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MINERALS YEARBOOK

MINERAL INDUSTRIES OF

EUROPE AND THE U.S.S.R.

U.S.
DEPARTMENT
OF THE
INTERIOR

BUREAU
OF
MINES

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1990

UNITED STATES DEPARTMENT OF THE INTERIOR • Manuel Lujan, Jr., Secretary
BUREAU OF MINES • T S Ary, Director

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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Preface

This edition of the Minerals Yearbook records the performance of the worldwide minerals industry during 1990 and provides background information to assist in interpreting that performance. Content of the individual Yearbook volumes follows:

Volume I, Metals and Minerals, contains annual reports on virtually all metallic and industrial mineral commodities important to the U.S. economy. In addition, a chapter on survey methods used in data collection with a statistical summary of nonfuel minerals and a chapter on trends in mining and quarrying in the metals and industrial mineral industries are included.

Volume II, Area Reports: Domestic, contains chapters on the minerals industry of each of the 50 States and Puerto Rico, Northern Marianas, Island Possessions, and Trust Territory. This volume also has a chapter on survey methods used in data collection, including a statistical summary of domestic nonfuel minerals.

Volume III, Area Reports: International, contains the latest available mineral data on more than 150 foreign countries and discusses the importance of minerals to the economies of these nations. The annual international review is presented as five area reports and one world overview: Mineral Industries of Africa, Mineral Industries of Asia and the Pacific, Mineral Industries of Latin America and Canada, Mineral Industries of Europe and the U.S.S.R., Mineral Industries of the Middle East, and Minerals in the World Economy. The reports incorporate location maps, industry structure tables, and an outlook section previously incorporated in our Mineral Perspectives Series quinquennial regional books, which were discontinued in 1990. The Bureau of Mines continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Yearbook are welcomed.

T S Ary, *Director*

Acknowledgments

The U.S. Bureau of Mines, in preparing these Volume III Minerals Yearbook Reports, extensively utilized statistics and data on mineral production, consumption, and trade provided by various foreign government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations is gratefully acknowledged. Statistical and informational material was also obtained from reports 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 10 Regional Resource Officers assigned to minerals and petroleum reporting and by economic and commercial officers and other officials of the Department of State located in American Embassies worldwide. Their contributions are sincerely appreciated.

The text and production, structure of the mineral industry, and reserve tables of this volume were prepared by the respective country authors on the staff of the Division of International Minerals, Information and Analysis Directorate. The mineral export and import trade tables were prepared by the International Data Section of the Division of Statistics and Information Services, Information and Analysis Directorate.

The regimes of some countries reviewed in this volume may not be recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not to be construed as conflicting with or being contradictory of U.S. foreign policy.

George J. Coakley
Chief, Division of International Minerals

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Vitae

Mr. Donald E. Buck is a country specialist in the Branch of Europe and the U.S.S.R. He joined the Bureau of Mines in 1988. Mr. Buck's work experience includes more than 16 years as a petroleum exploration geologist at Cities Service and Celeron Oil and Gas, Inc. He received his B.A. in Geology from Ohio Wesleyan University and an M.S. in Geology from the University of Southwestern Louisiana.

Mr. Michel C. Frippel is Chief, Branch of Europe and the U.S.S.R. He has been with the Bureau of Mines since 1988. His experience includes 7 years as a materials engineer in the U.S. aerospace industry (at Lycoming, The Boeing Airplane Co., and the Grumman Aircraft Engineering Corp.) and more than 13 years in international minerals investment, planning, and marketing at AMAX Inc. Over the course of his career at AMAX, Mr. Frippel represented the company in Europe, Asia, Latin America, and Africa. Mr. Frippel holds a Master's degree in Business Administration from Columbia University and a B.S. degree in Metallurgical Engineering from the Polytechnic Institute of Brooklyn. He has also done graduate work in Metallurgy and Materials Science at New York University.

Mr. Richard M. Levine is a country specialist in the Branch of Europe and the U.S.S.R. He has over 20 years experience as an analyst of Soviet industry and economic affairs. Mr. Levine joined the Bureau of Mines as a mineral specialist for the U.S.S.R. in 1981. Prior to joining the Bureau, he was Senior Research Specialist at the Library of Congress. Mr. Levine holds a B.A. degree from Ohio State University and an M.A. in Soviet Economics and Area Studies from Georgetown University.

Mr. Harold R. Newman is a country specialist in the Branch of Europe and the U.S.S.R. He has more than 25 years' experience, including 3 years as a civil engineer with the State of Texas, 2 years as a mining engineer with HPE Consulting, and 9 years with the U.S. Army Corps of Engineers.. Mr. Newman joined the Research Directorate of the Bureau of Mines in 1981 as a mining engineer working on improved efficiency in materials handling. He joined the Division of International Minerals in 1983 as a Canadian Minerals Industry Specialist. Mr. Newman holds a B.S. degree in Geology and an M.S. in Engineering, both from the University of Texas, El Paso. He is a registered professional engineer in the State of Texas.

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Mr. Walter Steblez has been a country specialist for Eastern Europe in the Branch of Europe and the U.S.S.R. since 1979. His work experience includes 4 years as U.S.S.R. Analyst for the Stanford Research Institute and 5 years as Russian language interpreter with the U.S. State Department. Mr. Steblez obtained his B.A. degree in history from the University of Cincinnati.

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THE MINERAL INDUSTRIES OF EUROPE AND THE U.S.S.R.

By Staff, Branch of Europe and the U.S.S.R.

INTRODUCTION[1]

This section of the Minerals Yearbook reviews the minerals industries of 29 countries: the 12 nations of the European Community (Belgium, France, the Federal Republic of Germany (FRG), Italy, Greece, the Netherlands, Denmark/Greenland, Spain, Portugal, Luxembourg, The United Kingdom, and Ireland); 6 of the 7 nations of the European Free Trade Association (Sweden, Norway, Finland, Iceland, Austria, and Switzerland); Malta; the 8 Centrally Planned Economies of Eastern Europe (the German Democratic Republic (GDR), Poland, Yugoslavia, Albania, Hungary, Czechoslovakia, Romania, and Bulgaria); and the U.S.S.R.

Western Europe

Western Europe [loosely defined to include the 12 nations of the European Community (EC) and the 7 nations of the European Free Trade Association (EFTA)] is the single largest trading area and consumer of raw materials in the world. If Western Europe was at one time an important mining sector, it has now increasingly relegated the role of supplying minerals for its minerals processing industry to its ex-colonies in North and South America, Africa, and Australia. In this regard, Western Europe is the most important determinant of raw materials consumption (and thus, indirectly, raw materials production). There is an important reason for this since Western Europe lies somewhere between Japan at one extreme and the United States and the U.S.S.R. at the other extreme as regards the availability of natural resources.

The United States and the U.S.S.R. are rich in natural resources while Japan has virtually none. Western Europe, on the other hand, has a reasonable amount of natural resources–particularly in the southern part of the continent,–but has nowhere near the natural resource wealth of the United States and the U.S.S.R. Nonetheless, there is an inherent tendency to underestimate the importance of Western Europe in the world of minerals—both as a minerals processor and raw materials buyer. The reason for this is that Western Europe is generally thought of on the basis of individual nations rather than as a whole. Viewed in this limited context, Japan, the United States, and the U.S.S.R. appear to dominate the world economy. Viewed as one regional area, however, Western Europe includes the fourth (FRG), fifth (France), sixth (United Kingdom) and seventh (Italy) largest economies of the world, all bordering on one another. With the remaining 15 EC and EFTA countries, Western Europe has a land area approximately 40% of that of the United States, exceeds the U.S. population by 50% and has a gross domestic product about the same as that of the United States.

Although more limited in the availability of local low cost raw materials, however, the minerals industries of Western Europe, which see themselves as international entities rather than local enterprises have, in the past few years, restructured themselves and merged together such that they now represent increasingly powerful multinational corporations. The British Steel Corporation, which was denationalized several years ago, is swiftly becoming one of the most efficient steel producers in the world. Usinor-Sacilor, the nationalized French steel giant, has absorbed virtually all of the French steel industry and formed a significant number of joint ventures or acquired companies worldwide such that Usinor-Sacilor is now second only to Nippon Steel in world steel production and is becoming an increasingly cost-effective producer. Germany's Thyssen and Krupp have historically been amongst the most efficient steel producers and are continuing this legacy. While many diversified minerals companies are shrinking in size or disappearing, Britain's RTZ, the world's largest diversified minerals company, is continuing to grow in size and importance. Finland's Outokumpu Oy, Belgium's ACEC-Union Miniere, Germany's Metallgesellschaft, and France's Pechiney are all expanding, heartily acquiring or merging with smaller firms in related sectors.

Although the official date wherein trade barriers between EC countries will be eliminated will not occur until the end of 1992, most international companies are preparing for the event in advance of this date.

It would be simplistic to say that any year prior to 1992 would be a watershed year for Western Europe because the official date wherein trade barriers across the community's borders will be eliminated will not occur until the end of 1992. This major event will lead more companies within and outside the community to consolidate their positions in their respective industries in what will be the world's largest market.

Eastern Europe

It was in 1987 that Soviet President Gorbachev first introduced his concepts of "glasnost" (openness) and "perestroika" (rebuilding) to the world. By 1989, the effects of glasnost were particularly being felt in the Eastern European Council for Mutual Economic Assistance (CMEA) nations which, gradually, were pulling themselves away from Soviet political and economic domination and, more importantly, were allowed to do so by the Soviet regime.

In short order, plans were made for the absorption of the GDR into the FRG in late 1990, and Czechoslovakia, Poland, Hungary, and Bulgaria found themselves "granted" national independence. Yugoslavia, which had never been under Soviet domination, and Romania and Albania, which had been independent from Moscow for more than a decade, were all feeling increasing pressure to adopt market economies. As these countries opened themselves to Western observers, the abuses that had occurred during central planning were revealed. Environmental pollution, particularly around lignite-rich Silesia (an area that extends across Poland, the GDR, and Czechoslovakia) and many parts of Romania, was found to have reached catastrophic levels. Furthermore, it was realized that the low productivity of the mining and metallurgical sectors in all these nations will eventually mean huge cutbacks in personnel in order to make these industries competitive with those in market economies. Of the world's major steel producers, for example, Czechoslovakia produces more steel on a per-capita basis, than any other. Part of the reason for this is that Czechoslovakia has, in the last half century, produced a great deal of heavy military equipment for the Soviet Union and other East Bloc nations. With the trend toward independence presently taking place in eastern Europe, there will be less interdependence between these nations and the demand for Czechoslovakian steel production will drop significantly. This type of "readjustment" will need to take place throughout Eastern Europe and will have significant bearing on Western Europe's, as well as the rest of the world's, minerals supply and demand status. 1990 statistics corroborate this view in that virtually all mineral production in former CMEA nations decreased between 1989 and 1990. Steel production in the eight east European nations declined 17% during this period.

U.S.S.R.

By virtue of its size, the U.S.S.R. is the world's largest source of raw materials. Because close to 80% of the U.S.S.R.'s hard currency is obtained from mineral resources (approximately 70% from the petroleum sector alone), the U.S.S.R., which does not presently have an internationally tradable currency, is seeking to expand production in the minerals sector in order to strengthen the ruble. In view of the present high level of production of minerals on the part of the U.S.S.R. and the potential for increased production, the effects of more liberal trade patterns between the U.S.S.R. and the market economies will have tremendous bearing on international mineral trade flows.

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[1]Michel C. Frippel, Chief, Branch of Europe and the U.S.S.R., Division of International Minerals.

SELECTED GENERAL SOURCES OF REGIONAL INFORMATION

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ABECOR Group Country Reports.

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TABLE 1

EUROPE AND THE U.S.S.R. PRODUCTION OF SELECTED MINERALS FOR 1990[1]

(Thousand metric tons unless otherwise specified)

	Iron and steel			Ferroalloying materials			Aluminum		Copper		Lead	
	Iron ore content basis	Pig iron	Crude steel	Chromite (gross weight)	Manganese ore (gross weight)	Nickel, plant production	Bauxite	Primary metal	Mine	Refined	Mine	Refined
Market Economy Countries:												
European Community (EC)												
Belgium	—	9,416	11,425	—	—	—	—	—	—	542	—	92
Denmark/Greenland	—	—	610	—	—	—	—	—	—	—	16	—
France	2,793	14,415	19,016	—	—	10	490	325	(3)	44	1	270
Germany, Federal Republic of	12	30,098	38,435	—	—	—	—	715	(3)	476	9	349
Greece	800	160	1,050	45	6	19	2,700	150	—	— 24	5	
Ireland	—	—	326	—	—	—	—	—	—	—	35	12
Italy	—	11,803	25,439	—	7	—	(3)	232	—	83	15	173
Luxembourg	—	2,616	3,561	—	—	—	—	—	—	—	—	—
Netherlands	—	4,960	5,412	—	—	—	—	258	—	—	—	42
Portugal	4	339	746	—	—	—	—	—	163	6	—	5
Spain	1,394	5,542	12,705	—	—	—	—	355	15	165	62	105
United Kingdom	6	12,277	17,908	—	—	27	—	294	1	122	1	334
Subtotal	5,009	91,626	136,633	45	13	56	3,190	2,329	179	1,438	163	1,387
European Free Trade Association (EFTA)												
Austria	653	3,452	4,292	—	12	—	—	89	—	50	1	21
Finland	—	2,283	2,861	347	—	17	—	—	13	65	2	—
Iceland	—	—	—	—	—	—	—	87	—	—	—	—
Norway	1,352	54	384	—	—	58	—	845	20	36	3	—
Sweden	12,901	2,736	4,454	—	—	—	—	96	74	97	98	35
Switzerland	—	70	970	—	—	—	—	72	—	—	—	1
Subtotal	14,906	8,595	12,961	347	12	75	—	1,189	107	248	104	57
Total, Market Economy Countries	19,915	100,221	149,594	392	25	131	3,190	3,518	286	1,686	267	1,444
Centrally Planned Economies:												
Eastern Europe												
Albania	409	96	65	910	—	3	26	—	12	10	—	—
Bulgaria	321	1,143	2,185	—	50	—	—	—	30	24	67	66
Czechoslovakia	480	9,667	14,877	—	—	3	—	70	3	25	3	24
German Democratic Republic	—	2,159	5,587	—	—	3	—	50	6	75	—	46
Hungary	—	1,697	2,963	—	60	—	2,559	72	—	19	—	—
Poland	—	8,658	13,625	—	—	—	—	46	370	352	61	65
Romania	580	6,355	9,787	—	65	—	230	178	32	36	16	13
Yugoslavia	1,578	2,313	3,609	11	51	1	2,952	349	140	151	99	119
Subtotal	3,368	32,088	52,698	921	226	10	5,767	765	593	692	246	333
U.S.S.R.	132,000	110,163	154,414	3,800	8,500	275	4,200	2,000	600	940	400	680
Total, Centrally Planned Economies	135,368	142,251	207,112	4,721	8,726	285	9,967	2,765	1,193	1,632	646	1,013
Total, Europe and U.S.S.R.	155,283	242,472	356,706	5,113	8,751	416	13,157	6,283	1,479	3,318	913	2,457
United States	35,695	49,668	89,726	—	(W)	(3)	(W)	4,048	1,194	2,017	495	1,327
World total	544,379	532,607	770,638	12,846	23,230	704	111,766	17,817	8,815	10,642	3,367	5,924
Europe and U.S.S.R., percent of world total	28.5%	45.5%	46.3%	39.8%	37.7%	59.1%	11.8%	35.3%	16.8%	31.2%	27.1%	41.5%

See footnotes at end of table.

TABLE 1—Continued

EUROPE AND U.S.S.R. PRODUCTION OF SELECTED MINERALS FOR 1990[1]

(Thousand metric tons unless otherwise specified)

	Zinc		Industrial minerals						Mineral fuels				
									Coal			Petroleum (million barrels)	
	Mine	Refined	Cement	Nitrogen (N content of ammonia)	Phosphate rock (gross weight)	Potash K_2O equivalent	Salt	Sulfur (all forms)	Anthracite and bituminous	Lignite	Marketable natural gas (Mm_3)	Crude	Refined
Market Economy Countries:													
European Community (EC)													
Belgium	—	318	6,929	300	([2])	—	—	310	1,037	—	24	—	207
Denmark/Greenland	48	—	1,656	—	—	—	—	14	—	—	2,548	45	65
France	24	263	26,388	1,916	([2])	1,230	5,739	1,046	10,448	2,256	3,080	22	567
Germany, Federal Republic of	58	338	30,456	1,671	([2])	2,215	12,550	1,900	70,150	107,525	15,700	26	654
Greece	27	—	13,944	257	—	—	145	210	—	52,000	85	6	116
Ireland	167	—	1,625	395	—	—	—	—	45	—	2,024	—	12
Italy	43	264	39,500	1,197	—	68	4,046	387	56,300	1,483	17,296	32	687
Luxembourg	—	—	590	—	([2])	—	—	—	—	—	—	—	—
Netherlands	—	207	3,729	3,194	—	—	3,653	405	—	—	72,238	27	443
Portugal	—	5	6,000	198	—	—	—	98	276	—	—	—	81
Spain	260	250	28,092	448	—	690	3,100	858	19,589	16,373	1,553	14	41
United Kingdom	7	93	14,000	1,148	([2])	488	5,400	175	86,297	18	45,771	687	674
Subtotal	634	1,738	172,909	10,724	([2])	4,691	34,633	5,403	244,142	179,655	160,319	859	3,925
European Free Trade Association (EFTA)													
Austria	18	27	4,903	410	—	—	674	42	—	2,448	1,081	8	68
Finland	52	175	1,666	24	—	—	—	568	—	—	—	—	73
Iceland	—	—	111	10	—	—	—	—	—	—	—	—	—
Norway	18	125	1,261	431	—	—	—	215	358	—	25,400	609	102
Sweden	164	—	2,550	—	7	—	—	395	—	—	—	—	138
Switzerland	—	—	5,206	32	—	—	—	4	—	—	5	—	24
Subtotal	252	327	15,697	907	7	—	674	1,224	358	2,448	26,486	617	405
Total, Market Economy Countries	886	2,065	188,606	11,631	7	4,691	35,307	6,627	244,500	182,103	186,805	1,476	4,330
Centrally Planned Economies:													
Eastern Europe													
Albania	—	—	750	100	—	—	85	—	—	2,071	243	7	9
Bulgaria	55	75	5,500	1,309	—	—	166	130	168	31,532	120	7	—
Czechoslovakia	8	—	10,215	514	—	—	340	96	22,406	85,167	457	1	95
German Democratic Republic	—	13	10,000	1,000	—	2,650	2,500	260	—	300,000	10,000	([3])	148
Hungary	—	—	3,933	445	—	—	—	10	1,736	15,842	4,932	13	53
Poland	178	132	12,600	2,006	—	—	4,055	4,834	147,669	67,584	3,866	1	81
Romania	15	11	11,000	2,000	—	—	4,000	200	8,200	52,000	28,000	65	170
Yugoslavia	84	114	7,954	549	—	—	375	400	292	64,054	2,659	23	193
Subtotal	340	345	61,952	7,923	—	2,650	11,521	5,930	180,471	618,250	50,277	117	749
U.S.S.R.	750	890	137,000	18,500	35,300	9,000	14,700	9,025	543,000	160,000	815,000	4,190	2,800
Total, Centrally Planned Economies	1,090	1,235	198,952	26,423	35,300	11,650	26,221	14,955	723,471	778,250	865,277	4,307	3,549
Total, Europe and U.S.S.R.	1,976	3,300	387,558	38,054[2]	35,307	16,341	61,528	21,582	967,971	960,353	1,052,082	5,783	7,879
United States	543	358	71,310	12,646	46,343	1,713	35,292	11,560	858,389	81,321	503,404	2,664	6,173

See footnotes at end of table.

TABLE 1—Continued

EUROPE AND THE U.S.S.R. PRODUCTION OF SELECTED MINERALS FOR 1990[1]

(Thousand metric tons unless otherwise specified)

	Zinc		Industrial minerals						Mineral fuels				
	Mine	Refined	Cement	Nitrogen (N content of ammonia)	Phosphate rock (gross weight)	Potash K_2O equiv-alent	Salt	Sulfur (all forms)	Coal: Anthracite and bituminous	Coal: Lignite	Marketable natural gas (Mn_3)	Petroleum (million barrels): Crude	Petroleum (million barrels): Refined
World total	7,325	7,041	1,134,348	98,025	154,106	28,310	183,311	57,668	3,660,483	1,164,321	1,951,691	20,982	22,579
Europe and U.S.S.R., percent of world total	27.0%	46.9%	34.2%	38.8%	22.9%	57.7%	33.6%	37.4%	26.4%	82.5%	53.9%	27.6%	34.9%

W Withheld to avoid disclosing company proprietary data; value included in "World total."

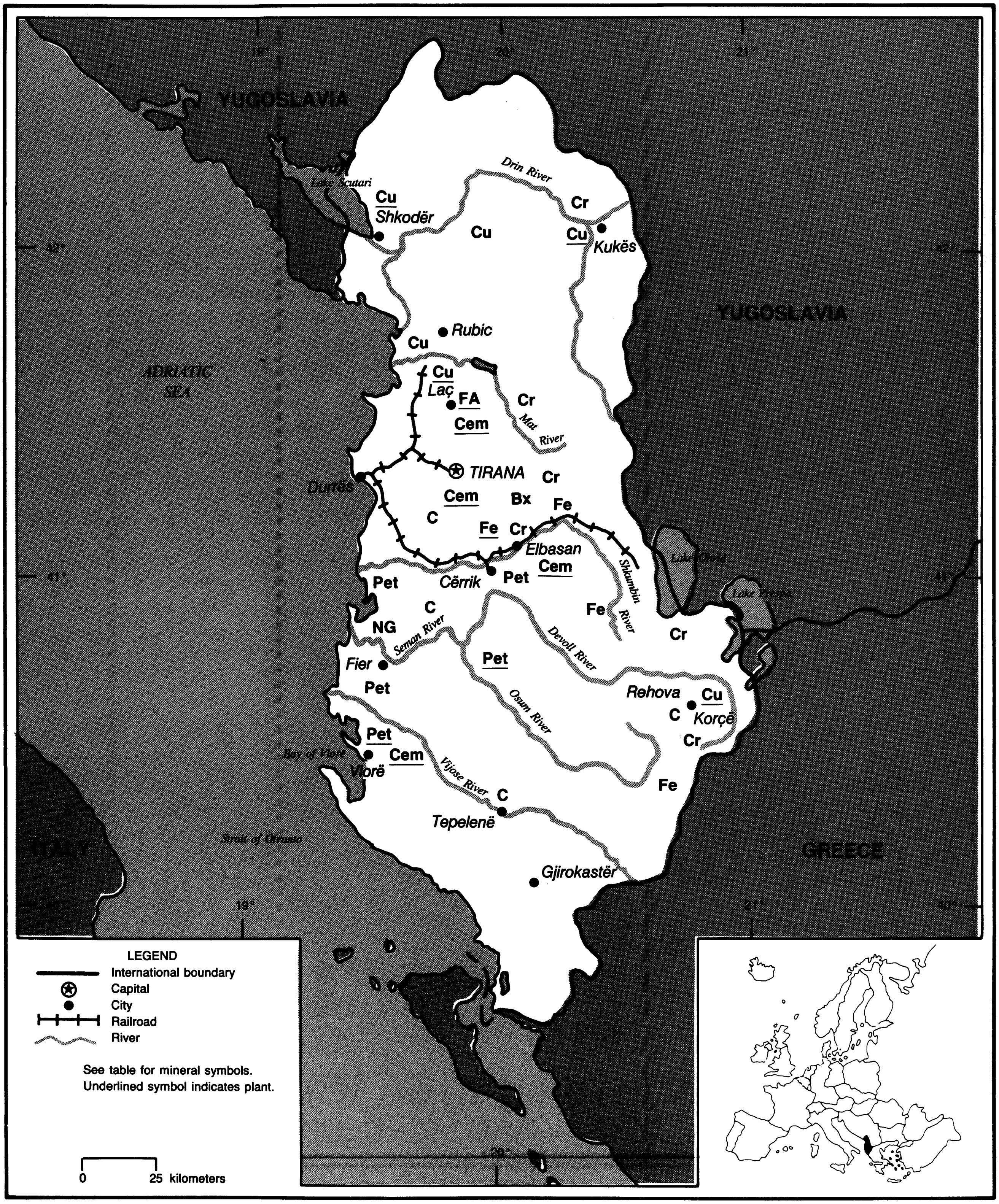
[1]Some of the individual entrees in this table may differ from those appearing in individual country production tables elsewhere in this volume owing to the inclusion in this table of data received at a later time.

[2]In addition to the production of phosphate rock that is listed in this column, the world phosphate supply was augmented by the production of Thomas slag, a byproduct of pig iron production from phosphate iron ores. Thomas slag production, a modest yet significant component of Europe's phosphate raw material supply, was as follows in 1989, in thousand metric tons: Belgium—165; France—500; Federal Republic of Germany—400; Luxembourg—550; European Economic Communities, Market Economy Europe, and Europe totals—1,665; World total—1,673. Thomas slag averages about 16% P_2O_5 content world phosphate rock production at 162,268,000 tons averaged slightly over 31% P_2O_5.

[3]Less than one-half of one unit.

ALBANIA

AREA 29,000 km² **POPULATION 3.2 million**



THE MINERAL INDUSTRY OF ALBANIA

By Jozef Plachy

The political changes affecting Eastern Europe reached Albania in 1990. Numerous strikes in the mining industry affected the steady supply of raw materials to the processing industries. In addition, the prolonged drought in the summer of 1990 caused a shortfall in the supply of electricity to Albania. This combination of events caused many enterprises to curtail or temporarily cease production. The decline in the production of chromite, as well as other minerals, adversely affected Albania's export earnings. Necessary investments in the mineral mining and processing industries had to be postponed, further aggravating the country's already deteriorating economic situation.

In an effort to ease the economic downturn in 1990, new stopes were put into operation at the Bulqize chromite mine, and a new chromite mine was commissioned at Vlahne in the Kukes district. Furthermore, a new copper deposit was located at Karme in the district of Shkodre, and natural gas deposits in southern Albania. Government-sponsored studies were undertaken for more effective development of the mining industry for 1990-91, but most of the resulting recommendations were reportedly not carried out for lack of funds.

GOVERNMENT POLICIES AND PROGRAMS

As the country continued to open to the outside world, it was expected to seek foreign assistance to modernize its mining industry, especially chromite mining and processing, the country's largest source foreign exchange.

At the end of July 1990, two decrees were adopted by the Government, which reportedly allowed joint ventures and guaranteed legal protection to foreign investors. The prospects for political and economic reform encouraged some foreign companies to explore possibilities for investment in the country, mainly in tourism and in mineral and hydrocarbon resources.

PRODUCTION

The 1990 output of Albania's mineral industry was generally lower than that in 1989. The largest decline was in iron and steel production, which decreased by 46% and 42%, respectively. Other branches of the mineral industry failing to reach 1989 levels of production included chromite mining (chromite production down by 24% and ferrochromium down 38%), copper (ore production down by 18%), and fuels (natural gas production declined by 22%). Reportedly, these shortfalls were caused mainly by a drought, which adversely effected the waterflow to the hydro power stations where 90% of Albania's electric energy had previously been generated.

Although a relatively small country, Albania had a relatively large mineral industry, which contributed substantially to the economic and social development of the country. According to Government sources, future plans for the mineral industry included: the production of cadmium, germanium, selenium and tellurium, as byproducts of copper ore processing; the reduction of waste during mining and processing; and the determination of profitability relative to low-grade ore mining.

TRADE

Trade in minerals, fuels, and metals remained the most important component in Albanian foreign trade. In 1989 (the latest year for which trade data were available), this sector constituted more than 49% of exports and 26% of imports. Chromium ore and concentrates made up the bulk of mineral exports, accounting for 17% to 21% of export value during the past 5 years. Other mineral exports included coal, copper metal, copper ore and concentrates, ferrochromium, nickel, and pyrite concentrates. Although specific figures were not available, the estimated export of minerals in 1990 was lower than that in previous years, mainly owing to lower levels of production. The deterioration of ore grades, age of machinery, lack of spare parts, political unrest, and drought all contributed to the decline of production and a consequent decline of exports of minerals and metals. Approximately one-half of Albania's mineral trade was conducted with East European countries (formerly CMEA). The EC was Albania's second largest trading area. Albania concluded an agreement with Hungary in 1990 to remove all quantitative restrictions on bilateral trade to increase exports of copper wire and possibly marble to Hungary.

By the end of 1990, foreign investment in Albania reportedly reached $10 billion, of which $1 billion was reportedly for development of existing onshore oil fields and another $1 billion reportedly for the development of the country's ore mining and processing industry. The Pitini Steel Group of Italy was one of the major foreign investors. Under an agreement reportedly signed in the fall of 1990, Pitini was to assist in the technical renovation of Steel of the Party Metallurgical Combine at Elbasan. Other Italian investments included the electrification of the railway from Prenjas, a nickeliferous iron ore mining region, to the Elbasan steelworks and the upgrading of the Kalimash chrome enrichment plant.

STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry continued to constitute the largest sector of Albania's industry. It was state owned and operated by the Ministry of Industry, Mines and Energy. Political changes in Albania, during the year, created opportunities to discuss ways to restructure the country's mineral industry. However, by the end of 1990, most of the new proposals were in the formative stage.

COMMODITY REVIEW

Metals

Bauxite.—In 1990, Albania's production of bauxite declined to 26,000 tons from

TABLE 1

ALBANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989[p]	1990[e]
METALS						
Bauxite[e]		50,000	55,000	55,000	[r]35,000	[3]26,000
Chromium:						
Chromite, gross weight	thousand tons	1,159	1,075	1,109	[r,e]900	[3]910
Marketable ore	do.	560	420	346	294	[3]295
Concentrate	do.	186	164	160	173	[3]157
Ferrochromium	do.	[r,e]26	[r,e]26	39	39	[3]24
Cobalt:[e]						
Mine output, Co content[4]		[r]600	[r]600	[r]600	600	600
Plant production, Co content[5]		—	—	10	10	20
Copper:						
Ore:						
Gross weight	thousand tons	1,011	1,166	1,187	1,136	[3]931
Concentrate		50,000	55,000	55,000	62,000	49,000
Cu content[e]		[r]13,500	[r]14,500	[r]15,500	[r]15,500	12,500
Metal, primary:						
Smelter		13,000	14,000	15,000	15,000	[3]12,000
Refined[e]		11,700	12,000	13,000	13,000	10,000
Iron and steel:						
Iron ore, nickeliferous:						
Gross weight	thousand tons	829	972	1,067	1,179	[3]930
Fe content[e]	do.	250	300	320	350	270
Metal:						
Pig iron		112,000	140,000	172,000	179,000	[3]96,000
Crude steel[e]		70,000	85,000	110,000	112,000	65,000
Rolled steel		[e]60,000	[e]65,000	96,000	92,500	60,000
Nickel:[e]						
Mine output, Ni content		9,700	9,500	10,000	11,000	11,000
Plant production, Ni content[6]		4,000	4,000	4,500	5,000	6,000
Metal, primary and secondary		2,500	2,500	2,500	2,500	2,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	[e]850	[e]860	746	754	750
Dolomite[e]		350,000	350,000	350,000	400,000	[3]397,000
Fertilizer, manufactured:						
Phosphatic		[e]150,000	[e]150,000	165,000	165,000	100,000
Urea		[e]90,000	[e]90,000	77,000	92,000	50,000
Nitrogen: N content of ammonia[e]		90,000	5,000	100,000	110,000	110,000
Pyrite, unroasted[e]		50,000	50,000	50,000	50,000	[3]48,000
Salt[e]		70,000	75,000	70,000	[r]80,000	[3]85,000
Sodium compounds n.e.s.:						
Soda ash, calcined		[e]33,000	[e]31,000	22,000	27,000	27,000
Sulfuric acid		[e]80,000	[e]80,000	81,000	82,000	70,000
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bitumen, natural[e 7]	thousand tons	950	950	900	900	900
Coal: Lignite	do.	2,167	2,134	2,184	2,193	[3]2,071
Gas, natural, gross production[8]	million cubic meters	263	263	480	312	[3]243

See footnotes at end of table.

TABLE 1—Continued

ALBANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989[p]	1990[e]
MINERAL FUELS AND RELATED MATERIAL—Continued						
Petroleum:						
Crude:						
Weight	thousand tons	1,205	1,181	1,167	1,129	[3]1,069
Converted	thousand 42-gallon barrels	8,040	7,880	7,786	7,533	7,132
Refinery products[e]		9,000	9,000	9,000	9,000	9,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Oct. 19, 1991.
[2]In addition to the commodities listed, a variety of industrial minerals and construction materials (common clay, olivinite, quartz, titanomagnetite, sand, gravel, and stone) are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.
[3]Reported figure.
[4]Calculated from reported and estimated weight of nickeliferous ore; the amount of cobalt recovered, if any, is conjectural.
[5]Figures represent cobalt content of estimated production of commercially marketable cobalt salts produced within Albania from domestically mined nickeliferous iron ore.
[6]Figures represent the sum of nickel content of estimated production of marketable nickel carbonate (1986-90), and ferronickel (1988-90) produced within Albania from domestically mined nickeliferous iron ore. The nickel content of nickel carbonate is included here because it is used in the production of steel in the same way as nickel oxide sinter produced elsewhere.
[7]Includes petroleum refinery-produced asphalt and bitumen.
[8]Separate data on marketable production are not available, but gross and marketed output are regarded as nearly equal.

TABLE 2

STRUCTURE OF THE MINERAL INDUSTRY OF ALBANIA FOR 1990

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Ministry of Industry, Mines and Energy	Elbasan, 32 kilometers southeast of Tirana; Kruje, 20 kilometers northwest of Tirana; Shkoder, 85 kilometers northwest of Tirana; and Vlore southwest of Tirana	1,200
Chromite	do.	Bater (including Bater I & II and Martanesh), 40 kilometers northwest of Tirana Bulqize (including Bulqize south, Fush, Newpoints, Ternove, and Todo Maco), 35 kilometers northeast of Tirana	450
Do.	do.	Kalimash, 60 kilometers north of Tirana	250
Do.	do.	Kam, 70 kilomters north of Tirana	100
Do.	do.	Klos, 20 kilometers northeast of Tirana	50
Do.	do.	Pogradec (including Katjiel, Memelisht, Poljske, Pishkash, and Prenjas), 50 kilometers east of Tirana	100
Ferrochromium	do.	Burrel, 35 kilometers northwest of Tirana	40
Do.	do.	Elbasan, 32 kilometers southeast of Tirana	36
Copper:			
Ore	do.	Fushe-Arrez, 80 kilometers north of Tirana	350
Do.	do.	Gjegjan, 100 kilometers northeast of Tirana	150
Do.	do.	Golaj (including Nikoliq and Pus), 120 kilometers northeast of Tirana	150
Do.	do.	Kurbnesh-Perlat, 55 kilometers of Tirana	100
Do.	do.	Rehove, 110 kilometers southeast Tirana	100
Do.	do.	Reps (including Gurch, Lajo, Spac, and Thurr), 55 kilometers north Tirana	350
Do.	do.	Rreshen, 50 kilometers north of Tirana	50
Do.	do.	Shkoder (including Palaj, Karma I & II), 85 kilometers northwest of Tirana	100

See footnotes at end of table.

TABLE 2—Continued

STRUCTURE OF THE MINERAL INDUSTRY OF ALBANIA FOR 1990

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Smelter	Ministry of Industry, Mines and Energy	Kukes, 110 kilometers northeast of Tirana	6
Do.	do.	Lac, 35 kilometers northwest of Tirana	7
Do.	do.	Rubik, 50 kilometers north of Tirana	3.5
Iron ore	do.	Prenjas (Bushtrica, Prenjas, Skorska I & II), 70 kilometers southeast of Tirana	650
Do.	do.	Guri i Kuq (including Cerveake, Grasishta, Guri i Kuq, Hudenisht & Guri Pergjrgjur), 25 kilometers east of Tirana	500
Steel	do.	"Steel of the Party" Metallurgical Combine at Elbasan	150
Nickel, smelter	do.	Elbasan	6
Coal, lignite	do.	Maneze, Mezes, and Valias Mines in Tirana Durres area; Krabe Mine, 20 kilometers southeast of Tirana; Alarup and Cervnake Mines, in Pogradec area, 80 kilometers south east of Tirana; Mborje-Drenove Mine in Korce area, 85 kilometers southwest of Tirana; and Memaliaj Mine in Tepelene are, 110 kilometers south of Tirana	2,500
Natural gas, million cubic feet per year	do.	Gasfields in southwest Albania between Ballsh and Fier	16,000
Petroleum:			
Crude 42-gallon barrels per day	do.	Oilfields at Marineze, Ballsh, Shqisht, Patos, Kucova, Gorrisht, and others	35,000
Refined	do.	Refineries: Ballsh, Cerrik, Fier, and Stalin	33,000

the estimated 1989 production of 35,000 tons. Because there were no processing facilities, the country's entire output of bauxite was exported to Yugoslavia in exchange for aluminum metal.

Chromite.—As in the past, chromite mining and processing remained the most important sector of Albania's mineral industry, involving more than 30 enterprises. During the past 5 years, the export of chromite ore and concentrate accounted for 17% to 21% of Albania's total exports.

Ninety percent of the chromite ore produced was metallurgical grade, with more than one-quarter of the ore grading of 41.6% Cr_2O_3. Production consisted of lumpy ore (42% to 44% Cr_2O_3 and 6% SiO_2) and concentrate (48% to 50% Cr_2O_3 and 6% SiO_2 having a Cr:Fe ratio of 3:1).

Most of the deposits are in the northern part of Albania in ultrabasic massifs in the Mirdite area. The mainly podiform ore was mined by several enterprises, of which Bulqize was the largest.

The Bulqize Combine consisted of five mines: Todo Manco, Bulqize south, Ternove, Nevpoints, and Fush. In 1990, the Bulqize Combine produced 386,000 tons of ore, mainly from Todo Manco (190,000 tons) and Bulqize south (105,000 tons). The Todo Manco ore graded up to 44% Cr_2O_3, 9% SiO_2, 10% Al_2O_3, 20% to 24% MgO and 12% to 13% FeO. The average chromium oxide content of the ore from the Ternove Mine was 40% and was between 25% to 30% at the other mines. In 1989, the two concentration plants, at Bulqize south and Todo Maco, produced an estimated 150,000 tons of high-grade concentrate. The flotation recovery, after gravity separation, was about 65%. The ore reserves at Bulqize amounted to about 7 Mmt, of which 6.5 Mmt was in the Todo Manco area.

Because of declining chromite extraction from existing mines, two new chromite mines near Tropoje and Mat were reportedly being developed; two additional mines were reportedly under construction near Pogradec and Librazhd to supply feedstock for the new ferrochromium plant in Elbasan. The Bulqize Mine was reportedly being expanded by extending the mine's vertical shafts to depths of 1,200 m.

Copper.—The production of copper in 1990 amounted to about 931,000 tons of ore, grading 1.5% Cu, or about 18% lower than that in 1989. Most of the estimated 12,000 tons of copper metal produced in 1990 was used for copper cables and wires, the bulk of which was exported. With the exception of the Rehove Mine, Albania's copper industry was in the northern part of the country. The Munella Copper Project has the largest copper deposit. According to the General Director of TEKNOIMPORT—the Albanian State Enterprise for Foreign Trade—the deposit consists mainly of volcanic rock overlaid transgressively by terrigenous carbonate sedimentary rocks in its eastern part. Gangue minerals include chalcopyrite, sphalerite, and pyrite. There are different mineralizations, with head grades ranging from 0.2% to 1.5% Cu, 0.4% to 1.6% Zn, and 2.5% to 40% S. According to Albanian specialists, copper ore reserves consisted of two different deposits. One deposit contained 8.75 Mmt of reserves, of which 7.3 Mmt was copper ore with 1.41% Cu content, 1.2 Mmt was zinc ore with 1.65% Zn content, and 0.25 Mmt of pyrite with 40% S content. The other deposits contained 10.2

Mmt of reserves of yet undetermined metal content. When fully developed, the annual production of the Munella Mine is to reach 300,000 tons. The local beneficiation plant would produce copper concentrate with 20% Cu content, zinc concentrate with 50% Zn content, and pyrite concentrate with 45% S content.

The major new copper industry project since the commissioning of the beneficiation plant at Golaj, near Kukes, in 1989, was the development of a new copper mine at Puka. Furthermore, a new continuous casting plant was planned to supplant the existing wire and sheet facility at Shkoder.

Ferrochromium.—The production of ferrochromium in 1990 (63% to 66% Cr) amounted to 24,000 tons, a 38% decrease from that of the previous year. The Burrel plant started operation in 1979 and was expanded in 1987 to a capacity of about 40,000 mt/a of ferrochromium (64% to 65% Cr, 6% to 8% C, and 3% silica). The Elbasan ferrochromium plant was scheduled to start operation in early 1991, after the installation of first of three 9-MVA furnaces. When fully operational, the plant would reportedly have the capacity to treat 100,000 tons of ore to produce up to 60,000 tons of ferrochromium containing 63% to 65% Cr and 7% to 8% C.

During the past decade, 80% to 85% of Albanian ferrochromium production was reportedly exported to Western countries.

Nickel.—Nickel metal production, which had been estimated at 2,500 mt/a, over several years declined to an estimated 2,000 tons in 1990. Nickel carbonate production in 1990 was reportedly 2,000 tons (capacity 6,000 tons) and ferronickel, reportedly, 1,500 tons (capacity 2,500 tons). The feed for the Elbasan electrolytic nickel refinery, built by Salzgitter at the end of 1989, was mainly indigenous nickeliferous iron ore augmented by higher grade imported nickel ores.

Nickeliferous Iron Ore.—In 1990, 2 Mmt of lateritic nickeliferous iron ore containing up to 45% Fe, 0.95 to 0.96% Ni, and 10% SiO_2 was mined in Albania. From this, 930,000 tons of marketable ore was produced. About 40% of the ore was exported to Czechoslovakia and a smaller amount to Bulgaria, while the rest was processed at the electrolytic nickel refinery plant at Elbasan.

The main nickeliferous iron ore deposits are in the mountains of eastern Albania, the site of two existing mining enterprises—Guri Kuq and Prenjas. The average content of ore ranged between 44% to 45% Fe, 0.95% to 0.97% Ni, 0.06% to 0.63% Co, and 7% to 11% SiO_2. Overall, about 12 mines were in operation in 1990, of which 4 belonged to Prenjas and 5 to Guri Kuq mining enterprises. The 1990 production at Prenjas was about 700,000 tons and at Guri i Kuq 500,000 tons. In 1990, the development reportedly began on a nickel mine in the Librazhd area. Output was expected to reach 500,000 mt/a. Reserves were estimated to contain about 200,000 tons of nickel and 12,000 tons of cobalt.

