10 years' production at current rates was estimated to remain. While the high world gold price of 1979-80 led to intensive exploration, there has been little success.

High hopes were held for copper production. Exploratory results had proved sufficiently attractive for a mining agreement to be negotiated, but subsequent reports showed low-grade deposits. In view of the poor outlook for world copper prices, the project has been stopped. The prospects for domestic oil production were improved. After initially promising results, two test wells have proved inconclusive; however, another test well was being drilled. On a smaller scale, exploitable resources of marble, pumice, and phosphates have been found.

Mineral exploration has been carried out by American, Australian, British, Canadian, West German, and South African companies since the early 1960's, and a high level of activity was maintained throughout 1981. At Mount Kasi on Vanua Levu, an extensive program of geological sampling and mapping was being conducted, and drilling was taking place at some base metal prospects in the south-central parts of Viti Levu. Also, high gold values in surface samples were reported at Vuda in western Viti Levu. Total expenditures by mining companies on land-based projects exceeded $6 million in 1981.

As in previous years, most activity was on the main island of Viti Levu. However, there was an increase in previously less well prospected islands. In the Namosi district of southeast Viti Levu, exploration and development work have indicated several occurrences of porphyry copper, molybdenum, and gold mineralization. In south and central Viti Levu, geological mapping and geophysical surveys were completed over areas containing small massive sulfide copper-zinc deposits. In western Viti Levu, gold mineralization was reported and systematic sampling was commenced, but the presence of economic mineralization has yet to be demonstrated.

Table 1.—Other South Pacific Islands: Production of mineral commodities[1]

Area and commodity	1977	1978	1979	1980[p]	1981[e]
FIJI					
Cement, hydraulic metric tons	77,488	82,000	96,000	82,883	[2]92,171
Gold, mine output, metal content troy ounces	49,067	28,065	25,656	23,939	30,594
Lime[3] metric tons	1,997	835	1,308	2,128	4,270
Silver, mine output, metal content troy ounces	14,695	10,415	10,656	6,768	8,057
Stone, sand and gravel:					
Coral sand for cement manufacture metric tons	107,861	88,104	120,000	105,436	93,514
River sand for cement manufacture do.	41,494	59,515	70,683	30,631	27,307
River sand and gravel, n.e.s cubic meters	562,898	310,041	367,700	370,000	375,000
Quarried stone do.	107,698	[e]120,000	205,071	274,000	210,000
Tellurium metal kilograms	[e]12,250	[e]22,700	[e]22,700	11,350	--
KIRIBATI[4]					
Phosphate rock (all produced on Banaba Island, formerly Ocean Island) thousand metric tons	446	465	420	--	--
NAURU[4]					
Phosphate rock[5] do.	1,146	1,999	1,828	2,087	[2]1,480
NEW CALEDONIA					
Cement metric tons	50,605	55,000	56,650	55,927	56,000
Chromite, gross weight do.	8,310	8,229	12,407	2,188	3,000
Cobalt, mine output:					
Content by analysis[6] do.	3,127	1,798	2,219	2,239	2,000
Recovered[e 7] do.	110	155	210	180	140
Nickel:					
Ore:					
Gross weight thousand metric tons	5,892	3,349	4,300	4,571	3,860
Metal content[8] metric tons	[r]113,319	[r]65,171	80,464	86,592	[2]74,483
Metallurgical products:					
Ferronickel:					
Gross weight do.	119,357	77,908	123,306	132,300	115,600
Metal content (nickel plus cobalt) do.	28,283	19,889	30,373	32,580	[2]27,989
Nickel matte:					
Gross weight do.	30,071	22,521	16,282	20,550	20,425
Metal content (nickel plus cobalt) do.	23,038	17,103	12,262	15,479	[2]15,380
Stone, sand and gravel:					
Stone:					
Crude (unspecified) cubic meters	34,700	26,000	104,051	104,051	NA
Crushed do.	80,500	166,000	73,435	140,079	NA
Sand do.	70,000	63,000	67,797	95,814	NA
Silica (for metallurgical use) do.	40,800	12,405	15,683	12,375	NA
PAPUA NEW GUINEA[4]					
Copper, mine output, metal content metric tons	182,291	198,603	170,788	146,813	[2]165,420
Gold, mine output, metal content troy ounces	739,730	751,265	630,496	451,707	[2]540,325
Silver, mine output, metal content do.	1,522,750	1,680,800	1,428,480	1,180,000	[2]1,362,804
SOLOMON ISLANDS[4]					
Gold do.	372	[e]400	1,076	1,093	[2]1,050
Silver do.	NA	NA	115	161	[2]150
VANUATU					
Manganese:					
Ore metric tons	153,000	133,000	112,400	--	--
Concentrate do.	23,040	20,732	10,544	--	--

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through July 26, 1982.

[2]Reported figure.

[3]Produced from an unreported amount of domestically quarried limestone.

[4]In addition to the commodities listed, crude construction materials (common clays, sand and gravel, and stone) are produced, but output is not reported quantitatively and available general information is inadequate to make reliable estimates of output levels.

[5]Data represent exports.

[6]Total cobalt content of nickel ores mined based on average nickel-cobalt ratio in metallurgical products for 1880-1972.

[7]Cobalt actually recovered for use as cobalt; excludes cobalt content of nickel-cobalt alloys and/or included in ferronickel.

[8]Nickel-cobalt content of ore produced as reported by New Caledonia's Mines Service. Of the total, about 97.323% is nickel; the balance is cobalt (based on average nickel-cobalt ratio in metallurgical products for 1880-1972).

At Mount Kasi on Vanua Levu, where gold has been mined, the diamond drilling program was completed. Again, no major new ore extensions were reported, but based on the drilling results and on detailed surveys in the area, some followup work was planned.

Four offshore oil exploration licenses were in force to U.S. oil companies in areas of the Fiji Platform known as Bligh Water,

Yasawa, Lomaiviti, and Great Sea Reef. The Mineral Resources Department's research vessel *RV Bulikula* was used on charter to carry out detailed surveys in Bligh Water. This work, together with further interpretation of geophysical and geochemical data, defined targets for a drilling program by Chevron Overseas Inc. that commenced in mid-1980.