Steel.—The industrial sector most affected by the drought of 1990 was the iron and steel industry. The production of pig iron was down by more than 46%, and production of crude steel declined by an estimated 40%. The only producer of steel in Albania was the "Steel of the Party Metallurgical Combine" in Elbasan. It began operation in 1966. In 1976, additional blast and electric furnaces, oxygen converters, and rolling mills were added. Continuous casting began in 1984. In 1989, production amounted to 37,500 tons of bars, 25,000 tons of sections, 28,000 tons of coiled rounds, 2,000 tons of wire, and 4,000 tons of forged products.

Industrial Minerals

The only urea combine in Albania was at Fier. It consisted of three plants, each containing urea and ammonia departments. The first was built in 1967 with Italian assistance, and subsequently the other two were built by Albania using Chinese designs. Although the combined capacity was 300,000 tons of urea, actual production in 1989 was only 92,000 tons owing to a lack of methane and crude oil.

The phosphatic fertilizer plant in Lac consisted of the fertilizer plant built in 1966, the nitric acid shop built in 1980, and a new sulfuric acid plant in 1989. The plant operated at 30% to 50% capacity in 1990 owing to lack of raw materials and aging equipment. In addition to basic fertilizers, the Lac fertilizer plant produced normal superphosphate with 15% to 20% P_2O_5, concentrated nitric acid, and some simple phosphates made into granular form.

Mineral Fuels

Coal.—To offset declining production in existing mines, new lignite mines were being developed in Korce, Pogradec, and Tepelene. In addition, the first bituminous coal deposit in Albania was being developed in the Vlore area. Most country's lignite production has been used for nonmetallurgical domestic needs. Only a small percentage of production was exported. Coking coal for the iron and steel industry was imported.

Crude Petroleum.—Albania has been extracting petroleum since 1927, reaching a maximum of 3 Mmt in 1973. Since then, the rate has declined annually with 1,069,000 tons produced in 1990. The petroleum industry employed about 23,000 people. During the past 63 years, more than 20 oil fields have been developed. Of the about 5,000 wells drilled, almost 3,000 were producing in 1990. The largest field was Marineze, producing 25% of total Albanian production. It is followed by Ballsh (20%), Shqisht (15%), Patos (11%), Kucova (10%), and Gorrisht (10%).

Reserves

The system used to measure "reserves" had little or no relationship to definitions of reserves applied in market economy countries. The data presented in Table 3 may more accurately be described as Albania's apparent mineral commodity resources.

INFRASTRUCTURE

Albania's system of inland transportation consisted mainly of roads and, to a lesser degree, railroads. Waterway transportation was almost exclusively between coastal cities. Albania had about 16,700 km of roads, of which 6,700 km was paved highways and roads and 10,000 km was

TABLE 3

ALBANIA: APPARENT RESOURCES OF MAJOR MINERAL COMMODITIES FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Bauxite	12,000
Chromite, 20% to 44%	25,000
Cobalt, recoverable in ore	60
Copper, recoverable in ore	500
Iron, recoverable in ore	13,000
Nickel, recoverable in ore	900
Coal	58,000
Natural gas billion cubic meters	20

Sources: Gornaya Entsiklopediya, V. I, Moscow; and Gazovaya Promyshlennost, Moscow, Dec. 1989.

forest and agricultural roads. One of the many new projects was the 241-km-long four-lane highway connecting the port city of Durres with Greece, via Pogradec and Kapshtica.

The railroad system consisted 509 km of standard gauge and 34 km of narrow gauge. All tracks were single, and none were electrified. The most immediate plan was to electrify the entire line from Titograd in Yugoslavia to Albanian cities of Vlore, Durres, and Pogradec.

Most shipping was limited to coastal waters, with a small portion on lakes and rivers. The largest seaport was at Durres having a depth of up to 9 m. Two smaller ports were in Vlore and Sarande.

In the mineral industry, most of the mines used trucks or narrow-gauge railroad to transport ore to the nearest railroad stations or directly to processing centers. Several major mines were connected by railroad to processing centers; for example, the nickeliferous mining areas in Prenjas and Guri i Kuq to the processing center at Elbasan, or the copper mining district at Shkoder to the smelter and refinery at Lac. Albania's hydrocarbon industry had about 145 km of crude oil pipeline, 55 km for refinery products, and 64 km of pipeline for natural gas.

OUTLOOK

Owing to a long period of self-imposed isolation, Albania was behind other east European countries in virtually all technical aspects of mineral mining and processing. Most of the mining and processing enterprises lack modern equipment and pollution controls. For example, in the Bulqize chrome mine, most mining was still performed with pneumatic hammers, dynamite blasting, and manual loading into hand pushed carts. In addition, the safety and health of workers was secondary to production targets.

Because of low labor costs, Albania's proximity to major European producers, and the country's potential mineral wealth, Albania may become an important mineral producing European country. The short-term increase of production could be achieved by application of modern technology at the existing underutilized mines.

OTHER SOURCES OF INFORMATION

Agencies

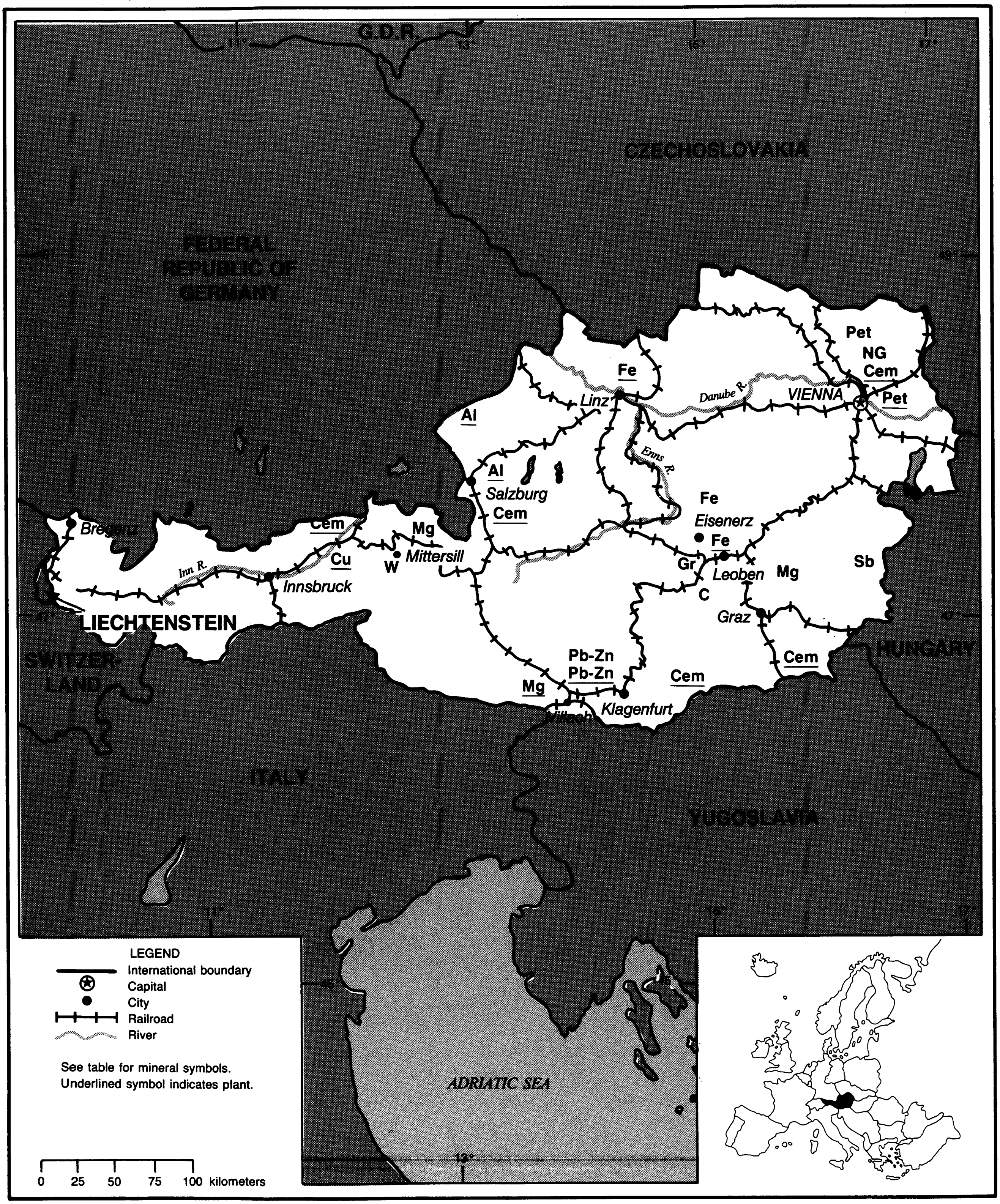
Ministry of Transport
Titania
Ministry of Industry, Mines and Energy
Titania
Ministry of Foreign Trade
Titania
Chamber of Commerce
Titania

Publications

Albania Today, published monthly in English by Albania.

AUSTRIA

AREA 84,000 km² **POPULATION 7.5 million**



THE MINERAL INDUSTRY OF AUSTRIA

By Donald E. Buck, Jr.

Steelmaking and the production of antimony, copper, germanium, lead, and zinc were the main processing industries contributing to Austria's minerals-related economy. Coal, graphite, iron ore, magnesite, tungsten, and zinc were among the more abundant minerals mined in Austria.

GOVERNMENT POLICIES AND PROGRAMS

The Supreme Mining Authority, a section of the Federal Ministry of Trade, Commerce, and Industry, regulates the mining and mineral processing facilities. The Government owns many of the country's metalliferous mining operations and processing facilities. Proprietorship is exercised by Austria's state holding company, Osterreichische Industrieholding AG (OIAG), which also administers the major part of other nationalized enterprises. Because Austria depends on imports for about 75% of its mineral raw material requirements, the Government has a policy of funding exploration and research through the Ministry of Trade, Commerce, and Industry and the Ministry of Science and Research. The Government also regulates all foreign investment ventures.

PRODUCTION

Generally, in 1990, base metal mining and metals production decreased slightly; however, the production of industrial minerals rose slightly. Coal production reversed its downward trend, recording an 18% gain over that of the previous year to 2,448 million tons. Industrial production continued an upward trend with the continued growth of the economy. Overall growth fueled investment in expanding industrial capacity and in production of consumer goods, which was strong and was expected to continue to grow with increased demand from Eastern Europe. The Austrian mining and minerals sectors were undertaking measures to reorganize and privatize industries, to meet increase global competition, and to conform to EC standards. Exploration continued abroad to augment future production capacities.

In 1990, there were reported to be 90 mining operations and 4 oil and gas enterprises operating in the country. The Government reported there were 23 underground and 67 open pit operations. Several underground and open pit operations were reported to be under development. In 1989, there were 91 active mining operations in Austria, 21 of them underground, 59 on the surface, 7 with both underground and surface sections, and 4 salt solution operations.

TRADE

The export of Austrian goods increased in value another 8.6% over 1989 figures to $39.2 billion,[1] while imports rose slightly less at 8% to $48.9 billion. Austria remained a member of the EFTA and maintained important trade links to Eastern Europe. However, Austria's economy also was closely tied to EC countries, especially to the Federal Republic of Germany. About 65% of Austrian exports went to EC countries, and 70% of Austria's imports came from them. The Federal Republic of Germany and France were Austria's two most important trading partners. Several of the imported steel commodities, mostly from West Germany, increased significantly, as did several ore imports (see table 3).

STRUCTURE OF THE MINERAL INDUSTRY

The Government nationalized most of Austria's mining and mineral processing enterprises in the early postwar period and presently encourages joint ventures with private companies. In 1990, the Government largely controlled the country's mining and processing companies, but many are now privately owned and have outlets throughout the world. The decentralization, modernization, and rationalization as well as other changes in East and West Europe are forces of change in the Austrian mining and processing industries.

COMMODITY REVIEW

Metals

Aluminum.—Salzburger Aluminium GmbH (Swiss Aluminium Ltd.) and Austria Metall AG (AM) had smelters operating in Austria. The production of primary aluminum decreased from approximately 93,000 tons in 1989 to 89,434 tons in 1990. Aluminum scrap facilities reported production of secondary aluminum that totalled about 69,700 tons per year.

Antimony.—Bleiberger Bergwerks Union (BBU) closed Austria's only antimony mine at Schlaining in eastern Austria in 1990. Antimony mining started in 1770, but the depletion of stibnite reserves forced the closure of the mine. Approximately 11,169 tons of crude ore was mined, which yielded 352 tons of antimony in 1990 before the mine was closed. The stibnite occurred disseminated in graphite schists as small lenses and veins interbedded with limestone and chlorite schists. The antimony was used solely by BBU's own chemical and metallurgical plant for the production of alloys and antimony derivatives.

Copper.—The copper smelter and refinery at Brixlegg imported copper scrap and residues to make electrical-grade copper products. Some of these products are electrolytic cakes, cathodes, wirebars, billets, and slabs. The Brixlegg smelter, with a capacity of 50,000 mt/a of copper, also produced gold, nickel, and silver from the refining of the scrap feedstock.

Iron and Steel.—The only significant iron ore strip mine operating in Austria was the Erberg Mine. Production dropped by 110,000 tons to 2.3 million tons in 1990. All of the manganese-rich iron ore produced went to the Donawitz steel plant near Leoben. The present contract to deliver iron ore to Voest Alpine Steel at Donawitz, Erzberg's only customer, will expire in 1993. It was reported that the Erzberg iron ore mine's future remained unclear, because it depends on the Donawitz's continued operation. For example, the planned closure of one of the two

TABLE 1

AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity	1986	1987	1988	1989[p]	1990[p]
METALS					
Aluminum metal:					
Primary	92,453	93,414	95,494	92,924	89,434
Secondary	24,700	19,800	29,400	[e]29,000	69,693
Total	117,153	113,214	124,894	[e]121,924	159,127
Antimony, mine output, Sb content of concentrate	514	322	228	350	352
Cadmium metal	52	26	26	49	44
Copper:					
Smelter, secondary	25,500	29,100	34,500	39,100	41,000
Refined:					
Primary	7,067	3,855	3,551	7,178	8,690
Secondary	32,579	32,924	38,378	39,089	41,013
Total	39,646	36,779	41,929	46,267	49,703
Germanium, Ge content of concentrate kilograms	6,300	6,700	6,000	6,000	5,000
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	3,120	3,061	2,311	2,410	2,301
Fe content do.	976	954	727	761	653
Metal:					
Pig iron do.	3,349	3,451	3,665	3,823	3,452
Ferroalloys, electric-furnace[e] do.	12	12	12	12	12
Crude steel do.	4,292	4,301	4,560	4,718	4,292
Semimanufactures do.	3,462	3,432	3,752	3,732	3,719
Lead:					
Mine output, Pb content of concentrate	4,662	5,246	2,281	1,571	1,494
Metal:					
Smelter:					
Primary	1,500	3,400	6,753	[e]6,500	[e]5,500
Secondary	15,000	15,700	15,651	15,800	[e]15,599
Total	16,500	19,100	22,404	[e]22,300	21,099
Refined:					
Primary[e]	6,000	6,800	9,000	8,800	8,400
Secondary	19,000	16,000	16,000	15,218	15,100
Total	25,000	22,800	25,000	24,018	23,500
Manganese, Mn content of domestic iron ore	58,945	57,486	40,917	46,287	42,669
Tungsten, mine output, W content of concentrate	1,387	1,250	1,235	1,517	1,378
Zinc:					
Mine output, Zn content of concentrate	16,290	15,735	17,051	14,800	17,900
Metal, refined	24,000	24,300	23,900	26,102	26,800
INDUSTRIAL MINERALS					
Cement, hydraulic thousand tons	4,569	4,522	4,763	4,749	4,903
Clay:					
Illite	268,451	275,921	280,369	242,767	191,121
Kaolin:					
Crude	444,852	444,927	485,011	492,417	473,386
Marketable	46,291	92,186	89,491	157,258	81,265
Other	33,037	12,961	52,102	6,855	31,039
Feldspar, crude	2,850	4,692	8,222	7,251	8,788

See footnotes at end of table.

TABLE 1—Continued

AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[p]
INDUSTRIAL MINERALS —Continued						
Graphite, crude		36,167	39,391	7,577	15,307	22,205
Gypsum and anhydrite, crude		701,749	664,452	721,745	625,433	751,645
Lime	thousand tons	1,275	1,378	1,545	1,622	1,637
Magnesite:						
Crude	do.	1,084	947	1,122	1,205	1,179
Sintered or dead-burned	do.	315	345	360	360	411
Caustic calcined	do.	73	58	67	60	55
Nitrogen: N content of ammonia[e]	do.	450	450	[r]408	[r]410	410
Pigments, mineral: Micaceous iron oxide		11,730	10,807	9,938	10,924	9,936
Pumice (trass)		5,808	6,922	7,359	8,130	8,954
Salt:						
Rock	thousand tons	2	1	1	1	1
In brine:						
Evaporated	do.	486	484	413	396	386
Other[e]	do.	215	180	256	251	288
Total	do.	701	664	669	647	674
Sand and gravel:						
Quartz sand	do.	798	684	756	819	818
Other sand and gravel	do.	8,861	9,322	14,700	16,057	16,064
Total	do.	9,659	10,006	15,456	16,876	16,882
Sodium compounds, n.e.s.:[e]						
Soda ash, manufactured	do.	150	150	145	150	150
Sulfate, manufactured	do.	55	109	118	120	120
Stone:[2]						
Dolomite	do.	1,308	1,406	1,521	1,645	1,880
Quartz and quartzite	do.	196	196	167	263	249
Other, including limestone and marble	do.	9,250	9,540	12,324	12,700	12,800
Total	do.	10,754	11,142	14,012	14,608	14,929
Sulfur:						
Byproduct:						
Of metallurgy		10,986	10,448	11,331	12,064	11,974
Of petroleum and natural gas		29,348	24,946	36,217	37,070	30,390
From gypsum and anhydrite		23,837	13,091	—	—	—
Total		64,171	48,485	47,548	49,134	42,364
Talc and soapstone		133,319	129,959	132,974	133,078	133,971
MINERAL FUELS AND RELATED MATERIALS						
Coal, brown and lignite	thousand tons	2,969	2,786	2,129	2,066	2,448
Coke	do.	1,744	1,727	1,744	1,771	1,725
Gas, natural:						
Gross	million cubic meters	1,112	1,167	1,265	1,323	1,288
Marketed	do.	921	968	1,062	[e]1,020	[e]1,081
Oil shale		400	1,090	210	570	475
Petroleum:						
Crude	thousand 42-gallon barrels	7,783	7,410	8,196	8,075	8,072
Refinery products:						
Liquefied petroleum gas	do.	5,145	6,476	7,010	[e]6,000	5,288
Gasoline	do.	18,023	20,054	20,516	19,935	22,237
Kerosene and jet fuel	do.	1,381	1,546	1,772	2,226	2,398

See footnotes at end of table.

TABLE 1—Continued

AUSTRIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued						
Refinery products—Continued						
Distillate fuel oil	thousand 42-gallon barrels	18,582	18,917	18,288	20,920	22,504
Lubricants	do.	1,591	—	—	—	416
Residual fuel oil	do.	13,530	12,411	12,027	9,912	11,353
Bitumen	do.	1,427	1,382	1,425	1,487	1,474
Unspecified	do.	220	82	71	75	75
Refinery fuel and losses	do.	3,502	3,620	3,458	2,387	2,124
Total	do.	63,401	64,488	64,567	62,942	67,869

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 1991.
[2]Excluding stone used by the cement and iron and steel industries.

TABLE 2

AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989: United States	Destinations, 1989: Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	11	2	—	NA.
Alkaline-earth metals	(2)	—		
Aluminum:				
Ore and concentrate	135	70	—	All to West Germany.
Oxides and hydroxides	402	1,025	25	Italy 388; Yugoslavia 188; West Germany 164.
Ash and residue containing aluminum	65,850	58,920	—	Italy 41,698; West Germany 12,278; Spain 3,168.
Metal including alloys:				
Scrap	46,911	35,508	—	Italy 15,207; West Germany 14,752; Poland 2,573.
Unwrought	44,894	42,984	—	West Germany 12,817; Italy 11,276; France 5,873.
Semimanufactures	126,127	126,439	1,204	West Germany 49,769; Italy 15,093; Switzerland 9,622.
Antimony:				
Ore and concentrate	77	138	—	West Germany 133.
Oxides	20	5	NA	NA.
Metal including alloys, all forms	3	7	NA	NA.
Arsenic: Metal including alloys, all forms	1	—		
Bismuth: Metal including alloys, all forms	(2)	—		
Cadmium: Metal including alloys, all forms	20	120	—	West Germany 74; Netherlands 20; United Kingdom 20.
Chromium:				
Ore and concentrate	213	94	—	All to Italy.
Oxides and hydroxides	8	27	—	Yugoslavia 19.
Metal including alloys, all forms	1	2	—	Mainly to West Germany.
Cobalt:				
Ore and concentrate	33	—		
Oxides and hydroxides	29	—		
Metal including alloys, all forms	7	18	—	Hungary 4; Romania 2; Yugoslavia 1.
Columbium and tantalum: Tantalum metal including alloys, all forms	37	31	(2)	West Germany 14; Belgium-Luxembourg 7; United Kingdom 3.

See footnotes at end of table.

TABLE 2—Continued

AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989	
			United States	Other (principal)
METALS—Continued				
Copper:				
Ore and concentrate	96	—		
Matte and speiss including cement copper	16	23	—	Mainly to Poland.
Oxides and hydroxides	3	3	—	NA.
Sulfate	52	38	NA	NA.
Ash and residue containing copper	11,269	10,746	NA	West Germany 7,993; Belgium-Luxembourg 1,730; United Kingdom 784.
Metal including alloys:				
Scrap	25,360	15,716	—	West Germany 9,546; Italy 2,973; United Kingdom 988.
Unwrought	24,434	33,444	—	Italy 19,556; West Germany 10,848; Yugoslavia 1,196.
Semimanufactures	28,569	28,403	321	West Germany 10,278; Italy 4,797; France 3,343.
Gold: Metal including alloys, unwrought and partly wrought kilograms	1,015	622	—	West Germany 276; Italy 264; Netherlands 20.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	([2])	—		
Metal:				
Scrap	47,222	95,983	—	Italy 67,137; West Germany 16,306; Hungary 7,118.
Pig iron, cast iron, related materials	10,462	1,488	NA	Bulgaria 403; France 388.
Ferroalloys	r18,804	19,707	268	West Germany 3,601; Italy 3,297; France 2,562.
Steel, primary forms	15,147	16,803	—	Italy 9,666; Yugoslavia 3,327; West Germany 2,717.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	1,471,170	1,404,430	928	West Germany 484,040; U.S.S.R. 269,346; Italy 214,404.
Clad, plated, coated	260,217	280,552	479	West Germany 131,650; Italy 48,026; Sweden 22,147.
Of alloy steel	289,682	220,870	1,419	West Germany 85,914; U.S.S.R. 85,473; Italy 13,052.
Bars, rods, angles, shapes, sections	370,815	393,006	1,811	West Germany 133,321; Italy 103,269; Switzerland 39,366.
Rails and accessories	97,008	101,827	397	Switzerland 38,514; Algeria 26,037; Denmark 9,719.
Wire	62,014	68,966	2,129	West Germany 33,448; Italy 10,060; Switzerland 5,783.
Tubes, pipes, fittings	575,970	623,065	19,912	U.S.S.R. 213,659; West Germany 116,653; Italy 54,451.
Lead:				
Ash and residue containing lead	1,975	5,715	—	Yugoslavia 4,566; West Germany 992; Italy 101.
Metal including alloys:				
Scrap	1,601	3,554	—	West Germany 2,146; Yugoslavia 1,084; Czechoslovakia 233.
Unwrought	7,273	4,659	—	Italy 4,288; Switzerland 146.
Semimanufactures	29	33	—	West Germany 9; Italy 2; unspecified 22.
Magnesium: Metal including alloys:				
Scrap	469	282	—	West Germany 164; Belgium-Luxembourg 85; Italy 32.
Unwrought	179	342	—	West Germany 334.
Semimanufactures	2,029	1,278	NA	West Germany 25; France 11; unspecified 1,235.
Manganese:				
Oxides	94	61	NA	NA.
Metal including alloys, all forms	—	1	—	NA.
Mercury	3	1	—	NA.
Molybdenum:				
Ore and concentrate:				
Roasted	1,378	406	—	Czechoslovakia 139; India 120; Italy 83.

See footnotes at end of table.

TABLE 2—Continued

AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989	
			United States	Other (principal)
METALS—Continued				
Molybdenum—Continued				
Ore and concentrate—Continued				
Unroasted	2	—		
Oxides and hydroxides	4	14	—	NA.
Metal including alloys, all forms	1,640	1,651	170	West Germany 851; United Kingdom 169.
Nickel:				
Matte and speiss	75	—		
Metal including alloys:				
Scrap	123	200	—	All to West Germany.
Unwrought	98	171	—	Sweden 142; West Germany 26.
Semimanufactures	626	608	—	West Germany 272; Italy 38; Iraq 20.
Platinum-group metals:				
Waste and sweepings value, thousands	$1,333	$3,319	—	West Germany $2,656; Italy $323; France $189.
Metals including alloys, unwrought and partly wrought kilograms	1,201	766	—	United Kingdom 290; West Germany 275; Yugoslavia 126.
Rare-earth metals including alloys, all forms	430	358	NA	NA.
Selenium, elemental	3	—		
Silicon, high-purity	1,000	438	—	All to West Germany.
Silver:				
Waste and sweepings[3] value, thousands	$12,896	$5,584	—	West Germany $4,180; France $1,391.
Metal including alloys, unwrought and partly wrought kilograms	171,174	175,888	NA	West Germany 149,915; Switzerland 13,359; Yugoslavia 7,784.
Tin:				
Oxides	1	—		
Metal including alloys:				
Scrap	10	36	—	All to West Germany.
Unwrought	47	25	—	West Germany 21.
Semimanufactures	53	14	—	Czechoslovakia 12.
Titanium:				
Ore and concentrate	2	8	—	NA.
Oxides	952	725	NA	West Germany 281; Netherlands 170; Italy 90.
Metal including alloys:				
Unwrought including scrap	6,970	3,339	31	United Kingdom 1,826; Italy 867; Switzerland 376.
Semimanufactures	28	41	17	West Germany 16; Italy 3.
Tungsten: Metal including alloys, all forms	1,119	1,318	29	West Germany 928; Israel 118; India 67.
Uranium and thorium: Oxides and other compounds value, thousands	$83	$31	NA	NA.
Vanadium:				
Oxides and hydroxides	494	370	—	U.S.S.R. 240; West Germany 48; Netherlands 39.
Ash and residue containing vanadium	—	122	—	All to West Germany.
Zinc:				
Ore and concentrate	21	([2])	—	NA.
Oxides	2,177	2,461	—	West Germany 1,241; Italy 442; Yugoslavia 440.
Blue powder	112	156	22	Yugoslavia 25; France 24.
Ash and residue containing zinc	2,166	2,517	—	West Germany 1,066; France 829; Spain 321.
Metal including alloys:				
Scrap	2,399	2,539	—	West Germany 902; Taiwan 714; Belgium-Luxembourg 674.

See footnotes at end of table.

TABLE 2—Continued

AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989	
			United States	Other (principal)
METALS—Continued				
Zinc—Continued				
Metal including alloys—Continued				
Unwrought	7,066	6,360	—	Italy 3,159; Yugoslavia 2,296; West Germany 1,118.
Semimanufactures	48	187	21	Yugoslavia 53; West Germany 13.
Zirconium:				
Ore and concentrate	21	24	—	NA.
Metal including alloys, all forms	(2)	22	—	West Germany 21.
Other:				
Ores and concentrates	24	—		
Oxides and hydroxides	166	52	1	France 20; West Germany 17; Italy 6.
Ashes and residues	1,503	1,644	225	West Germany 496; U.S.S.R. 496.
Base metals including alloys, all forms	46	14	NA	NA.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	158	128	—	West Germany 94.
Artificial: Silicon carbide	59	83	—	Yugoslavia 37.
Dust and powder of precious and semi-precious stones excluding diamond value, thousands	$7	—		
Grinding and polishing wheels and stones	13,866	14,781	602	West Germany 2,928; Italy 1,490; France 1,232.
Asbestos, crude	28	247	NA	Hungary 118; Italy 63.
Barite and witherite	10	3	—	NA.
Boron materials:				
Crude natural borates	228	57	NA	NA.
Oxides and acids	102	3	NA	NA.
Bromine	(2)	(2)	NA	NA.
Cement	12,276	29,390	—	West Germany 24,174; Italy 3,918; France 841.
Chalk	3,623	2,559	—	Hungary 1,388; Czechoslovakia 590; West Germany 192.
Clays, crude:				
Bentonite	34	1,114	—	Switzerland 1,023; West Germany 59.
Chamotte earth	473	482	NA	West Germany 169; Denmark 144; East Germany 76.
Fuller's earth	8	12	—	NA.
Fire clay	45	95	NA	West Germany 50.
Kaolin	48,568	50,040	—	Hungary 25,539; West Germany 11,871; Yugoslavia 7,670
Unspecified	93	255	NA	West Germany 212.
Cryolite and chiolite	26	1	—	NA.
Diamond, natural:				
Gem, not set or strung value, thousands	$279	$635	NA	Switzerland $381; Belgium-Luxembourg $159.
Industrial stones do.	$194	$122	—	Yugoslavia $66.
Dust and powder kilograms	2	18	—	West Germany 8: United Kingdom 3.
Diatomite and other infusorial earth	2,811	3,671	—	Hungary 1,327; Bulgaria 691; Czechoslovakia 654.
Feldspar, fluorspar, related materials:				
Feldspar	17	—		
Fluorspar	—	47	—	NA.
Unspecified	37	—		
Fertilizer materials:				
Crude, n.e.s.	330	206	NA	Switzerland 136.

See footnotes at end of table.

TABLE 2—Continued

AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989: United States	Destinations, 1989: Other (principal)
INDUSTRIAL MINERALS—Continued				
Fertilizer materials—Continued				
Manufactured:				
Ammonia	(2)	1	—	NA.
Nitrogenous	NA	556,445	—	West Germany 180,717; East Germany 152,101; Italy 86,033.
Phosphatic	60,041	67,515	—	Czechoslovakia 66,163; Yugoslavia 1,348.
Potassic	23	3,655	—	Yugoslavia 2,971.
Unspecified and mixed	r1,052,930	906,618	17	West Germany 329,670; East Germany 152,101; Italy 127,966.
Graphite, natural	8,926	8,723	NA	West Germany 3,221; Poland 2,094; Italy 1,786.
Gypsum and plaster	127,749	151,337	—	West Germany 148,919; Italy 2,075; U.S.S.R. 85.
Iodine	(2)	1	NA	NA.
Kyanite and related materials	1	10	—	NA.
Lime	5,613	7,552	—	West Germany 6,985; East Germany 151; Italy 92.
Magnesium compounds:				
Magnesite, crude	58	219	NA	NA.
Oxides and hydroxides	149,112	165,686	NA	NA. Mica:
Crude including splittings and waste	651	615	—	West Germany 404; Italy 136.
Worked including agglomerated splittings	3,079	4,811	—	Yugoslavia 2,862; Czechoslovakia 825; India 40.
Phosphorus, elemental	(2)	—		
Pigments, mineral:				
Natural, crude	6,899	7,198	216	West Germany 1,524; United Kingdom 1,490; Netherlands 796.
Iron oxides and hydroxides, processed	3,975	4,703	102	Taiwan 1,121; West Germany 1,025; Italy 814.
Precious and semiprecious stones other than diamond:				
Natural kilograms	3,576	2,316	NA	Thailand 219; West Germany 51; Switzerland 43.
Synthetic do.	2,956	19,486	2,140	Singapore 11,024; India 3,000; Switzerland 1,050.
Pyrite, unroasted	34	—		
Quartz crystal, piezoelectric kilograms	2	10	—	All to West Germany.
Salt and brine	—	13,682	—	Hungary 5,555; West Germany 3,196; Netherlands 2,461.
Sodium compounds, n.e.s.: Sulfate, manufactured	99,268	108,549	NA	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	81,518	51,907	—	West Germany 39,876; Switzerland 9,861; Italy 1,293.
Worked	32,343	24,362	392	West Germany 16,725; Switzerland 4,569; Yugoslavia 442.
Dolomite, chiefly refractory-grade	24,191	32,915	—	West Germany 32,094; Tanzania 214; Brazil 111.
Gravel and crushed rock	701,676	743,361	NA	West Germany 358,582; Switzerland 198,358; Italy 94,897.
Limestone other than dimension	4,034	699	—	All to West Germany.
Quartz and quartzite	1104	76	—	West Germany 65.
Sand other than metal-bearing	71,035	83,905	NA	Switzerland 52,351; West Germany 28,548; Italy 2,304.
Sulfur:				
Elemental:				
Crude including native and byproduct	87	56	NA	Hungary 50.
Colloidal, precipitated, sublimed	50	285	—	Mainly to Yugoslavia.
Dioxide	14	23	—	NA.
Sulfuric acid	8,931	5,443	NA	Italy 4,397; West Germany 667; Czechoslovakia 332.
Talc, steatite, soapstone, pyrophyllite	115,565	116,949	62	West Germany 60,412; Italy 17,461; Switzerland 9,203.
Vermiculite, perlite, chlorite	185	512	—	West Germany 470.

See footnotes at end of table.

TABLE 2—Continued

AUSTRIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989: United States	Destinations, 1989: Other (principal)
INDUSTRIAL MINERALS—Continued					
Other:					
Crude		r36,165	32,527	463	Italy 2,714; West Germany 2,614; Yugoslavia 1,126.
Slag and dross, not metal-bearing		107,556	108,033	—	West Germany 73,118; Yugoslavia 28,823; Switzerland 3,764.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		35	36	—	NA.
Carbon:					
Carbon black		46	54	NA	West Germany 30; Yugoslavia 6.
Gas carbon		(2)	—		
Coal:					
Anthracite and bituminous		197	48	—	Yugoslavia 9.
Briquets of anthracite and bituminous coal		25	25	—	NA.
Lignite including briquets		3,665	3,289	—	West Germany 3,285.
Coke and semicoke		4,323	3,347	NA	West Germany 3,301.
Peat including briquets and litter		21,438	12,764	—	West Germany 6,529; Italy 6,223.
Petroleum:					
Crude	42-gallon barrels	20	—		
Refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	19	11	—	Hungary 10.
Gasoline	do.	2,003	1,989	—	Poland 1,021; West Germany 836; Hungary 83.
Mineral jelly and wax	do.	4	8	—	West Germany 2; Greece 2; Italy 1.
Kerosene and jet fuel	do.	48	59	—	Yugoslavia 27; West Germany 23; Greece 3.
Distillate fuel oil	do.	11	34	—	West Germany 29; Yugoslavia 4.
Lubricants	do.	306	349	—	Czechoslovakia 89; Hungary 83; Iran 33.
Residual fuel oil	do.	(2)	47	—	Mainly to West Germany.
Bitumen and other residues	do.	10	387	—	West Geramny 325; United Kingdom 23; Italy 21.
Bituminous mixtures	do.	86	166	—	West Germany 105; Yugoslavia 40; Italy 11.
Petroleum coke	do.	—	(2)	—	Mainly to Hungary.

rRevised. NA Not available.
[1]Table prepared by staff, International Data Section.
[2]Less than 1/2 unit.
[3]May include other precious metals.

TABLE 3

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	6	4	—	NA.
Alkaline-earth metals	22	23	10	Belgium-Luxembourg 10.
Aluminum:				
Ore and concentrate	49,222	54,922	—	Australia 22,560; Guinea 13,218; West Germany 5,933.
Oxides and hydroxides	306,972	232,645	39	West Germany 143,910; Yugoslavia 39,396; Hungary 35,663.
Ash and residue containing aluminum	102,416	86,953	—	U.S.S.R. 59,636; Hungary 13,248; Poland 4,184.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
METALS—Continued					
Metal including alloys:					
Scrap		56,043	47,231	NA	NA.
Unwrought		108,266	130,429	483	West Germany 67,524; Norway 22,376; U.S.S.R. 3,264.
Semimanufactures		68,729	78,938	47	West Germany 29,859; Switzerland 10,279; Italy 9,384.
Antimony:					
Ore and concentrate	value, thousands	$2,099	—		
Oxides		115	200	—	Belgium-Luxembourg 113; U.S.S.R. 49; West Germany 20.
Metal including alloys, all forms		45	64	NA	China 43; West Germany 16.
Arsenic: Metal including alloys, all forms		11	20	—	NA.
Beryllium: Metal including alloys, all forms	kilograms	200	200	NA	NA.
Bismuth: Metal including alloys, all forms		8	2	NA	NA.
Cadmium: Metal including alloys, all forms		1	1	—	NA.
Chromium:					
Ore and concentrate		58,712	60,936	—	Republic of South Africa 50,747; Cuba 4,270; New Caledonia 1,930.
Oxides and hydroxides		565	464	—	West Germany 334; U.S.S.R. 66; Italy 22.
Metal including alloys, all forms		170	112	2	United Kingdom 44; Republic of South Africa 20; West Germany 19.
Cobalt:					
Oxides and hydroxides		28	28	NA	Finland 23; West Germany 4.
Metal including alloys, all forms		347	388	27	Belgium-Luxembourg 98; Zaire 50; Tanzania 40.
Columbium and tantalum:					
Ore and concentrate[2]		169	57	—	Australia 29; China 12.
Metal including alloys, all forms, tantalum		68	65	9	West Germany 37; Belgium-Luxembourg 16.
Copper:					
Ore and concentrate		30	([3])	—	NA.
Matte and speiss including cement copper		14	([3])	—	NA.
Oxides and hydroxides		50	51	—	Belgium-Luxembourg 42; West Germany 6.
Sulfate		916	710	—	Italy 234; Yugoslavia 189; U.S.S.R. 169.
Ash and residue containing copper		4,883	3,535	—	Czechoslovakia 2,239; West Germany 981; Hungary 168.
Metal including alloys:					
Scrap		49,652	32,226	1,447	West Germany 13,517; U.S.S.R. 5,365; Czechoslovakia 1,930.
Unwrought		11,411	7,291	1,452	West Germany 2,280; Republic of South Africa 1,632.
Semimanufactures		86,457	91,676	58	West Germany 55,555; Belgium-Luxembourg 9,474; Italy 7,703.
Germanium: Metal including alloys, all forms value, thousands		$13	$2	—	NA.
Gold:					
Waste and sweepings	do.	$3	$38	—	Mainly from West Germany.
Metal including alloys, unwrought and partly wrought	kilograms	11,930	3,482	186	Singapore 1,295; West Germany 923; Switzerland 718.
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite	thousand tons	4,164	4,192	6	U.S.S.R. 1,527; Brazil 655; Sweden 501.
Pyrite, roasted	do.	11	12	—	Mainly from Yugoslavia.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS—Continued				
Iron and steel—Continued				
Metal:				
Scrap	101,538	88,183	323	West Germany 51,123; Czechoslovakia 15,614; U.S.S.R. 9,877.
Pig iron, cast iron, related materials	53,889	76,999	—	Hungary 20,122; West Germany 16,965; Canada 16,056.
Ferroalloys:				
Ferrocolumbium	275	306	6	Brazil 196; West Germany 60; Canada 25.
Ferrochromium	22,201	21,969	—	Yugoslavia 6,493; U.S.S.R. 5m158; Hungary 4,196.
Ferromanganese	23,887	23,899	—	West Germany 12,823; Norway 8,062; France 1,313.
Ferromolybdenum	191	274	—	United Kingdom 154; Chile 74; Canada 20.
Ferronickel	1,305	1,369	—	Yugoslavia 1,021; Greece 328; United Kingdom 20.
Ferrosilicochromium	655	641	—	U.S.S.R. 549; Zimbabwe 50; West Germany 42.
Ferrosilicomanganese	6,907	5,103	—	Czechoslovakia 2,242; Yugoslavia 1,141; Norway 911.
Ferrosilicon	21,452	20,732	10	Yugoslavia 5,480; West Germany 3,832; Poland 2,954.
Ferrotitanium	487	414	—	Italy 200; United Kingdom 51; Canada 49.
Ferrotungsten	648	888	25	China 732; Hong Kong 58.
Ferrovanadium	177	286	30	West Germany 147; Czechoslovakia 25.
Silicon metal	4,126	4,325	—	Norway 890; China 875; West Germany 651.
Unspecified	r1,955	2,092	52	West Germany 1,020; U.S.S.R. 350; Yugoslavia 281.
Steel, primary forms	222,418	204,438	—	West Germany 127,138; Hungary 33,537; Sweden 19,829.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	291,717	329,215	—	West Germany 134,322; Hungary 43,816; Czechoslovakia 31,015.
Clad, plated, coated	119,489	137,337	—	West Germany 67,244; Belgium-Luxembourg 22,802.
Of alloy steel	63,054	76,030	26	West Germany 36,859; Sweden 12,080; Italy 6,837.
Bars, rods, angles, shapes, sections	389,235	502,211	178	Italy 157,275; West Germany 144,730; East Germany 32,101.
Rails and accessories	3,546	4,721	463	West Germany 2,947; Switzerland 399.
Wire	44,086	47,603	—	West Germany 17,027; Belgium-Luxembourg 15,744; Italy 7,802.
Tubes, pipes, fittings	222,331	223,063	212	West Germany 94,003; Italy 32,363; France 13,850.
Lead:				
Ore and concentrate	6,884	17,946	—	Spain 4,955; Poland 4,755; Italy 3,622.
Oxides	1,154	1,683	—	West Germany 1,658.
Ash and residue containing lead	592	758	—	Hungary 606; Netherlands 101.
Metal including alloys:				
Scrap	3,023	2,637	—	Poland 1,061; Czechoslovakia 612; Yugoslavia 286.
Unwrought	36,714	38,902	—	West Germany 14,922; United Kingdom 7,291; Namibia 4,620.
Semimanufactures	925	927	—	West Germany 799; United Kingdom 83.
Lithium: Oxides and hydroxides	34	30	15	West Germany 15.
Magnesium: Metal including alloys:				
Scrap	76	30	17	West Germany 7.
Unwrought	2,858	2,523	NA	NA.
Semimanufactures	380	96	2	West Germany 36; Italy 24; Norway 22.
Manganese:				
Ore and concentrate, metallurgical-grade	270	528	—	Netherlands 383; Greece 24.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989	
			United States	Other (principal)
METALS—Continued				
Manganese—Continued				
Oxides	542	186	—	Republic of South Africa 148; Japan 8.
Metal including alloys, all forms	402	428	58	Republic of South Africa 99; Belgium-Luxembourg 68.
Mercury	7	4	—	NA.
Molybdenum:				
Ore and concentrate:				
Roasted	9,510	9,962	5,664	Belgium-Luxembourg 1,117; West Germany 1,023.
Unroasted	32	7	—	NA.
Oxides and hydroxides	2,852	2,486	—	NA.
Metal including alloys:				
Scrap	13	116	NA	West Germany 73; Netherlands 23; France 19.
Unwrought	44	77	34	West Germany 41.
Semimanufactures	73	62	—	France 38; West Germany 19.
Nickel:				
Ore and concentrate	191	169	—	All from U.S.S.R.
Matte and speiss	671	834	—	Netherlands 432; Cuba 176; Canada 106.
Oxides and hydroxides	5	3	—	NA.
Metal including alloys:				
Scrap	626	579	9	Netherlands 129; Cuba 117; Canada 110.
Unwrought	2,735	2,370	39	U.S.S.R. 718; Republic of South Africa 293; Norway 193.
Semimanufactures	709	697	36	West Germany 358; Sweden 143; United Kingdom 45.
Platinum-group metals:				
Waste and sweepings value, thousands	$30	$19	—	NA.
Metals including alloys, unwrought and partly wrought kilograms	2,512	2,429	350	France 1,126; West Germany 456; U.S.S.R. 348.
Rare-earth metals including alloys, all forms	111	245	—	U.S.S.R. 240; China 5.
Selenium, elemental	28	5	—	West Germany 3.
Silicon, high-purity	74	220	—	All from West Germany.
Silver:				
Waste and sweepings[4] value, thousands	$5	$3	NA	NA.
Metal including alloys, unwrought and partly wrought kilograms	175,794	164,580	—	West Germany 111,558; United Kingdom 17,611; Switzerland 9,450.
Tellurium and boron, elemental	1	1	NA	NA.
Tin:				
Ore and concentrate	—	302	—	All from Yugoslavia.
Oxides	9	5	—	West Germany 4.
Metal including alloys:				
Scrap	—	47	—	NA.
Unwrought	500	492	—	Brazil 179; West Germany 103; Netherlands 93.
Semimanufactures	337	358	—	West Germany 309; Netherlands 29.
Titanium:				
Ore and concentrate	809	537	—	Australia 285; Republic of South Africa 216.
Oxides	5,722	4,594	37	Finland 1,236; West Germany 1,170; United Kingdom 1,074.
Metal including alloys:				
Unwrought including scrap	2,535	1,921	32	U.S.S.R. 1,784; Netherlands 62.
Semimanufactures	78	153	57	U.S.S.R. 47; West Germany 20.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989	
			United States	Other (principal)
METALS—Continued				
Tungsten:				
Ore and concentrate	1,249	807	NA	NA.
Oxides and hydroxides	136	191	—	NA.
Metal including alloys:				
Scrap	696	688	86	West Germany 390; Belgium-Luxembourg 45.
Unwrought	207	196	48	Belgium-Luxembourg 49; West Germany 37.
Semimanufactures	22	19	—	West Germany 16.
Uranium and thorium:				
Oxides and other compounds value, thousands	$20	$1	—	NA.
Metal including alloys, all forms	8	6	—	Mainly from France.
Vanadium:				
Oxides and hydroxides	2,258	1,917	127	Republic of South Africa 1,533; China 204.
Ash and residue containing vanadium	21,137	22,827	—	Republic of South Africa 20,906; Belgium-Luxembourg 1,898.
Metal including alloys, all forms	12	2	—	All from West Germany.
Zinc:				
Ore and concentrate	15,326	26,184	—	Italy 18,790; Ireland 5,310; Turkey 1,858.
Oxides	1,007	1,161	—	West Germany 974; France 83; Japan 42.
Blue powder	1,570	1,727	—	Belgium-Luxembourg 911; West Germany 431; Norway 382.
Ash and residue containing zinc including hard zinc	r3,095	3,445	—	West Germany 2,288; Hungary 642; Yugoslavia 346.
Metal including alloys:				
Scrap	354	1,030	—	West Germany 584; Hungary 316; Italy 46.
Unwrought	16,243	13,440	—	Belgium-Luxembourg 6,410; West Germany 4,758; Poland 1,023.
Semimanufactures	4,361	5,723	—	West Germany 3,174; Belgium-Luxembourg 956.
Zirconium:				
Ore and concentrate	1,836	1,821	—	Republic of South Africa 1,255; Australia 397.
Metal including alloys:				
Unwrought including scrap	64	(3)	NA	NA.
Semimanufactures kilograms	300	1,300	NA	NA.
Other:				
Ores and concentrates	29	—		
Oxides and hydroxides	260	54	NA	United Kingdom 30; France 16; West Germany 6.
Ashes and residues	14,468	21,911	2,531	East Germany 8,607; Netherlands 3,106; West Germany 2,866.
Base metals including alloys, all forms	37	8	1	West Germany 6; Belgium-Luxembourg 1.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	964	541	NA	Italy 262; West Germany 83; Spain 70.
Artificial:				
Corundum	15,747	18,860	1,511	West Germany 7,250; Hungary 3,022; France 2,878.
Silicon carbide	2,592	2,632	4	West Germany 1,340; Italy 502; Netherlands 256.
Dust and powder of precious and semi-precious stones excluding diamond kilograms	3	1	NA	NA.
Grinding and polishing wheels and stones	1,851	2,122	7	West Germany 952; Italy 465; Spain 223.
Asbestos, crude	14,858	15,750	7	Canada 10,134; Zimbabwe 3,226; U.S.S.R. 1,633.
Barite and witherite	6,555	2,668	—	West Germany 2,586; France 55.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Boron materials:					
Crude natural borates		14,915	25,051	2,874	Turkey 22,030; Argentina 44.
Oxides and acids		751	812	NA	Italy 355; Argentina 117; Chile 102.
Bromine		78	111	—	Mainly from France.
Cement		105,533	103,653	—	Yugoslavia 41,001; Poland 19,765; Italy 12,365.
Chalk		4,348	3,512	NA	France 2,153; West Germany 1,291; East Germany 60.
Clays, crude:					
Bentonite		12,620	15,042	NA	West Germany 5,991; Turkey 5,677; Bulgaria 1,216.
Chamotte earth		27,535	30,705	NA	Czechoslovakia 16,574; West Germany 7,828; France 5,204.
Fuller's earth		538	604	—	West Germany 525; United Kingdom 67.
Fire clay		20,140	23,149	—	West Germany 18,565; Czechoslovakia 1,825; Hungary 1,505.
Kaolin		140,887	140,849	9,984	West Germany 40,150; Czechoslovakia 36,274; United Kingdom 27,442.
Unspecified		43,746	49,959	79	West Germany 31,975; Czechoslovakia 14,474.
Cryolite and chiolite		220	185	—	All from Denmark.
Diamond, natural:					
Gem, not set or strung	value, thousands	$10,881	$12,015	NA	Belgium-Luxembourg $4,474; Israel $3,693; Switzerland $1,019.
Industrial stones	do.	$1,061	$813	NA	West Germany $248; Netherlands $106; Taiwan $90.
Dust and powder	kilograms	901	1,088	776	West Germany 107; Switzerland 93.
Diatomite and other infusorial earth		14,342	14,080	2,034	Czechoslovakia 5,335; Denmark 2,416.
Feldspar, fluorspar, related materials:					
Feldspar		4,767	4,386	—	Sweden 2,557; West Germany 1,266; Italy 458.
Fluorspar		11,388	16,778	—	West Germany 11,910; Mexico 3,805; U.S.S.R. 500.
Unspecified		50	64	—	NA.
Fertilizer materials:					
Crude, n.e.s.		2,719	2,925	—	West Germany 1,577; Hungary 702; France 241.
Manufactured:					
Ammonia		52,432	35,241	NA	NA.
Nitrogenous		r205,038	167,678	—	Czechoslovakia 49,253; Hungary 35,970; France 20,115.
Phosphatic		56,535	68,846	75	Yugoslavia 29,083; France 17,917; Belgium-Luxembourg 14,280.
Potassic		217,336	186,819	NA	East Germany 65,930; U.S.S.R. 62,409; West Germany 55,147.
Unspecified and mixed		r1,241,721	1,063,853	3,522	West Germany 363,442; Italy 158,238; East Germany 152,101.
Graphite, natural		3,291	8,363	50	North Korea 4,252; China 2,720; Brazil 465.
Gypsum and plaster		10,517	11,907	30	West Germany 10,632; Italy 615; East Germany 388.
Iodine		4	4	NA	NA.
Kyanite and related materials		2,213	3,338	206	Republic of South Africa 1,781; France 790.
Lime		4,156	3,114	—	Yugoslavia 1,719; West Germany 566; East Germany 427.
Magnesium compounds:					
Magnesite, crude		590	594	NA	Turkey 231; Hungary 229; West Germany 120.
Oxides and hydroxides		136,280	142,720	NA	China 6,228; Netherlands 2,938; unspecified 127,923.
Sulfate		13,004	14,310	—	West Germany 12,187; East Germany 2,123.
Mica:					
Crude including splittings and waste		426	401	—	United Kingdom 100; West Germany 51; unspecified 205.
Worked including agglomerated splittings		272	301	6	France 138; Belgium-Luxembourg 44; India 42.
Nitrates, crude		402	—		

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Phosphates, crude		328,113	426,004	100,357	Algeria 88,193; Israel 38,696.
Phosphorous, elemental		4,251	3,596	—	Netherlands 2,857; West Germany 739.
Pigments, mineral:					
Natural, crude		323	218	NA	France 141; unspecified 77.
Iron oxides and hydroxides, processed		4,584	4,194	NA	West Germany 3,144; Italy 470; Spain 241.
Potassium salts, crude		11,842	16,646	—	West Germany 16,561; Hungary 55.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	8,593	26,625	1,407	Italy 8,701; Brazil 7,859; West Germany 3,233.
Synthetic	do.	10,533	45,263	27,601	Taiwan 10,025; Singapore 1,801.
Pyrite, unroasted		746	800	—	Italy 637; West Germany 161.
Quartz crystal, piezoelectric	kilograms	380	2,593	522	Belgium-Luxembourg 1,175; Bulgaria 885.
Salt and brine		179	171	—	West Germany 64.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		4,053	4,485	—	East Germany 1,294; West Germany 1,111; Romania 999.
Sulfate, manufactured		4,179	3,341	—	West Germany 2,931; Spain 190.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		49,417	46,902	—	Italy 24,317; France 3,504; India 2,511.
Worked		93,862	116,222	—	Italy 77,548; West Germany 15,015; Yugoslavia 5,583.
Dolomite, chiefly refractory-grade		5,166	5,934	54	West Germany 2,218; Italy 1,891; Yugoslavia 1,261.
Gravel and crushed rock		412,480	277,135	—	West Germany 204,209; Italy 31,484.
Limestone other than dimension		1,048	1,568	NA	Yugoslavia 1,003; West Germany 563.
Quartz and quartzite		9,358	9,255	—	West Germany 7,765; Norway 678; Italy 373.
Sand other than metal-bearing		295,206	315,660	72	West Germany 231,646; Czechoslovakia 65,738.
Sulfur:					
Elemental:					
Crude including native and byproduct		87,995	84,879	—	Poland 35,472; Hungary 29,564; West Germany 19,770.
Colloidal, precipitated, sublimed		242	190	—	West Germany 92; Hong Kong 56.
Dioxide		13,595	10,901	—	West Germany 10,876.
Sulfuric acid		32,467	31,184	—	Hungary 18,619; Czechoslovakia 4,331; West Germany 3,965.
Talc, steatite, soapstone, pyrophyllite		8,178	12,980	NA	India 6,522; China 4,576; Finland 825.
Vermiculite, perlite, chlorite		40,051	37,804	NA	Hungary 23,839; Republic of South Africa 6,064; Greece 5,643.
Other:					
Crude		33,465	33,426	1,175	West Germany 14,590; Yugoslavia 6,022.
Slag and dross, not metal-bearing		31,829	19,896	—	West Germany 13,808; Italy 3,195; Yugoslavia 1,419.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		4,650	3,236	371	Trinidad and Tobago 1,550; West Germany 761.
Carbon:					
Carbon black		31,199	29,559	93	West Germany 17,871; Italy 6,412; Netherlands 1,900.
Gas carbon	kilograms	100	—		
Coal:					
Anthracite and bituminous	thousand tons	3,860	3,721	517	Poland 1,689; Czechoslovakia 772; U.S.S.R. 653.
Briquets of anthracite and bituminous coal	do.	11	11	—	Mainly from West Germany.
Lignite including briquets	do.	386	331	—	East Germany 194; West Germany 136.

See footnotes at end of table.

TABLE 3—Continued

AUSTRIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Coke and semicoke		882,818	832,557	—	Czechoslovakia 323,731; Hungary 149,266; West Germany 141,619.
Gas, natural: Gaseous	million cubic meters	3,763	4,013	—	U.S.S.R. 3,890; West Germany 124.
Peat including briquets and litter		77,731	86,268	—	West Germany 64,036; U.S.S.R. 13,836; Hungary 4,364.
Petroleum:					
Crude	thousand 42-gallon barrels	41,787	44,394	—	Algeria 12,500; Libya 8,111; Iran 6,017.
Refinery products:					
Liquefied petroleum gas	do.	1,829	1,553	—	West Germany 680; Czechoslovakia 369; U.S.S.R. 156.
Gasoline	do.	5,593	5,215	—	Italy 1,718; West Germany 1,295; Hungary 1,159.
Mineral jelly and wax	do.	134	130	—	West Germany 56; Poland 33; Hungary 29.
Kerosene and jet fuel	do.	959	535	—	Hungary 189; Czechoslovakia 171; West Germany 113.
Distillate fuel oil	do.	7,485	8,146	—	Hungary 2,913; Czechoslovakia 1,899; West Germany 1,741.
Lubricants	do.	3,020	5,091	1	Czechoslovakia 1,639; Yugoslavia 1,198; Hungary 948.
Residual fuel oil	do.	4,922	4,227	—	West Germany 1,845; Czechoslovakia 1,076; Yugoslavia 836.
Bitumen and other residues	do.	1,754	2,486	105	West Germany 1,195; Yugoslavia 492; Hungary 334.
Bituminous mixtures	do.	51	110	—	Poland 72; West Germany 20; Czechoslovakia 16.
Petroleum coke	do.	641	143	1	Hungary 58; Poland 19; Yugoslavia 13.

[r]Revised. NA Not available.
[1]Table prepared by staff, International Data Section.
[2]May include vanadium.
[3]Less than 1/2 unit.
[4]May include other precious metals.

TABLE 4

AUSTRIA: STRUCTURE OF THE MINERAL INDUSTRY OF 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Aluminum	Austria Metall AG	Smelter at Ranshofen	135.
Do.	Salzburger Aluminum GmbH	Smelter at Lend	15.
Antimony metric tons per year	Bleiberger Bergwerks-Union AG	Mine at Stadt Schlaining	500.
Cement	13 companies, of which the major ones are—	16 plants, including—	6,000.
Do.	Perlmooser Zementwerke AG	Mannesdorf (Vienna), Rodaun, Kirchbichl, and Retznei	(3,000).
Do.	Gebr. Leube Portlandzementwerke	Gartenau	(700).
Do.	Zementwerke Eiberg	Eiberg	(600).
Do.	Wietersdorfer Zementwerke	Wietersdorf	(600).
Coal	Graz-Koflacher Eisenbahn und Bergbaugesellschaft	Mines in Styria (Oberdorf, Zangtal, Karlschacht)	1,700.
Do.	Salzch-Kohlenbergbau GmbH	Mine at Trimmelkam	640.
Do.	Wolfsegg-Traunthaler Kohlenwerk AG	Two mines at Ampfelwang	510.
Copper	Austria Metall AG	Refinery at Brixlegg	45.
Do.	do.	Smelter at Amstetten	40.
Graphite	Graphitbergbau Kaisersberg, Franz Mayr-Melnhof und Co. KG	Mines at Kaisersberg	15.

TABLE 4—Continued

AUSTRIA: STRUCTURE OF THE MINERAL INDUSTRY OF 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Graphite	Industrie-und Bergbaugesellschaft Pryssok und Co. KG	Mine at Muhldorf	8.
Gypsum and anhydrite	8 companies, of which the major ones are—		
Do.	Erste Salzburger Gipswerks-Gesellschaft Christian Moldan KG	Mines and plants at Moldan, Revier Webing/Abtenau and Revier Mossegg	300.
Do.	Rigips Austria GmbH	Mine at Wienern, plant at Bad Aussee, and mine and plant at Puchberg	255.
Iron ore	Voest-Alpine AG	Mine at Eisenerz (Erzberg)	3,500.
Lead-zinc:			
Lead	Bleiberger Bergwerks-Union AG	Mine at Bleiberg ob Villach	8 (concentrate).
Do.	do.	Smelter at Arnoldstein	18 (crude).
Do.	do.	Refinery at Arnoldstein	18 (primary).
Zinc	do.	Mine at Bleiberg ob Villach	25.
Do.	do.	Smelter at Arnoldstein	23.
Magnesite	The major companies are—	Six mines and six calcining plants, including—	1,300 crude, 450 sinter.
Do.	Tiroler Magnesite AG	Mine and plant at Hochfilzen	305 crude, 85 sinter.
Do.	Radex-Austria AG	Mine at Millstatteralpe	300 crude.
Do.	do.	Mine and plant at Radenthein	55 sinter.
Do.	Veitscher Magnesitwerke AG Breitenau	Mines at Hohentauern and	500 crude.
Do.	do.	Plant at Trieben	250 sinter.
Natural gas million cubic meters per year	Osterreichische Mineralol-verwaltungs AG (Government)	Gasfields in Vienna Basin	850.
Do.	Rohol-Aufsuchungs GmbH	Gasfields in Upper Austria	680.
Steel	Voest-Alpine AG	Linz and Leoben steelworks	4,780.

blast furnaces at the Donawitz steel plant in Leoben was thought to reduce Erzberg's sales to 2 million tons in 1991. The Erzberg production might decrease even further owing to changes in the steel industry as a result of the public's environmental concerns.

The sinter plant at Linz has an estimated capacity of 3.6 million tons. One two-strand, 75-square-meter facility has a reported annual capacity of 1.950 million tons, while the other is a one-strand 168-sqare-meter with a capacity of 1.66 million tons. For environmental considerations, there was a possibility that the Lintz sinter plant could be closed or restructured. Environmental and overcapacity pressures are projected to influence the Austrian steel industry, as it has impacted other companies in Eastern and Western Europe.

The general growth in the Austrian and EC economies initially bolstered the Austrian steel industry. Steel consumption in Western Europe was strong for most of the year; however, steel production declined 9% by yearend. Profits dropped 40% from the previous year's level as prices dropped. The reason for the price drop was the decreased sales to Eastern Europe and the U.S.S.R. and stiffer competition in the European market. For example, the Soviet orders for sheet steel from Voest dropped from 500,000 tons in 1989 to 150,000 tons in 1990, as Soviets reportedly had insufficient foreign currency to purchase additional tonnage.

Lead-Zinc.—BBU mined and concentrated lead-zinc ores at Bleiberg. The Galena, with associated sphalerite forming a lead-zinc blend, is transported to the primary smelter at Arnoldstein. Products from this BBU facility include: cadmium metal, germanium dioxide, lead, and zinc. The price of the mine's prime product, zinc, dropped drastically, as did the prices for the other mined commodities. This problem was compounded by declining exchange rates, which worsen the company's operating loss. The company elected to restructure itself. The mine can not survive without the zinc metal works. Therefore, the company's new plan is to link the two closer together and to make the metallurgical plant into a multiple functional plant capable of reprocessing products, such as batteries and steel mill dust.

Tungsten.—The tungsten mine at Mittersill, operated by Wolfram Bergbau-und

Hutengesellschaft mbH, was one of the world's largest mines. Since 1977, when the mine began underground operations, 35 kilometers of underground workings has been completed. Initially, the mining method was open stoping. In recent years, the mining method was converted to the cut-and-fill method. In the years between 1975 and 1986, 2.5 million tons of ore averaging 0.7% WO_3 was mined and 2.5 million tons of overburden was removed. Presently, the mine has been reported to be operating on a 1-shift basis with 26 miners extracting more than 1,500 tons of ore containing 0.55% WO_3 daily. The ore is processed in concentrators at the 1,000-meter level underground. The 25%-grade concentrate is then trucked to the Bergla tungsten extraction plant in eastern Austria. Two-thirds of the Bergla plant's requirements come from the Mittersill Mine with the additional concentrates imported from China.

Industrial Minerals

Cement.—Austria has ample supplies of calcite, dolomite, and limestone to support a viable cement industry. Perlmooser Zementwerke AG (PZ), with three plants, was the largest company. PZ's largest plant, at Mannesdorf near Vienna, had a 1.4-million-ton-per-year capacity, accounting for about 65% of the annual domestic cement production. PZ installed a high-pressure mill for raw material and for cement grinding at its plant in Vienna. High-pressure grinding rolls were ordered for the Schretter und Cie AG plant in Vils and for Peggauer Zementwerke AG in Peggau. Schretter's roll press will be used to grind cement clinker and granulated blast furnace slag at a rate of 85 metric tons per hour, while Peggauer's mill will be used to grind clinker at the rate of 105 metric tons per hour.

Graphite.—Austria is one of the world's largest sources of high-grade graphite. Production has been erratic with several rises and falls. Although production of graphite had risen to 102,237 tons per year in the period between the end of World War II and 1964, it fell in 1970 to 23,992 tons, and rose again to 39,391 tons by 1987. In 1988, production ceased in the Niederosterreich Province, leaving Steiermark the only productive region for graphite in Austria. Only 7,577 tons were produced that year; however, crude graphite production increased to 15,307 tons in 1989 with the addition of a new mine in Niederosterreich Province. The number of employed personnel totaled less than 70 for the three operations. Approximately 75% of the crude graphite came from the open pit mine in Donawitz. In 1990, production increased 48% to 22,705 tons per year. The graphite from Niederosterreich Province (lower Austria) is generally harder and more crystalline than the graphite from the two mines in Stria Province. The graphite in Lower Austria is encased in mica gneiss and marble. However, in Styria Province, the graphite was formed by the metamorphism of coal seams and is therefore in highly folded slates and limestones. The seams range up to 9 meters in thickness and extend nearly 48 kilometers. The carbon content varies between 40% and 88%.

Gypsum and Anhydride.—There were eight operational mines and plants distributed along the northern Calcareous Alps, employing about 301 persons. One of the main producers of domestic gypsum and anhydride was Erste Salzburger Gipswerk Gesellschaft, Christian Moldan KG, which was operating a mine at Mooseg-Abtenau. About 80% of the gypsum and 85% of the anhydride were produced from surface pits. Artificial gypsum production was started in thermal powerplants by the coal desulfurization process.

Magnesite.—In 1990, there were six operations, four of which were in Styria Province and produced one-half of the country's magnesite production, which totaled 1,179 thousand tons. The largest producer of magnesite in Austria was Radex-Austria AG (Radex). Radex reported a 7.5% increase in business turnover to $413 million; however, earnings after taxes were only $10.4 million. Earnings were adversely affected by a drop in prices and an increase in personnel costs. The company expects a magnitude of significant decrease in the demand for refractory materials in the future.

In 1990, shaped products accounted for 75.1% of Radex's refractory sales, unshaped products for 16%, and sintered and caustic magnesia for 8.9%. The steel industry accounted for 70% of the product sales, cement for 10.1%, and others 19.9% (glass, nonferrous metals, etc.) Geographically, Radex's refractory sales were as follows: 42.5% to EC countries, 31.8% overseas, and 25.7% to other European countries.

Recently, Radex has made a concerted effort to expand its international market share through acquisition of companies. In Eastern Europe, Radex has investigated the potential for its products and invested in a Hungarian refractory development company. In Australia, Radex has an interest in Queensland Magnesia the world's largest and modern producer of natural magnesia. Reserves for the low-iron magnesite deposit in the Kunwarara area are 800 million tons.

Austria's other major magnesite and basic refractory producer, Veitscher Magnesitwerke AG, sold its interest in Steirische Magnesit-Industrie AG (Magindag), both state-owned, to the Franz Walek GmbH group of Vienna. Magindag produced caustic magnesia and nonbasic refractories.

Salt.—Salt was produced in Austria mostly by underground leaching. Most of the Permian-Triassic salt-bearing strata are a mixture of clays and marls, with only a few layers of pure rock salt. The salt-producing region is in the Salzkammergut area of north-central Austria. More than 90% of the rock salt was produced at Steinkogel, in Styria, and the rest at Hallein. Salt from brines was produced solely in the Salzburg area, at Altensee, Hallstaat, Bad Ischl, and Hallein, in descending order of magnitude. In the four active salt mines, there were 270 persons employed in 1990, and in the brine plant, 126 workers produced 386,188 tons of salt.

Talc.—There were three talc-producing operations in Austria, with an estimated production capacity of 150,000 tons per year. About 250 people were employed by the industry, of which 193 were in the mine labor force. About 90% of the output was produced by the Talkumwerke Naintsch GmbH (TN), with headquarters north of Graz. Talcs de Luzenac SA of France owned 80% of the company. About 73% of talc was mined from open pits.

Mineral Fuels

Coal.—Coal production rose 18% in 1990 to 2.45 million tons and was used exclusively in thermal plants. However, the domestic price was higher than some imported coals. To maintain their share of the coal market, Graz-Koflacher Eisenbahn-und Bergbaugesellschaft (GKB) collected the ash from the thermal powerplants to use as fill in land reclamation, which reduced the disposal costs of the thermal plants. The largest producer, GKB, produced approximately 59% of Austria's coal. Salzach Kohlenbergbau (SAKOG) and the Wolfsegg-Traunthaler Kohlenwerks AG (WTK) each produced 20.5% of the country's coal production. By the end of the year, GKB was mining from only two open pits, Oberdof (East and West) and the Koeflach. The company closed the Karlschacht pit in July 1990. On the other hand, WTK drilled 264 borings with a combined depth of 4,686 meters to evaluate additional layers of minable coal. In 1990, the company increased its share of the country's coal output from 18.5% in 1989 to 20.5%. Also, the company completed its coal drying facility at Ampflwang. SAKOG continued to suffer water intrusion problems at its Tarsdorf-East strip. As a result of the water problem, lower product prices, and increased production costs, SAKOG reportedly elected to phase out production in 1993.

Natural Gas.—Austria's proven and probable reserves were about 13.9 billion m^3, including only deposits that are commercially exploitable at prevailing prices. Domestic production accounted for about 20% of Austria's consumption. Natural gas was produced by Osterreichische Mineralolverwaltungs (OMV), which accounted for about 55% of total output, and by Rohol-Aufsuchungs GmbH (RAG), which produced about 45% of the output. Domestic gas production decreased slightly over that of 1989 to 1,288 billion m^3. OMV handled all gas imports and managed gas transport lines. Austria supplemented its gas consumption by importing 4,013 billion m^3 of natural gas of which 97% was from the U.S.S.R. Gas was delivered through a 3,114-kilometer pipeline from the U.S.S.R.

Petroleum.—The commercial production of petroleum began in Austria in the early 1930's. In 1990, the national oil company, OMV, supplied about 80% of Austria's petroleum needs. Slightly more than 10% of these needs were met through domestic production. RAG, a subsidiary of the Mobil and Shell Oil corporations, accounted for virtually all of the rest. The Austrian Government controlled the majority of shares in OMV, through OIAG. The remaining shares, or approximately 15% of the total were traded on the stock exchange. OMV operated the country's only domestic refinery, near Vienna's Schwechat airport. OMV also operated a number of petrochemical companies. The Schwechat refinery receives imported crude oil via a pipeline from Italy. In 1990, Algeria was Austria's principal oil supplier, accounting for 28% of the total oil imports, followed by Libya, with 18%.

OMV reduced its exploration and drilling activities in Austria, while increasing them abroad. OMV held stakes in natural gas and petroleum production and exploration activity in Canada, Denmark, Great Britain, Jordan, Malaysia, Norway, Tunisia, Turkey, and West Germany.

Reserves

The resource base in the country has been exploited for years, and the remaining resources have been in stiff competition with generally cheaper foreign sources.

INFRASTRUCTURE

Austria is totally landlocked, and, except for the Danube River, all transportation is by railroads and highways. The total Austrian road network covers about 106,000 kilometers. The Danube is the most important river connection between the Federal Republic of Germany and the Black Sea. Ores, metals, coal, and coke made up more than 65% of the cargo shipped on the Danube River.

OUTLOOK

By European standards, Austria will continue to be a modest producer and processor of mineral raw materials of which a reasonable share would be obtained through imports. Presumably, mineral consumption should increase in proportion to the officially forecast diminishing growth rate of the country's economy. Owing to its proximity to the emerging market economies of Eastern Europe, Austria is well positioned to serve as a conduit of western technical and economic know-how to former CMEA-Eastern European countries as well as to the emerging countries (Republics) of the former U.S.S.R. This position could benefit Austria's minerals processing sector by allowing it greater access to imports of mineral commodities from Eastern European and Central Eurasian areas in exchange for exports of finished high-technology-industrial products and technology transfer to these areas.

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[1]Values have been converted from Austrian schillings (S) to U.S. dollars at the rate of S11.37=US$1.00, the average rate in 1990.

OTHER SOURCES OF INFORMATION

Agencies

Bundesministerium fur Wirtschaftliche Angelegenheiten Oberste Bergbehorde-Roh-und Grundstoffe
(Ministry of Economic Affairs, Commerce, and Industry, Supreme Mining Authority)
Wien, Austria

Geologische Bundesanstalt
(Federal Geological Survey)
Wien, Austria

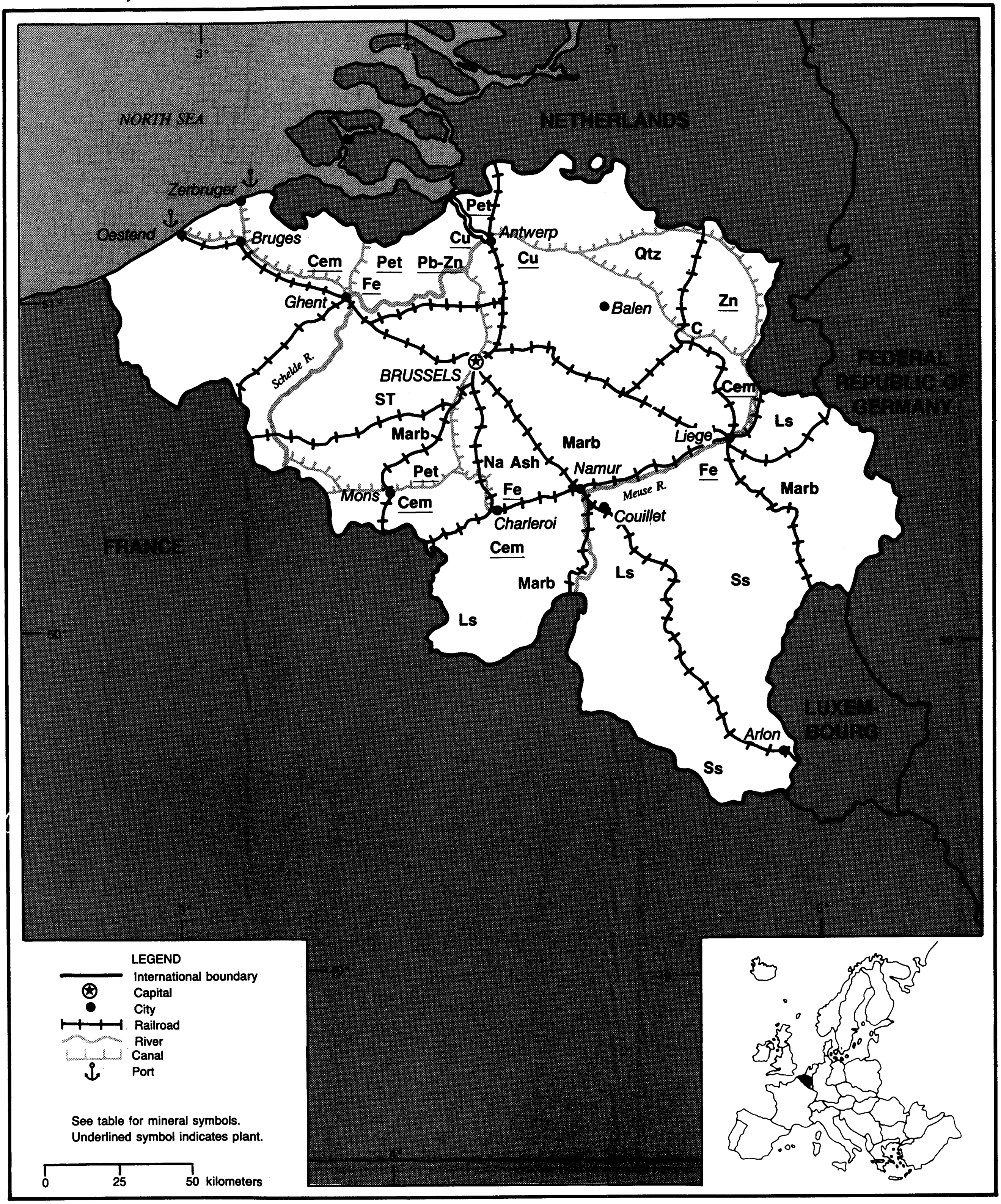
Publications

Osterreichisches Montan-Handbuch (Austrian Mining Handbook), Bundesministerium fur Handel, Gewerbe und Industrie, Sektion V/A, Oberste Bergbehorde-Grundstoffe, Wien, Austria; published annually.

Statistisches Handbuch fur die Republik Osterreich (Austrian Statistical Handbook), Osterreichisches Statistisches Zentralamt, Wien, Austria; published annually.

BELGIUM

AREA 31,000 km² **POPULATION 9.9 million**



THE MINERAL INDUSTRY OF BELGIUM-LUXEMBOURG

By Harold R. Newman

BELGIUM

Mineral activities in Belgium date from prehistoric to modern times. These activities ranged from Neolithic flint workings, Gallic iron ore mining, Middle Ages lead and zinc mining, to the current industrial minerals sector.

Metallic mining reportedly reached its apogee between 1850 and 1870, after which mining activity steadily declined until 1978 when the last iron ore operations at Musson and Halanzy in the Belgian sector of the Lorraine basin were closed.

The refining of copper, zinc, and minor metals and the production of steel, all from imported materials, are the largest mineral industries in Belgium. Most base metal raw materials were imported from Africa. The mineral processing industry is a significant contributor to the Belgian economy.

Although the country of Belgium is relatively small in size, there is a large and rather vigorous industrial minerals sector. Belgium is an important producer of four groups of industrial minerals. These are carbonates, including limestone, dolomite, and whiting; synthetic materials in the form of soda ash and sodium sulfate; silica sand; and construction materials, including a wide range of marbles.

The Belgian economy performed well in 1990, with a real GNP growth of 3.7%, against 2.9% EC as a whole. This was the third year in succession that Belgium exceeded the EC average growth. Belgium's unemployment rate of 8% was below the EC average unemployment rate of 8.4%.

Production

Coal and industrial minerals were the only commodities mined in significant amounts. The country remained a significant producer of cobaltiferous materials, germanium, and selenium, all from imported ores. There was smelter production of cadmium, copper, indium, lead, silver, steel, tellurium, and zinc.

Trade

Belgium is a major exporting country. With exports of goods and services equivalent to almost 80% of GNP, Belgium is one of Europe's most trade-intensive countries. This tends to place the economy in a sensitive position in regard to the vagaries of world demand and prices. One out of every three workers in Belgium was producing for the export market.

Belgium, together with Luxembourg and the Netherlands, forms the Benelux customs union. Benelux, with 25 million inhabitants, has combined exports equal to 70% of Japan's exports or one-half the total exports of the United States. Belgium is also a partner in the Belgium-Luxembourg Economic Union (BLEU), which results in a close economic integration between the two countries.

The main mineral resource-related exports were iron and steel products and chemical products. Silica sand and marble, which are high-value industrial minerals, were also exported.

STRUCTURE OF THE MINERAL INDUSTRY

The structure of the mineral industry of Belgium is shown in Table 2.

Commodity Review

Metals.—The extraction and recovery of nonferrous metals are carried out in high-technology, large-scale plants. Europe's largest electrolytic copper and zinc refineries are in Belgium, as is one of the continent's largest lead refineries. Union Miniere SA was absorbed by Acec in July 1989. Acec-Union Miniere SA (Acec-UM) acquired 75% of Metallurgie Hoboken-Overpelt SA (MHO) and 95% of Vieille-Montagne SA (VM) in December 1989.

Acec-UM consists of two operating units, MHO and VM, and one trading and marketing unit, Sogem SA. The parent company of Acec-UM is Societe Generale de Belgique. In terms of installed capacity, Acec-UM was ranked as the largest zinc producer in the world and the leading copper refiner in Europe.

The total capacity of production of MHO's three operations at Hoboken, Olen, and Overpelt is shown in table 3.

Cadmium.—VM produced 1,956 tons of cadmium in 1990 at its Belen and Overpelt plants. This was up from the 1,746 tons of the previous year. VM continued to be concerned about the reduced cadmium content in the zinc concentrates being processed.

VM announced it would close its cadmium plant at the Overpelt complex in 1991 and concentrate cadmium production at the Belen plant. This action was expected to reduce VM's European cadmium production to about 1,300 to 1,500 mt/a.

Cobalt.—MHO was the world's leading producer of special cobalt products: salts, oxides, and metal powders. Since 1986, a plant has been in operation at Olen using advanced hydrometallurgical techniques, such as pyrolysis and solvent extraction, for the recovery of cobalt from complex residues, scrap, and spent catalysts.

The plant was reported to have the capacity to produce 2 million pounds per year of cobalt in the form of metal powders, oxides, and salts. Another plant processes complex cobalt-nickel-bearing ores to produce 1,000 mt/a of high-purity cobalt.

Copper.—Acec-UM was investigating several options to diversify its supply of copper. The company signed a 3-year contract with Mexicana de Cobre of Mexico for 50,000 mt/a of blister copper. Acec-UM also purchased 21% of Mexicana de Cananea, Mexico's largest copper mine.

In line with a stated policy of industrial integration, Acec-UM strengthen its downstream position with the acquisition of Metalrame SA of Italy. Metalrame is a large producer of copperwire rod and has an established distribution system for its product.

TABLE 1

BELGIUM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1986	1987	1988	1989	1990[e]
METALS					
Aluminum	5,196	6,300	7,464	7,355	[3]7,905
Arsenic, white[e]	3,000	3,500	3,500	3,500	3,000
Bismuth, metal[e]	1,000	865	795	800	750
Cadmium, smelter	1,374	1,308	1,836	[r]1,746	[3]1,956
Copper:					
Blister:[e]					
Primary	900	100	200	200	200
Secondary	105,000	92,100	93,200	93,400	103,000
Total	105,900	92,200	93,400	93,600	103,200
Refined, primary and secondary, including alloys	457,776	475,908	504,333	[r]564,454	[3]542,458
Iron and steel:					
Pig iron thousand tons	8,052	8,244	9,147	[r]9,437	[3]9,416
Ferroalloys: Electric furnace ferromanganese[e] do.	87	90	95	95	99
Steel:					
Crude do.	9,770	9,787	11,222	[r]10,948	[3]11,425
Semimanufactures do.	7,358	7,417	7,417	[e]7,200	2,305
Lead:					
Smelter:[e]					
Primary[4]	48,100	59,400	64,100	[r]70,000	73,500
Secondary[5]	26,000	18,500	22,000	[r]22,800	21,800
Total	74,100	77,900	86,100	[r]92,800	95,300
Refined:					
Primary	64,500	71,100	83,200	[e]80,000	81,000
Secondary	33,816	36,936	43,361	[e]46,000	42,000
Total	98,316	108,036	126,561	[e]126,000	123,000
Selenium[e]	250	230	250	250	250
Tin: Secondary	2,712	3,900	4,972	[e]5,000	[3]6,063
Zinc:					
Slab:					
Primary	268,700	284,500	298,100	[r]286,900	292,200
Secondary (remelted zinc)	20,092	24,080	25,658	[e]25,500	26,000
Total	288,792	308,580	323,758	[r][e]312,400	318,200
Powder	32,196	32,556	37,708	[e]39,000	52,630
Other, nonferrous: Precious metals, unworked n.e.s.[6]	1,252	1,241	1,234	1,225	[3]639
INDUSTRIAL MINERALS					
Barite[e] 40,000	40,000	35,000	40,000	35,000	
Cement, hydraulic thousand tons	5,760	5,689	6,451	[e]6,900	[3]6,929
Clays: Kaolin[e] do.	40	45	[3]40	35	35
Lime and dead-burned dolomite: Quicklime do.	1,788	1,764	1,892	[e]1,900	[3]2,014
Nitrogen: N content of ammonia do.	306	269	365	[e]290300	
Phosphates: Thomas slag, gross weight[e] do.	180	175	170	165160	
Sodium compounds:					
Soda ash	481,656	447,972	378,960	[e]380,000	375,000
Sulfate[e]	265,000	260,000	255,000	255,000	250,000
Stone, sand and gravel:					
Calcareous:					
Dolomite thousand tons	4,034	4,072	4,684	[e]5,000	4,300

See footnotes at end of table.