COMMODITY REVIEW

Metals.—*Copper.*—Copper Resources Ltd. (a subsidiary of Conzinc Riotinto of Australia Ltd.) delivered a full report to the Fijian Government on the economics of the Namosi copper deposits on Viti Levu. In its report, the company informed the Government that the deposits were currently uneconomical, in view of this copper content and the current forecast for copper prices. As a result of the prefeasibility study's findings, the venturers (also including Anglo Pacific Ltd., a subsidiary of Australian Anglo American Ltd., and Preussag Fiji Ltd. of the West German Preussag Group) decided against undertaking a full feasibility study. The deposit remains a significant potential resource, and the companies have indicated to the Fijian Government that they wish to retain their special prospecting license. The study, which included diamond drilling and geological sampling, indicated an ore body of 450 million tons at 0.4% to 0.5% copper. The study also indicated that the deposit was minable by open pit methods, with a waste-to-ore ratio of about 2:1.

Gold.—Emperor Gold Mining Co. Ltd., the wholly owned operating subsidiary of Emperor Mines Ltd., mined sulfotelluride gold ores at Vatukoula on the north coast of Viti Levu. During 1981, the company employed about 700 men to mine and treat 300,000 tons of ore and recovered 30,600 troy ounces of gold and 8,060 troy ounces of silver. The high mine production as compared with that of 1980 was due to the company's decision to increase the underground work force and the absence of industrial disputes.

Emperor Mining made a complete recalculation of reserve tonnages and grade during the year; as of June 30, the total underground reserves using a cutoff grade of 0.2 ounce per ton stood at 900,000 tons of measured ore at an average grade of 0.29 ounce per ton. Indicated ore reserves totaled 187,000 tons at an average grade of 0.25 ounce per ton. Indicated reserves in the open pit amounted to 71,000 tons at an average grade of 0.20 ounce.

When gold prices reached a record high several years ago, a number of companies took out prospecting licenses and continued to work in Fiji. Altherton Antimony NL reported that the Vuda gold prospect produced an average assay of 0.20 ounce per ton of gold across a 9-meter width. Pacific Energy and Minerals Co. of Golden, Colo., continued exploring the inland areas of Viti Levu near the Vatukoula gold mine. Consolidated Goldfields of Australia was prospecting on the islands of Kadavu and Ono, where gold traces have been reported.

Nonmetals.—Emperor Gold Mines continued to produce burnt lime from its limestone quarry at Tau but did not report production. The number of sand and gravel licenses granted continued to increase.

Fiji Industries Ltd. dredged 200,000 tons of coral sand from Suva Harbor and 70,000 tons of common sand and gravel from the Rewa River and tributaries in 1981. Several tons of quarried stone were also recovered.

The Government's Mineral Resources Division continued evaluating a phosphate clay deposit on the Island of Tuvutha, where 1.5 million tons of 10% P_2O_5 was reported.

Mineral Fuels.—*Petroleum.*—Mapco Ltd. and Pacific Energy and Minerals Co. continued drilling for oil in Fiji. Drilling began in the Bligh Waters in 1980, and other areas scheduled for drilling include Yasawa, Lomaiviti, and Great Sea Reef.

Table 2.—Fiji Islands: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, unwrought and semimanufactures	7	17	--	New Zealand 15.
Copper metal including alloys:				
Waste and scrap	234	111	--	All to Australia.
Unwrought and semimanufactures	10	22	--	Mainly to Australia.
Gold:				
Ore and concentrate value	--	$380	--	All to Australia.
Waste and sweepings do	$17,054	$12,173	--	All to Singapore.
Bullion troy ounces	29,069	25,013	--	All to Australia.
Metal including alloys, unwrought and partly wrought do	622	64	--	Do.
Iron and steel metal:				
Waste and scrap	1,192	1,771	--	New Zealand 1,245; Australia 378; Japan 148.
Steel, primary forms	10	34	1	Tuvalu 18; New Zealand 11.
Semimanufactures[1]	959	736	--	Tonga 232; Western Samoa 128; Wallis and Futuna Islands 105.
Lead metal including alloys:				
Waste and scrap	82	124	--	Australia 72; Japan 52.
Unwrought	16	304	--	All to Australia.
Semimanufactures value	--	$3,268	--	Tuvalu $2,313; Western Samoa $954.
Silver:				
Waste and sweepings do	$2,394	$3,058	--	All to Hong Kong.
Bullion troy ounces	10,915	7,450	--	All to Australia.
Metal including alloys, unwrought and partly wrought value	$11,127	--		
Tin metal including alloys, semimanufactures do	--	$800	--	Gilbert Islands $538; Tuvalu $226.
Titanium: Oxides and hydroxides	--	2	--	All to Western Samoa.
Zinc metal including alloys:				
Unwrought kilograms	47	--		
Semimanufactures value	$41,124	$9,733	--	All to Wallis and Futuna Islands.
Other:				
Ores and concentrates	--	1	1	
Ash and residue containing nonferrous metals	65	51	1	Australia 50.
Oxides, hydroxides, peroxides kilograms	--	845	--	New Zealand 840; Western Samoa 5.
NONMETALS				
Abrasives, n.e.s.:				
Grinding and polishing wheels and stones value	$541	$911	$16	Tuvalu $793; Australia $86.
Natural and artificial powders and grains do	$24	$44	--	All to Tuvalu.
Cement	3,310	1,820	--	American Samoa 709; Tuvalu 393; Tonga 305.
Chalk kilograms	100	290	--	All to New Zealand.
Clays and clay products:				
Crude clays	(2)	44	43	Tonga 1.
Products:				
Nonrefractory value	$19,632	$6,822	--	Tonga $5,483; Tuvalu $1,338.
Refractory including nonclay brick do	$1,934	$1,869	--	Wallis and Futuna Islands $1,670.
Diatomite and other infusorial earth	--	2	--	All to Australia.
Fertilizer materials, manufactured kilograms	150	5	--	All to Tuvalu.
Graphite, natural do	--	12	--	All to Tonga.
Lime	--	1	--	All to Tuvalu.
Precious and semiprecious stones, except diamond value	$80,885	$289	--	All to New Caledonia.
Salt and brine	8	6	--	Tuvalu 3; Line Islands 2.
Sodium and potassium compounds, n.e.s.:				
Caustic soda kilograms	--	16	--	All to Tonga.
Stone, sand and gravel:				
Dimension stone, worked value	$967	--		
Gravel and crushed rock	1	86	82	Tonga 4.
Sand excluding metal-bearing	5	128	--	Tuvalu 87; Tonga 41.
Sulfur: Sulfuric acid, oleum value	$125	$237	--	Tuvalu $169; Gilbert Islands $34.
Other:				
Crude	--	17	--	All to Australia.
Oxides, hydroxides, peroxides value	$2,916	$604	--	Western Samoa $328; Tonga $276.
Slag, dross, ash, not metal-bearing:				
From iron and steel manufacture	5	--		
Unspecified	21	12	--	All to Australia.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals value	--	$252	--	All to Tuvalu.
Unspecified do	$60,524	$1,466	--	Western Samoa $844; Tuvalu $276.