TABLE 1—Continued

BELGIUM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1986	1987	1988	1989	1990[e]
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel:—Continued					
Calcareous:—Continued					
Limestone thousand tons	21,168	23,616	25,872	[e]26,000	[3]31,845
Marble:					
In blocks cubic meters	1,068	672	576	[e]650	[3]508
Crushed and other	84	72	60	[e]65	440
Petit granite (Belgian bluestone):					
Quarried thousand cubic meters	452	515	959	[e]1,350	1,010
Sawed do.	48	53	64	[e]65	[3]71
Worked do.	11	12	12	[e]12	[3]11
Crushed and other do.	455	414	652	[e]700	540
Porphyry, all types thousand tons	3,308	3,464	3,395	[e]3,400	[3]3,996
Quartz and quartzite[e]	250,000	[3]205,196	205,000	200,000	[3]204,308
Sandstone:					
Rough stone including crushed thousand tons	1,998	1,990	2,248	[e]2,260	[3]2,092
Paving	8,400	9,912	13,152	[e]13,500	[3]56,408
Sand and gravel:					
Construction sand thousand tons	6,252	7,260	8,988	[e]9,200	[3]9,499
Foundry sand do.	552	588	595	[e]600	540
Dredged sand do.	913	928	788	[e]750	678
Glass sand do.	1,512	1,680	1,845	[e]2,000	2,100
Other sand do.	1,956	2,376	2,448	[e]2,600	2,067
Gravel, dredged do.	5,016	5,856	5,832	[e]4,870	[3]4,231
Sulfur, byproduct:[e]					
Elemental do.	150	155	155	160	160
Other forms do.	150	145	155	160	150
Total do.	300	300	310	320	310
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e]	1,800	1,800	1,900	1,800	1,700
Coal: Bituminous thousand tons	5,589	4,356	[r]2,487	[r]1,916	1,440
Coke, all types do.	5,136	5,232	5,544	[e]3,200	[3]5,421
Gas:					
Manufactured million cubic feet	22,473	23,793	24,334	[e]25,000	24,000
Natural[e] do.	1,300	1,350	1,400	1,350	1,250
Petroleum refinery products:					
Liquefied petroleum gas thousand 42-gallon barrels	11,830	12,457	13,135	[re]6,090	5,220
Naphtha do.	8,962	12,647	[e]12,200	[r]13,626	[3]11,221
Gasoline do.	41,704	41,283	41,848	[r]45,433	[3]44,803
Jet fuel and kerosene do.	10,616	10,332	12,584	[re]13,330	[3]11,757
Distillate fuel oil do.	70,742	67,687	68,416	[r]72,466	[3]72,466
Residual fuel oil do.	48,726	51,771	43,746	[r]35,265	[3]34,332
Bitumen, asphaltic do.	4,034	3,953	4,448	4,800	4,680
Other do.	9,786	10,297	11,985	12,000	11,000
Refinery fuel and losses[e] do.	10,320	10,516	10,660	10,800	10,000
Total do.	216,720	220,943	219,022	[re]213,810	205,479

[e]Estimated. [r]Revised.

[1]Table includes data available through Dec. 31, 1991.

[2]In addition to the commodities listed, Belgium produced a number of other metals and alloys for which only aggregate output figures were available.

[3]Reported figure.

[4]Data not reported; derived by taking reported primary lead output plus exports of lead bullion minus imports of lead bullion.

[5]Data represent secondary refined lead output minus remelted lead; as such, the figures are probably high, because they include some lead that was sufficiently pure as scrap that it did not require resmelting, but data are not adequate to permit differentiation.

[6]Known to include gold, silver, and platinum-group metals.

TABLE 2

BELGIUM: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Major commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Seven major companies, of which the largest is Cimenteries CBR SA	13 plants, including ones at Lixhe, Mons/Obourg, Harmignies, Marchienne, and Ghent	8,000
Do.	Ciments d'Obourg SA	Plants at Obourg and Thieu	2,640
Do.	Compagnie des Ciments	Plant at Tournia	3,000
Do.	Others	Plants at Chercq/Tournai, Gaurain-Ramecroix, Antoing, Vaulx-Lez-Tournai, and Haccourt	2,860
Coal	NV Kempense Steenkolenmijnen	Open pits in northern Limbourg Province	3,000
Copper	Metallurgie Hoboken-Overpelt SA	Smelter at Antwerp-Hoboken	50
Do.	do.	Refinery at Olen	500
Do.	La Metallo-Chimique SA	Smelter at Beerse	100
Do.	do.	Refinery at Beerse	60
Dolomite	Carsambre SA Dolomeuse	Quarry at Floreffe	300
Do.	do.	Quarry at Marche les Dames	600
Do.	do.	Plant at Namur	37
Do.	SA de Marche les Dames	Quarries atVezin and Sclaigneaux Andenne	300
Do.	do.	Plant at Vezin	35
Do.	SA des Dolomies de	Quarry at Nameche Marche-les-Dames	300
Do.	do.	Plant at Nameche, of which—	
		Soft-burned	500
		Dead-burned	200
Do.	SA Dolomies de Villers-le-Gambon	Quarry at Villers-le-Gambon	300
Lead	Metallurgie Hoboken-(Acec-Union Miniere SA)	Smelter at Antwerp-Hoboken	100
Do.	do.	Refinery at Antwerp-Hoboken	130
Petroleum, refined	Eight refineries, of which the major ones are—		[1]865,000, including—
Do.	Societe Industrielle Belge des Petroles SA	Refinery at Antwerp	[1](330,000)
Do.	SA Esso NV	do.	[1](225,000)
Do.	Texaco Belgium NV	Refinery at Ghent	[1](185,000)
Do.	SA Chevron Oil Belgium NV	Refinery at Felny	[1](125,000)
Steel	Five companies, of which the major ones are—		15,000, including—
Do.	SA Cockerill-Sambre	Plants at Liege and Charleroi	(8,000)
Do.	Maritieme Staalnijver-heid NV	Plants at Ghent-Zelzate	(3,000)
Do.	Usines Gustave Boel NV	Plant at La Louviere	(1,500)
Do.	Forges de Clabecq	Plant at Clabecq	(1,300)
Zinc	Vieille-Montagne SA	Smelter and refinery at Balen	200
Do.	Metallurgie Hoboken-Overpelt SA	Refinery at Overpelt	120

[1]42-gallon barrels per day.

Steel.—Cockerill-Sambre SA, Belgium's largest steel company, announced that the plan to merge its flat products operation with Arbed SA of Luxembourg had been abandoned. Arbed was Europe's fifth largest iron and steel producer and was active in Belgium.

Sidmar NV awarded a contract to Mannesmann Demag Sack GmbH of Germany to expand and modernize a cold-rolling mill at its plant near Ghent. The contract calls for the modernization of the existing four stand tandem mill, addition of an extra stand to the mill, and construction of a new turbulence pickling section. The value of the contract was estimated to be $103 million and would raise capacity to about 2 Mmt/a.

TABLE 3

BELGIUM: TOTAL CAPACITY OF PRODUCTION OF METALLURGIE HOBOKEN-OVERPELT OPERATIONS

(metric tons per year)

Commodity	Capacity (mt/a)
Cobalt, metal powders and oxides	8,700
Copper, refined	330,000
Gold	50
Indium	25
Lead, refined	125,000
Palladium	12
Platinum	5
Rhodium	0.5
Scrap	480,000
Selenium	360
Silver	2,400
Tellurium	150
Zinc, refined	150,000

Zinc.—VM, founded 150 years ago, was one of the world's largest zinc refiners. VM operated zinc plants in Overpelt and Balen in Belgium, Auby in France, Asturienne in France, and a zinc mine in Sweden. VM's 100% subsidiary, Union Mines Inc., operated the Union Zinc Inc. mines in the United States, in Gordonsville and Jefferson City, Tennessee.

Acec-UM announced that the proposed transfer of its electrolytic zinc operation from the Overpelt plant to the Balen plant was delayed indefinitely. Both plants were operating at the same capacities as in the past. The capacity was 200,000 mt/a at the Balen plant and 100,000 mt/a at the Overpelt plant. The transfer was to have raised capacity at the Balen plant to 400,000 mt/a of zinc.

Acec-UM also shelved plans for a 2,500-mt/a electrolytic cadmium line and a production unit for zinc oxide at Overpelt. The electrolytic cadmium operation would have been the largest in the world. The company cited market conditions and unfavorable exchange rates as the basis for the decision to delay the capital investment program.

Industrial Minerals.—Belgium has a vigorous industrial mineral sector and is an important producer of several industrial minerals. Significant amounts of aggregates, lime, and limestone are exported to neighboring countries while higher value industrial minerals such as marble and silica sand are exported worldwide. The country has a strong international base with some of the largest global corporate producers of industrial minerals headquartered in Belgium.

Aggregate.—Belgium's leading aggregate producer was Gralex SA whose annual output of about 7 Mmt accounts for about 20% of domestic production of coarse aggregate and 75% of domestic production of lightweight aggregate. Gralex exports about 20% of its natural aggregate production.

Cement.—Belgian cement production capacity was about 8 Mmt/a. SA Cimenteries CBR is Belgium's largest cement producer and controls about 45% of the domestic market. CBR has five plants throughout the country. They are located in Antoing, Ghent, Harmignies, Lixhe, and Mons.

The plants at Antoing and Lixhe produce gray clinker. The Ghent and Mons plants produce gray cement while the plant at Harmignies produces a white cement. CBR has other subsidiary companies engaged in related activities such as ready-mix concrete and aggregates.

Fumed Silica.—A fumed silica plant to become operational in 1992 was being built in Puurs for the European Darex Div. of Grace Specialty Chemicals Co. Production capacity was expected to be about 5,000 mt/a. Manufacturing was to take place using proprietary technology licensed from Nynaes Petroleum AB of Sweden. The main contractor was Bdger BV of The Hague, the Netherlands. Materials from Puurs would complement the company's existing SYLOID brand line of silica products and will be targeted at markets in North America and Asia.

Potassium-Sodium Sulfate.—Belgium had two sodium sulfate producers: Tessenderlo Chemie SA, in Tessenderlo, and Union Chimique-Chemische Bedrijven (UCB), in Ghent. Tessenderlo is a major producer of both potassium and sodium sulfate while UCB produces only sodium sulfate.

Tessenderlo operates more than 20 Mannheim furnaces with an aggregate production capacity of 1 Mmt/a, of which 800,000 mt/a is potassium sulfate and 200,000 mt/a is sodium sulfate. The combined capacity of UCB's three Mannheim furnaces is 24,000 mt/a of sodium sulfate.

The detergent, glass, and paper industries account for the bulk of the production from the two companies. Most of the output is for the domestic market; however, nominal quantities are exported to France, the Netherlands, and the United Kingdom.

Silica sand.—Belgium has long been recognized as a producer of high-quality quartz or "silica" sand. Sibelco SA is the primary producer, with three operations at Lommel, Maasmechelen, and Mol. The largest reserves are at Lommel.

The Lommel-Mol quartz sands have very similar characteristics that permit the production of a consistent product. The silica content is about 99.5% with the levels of Fe_2O_3 and Al_2O_3 content maintained within 0.025% and 0.2%, respectively. This product is used mainly in the glass industry; however, a market also exists in the metal casting industry.

The Maasmechelen quartz sand with a silica content of 99.8% is very pure. It has an iron content of 0.012% with minor amounts of alumina and less than 0.001% heavy-mineral content. The product is used mainly for crystalware and the manufacture of silicon carbide.

Stone.—Belgium is recognized worldwide for the diversity and quality of its dimension stone. The so-called "petit granit," actually a dark blue-gray crinoidal limestone, is one of the most important facing stones the country produces. There were about 60 quarries producing dimension stone, most of which were small family operations.

The country has been an important producer of marble for more than 2,000 years. All of the marble quarries are in the Wallonia region. Red, black, and gray are the three principal color ranges of the Walloon marbles.

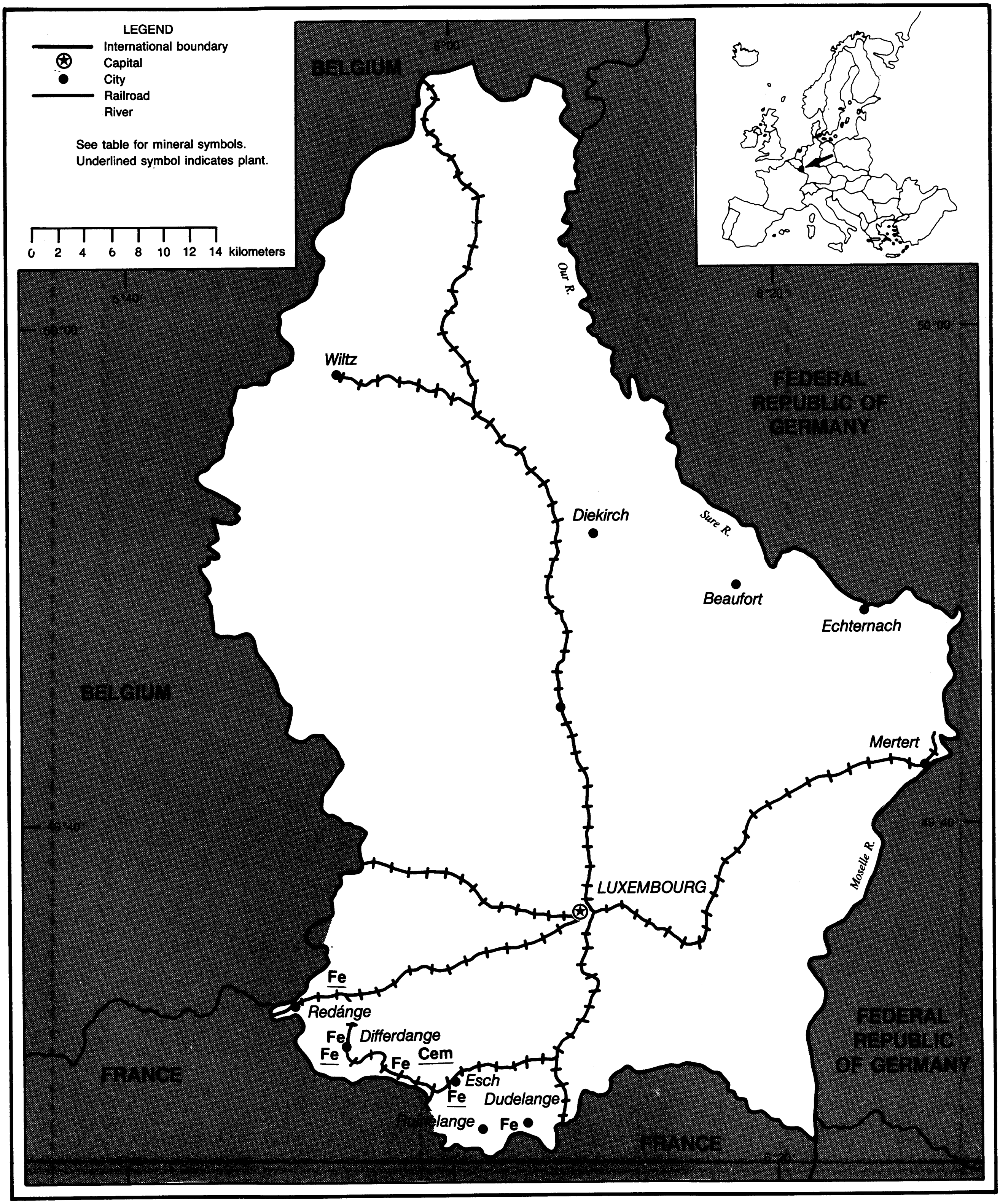
Belgium's specialty is the famous black marble that is produced at Golzinne from the underground workings of Les Carrieres de Marbre Noir de Golzinne SA. Three grades, starting with grade A, are produced. Grade A is the premier material and is the one most in demand. This marble is totally black with no traces of veining or spotting. The company mines about 500 m^3/a from five marble horizons.

Red and gray marble production is mainly in the Philippville area where four quarries are located. Most of the material produced is crude marble except at one quarry where red marble is dressed and polished. Most of the marble, either black, red or gray, is exported.

Zeolite.—Tessenderlo Chemie and Chimique Prayon Rupel SA announced

LUXEMBOURG

AREA 2,600 km² **POPULATION 366,000 million**



plans for a joint-venture project to construct a synthetic zeolite plant near Liege. The plant would have an annual capacity of 60,000 tons of detergent-grade zeolite 4A and would cost an estimated $29 million. Completion of construction and commissioning of the plant was scheduled for the first part of 1992.

The plant, using the W. R. Grace process, would transform sodium silicate into zeolite 4A. Prayon and Tessenderlo would produce the sodium silicate, and Tessenderlo would provide the soda ash requirements.

***Mineral Fuels.*—Coal.**—The Borinage coal mining area in the Sambre-Meuse Valley lies in a narrow band across the center of Belgium from the French border through Mons, Charleroi, Namur, and Liege. Although many mines in the Kempenland Field have been worked out or abandoned as uneconomic, the Sambre-Meuse region provided most of the domestically produced coking and slow-burning coal for domestic industry.

The Limburg coal mines were in the process of being phased out. The state-owned Kempense Steenkolenmijnen SA will close its last two mines, at Beringen and Zolder, in 1992. Coal mining was one of Belgium's five so-called "sectors." Until 1983, these national "sectors" enjoyed a privileged status and benefitted from the central Government's subsidies. In July 1983, the central Government agreed that the national sectors would be regionalized and all future financial support for them would have to be provided from the region's own resources. While there originally were two mining districts, one in Wallonia and one in Flanders, only two of Flanders' mines were in operation at yearend. In 1987, when the first mining retrenchment plan was implemented in Limburg, regional authorities affirmed that mining in the two remaining pits would continue until at least 1992.

Natural Gas.—Distrigaz, 50% owned by the national Government, controlled all aspects of natural gas in Belgium. Almost all of the country's gas requirements were satisfied by imports.

Nuclear Power.—The seven nuclear power plants in Belgium supplied about 65.5% of its electricity requirements.

Petroleum.—Belgium imported all of its crude oil for its four refineries. Fina Raffinaderij Antwerpen (Fina), in Antwerp, was the largest refinery in the country, with a throughput of about 306,000 barrels per day or 49% of the country's capacity. Production at the refinery was upgraded and diversified by the construction of new processing plants.

Infrastructure

The Belgian National Railways operates 3,667 km of 1.435-m standard-gauge track. The country has 103,396 km of highways and 2,043 km of inland waterways in regular commercial use. The country's major ports are Antwerp, Bruges, Ghent, Oostende, and Zeebrugge.

With an annual turnover of 95 Mmt Antwerp is a world class port. It is an important transit center handling general cargo and bulk cargo to and from various locations throughout the world.

In addition, Belgium has 1,167 km of refined products pipeline, 161 km of crude pipeline, and 3,300 km of natural gas pipeline.

Outlook

The gradual cessation of the country's coal production is bound to increase Belgium's coal imports in the coming years. Belgium will remain a country highly dependent on foreign trade and will maintain its very high export-to-production ratio. With exports of goods and services accounting for about 80% of GNP, any change in world trade, either up or down, will have an impact on the economy.

LUXEMBOURG

Luxembourg's mineral industry is dominated by one steel company, Arbed S.A., which has domestic and foreign subsidiaries. Steel is the main export commodity. Mining in Luxembourg is represented by small industrial mineral operations that produce material for domestic consumption. These minerals include dolomite, limestone, sand and gravel, and slate.

Luxembourg's economy was stable, with a GDP growth rate of 3.3% in 1990. The country sustained modest inflation and the lowest unemployment rate of the EC member states.

Luxembourg is a partner in the BLEU, which has been in place since 1921. At yearend, both countries had agreed to a further 10 years of economic union under the aegis of BLEU. There is also close economic integration with the Netherlands and with other EC member countries.

The industrial sector, until recently dominated entirely by steel, was becoming increasingly diversified. The financial sector's rapid growth over the past two decades has more than compensated for the long-term decline of the steel industry. Luxembourg's position as a major financial center was further strengthen by the deregulation of the Luxembourg capital market in July 1990.

PRODUCTION

The steel sector and the financial sector combined contributed about 25% of GDP. Steel's share was a little less than 9%. The country, despite its small size, ranked 30th in world steel production.

TRADE

Luxembourg's main export commodity is steel, with Arbed SA the main producer. EC countries absorb about 75% of Arbed's output; U.S. markets account for an additional 4%. Arbed specializes in the production of large beams used in construction of skyscrapers.

Structure of the Mineral Industry

The mineral industry is dominated by one private steel company, Arbed, which had domestic and foreign subsidiaries and part foreign ownership. Production depends on scrap and imported ores. There is no mining in Luxembourg except for some small industrial minerals operations.

Mining and mineral policy is in accordance with the Napoleonic Mining Law of 1810. Regulations are enforced by the Government's Inspection du Travail et des Mines. The Ministry of Economics published annual statistics on the mining and minerals industry.

Commodity Review

Metals.—The iron and steel industry was the most important single industrial sector of the economy. The production and export of steel have traditionally played major roles in Luxembourg's economy. Steel accounts for about 35% of all exports (excluding services), almost 9% of GDP, and 5% of the work force. Arbed, the only iron

TABLE 4

LUXEMBOURG: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989	1990[e]
Cement, hydraulic		389	509	563	[e]550	590
Gypsum and anhydrite, crude[e]	tons	420	420	450	450	400
Iron and steel: Metal:						
Pig iron (including blast furnace ferroalloys)		2,650	2,305	2,521	2,685	[3]2,616
Steel:						
Crude		3,705	3,301	3,661	[r e]3,721	3,560
Semimanufactures		3,771	3,481	[r]3,277	[r]3,297	[3]3,222
Phosphates: Thomas slag, gross weight		620	542	664	[r]672	600
Sand and gravel:						
Other sand except glass sand		616	760	780	[e]780	760
Gravel		61	197	150	[e]170	190
Stone: Construction:						
Crushed	thousand cubic meters	547	345	[e]400	[e]380	345
Dimension:						
Rough cut	do.	15	16	[e]17	[e]16	16
Facing	square meters	4,100	5,599	[e]4,000	[e]4,500	5,600
Finished[e]	cubic meters	[3]707	800	900	900	760
Flagstone:						
Polished	square meters	400	—	—	—	—
Rough	tons	71	—	—	—	—
Slate slabs	thousand pieces	335	—	—	—	—

[e]Estimated. [r]Revised.
[1]Table includes data available through July 1991.
[2]In addition to the commodities listed, dolomite, quartzite, refractory clays, and manufactured phosphatic fertilizers other than Thomas slag were produced, but data are not published, and information is inadequate to make reliable estimates of output levels.
[3]Reported figure.

TABLE 5

LUXEMBOURG: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	SA des Ciments Luxembourgeois	Plant at Esch-sur-Alzette	450
Ferro-alloys	Continental Alloys SA	Plant at Dommeldange	9
Steel	Acieries Reunies de Burbach-Eich-Dudelange (ARBED)	Plants at Dudelange, Esch-Schifflange, Esch-Belval, and Differdange	4,000

and steel producer in Luxembourg, earned profits of $76 million in 1990. The company specializes in the production of long and round steel products. Steelplate was produced by Arbed Dudelange. Arbed's productivity, amongst the highest in the world, continued to improve. The company has plans to boost productivity even more through a $1.25 billion investment plan over the period 1989-93. Government ownership in Arbed amounted to 31% of voting shares.

Industrial Minerals.—Industrial minerals for domestic consumption were the only minerals mined in Luxembourg. They included dolomite, gypsum, limestone, and sand and gravel. These industrial minerals were all mined from small open pits and quarries by independent operators for domestic consumption. Luxembourg imported all its requirements for fertilizers and other industrial minerals.

Mineral Fuels.—Luxembourg met virtually all of its energy needs through imports. Its major domestic source of energy was hydroelectricity. The country has three hydroelectric plants, one of them associated with a reservoir supplying water to most of the country. Only 1% of total solid fuel requirements was produced domestically, mostly from incineration of waste material. The steel industry accounted for more than 80% of total industrial energy demand. About 90% of imported coal went to the steel industry. Luxembourg did not have any oil refineries, and almost 90% of oil products was imported via Belgium. The rest was imported from other neighboring European countries. About 85% of natural gas was imported via Belgium. France supplied the remainder of the country's gas needs.

INFRASTRUCTURE

Luxembourg National Railways operates 270 km of 1.435-m standard gauge. The country has 5,108 km of highways and 37 km of inland waterways. In addition, the country has a 48-km refined products pipeline. The major river port of this landlocked country is at Mertert.

OUTLOOK

For the near future, the level of Luxembourg's steel exports are expected to remain constant. The Government's policy of industrial diversification to prevent the country from becoming overdependent on one sector is expected to continue. Luxembourg is a potentially attractive market for U.S. products.

OTHER SOURCES OF INFORMATION

Agencies

Administration des Mines, Ministere des Affaires Economiques (Administration of Mines, Minister of Economic Affairs) Brussels, Belgium

Institute National des Industries Extractives (National Institute of Extractive Industries) Liege, Belgium

L'Inspection du Travail et des Mines (Office of Labor and Mine Inspection) Luxembourg, Luxembourg

Service Geologique de Belgique (Belgian Geological Survey) Brussels, Belgium

Service Geologique (Geological Survey) Luxembourg, Luxembourg

Publications

Annales des Mines de Belgique: Institute National des Industries Extractives et de l'Administration des Mines (Mining Chronicle of Belgium), Liege, published monthly.

Annuaire Statistique du Luxembourg: Service Central de la Statistique et des Etudes Economiques (Statistical and Economic Annual of Luxembourg), Luxembourg.

Bulletin de la Banque Nationale de Belgique (Bulletin of the National Bank of Belgium), Brussels, published monthly.

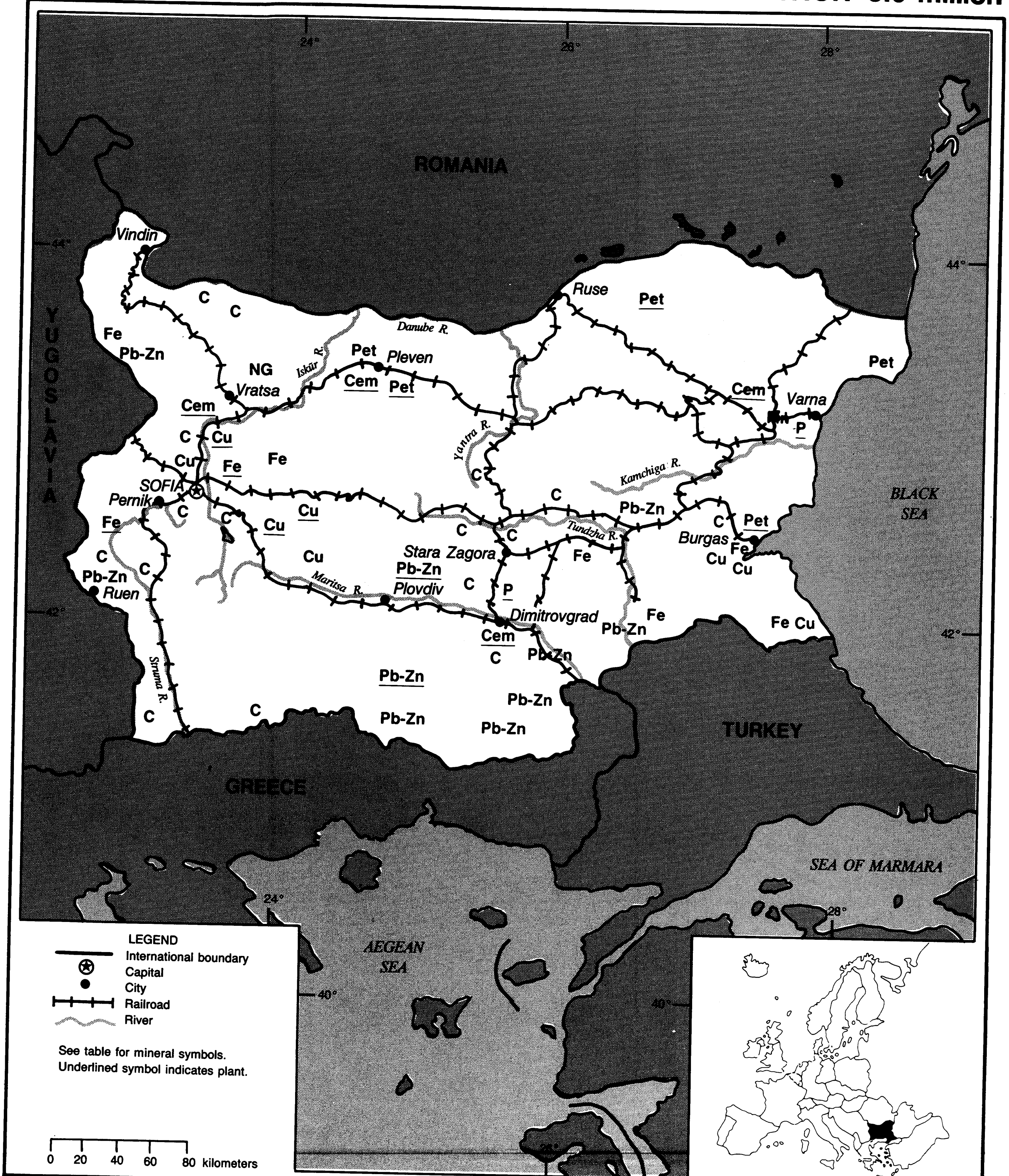
Bulletin de Statistique: Institute National de Statistique (Statistical Bulletin), Brussels, published monthly.

Statistiques Industrielles: Institute National de Statistique (Industrial Statistics), Brussels, published monthly.

Various companies' annual reports.

BULGARIA

AREA 112,000 km² **POPULATION 8.9 million**



THE MINERAL INDUSTRY OF BULGARIA

By Jozef Plachy

In 1990, Bulgaria's mineral industry continued to meet most of the country's needs for major nonferrous metals, with the exception of aluminum. In lead mine production, Bulgaria ranked third in Europe, after the U.S.S.R. and Yugoslavia. Bulgaria also mined about 5% of Europe's copper and zinc, and copper, lead, and zinc metal contributed between 2% to 5% of European production. During 1990, the Assarel copper mine continued to be developed, while work on the Georgi Damyanov Copper Smelter and Refinery Complex (Damyanov Complex) was stopped due to lack of funds.

Most iron production relied on imported ore mainly from the U.S.S.R. Major expansion at the Blagoj Popov steelworks began in 1990 with foreign participation. The development of a new shaft at Obrotchishte was expected to increase manganese output eightfold by the end of 1991.

GOVERNMENT POLICIES AND PROGRAMS

The introduction of major economic reforms that began in January 1989 brought Bulgaria closer to a market economic system. The status of the country's mining and processing industries, however, remained undecided with respect to private ownership.

More progress was achieved in the monetary field. The introduction of a market pricing system would allow measurement of performance in terms of cost, turnover, and profit margins. Convertibility of the leva was established, and Bulgaria became a member of the International Monetary Fund and the World Bank.

PRODUCTION

The largest decline of production in the mineral industry was displayed by the copper mining and processing sector. The decrease in copper ore production largely was due to the declining metal content of ore in the older mines, while the newer mines were still being developed. This decrease should be reversed when the new copper mines reach full production. Furthermore, the 56% fall in refined copper output was caused mainly by the cessation of processing of copper ore with a high arsenic content at the Damyanov Complex, where arsenic from the tailings pond seeped into the ground water.

In 1990, Bulgaria's petroleum refinery output fell 41% owing to the cutback of Soviet crude petroleum deliveries and the suspension of shipments from Iraq after Bulgaria joined the UN Security Council trade embargo against that country.

TRADE

In 1990, Bulgaria continued to depend on imports of some basic minerals. All aluminum metal was imported, mainly from Hungary, the U.S.S.R., and Yugoslavia. With the collapse of communist regimes in eastern Europe and the disintegration of CMEA, Bulgaria's barter trade for aluminum decreased significantly in 1990.

The country's indigenous low-grade lead-zinc ores were supplemented with higher grade imported concentrates. Canada and Peru have been the major suppliers of these concentrates, with occasional supplements from Poland and Yugoslavia. In 1990, excessive air pollution forced the reduction of lead production, making imports of lead ores and concentrates unnecessary. Zinc mine production remained near capacity, making slab zinc Bulgaria's most important, albeit declining, nonferrous metal export. In addition to the abovementioned minerals, Bulgaria also imported ferroalloys, iron and manganese ores, some copper, and a variety of other metals.

In 1990, Bulgaria's mineral trade was conducted by Polimet and Rudmetal. Polimet traded mainly in copper ore and metal, while Rudmetal handled Bulgaria's foreign trade of all ferrous and nonferrous ores, concentrates, and metals.

In 1990, Bulgaria reportedly signed a trade agreement for 1991 with the U.S.S.R. that called for the delivery of 6.5 Mmt of crude oil, 7,000 Mm^3 of natural gas, 4,500 MkW.h of electricity, 6 Mmt of coal, and 1.2 Mmt of iron ore to Bulgaria. In exchange, Bulgaria was to export 470,000 tons of soda ash, manufactured goods, and agricultural products. According to a similar barter agreement, Iran was to deliver 1 Mmt of crude oil in 1991.

STRUCTURE OF THE MINERAL INDUSTRY

Bulgaria's mineral industry was entirely Government-controlled. The state-owned Polimet company operated seven copper mines and concentrators, two copper smelters, and one copper refinery. The newly formed state-owned Lead and Zinc Co. owned and operated two lead and zinc mines directly; 19 more lead and zinc mines were operated through Lead and Zinc's Gorubso subsidiary. The remaining independent state-owned lead and zinc mines shipped their concentrates to the Lead and Zinc Co. for processing.

COMMODITY REVIEW

Metals

Aluminum.—In 1990, Bulgaria's aluminum industry consisted of only two scrap smelting plants (Eliseina and Burgas) and two semimanufacturing plants (Stamen Stamenov in Shoumen and Tolbuhin in Burgas). Reportedly, the feasibility of recovering aluminum from kaolin deposits at Vetovo, Kaolinovo, and Senovo was planned for future study.

Copper.—Most of Bulgaria's copper deposits were found in an area about 50 km wide, stretching from Burgas in the east to the Yugoslavian border in the west. More than 90% of production came from three open pit mines—Elatzite, Medet, and Assarel. Of these three, Medet was the oldest mining operation (opened in 1965 and reportedly expected to close in 1991). Elatzite was the largest producer of copper ore (1990 production about 6 Mmt). The projected annual production at the Assarel Mine reportedly was to increase from the

TABLE 1

BULGARIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1986	1987	1988	1989	1990
METALS					
Bismuth metal	60	56	51	48	45
Cadmium metal, smelter[e]	200	[r]250	[r]300	[r]350	[3]309
Copper:[e]					
Ore:					
Gross weight, thousand tons	10,000	11,500	12,500	[3]12,634	[3]8,712
Cu content, do.	38	44	47	48	30
Concentrate:					
Gross weight, do.	190	220	290	[3]296	200
Cu content, do.	32	35	37	[3]39	26
Metal, primary and secondary:					
Smelter	50,000	55,000	57,000	[3]57,000	25,500
Refined	48,000	54,000	55,500	[3]55,800	[3]24,333
Gold metal[e], kilograms	2,500	2,500	2,500	2,500	2,400
Iron and steel:					
Iron ore:					
Gross weight, thousand tons	2,179	1,850	1,826	1,613	[3]1,079
Fe content, do.	661	559	528	482	[3]321
Iron concentrates, do.	986	990	629	[e]600	400
Metal:					
Pig iron, do.	1,579	1,652	1,437	1,484	[3]1,143
Ferroalloys, electric furnace, all types[e 4], do.	48	42	47	45	15
Steel, crude, do.	2,965	3,045	2,875	2,899	[3]2,185
Semimanufactures, rolled, do.	3,347	3,225	3,320	3,037	[e]2,500
Lead:[e]					
Mine output, Pb content	74,000	69,000	69,000	[3]65,300	[3]66,570
Concentrate:					
Gross weight	93,000	86,000	86,000	[3]81,400	81,000
Pb content	65,000	60,000	60,000	[3]57,000	57,000
Metal, refined, primary and secondary	[r]115,000	105,000	[r]100,000	[3],000	[3]65,952
Manganese ore:					
Gross weight	37,000	38,000	35,000	[e]61,000	50,000
Mn content	11,200	10,900	9,900	[e]17,500	14,000
Molybdenum, mine output, Mo content[e]	190	200	200	190	150
Silver, mine output, Ag content[e]	[r]72	[r]77	[r]85	[3]95	100
Uranium, oxide, U content[e]	1,000	1,000	1,000	1,000	1,000
Zinc:[e]					
Mine output, Zn content, ore hoisted	56,000	56,000	56,000	[3]55,600	56,000
Concentrate:					
Gross weight	79,000	79,000	79,000	79,200	79,000
Zn content	41,000	41,000	41,000	[3]41,000	40,000
Metal, smelter, primary and secondary	[r]90,000	[3]92,000	[r]90,000	[3]86,800	[3]75,457
INDUSTRIAL MINERALS					
Asbestos	300	400	300	[e]300	300
Cement, hydraulic, thousand tons	5,702	5,494	5,535	4,968	4,680
Clays: Kaolin, do.	265	281	220	[e]220	[3]186
Gypsum and anhydrite:					
Crude, do.	395	306	401	451	[3]494
Calcined	99	103	113	[e]130	[3]102

See footnotes at end of table.

TABLE 1—Continued

BULGARIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1986	1987	1988	1989	1990
INDUSTRIAL MINERALS—Continued					
Lime: Quicklime thousand tons	1,632	1,278	1,424	1,434	[3]1,317
Nitrogen: N content of ammonia do.	1,091	1,070	1,342	[r,e]1,300	[3]1,309
Pyrites, gross weight[e] do.	187	185	185	180	180
Salt, all types do.	91	92	103	78	[3]166
Sodium carbonate, calcined do.	1,054	1,070	[e]1,100	[e]1,100	[3]1,046
Sulfur:[e]					
S content of pyrites	80,000	80,000	70,000	70,000	70,000
Byproduct, all sources	62,000	65,000	60,000	60,000	60,000
Total	142,000	145,000	130,000	130,000	130,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, marketable:					
Anthracite thousand tons	80	71	65	[r,e]100	[3]43
Bituminous do.	127	127	131	[r,e]200	[3]125
Brown do.	5,119	5,220	4,762	[r,e]6,000	[3]3,705
Lignite do.	29,896	31,401	29,189	[r,e]32,500	[3]27,827
Total do.	35,222	36,819	34,147	[r,e]38,800	[3]31,700
Coke do.	1,156	1,314	1,457	1,350	[3]1,376
Gas, natural, marketed[e] million cubic meters	130	[r]130	127	127	120
Petroleum:[e]					
Crude: As reported thousand tons	1,080	1,000	1,000	1,000	900
Refinery products thousand 42-gallon barrels	100,000	100,000	100,000	110,000	65,000

[e]Estimated. [r]Revised.
[1]Table includes data available through June 1992.
[2]In addition to the commodities listed, barite, chromite, fluorspar, gold, magnesite, palladium, platinum, tellurium, uranium, 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.
[3]Reported figure.
[4]1987-1989 production includes ferromanganese; since 1990, only ferrosilicon is produced.

TABLE 2

BULGARIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Reka Devnia	Devnia	1,825
Do.	Zlatna Panega	Panega	1,300
Do.	Others	Temelkovo, Dimitrovgrad, Pleven and Beli Izvor	1,590
Coal: Bituminous	Economic Mining and Power Combine (SMEK) Balkanbass	Balkan coal basin in central Bulgaria, northwest of Silven	445
Brown	G. Dimitrov	Pernik coal basin, southwest of Sofia	4,000
Do.	Others	Bobov Dol and Pirin in western Bulgaria	3,100
Lignite	SMEK East Maritsa	East Maritsa coal basin near Zagora	25,000
Do.	Others	Marbas, Pernik, Bobov Dol, and Pirnik coal basins	5,300
Copper: Concentrate (Cu content)	Medet-Asarel	Panagurishte, Pazardzhik district	25
Do.	Chelopech	Srednogorie, Sofia district	5
Do.	Bradtze	Malko Turnovo	2

See footnotes at end of table.

TABLE 2—Continued

BULGARIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Copper—Continued			
Concentrate (Cu content)	Elatzite	Srednogorie, Sofia district	15
Do.	Rosen	Burgas, near the Black Sea	1
Do.	Tsar Asen	Srednogorie, Sofia district	2
Do.	Zidrovo	Burgas, near the Black Sea	.5
Metal, refined	Georgi Damyanov	Srednogorie, Sofia district	120
Iron ore	Kremikovtsi Iron and Steel Combine	Kremikovtsi	2,000
Lead-zinc:			
Concentrate (Pb and Zn content)	Gorubso	Erma Reka, Kurdjali, Laki, and Rudozem all in Madan area near Greek border	59 Pb 47 Zn
Do.	Madzarovo	Near Plovdiv	3 Pb 2 Zn
Do.	Ossogovo	Ossogovo mountains, western Bulgaria	3 Pb 2 Zn
Do.	Ustrem	On Thundza river, eastern Bulgaria	3.5 Pb .8 Zn
Metal:			
Pb refined	Dimitur Blagoev	Plovdiv	65
Do.	Georgi Dimitrov	Kurdjali	60
Zn smelter	Dimitur Blagoev	Plovdiv	60
Do.	Georgi Dimitrov	Kurdjali	30
Manganese ore	Obrotchishte	Varna district	50
Natural gas	Ministry of Power Supply	Chiren field, in the northwest	([1])
Petroleum:			
Crude	Ministry of Power Supply	Chiren field, in the northwest	([1])
Refined barrels per day	Economic Trust for Petroleum Products	Refineries in Burgas, Pleven, and Ruse	260,000
Steel, crude	Kremikovtsi Iron and Steel Works	Near Sofia	1,800
Do.	Lenin Metallurgical Complex	Pernik (Dimitrov)	1,300

[1]Insignificant capacity.

present 5 Mmt to 12.5 Mmt of ore in 1995. Chelopech was Bulgaria's richest copper mine, with ore grading almost 1% copper. Associated gold and silver in the Chelopech ore reportedly graded 3 g per ton and 10 g per ton, respectively.

With an annual capacity of 120,000 tons of refined copper, the Damyanov Complex in Srednogorie was the largest of Bulgaria's two copper smelters. The other smelter, in Eliseina, had a capacity of 12,000 mt/a of scrap-based blister copper, which was sent to Srednogorie for refining.

The plan to increase the production capacity of the Damyanov Complex to 130,000 tons of refined copper and 300,000 tons of sulfuric acid was reportedly abandoned in 1990 for lack of funds. Because of declining ore grades and a high arsenic content in the copper ore, the existing refinery may eventually be closed down.

Ferroalloys.—At the end of 1989, the production of ferromanganese was stopped. Consequently, all 1990 ferromanganese consumption was met by imports from the Norwegian company Elkem A/S. About 15,000 mt/a of ferrosilicon has been produced in Bulgaria at Kremikovtsi near Sofia.

Gold.—Gold in Bulgaria was produced either as a byproduct of copper mining or in open pit gold mines. The 1990 production was estimated at 2,400 kg, about one-half of which was obtained from the Chelopech copper mine. All the country's gold-bearing copper slimes were processed at the Damyanov Complex.

The most important Bulgarian gold mine was the open pit mine operated by the state-owned Chiprovtsi company, on the Dulgodelska Ogosta River near Mihailograd, in northern Bulgaria. The gold content of this deposit reportedly ranged from about 0.3 to 0.4 g/m^3 of material. The Bulgarian Committee for Geology reported that commercially workable deposits of gold and silver have been found in the southern part of the country.