See footnotes at end of table.

Table 2.—Fiji Islands: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	20	--	All to American Samoa.
Hydrogen, helium, rare gases	3	9	--	Gilbert Islands 8.
Petroleum refinery products:				
Nonbunker:				
Gasoline:				
Motor, 42-gallon barrels	134,048	129,365	--	New Hebrides 35,403; Western Samoa 26,803; Tonga 24,894.
Aviation, do.	12,896	20,303	--	New Hebrides 7,314; Cook Islands 4,659; Tonga 2,716.
Kerosine, do.	40,409	55,914	--	Tonga 16,437; Western Samoa 14,376; New Hebrides 13,085.
Jet fuel, do.	97,256	120,131	--	Australia 34,475; Tonga 25,927; Western Samoa 15,066.
Distillate fuel oil, do.	178,724	208,934	--	New Hebrides 45,083; Tonga 43,455; Western Samoa 33,228.
Lubricants, do.	420	281	--	Tuvalu 104.
Other:				
Liquefied petroleum gas, do.	642	71	--	Gilbert Islands 64.
Naphtha, do.	3,235	1,937	--	Tonga 981; Western Samoa 956.
Unspecified, do.	57	45	--	Tonga 25; Tuvalu 9.
Bunker:				
Gasoline:				
Motor, do.	358	605	--	NA.
Aviation, do.	883	170	--	NA.
Jet fuel, do.	562,613	553,534	--	NA.
Distillate fuel oil, do.	159,377	151,149	--	NA.
Residual fuel oil, do.	49,284	63,432	--	NA.
Lubricants, do.	735	1,195	--	NA.
Unspecified, do.	30	12	--	NA.

NA Not available.
[1]Totals exclude unreported quantities valued at $236,800 in 1979 and $9,500 in 1980.
[2]Less than 1/2 unit.

Table 3.—Fiji Islands: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, unwrought and semimanufactures	448	380	1	New Zealand 209; Australia 130; Hong Kong 25.
Copper metal including alloys:				
Scrap, kilograms	9,849	31	--	Australia 30; New Zealand 1.
Unwrought and semimanufactures	93	114	4	Australia 54; New Zealand 27; United Kingdom 24.
Gold:				
Waste and sweepings, value	--	$324	--	All from New Zealand.
Metal including alloys, unwrought and partly wrought, troy ounces	1,517	411	--	Singapore 193; Australia 187; Canada 19.
Iron and steel metal:				
Scrap	(1)	7	--	All from Australia.
Pig iron, cast iron, powder, shot	68	102	--	Australia 34; Japan 33; Hong Kong 32.
Ferroalloys	6	14	--	Australia 10; New Zealand 4.
Steel, primary forms	9,025	11,221	37	Japan 5,049; Australia 4,906; West Germany 997.
Semimanufactures:				
Bars, rods, angles, shapes, sections	7,399	6,827	1	New Zealand 3,519; Japan 1,712; Australia 837.
Universals, plates, sheets	10,295	11,422	6	Australia 4,952; New Zealand 3,088; Japan 2,609.
Hoop and strip	363	1,703	--	Australia 1,652; New Zealand 46.
Rails and accessories, value	$146,897	$209,474	--	Australia $162,089; United Kingdom $33,330.
Wire	2,229	3,579	(1)	Australia 2,711; New Zealand 732; China 66.
Tubes, pipes, fittings[2]	4,066	5,732	13	Australia 3,071; Japan 1,119; Taiwan 557.
Castings and forgings, rough	1	5	--	Australia 2; United Kingdom 2.

See footnotes at end of table.