Iron Ore.—Iron ore production in Bulgaria has been declining since 1975, owing to the depletion of reserves and declining ore grades. In 1990, the production of 1.079 Mmt of iron ore was 33% less than that in the previous year. More than 80% of production was supplied by the open pit mine operation at Kremikovtsi, 20 km northeast of Sofia. The ore grade varied from about 25% Fe to 40% Fe (25% Fe in siderite, 35% Fe in limonite, and 40% Fe in hematite ore). The low-grade ore also contained lead, causing severe air pollution problems during processing at the local iron- and steelmaking facilities.

The reserves at the two other mines—Martinovo and Krumovo—are nearly exhausted and are reportedly scheduled to close by 1992.

Lead and Zinc.—There are numerous lead-zinc deposits in Bulgaria. The vein-type deposits contain galena and sphalerite and to a lesser degree, pyrite, chalcopyrite, arsenopyrite, silver, and gold. The most important reserves were found in the southern part of the country, between Plovdiv and the Greek border. The 19 mines and 4 concentrators in this area produced about 80% of all lead-zinc ore, 84% of lead concentrates, and 91% of zinc concentrates.

In 1990, there were 28 lead-zinc mines, 8 concentrators, 2 smelters and refineries, and a number of semimanufacturing plants. Some of the mines were in the mountains up to 40 km from the concentrator, making transportation difficult and expensive. In addition, the size and irregular nature of the vein deposits made it difficult to mechanize the underground mines. Since ore grades in many existing mines were generally low, many small mines may become uneconomical under market economic conditions despite some associated copper and silver in the ore.

The Dimitur Blagoev Smelting and Refining Complex (Blagoev Complex) in Plovdiv was the larger of the two smelters, with a capacity of 65,000 mt/a of refined lead and 60,000 mt/a of slab zinc. The Georgi Dimitrov Smelting and Refining Complex (Dimitrov Complex) in Kurdjali had a capacity to produce 60,000 mt/a of refined lead and 30,000 mt/a of slab zinc. Because of high pollution, both refineries had to curtail their lead production, causing a 33% drop in refined lead output. In order to prevent more environmental damage, the Blagoev Complex reportedly was to close by the end of 1991. The lead and cadmium contained in the tailings was found to contaminate the surrounding soil. Although the concentration of these metals in the surrounding soil was 300 to 400 times higher than the maximum safe level, no decision has been reached about the Dimitrov Complex.

Manganese.—One of the largest deposits of manganese ore in Europe is found in Bulgaria, near Varna on the Black Sea. The estimated reserves of 500 Mmt cover an area 25 km wide and 80 km long. The average thickness of ore layers is 9 m, containing 23% to 31% manganese. In 1990, the deposit was mined only at Obrotchishte, at a rate of about 50,000 mt/a. The mine started operation in 1970 and currently has two shafts 60 m apart and 330 m deep. Since the only ferromanganese plant was closed in 1989, the ore was concentrated locally and, with the exception of 5,000 tons used by the domestic chemical industry, was exported.

Molybdenum.—In 1990, molybdenum was produced as a byproduct of the Medet and Elatzite copper mining operations. The locally-produced concentrate with a molybdenum content of 40% to 45% was exported. The future production of molybdenum may decrease, however, because of the high cost of removal of overburden and the declining copper content at Medet. But because of the large, albeit low-grade (0.3% Cu and 10.7 g/mt Mo) ore reserve at the site, other methods of extraction were under investigation.

Silver.—The 1990 production of silver was estimated at 100 tons, most of it as a byproduct of lead production. A small portion came from copper slime. All the country's silver was processed and refined at the Damyanov Complex. Most of the silver was used by the domestic industry with a small portion deposited at the Central Bank.

Steel.—A major expansion of the Blagoj Popov steelworks began in 1990. The Bulgarian Government reportedly contracted the Italian firm Danieli to build a steelwork with an annual capacity of 250,000 tons of formed steel. Facility expansion reportedly would include an electric furnace, a ladle furnace, a continuous caster, and a rolling mill.

Uranium.—Bulgarian uranium ore mining started after the Second World War. Before 1966, Bukhovo was the only uranium mine in the country. In 1990, there were about five mines producing a combined estimate of 1,000 tons of contained uranium. Almost 70% of production was obtained by in situ leaching. The entire output was reportedly exported to the U.S.S.R. in exchange for fuel-grade uranium for the Kozloduy nuclear powerplant. According to NUKEM, Bulgaria has about 15,000 tons of proven and 30,000 tons of inferred reserves of contained uranium.

Mineral Fuels

Coal.—The 1990 production of almost 32 Mmt of coal (mostly lignite) was 18% lower than that of the previous year. The city most affected by declining coal production was Sofia, where the main suppliers of coal (the G. Dimitrov enterprise in Pernik, Pirin, and Bobovdol) had considerable difficulties with the aging equipment and labor shortages. Imports from the U.S.S.R. continued at the contracted level, supplying the electric power plants in Varna and Ruse-East.

Crude Oil.—Petroleum refining in 1990 declined more than 40% from the 1989 level owing to declining Soviet deliveries and UN imposed trade embargo on Iraq. The 7.81 Mmt of crude petroleum imported from the U.S.S.R. in 1990 was well below the reportedly agreed-upon level. Of all the debts owed to Bulgaria by developing countries in 1990, 55% was owed by Iraq. It was to be repaid by deliveries of 4.75 Mmt of crude oil, but because of the embargo, only a small portion was actually delivered. The shortfall of crude oil for Bulgaria's refineries was partially amended by imports of 0.4 Mmt of crude oil from Iran and 2.3 Mmt from other countries. Under an agreement signed in September of 1990, Iran reportedly was to deliver 1 Mmt of crude petroleum to Bulgaria in 1991. The imports from Libya were to double from about 1 Mmt in 1990 to about 2 Mmt of crude oil in 1991. In addition to traditional suppliers, in 1991, crude oil was to be imported from Turkey and possibly from Nigeria and Saudi Arabia.

Nuclear Energy.—The sixth reactor at the Kozloduy nuclear powerplant was put into operation in 1990. The frequent breakdowns of the fifth reactor resulted in a warning issued by the UN's International Atomic Energy and protests by workers at the site. Recurrent stoppages at the Kozloduy powerplant, which accounted for almost 40% of the country's electric output, caused shortages in electric power supply. According to the Bulgaria-U.S.S.R. agreement, the fuel for the Kozloduy plant was to be obtained from the U.S.S.R. Storage facilities were never built, creating problems with disposal of the thousands of tons of materials that have become radioactive. Offers for disposal of contaminated material were submitted by the Westinghouse Electric Corp. of the United States, Siemens Nuchem AG of the Federal Republic of Germany, and other organizations.

Reserves

Information about reserves, as defined by market economy standards, were not be available. Bulgaria's former centrally planned economic system defined reserves according to the needs of the Government to achieve self-sufficiency, full employment, and other noneconomic goals. Mineral reserves in Bulgaria, that is, deposits that can be mined at profit under existing conditions and with existing technology, still have to be classified. Table 3 provides details of available mineral resources in Bulgaria in 1990.

INFRASTRUCTURE

On October 10, 1990, Bulgaria, together with other Balkan countries (Albania, Greece, Romania, and Yugoslavia) created the Balkan Railway Union to improve the railway system in the Balkans and integrate it with the rest of the European system. The rotating chairmanship will be held by each member for 2 years.

The railroad system in Bulgaria measured 4,049 km of standard- and 245 km of narrow-gauge track. While the standard- gauge tracks are used for freight and personal transport and are part of the international railway system, the narrow tracks are used mainly by the mineral industry for transport of ore or concentrate. Most of the rolling stock and tracks were in need of modernization to accommodate higher speed trains and more frequent use.

The highway system consisted of 33,535 km of hard-surface roads, including 242 km of highway. There were also 470 km of inland waterways, mainly on the Danube, with ports at Ruse, Vindin, and Lom. Major ports were at Burgas, Varna, and Varna West.

TABLE 3

BULGARIA: APPARENT RESOURCES OF MAJOR MINERAL COMMODITIES FOR 1990

(Thousand metric tons)

Commodity	Reserves
Bentonite	58,000
Barite	30,000
Copper, contained in ore	4,600
Gypsum	200,000
Iron, contained in ore	75,000
Lead, contained in ore	1,500
Manganese, contained in ore	35,000
Zinc, contained in ore	1,400

Source: Niproruda.

OUTLOOK

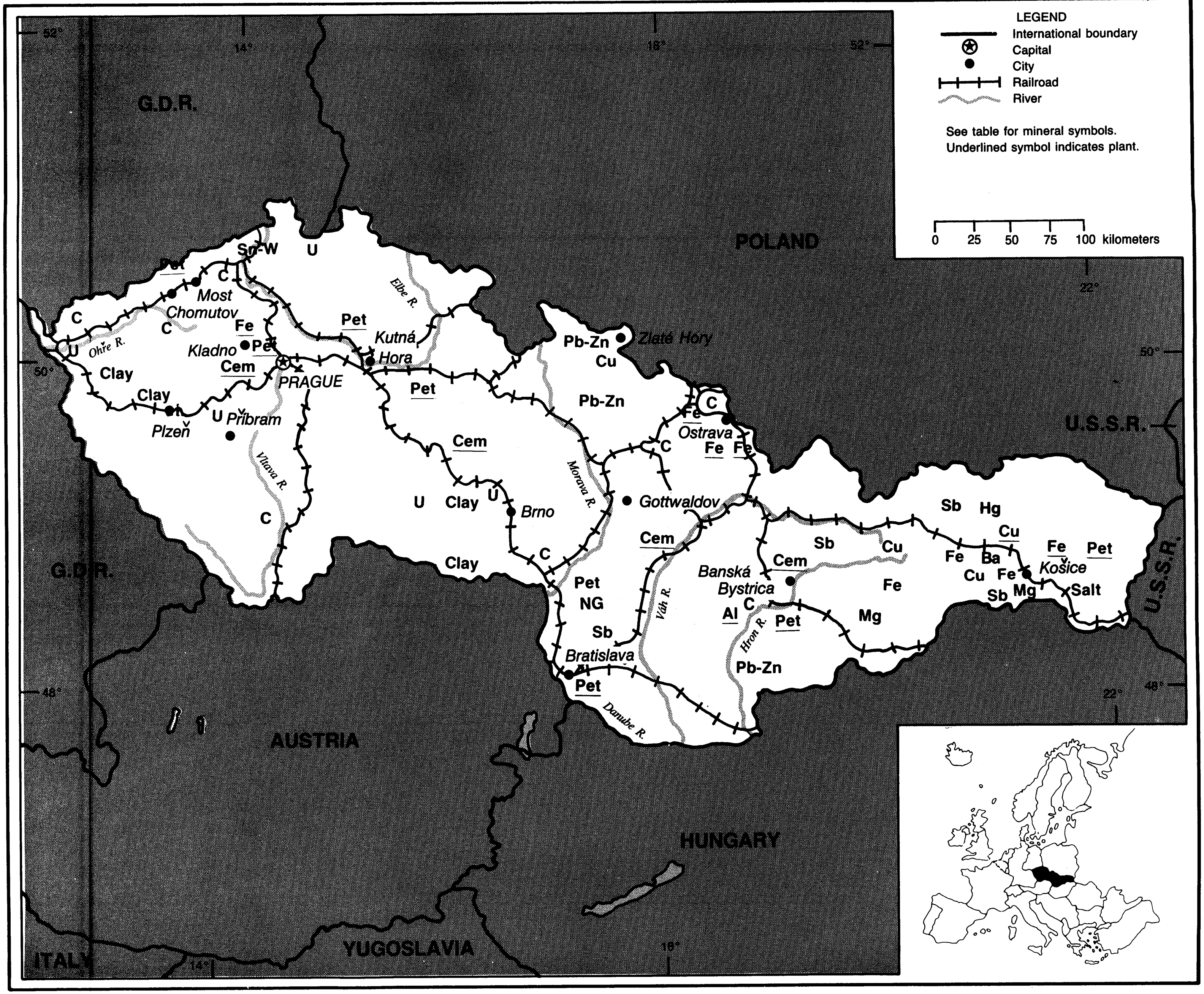
Most of the known deposits are of relatively low-grade ores. Without Government subsidies, a large number of presently operating mines would be marginal at best. One of the mines reportedly slated for expansion, however, is the manganese mine in Obrotchishte that reportedly has proven reserves of 130 Mmt manganese ore with a potential 300 Mmt nearby. With the purchase of new equipment, the present production of 50,000 to 55,000 mt/a of manganese ore will reportedly be increased to 400,000 to 650,000 mt/a.

The Chelopech Mine is reportedly the richest known copper mine in Bulgaria. It has reserves of more than 50 Mmt, containing about 1% copper and a number of other minerals. The management is reportedly seeking investment to double the production from 0.5 Mmt to 1 Mmt of copper ore.

Opportunities for foreign investment also reportedly exist in the ore processing sector. Lead-zinc and copper smelters are about 30 years old, with outdated technology that causes extensive environmental problems. Their future operation depends on their ability to reduce pollution.

CZECHOSLOVAKIA

AREA 128,000 km² **POPULATION 15.7 million**



THE MINERAL INDUSTRY OF CZECHOSLOVAKIA

By Jozef Plachy

Czechoslovakia was among the largest steel producers in Eastern Europe. The country's heavy industry has a long tradition, dating back to the early 18th century. During the 1980's, a record of almost 16 Mmt of crude steel was produced annually, or about 1 mt per capita. In 1990, because of social and economic changes, this level of production could not be sustained, and gradual restructuring of the steel industry was introduced. Most of the 13 small blast furnaces would be decommissioned and the tandem and open-hearth furnaces would be replaced by electric furnaces. The aim was to make Czechoslovakian steelworks competitive in the foreign markets by producing less steel, but of higher quality.

GOVERNMENT POLICIES AND PROGRAMS

In 1990, Czechoslovakia began to convert to a market economy system. Some of the economic reform measures passed that year included: legalization of foreign ownership of enterprises; abolition of Government-controlled foreign trade monopolies; price liberalization; and the establishment of a framework for the privatization of small enterprises. The Czechoslovakian Government intended the reforms to attract foreign investment for modernization of existing industries and the initiation of new projects. By the end of 1990, 1,236 Czechoslovakian firms with foreign capital participation reportedly were registered with a basic capital totaling $126 million. Of these, only 18 foreign investments were in the mineral industry. The question of who owns mineral rights and general lack of clarification proved a deterrent for many foreign mining firms. The largest overall participation was by Austrian and German enterpeneurs, followed by the United States. On August 1, 1990, the Federal Department of Ore Mining was divided into separate Czech and Slovak Mining Institutes situated in Prague and Bratislava. At the same time, the former Czech and Slovak Geological Survey was combined under the Federal Ministry of Environment. As part of a 4-year program with United Nations Educational, Scientific, and Cultural Organization (UNESCO), the new Federal Geological Survey was to invest almost $3 million to explore for nontraditional, nonmetallic minerals, and to exploit raw materials not previously considered, such as kaolinitic clays with high organic content, sillimanite, glauconite, rare-earth metals, and zircon.

PRODUCTION

A major problem afflicting the Czechoslovakian mineral processing industry was excessive pollution. In 1990, steps were taken to reduce pollution in northern Bohemia and Moravia, where the pollution was most critical. A number of lignite mines were either closed or produced below capacity, resulting in a 10% decline in total coal and lignite production in 1990. Work on the new coking plant in Stonava was halted, and production of the remaining coking plants was reduced. Production of pig iron was reduced by 2% and crude steel by 4%.

In the ore mining industry, the only significant change was in the copper industry. Declining ore grades and closure of the Zlate Hory mine resulted in lower copper ore output and consequent drop in metal production.

The rest of the mineral industry remained basically unchanged. During 1990, a number of studies were conducted by Czechoslovakian and foreign experts about profitability of mines and processing enterprises and their environmental impact.

TRADE

During 1990, the CMEA's trade organizations further disintegrated, and by the beginning of 1991, trade based on rubles was to be replaced by convertible currency. However, the largest trading partner in 1990 was still the U.S.S.R., with whom Czechoslovakia has a surplus of 500 million rubles, mainly because of the reduction of contracted and paid-for crude petroleum delivery to Czechoslovakia. In addition to a 20% decline in crude petroleum imports from the Soviet Union, imports of other commodities remained basically unchanged. The only substantial increase in imports was in natural gas, which increased 10% over that of 1989. The "payment" for these imports was made mostly in machinery and equipment which made up 70% of all exports to the U.S.S.R. in 1990. In the trade of mineral commodities, Czechoslovakia had a negative trade balance ($1,857 million in imports and $1,188 million in exports). The largest import was in fuel, comprising 12.3% of the total value of imports.

In April 1990, the United States and Czechoslovakia signed a trade agreement that came into effect in November 1990, restoring the most-favored-nation status. Czechoslovakia signed a trade and economic cooperation accord in May 8, 1990, with the EC, an important step toward full membership by the year 2000.

STRUCTURE OF THE MINERAL INDUSTRY

The structure of the mineral industry of Czechoslovakia in 1990 remained virtually the same as that in 1989. The largest changes were in coal mining, mainly in the Ostrava-Karvina region. Two underground mines were closed (Ostrava and Zapotocky), others are planned to close in 1991 (Dobre Stesti, Jindrich, Jan Sverma, etc.), and some became autonomous from a larger organization (CSM and Pohranicna Straz). In addition, two nonferrous ore mines in Zlate Hory in northern Moravia were closed in 1990. These changes affected only the organization of mining enterprises, not the

TABLE 1

CZECHOSLOVAKIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[p]
METALS						
Aluminum:						
Alumina		138,600	134,200	137,500	205,000	[e]175,000
Aluminum ingot, primary		33,078	32,366	31,435	32,576	30,067
Antimony, mine output, Sb content		[e]1,000	[e]1,000	2,921	1,187	1,272
Cobalt metal[e]		50	50	50	[2]50	[2]59
Copper:						
Mine output:						
Ore, gross wieght		966,000	830,000	796,000	743,000	[e]700,000
Concentrate, gross wieght		24,657	24,782	23,303	20,895	16,899
Cu content[e]		5,300	5,300	5,000	[2]4,900	[2]3,308
Metal:						
Smelter, primary[e]		5,300	5,300	5,000	[r]5,500	[2]4,300
Refined, primary and secondary		26,182	27,202	27,076	26,920	24,606
Gallium metal[e]	kilograms	3,000	3,500	3,700	[2]2,000	[2]1,345
Gold metal[e]	do.	600	600	600	550	550
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	1,784	1,798	1,773	1,780	1,831
Fe content	do.	458	462	[e]440	470	480
Metal:						
Pig iron	do.	9,573	9,788	9,706	9,911	9,667
Ferroalloys, electric furnace	do.	160	161	162	166	169
Crude steel	do.	15,112	15,356	15,319	15,465	14,877
Semimanufactures	do.	12,745	12,950	12,999	12,929	12,555
Lead:						
Mine output:						
Concentrate, gross weight		5,700	5,612	5,429	5,351	5,898
Pb content		2,944	2,801	[e]2,800	[e]2,700	2,997
Metal, secondary		23,602	26,008	26,045	26,008	23,665
Manganese ore, gross weight[3]		900	900	—	—	—
Mercury		168	164	168	131	126
Nickel metal, primary[e]		3,800	3,800	3,800	[2]3,800	[2]2,970
Silver[e]	kilograms	30,000	30,000	30,000	[r]30,000	25,000
Tin:						
Mine output, Sn content		550	550	515	562	613
Metal, primary and secondary		240	545	515	562	550
Tungsten, mine output, W content[e]		50	45	50	[2]74	[2]83
Uranium[e]		2,300	2,300	2,300	[2]2,300	1,900
Zinc:						
Mine output:						
Ore, gross weight		701,000	700,000	694,000	682,000	[e]650,000
Concentrate, gross weight		13,265	13,662	13,870	14,137	15,423
Zn content		6,700	[e]7,000	[e]7,000	7,067	7,500
Metal, secondary		[e]1,000	1,143	1,357	1,296	1,726
INDUSTRIAL MINERALS						
Barite		[e]60,000	[e]60,000	60,794	50,800	87,000
Cement, hydraulic	thousand tons	10,298	10,369	10,974	10,888	10,215

See footnotes at end of table.

TABLE 1—Continued

CZECHOSLOVAKIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[p]
INDUSTRIAL MINERALS—Continued						
Clays:						
Bentonite[e]		30,000	30,000	30,000	30,000	30,000
Kaolin		546,101	697,000	685,958	698,000	670,550
Diamond, synthetic[e]	carats	—	—	5,000	5,000	5,000
Fertilizer, manufactured:						
Nitrogenous, N content		614,340	596,409	596,420	603,848	514,000
Phosphatic, P_2O_5 content		307,021	277,041	313,009	295,643	256,870
Potassic, K_2O content		[e]100,000	110,542	115,625	108,420	[e]110,000
Mixed		[e]400,000	427,095	478,001	410,631	[e]410,000
Fluorite[e]		60,000	60,000	60,000	60,000	60,000
Fluorspar[e]		95,000	95,000	95,000	[2]68,910	[2]46,966
Graphite		25,254	[r e]20,000	[r e]15,000	14,676	12,171
Gypsum and anhydrite, crude		743,100	770,998	774,133	796,000	714,000
Lime, hydrated and quicklime	thousand tons	3,329	3,237	3,311	3,346	3,120
Magnesite, crude		666,000	671,000	630,786	642,000	561,000
Nitrogen: N content of ammonia		760,220	775,640	771,100	603,848	513,807
Perlite		41,443	41,997	43,390	[e]44,000	41,700
Pyrite, gross weight[e]		140,000	140,000	140,000	140,000	140,000
Salt		338,240	337,985	350,201	344,201	[e]340,000
Silicon[e]		30,000	30,000	30,000	30,000	30,000
Sodium compounds, n.e.s.:						
Caustic soda		335,000	332,441	337,062	337,053	334,754
Soda ash		113,000	102,659	112,217	[e]110,000	104,360
Stone:						
Limestone and other calcareous stones	thousand tons	23,566	22,927	23,244	22,969	[e]20,000
Quarry stone, not further described	thousand cubic meters	32,826	33,317	35,225	32,889	[e]30,000
Sulfur:[e]						
Native		6,000	6,000	6,000	6,000	6,000
From pyrites		60,000	[2]38,000	60,000	50,000	50,000
Byproducts, all sources		[2]42,193	40,000	40,000	40,000	40,000
Total		108,193	84,000	106,000	96,000	96,000
Sulfuric acid	thousand tons	1,292	1,264	1,249	1,142	1,032
Talc[e]		30,000	30,000	30,000	30,000	26,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	thousand tons	25,658	25,736	25,504	25,070	22,406
Brown and lignite	do.	102,738	101,986	99,919	94,263	85,167
Coke:						
Metallurgical	do.	8,005	8,351	8,349	8,130	7,965
Unspecified	do.	2,068	2,235	2,237	2,017	1,660
Fuel briquets from brown coal	do.	1,093	[e]1,000	1,128	1,147	1,511
Gas:						
Manufactured, all types	million cubic meters	7,245	7,270	6,782	6,334	6,332
Natural, marketed[4]	do.	[e]700	696	732	683	457

See footnotes at end of table.

TABLE 1—Continued

CZECHOSLOVAKIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum:						
Crude:						
As reported	thousand tons	142	147	142	144	123
Converted	thousand 42-gallon barrels	963	997	963	976	834
Refinery products[e]	do.	125,000	126,000	126,000	[r]120,000	[2]95,462

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

[1]Table includes data available through Dec. 15, 1991. In addition to the commodities listed, arsenic, diatomite, dolomite, feldspar, illite, and zeolite 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.

ownership, which remained in the hands of the Government. The legal status of mining and processing enterprises was to be decided at the end of 1991.

COMMODITY REVIEW

Metals

Antimony.—About one-half of 1990 production of antimony was generated in Liptovska Dubrava, central Slovakia. The second largest producer was the antimony mine in Pezinok, while the rest of the country's output of antimony originated from the polymetallic ores at various locations, the most notable of which is at Krasna Hora in central Bohemia. All the antimony concentrate is processed in Vajskova in central Slovakia.

Reserves in Liptovska Dubrava amount to 1.8 Mmt of ore grading 1.19% Sb. The deposit covers an area of 4 km by 800 m. The north-trending veins are 0.2 to 0.5 m wide, dipping at 70 to 90 degrees to a depth of 500 m. Annual production was almost 50,000 mt, from which about 1,200 mt of 50% Sb concentrate was produced with an 87% recovery rate. Exploration in the adjacent areas (Klacianka, Risianka, Salisko, Mala Zelene and Magurka) has been carried out for possible future expansion or the replacement of the existing underground mine in Liptovska Dubrava.

The Kollarov Hill deposit in Pezinok reportedly contains 324,000 mt of reserves, grading 1.35% Sb and small amounts of gold. The antimony-bearing lenses are reportedly 10 to 40 m wide. The production from the 60-m-wide and 420-m-long open pit mine was about 50,000 mt of ore yielding about 1,500 mt of concentrate with an antimony content of 20% to 22%. A new deposit in neighboring Trojanova was under development, while exploration was carried out in the adjacent areas of Vinohrady and Sirkova.

Copper.—Of all the nonferrous metal reserves of Czechoslovakia, those of copper were the largest, albeit of low metal content. In the past 25 years, the Cu content of the ore declined from 0.72% to about 0.5%. The largest copper reserves are at Slovinky, followed by Banska Hodrusa-Zlatno, both in central Slovakia. The Slovinky deposit is 6 km long and 20 to 100 m wide, containing 22.7 Mmt of reserves with a copper content of about 0.8% and small amounts of associated silver and gold. The vein-type mineralization (average thickness of 2.5 m) contains hydrothermal siderite-sulfide, chalcopyrite, and tetrahidrite. The last vein in Banska Hodrusa (Rozalia) was depleted in 1990, and the operation was relocated to nearby Zlatno. The reserves at Zlatno, together with the remaining ore at the old location, reportedly amounted to 20.3 Mmt. In addition, there was a 35-Mmt reserve of copper and polymetallic ore in Zlate Hory in northern Moravia. However, both mines, one producing copper ore (0.44% Cu content) and the other polymetallic ore with less than 0.4% Cu content, were closed in June 1990. Additional ore was produced from polymetallic ores from various locations, mainly in Slovakia. All the copper ore was locally concentrated and transported to Krompachy in central Slovakia for smelting and refining. The indigenous ore also was augmented with imported ore and domestic scrap. The 1990 production of primary and secondary refined copper was 24,606 mt, a 9% decrease over that of the previous year.

Gold.—All present gold production is from indigenous polymetallic ore. The largest gold deposit is in Mokrsko, 50 km south of Prague. Despite a large reserve—30 Mmt of ore—the development was postponed because of a lack of foreign exchange, low grades (1.8 to 2.1 g/mt of ore), and because of possible environmental damage. In 1990, the Institute of Landscape Ecology of the Czechoslovak Academy of Science in Ceske Budejovice, began a study of different mining technologies to ensure safe ecological conditions for possible future extraction. In addition to Mokrsko, the largest gold reserves are in Kasperske Hory, Sucha Rudna, Roudny and Krasna Hora in Bohemia, Zlate Hory in Moravia, and Kremnica and Sturec in Slovakia. In 1990, the area of the closed copper mine Spania Dolina in central Slovakia was explored for gold by RB Banska Bystrica.

Iron Ore.—The slight increase of iron ore production in 1990 was mainly due to increased mine output at Nizna Slana in eastern Slovakia. Reserves of siderite ore amounted to 44 Mmt containing about 30% iron with about 2% manganese content. Annual production at the underground mine was about 750,000 mt of ore yielding about 350,000 mt of concentrates and pellets with more than 50% iron content.

The second largest producer, Rudnany, central Slovakia, contributed 650,000 mt of ore. The more than 35 Mmt of the country's iron ore reserves consisted of siderite, barite, and ferrobarite. The metal

TABLE 2

CZECHOSLOVAKIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies[1]	Location[2]	Annual capacity
Aluminum	SNP Aluminum Works	Ziar nad Hronom, central Slovakia	60
Antimony:			
Ore	Krasna Hora	Central Bohemia	NA
Do.	Liptovska Dubrava	Central Slovakia	50
Do.	Pezinok	West Slovakia	50
Smelter	Vajskova	Central Slovakia	2
Cement	Cizkovice, Hranice, Karlov Dvor, Lochkov, Pracovice, and Velary	Bohemia	3,500
Do.	Bystre, Malomerice, Mokra, Ostrava-Kunice, and Zahorie	Moravia	2,800
Do.	Banska Bystrica, Horne Srnie, Ladce, Lietavska Lucka, Stupava, and Turna	Slovakia	5,400
Clay, kaolin	Mines in Karlove Vary area	West Bohemia	450
Do.	Mines in Plzen area	Central Bohemia	150
Coal:			
Bituminous	Mines in OKD coal basin	Ostrava-Karvina, North Moravia	22,100
Do.	Mines in KD coal basin	Kladno, central Bohemia	3,000
Brown	SHD administration	Most, Northwest Bohemia	61,200
Do.	HDB administration	Sokolov, west Bohemia	17,000
Do.	ULB administration	Prievidza, central Slovakia	6,800
Lignite	JLD administration	Hodonin, south Moravia	5,000
Copper:			
Ore	Slovinky, Hodrusa-Hamre, and Rudnany	Central Slovakia	500
Do.	Zlate Hory	North Moravia	300
Refinery	Krompachy	Central Slovakia	27
Gallium kilograms	SNP Aluminum Works	Ziar nad Hronom, central Slovakia	4,000
Iron ore	Nizna Slana and Rudnany	Central Slovakia	1,600
Lead-zinc, ore	Horni Benesov and Zlate Hory	North Moravia	400
Do.	Banska Stiavnica	Central Slovakia	200
Magnesite	SMZ administration	East Slovakia	550
Mercury metric tons	Dubnik, Malachov, and Rudnany	Central Slovakia	150
Nickel, smelter	Niklova Huta	Sered, south Slovakia	5
Natural gas billion cubic meters	Gasfields around Hodonin	South Moravia	25
Petroleum:			
Crude	Oilfields around Hodonin	South Moravia	140
Refinery	Kolin, Kralupy, Pardubice, and Zaluzi	Bohemia	NA
	Bratislava, Strazske, and Zvolen	Slovakia	NA
Tin, ore	Krasno (Stannum) and Cinovec	Northwest Bohemia	300

NA Not available.

[1]All mining companies are Government owned.

[2]Names and locations of mines and crude oil refineries are identical.

content of these ores was about 24% Fe, 44% $BaSO_4$, and a small percentage of copper, mercury, and antimony.

The reserves of iron ore at Roznava in central Slovakia measured almost 6 Mmt, and in addition to iron, it contained undetermined percentages of antimony, copper, and silver. Production from this location amounted to about 430,000 mt/a of ore, which was transported to Rudnany for processing. Because of very low flotation recovery, the iron concentrate production from the combined ores from Roznava and Rudnany was only about 350,000 mt/a.

Iron and Steel.—Czechoslovakia's steel industry faced the biggest problems in the country's mineral industry. The steel industry's difficulties were almost total dependence on imported iron ore and the high cost of coal and coke. In addition, poor productivity (95 mt per employee in Czechoslovakia compared with 343 mt in the West), obsolete equipment, pollution, lack of capital, and poor location hampered the steel industry. According to the Federal Ministry of Economy, the remedy should include reduction per capita consumption of steel from 700 kg to about 350 kg to 400 kg, an increase in scrap consumption, and the introduction of new technologies and modern equipment.

An immediate supply of iron pellets from the U.S.S.R. was guaranteed by Soviet officials in exchange for investment in the construction of magnetic separation in Krivoj Rog. In 1990, unexpected problems arose in the area of coal and coke supply. The increasing depth of coking coal mining and the cost of coking and transportation made the import of Polish coke more economical for some of the steelworks.

One of the first steelworks to be modernized was the Sverma Steel Works in Podbrezova in central Slovakia. The small manufacturer of semis for seamless tubes was to install a 60-mt electric arc furnace and a ladle furnace, with the accompanying technology.

Poldi Kladno, 30 km west of Prague, would streamline its production in 1991 by closing down its outmoded open-hearth operations and concentrating on electric steelmaking.

Lead and Zinc.—The largest lead-zinc mine is in Banska Stiavnica in central Slovakia. The ore reserve, consisting of pyrite, galena, sphalerite, chalcopyrite, quartz, and carbonates, totaled more than 10 Mmt. Because of the relatively low grade of ore—1.3% Pb, 1.8% Zn, 0.2% Cu, 20 g/mt Ag, and 2 g/mt Au—the mine may not be economically viable once Government subsidies are removed in 1993. In 1990, most mining was done on the middle and lower portions of three veins: Theresa, Bieber, and Spitaller. The hydrothermal subvolcanic veins are up to 3 km in length and 2 to 6 m wide. In 1990, 4,300 mt of lead concentrate containing 52% Pb and 6,300 mt of zinc concentrate containing 50% Zn were produced from 220,000 mt of ore.

The ore body in Horni Benesov in northern Moravia consists of a number of stratabound lenses extending over a length of 1,500 m with a dip of about 45 degrees. The ore minerals are pyrite, galena, and sphalerite. The reserves at this location reportedly totaled 7 Mmt of ore grading 0.47% Pb, 1.17% Zn, plus undetermined amounts of cadmium, gold, and silver. In 1990, this underground mine reportedly produced about 230,000 mt of ore yielding about 1,800 mt of lead and 4,250 mt of zinc concentrate. Most of the rest of the country's zinc ore was mined at the polymetallic ore deposit in Zlate Hory in northern Moravia.

Reportedly, a new polymetallic ore deposit, with an estimated reserve of 8 Mmt of ore was explored in Zlata Bana in eastern Slovakia.

Because the need for a nonferrous smelting plant in Bruntal was under review, all of Czechoslovakia's lead and zinc concentrates continued to be exported to Germany and a small amount of zinc concentrate to Yugoslavia. The country's only lead smelter in Pribram in southern Bohemia treated only secondary raw materials, principally battery scrap.

Lithium.—According to a survey in 1961 and subsequent analyses, there was about 1 Mmt of reserves of lithium in the tin-tungsten deposit of Cinovec, northwest Bohemia. The cinvaldit ore contains 1.68% lithium, 1.1% rubidium, and 0.4% cesium.

Molybdenum.—For the past 5 years the ferroalloy plant in Istebne in northern Moravia annually produced ferromolybdenum containing about 1,200 mt of molybdenum.

Nickel.—The nickel refinery in Seredin western Slovakia stopped using New Caledonian ore in 1987 and Cuban ore in 1989 and in 1990 was totally dependent on Albanian ore. Laterite ore containing only 0.9% to 1% nickel and an undetermined amount of cobalt was railed over 1,200 km from Albania. The production of refined nickel declined from 4,600 mt in the early 1980's to 2,970 mt in 1990. In addition to nickel metal, the Sered Nickel Refinery also produced about 60 mt of cobalt metal, nickel powder, and nickel salts.

Tin-Tungsten.—At the end of 1990, a decision was made to close down one of two tin-tungsten mines in Czechoslovakia. The Stannum Mine in Krasno, northwest Bohemia, started operation in 1967, and by the 1970's, the annual production reached about 300,000 mt of ore. During past years, the production of ore at this facility declined to about 50,000 mt in 1990, yielding about 80 mt of tin and 2 mt of tungsten concentrates. The future for the Stannum Mine would involve finding outside investors interested in 14 Mmt of low-content tin-tungsten reserves, in reprocessing 10 Mmt of tailings believed to contain a sizable tonnage of tin and tungsten, or in developing a nearby feldspar deposit.

In 1990, officials from the China and the Czecho-Slovak Republic met in Prague to discuss future tungsten trade.

Uranium.—On June 30, 1990, the old management of the Czecho-Slovakian Uranium Industry (CSUP) was replaced, and the headquarters of CSUP was moved from Pribram to Hamr, north Bohemia. By the end of the year, the work force was reduced by 18% to 11,945 people. Until the end of 1990, the country's entire uranium production was sold to the U.S.S.R. in exchange for fuel elements for domestic nuclear generators. Sixty percent of the estimated 1990 production of uranium originated in the Hamr region in northern Bohemia. Ore from the eight operating mines was processed at three mills with a total capacity of 2,300 mt/a.

According to economists from the Czechoslovak Ministry of Economy, production and internal consumption of uranium should balance out between 1994-95 given the planned pace of mine closings and nuclear power station construction. Because of overproduction during this period, there should be enough uranium available up to the year 2000. After that, production and trade will be determined by market.

By 1991, the country's uranium treatment plant at Mydlovary in southern Bohemia was to process only 106,000 mt of uranium ore, about 600,000 mt less than that in the early 1980's.

Other Metals.—The 55.6-Mmt tin-tungsten ore deposit at Cinovec in northwestern Bohemia reportedly also contains 2,000 mt of niobium, 400 mt of tantalum, 300 mt of scandium, and 40 mt of indium. However, because of the low level of production and low content of main minerals (0.2% Sn and 0.045% W) the commercial production of rare-earth metals was not cost effective.

Industrial Minerals

Barite.—The 71% increase of barite production in 1990 was mainly due to the increased output of the 1-year-old Krizanovice Mine in central Bohemia. The 3.7 Mmt of reserves at this location reportedly contain 18.6% $BaSO_4$, 4.4% Zn, 0.52% Pb, 0.1% Cu, and 8.5 g/mt of silver. The largest producer of barite was the Rudnany Mine in central Slovakia, where reserves reportedly amounted to 34.5 Mmt of 44% $BaSO_4$, 24% Fe, and some copper. The deposit has two principal veins: Zlatnik in the northern part and Hruba in the center. Because barite appears in the middle of a siderite vein, in a form of modules and lenses, its output was contingent on iron ore production. In 1990, the "Barytarna" enterprise of Rudnany produced 17 barite products. Twenty-five percent of production was exported.

Bentonite.—Out of seven known bentonite deposits in Czechoslovakia, only three were exploited: Velky Rybnik and Rokle in Bohemia and the Jelsovsky Potok region in central Slovakia. The largest reserve, 32 Mmt, was in Blov-Krasny Dvorcek, Bohemia. The reserves at Jelsovsky Potok amounted to only about 6.6 Mmt, the smallest known deposit in Czechoslovakia. The montmorillonite deposit has up to 20% Mg. Production at Jelsovsky Potok included grades for application in wine clarification, animal feed, the foundry industry, the manufacture of bleaching clays, and for the glass industry.

Fluorspar.—There are five fluorspar deposits in Czechoslovakia, all in Bohemia. Of these, three are associated with barite, including the two largest ones: Moldava-Mackov in the north and Kovarska in western Bohemia. The known reserves amounted to more than 10 Mmt of 45% CaF_2.

Graphite.—Following the trend of the past few years, in 1990 the output of graphite declined by 17%. The mining of graphite was concentrated in two areas. Fine, flaky graphite with at least 15% carbon was produced in southern Bohemia, while foundry graphite with a carbon content of 35% was produced largely in northern Moravia. More than one-half of Czechoslovakia's 1990 production of fluorspar originated at Lazec in southern Bohemia. Reserves at this location, including those at nearby Cesky Krumlov, measured 4.5 Mmt with an average carbon content of 20%.

Kaolin.—More than 400 Mmt of the country's reserves of kaolin are mostly in western Bohemia around Karlove Vary, Podborany, Cheb, and Plzen. Smaller deposits are in Znojmo in northern Moravia, and in Slovakia. The oldest mine was at Karlove Vary, where reserves of kaolin reportedly amount to 100 Mmt with outstanding physical properties for porcelain manufacture.

Magnesite.—Magnesite has been one of Czechoslovakia's most important mineral exports. All the reserves of about 470 Mmt were in eastern Slovakia between Lucenec and Kosice. Slovak Magnesite Enterprise (SMZ), the major producer of magnesite, operated five plants: Jelsava, Kosice, Lubenik, Podrecany, and Burda-Poproc. To increase its product range, SMZ's plans for 1991 included the introduction of a new 15,000-mt/a flotation process to manufacture high-quality magnesite and a 26,000-mt/a new production facility for calcined magnesite containing 99.5% MgO. The construction of this facility by Zvolen Stavoindustria in Hnuste-Hacava began in 1985 and was scheduled for completion in 1991 at a cost of $50 million.

Salt.—The country's only salt mining enterprise was at Presov in eastern Slovakia. Reportedly, production during the 1980's remained constant at about 340,000 mt/a of kitchen and industrial salt. The reserves at the newest mine, Solna Bana, amounted to more than 20 Mmt of 15% NaCl content. The deposit was 150 m thick and covered an area of 15 km^2. Part of the salt was recovered from an open pit mine, and the rest as a 25% brine solution from underground deposits at depths of 200 m.

The largest deposit of salt is in Zbudza in eastern Slovakia, where reserves reportedly totaled 723 Mmt. In 1990, the deposit was being prepared for exploitation.

Talc.—Talc deposits in Czechoslovakia are associated with magnesite deposits and metamorphosed basic rocks in the Spisko-Gemerske Mountains in eastern Slovakia. A lesser quality talc was found in the area of Muranska Dlha Luka, also in eastern Slovakia. Talc was mined at two underground mines at Hnusta-Mutnik, with reported reserves of 21 Mmt, and Kokava, with more than 7 Mmt. The Hnusta plant, "Talcum," produced eight grades of products totaling about 26,000 mt.

Mineral Fuels

Coal.—The future of the Czechoslovakia's coal industry depended on whether nuclear power could be developed safely and efficiently and on whether indigenous coal could be economically produced and burned cleanly and efficiently. While the reduction of coal mining and power generation was generally accepted, the issue of further construction and use of nuclear power stations met with opposition. The area that would be most affected by the reduction of coal mining and power generation was northern Bohemia and Moravia, the regions with the most serious environmental problems. The oldest blocks of thermal power stations in this area were gradually shut down, while at the same time desulfurization units were installed on the remaining blocks. Two mines in the Ostrava-Kladno bituminous coal basin were closed in 1990: Zapotocky and Ostrava. An additional four mines were to be closed in 1991, reducing Government subsidies by 380 million korunas ($12.7 million). From 1989 to 1990, coal production declined by 10%, owing to coal mine closures and the postponement of new mine development. The cost of mine closures was estimated to reach $54 million for 1991 and $30 million for 1992.

Czechoslovakia reported having 4,500 Mmt of reserves of bituminous and anthracite coal, of which 2,040 Mmt was exploitable. Out of 5,500 Mmt of lignite and brown coal reserves, 4,020 Mmt was recoverable. The highest quality coal (25,120 kJ/kg with low ash content and sulfur) was produced in Ostrava-Karvina.