Table 3.—Fiji Islands: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS —Continued				
Lead metal including alloys:				
Scrap kilograms	--	50	--	All from Australia.
Unwrought and semimanufactures value	$190,762	$259,212	$18	New Zealand $111,723; United Kingdom $88,057; Australia $52,604.
Magnesium metal including alloys, unwrought do	--	$13	--	All from Australia.
Nickel:				
Matte, speiss, dross kilograms	--	150	--	All from New Zealand.
Metal including alloys, unwrought and semimanufactures do	284	400	--	Australia 326; Switzerland 74.
Platinum-group metals including alloys, unwrought and wrought troy ounces	19	6	--	All from United Kingdom.
Silver metal including alloys:				
Bullion	42	6	--	All from Australia.
Unwrought and partly wrought value	$8,428	$25,568	--	Australia $21,139; New Zealand $4,429.
Tin metal including alloys:				
Scrap kilograms	1	1	--	All from New Zealand.
Unwrought and semimanufactures value, thousands	$1,735	$1,415	--	Japan $1,320; Australia $63; New Zealand $17.
Titanium: Oxides and hydroxides	264	211	--	Australia 157; West Germany 54.
Zinc metal including alloys:				
Scrap kilograms	1,466	8	--	Australia 5; New Zealand 3.
Unwrought	66	76	--	Mainly from Australia.
Blue powder value	$55,224	$60,466	--	Australia $53,381; New Zealand $5,676; United Kingdom $1,409.
Semimanufactures do	$21,599	$37,678	--	Australia $28,963; New Zealand $5,729; United Kingdom $2,986.
Other:				
Ores and concentrates kilograms	--	305	--	United Kingdom 300; New Zealand 5.
Ash and residue containing nonferrous metals	52	18	--	Mainly from United Kingdom.
Oxides, hydroxides, peroxides	54	60	1	Australia 31; West Germany 9; Norway 8.
Metals including alloys, unwrought and semimaufactures value	--	$131	--	All from Australia.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc	(1)	5	--	Mainly from United Kingdom.
Grinding and polishing wheels and stones value, thousands	$133	$126	$2	Australia $46; New Zealand $45; United Kingdom $17.
Natural and artificial powders and grains do	$125	$151	$2	New Zealand $67; Australia $66; Switzerland $6.
Asbestos, crude kilograms	273	25	--	All from Australia.
Barite and witherite	31	129	2	Australia 113; West Germany 7.
Cement	50	785	332	Thailand 309; New Zealand 96.
Chalk	161	143	(1)	New Zealand 94; United Kingdom 36; Australia 13.
Clays and clay products:				
Crude clays	149	244	188	Australia 39; New Zealand 15.
Products:				
Nonrefractory value, thousands	$737	$782	$28	United Kingdom $166; Japan $126; New Zealand $117.
Refractory including nonclay brick do	$510	$389	--	Australia $231; Japan $110; New Zealand $41.
Cryolite and chiolite kilograms	--	200	--	All from New Zealand.
Diamond, industrial do	2,231	--	--	
Diatomite and other infusorial earth	91	81	43	Japan 20; Australia 15.
Fertilizer materials:				
Crude:				
Nitrogenous	6	--		
Potassic	(1)	12	--	United Kingdom 10; Australia 2.
Manufactured:				
Nitrogenous	45,114	40,979	4	Japan 25,571; Republic of Korea 15,032.
Phosphatic	10,286	9,309	--	New Zealand 9,184; Australia 125.
Potassic	2,241	2,767	--	New Zealand 2,705; United Kingdom 10.
Other including mixed	428	639	1	Australia 252; Japan 140; West Germany 100.
Graphite, natural kilograms	1,486	105	--	All from Australia.
Gypsum and plasters	537	122	--	Australia 106; New Zealand 8; Taiwan 5.
Lime	229	73	(1)	New Zealand 43; United Kingdom 30.
Magnesite	--	4	--	Mainly from New Zealand.

See footnotes at end of table.

Table 3.—Fiji Islands: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Mica:				
Crude including splittings and waste	3	5	--	Australia 4.
Worked including agglomerated splittings value	$118	$1,114	--	Australia $735; New Zealand $379.
Precious and semiprecious stones except diamond do	$89,547	$40,700	$5,590	New Zealand $21,244; Australia $6,334; Netherlands $3,636.
Pyrites, unroasted kilograms	14	--	--	
Salt and brine	3,043	2,272	19	West Germany 1,093; Netherlands 388; United Kingdom 239; New Zealand 238.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	1,042	1,591	23	United Kingdom 1,370; New Zealand 179.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	--	3	--	All from New Zealand.
Worked value	$31,968	$52,326	$1,347	Republic of South Africa $24,621; New Zealand $15,416.
Dolomite, chiefly refractory grade	--	5	--	All from New Zealand.
Gravel and crushed rock	15	2	1	New Zealand 1.
Quartz and quartzite	1	2	--	Australia 1; New Zealand 1.
Sand excluding metal-bearing	139	80	--	New Zealand 76; Australia 3.
Sulfur:				
Elemental:				
Other than colloidal	2	3	--	Mainly from New Zealand.
Colloidal kilograms	1	1	--	All from New Zealand.
Sulfuric acid, oleum value	$74,003	$119,075	$108	United Kingdom $43,516; Australia $39,369; New Zealand $33,450.
Talc, steatite, soapstone	9	10	--	New Zealand 7; Australia 3.
Other:				
Crude	(1)	9		Australia 5; New Zealand 4.
Slag and dross, not metal-bearing:				
From iron and steel manufacture kilograms	720	--		
Unspecified	(1)	11	--	All from India.
Acids and oxides value	$96,998	$135,156	$3,028	Australia $75,369; New Zealand $30,355.
Activated minerals, natural do	$66,378	$82,739	$28,257	Japan $53,629; Australia $853.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals do	$885,732	$723,305	--	New Zealand $631,633; Australia $68,537.
Unspecified do	$203,303	$374,600	$3,883	Australia $159,109; United Kingdom $106,169.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,881	652	--	Japan 343; New Zealand 309.
Carbon black and retort carbon kilograms	1	--		
Coal, all grades including briquets and coke	23,124	21,141	1	Australia 21,132; New Zealand 8.
Hydrogen, nitrogen, rare gases	31	62	31	Australia 20; United Kingdom 11.
Petroleum and refinery products:				
Crude and partly refined 42-gallon barrels	3	1	--	All from New Zealand.
Refinery products:				
Gasoline:				
Motor thousand 42-gallon barrels	527	473	--	Australia 249; Singapore 224.
Aviation do	34	19	--	Trinidad and Tobago 8; Netherlands Antilles 7; Australia 4.
Kerosine do	173	160	--	Singapore 81; Australia 79.
Jet fuel do	786	641	--	Australia 437; Singapore 196.
Distillate fuel oil do	1,296	1,425	--	Singapore 747; Australia 678.
Residual fuel oil do	126	133	--	Australia 100; Singapore 33.
Lubricants do	39	29	(1)	Australia 24; New Zealand 5.
Other:				
Liquefied petroleum gas do	32	31	(1)	Mainly from Australia.
Naphtha do	25	22	(1)	Singapore 14; Australia 8.
Unspecified do	3	5	(1)	New Zealand 1; Singapore 1.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals value	$76,392	$80,441		New Zealand $54,261; Australia $14,771; Singapore $7,154.

[1]Less than 1/2 unit.
[2]Totals exclude unreported quantities valued at $958,486 in 1979 and $1,732,800 in 1980.

NAURU AND KIRIBATI

The Republic of Nauru and Kiribati lies halfway between Honolulu, Hawaii, and Melbourne, Australia. Kiribati, the former British colony consisting of Ocean Island, Gilbert Islands, Line Islands, and Phoenix Islands, became independent on July 12, 1979.

Phosphate rock production by Nauru Phosphate Corp. totaled 2.0 million tons in 1981; no production was reported from Kiribati. Nauru exported 66% of its total output to Australia, 24% to New Zealand, and the remaining 10% to Japan and the Republic of Korea. The price for Nauru's phosphate generally follows Florida price trends, with allowance for quality.