Coke.—The 1990 production of heating coke was 1,660,000 mt, an 18% decline from that of 1989. More than one-half was produced by three coking plants in northern Moravia: J. Sverma, CSA, and Svoboda. The planned increase in heating coke production to 2.3 Mmt was to be achieved by the completion of a new coking plant in Stonava and modernization of Svoboda. The other two plants, J. Sverma and CSA, were planned to gradually cease production. Because of environmental concerns, construction of a new coking plant in Stonava was halted and modernization of the Svoboda plant has been delayed.

Natural Gas.—The 1990 production of natural gas dropped by 33% to 457 Mm^3. Domestic production covered only about 2% of the country's consumption needs with the rest being imported mainly from the U.S.S.R.

At the newly formed Pentagonal Commission for the Energy Industry, consisting of Austria, Czechoslovakia, Hungary, Italy, and Yugoslavia, Czechoslovakia proposed creating a joint venture to import Algerian natural gas to Europe and to build a pipeline for delivery of Norwegian natural gas. Since 23% (61 Gm^3/a) of all transmitted gas in Europe passed through Czechoslovakia, this proposal attempted to ensure an equitable division of revenues and expenses connected with the transit and import of natural gas. Shares proportional to the length of the pipeline would be held by the Czech and Slovak Republics and the Federal Government. By the year 2005, Czechoslovakia reportedly would require 25 Gm^3 of natural gas annually. Of this amount, 18.5 Gm^3 was to come from the U.S.S.R., a 23% increase over that of 1990, and 0.5 Gm^3 would come from domestic production. The remaining 6 Gm^3 was expected to be imported fromAlgeria and Norway, and possibly Iran.

Petroleum.—By the beginning of 1990, Czechoslovakia's economy began to feel the effects of falling Soviet exports of crude petroleum. In 1990, Czechoslovakia's imports of Soviet petroleum declined by 20% from 16.6 Mmt in 1989 to 13.2 Mmt in 1990. To alleviate this shortage, an agreement was signed with the Russian Republic for delivery of 500 kmt and with Iran for 400 kmt of crude petroleum by yearend 1990. However, these deliveries arrived too late for many refineries. The refinery at Vojany near Trebisov in eastern Slovakia closed down in February, and the Slovnaft refinery in Bratislava reportedly worked at about one-half capacity. For future long-term deliveries, Iran was willing to supply 5 to 10 Mmt of crude oil in exchange for industrial goods. Most of the Iranian crude oil will come through the Adria pipeline, whose capacity of 2 Mmt/a could be increased to 5 Mmt/a by adding supplementary pumping stations. Additional crude oil or refinery products could come via pipeline from the Austrian refinery at Schwechat and Slovnaft in Bratislava or through a branch of Transalpine pipeline from Ingolstand in Germany to the Litvinov refinery in northwest Bohemia. In 1990, Slovnaft signed an agreement with CHISSO of Japan to build a 250,000-mt/a lead-free gasoline production unit in Bratislava by March, 1992. In anticipation of privatization, instead of waiting for the Government to make an agreement, some of the Czechoslovakian refineries began negotiations on their own. Slovnaft negotiated with Megyoneftegaz, while the Litvinov refinery held discussions with Nizhnevartovskneftgaz of the Russian Republic.

In 1990, six wells were drilled at the newly discovered crude oil and natural gas deposit in southern Moravia. Exploration at Zlin (formerly Gottwaldov) and Ostrava, central and northern Moravia, continued in 1990.

Nuclear Power.—The output of nuclear power stations in 1990 was 24,621 MkW.h, slightly higher than that in 1989.

In response to pressure from environmentalists, the work on the Temelin nuclear powerplant has been suspended and the start of construction of the Kecerovce nuclear power station in eastern Slovakia had to be postponed. Problems at Jaslovske Bohunice, the oldest nuclear power station in Czechoslovakia, continued in 1990. In February, vibration damaged the oil distribution pipe, causing an oil leak and subsequent fire. In spite of these problems, a team of experts from Germany's Siemens A.G. and a commission of Austrian experts reached the conclusion that the Jaslovske Bohunice need not be closed down.

Reserves

The economic changes in Czechoslovakia during 1990 made the reassessment of reserves essential. In the past, the determination of quantities of mineral reserves was often influenced by political considerations. Table 3 presents selected mineral resources in Czechoslovakia.

TABLE 3

CZECHOSLOVAKIA: RESOURCES OF MAJOR MINERAL COMMODITIES FOR 1990

(Thousand metric tons (gross weight) unless otherwise specified)

Commodity	Average grade content	Reserves
Antimony	2.3% to 3% Sb	2,167
Barite	18.6% to 44% $BaSO_4$	46,700
Bentonite	20%	125,687
Bituminous and anthracite	NA	4,500,000
Copper	0.6% to 0.9% Cu	44,846
Feldspar	NA	23,000
Fluorspar	45% CaF_2	10,200
Germanium	NA	4
Gold metric tons	2 grams per ton Au (content)	210
Graphite	20% C	5,000
Iron	24% to 36% Fe	91,869
Kaolin	NA	400,000
Lead	0.47% to 0.9% Pb	17,365
Lignite and brown coal	NA	5,500,000
Lithium	NA	250
Magnesite	43% MgO (5% to 9% Fe)	470,000
Manganese	15% Mn	441,041
Polymetallic ore metric tons	NA	59,641
Quartz and quartzite	97.2% SiO_2	20,747
Salt	15% NaCl	743,583
Silver	12 to 15 grams per ton (content)	[1]1,000
Talc	NA	28,362
Tin	0.2% Sn	73,000
Tungsten	0.04% W	73,000
Uranium	NA (metal content)	25
Zinc	1.17% to 1.3% Zn	17,365

[e]Estimated. NA Not available.
[1]Undetermined metal content.
Sources: GEOFOND, Kostelni 26, 17021 Prague; GEOFOND, Bukurestska 4, 81104 Bratislava; Ceskoslovenske Rudne Bane (Czechoslovakian Ore Mines) 1990, Bratislava, Mytna 23, Czechoslovakia.

INFRASTRUCTURE

The total length of the railroad system in Czechoslovakia was 13,111 km, of which 12,855 km was standard gauge, 2,896 km was double track, and 3,909 km was electrified. Out of 73,751 km of roads, 548 km was highways. The length of inland waterways was 475 km. The main river in Slovakia is Dunaj (Danube), with ports in Komarno and Bratislava. The principal river in Bohemia is Labe (Elbe), with Decin as its main port.

The length of pipelines in 1990 were 1,448 km for crude oil, 1,500 km for refined products, and 8,100 km for natural gas.

OUTLOOK

During 1990, in spite of political disagreements between the Czech and Slovak Republics, certain economic restructuring has been accomplished. In the future, a decision about privatizing large enterprises is to be made, and the legal status of the mineral industry would have to be established. One of the main tasks is the reduction of pollution. This will be achieved by reducing heavy industrial output and installing modern technological processes in the remaining factories. Old open-hearth furnaces will likely be replaced by more efficient and less polluting oxygen and electric arc furnaces. Despite temporary setbacks, the reduction of coal mining is to be compensated by increased capacity of nuclear power stations, which by the turn of century should reach 10,280 MW, generating more than one-half of the country's electric energy. This would allow old coal burning power stations to close, and, with installation of desulfurizing equipment and filters on remaining stations, air pollution would be reduced.

The new legal status of the mineral industry was to be determined by the end of 1991. Coupled with planned elimination of subsidies by 1993, it should clarify the prospects of many mining and processing enterprises.

OTHER SOURCES OF INFORMATION

Federalni statisticky urad
Sokolovska 142
18613 Prague 8
Czechoslovakia

Ministerstvo zahranicneho obchodu
Politickych veznu 20
11001 Prague 1
Czechoslovakia

GEOFOND
Kostelni 26
17021 Prague 7
Czechoslovakia

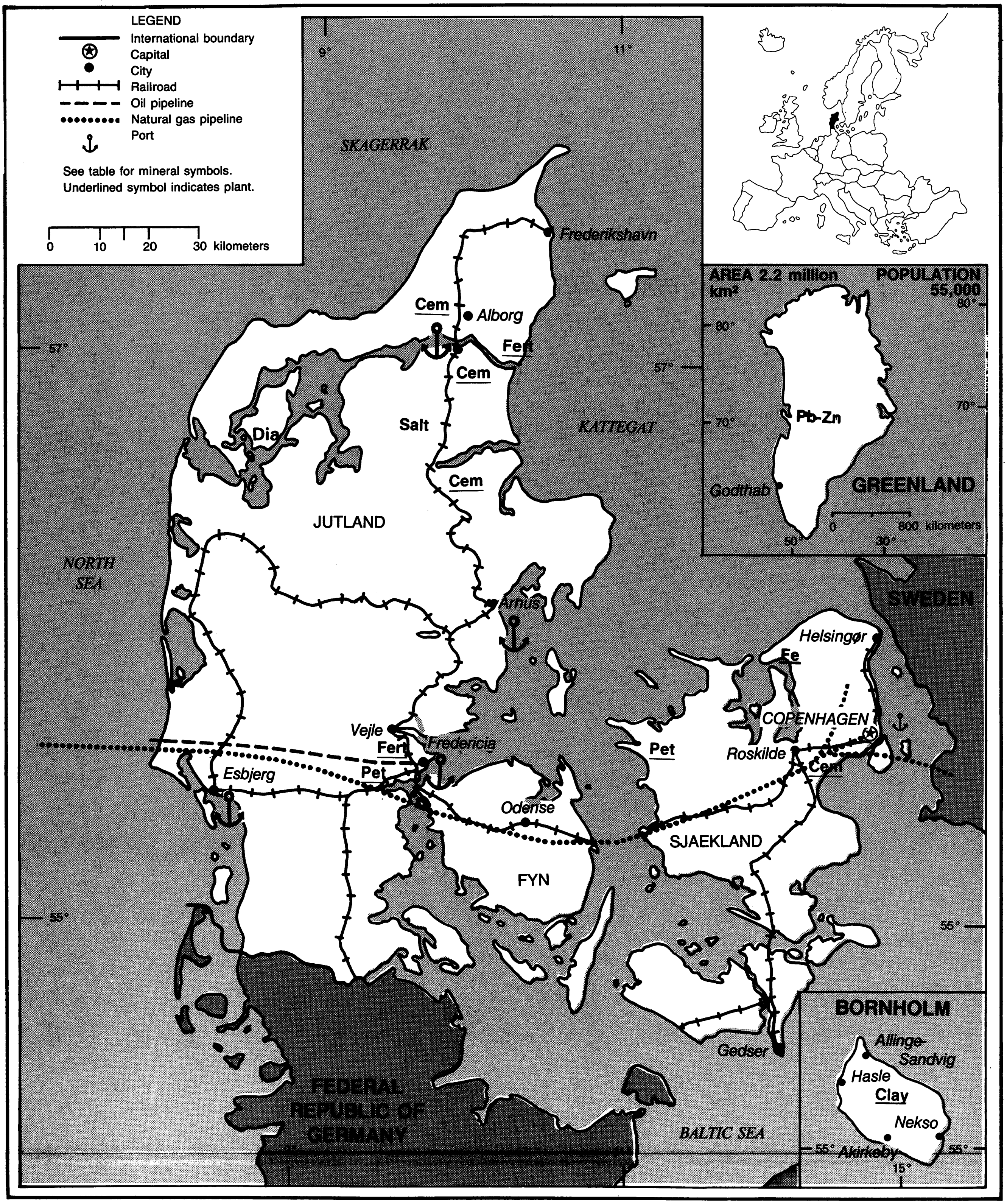
GEOFOND
Bukurestska 4
81104 Bratislava
Czechoslovakia

Ustredni ustav geologicky
Malstranske nam. 19
11821 Prague 1
Czechoslovakia

Slovensky geologicky ustav
Bukurestska 4
81104 Bratislava
Czechoslovakia

DENMARK

AREA 43,000 km² **POPULATION 5.1 million**



The Mineral Industry of Denmark and Greenland

By George A. Rabchevsky

DENMARK

About 75% of Denmark's mineral industry value came from raw petroleum products from the Danish sector of the North Sea. The only significant metals industry in Denmark was steel produced from scrap at the Danish Steel Works Ltd. With regards to industrial minerals, cement, clays, diatomaceous materials, and crushed and dimension stone were produced.

Government Policies and Programs

Mining and petroleum production were regulated by the Danish Ministry of Public Works under the Danish Subsoil Act of 1950, which was revised in 1973. Originally, the Dansk Undergrounds Consortium (DUC) had a 50-year concession on the exploration and exploitation of hydrocarbons on Denmark's continental shelf, excluding the shelf around Greenland and the Faroe Islands. This concession was rewritten in 1980, allowing other companies to participate in activities in the Danish North Sea.

Production

Besides petroleum and natural gas from the North Sea, mineral production was generally limited to clays, chalk and limestone, diatomite, granite, and sand and gravel. The production of petroleum and natural gas increased to a record highs. Production in the only iron and steel mill fell for the third year. The output of steel was 610,000 metric tons in 1990.

Trade

About 17% of Denmark's exports went to the Federal Republic of Germany. Imports of coal from the United States increased in 1990. Coal was also imported from Australia and Colombia. In exchange for equipment for the U.S.S.R.'s cement industry, Denmark imported natural gas from the Soviets.

Structure of the Mineral Industry

The major production and processing companies in Denmark are listed in table 3.

Commodity Review

Metals.—The Danish Steel Works Ltd., the only Danish steel producer, produced 610,000 tons of crude steel in 1990. The plant is in Frederiksvaerk, 60 kilometers northwest of Copenhagen. A new and improved electric arc furnace was constructed and installed in 1989.

Industrial Minerals.—Significant volumes of construction aggregates were produced primarily for domestic consumption. About 85% of sand, gravel, and pebbles came from about 800 gravel pits and the rest from the offshore dredging operations. About 20 chalk and limestone quarries were in operation, producing white chalk and limestone for the cement industry. There were about 90 pits from which clay was excavated, and used primarily by the cement, brickmaking, and tile industries. Kaolin and fire clay were mined for ceramic use. About 29,000 metric tons of kaolin was imported in 1989. Other industrial minerals produced in Denmark included, cryolite, diatomaceous materials, granite, lime, salt, soda ash, and sulfur as a byproduct.

Cement.—On January 1, 1990, the structure of the Alborg Portland Group was changed. The new company's name is Alborg Portland Holding A/S. Alborg Portland A/S, its subsidiary, was the only cement producer in Denmark, with a capacity of about 2.5 million tons per year. Blue Circle Industries PLC, a United Kingdom company, held a 50% interest in Alborg Portland A/S. Alborg Portland will supply Blue Circle all of its need for white cement and a major part of its need for sulfur-resistant cement, as well as portland cement. The Alborg cement plant produced semidry, grey, and white portland cement at Rordal in Alborg, with a capacity of about 1.5 million tons per year. The cement company was Denmark's largest industrial consumer of coal, and accounted for about 5% of Denmark's total coal consumption. Alborg was the largest world producer and exporter of white cement. About 35% of total cement production was exported to Europe.

Diatomaceous Materials.—Diatomite production in Denmark has virtually ceased, but the country was the only commercial source of moler, a natural mixture of diatomite and clay composed of about 85% SiO_2 and 10% Al_2O_3. The deposits are on the islands of Mors and Fur, both in northern Jutland. The moler beds are of Eocene age. Skamol-Skarrehage Molervaek A/S has the capacity of about 85,000 tons per year of moler products from the Mors Island and 40,000 cubic meters of moler insulating bricks from the Fur Island and the Thy district. Dansk Moler Industri A/S has a capacity of about 50,000 mt/a of moler from the Fur Island.[1]

Fertilizer Materials.—Kemira Oy, a Finnish company, operates in the chemical industries of 19 countries. The Kemira Group produced fertilizers, agricultural and industrial chemicals, organic fine chemicals, paints, titanium dioxide pigments, and other chemicals. Kemira Oy purchased the outstanding 35% of the shares in the Danish company Superfos Godning A/S, after having earlier purchased 65%. The company's name was changed to Kemira Danmark A/S. Denmark's fertilizer producer Kemira Danmark A/S, one of Europe's largest, also owned the Royster Co. (Kemira Holdings Inc., U.S.), a large U.S. fertilizer enterprise with major facilities in Florida. The group employed about 15,255 people, of which 7,700 worked in

TABLE 1

DENMARK: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
Cement, hydraulic	thousand tons	2,029	1,887	1,681	[e]2,000	[2]1,656
Clays:						
Kaolin		10,404	9,304	39,324	[re]15,900	[2]17,423
Other[e]		6,000	6,000	[2]230	[e]250	—
Cryolite[3]		18,000	17,200	[e]18,000	[e]18,000	—
Diatomaceous materials:						
Diatomite[e]		6,000	6,000	6,000	6,000	1,000
Moler[e]		[2]72,958	66,000	66,000	70,000	70,000
Gas, natural[3]	million cubic meters	[r]2,767	[r]4,100	5,066	5,324	5,380
Iron and steel:[3]						
Steel, crude	thousand tons	632	606	650	625	[2]610
Semimanufactures	do.	539	538	580	619	[2]539
Lead metal, including alloys, secondary[4]		[e]560	—	—	—	—
Lime, hydrated and quicklime	thousand tons	134	119	114	131	[2]134
Peat	do.	48	50	50	50	[2]110
Petroleum:[3]						
Crude	thousand 42-gallon barrels	[r]27,708	[r]35,167	36,222	42,304	[2]45,387
Refinery products:						
Liquefied petroleum gas	do.	[r]1,879	[r]1,879	1,751	1,624	1,650
Gasoline	do.	[r]11,305	[r]11,033	11,203	11,951	12,500
Naphtha	do.	[r]1,530	[r]1,581	2,057	2,422	2,500
Jet fuel	do.	[r]1,488	[r]1,168	1,696	1,992	2,200
Kerosene	do.	[r]1,604	[r]1,457	1,999	2,371	2,500
Distillate fuel oil	do.	[r]24,923	[r]23,566	24,215	25,401	25,500
Bitumen and other products	do.	[r]1,332	[r]1,683	1,359	1,162	1,200
Residual fuel oil	do.	[r]14,352	[r]15,051	15,684	16,210	16,500
Total	do.	[r]58,413	[r]57,418	59,964	63,133	64,550
Salt[3]	thousand tons	564	[r]590	549	604	[2]522
Sand, industrial	thousand cubic meters	1,629	[e]1,600	2,024	[e]2,050	[2]2,685
Sand and gravel[3]	do.	28,500	[r]30,309	28,356	28,976	29,000
Sodium carbonate	thousand tons	117	120	134	[e]140	[2]92
Stone:						
Crushed:						
Flint[3]	thousand cubic meters	59	[e]60	7,456	[e]7,500	[2]6,158
Limestone:[3]						
Agricultural	thousand tons	1,672	[e]2,000	1,795	[e]1,800	[2]1,482
Industrial	do.	153	[e]150	172	[e]180	[2]205
Chalk	do.	249	[e]250	1,664	[e]1,700	[2]1,814
Other	thousand cubic meters	1,365	[e]1,400	2,134	[e]2,200	[2]2,543
Dimension (mostly granite)[3]	do.	213	[e]200	65	[e]65	[2]226
Sulfur, byproduct[3]		12,810	[e]13,000	13,571	[e]14,000	[2]12,118

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 1991.
[2]Reported figure.
[3]Data represents production.
[4]Includes antimonial lead.

TABLE 2

GREENLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989	1990[p]
Cryolite, crude ore[2]		70,343	38,185	—	—	—
Lead: Concentrate, Pb content		16,200	20,500	23,120	24,120	16,000
Silver: In lead concentrate, Ag content	kilograms	11,975	13,001	13,001	14,712	9,176
Zinc: Concentrate, Zn content		62,100	69,200	77,520	71,500	47,850

[p]Preliminary.
[1]Table includes data available through May 1991.
[2]Shipments.

TABLE 3

DENMARK: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Aalborg Portland A/S	Plant at Rordal	2,500
Chalk, crude	A/S Faxe Kalkbrud	Quarries at Stevns and Sigerslev	250
Diatomite (moler)	Skamol-Skarrehage Molervaerk A/S	Quarries on Mors and Fur (Fyr) Islands	85
Do.	Dansk Moler Industri A/S	Quarries on Fur Island	50
Kaolin	Aalborg Portland A/S	Mine and plant on Bornholm Island	25
Lime	A/S Faxe Kalkbrud	Plant at Stubberup, near Fakse, on Zealand Island	190
Natural gas million cubic meters	Maersk Olie og Gas A/S	Roar and Tyra gasfields, Danish North Sea	2,550
Petroleum: Crude barrels per day	Dansk Undergrounds Consortium	Dan, Gorm, Rolf, Skjold, and Tyra Oilfields, Danish North Sea	127,000
Refined barrels per day	A/S Dansk Shell Kuwait Petroleum	Fredericia	55,000
Do.	Refining A/S	Gulfhavn	56,500
Do.	Statoil A/S	Kalundborg	65,000
Salt	Dansk Salt I/S	Mine (brine) at Hvornum, processing plant at Mariager	600
Steel	Danish Steel Works Ltd.	Plant at Frederiksvaerk	650

Finland. The Agricultural Div. (Kemira Agro), produces fertilizers, and employs around of 5,970 people. About 60% of its production occurred abroad, and about 75% of the group's sales was derived from operations outside Finland.

Kemira Danmark A/S closed its Fredericia nitrogen-phosphorus-potassium (NPK) production unit in the third quarter of 1990. The company planned to increase the production capacity at its Noerresundby PK facility to counter the loss from the closure of the Fredericia plant. The Fredericia plant's production capacity was 900,000 mt/a of NPK's, of which 400,000 tons was for the production of phosphorus-potassium. Kemira Danmark imported all the raw materials to produce NPK fertilizers.

A statutory order was signed in 1990 by the Danish Environmental Department that limits the cadmium content in fertilizers to a maximum of 200 milligrams of cadmium per kilogram of potassium.[2]

Lime.—Faxe Kalk A/S produced lime, limestone and chalk in Denmark. Table 4 is the company's 1990 annual report summary.

Salt.—The main producer of salt in Denmark was Dansk Salt I/S, with the capacity of about 600,000 mt/a, employing about 150 people. Dried vacuum salt was produced near Mariager; brine was extracted at Hvornum and pumped 26 kilometers to the processing plant. About

TABLE 4

PRODUCTION OF COMMODITIES BY FAXE KALK A/S

(Metric tons)

Commodity	Production 1989	Production 1990
Burnt and hydrated lime	131,146	133,503
Agricultural limestone	563,916	453,877
Other limestones and chalk products	464,074	570,850

300,000 tons was delivered to chemical companies, 130,000 tons to the transportation section, 100,000 tons to other industries, and 70,000 tons for food consumption. About one-half of its production was exported primarily to the neighboring Scandinavian countries.[3] Solution mining came from a salt dome at Hvornum in the northeast area of Jylland.

Minerals Fuels.—Denmark's production of North Sea petroleum and natural gas continued to increase significantly and provided about 75% of the country's energy requirements in 1990. The petroleum and natural gas reserves were estimated to last for the next 20 to 30 years. A large section of oil and gas pipeline was completed from the North Sea to the mainland. The DUC continued to control all significant gasfield and oilfield development and production in the Danish North Sea. The major objective of the Government's energy policy continued to be the reduction of petroleum imports. There were no nuclear power plants in Denmark.

Coal.—Mining of peat and lignite has ceased. Denmark continued to import all of its coal requirements primarily from Australia, Colombia, Poland, and the U.S.S.R. In 1990, Denmark imported about 10 million tons of coal, of which the United States supplied close to 30%. Almost all electricity in Denmark was generated by using coal in powerplants. The United States became Denmark's leading supplier of petroleum coke which was used primarily as fuel by the Danish cement industry.

Natural Gas.—The only natural gas and petroleum operator in Denmark was Maersk Olie og Gas A/S, part of DUC. Production of natural gas began in 1984 from the Tyra Gasfield in the Danish North Sea. The Roar Gasfield was in production in 1990. With the production of 220 million cubic meters in 1984 and in 1990 reaching more than 2,550 million cubic meters, Denmark became a significant producer of natural gas, as well as petroleum. Long-term contracts were made with Sweden and the Federal Republic of Germany for delivery of Danish natural gas through the year 2003.

Petroleum.—About 90% of the country's petroleum needs was supplied from indigenous sources. Denmark was a significant exporter of natural gas and petroleum, primarily to Sweden and the Federal Republic of Germany. Production of crude petroleum from the Danish sector of the North Sea increased significantly as it has done each year since 1980. Crude oil was pumped from the Gorm Field, the Dan Field, the Skjold Field, and the smallest and newest Rolf Field. Reserves in the Gorm Field were nearing exhaustion, and production from the Dan Field was scheduled to increase. New lightweight platforms were installed in the Dagmar and Kraka Oilfields, and scheduled to begin production in 1991. Estimated proven reserves were limited but appeared to be sufficient to last until the end of the century.

GREENLAND

About 85% of Greenland's area was covered by inland ice and was not regarded as a potential exploration area. On July 25, 1990, the Greenex A/S's Black Angel lead-silver-zinc mine at Maarmorilik in west Greenland closed after 17 years of production. About 250 people worked for Greenex. The Kryolitselskabet Oresund A/S (KO) company, a cryolite producer, ceased operation in 1990. The closure of the pit at Ivigtut (Ivittuut) marked the end of 131 years of continuous mining activity for cryolite. The production of refined natural cryolite was also stopped, on September 1, 1990, at KO's plant in Copenhagen. Production was based on stockpiled ore. Production of refined cryolite amounted to 11,330 tons in 1989.[4] The Atlanta-Richfield Corporation-Azienda Generale Italiana Petroli Group withdrew from oil exploration in Jameson Land in east Greenland. Thus, Greenland had no working mines or oil exploration activities.

The only significant mineral exploration project in Greenland in 1990 was the Canadian Teck Corp. and Platinova Resources Ltd. Group's discovery of a large gold and platinum deposit in the Skaergaard area, just north of the Kangerdlugssuaq fiord in southeast Greenland. The first trace of gold was found in 1986. Additional exploration in 1987 and 1988 revealed that increased gold content was found in the ore deposit that extended over an area of 40 square kilometers. The Greenlandic east coast is one of the most remote areas in the world with a harsh polar climate. This makes mining operations very difficult and very expensive. A decision to start mining would depend on additional exploration and a number of feasibility studies yet to be performed. This is not the first time gold mining in Greenland was considered. In 1987, the municipality of Nanortalik, in cooperation with Greenex, the only company with a mining operation in Greenland, investigated possible exploitation of gold deposits in the Nanortalik area. However, the project was shelved because of the limited amount of ore found and its low-grade gold content.

Three million tons of eudialyte in four separate bodies was defined with a grade of 4% yttrium and from 2% to 3.5% of zirconium oxide (ZrO_2). The Geological Survey of Greenland confirmed the existence of a large deposit of columbium and also discovered lanthanum-bearing deposits. The Survey also discovered significant tungsten mineralization near the capital coastal city of Nuuk on the west coast of Greenland. A uranium deposit in the Kvanefjeld area in southern Greenland was assayed and contained an average of 365 grams of uranium per ton.

Infrastructure

Coastal shipping, airports, highways (66,482 kilometers), railroads (2,675 kilometers), and inland waterways (417 kilometers) are well developed in Denmark. The main ports are Alborg, Arhus, Copenhagen, Esbjerg, and Fredericia. There are also numerous secondary and minor ports. There are 110 kilometers of pipeline to transport crude oil. Refined products are transported through 578 kilometers of pipeline, and natural gas through 700 kilometers of pipeline. The Government has initiated a new transportation system called the Great Belt under the Eastern Channel that was expected to improve the transportation system of the country.

Outlook

Denmark is committed to the establishment of an economic and monetary union within the EC. However, the removal of barriers between EC countries scheduled for 1993 presents difficulties for the Danish authorities to overcome. A shortage of large companies and overdependence on agriculturally based products are structural factors that will limit success in the new single market. Furthermore, the removal of customs barriers will cause major problems because of an existing tax structure that is highly dependent on personal income and sales taxes. The steel industry will remain insignificant to the economy, and the industrial minerals are becoming scarcer because Denmark is composed of islands and is a part of the peninsula.

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[1]Harben, P. W., and R. L. Bates. Industrial Minerals, Geology and World Deposits. Metal Bulletin Plc, Industrial Minerals Division (London). 1990, p.105.

[2]Phosphorus & Potassium (London). No. 167, May-June 1990, p. 9.

[3]Industrial Minerals. (London). Apr. 1990, p. 27.

[4]International Mining. (London). Aug. 1990, pp. 108-109.

OTHER SOURCES OF INFORMATION

Agencies

Danmarks Geologiske Undersogelse
(The Geological Suvey of Denmark)
Kobenhavn, NV

Gronlands Geologiske Undersogelse
(The Geological Survey of Greenland)
Kobenhavn, NV

Ministry of Economic Affairs
Kobenhavn, NV

Ministry of Environment
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Ministry of Energy
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Publications

Varestatistik for Industri (Industrial Statistics), Office of Danish Statistics, Kobenhavn NV; published quarterly and annually.

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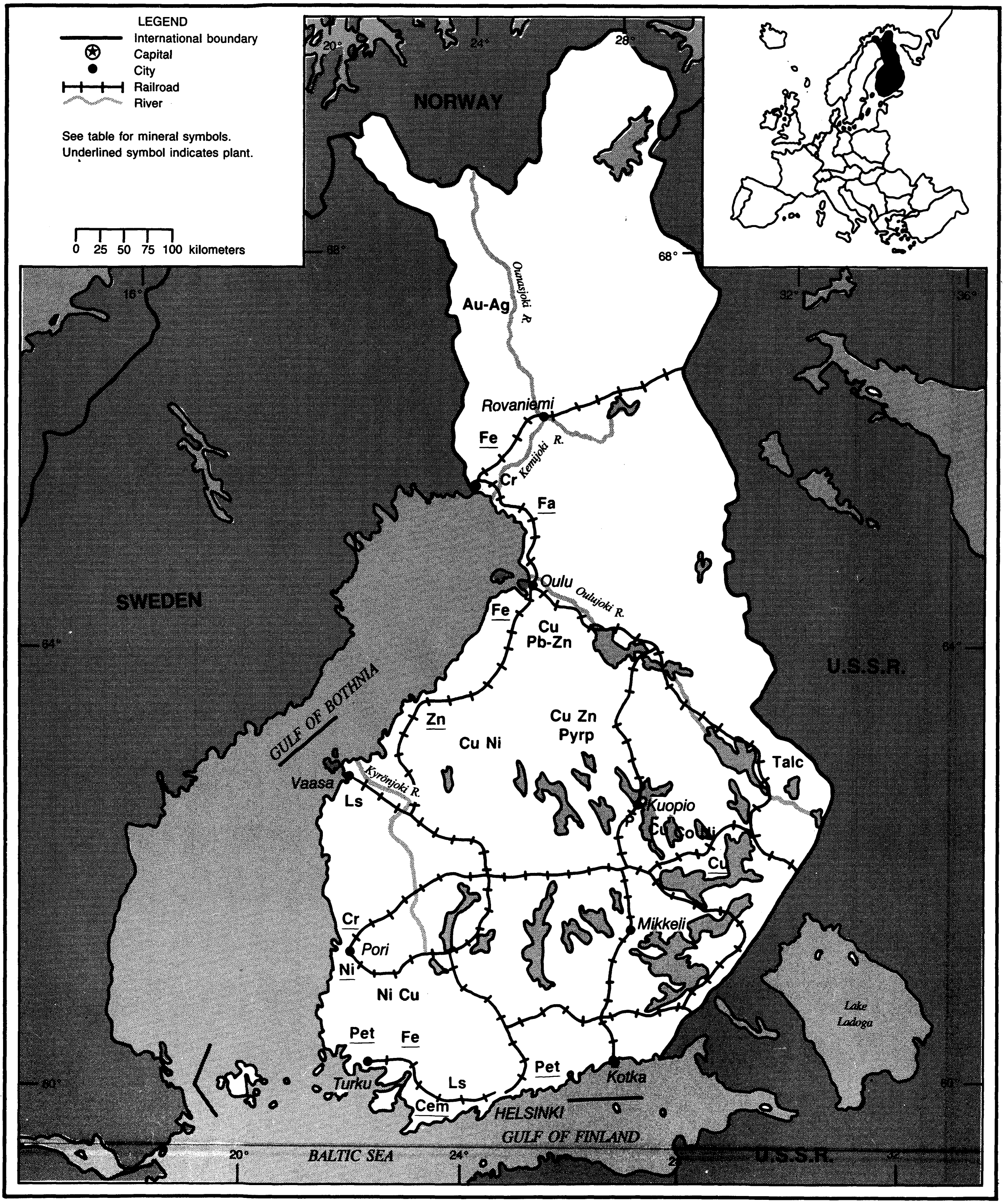
FINLAND

AREA 337,000 km² **POPULATION 4.9 million**



THE MINERAL INDUSTRY OF FINLAND

By Donald E. Buck, Jr.

Historically, the Finnish mineral industry has been noted for its domestic metalliferous mines. These mines have been important domestic sources of chrome, copper, nickel, and zinc. However, the metalliferous resources and deposits have been progressively exhausted by the extensive mining activity during the past 400 years. Most of the mines that are now operating were started less than 25 years ago. With the reduction of available raw materials, Finland has become more dependent on imported metallic ores. Furthermore, the domestic industrial minerals industry has gained in importance.

On January 1, 1990, Outokumpu Oy, the worldwide mining and smelting company, reorganized into four independent companies. Outokumpu Metals Oy will consist of the mining, zinc, and chemicals subdivisions. Outokumpu Copper Oy, formed in 1987, will continue to handle the copper business. The third group, Outokumpu Steel Oy, consists of the subdivisions of Chrome, Polarit, and JA-RO. The Technology Div. is the fourth company and represented approximately 10% of the former company's sales. A new ruling permits the state's ownership in the group to decrease from the 57% ownership in issued capital stock to 51%. However, as of December 31, 1990, the state still owned 57.5% of the shares in the group.

The Finnish mining industry was adversely impacted by the weakening economic condition worldwide. The country's major mineral companies, however, continued to invest heavily overseas in new operations and existing companies. The domestic economy, which had previously been growing at 5%, came to an abrupt halt and registered only a 0.3% growth in GDP for 1990. Industrial production declined 1.9%, and unemployment grew to 5.5%. Overall investments decreased 2% partially owing to the high interest rates (13% to 14%) and to uncertainty about trade developments, especially with the U.S.S.R., an important trading partner. Exports and technology agreements involving the metal industry with the U.S.S.R. were especially adversely impacted.

GOVERNMENT POLICIES AND PROGRAMS

The Government has a long history of involvement with the mineral industry. State-owned companies, Kemira Oy, Outokumpu Oy and Rautaruukki Oy, dominate the domestic industry. In addition, the State Geologic Research Institute and the National Mineral Laboratory and Test Factory of the State Technological Research Center, together with the Finnish Government, are active in research and mineral exploitation in Finland and in foreign countries. The Government takes an active role in securing mineral requirements for its industry and is also active in promoting and assisting in the export of its highly developed mineral technology and mining equipment. Research activity in the mining industry is markedly higher than that in industry in general.[1] The level of R & D is in harmony with the "Guidelines for Technology Development in the 1990's" (the Pessi Committee). This report emphasizes the importance of the basic domestic industry and the high quality of the research it undertakes. Every effort is made to secure domestic sources of raw material, which enhances the country's advanced technical expertise in mining.

PRODUCTION

Output of domestic metallic ores was 5.5 Mmt, approximately the same as for that of the previous year, with the most important ores as follows: pyrite concentrate, chromite concentrate, and iron ore pyrite residues.[2] This production level was not expected to continue, owing to the further reduction in metallic mining operations. For example, iron ore mining stopped in 1989. At yearend, there were reportedly 43 mines in operation, of which 12 were metal mines, 26 produced industrial minerals, and 5 produced rock aggregate. Three metalliferous mines, which operated in 1989, were not operating in 1990, and a new mine, Sere, was opened to extract gold at Orivesi.

TRADE

Finland is a member of EFTA. The Government was also engaged in negotiations with the EC to create the European Economic Space (EES), which would allow Finland and some other European countries, who are not members of the EC, to trade within the EC with minimum restrictions. Finnish policymakers are acutely aware of the necessity to remain competitive for the 1992 EC single market.

Recessions in other OECD countries were factors for the lack of economic growth in Finland. Another factor was the internal difficulties within the U.S.S.R., which resulted in a sharp decline in trade, especially Finnish exports to the U.S.S.R. Domestic consequences from this trade drop included decreasing private consumption and investment (down 9%). Also, the termination of the bilateral Fenno-Soviet clearing trade system reduced the traditional importance of Finland between Eastern and Western economies. In 1990, Soviet trade represented only 13% of total Finnish trade, and this was projected to decrease to 7% in 1991. The metals and engineering industries accounted for 43% of the Finnish exports. However, this was expected to decrease owing to a 50% drop in metal industry exports and deliveries to the U.S.S.R.

The percentage of Finnish exports of raw materials has dropped from 16% in 1977 to 13% in 1990. The metal industries have evolved and expanded downstream domestic processing to higher value added products. The higher cost of mining in Finland has meant that the companies resorted to high technologies and improved efficiencies to compete. The Finns were exporting that gained technology, especially to the Soviets, who face the same Arctic conditions for many of their mines.

For some imported raw materials, the volume imported for the purposes of metallurgical processing was a significant share of the total requirement. The following commodities were such examples: copper concentrate, 72%; iron ore concentrate, 100%; zinc concentrate, 78%; and nickel matte and concentrate, 45%.[3] Most of these mineral commodities increased, as did most

TABLE 1

FINLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
METALS						
Aluminum metal, secondary		22,200	25,700	29,900	27,989	23,400
Cadmium metal, refined		523	687	703	612	[2]569
Chromium: Chromite:						
Gross weight:						
Lump ore[e]	thousand tons	450	338	450	353	347
Concentrate	do.	203	192	235	140	137
Foundry sand[e]	do.	15	13	15	5	5
Total	do.	668	543	700	498	489
Cr_2O_3 content:						
Lump ore[e]	do.	95	91	95	92	90
Concentrate	do.	[e]75	[e]77	85	65	64
Foundry sand[e]	do.	5	6	10	5	5
Total	do.	[e]175	[e]174	190	162	159
Cobalt:						
Mine output, Co content		627	190	—	—	—
Metal, refined, and salts		1,348	980	1,132	1,295	1,300
Copper:						
Mine output, Cu content		25,987	20,398	20,200	14,459	12,600
Metal:						
Smelter		84,460	77,400	79,000	79,470	90,200
Refined		64,235	59,500	53,900	55,689	[2]65,103
Gold metal	kilograms	1,172	[e]1,800	2,035	2,510	[2]2,813
Iron and steel:						
Iron ore, marketable, all types:[3]						
Gross weight	thousand tons	973	896	556	—	—
Fe content	do.	635	588	345	—	—
Metal:						
Pig iron	do.	1,978	2,063	2,174	2,284	[2]2,283
Ferroalloys, ferrochromium	do.	134	143	156	169	[2]157
Steel, crude	do.	2,586	2,669	2,798	2,921	[2]2,861
Semimanufactures, rolled	do.	1,997	2,025	2,300	2,452	[2]2,486
Lead:						
Mine output, Pb content		1,980	2,400	1,900	2,567	1,700
Refined, secondary		1,200	([4])	([4])	([4])	—
Mercury		146	144	131	159	[2]141
Nickel:						
Mine output, Ni content		11,886	10,557	[e]11,699	10,480	[2]11,524
Metal, electrolytic		17,791	15,392	15,721	13,355	[2]16,882
Platinum-group metals:						
Palladium	kilograms	96	89	106	100	100
Platinum	do.	120	[e]120	54	60	60
Selenium metal	do.	5,693	23,638	25,073	27,969	[2]31,160
Silver metal	do.	37,106	44,198	31,411	31,127	[2]28,508
Zinc:						
Mine output, Zn content		60,351	55,100	63,900	58,430	51,700
Metal		155,397	151,467	156,076	162,508	[2]174,923
INDUSTRIAL MINERALS						
Barite		6,969	11,000	10,993	1,614	[2]—

See footnotes at end table.

TABLE 1—Continued

FINLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
INDUSTRIAL MINERALS—Continued						
Cement, hydraulic	thousand tons	1,422	1,426	1,504	1,596	[2]1,666
Feldspar		47,049	51,632	56,200	54,581	[2]52,630
Mica, flake[e]		—	5,000	5,000	5,000	5,000
Lime	thousand tons	261	271	260	224	225
Nitrogen: N content of ammonia		66,800	70,000	42,630	41,600	23,600
Phosphate rock, apatite concentrate:						
Gross weight	thousand tons	527	553	584	580	[2]546
P_2O_5 content	do.	185	195	215	214	[2]201
Pyrite, gross weight	do.	547	621	615	730	700
Sodium sulfate[e]	do.	35	35	35	33	33
Stone, crushed:						
Limestone and dolomite:						
For cement manufacture	do.	1,968	2,054	2,150	2,107	[2]2,397
For agriculture	do.	1,108	1,203	1,072	1,188	[2]1,269
For lime manufacture	do.	381	328	418	464	[2]439
Fine powders	do.	330	397	455	579	[2]648
Metallurgical	do.	13	[e]12	123	25	1
Total	do.	3,800	3,994	4,218	4,363	[2]4,754
Quartz silica sand	do.	232	233	272	274	[2]276
Sulfur:						
S content of pyrite	thousand tons	276	313	300	938	940
Byproduct:						
Of metallurgy	do.	260	[e]230	240	230	230
Of petroleum	do.	42	[e]40	47	41	42
Total	do.	578	[e]583	587	1,209	1,212
Sulfuric acid	do.	1,359	1,160	1,095	1,392	1,325
Talc	do.	284	324	379	398	[2]385
Wollastonite		16,795	16,000	26,000	31,400	[2]29,844
MINERALS FUELS AND RELATED MATERIALS						
Peat:						
For fuel use[e]	thousand tons	[r]5,600	[r]2,000	[r]4,100	[r]4,900	4,500
For agriculture and other uses[e]	do.	[r]370	[r]210	[r]400	[r]490	530
Petroleum refinery products	thousand 42-gallon barrels	65,300	73,400	72,000	74,000	72,500

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 1991.
[2]Reported figure.
[3]Includes approximately 30% of unused roasted pyrite (purple ore) from the Kokkola Works.
[4]Revised to zero.

of the other high-volume imports shown in table 3. The highest volume of imports from the United States was that of kaolin and coal, followed by aluminum scrap and copper ores.

The United States exports have 6.8% ($1.8 billion[4]) of the import market in Finland, fifth behind the Federal Republic of Germany, Sweden, the U.S.S.R., and the United Kingdom.