As most of the phosphate was mined from between limestone pinnacles using grab buckets, methods were being investigated to recover the residual phosphate, estimated at 6% to 7% of the total.

Present reserves of phosphate rock in Nauru were estimated at 34 million tons.

Table 4.—Nauru: Exports of phosphate rock, by destination

(Thousand metric tons)

Destination	1979	1980
Australia	1,315	1,381
Indonesia	16	--
Japan	110	123
Korea, Republic of	66	82
New Zealand	321	501
Total	1,828	2,087

NEW CALEDONIA

The French island territory of New Caledonia was the second largest producer of nickel in the market economy countries in 1981. Output of nickel by Société Métallurgique le Nickel (SLN), New Caledonia's only producer, declined in 1981 as a result of lower world demand throughout most of the year. In addition to nickel products of nickel matte and ferronickel, byproduct cobalt matte resulting from nickel smelting operations was produced by SLN. Other minerals produced in New Caledonia included chromite and pit quarry construction materials.

Nickel ore was produced at four major locations, Thio, Kouaoua, and Poro, near the east coast, and Népoui, near the west coast. Work to expand output at Népoui to 2 million tons of ore per year and at Kouaoua to 1.5 million tons per year was almost completed. Production of nickel ore totaled about 4.1 million tons in 1981.

In 1979, operations of SLN's refinery were severely affected by a fire, but it has operated normally for the past several years. The 1981 output of the metallurgical products, nickel matte and ferronickel, declined from the 1980 level.

The cobalt content of the nickel ore mined in New Caledonia during 1981 was estimated at 2,000 tons, but the total recovered metal was estimated at 150 tons. The cobalt content in either the total ore production or the nickel matte was recoverable as cobalt or cobalt chemicals.

Inco Ltd. of Canada has announced that it has agreed to develop a chromite mining and processing facility at Tiebaghi in the northern part of New Caledonia in partnership with two French companies. The two French companies are Banque de Paris and Compagnie Minière Dong-Trieu, and the venture is scheduled to start production in mid-1982. Inco will hold 55% of the equity in the new operation with Banque de Paris holding 22.5%. Dong-Trieu will be the head member of a joint company to be formed with another French concern which will hold the remaining 22.5%. The deposit was outlined by exploration work begun in 1976 by three companies, and development of the project will involve a $14 million investment.[3] Initial plans for the operation are the production of 450 tons of ore per day, which will provide feed to a nearby processing plant with an annual capacity of about 110,000 tons. The reduction plant has a capacity of about 85,000 tons annually of

chromite products.

Also, Inco, under agreement with the New Caledonian Government, continued studying the possibility of development of lateritic nickel deposits in the southern part of the island. Inco will be required to take a French partner before the project reaches the development stage.

Energy requirements were considered a potential problem since New Caledonia has no domestic energy resources. All fuel oil was imported to New Caledonia, and there were no known domestic energy resources except for the possibility of developing hydroelectric energy sources in the Plaine de Lacs area. SLN used 85% of the industrial electricity in its mining and smelting operations.

Table 5.—New Caledonia: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Destinations, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, unwrought and semimanufactures	15	(1)	--	All to Wallis and Futuna Islands.
Copper:				
Matte, dross, scalings	131	208	--	All to Australia.
Metal including alloys, semimanufactures	10	1	--	Mainly to Wallis and Futuna Islands.
Iron and steel metal:				
Scrap	5	2,453	--	Japan 2,162; New Zealand 275; Vanuatu 16.
Ferroalloys:				
Ferromanganese	178,577	--	--	
Unspecified	--	128,796	12,787	France 106,553; Japan 8,145; Singapore 1,097.
Steel, primary forms	5	--	--	
Semimanufactures	75	246	--	Wallis and Futuna Islands 178; France 51.
Lead metal including alloys, unwrought	10	6	--	All to Australia.
Nickel:				
Ore and concentrate thousand tons	1,996	1,910	--	All to Japan.
Metal including alloys, unwrought	17,011	21,980	5,325	France 12,513; Japan 4,142.
Silver metal including alloys, unwrought and partly wrought value, thousands	--	$35	--	Australia $28; France $7.
NONMETALS				
Abrasives, n.e.s: Grinding and polishing wheels and stones	$1	$1	--	All to Vanuatu.
Cement	82	13	--	Wallis and Futuna Islands 12; Vanuatu 1.
Clay products:				
Nonrefractory	27	46	--	Wallis and Futuna Islands 38; Vanuatu 3.
Refractory including nonclay brick	--	8	--	Wallis and Futuna Islands 5; Vanuatu 1.
Diamond, industrial value, thousands	$1	--		
Gypsum and plasters	4	--		
Salt and brine	2	2	--	All to Wallis and Futuna Islands.
Stone, sand and gravel:				
Dimension stone, crude and worked value, thousands	$1	$3	--	Vanuatu $2; Wallis and Futuna Islands $1.
Gravel and crushed rock	--	70	--	All to Wallis and Futuna Islands.
Other:				
Crude	1	--		
Slag, dross, scalings, not metal-bearing	91	--		
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals value, thousands	$1	--		
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline 42-gallon barrels	17	26	--	All to Wallis and Futuna Islands.
Kerosine do.	16	16	--	Do.
Residual fuel oil do.	13	(1)	--	Do.
Lubricants do.	581	406	--	Wallis and Futuna Islands 203; France 28.
Liquefied petroleum gas do.	290	220	--	All to Wallis and Futuna Islands.
Bituminous mixtures do.	--	803	--	Do.

[1]Less than 1/2 unit.

Table 6.—New Caledonia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
METALS				
Aluminum metal including alloys, unwrought and semimanufactures	232	234	2	New Zealand 98; France 46; Australia 19; West Germany 19.
Chromium oxides and hydroxides	1	1	--	All from Australia.
Copper:				
Matte, dross, scalings value, thousands	--	$3	--	All from France.
Metal including alloys, semimanufactures	44	33	(1)	France 25; New Zealand 6.
Iron and steel metal:				
Scrap	--	11	--	All from Australia.
Pig iron, spiegeleisen, ferroalloys	442	140	1	Australia 77; France 61.
Steel, primary forms	1,346	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	2,384	5,162	--	France 3,521; Belgium-Luxembourg 878; New Zealand 567.
Universals, plates, sheets	3,717	5,107	--	Australia 2,509; France 1,081; New Zealand 449.
Hoop and strip	224	163	--	Australia 88; Netherlands 65.
Rails and accessories	126	4	--	All from France.
Wire	444	670	1	Australia 389; New Zealand 207.
Tubes, pipes, fittings	303	2,040	1	France 1,734; Italy 117; Belgium-Luxembourg 113.
Castings and forgings, rough	679	78	--	All from France.
Lead:				
Oxides and hydroxides	6	1	--	Do.
Metal including alloys, semimanufactures	28	29	--	France 19; Australia 9.
Silver metal including alloys, unwrought and partly wrought value, thousands	$9	$20	--	France $17; Switzerland $3.
Tin metal including alloys, unwrought and semimanufactures	1	2	(1)	Mainly from France.
Zinc metal including alloys, unwrought and semimanufactures	13	9	--	France 5; Australia 4.
Other:				
Alkali, alkaline-earth, rare-earth metals value, thousands	$1	$1	--	All from France.
Metalloids	2	--		
Metals including alloys, unwrought and semimanufactures value, thousands	$1	$1	--	All from France.
NONMETALS				
Abrasives, n.e.s.:				
Natural: Pumice, emery, corundum, etc. do	$1	$1	$1	
Grinding and polishing wheels and stones	10	8	(1)	France 4; West Germany 3.
Cement	41,497	48,098	--	Japan 46,081; New Zealand 1,726.
Clays and clay products:				
Crude clays	37	23	--	Australia 13; France 5; New Zealand 5.
Products:				
Nonrefractory	2,316	1,844	--	Italy 811; France 754; Spain 162.
Refractory including nonclay brick	5,827	5,703	36	France 2,800; Norway 1,256; Austria 1,038.
Diamond, industrial value, thousands	$189	--		
Diatomite and other infusorial earth	311	8	8	
Fertilizer materials:				
Crude	16	5	--	France 4; Netherlands 1.
Manufactured:				
Nitrogenous	2,333	2,454	--	France 2,300; Japan 118.
Phosphatic	809	--		
Potassic	225	1,644	--	France 850; Australia 549; Belgium-Luxembourg 103.
Other including mixed	35	89	1	Australia 53; France 15; New Zealand 11.
Ammonia	6	10	--	Australia 6; France 4.
Gypsum and plasters	29,464	15,775	--	Australia 14,529; France 1,155; Netherlands 54.
Lime	207	1,124	--	Belgium-Luxembourg 828; Australia 241; France 55.
Pigments, mineral: Processed iron oxides	(1)	4	--	West Germany 2; Australia 1.
Precious and semiprecious stones, except diamond:				
Natural value, thousands	--	$168	--	France $123; Israel $27; West Germany $7.
Synthetic do	$2	--		

See footnotes at end of table.

Table 6.—New Caledonia: Imports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1979	1980	Sources, 1980	
			United States	Other (principal)
NONMETALS —Continued				
Salt and brine	565	518	--	West Germany 208; Australia 131; France 122.
Sodium and potassium compounds, n.e.s.:				
Caustic potash value, thousands	$1	$1	--	All from Australia.
Caustic soda	45	81	--	France 62; West Germany 10; Australia 8.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	34	173	--	France 95; Italy 72.
Worked	91	60	(1)	France 47; Italy 8.
Gravel and crushed rock	36	22	(1)	France 21.
Sand excluding metal-bearing	37	59	7	Australia 32; France 13.
Sulfur: Sulfuric acid, oleum	30	50	--	France 36; Italy 6; Australia 5.
Talc, steatite, soapstone, pyrophyllite	1	1	--	Mainly from New Zealand.
Other:				
Crude	118	115	--	Netherlands 52; France 33; New Zealand 30.
Halogens	32	11	--	Australia 9.
Slag, dross, scalings, not metal-bearing	75	22	--	All from France.
Building materials of asphalt, asbestos and fiber cements, unfired nonmetals	539	410	1	France 313; Austria 67; New Zealand 17.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	11	--		
Coal, all grades including briquets	87,906	119,799	19,446	Republic of South Africa 75,169; Australia 25,184.
Coke and semicoke	85	36	--	Australia 35; France 1.
Hydrogen, helium, rare gases value, thousands	$2	NA		
Peat including briquets and litter	5	22	--	France 9; Netherlands 7; New Zealand 6.
Petroleum refinery products:				
Gasoline thousand 42-gallon barrels	776	807	--	NA.
Kerosine do	33	30	NA	NA.
Residual fuel oil do	2,350	2,949	--	Bahrain 2,655; Singapore 293.
Lubricants 42-gallon barrels	22,351	24,395	413	Australia 16,639; France 217.
Other:				
Liquefied petroleum gas do	68,196	58,742	--	Australia 58,360; France 197.
Mineral jelly and wax do	32	8	--	Mainly from Australia.
Bitumen, other residues, bituminous mixtures do	17,919	21,060	--	Singapore 20,146; Australia 610.
Mineral tar and other coal-, petroleum-, and gas-derived crude chemicals	75	54	--	Australia 53; France 1.

NA Not available.
[1]Less than 1/2 unit.

PAPUA NEW GUINEA

Papua New Guinea (PNG) has abundant mineral resources, but currently, Bougainville Copper Ltd. is PNG's only producing metal mining company. Bougainville Copper's mine at Panguna on North Solomon Island contributed significantly to Government revenues and the gross domestic product (GDP), estimated at $2.15 billion in 1981.[4] Values of 1981 output were as follows: Copper, $200 million; gold, $130 million; and silver, $8 million. Total production value of $338 million was nearly 16% of the GDP.

The only other mineral activity was the production of small quantities of limestone and sand for local use and of some alluvial gold recovered by panning in the Bulolo-Wau area. However, in addition to the Bougainville Mine, development and exploration work on two other major deposits was underway. One deposit is OK Tedi; located in the Star Mountains near the Irian Jaya border, it has large resources of copper, gold, and silver. The other, Frieda River, near Madang, has large copper resources. The principal obstacles to commercial development have been the current depressed price of copper and the difficulty of access to these remote areas.