STRUCTURE OF THE MINERAL INDUSTRY

The major segment of Finland's mineral industry is Government controlled. Of the state-owned companies, Outokumpu Oy is the country's largest mining and metallurgical company. Because of the decreasing availability of raw materials domestically, Outokumpu increased its investment abroad. The group includes about 200 companies, the majority being registered outside Finland. The company operates in more than 25 countries, and almost 90% of its sales was outside of Finland. About one-third of the company's sales is copper-related, with the remaining consisting of steel, other metals, and engineering services. Other metal producers are

TABLE 2

FINLAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989 United States	Destinations, 1989 Other (principal)
METALS				
Aluminum:				
Ore and concentrate	41	—		
Oxides and hydroxides	105	—		
Metal including alloys:				
Scrap	389	659	—	West Germany 394; Denmark 118; United Kingdom 84.
Unwrought	25,291	24,023	213	West Germany 7,511; Sweden 5,082; Denmark 1,004.
Semimanufactures	13,413	13,705	1	Sweden 4,360; West Germany 1,726; United Kingdom 1,561.
Cadmium: Metal including alloys, all forms	784	591	145	Netherlands 145; United Kingdom 120.
Beryllium: Metal including alloys, all forms	—	19	—	Mainly to West Germany.
Chromium:				
Ore and concentrate	200,693	109,976	—	Sweden 103,733; Netherlands 4,006; France 1,100.
Oxides	86	—	—	
Metal including alloys, all forms	1	(2)	—	All to Sweden.
Cobalt:				
Ore and concentrate	2	—		
Oxides and hydroxides	1,772	1,539	53	Norway 649; Netherlands 436; United Kingdom 88.
Metal including alloys, all forms	282	288	56	Sweden 114; Japan 40; Netherlands 20.
Copper:				
Ore and concentrate	5,243	16,701	—	Taiwan 9,324; Sweden 7,377.
Matte and speiss including cement copper	3	28	—	West Germany 23; United Kingdom 5.
Metal including alloys:				
Scrap	3,596	4,621	—	West Germany 1,593; Belgium-Luxembourg 1,226.
Unwrought	40,695	43,377	—	Sweden 15,580; Belgium-Luxembourg 7,670; United Kingdom 6,979.
Semimanufactures	60,775	64,535	4,649	West Germany 12,605; Italy 11,306; United Kingdom 9,198.
Gold:				
Waste and sweepings value, thousands	—	$187	$4	Sweden $100; Netherlands $80.
Metal including alloys, unwrought and partly wrought kilograms	2,135	1,700	63	United Kigndom 825; Switzerland 554; West Germany 252.
Iron and steel: Metal:				
Scrap	1,660	1,265	—	Sweden 405; Belgium-Luxembourg 306; West Germany 301.
Pig iron, cast iron, related materials	43	37	—	Sweden 18; U.S.S.R. 7.
Ferroalloys:				
Ferrochromium	90,148	77,338	—	France 19,057; West Germany 16,355; Sweden 12,941.
Ferronickel	21	13	—	West Germany 9; United Kingdom 4.
Ferrosilicochromium	—	1	—	All to Sweden.
Ferrosilicomanganese	—	29	—	All to Norway.
Silicon metal	—	4	—	All to U.S.S.R.
Steel, primary forms	183,502	143,228	36,854	Sweden 53,684; United Kingdom 37,091.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated value, thousands	$264,248	$284,609	$54,894	West Germany $65,844; Denmark $36,192.
Clad, plated, coated do.	$49,679	$67,454	$8,987	United Kingdom $9,386; West Germany $7,636; Denmark $6,782.
Of alloy steel	160,805	185,117	6,331	West Germany 23,666; Italy 16,253; U.S.S.R. 14,377.
Bars, rods, angles, shapes, sections	227,807	242,505	3,884	Sweden 94,065; West Germany 36,157; Norway 23,137.

See footnotes at end of table.

TABLE 2—Continued

FINLAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
METALS—Continued					
Iron and steel: Metal —Continued					
Semimanufactures —Continued					
Rails and accessories		490	495	—	Sweden 378; Norway 71; U.S.S.R. 45.
Wire		8,866	9,293	(2)	Sweden 5,622; Denmark 1,924; Poland 894.
Tubes, pipes, fittings	value, thousands	$152,059	$161,753	$1,308	Sweden $53,565; West Germany $19,968;
Lead:					
Ore and concentrate		4,277	5,677	—	West Germany 3,865; France 1,812.
Oxides		(2)	33	—	United Kingdom 20; Norway 13.
Metal including alloys:					
Scrap		9,751	11,546	—	East Germany 6,406; Belgium-Luxembourg 2,043; Sweden 1,136.
Unwrought		184	316	—	Belgium-Luxembourg 191; United Kingdom 65.
Semimanufactures		42	16	—	Sweden 14; U.S.S.R. 1.
Magnesium: Metal including alloys, scrap		132	120	20	West Germany 40; United Kingdom 39.
Mercury		94	188	—	Netherlands 134; East Germany 29; India 17.
Nickel:					
Ore and concentrate		6,039	31,448	—	U.S.S.R. 15,657; Norway 6,181; Canada 5,015.
Matte and speiss		—	310	—	Mainly to Canada.
Metal including alloys:					
Scrap		(2)	3	—	West Germany 2; U.S.S.R. 1.
Unwrought		10,458	9,456	358	Netherlands 2,192; Sweden 1,227; West Germany 1,076.
Semimanufactures		7	3	—	Sweden 2.
Platinum-group metals:					
Waste and scrap	value, thousands	$16	$21	—	Netherlands $12; Sweden $9.
Metals including alloys, unwrought and partly wrought	do.	$38	$53	—	Sweden $16; West Germany $13; United Kingdom $13.
Silver:					
Ore and concentrate[3]	do.	$23	$2,290	$174	United Kingdom $1,678; West Germany $438.
Waste and sweepings[3]	do.	$698	$919	$6	Sweden $657; West Germany $485; Denmark $296.
Metal including alloys, unwrought and partly wrought	do.	$5,832	$4,601	—	United Kingdom $2,544; West Germany $972; Sweden $448.
Tin: Metal including alloys:					
Scrap		63	138	—	West Germany 66; Sweden 47; United Kingdom 26.
Unwrought		26	17	—	Mainly to United Kingdom.
Semimanufactures		1	7	—	Mainly to Sweden.
Titanium:					
Oxides	value, thousands	$5,243	$4,118	NA	NA.
Metal including alloys, all forms		6	16	—	Mainly to West Germany.
Tungsten: Metal including alloys, all forms		6	41	—	United Kingdom 27; West Germany 14.
Zinc:					
Ore and concentrate		1,608	2,690	—	Belgium-Luxembourg 2,053; United Kingdom 637.
Metal including alloys:					
Scrap		2,595	4,424	—	Taiwan 3,442; Norway 422; United Kingdom 310.
Unwrought		128,138	138,493	25,253	Netherlands 30,023; United Kingdom 22,581.
Semimanufactures		115	369	—	U.S.S.R. 291; Norway 29.
Zirconium:					
Ore and concentrate		96	—		

See footnotes at end table.

TABLE 2—Continued

FINLAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
METALS—Continued					
Zirconium:—Continued					
Metal including alloys, all forms		—	5	—	All to Italy.
Other:					
Ores and concentrates		2	—	—	
Ashes and residues		3,208	9,450	—	East Germany 5,040; Belgium-Luxembourg 1,199; West Germany 1,052.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		11	(2)	—	All to Sweden.
Artificial: Corundum		39	31	—	All to Portugal.
Grinding and polishing wheels and stones		190	213	6	Sweden 62; U.S.S.R. 42; West Germany 25.
Barite and witherite	value, thousands	$517	$101	NA	NA.
Boron materials:					
Crude natural borates		1,091	1,582	—	All to Sweden.
Oxides and acids		—	3	—	Do.
Cement		5,187	3,637	—	U.S.S.R. 2,237; Sweden 760; Norway 623.
Chalk		—	20	—	All to United Kingdom.
Clays, crude:					
Bentonite		330	315	—	Sweden 245; Poland 24; United Kingdom 24.
Kaolin		202	349	(2)	Sweden 315; Norway 20.
Unspecified		—	3	—	NA.
Cryolite and chiolite		3	21	—	All to West Germany.
Diamond, natural:					
Gem, not set or strung	value, thousands	$60	$39	—	Belgium-Luxembourg $20; Sweden $17; Israel $2.
Industrial stones	do.	—	$30	—	Italy $17; Austria $2; Sweden $2.
Diatomite and other infusorial earth		29	—		
Feldspar, fluorspar, related materials:					
Feldspar		34,050	32,328	—	United Kingdom 15,819; West Germany 12,683; Czechoslovakia 985.
Fluorspar		10	—		
Fertilizer materials:					
Crude, n.e.s.		10	24	—	Czechoslovakia 22; Sweden 2.
Manufactured:					
Ammonia		(2)	—		
Nitrogenous		471	112	—	Italy 100; Greece 5.
Phosphatic		188	2	—	All to U.S.S.R.
Potassic	value, thousands	$12,230	$16,934	—	Pakistan $10,152; Denmark $4,080; East Germany $2,678.
Unspecified and mixed	do.	$57,812	$58,540	$14	China $13,548; Venezuela $11,415; Nicaragua $5,990.
Graphite, natrual		4	(2)	—	All to Ireland.
Gypsum and plaster		33	858	(2)	U.S.S.R. 854; Sweden 3.
Lime		1,405	1,427	—	Sweden 687; West Germany 301; U.S.S.R. 208.
Magnesium compounds: Oxides and hydroxides		33	30	—	All to Sweden.
Mica:					
Crude including splittings and waste		1,976	3,549	16	Japan 2,350; West Germany 267; Netherlands 247.
Worked including agglomerated splittings	value, thousands	$3	$4	—	Norway $3; Sweden $1.
Nitrates, crude		8	12	—	Mainly to Ireland.

See footnotes at end of table.

TABLE 2—Continued

FINLAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989: United States	Destinations, 1989: Other (principal)
INDUSTRIAL MINERALS—Continued				
Phosphates, crude	2,807	15,430	—	All to Denmark.
Pigments, mineral: Iron oxides and hydroxides, processed	1,637	2,372	—	United Kingdom 2,274; Italy 54.
Precious and semiprecious stones other than diamond: Natural value, thousands	$98	$47	$1	West Germany $27; Thailand $7.
Pyrite, unroasted do.	$7,228	$8,758	NA	NA.
Salt and brine	505	257	—	United Kingdom 128; Sweden 109.
Sodium compounds, n.e.s.: Sulfate, manufactured	11,915	13,299	—	United Kingdom 11,105; Greece 892; Sweden 824.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	226,891	262,133	621	Italy 132,723; Spain 33,790; Japan 28,725.
Worked	2,953	3,451	17	West Germany 1,348; Sweden 694; Japan 675.
Dolomite, chiefly refractory-grade	12	—		
Gravel and crushed rock	26,015	35,705	—	Sweden 35,319; U.S.S.R. 192.
Limestone other than dimension	4,886	2,783	—	Sweden 2,747; U.S.S.R. 9.
Quartz and quartzite	4,047	6,003	—	Netherlands 3,800; Sweden 1,781; Japan 186.
Sand other than metal-bearing	2,075	3,040	—	U.S.S.R. 1,881; Sweden 1,155.
Sulfur:				
Elemental: Crude including native and byproduct	86	30	3	France 27.
Sulfuric acid value, thousands	$1,323	$972	—	Switzerland $625; Netherlands $198; Sweden $136.
Talc, steatite, soapstone, pyrophyllite	72,537	90,635	—	Netherlands 25,061; Sweden 18,806; West Germany 16,265.
Vermiculite, perlite, chlorite	—	730	—	United Kingdom 602; Sweden 63; Dominican Republic 43.
Other:				
Crude	18,066	21,828	—	West Germany 9,874; Italy 5,613; Spain 1,964.
Slag and dross, not metal-bearing	44,561	63,698	—	Sweden 63,556; Australia 137.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3,575	577	—	U.S.S.R. 323; Sweden 200; United Kingdom 52.
Carbon black	5	35	(2)	Israel 20; Sweden 14.
Coke and semicoke	14,812	6,563	—	Netherlands 5,957; Sweden 583.
Peat including briquets and litter	86,524	83,572	15	Netherlands 35,945; Sweden 20,026; United Kingdom 9,358.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	6	24	—	Mainly to Sweden.
Gasoline do.	7,556	3,518	—	Sweden 3,413; Denmark 62.
Mineral jelly and wax do.	1	20	(2)	Mainly to Sweden.
Kerosene and jet fuel do.	917	776	—	Do.
Distillate fuel oil do.	7,393	2,617	—	Sweden 2,269; West Germany 183; Norway 163.
Lubricants do.	386	302	(2)	U.S.S.R. 251; West Germany 35.
Residual fuel oil do.	1,959	1,286	—	Mainly to United Kingdom.
Asphalt do.	442	74	—	Mainly to Denmark.
Bitumen and other residues do.	123	377	—	Sweden 242; Denmark 109; West Germany 23.
Bituminous mixtures do.	1	1	—	Mainly to U.S.S.R.

NA Not available.
[1]Table prepared by staff, International Data Section.
[2]Less than 1/2 unit.
[3]May include other precious metals.

TABLE 3

FINLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS				
Aluminum:				
Ore and concentrate	2,043	236	—	Guyana 100; West Germany 61; Norway 30.
Oxides and hydroxides	27,654	34,013	19	Spain 17,233; West Germany 15,836; United Kingdom 701.
Metal including alloys:				
Scrap	69,811	70,477	27,968	U.S.S.R. 14,092; United Kingdom 8,814.
Unwrought	23,581	23,737	124	Canada 6,089; Brazil 2,433; Norway 2,233.
Semimanufactures	37,322	40,179	116	West Germany 9,247; Sweden 8,535; Norway 5,124.
Antimony: Metal including alloys, all forms	7	5	—	China 2; Sweden 2.
Beryllium: Metal including alloys, all forms value, thousands	—	$1	—	All from Italy.
Bismuth: Metal including alloys, unwrought including waste and scrap	1	2	(2)	United Kingdom 1.
Cadmium: Metal including alloys, unwrought including waste and scrap	67	—		
Chromium:				
Ore and concentrate	11	35	—	All from Netherlands.
Oxides and hydroxides	918	977	(2)	United Kingdom 314; West Germany 209; U.S.S.R. 200.
Metal including alloys, all forms	3	9	(2)	Sweden 7.
Cobalt:				
Oxides and hydroxides	—	1	(2)	Mainly from Netherlands.
Metal including alloys, all forms value, thousands	$711	$256	$57	West Germany $85; Zambia $50.
Columbium and tantalum: Metal including alloys, all forms: Tantalum do.	—	$10	—	Austria $9.
Copper:				
Ore and concentrate	249,107	209,136	20,666	Norway 60,597; Chile 49,489; Sweden 36,103.
Matte and speiss including cement copper	20	49	—	Australia 21; West Germany 19; United Kingdom 9.
Metal including alloys:				
Scrap	7,462	3,392	—	U.S.S.R. 1,774; East Germany 501; Poland 425.
Unwrought	33,580	41,146	4	U.S.S.R. 16,474; Sweden 14,591; Zaire 1,840.
Semimanufactures	27,444	34,761	32	West Germany 12,665; Sweden 11,660; United Kingdom 2,994.
Germanium: Metal including alloys, all forms	1	—		
Gold:				
Waste and sweepings value, thousands	$21	$29	—	Sweden $28; Czechoslovakia $1.
Metal including alloys, unwrought and partly wrought kilograms	781	1,168	2	United Kingdom 316; West Germany 263; Switzerland 250.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	1,916,092	3,015,823	—	Sweden 1,914,169; U.S.S.R. 1,087,529; West Germany 13,387.
Pyrite, roasted	50	—		
Metal:				
Scrap	16,096	33,499	1,046	U.S.S.R. 14,399; United Kingdom 13,803; Poland 2,561.
Pig iron, cast iron, related materials	14,478	23,446	—	U.S.S.R. 7,682; Poland 5,645; United Kingdom 4,061.
Ferroalloys:				
Ferrochromium	1,832	1,972	—	West Germany 576; Sweden 480; Zimbabwe 279.
Ferromanganese	5,955	8,812	—	Norway 4,203; France 2,403; West Germany 1,387.
Ferronickel	24,091	19,704	—	Dominican Republic 5,674; Greece 4,809; Colombia 3,463.
Ferrosilicochromium	31	20	—	All from Switzerland.

See footnotes at end of table.

TABLE 3—Continued

FINLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989 United States	Sources, 1989 Other (principal)
METALS—Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys —Continued				
Ferrosilicomanganese	16,472	21,700	—	Norway 14,117; U.S.S.R. 6,951; Belgium-Luxembourg 500.
Ferrosilicon	8,422	10,826	—	Norway 6,223; U.S.S.R. 3,593; Sweden 324.
Silicon metal	1,838	2,155	3	Norway 1,031; China 581; Sweden 418.
Unspecified	2,216	2,286	77	United Kingdom 841; Norway 236; Sweden 194.
Steel, primary forms	76,839	162,893	16,069	West Germany 71,345; Netherlands 18,129; Sweden 16,245
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	67,231	81,923	—	Sweden 22,164; Czechoslovakia 18,293; Netherlands 16,361.
Clad, plated, coated	79,049	75,032	(2)	West Germany 19,388; Sweden 18,749; United Kingdom 11,029.
Of alloy steel	68,832	78,214	(2)	Sweden 35,741; West Germany 18,778; Belgium-Luxembourg 10,205.
Bars, rods, angles, shapes, sections	256,827	309,715	510	West Germany 48,242; Sweden 47,989; Czechoslovakia 22,057.
Rails and accessories	2,926	10,592	—	Poland 6,974; West Germany 1,401; Austria 815.
Wire	19,081	19,967	69	Sweden 8,437; Belgium-Luxembourg 3,460; West Germany 3,084.
Tubes, pipes, fittings	127,770	154,836	41	West Germany 39,770; United Kingdom 22,091; Czechoslovakia 19,216.
Lead:				
Ore and concentrate	—	4,170	—	All from United Kingdom.
Oxides	423	589	—	West Germany 536; United Kingdom 30.
Metal including alloys:				
Unwrought	12,090	13,227	(2)	Sweden 7,121; U.S.S.R. 5,018; United Kingdom 592.
Semimanufactures	751	647	(2)	West Germany 329; Sweden 193; U.S.S.R. 129.
Magnesium: Metal including alloys:				
Scrap	23	—		
Unwrought	113	89	6	Norway 73; France 5.
Manganese:				
Ore and concentrate, metallurgical-grade	1,266	16,828	19	Ghana 14,615; Morocco 1,352; Netherlands 842.
Oxides	1,375	365	21	Belgium-Luxembourg 213; Netherlands 126.
Metal including alloys, all forms	261	205	—	France 179; China 10; West Germany 10.
Mercury	2	(2)	(2)	Mainly from U.S.S.R.
Molybdenum:				
Ore and concentrate, roasted	1,245	1,256	156	Belgium-Luxembourg 429; Netherlands 403; Chile 153.
Metal including alloys, unwrought including waste and scrap	3	6	—	West Germany 3; Netherlands 3.
Nickel:				
Ore and concentrate	7,582	11,286	651	Norway 10,635.
Matte and speiss	5,778	5,417	213	Australia 5,204.
Metal including alloys:				
Scrap	5,761	5,738	—	Netherlands 5,302; United Kingdom 229; West Germany 125.
Unwrought	3,140	4,044	(2)	Canada 1,965; U.S.S.R. 1,090; United Kingdom 354.
Semimanufactures	61	68	4	West Germany 41; United Kingdom 13; Italy 4.

See footnotes at end of table.

TABLE 3—Continued

FINLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS—Continued				
Platinum-group metals:				
Waste and sweepings value, thousands	$128	—		
Metals including alloys, unwrought and partly wrought do.	$886	$1,126	$2	United Kingdom $358; West Germany $288; Sweden $172.
Silver:				
Ore and concentrate[3] do.	$789	$1,586	—	Greece $1,585; China $1.
Waste and sweepings[3] do.	$4	$53	—	Sweden $28; Italy $23; Czechoslovakia $2.
Metal including alloys, unwrought and partly wrought do.	$7,067	$10,229	$6	Sweden $4,484; West Germany $2,943; Switzerland $1,266
Tin: Metal including alloys:				
Scrap	1	1	—	All from Italy.
Unwrought	111	132	(2)	Malaysia 40; United Kingdom 27; Sweden 20.
Semimanufactures	203	248	(2)	United Kingdom 101; West Germany 73; Sweden 54.
Titanium:				
Ore and concentrate value, thousands	$14,601	$18,492	$434	Norway $13,949; Australia $4,108.
Oxides	651	1,117	183	United Kingdom 551; West Germany 301.
Metal, unwrought including waste and scrap	40	39	4	Japan 15; Netherlands 15.
Tungsten: Metal including alloys, unwrought including waste and scrap	29	22	19	West Germany 3.
Zinc:				
Ore and concentrate	187,411	154,442	—	Sweden 58,824; Canada 44,504; Spain 18,318.
Oxides	412	456	(2)	West Germany 330; Portugal 84; United Kingdom 22.
Metal including alloys:				
Scrap	131	319	—	West Germany 247; Sweden 71.
Unwrought	63	551	—	U.S.S.R. 500; Norway 36.
Semimanufactures	537	610	20	Norway 289; West Germany 122; Peru 40.
Zirconium: Metal including alloys, unwrought including waste and scrap	6	(2)	—	Mainly from Belgium-Luxembourg.
Other:				
Ores and concentrates	—	58	NA	Australia 49.
Oxides and hydroxides	15,020	10,014	1,089	Australia 4,461; West Germany 2,758.
Base metals including alloys, all forms	—	2,589	—	Australia 2,567; France 22.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	659	745	(2)	Greece 246; Denmark 209; Turkey 127.
Artificial: Corundum	1,694	1,792	(2)	Austria 822; Hungary 362; United Kingdom 292.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$12	$17	$12	United Kingdom $3; Sweden $2.
Grinding and polishing wheels and stones	2,342	2,718	17	West Germany 568; Italy 335; Canada 272.
Asbestos, crude	853	1	1	
Barite and witherite	1,845	2,036	—	West Germany 1,363; United Kingdom 442; China 131.
Boron materials:				
Crude natural borates	12,171	16,167	20	Turkey 16,147.
Oxides and acids	2,229	2,160	27	Turkey 1,618; Italy 406.
Cement	188,607	263,505	—	U.S.S.R. 146,520; East Germany 91,346; Denmark 19,534.
Chalk	199,634	250,797	1	Denmark 178,548; West Germany 65,733.

See footnotes at end of table.

TABLE 3—Continued

FINLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989 United States	Sources, 1989 Other (principal)
INDUSTRIAL MINERALS—Continued					
Clays, crude:					
Bentonite		9,412	5,674	6	Greece 44,53; Sweden 496; West Germany 354.
Kaolin		950,300	932,299	155,299	United Kingdom 737,873; Australia 11,195.
Unspecified		42,561	25,578	11	United Kingdom 13,924; West Germany 10,584.
Cryolite and chiolite		21	34	—	All from Denmark.
Diamond, natural:					
Gem, not set or strung	value, thousands	$6,036	$7,831	$2	Belgium-Luxembourg $3,986; Sweden $1,756; India $924.
Industrial stones	do.	$830	$945	$518	Belgium-Luxembourg $113; Switzerland $98.
Diatomite and other infusorial earth		2,785	3,443	856	Iceland 1,384; Denmark 817.
Feldspar		9	24	—	Sweden 23.
Fertilizer materials:					
Crude, n.e.s.		65	123	1	Switzerland 66; West Germany 23; United Kingdom 21.
Manufactured:					
Ammonia		278,083	315,400	—	U.S.S.R. 268,199; United Kingdom 23,968; France 8,025.
Nitrogenous		71,347	73,142	18	Nethelrands 31,890; Norway 14,366; East Germany 12,899
Phosphatic		9,449	2,591	—	Mainly from Denmark.
Potassic	value, thousands	$38,572	$38,673	—	U.S.S.R. $22,358; East Germany $9,096; United Kingdom $6,355.
Unspecified and mixed		21,875	25,298	(2)	Netherlands 14,316; Hungary 9,905; United Kingdom 363.
Fluorspar		7,548	7,851	—	United Kingdom 1,976; Mexico 1,887; Canada 1,705.
Graphite, natural		77	301	—	West Germany 207; Sweden 92.
Gypsum and plaster		208,434	258,410	—	Spain 234,991; U.S.S.R. 19,510.
Lime		2,061	24,712	1	Sweden 11,550; Belgium-Luxembourg 5,860; Norway 4,200.
Magnesium compounds:					
Magnesite, crude		1,254	1,525	—	Spain 780; Austria 331; China 150.
Oxides and hydroxides		5,473	6,270	17	Spain 2,755; China 1,916; North Korea 1,243.
Mica:					
Crude including splittings and waste		590	244	—	United Kingdom 197; Norway 30; India 12.
Worked including agglomerated splittings		35	73	(2)	Switzerland 54; Austria 8.
Nitrates, crude		301	525	—	Chile 505; Netherlands 20.
Phosphates, crude	value, thousands	$6,308	$6,770	$3,363	Morocco $3,307; U.S.S.R. $77.
Pigments, mineral: Iron oxides and hydroxides, processed		3,234	4,426	38	West Germany 3,489; United Kingdom 558; Italy 100.
Potassium salts, crude		2	1	1	
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$931	$942	$12	West Germany $270; Thailand $168; Switzerland $142.
Synthetic	do.	$300	$300	$5	West Germany $191; Austria $64.
Pyrite, unroasted		7	10	—	Italy 8; West Germany 2.
Quartz crystal, piezoelectric	value, thousands	$3	—		
Salt and brine		645,815	710,140	36	Netherlands 256,724; Poland 163,879; East Germany 113,802.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		53,931	58,841	—	Poland 21,421; Netherlands 12,583; U.S.S.R. 8,235.
Sulfate, manufactured		1,646	2,509	—	Sweden 2,107; United Kingdom 248.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		2,470	5,131	(2)	Norway 2,826; Sweden 1,671; Italy 324.
Worked		5,031	7,076	274	Italy 4,081; Portugal 716; Taiwan 324.

See footnotes at end of table.

TABLE 3—Continued

FINLAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
INDUSTRIAL MINERALS—Continued				
Stone, sand and gravel—Continued				
Dolomite, chiefly refractory-grade	21,178	19,958	—	Norway 9,352; Spain 4,496; West Germany 3,612.
Gravel and crushed rock	34,600	99,273	237	West Germany 59,729; Sweden 20,431; Norway 16,201.
Limestone other than dimension	744,864	901,472	19	Sweden 898,884; Austria 1,344.
Quartz and quartzite	242	297	35	Sweden 99; Netherlands 54; Canada 52.
Sand other than metal-bearing	68,251	99,926	55	Belgium-Luxembourg 63,956; Sweden 14,472;Denmark 13,476.
Sulfur:				
Elemental:				
Crude including native and byproduct	42,256	54,016	—	Poland 32,271; West Germany 20,881; Sweden 754.
Colloidal, precipitated, sublimed	11	13	—	West Germany 12.
Dioxide	21,237	26,310	(2)	Sweden 23,231; U.S.S.R. 3,044.
Sulfuric acid	10,312	11,147	—	U.S.S.R. 11,019; Netherlands 82.
Talc, steatite, soapstone, pyrophyllite	568	612	—	Belgium-Luxembourg 283; Norway 189; West Germany 45.
Vermiculite, perlite, chlorite	1,075	1,423	—	U.S.S.R. 1,047; United Kingdom 352; Denmark 13.
Other:				
Crude	63,946	96,364	232	Norway 93,634; Spain 867; Netherlands 609.
Slag and dross, not metal-bearing	19,158	32,115	743	Sweden 26,153; Netherlands 3,630; West Germany 1,361.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	112	5,713	67	U.S.S.R. 4,168; Hungary 1,251.
Carbon black	9,992	9,776	422	Sweden 3,901; Netherlands 3,523.
Coal:				
Anthracite	43,486	24,605	2,390	U.S.S.R. 22,215.
Bituminous	4,756,402	5,540,412	105,760	Poland 2,569,328; U.S.S.R. 2,190,243.
Lignite including briquets	7,120	7,456	9	East Germany 7,447.
Coke and semicoke	757,374	832,577	—	U.S.S.R. 507,127; West Germany 128,490; Poland 51,880.
Gas, natural: Gaseous value, thousands	$110,415	$152,971	—	All from U.S.S.R.
Peat including briquets and litter	352	3,875	—	U.S.S.R. 3,826; Netherlands 37.
Petroleum:				
Crude thousand 42-gallon barrels	65,683	64,927	—	U.S.S.R. 60,806; Saudi Arabia 3,155; United Kingdom 966.
Refinery products:				
Liquefied petroleum gas do.	95	1,408	—	Saudi Arabia 552; United Arab Emirates 357; Algeria 346.
Gasoline do.	99	1,031	(2)	U.S.S.R. 382; Norway 175; United Kingdom 169.
Mineral jelly and wax do.	96	102	(2)	West Germany 67; Hungary 11; U.S.S.R. 4.
Kerosene and jet fuel do.	30	94	(2)	U.S.S.R. 79; Netherlands 8.
Distillate fuel oil do.	10,713	8,658	—	Mainly from U.S.S.R.
Lubricants do.	947	2,791	13	U.S.S.R. 1,229; Netherlands 717; Sweden 256.
Residual fuel oil do.	11,178	9,235	—	Mainly from U.S.S.R.
Asphalt do.	1	111	—	Netherlands 38; Poland 29; Canada 18.
Bitumen and other residues do.	312	340	(2)	Sweden 327; France 9.
Bituminous mixtures do.	7	9	2	West Germany 3; Sweden 2.
Petroleum coke do.	266	465	369	U.S.S.R. 91; West Germany 5.

NA. Not available.
[1]Table prepared by staff, International Data Section.
[2]Less than 1/2 unit.
[3]May include other precious metals.

Rautaruukki Oy, which produces steel plate, welded steel tubes, and beams; Ovako Steel AB, which produces long steel products; and Dalsbruk AB, whose line of production ranges from steel billets to rolled specialty steel products.

Kemira, specializing in fertilizers and agriculture chemicals, is the largest chemical enterprise in Finland and one of the largest fertilizer producers in Europe. The company has also increased its foreign activities and now operates in 18 countries. Kemira's main exports were fertilizers, titanium dioxide, and viscose fibers. Another state-owned enterprise is Neste Oy, which operates Finland's petroleum refineries.

Two private companies, Oy Lohja AB and Oy Partek AB, are the major producers of industrial minerals. The main products are clays, dolomite, feldspar, and limestone. Other companies are involved in the growing dimension stone industry.

Overall, there were about 65,000 persons employed in the mining and metal processing industry in Finland. Of these, about 825 are employed in mining and quarrying, down from 860 in 1989.Approximately 42% of the workers are in open pit operations, while the rest are in underground mines.

COMMODITY REVIEW

Metals

Chromium.—Outokumpu's Kemi Mine is Scandinavia's only chromite mine. The mine, on the north coast of the Gulf of Bothnia, is one of the world's major chromite mines and has estimated reserves of 150 Mmt. The Kemi deposits consist of chromite seams associated with a layered ultrabasic sill-like intrusion between a pegmatite granite massif and a large schist area. About one-third of the reserves can be extracted by open pit mining, which is the current mining method. The average content of the ore was reported to be 26% chromium trioxide (Cr_2O_3) with a reported chromium-iron (Cr-Fe) ratio of 1.55:1. The mining operations must remove approximately 5 Mmt of waste rock for every 1 Mmt of low-grade ore. From the 800,000 to 1,000,000 mt/a of ore mined, the product is split 400,000 to 550,000 mt/a 33% Cr_2O_3 lump and 150,000 42% Cr_2O_3 fines. A large portion of the Kemi Mine's output was used for the domestic production of charge-grade ferrochrome containing 52% chromium and 7% carbon.

The recent investment of $23 million in the pelletizing plant at Tornio, 40 km from the Kemi Mine, has increased pellet production capacity to 200,000 mt/a. Of the 170,000 tons output, 35% to 40% was used in the adjacent stainless steel plant, while most of the rest was shipped to Western Europe.

Copper.—Copper accounts for approximately one-third of Outokumpu's sales and employs more than 6,000 people worldwide. Outokumpu's oldest operation, the Keretti Mine, closed in 1989, leaving the Phyasalmi and Vihanti Mines as the country's largest domestic copper sources. The production of copper concentrates[5] continued to decline significantly (from 86,000 tons in 1988 to only 52,449 tons in 1990), and the trend was expected to continue because no new mines were projected to be developed in the future. To meet the domestic requirements, as production decreased, copper imports have reportedly increased 78% in recent years.

As a result of the limited domestic availability of copper concentrates, Outokumpu is expanding its foreign operations to ensure its metallurgical requirements are met. One project, reportedly purchased by Outokumpu Copper Oy for $25 million, was the Zalvidar copper deposit in Chile. Zalvidar is a polymetallic deposit 5 km from the large Escondida copper deposit. The deposit was reported to contain an estimated 60 Mmt of ore grading 1.6% copper. However, Outokumpu reported in its annual report that the deposit might contain significantly more copper, and exploration activities were continuing. An investment decision concerning production facilities was expected in 1992. The deposit would be developed by Outokumpu Resources Chile Ltd.

Another overseas investment, by Outokumpu Oy, was signed with seven Portuguese companies to construct a $300 million smelter in southern Portugal. The 200,000-mt/a-capacity smelter, which would reportedly employ 400 people, is to be owned by Metalurgia do Cobre Ltd. (Metcob).[6] Outokumpu was reported to have 60% interest in Metcob with the Government holding company and the national mining company retaining 35%. The downstream copper users comprise the remaining 5% interest in the plant. The Portuguese national mining company, which has a majority interest in the nearby Neves Corvo Mine that produces 130,000 mt/a of copper concentrate, was interested in securing a smelter for the mine output. Outokumpu has also expressed an interest in a refinery at the site, but has expressed concern of the overrefining capacity in Europe.

In the fall of 1990, Outokumpu purchased the American company, American Brass, based in Buffalo, New York. The company is one of the largest copper and copper alloy mill producer in the United States, with 120,000 tons annual production. This purchase strengthens Outokumpu's position as the second largest producer of copper and copper alloy semiproducts in the world. Annual output for the company is approximately 450,000 mt/a.

Gold.—Outokumpu's Saattopora Mine, the company's first gold mine, is an open pit operation at Kittila in Finnish Lapland. The mine started operations in January 1989. Saattoporo's ore reserves were estimated to be 700,000 tons with an average estimated grade of 3.6 grams of gold per ton and 0.3% copper. The mining plan called for the mining of 308,000 tons of ore in 1989 increasing to 372,000 tons in 1990, thus depleting the ore body in 2 years. Exploration is continuing in areas around Saattopora. The ore was trucked 55 km to the Rautuvarra concentrator, which was purchased in 1989 by Outokumpu from Rautaruukki Oy. The concentrate is then processed in the Pori smelter. The smelter, designed to process 50,000 tons of concentrates, must supplement domestic production with concentrates from other sources. The smelter was reported to have operated at less than optimum conditions owing to a lack of feed and/or content of precious-metal content in the concentrates processed within recent years.

Iron and Steel.—In 1990, Outokumpu reorganized its stainless steel segment, which was renamed Outokumpu Steel Oy. This independent corporation is composed of three seperate sectors for the production of chrome, ferrochrome, and stainless steel, which will be named Outokumpu Chrome Oy, Outokumpu Polarit Oy, and Oy JA-RO Ab, respectively.

Sales for Rautaruukki Oy grew by 3% for 1990, with the Tubular Products and Sections Div. showing the largest increase (19%) over the previous year's sales. The Steel Div.'s sales decreased 8% from those of the previous year. The price of steel dropped significantly during the year; however, capacity utilization remained high. The Finnish steel demand remained

TABLE 4

FINLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Major commodity	Major operating companies	Location of main facilities	Annual capacity
Ammonia	Kemira Oy	Plant at Oulu	150
Cement	Oy Partek AB	Lappeenranta, Kolari, and Pargas.	1,400
	Oy Lohja AB	Virkkala	1,000
Chromite	Outokumpu Oy	Mine at Kemi	420
Cobalt, metal.	do.	Smelter at Kokkola	1
Copper, concentrate	do.	Mines at Hitura, Enonkoski, Polyhasalmi, Vammala, and Telkkala.	86
Copper, metal	do.	Smelter at Harjavalta	75
		Refinery at Pori	60
Feldspar	Oy Lohja AB	Mine and plant at Kemio and Lohja	180
Ferrochrome	Outokumpu Oy	Smelter at Tornio	200
Gold kilograms	do.	Mines at Saattopra and Orivesi	1,200
	do.	Smelter at Pori	1,350
Lead, concentrate kilograms	do.	Mine at Vihanti	5
Limestone	Oy Partek AB	Mines at Parainen, Kolari, Lappeenranta.	1,500
Oy Lohja AB		Mines at Frejdbole, Karjaa, Sipoo.	1,200
Mercury kilograms	Outokumpu Oy	Smelter at Kokkola	76,000
Nickel, concentrate	do.	Mines at Hitura, Enonkoski, Telkkala, Vammala	150
Nickel, metal	do.	Smelter at Harjavalta	15
Petroleum, refined	Neste Oy	Refineries at Porvoo and Naantali	9,000
Phosphate, apatite	Kemira Oy	Mine at Siilinjärva	600
Selenium kilograms	Outokumpu Oy	Smelter at Pori	20,000
Silver kilograms	do.	do.	47,000
Steel	Rautaruukki Oy	Plants at Raahe and Hameenlinna	2,000
	Oy Ovako AB	Plant at Imatra	600
	Oy Dalsbruck AB	Plants at Dalsbruck, Kovenhar, and Aminnefors.	850
	Outokumpu Oy	Stainless steel plant at Tornio	100
Talc	Oy Lohja AB	Mine at Polvijärvi, Plant at Vuonos	150
Titanium dioxide	Kemira Oy	Plant at Pori	80
	Oy Partek AB	Mine at Polvijärvi, Plant at Luikonlahti	100
Wollastonite	do.	Mine and plant at Lappeenranta	40
Zinc, concentrate	Outokumpu Oy	Mines at Vihanti, and Pyhäsalmi	150
Zinc, metal	do.	Smelter at Kokkola	160

[1]Kilograms per year.

constant with that of the previous year, except for sheet products, which declined owing to a cutback in the construction industry.

Rautaruukki Oy reportedly invested $352 million in enhancing production, expanding the product range, improving quality, and purchasing overseas facilities. The capacity at the Raahe steelworks coking facilities was doubled in size, and the blast furnaces and steel melt shop were renovated. The galvanizing capacity at Hammeenlinna and the production of sections at the Toijala Works were also expanded.

Rautaruukki Oy also purchased the Swedish tubemaker, Wirsbo Bruks AB and MAS Seuthe GmbH, a West German manufacturer of tube welding lines. Rautaruukki's purchase of Gavle Ahlsell Industri AB's two plants in Sweden from the Trelleborg Group increased the company's Scandinavian position in the manufacture and upgrading of coated steel sheets. Two joint ventures were initiated in the steel construction industry. PPTH Teras OY, in which Rautaruukki has a 40% holding, produces steel frame structures, and Nordicon Oy, which markets steel facade structures, with a 60% interest obtained by Rautaruukki Oy.

Nickel.—Outokumpu reported that in 1989 the drop in nickel production at the Harjavalta nickel smelter was the result of an explosion. In 1990, the facility resumed its normal production of 50 mt/d of nickel

TABLE 5

FINLAND: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1990

(Million metric tons unless otherwise specified)

Commodity		Reserves
Apatite		400
Chromium		38
Cobalt	thousand tons	18
Gold	kilograms	2,500
Nickel	thousand tons	40
Peat		[e]350
Phosphate rock		110

[e]Estimated.

cathode, producing a reported 16,882 tons for the year.

Outokumpu Finnmines Oy, operator of the Hitura nickel mine, plans to invest $40 million in the development of a new underground operation and a new processing facility at the chemical plant. The open pit operation, which was closed in 1985 due to low nickel prices, was reopened in 1988. The new development plans call for a 6- to 10-year life for the underground operation. Hitura Mine supplies 2,500 mt/a of nickel to the Outokumpu Chemical, which has plans to increase nickel in chemicals production to between 5,000 to 6,000 mt/a from the present level of 2,000 mt/a.

Outokumpu formed a joint venture with Australian Consolidated Minerals (ACM) to develop ACM's Mt. Keith nickel deposit in Western Australia. The deposit was estimated to contain resources of 200 Mmt with 100 Mmt of minable proven reserves of pentlandite ore averaging 0.63% nickel. The nickel concentrate produced from the open pit mine at Mt. Keith will be shipped to Outokumpu's facilities in Kokkola, Finland. The roasters at Kokkola, which previously were intermittently used on pyrites, were under consideration to be refurbished. However, the feasibility study for constructing a completely new facility to process the ore into ferronickel was canceled, owing to the ecomonic risks involved in the project.

Outokumpu also had initiated talks with the U.S.S.R. about a joint venture to develop a nickel mine on the Kola Peninsula. The mine site is about 80 km from Pechenga. A yearend agreement in principle was reached with the Soviet officials and the Norilsk Nikel Group. The company was interested in a countertrade agreement whereby it would provide investment and technology to start the underground mine in return for payment in nickel and apatite ore to be processed at its nickel plant at Harjavalta. Outokumpu Technology, as part of the agreement, was to renovate the nickel smelters on the Kola Peninsula, thereby reducing the acid rain problems and environmental damage originating from that facility.

Industrial Minerals

The Geologic Survey of Finland reported its preliminary study of the Virtasalmi kaolin (china clay) deposit completed. According to the Survey's estimate, the deposit contained between 10 and 20 Mmt of kaolin. Further studies were to be made on other sites in the area.

Exploration activities for other industrial minerals were mainly focused on limestone, soapstone, and wollastonite.

Kemira Oy's goal to stop all discharge into the sea was furthered by a planned $25 million investment at its titania sulfate plant in Pori. Acid recycling equipment and a fourth evaporating line will raise total concentrating capacity to 800,000 mt/a. The concentrating of the waste acid from 70% to 80% would facilitate the reusing of the acid in the TiO_2 production.

Mineral Fuels

Finland has one of the world's highest per capita energy consumption levels owing to its harsh climate and industrial structure. The country has historically allocated resources to make processes more energy efficient. Domestic energy consumption was fulfilled by the construction of hydroelectric facilities, but in recent years, energy demand has out stripped domestic sources. As a result, the country imports substantial amounts of energy from the U.S.S.R., particularly natural gas, coal, and electrical power. Oil and oil-refined products from the U.S.S.R. have been reduced significantly in recent years. The Soviets have reportedly requested that purchases of energy products be paid in hard currency.