In 1980, PNG sent a large mission to the United States to discuss newly enacted legislation relating to foreign investment guidelines for minerals and energy projects. The Government considers the development of mining and petroleum projects to be of the highest priority and welcomes foreign

investors. The basic principles of the legislation adopted were as follows:

Mineral resources belong to the people of Papua New Guinea and the Government, and the people must receive a fair price in return for extraction of the minerals.

Foreign enterprises exploiting Papua New Guinea's mineral resources deserve a reasonable return on their investment, but extraordinary gains above a reasonable return on investment will go in large part to the Government.

The Government has the right to regulate extractive enterprises so as to maximize the benefits to the local community while minimizing the potentially harmful social and economic costs.

As a result of the visit by PNG officials, the Overseas Private Investment Corp. sponsored a mission to PNG in February 1981, with representatives of 10 large U.S. corporations participating.

The climate for foreign investment in PNG is generally favorable, and the OK Tedi Copper and Gold Mine is owned by Metallgesellschaft AG (20%), BHP Australia Ltd. (30%), Amoco Minerals Co. (30%), and the PNG Government (20%). The Government reserves the right to participate as an equity partner with up to 30% interest; however, thus far it has limited its equity interest to about 20%.

Mineral and oil exploration companies have shown increasing interest in PNG during recent years. Currently, prospects for mineral development appear more promising than those for petroleum. A number of oil companies were in the initial stages of developing, but so far there are no reports of oil being found in commercial quantities.

COMMODITY REVIEW

Metals.—*Chromite.*—Development of the Ramu River chromite-nickel-cobalt deposit located 70 kilometers southwest of Madang is being assessed. The project is owned by Nord Resources (69.5%) and MIM Holdings Ltd. (30.5%). The deposit is expected to be developed in two stages, with chromite mined in the first stage and nickel and cobalt extracted in the second.

It is estimated that there are reserves of between 80 and 100 million tons of 8% to 10% chromite that occur as a lateritic-type deposit. The chromite overlies a lateritic nickel cobalt deposit with reserves put at 67 million tons of 1.14% nickel and 0.16% cobalt. When developed, the deposit could produce between 200,000 and 400,000 tons of chromite annually, and operations could begin in 2 years. Restrictions are imposed, however, by the lack of necessary infrastructure such as roads and harbor facilities.

Amax Exploration Australia Inc., a subsidiary of Amax Inc., continued evaluating chromite and other minerals in beach sands along the Marobe coast, between Salamaua and Salua. Preliminary estimates indicated reserves of 200 million tons of mineralized sands containing 1.5% chromium.

Copper.—Bougainville Copper Ltd.'s (BCL) mine at Panguna remained the only significant mining operation in Papua New Guinea. The 1981 output of all three commodities, copper, gold, and silver, was above the 1980 level. This resulted from an increase in tonnage of ore milled as ore grade declined slightly. Since 1972, the copper grade at Bougainville has fallen from 0.75% to 0.46%, and the gold grade was halved to 0.016 ounce per ton. About 38.5 million tons of ore were mined from the Panguna open pit in 1981, and the waste-to-ore ratio rose to 1.12:1. The pit was deepened by 30 meters to 445 meters above sea level, but drainage problems will prevent any further deepening of the pit until completion of the 6,400-meter drainage tunnel in 1982.

Measured reserves at Bougainville stood at 610 million tons averaging 0.43% copper and 0.015 ounce of gold per ton, and although the grade will decline further during future mining operations, it is expected to be at a reduced rate. Reserves are sufficient for the next two decades, but the company has stressed the need to explore outside its existing lease, given the long lead times to develop new ore bodies. The Government of PNG is expected to lift its present restrictions on further exploration.

In 1981, sales totaled about 160,000 tons of copper, 530,000 ounces of gold, and 1.3 million ounces of silver. Concentrates were shipped under long-term contracts to Japan, the Federal Republic of Germany, and Spain.

The feasibility study of the $1.6 billion OK Tedi Copper and Gold Mine was completed, and construction began in late 1981. Gold production is expected to commence in 1984 and copper production in 1986. An international consortium will own and operate the mine; the four partners are Dampier Mining Co., Ltd., a subsidiary of BHP Co. (30%); Mount Fubilan Development Co. Pty. Ltd., a subsidiary of Amoco Minerals Ltd. (30%); Kupferexploration GmbH, a Federal Republic of Germany group (20%); and the

PNG Government (20%). Situated near the West Irian border, the deposit has ore reserves estimated at 300 million tons. Ore grade averages 0.85% copper and 0.18 ounce per ton of gold, with some molybdenum. A hydrographic, geophysical, and geological investigation was continued of the Fly River to assess the feasibility of transporting copper concentrates from OK Tedi via barge from Kiunga on the Fly River to an as-yet-to-be-selected deepwater port on the Gulf of Papua.

Exploration also continued on the Frieda River porphyry ore body, estimated to contain 500 million tons, averaging 0.5% copper. This is a major ore body located in the Western Sepik Province about 80 kilometers northwest of OK Tedi; however, development could be hampered by its low grade. The consortium members are MIM Holdings Ltd. of Australia (30%), the Japanese consortium Furukawa & Metal Mining (25%), Norddeutsche Affinerie AG of the Federal Republic of Germany (5%), and Conzinc Riotinto Australia (CRA) (20%). The Papua New Guinea Government may opt for a 20% equity interest in the project. The Government expects to discover additional mineral deposits in the area around Frieda River. A deposit of high-grade massive sulfide minerals has been discovered a few kilometers away. This is now called the Nena Project.

On Manus Island, 360 kilometers north of the PNG mainland in the Admiralty Group, joint venture exploration by Exoil NL and Transoil NL indicated 160 million tons of ore at 0.32% copper, associated with gold, silver, and molybdenum, in ore of several known prospects. Some factors acting in favor of the Manus prospect were the limited infrastructural development required and relatively good accessibility compared with the mainland deposits. Also, the existence of a small bauxite deposit on Manus Island has been reported.

Gold and Silver.—Gold continued to be an important byproduct of BCL's Panguna copper mine. The gold production totaled about 540,300 ounces during 1981. Byproduct silver recovery was about 1.3 million ounces.

At Porgera in Papua New Guinea's central mountain range, Placer Development Ltd., MIM, and Consolidated Goldfields of Australia were engaged in a joint venture to explore and develop an alluvial gold deposit. Two zones have been explored: One was estimated to be 250 meters long, 150 meters wide, and up to 250 meters deep, with an average 0.07 ounce per ton of gold and 0.13 ounce per ton of silver. The other has a length of 420 meters, a width of 250 meters, and a depth of 240 meters and an average 0.08 ounce per ton of gold and 0.13 ounce per ton of silver. The results suggest the possibility of a large gold mine, but work was still at an early stage of development.

Mineral Fuels.—*Petroleum.*—The petroleum potential of Papua New Guinea may be considered in terms of three major sedimentary basins: The Papuan Basin, which comprises the southwestern portion of the mainland and offshore beneath the Gulf of Papua, an area of about 250,000 square kilometers; the North New Guinea Basin, almost entirely onshore in the northern mainland region and about 120,000 square kilometers in area; and the Cape Vogel Basin, predominantly offshore between the Papua Peninsula and the Trobriand Islands, an area of about 40,000 square kilometers. Prospecting continued, but no significant discoveries were reported.

The Papua New Guinea Government signed petroleum prospecting concession agreements with Gulf Oil Corp., Australian Oil Ltd., and BP Petroleum Development Australia Pty. Ltd. The concession areas involve two permits (Nos. 76 and 77). Permit No. 76 covered 7,300 square kilometers in the Western Province, and permit No. 77 covered 13,400 square kilometers in the Western and Southern Highlands Provinces. The cost of exploration over a 3-year period was estimated at $7 million. In another development, Esso Papua New Guinea Inc. announced it had spudded the Goari No. 1 well on the Paibuna River, 415 kilometers northwest of Port Moresby. Planned depth was 11,500 feet.

Recently passed legislation by the PNG Government would entitle it to receive 60% to 80% of any future revenues from oil or gas production. This would be in the form of a 1.25% royalty based on wellhead values, petroleum income tax of 50% of taxable income, a profit tax after an agreed rate of return is achieved, and a Government equity up to 22.5% with payment from the Government's share of production.

Table 7.—Papua New Guinea: Exports of copper, by destination

(Metric tons of copper content)

Destination	1979	1980
China	6,398	5,884
Germany, Federal Republic of	54,985	47,302
Japan	96,282	77,178
Spain	14,332	11,877
Total	171,997	142,241

SOLOMON ISLANDS

In 1981, the Solomon Islands' minerals output consisted of small quantities of alluvial gold and silver, valued at an estimated $675,000.[5] In addition, marine shells were harvested for lime, but production was not reported.

The International Development Association (IDA) has approved a credit of $1.5 million to the Solomon Islands to assist the Development Bank of Solomon Islands in providing finance for productive investments by indigeneous entrepreneurs during 1981-82. This is the first operation assisted by IDA in the Solomon Islands.

The Government continued to actively seek foreign investors as a major force in the country's resource development. A bauxite mine and refinery project on Rennell and Vaghena Islands have been surveyed, but temporarily shelved owing to low world bauxite prices. CRA, in partnership with Mitsui Mining and Smelting Co. Ltd. and the Solomon Islands Government, withdrew from the project, and Mitsui decided to defer further work because of the lack of market for aluminum. The project was to produce 1.5 million tons of bauxite and 600,000 tons of alumina per year from reserves estimated at 60 million tons of 45% to 50% Al_2O_3.

In addition to bauxite, other minerals known to exist in the Solomon Islands were phosphate on Bellona and Rennell, copper on Guadalcanal and Florida, nickel on Isabel, manganese on Florida, and gold on Guadalcanal. Currently, these mineral deposits were regarded as uneconomic prospects owing to the small size of known occurrences.

The Government was particularly interested in receiving proposals for prospecting for hydrocarbons both onshore and offshore. A Petroleum Act establishing the framework to enable orderly prospecting and development to be carried out by commercial companies was completed. Within the terms of the act, detailed agreements between individual companies and the Solomon Islands Government concerning work programs, expenditure levels, and the extent and nature of Government participation were considered.

TONGA ISLANDS

In 1981, minerals exploration and exploitation activities were almost exclusively concerned with sand, gravel, and other building materials obtained from beach areas and inland coral quarries. In the future, there may be other mineral potential in the country resulting from offshore petroleum exploration and the mining of manganese nodules.

Samuel Gray Oil Producers Inc. was reportedly planning to drill three offshore wells on the company's Tongan concession during 1982. Under the terms of the company's current agreement with the Tongan Government, drilling had to commence by July 1982. In July 1980, Samuel Gray Oil of Englewood, Colo., took over the Petroleum Agreement from Webb Resources of Colorado.

VANUATU (NEW HEBRIDES)

Vanuatu (formerly New Hebrides) was granted independence in July 1980. A condominium government between Britain and France had ruled the 70-island territory since 1906.

Vanuatu's only mine, located at Forari, 55 kilometers northwest of Port Vita on Vate (Efate) Island, remained closed in 1981. The mine, which produced manganese concentrate, was operated by Le Manganese de Vate and owned by Southland Mining Ltd. of Australia (87.5%) and public shareholders (12.5%). The mine is expected to reopen at about future date, although only about 120,000 tons of commercially minable reserves remain in it. The company had 100 employees, largely native Vanuatuans, and shipped a 40% to 42% manganese of metallurgical grade. The market value was $35 per ton for 40% manganese products.

Manganese concentrate was the only mineral exported in recent years, but various mineral deposits were under investigation. Samples of possolan, a consolidated volcanic ash occurring on Efate and other islands, were being evaluated in Australia and Fiji for use in cement. Surveys have taken place in recent years in search of nickel, copper, bauxite, sulfur, and zinc. None of these commodities were expected to be mined in the foreseeable future.

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[1]Physical scientist, Division of Foreign Data.

[2]Where necessary, values have been converted from Fijian dollars (FD$) to U.S. dollars at the rate of FD$1=US$1.13.

[3]Where necessary, values have been converted from Communaute Financiere Pacifique francs (CFPF) to U.S. dollars at the rate of CFPF1.80=US$1.00.

[4]Where necessary, values have been converted from Papua New Guinea dollars (K$) to U.S. dollars at the rate of K$1=US$1.46.

[5]Where necessary, values have been converted from Solomon dollars (S$) to U.S. dollars at the rate of S$1=US$1.15.

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