Reserves

The country has exploited many of its domestic metalliferous resources and those that remain are generally high extraction cost projects, which are reportedly not as economic as many overseas deposits. Therefore, Finnish companies, such as Outokumpu, have been investing heavily in overseas operations and are exporting technology that was developed to domestic operations competitive and efficient.

INFRASTRUCTURE

There is an adequate railroad and road system. Finnish State Railways (VR) operates a total of 5,863 km of 1.524-m gauge railroad, of which 480 km is multiple track and 1,445 km is electrified. There are about 103,000 km of roads, of which 35,000 km is paved. Including the Saimaa Canal, there is about 6,675 km of inland waterways, of which 3,700 km is suitable for steamers.

OUTLOOK

Dwindling domestic reserves have forced the Finnish mining industry to look abroad and to develop new, more efficient production methods to remain competitive. This trend is expected to continue.

The Geologic Survey of Finland has an active data collecting program through mapping and resource-related studies and offers technical assistance. The Helsinki University of Technology has an active mineral resource research program. This should continue to be a significant benefit and encouragement to individuals and companies engaged in mineral resource activities.

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[1]Vuoriteollisuus Bergshanteringen, 1991, No. 1, pp. 16.

[2]London Mining Journal. Annual Mining Review. 1991, pp. 171.

[3]Work cited in footnote 2.

[4]Where necessary, values have been converted from finnmarks (FIM) to U.S. dollars at the rate of FIM 3.831=US$1.00, the average value for 1990.

[5]Work cited in footnote 1.

[6]Work cited in footnote 2.

OTHER SOURCES OF INFORMATION

Agencies

Central Statistical Office of Finland
SF-00101
Helsinki, Finland

Geologic Survey of Finland
SF-02150
Espoo, Finland

Helsinki University of Technology
Laboratory of Rock Engineering
SF-02150
Espoo, Finland

Ministry of Commerce and Industry
SF-00101
Helsinki, Finland

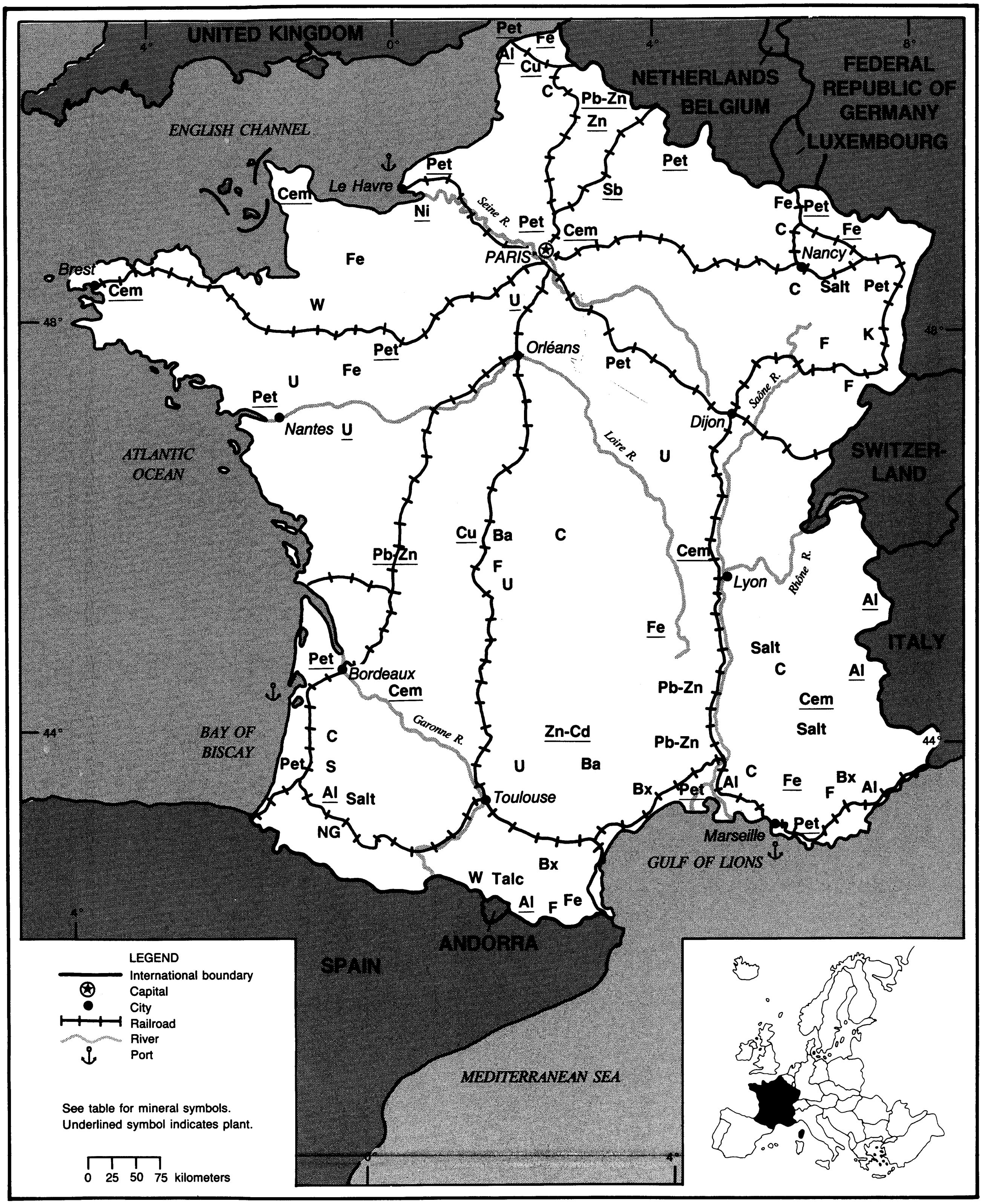
Publications

Bulletin of Statistics, Central Statistics Office, Company annual reports: Outokumpu Oy, Rautaruukki Oy, Ab Partek Oy, etc. Finnish Mining Journal, Oulu.

Statistical Yearbook of Finland, Central Statistics Office.

FRANCE

AREA 552,000 km² **POPULATION 56 million**



THE MINERAL INDUSTRY OF FRANCE

By Harold R. Newman

France is one of the major European mineral producers. The traditional mineral industries in France have been in a state of transition over the past several years. Changing economic conditions such as rising energy costs, increasing supplies of raw materials from other countries, lower prices due to increased competition, and depletion of reserves have necessitated the rationalization of many traditionally strong mineral industries such as bauxite, coal, iron ore, and steel.

Some industries have also had to adjust to a change in the state's economic policies. In the past, the heavy involvement of the state, both economic and political, was one of the main elements of French mineral policy. Reduction of Government subsidies supporting uneconomic mineral operations and the depletion of mineral reserves have had a significant impact on a number of extractive operations in the mineral industry.

In current dollars, the GNP increased by 2.8% and industrial output by 2% over that of 1989. At yearend, the unemployment rate was about 9% of the working population. The mineral industry accounted for about 6% of the GNP.

GOVERNMENT POLICIES AND PROGRAMS

The French Government has initiated policies to reduce the budget deficit, which was not only affecting the mineral industry, but other industries as well. At the same time, other economic policies were driven by the desire to reduce unemployment and improve French competitiveness, particularly as 1992 and the advent of the single European market approaches. Efforts have been made to promote the private sector and to reduce the dependence of state-owned companies on subsidies. Some exchange controls have been eliminated and value added taxes have been reduced to bring these taxes in line with the EC norms. Many state-controlled industries have made significant strides in preparing themselves for the impact of EC 1992.

PRODUCTION

With the exception of gold and silver, which increased output, mineral and metal industries maintained their production and other activities at about the same or decreased rates from those of the previous year. Several industries, such as bauxite, coal, iron ore, and uranium industries, have steadily undergone changes over the past few years. The coal and iron ore industries were affected by cheaper foreign sources and the depletion of domestic resources. As a result, the Government was reducing the subsidies to these industries and closing high-cost or inefficient operations. Similarly, bauxite reserves were being depleted, which resulted in closure of mining operations. Other domestic companies were facing increased foreign competition.

The uranium industry had to reduce its operations by closing a number of mines and processing plants. This was because the electrical industry had built an excess of generating capacity and the export market for uranium had decreased. Another factor in the drop of uranium demand was the reduced cost for petroleum and the increased accessibility of natural gas from the North Sea and the U.S.S.R. Lower petroleum prices meant that fewer new nuclear plants were considered for construction and some older plants were being closed.

TRADE

The Government's efforts to refocus the country's trading patterns toward the OECD countries were continuing. The percentage of France's trade with its EC partners increased while the trade deficit with the EC decreased. There were also strong commercial relations between France and the United States. Exports from the United States to France increased 18% because of a depreciated dollar and strong French demand. France was the United States' eighth largest trading partner with two-way trade totaling more than $26 billion in 1990.

Table 2 below shows the impact of selected classes of mineral commodities on France's balance of payments position in relation to the EC and the world.

STRUCTURE OF THE MINERAL INDUSTRY

Government and private companies produce minerals and mineral products, conduct research, and explore domestically and internationally for new resources. Since 1981, when some of the major companies were nationalized, the Government has had to restructure some of these industries, notably the steel and coal industries. Adjustments to the forthcoming 1992 Common Market resulted in numerous mergers, closures of operations, and cooperative ventures as companies sought ways to obtain a competitive advantage. Some industries that have benefited greatly from Government assistance in the past were experiencing a Government determined to reduce assistance for nonprofitable operations. Others were expanding as the previous Government programs resulted in exploitable opportunities, such as the availability of abundant and inexpensive electrical power.

The Government held significant financial interests in most of the mining, metallurgical, and energy companies in France. These included Societe Nationale Elf Aquitaine (SNEA); Usinor-Sacilor SA.; Imetal S.A.; Pechiney; Charbonnages de France (CdF); Compagnie Generale des Matieres Nucleaires (Cogema); and Bureau de Recherches Geologiques et Minieres (BRGM) and its subsidiary, Compagnie Francaise des Mines S.A.

COMMODITY REVIEW

Metals

Alumina and Bauxite.—French bauxite production in 1990 continued to decline and ceased altogether at year end. In comparison, the bauxite output in 1980 was 1,921,000 tons, while in 1990, production was 490,000 tons. The depletion of ores and competition from cheaper foreign sources

TABLE 1

FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989[p]	1990[e]
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	1,379	1,272	878	550	[3]490
Alumina:						
Crude	do.	884	866	720	624	[3]606
Calcined	do.	740	712	551	479	[3]467
Metal:						
Primary	do.	322	323	327	335	325
Secondary	do.	173	196	211	[e]215	205
Antimony: Metal, including regulus		6,822	7,100	6,093	6,910	[3]6,480
Arsenic, white[e]		10,000	10,000	10,000	10,000	7,000
Bismuth metal		70	95	90	100	[3]70
Cadmium metal		431	400	355	170	[3]780
Cobalt metal including powder		[e]100	110	—	160	[3]300
Copper:						
Mine output, Cu content		294	300	246	300	[3]480
Metal:						
Blister, secondary		6,100	7,000	8,500	[e]10,000	9,000
Refined:						
Primary		17,900	11,323	7,239	16,300	18,000
Secondary[e]		24,000	28,000	36,000	33,000	34,000
Total		41,900	39,323	43,239	49,300	52,000
Gold, mine output, Au content	kilograms	2,382	2,225	2,525	3,537	[3]4,236
Iron and steel:						
Iron ore and concentrates:						
Gross weight	thousand tons	12,436	10,852	9,983	9,368	[3]8,729
Fe content	do.	3,861	3,255	2,994	2,810	2,793
Metal:						
Pig iron	do.	13,708	13,267	14,800	15,082	[3]14,100
Ferroalloys:						
Blast furnace: Spiegeleisen and ferromanganese	do.	274	[e]296	300	325	[3]324
Electric furnace:						
Ferrochrome	thousand tons	[r e]2	1	18	[e]18	[3]25
Ferromanganese	do.	22	23	27	[e]27	[3]36
Ferrosilicon	do.	196	154	131	[e]130	[3]117
Silicon metal	do.	[e]75	70	75	[e]75	[3]64
Other	do.	77	59	59	[e]79	50
Total	do.	[r]646	[e]603	610	[e]654	616
Steel ingots and castings	do.	17,624	17,726	19,003	19,335	[3]19,032
Semimanufactures	do.	15,343	[e]15,000	16,000	17,691	[3]17,330
Lead:						
Mine output, Pb content		2,478	2,213	1,966	1,060	[3]1,140
Smelter:						
Primary		132,000	138,795	146,500	[e]147,000	140,000
Secondary[e]		12,500	12,000	15,000	20,000	20,000
Total		144,500	150,795	[e]161,500	[e]167,000	160,000
Refined:						
Primary: Soft lead		132,000	138,795	146,511	149,300	[3]162,260

See footnotes at end of table.

TABLE 1—Continued

FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989[p]	1990[e]
METALS—Continued						
Lead:—Continued						
Refined:—Continued						
Secondary:						
Soft lead		27,300	32,700	37,400	52,100	[3]47,612
Pb content of antimonial lead		71,100	74,370	71,791	[r e]66,000	[3]60,598
Total		230,400	245,865	255,702	[r e]267,400	[3]270,470
Magnesium metal including secondary		13,376	13,600	13,800	14,600	14,000
Nickel metal		8,241	6,680	9,200	8,632	8,540
Silver:						
Mine output, Ag content:						
Lead and zinc concentrates	kilograms	21,057	21,150	24,074	20,600	22,100
Mixed copper, gold, silver concentrates	kilograms	4,821	4,665	6,220	[e]5,000	5,000
Total	do.	25,878	25,815	30,294	25,600	27,100
Metal, Ag content of final smelter products	do.	[e]26,000	24,200	24,882	[e]25,000	22,200
Tin, smelter output of solder and other alloys, secondary		2,912	2,532	2,635	2,670	2,560
Tungsten concentrate, W content		982	—	—	—	—
Uranium:						
Mine output, U content		3,737	3,321	3,385	3,219	[3]3,276
Chemical concentrate, U3O8 equivalent		4,106	3,740	3,669	3,763	[3]3,886
Zinc:						
Mine output, Zn content		39,534	31,339	30,900	26,700	[3]23,820
Metal including secondary:						
Slab		289,500	249,340	274,000	264,500	[3]263,136
Dust[e]		8,000	9,000	9,000	9,000	8,600
INDUSTRIAL MINERALS						
Barite		116,400	104,050	[e]100,000	315,000	310,000
Bromine, elemental[e]		19,000	20,000	20,000	18,000	3,100
Cement, hydraulic	thousand tons	22,596	23,560	25,300	26,835	[3]26,388
Clays:						
Bentonite[e 4]		10,000	10,000	[r]5,000	[r]5,000	1,000
Kaolin and kaolinitic clay (marketable)	thousand tons	1,350	[e]1,400	[e]1,400	356	370
Refractory clay, unspecified[e]	do.	500	500	[r]50	[3]15	16
Diamonds: Synthetic, industrial[e]	thousand carats	—	—	4,000	4,000	5,000
Diatomite[e]	thousand tons	[3]269	250	250	250	250
Feldspar, crude	do.	216	274	322	[r e]360	420
Fluorspar:						
Crude	thousand carats	497	374	313	449	515
Marketable:						
Acid and ceramic-grade	do.	148	134	133	158	145
Metallurgical-grade	do.	50	[e]50	50	[e]50	113
Total	do.	198	184	183	[r e]208	258
Gypsum and anhydrite, crude	do.	5,259	5,409	5,628	5,684	[3]5,796
Kyanite, andalusite, related materials	do.	51	50	[e]50	[e]50	75
Lime: Quicklime, hydrated lime, dead-burned dolomite	do.	2,900	[e]3,000	3,089	3,084	3,000
Mica[e]		[3]10,834	11,000	11,000	[r]8,000	7,000

See footnotes at end of table.

TABLE 1—Continued

FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989[p]	1990[e]
INDUSTRIAL MINERALS—Continued						
Nitrogen: N content of ammonia	thousand tons	[e]2,000	[e]2,100	1,832	1,840	[3]1,916
Pigments, mineral, natural: Iron oxides[e]		15,000	15,000	15,000	15,000	15,000
Phosphates: Thomas slag	thousand tons	855	768	555	[r e]700	700
Potash:						
Gross weight (run-of-mine)	do.	11,600	10,716	10,392	8,791	[3]9,468
K_2O equivalent (run-of-mine)	do.	1,748	1,500	[e]1,400	[e]1,400	1,400
K_2O equivalent (marketable)	do.	1,620	1,485	[e]1,350	1,195	1,400
Pozzolan and lapilli	do.	410	420	[e]400	[e]400	336
Salt:						
Rock salt	do.	386	1,476	1,145	91	79
Brine salt (refined)	do.	1,125	1,070	[e]1,100	[e]1,100	1,000
Marine salt	do.	1,610	1,627	1,435	1,132	1,298
Salt in solution	do.	3,963	3,663	3,973	4,322	3,362
Total	do.	7,084	7,836	7,653	[r e]6,645	5,739
Sodium compounds:[e]						
Soda ash	do.	750	780	780	780	1,180
Sodium sulfat	do.	110	120	120	120	120
Stone, sand and gravel:						
Limestone, agricultural and industrial[e]	thousand tons	6,000	6,000	7,000	7,000	7,000
Slate, roof	do.	57	60	[e]60	[e]60	40
Sand and gravel:						
Industrial sands, total	do.	5,332	7,472	[e]7,500	[e]7,500	3,500
Other sand and gravel, alluvial	do.	186,800	193,000	208,000	[e]210,000	208,500
Sulfur, byproduct:						
Of natural gas	do.	957	883	725	647	919
Of petroleum	do.	193	188	225	239	230
Of unspecified sources[e]	do.	156	150	150	150	150
Total	do.	1,306	1,221	1,100	[e]1,036	1,299
Talc:						
Crude		324,660	269,000	280,000	[e]280,000	284,000
Powder[e]		[3]314,965	260,000	270,000	270,000	258,000
MINERAL FUELS AND RELATED MATERIALS						
Asphaltic material[e]		[3]37,817	40,000	40,000	40,000	40,000
Carbon black[e]		175,000	180,000	180,000	180,000	252,000
Coal, including briquets:						
Anthracite and bituminous coal	thousand tons	14,394	13,694	12,139	11,471	[3]10,488
Lignite	do.	2,142	2,061	2,344	2,168	2,256
Total	do.	16,536	15,755	14,483	13,639	12,744
Briquets	do.	1,176	1,071	804	[e]825	540
Coke, metallurgical	do.	8,258	7,470	7,305	5,340	[3]5,208
Gas, natural:						
Gross	million cubic meters	5,964	5,890	4,644	4,406	[3]3,250
Marketed	do.	4,217	4,106	3,207	3,073	3,080
Natural gas liquids	thousand 42-gallon barrels	5,245	4,171	3,882	3,983	4,000
Peat[e]	thousand tons	220	200	200	200	200
Petroleum:						
Crude	thousand 42-gallon barrels	21,482	23.610	24,776	23,639	[3]22,036

See footnotes at end of table.

TABLE 1—Continued

FRANCE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989[p]	1990[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Refinery products:						
Liquefied petroleum gas	do.	27,326	28,835	24,000	20,112	[3]32,492
Gasoline, all kinds	do.	140,637	141,620	127,140	129,515	[3]145,029
Jet fuel	do.	33,886	32,850	30,600	[e]30,000	[3]39,976
Kerosene	do.	376	365	400	372	[3]462
Distillate fuel oil	do.	214,165	193,450	200,150	208,768	[3]210,372
Heavy fuel oil	do.	85,227	86,140	77,000	76,732	[3]76,510
Other products	do.	51,189	46,355	45,000	40,041	[3]42,000
Refinery fuel and losses	do.	30,935	27,740	28,000	26,537	[3]20,286
Total	do.	583,741	557,355	532,290	[e]532,077	[3]567,127

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Jan. 31, 1992.
[2]In addition to the commodities listed, France also produces germanium from domestic ores and has been described as the world's leading producer of this commodity in French sources. Output was reported as being all from the Saint-Salvy Mine. Unfortunately, actual output is not regularly reported, and the ore from this mine is not sufficiently uniform in grade to permit estimates of output based on reported concentrate production. In addition, France produces large quantities of stone, but statistics on output are not available.
[3]Reported figure.
[4]Includes smectic clay.

TABLE 2

FRANCE: BALANCE OF PAYMENTS, SELECTED MINERAL COMMODITIES[1]

(Thousand dollars)

Mineral commodity	Exports to EC	Imports from EC	Net gain or (loss)	Exports to the world	Imports from the world	Net gain or (loss)
Crude industrial minerals:						
Feldspar	7,177	2,184	4,993	8,122	5,060	3,062
Magnesite	66	332	(266)	67	519	(452)
Slate	1,453	585	868	1,589	594	995
Other	369,499	325,851	43,648	512,280	815,598	(303,318)
Total	378,195	328,952	49,243	522,058	821,771	(299,713)
Metalliferous ores:						
Copper	990	247	743	1,143	470	673
Lead	—	9,568	(9,568)	28	70,120	(70,092)
Tin	10	—	10	19	—	19
Zinc	14,318	60,122	(45,804)	14,319	254,647	(240,328)
Other (including waste and scrap)	1,348,989	564,485	784,504	1,483,848	1,622,460	(138,612)
Total	1,364,307	634,422	729,885	1,499,357	1,947,697	(448,340)
Nonmetallic mineral manufactures						
Metals:						
Iron and steel	5,405,893	5,569,322	(163,429)	8,511,785	6,801,011	1,710,774
Mercury	613	620	(7)	694	904	(210)
Other nonferrous metals	2,656,590	3,402,804	(746,214)	3,645,025	5,849,547	(2,204,522)
Total	8,063,096	8,972,746	(909,650)	12,157,504	12,651,462	(493,958)
Mineral fuels	2,459,346	3,783,142	(1,323,796)	3,764,988	16,874,772	(13,109,784)

[1]Table prepared by Harold Willis, Section of International Data.

TABLE 3

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989 United States	Destinations, 1989 Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	27	36	—	Japan 18; United Kingdom 14; Iraq 3.
Alkaline-earth metals	687	—		
Aluminum:				
Ore and concentrate	13,487	28,916	—	Yugoslavia 11,584; East Germany 10,500; Belgium-Luxembourg 369.
Oxides and hydroxides	319,763	243,336	4,780	Italy 94,503; Jordan 28,087; West Germany 25,542.
Ash and residue containing aluminum	14,658	16,350	—	Italy 8,035; West Germany 4,255; Spain 3,811.
Metal including alloys:				
Scrap	160,811	155,886	15,879	Italy 61,171; Belgium-Luxembourg 38,983; Netherland 8,985.
Unwrought	113,140	121,634	67	Italy 42,721; West Germany 28,330; Belgium-Luxembourg 16,494.
Semimanufactures	348,110	363,204	26,144	West Germany 109,079; Italy 64,219; United Kingdom 55,159.
Antimony:				
Ore and concentrate	144	73	—	Switzerland 64; Spain 8.
Oxides	5,508	5,479	533	West Germany 1,277; United Kingdom 564.
Ash and residue containing antimony	2,545	774	540	Japan 188.
Metal including alloys, all forms	158	69	16	Belgium-Luxembourg 35.
Arsenic: Metal including alloys, all forms	128	1,058	—	Israel 198; India 144; Taiwan 119.
Beryllium: Metal including alloys, all forms	3	196	—	All to West Germany.
Bismuth: Metal including alloys, all forms	73	88	—	Belgium-Luxembourg 37; Netherlands 21.
Cadmium: Metal including alloys, all forms	544	679	77	Begium-Luxembourg 291; Netherlands 136.
Chromium:				
Ore and concentrate	3,113	9,676	—	Italy 8,095; West Germany 1,225.
Oxides and hydroxides	133	106	1	West Germany 601.
Metal including alloys, all forms	2,205	2,354	797	West Germany 890; United Kingdom 247.
Cobalt:				
Ore and concentrate	—	(2)	—	All to West Germany.
Oxides and hydroxides	33	55	6	Italy 8.
Ash and residue containing cobalt	117	14	—	United Kingdom 7; Netherlands 4; West Germany 3.
Metal including alloys, all forms	597	966	115	Belgium-Luxembourg 334; West Germany 129;
Columbium and tantalum: Tantalum metal including alloys, all forms	25	27	3	West Germany 19; United Kingdom 2.
Copper:				
Ore and concentrate	1,707	996	—	West Germany 820; Belgium-Luxembourg 124.
Matte and speiss including cement copper	578	215	—	Italy 77; West Germany 35; U.S.S.R. 5.
Oxides and hydroxides	14	20	—	Algeria 7; Tunisia 7; Japan 2.
Sulfate	825	381	—	Belgium-Luxembourg 125; Finland 45; United Kingdom 45.
Ash and residue containing copper	14,960	12,430	30	Belgium-Luxembourg 8,823; Sweden 1,320; Spain 720.
Metal including alloys:				
Scrap	174,213	188,955	428	West Germany 66,433; Belgium-Luxembourg 49,044; Italy 35,205.
Unwrought	5,638	28,658	57	Spain 11,353; Belgium-Luxembourg 8,787; Italy 4,191.
Semimanufactures	312,129	336,433	3,565	West Germany 89,939; Italy 77,835; Spain 40,466.
Germanium: Metal including alloys, all forms	17	19	13	Belgium-Luxembourg 5; United Kingdom 1; Japan 1.

TABLE 3—Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989 United States	Destinations, 1989 Other (principal)
METALS—Continued				
Gold:				
Waste and sweepings value, thousands	$2,431	$6,846	$22	Switzerland $4,036; Canada $1,414; Belgium-Luxembourg $990.
Metal including alloys, unwrought and partly wrought kilograms	28,762	40,779	160	United Kingdom 13,832; Switzerland 9,374; Singapore 6,048.
Hafnium: Metal including alloys, all forms	3	10	5	United Kingdom 3; Sweden 1.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	3,775	3,563	—	Belgium-Luxembourg 3,462.
Pyrite, roasted	36	317	—	Mainly to Italy.
Metal:				
Scrap thousand tons	3,692	4,260	1	Italy 1,636; Spain 1,194.
Pig iron, cast iron, related materials	142,626	43,627	—	Belgium-Luxembourg 30,404; Italy 5,932.
Ferroalloys:				
Ferrochromium	48,364	12,895	24	West Germany 6,374; United Kingdom 2,183; Belgium Luxembourg 1,690.
Ferromanganese	31,963	21,586	11,712	Italy 1,911; West Germany 1,591; Belgium-Luxembourg 1,110.
Ferromolybdenum	2,199	2,433	—	Netherlands 1,245; West Germany 578; Italy 485.
Ferronickel	3,720	4,325	—	Italy 1,840; Spain 1,787; West Germany 698.
Ferroniobium	17	46	—	Taiwan 12; Belgium-Luxembourg 30.
Ferrosilicochromium	9	4	—	All to Saudi Arabia.
Ferrosilicomagnesium	9,389	10,240	—	Italy 2,364; Spain 1,800; Replublic of Korea 804.
Ferrosilicomanganese	26,290	45,002	429	West Germany 11,141; Belgium-Luxembourg 10,528; Italy 10,459.
Ferrosilicon	46,945	40,739	933	West Germany 14,778; Italy 11,915; Japan 5,772.
Ferrosilicozirconium	1,809	1,221	244	Yugoslavia 322; Replublic of South Africa 126.
Unspecified	30,140	28,485	3,713	Belgium-Luxembourg 4,568; West Germany 4,165.
Semimanufactures:				
Steel, primary forms	966,668	887,352	141,670	Belgium-Luxembourg 424,821; West Germany 118,513.
Flat-rolled products:				
Of iron or non alloy steel:				
Not clad, plated, coated thousand tons	4,411	4,475	443	Italy 1,212; West Germany 579; Spain 508.
Clad, plated, coated do.	1,634	1,569	100	West Germany 342; Italy 198; Belgium-Luxembourg 113.
Of alloy steel do.	546	528	30	West Germany 108; Italy 73; Spain 62.
Bars, rods, angles, shapes, sections do.	2,462	2,662	209	West Germany 795; Italy 289; Belgium-Luxembourg 276.
Rails and accessories do.	92	126	1	Italy 24; Spain 13; Tunisia 8.
Wire do.	194	193	38	West Germany 46; Libya 19; Belgium-Luxembourg 10.
Tubes, pipes, fittings do.	1,036	1,372	74	West Germany 149; Italy 125; Iraq 96.
Lead:				
Ore and concentrate	23	10	—	Yugoslavia 5; Switzerland 3; Israel 1.
Oxides	18,163	21,531	—	Japan 6,773; Belgium-Luxembourg 4,566; U.S.S.R. 3,899.
Ash and residue containing lead	5,265	2,613	—	Belgium-Luxembourg 1,444; Netherlands 631; West Germany 537.
Metal including alloys:				
Scrap	5,455	12,692	—	West Germany 5,046; Ireland 1,937; Spain 1,864.
Unwrought	75,874	73,575	701	West Germany 24,452; Italy 10,903;

See footnotes at end of table.

TABLE 3—Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989: United States	Destinations, 1989: Other (principal)
METALS—Continued				
Lead:—Continued				
Metal including alloys:—Continued				
Semimanufactures	1,604	1,779	18	Netherlands 487; Belgium-Luxembourg 372; West Germany 119.
Lithium: Oxides and hydroxides	185	3	—	Mainly to Ivory Coast.
Magnesium: Metal including alloys:				
Scrap	490	299	21	Netherlands 215.
Unwrought	7,144	385	—	West Germany 187; Greece 70; Netherlands 67.
Semimanufactures	1,411	1,892	4	West Germany 1,155; Italy 321; United Kingdom 225.
Manganese:				
Ore and concentrate, metallurgical-grade	95,584	94,956	—	Norway 62,000; Italy 10,686; Spain 8,733.
Oxides	1,009	1,901	—	Belgium-Luxembourg 1,003; Italy 440.
Metal including alloys, all forms	7,294	6,823	393	West Germany 2,126; Sweden 1,103; United Kingdom 830.
Mercury	324	105	—	Netherlands 65; West Germany 22; Belgium-Luxembourg 6.
Molybdenum:				
Ore and concentrate	1,267	1,273	102	Austria 735; Belgium-Luxembourg 289.
Ash and residue containing molybdenum	226	400	—	United Kingdom 16 7; Austria 75; West Germany 58.
Metal including alloys:				
Scrap	76	96	—	West Germany 21.
Unwrought	75	72	(2)	Austria 41; West Germany 21.
Semimanufactures	160	127	13	Belgium-Luxembourg 21; West Germany 18; India 18.
Nickel:				
Ore and concentrate	—	289	—	Belgium-Luxembourg 163.
Matte and speiss	139	72	—	Belgium-Luxembourg 64.
Oxides and hydroxides	66	15	—	Replublic of Korea 6.
Ash and residue containing nickel	1,636	2,275	291	Netherlands 619; Belgium-Luxembourg 397; Austria 341.
Metal including alloys:				
Scrap	4,582	3,863	293	West Germany 2,069; Netherlands 562; United Kingdom 403.
Unwrought	7,038	6,263	2,076	West Germany 2,438; Sweden 490.
Semimanufactures	6,379	4,589	937	West Germany 2,218; United Kingdom 696.
Platinum-group metals:				
Waste and sweepings value, thousands	$4,464	$11,690	$36	Belgium-Luxembourg $5,495; Italy $3,782; Norway $831.
Metals including alloys, unwrought and partly wrought:				
Palladium kilograms	3,957	4,722	13	Austria 1,208; Netherlands 1,067.
Platinum do.	7,065	7,164	468	Netherlands 3,415; Spain 1,706; United Kingdom 705.
Rhodium do.	455	315	119	Belgium-Luxembourg 152; United Kingdom 25.
Iridium, osmium, ruthenium do.	24	32	6	Belgium-Luxembourg 23; West Germany 8.
Rare-earth metals including alloys, all forms	30	1	(2)	Mainly to Spain.
Selenium, elemental	13	26	—	Switzerland 11; Spain 7; West Germany 5.
Silicon, high-purity	35	45	4	Japan 17; West Germany 4.
Silver:				
Ore and concentrate	25	5	5	
Waste and sweepings[3] value, thousands	$8,872	$10,674	$79	United Kingdom $3,998; Switzerland $1,850; Italy $1,709.
Metal including alloys, unwrought and partly wrought kilograms	529,104	601,317	(2)	Switzerland 200,206; Spain 179,847; United Kingdom 76,844.

See footnotes at end of table.

TABLE 3—Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989: United States	Destinations, 1989: Other (principal)
METALS—Continued				
Tellurium, elemental	129	37	—	West Germany 13; Greece 6; Argentina 5.
Tin:				
Ore and concentrate	—	3	—	All to Belgium-Luxembourg.
Oxides	66	23	—	Mainly to Netherlands.
Ash and residue containing tin	87	68	—	Belgium-Luxembourg 31; West Germany 24; United Kingdom 9.
Metal including alloys:				
Scrap	468	442	4	West Germany 309; Belgium-Luxembourg 59; Netherlands 39.
Unwrought	205	171	—	West Germany 94; United Kingdom 25.
Semimanufactures	139	239	12	Spain 57; Tunisia 13; Belgium-Luxembourg 12.
Titanium:				
Ore and concentrate	481	4,735	—	United Kingdom 4,500; Malaysia 70.
Oxides	25,724	24,911	4,996	West Germany 5,284; Italy 2,675.
Ash and residue containing titanium	7,912	—		
Metal including alloys:				
Scrap	1,459	1,254	203	United Kingdom 580; West Germany 255.
Unwrought	130	230	1	United Kingdom 44; Egypt 40; Italy 39.
Semimanufactures	554	1,631	157	Taiwan 443; United Kingdom 189.
Tungsten:				
Ore and concentrate	99	(2)	—	All to Netherlands.
Oxides and hydroxides	100	62	—	Spain 42.
Metal including alloys:				
Scrap	203	148	—	West Germany 117.
Unwrought	176	(2)	—	Mainly to Italy.
Semimanufactures	62	288	11	United Kingdom 57; West Germany 46; Belgium-Luxembourg 42.
Uranium and thorium:				
Oxides and other compounds	2,184	1,515	191	U.S.S.R. 422; Belgium-Luxembourg 339.
Metal including alloys, all forms:				
Uranium	4,722	3,167	473	Niger 4,807; Nambia 2,209; Australia 1,305.
Thorium	1	(2)	—	Mainly to Japan
Vanadium:				
Ore and concentrate	—	(2)	—	All to West Germany.
Oxides and hydroxides	269	84	31	Belgium-Luxembourg 50.
Ash and residue containing vanadium	529	134	—	All to West Germany.
Metal including alloys:				
Unwrought including waste and scrap	4	1	1	
Semimanufactures	54	(2)	(2)	
Zinc:				
Ore and concentrate	31,190	26,823	1	Italy 14,686; Belgium-Luxembourg 11,626: Spain 511.
Oxides	21,059	23,134	403	Italy 4,083; West Germany 3,964; Belgium-Luxembourg 3,194.
Blue powder	2,961	2,066	—	West Germany 1,343; Belgium-Luxembourg 245; Italy 229.
Ash and residue containing zinc	28,594	33,937	95	Belgium-Luxembourg 17,999; Spain 7,608; West Germany 4,591.

See footnotes at end of table.

TABLE 3—Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989 United States	Destinations, 1989 Other (principal)
METALS—Continued				
Zinc:—Continued				
Metal including alloys:				
Scrap	23,086	28,844	22	Italy 6,177; West Germany 6,160; Belgium-Luxembourg 5,608.
Unwrought	75,513	85,772	7,613	West Germany 23,515; Italy 13,321; Belgium-Luxemmbourg 11,229.
Semimanufactures	39,498	42,263	79	Belgium-Luxembourg 16,378; West Germany 13,242; Hungary 2,693.
Zirconium: Ore and concentrate	3,291	3,288	—	Italy 1,299; West Germany 867; Netherlands 536.
Other:				
Ores and concentrates	133	173	1	Italy 121; Denmark 24; Spain 22.
Oxides and hydroxides	3,226	5,653	37	West Germany 5,372; Belgium-Luxembourg 96.
Ashes and residues	23,733	40,303	10	France 19,613; Italy 7,295; Canada 6,340.
Base metals including alloys, all forms	3	70	18	Japan 21; West Germany 17.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	2,415	3,331	28	Portugal 499; Turkey 402; Italy 245.
Artificial:Corundum	23,582	23,917	718	Netherlands 5,374; West Germany 4,507; Spain 3,137.
Grinding and polishing wheels and stones	7,951	10,048	604	Italy 2,295; United Kingdom 1,483; Netherlands 1,296.
Asbestos, crude	557	—		
Barite and witherite	93,888	89,037	523	West Germany 83,469; Italy 2,440; Belgium 1,215.
Boron materials: Crude natural borates	6,246	5,777	—	Spain 5,427.
Cement thousand tons	1,961	2,114	317	United Kingdom 749; Ivory Coast 206; West Germany 203.
Chalk	629,897	605,103	1,534	West Germany 172,210; Belgium-Luxembourg 140,439; Switzerland 56,444.
Clays, crude:				
Bentonite	9,006	19,315	20	Spain 5,246; Portugal 4,217; Netherlands 3,583.
Chamotte earth or dinas earth	128,642	141,729	—	West Germany 39,082; Italy 29,519; Netherlands 23,240.
Fuller's earth	3,971	4,113	—	Italy 3,244; Switzerland 629.
Fire clay	125,924	139,957	—	Italy 86,812; West Germany 26,894; Morocco 5,848.
Kaolin	248,253	267,080	10	Italy 84,107; West Germany 58,840; Spain 33,165.
Unspecified	82,474	89,212	6	Italy 54,565; West Germany 17,501; Spain 4,349.
Cryolite and chiolite	128	258	—	Replublic of South Africa 90; Switzerland 81; Tunisia 70.
Diamond, natural:				
Gem, not set or strung carats	35,098	43,982	3,307	Switzerland 17,940; Belgium-Luxembourg 6,831; Hong Kong 3,969.
Industrial do.	179,120	142,485	76,780	Belgium-Luxembourg 16,595; Netherlands 9,010.
Unsorted do.	7,931	12,267	—	Belgium-Luxembourg 11,936.
Dust and powder kilograms	167	239	5	Italy 115; United Kingdom 37; Switzerland 33.
Diatomite and other infusorial earth	36,309	36,767	—	West Germany 12,785; Italy 5,769; Belgium-Luxembourg 2,790.
Feldspar, fluorspar, related materials:				
Feldspar	77,857	119,843	—	Spain 65,550; Belgium-Luxembourg 22,010; West Germany 21,768.
Fluorspar	38,564	57,842	18	Italy 29,487; West Germany 14,968; Belgium-Luxembourg 5,259.
Unspecified	57	393	—	Mainly to Netherlands.

See footnotes at end of table.

TABLE 3—Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989 United States	Destinations, 1989 Other (principal)
INDUSTRIAL MATERIALS—Continued					
Fertilizer materials:					
Crude, n.e.s.		79,826	53,834	166	Switzerland 12,847; West Germany 12,774; United Kingdom 10,549.
Manufactured:					
Ammonia		93,568	42,505	—	United Kingdom 18,217; Finland 8,025; West Germany 5,176.
Nitrogenous		702,270	603,650	12,096	Spain 151,032; United Kingdom 71,395; Netherlands 62,122.
Phosphatic		190,198	278,103	—	West Germany 162,566; Switzerland 44,247.
Potassic		531,597	356,234	—	Belgium-Luxembourg 154,952; Netherlands 39,843.
Unspecified and mixed		564,079	645,489	55	Spain 107,960; West Germany 91,884; Ireland 74,096.
Graphite, natural		616	726	33	West Germany 367; Spain 51.
Gypsum and plaster	thousand tons	1,157	1,005	(2)	West Germany 507; Belgium-Luxembourg 1,375; Netherlands 49.
Iodine		69	30	—	Mainly to Netherlands.
Kyanite and related materials		46,516	49,764	18	United Kingdom 33,398; Sweden 2,223; Belgium-Luxembourg 2,164.
Lime		400,304	410,844	—	West Germany 293,736; Belgium-Luxembourg 84,442; Guinea 14,518.
Magnesium compounds:					
Magnesite, crude		450	573	—	Belgium-Luxembourg 498; West Germany 57.
Oxides and hydroxides		21,685	19,580	20	West Germany 6,778; Italy 2,992; Martinique 1,173.
Sulfate		930	720	—	Spain 424; Martinique 161; West Germany 72.
Mica:					
Crude including splittings and waste		7,414	8,405	44	West Germany 3,351; United Kingdom 1,770; Belgium-Luxembourg 730.
Worked including agglomerated splittings		1,352	1,214	9	Hong Kong 244; Switzerland 215; Italy 170.
Nitrates, crude		3	25	—	Mainly to Belgium-Luxembourg.
Phosphates, crude		4,459	12,863	—	China 10,500.
Pigments, mineral:					
Natural, crude		1,506	1,137	20	Togo 171; Spain 160; Burkina Faso 129.
Iron oxides and hydroxides, processed		9,716	13,068	90	Italy 6,458; West Germany 1,903; Spain 1,100.
Potassium salts, crude		—	2	—	All to Belgium-Luxembourg
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$52,224	$59,610	$6,558	Switzerland $40,277; United Kingdom $25,396.
Synthetic	do.	$19,039	$18,345	$718	Switzerland $11,920; West Germany $968; Italy $432.
Pyrite, unroasted		(2)	23	(2)	Mainly to West Germany.
Salt and brine		514,074	529,287	27,809	Italy 241,450; West Germany 83,100; Spain 32,245.
Sodium compounds, n.e.s.: Sulfate, manufactured		27,295	40,838	—	Italy 12,841; Spain 9,235; Iraq 6,998.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	thousand tons	168	196	15	Belgium-Luxembourg 88; Switzerland 46; West Germany 22.
Worked	do.	84	95	10	Belgium-Luxembourg 34; West Germany 19; Switzerland 11.

See footnotes at end of table.

TABLE 3—Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989: United States	Destinations, 1989: Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel —Continued					
Dolomite, chiefly refractory-grade	do.	93	69	—	Belgium-Luxembourg 30; West Germany 7; Spain 7.
Gravel and crushed rock	do.	10,864	11,522	6	West Germany 4,466; Switzerland 4,222; Netherlands 1,284.
Limestone other than dimension	do.	265	296	(2)	Norway 27; West Germany 118; United Kingdom 22.
Quartz and quartzite	do.	6	3	(2)	Switzerland 1; Belgium-Luxembourg 1.
Sand other than metal-bearing	do.	4,365	4,897	(2)	West Germany 2,412; Switzerland 1,103; Italy 806.
Sulfur:					
Elemental:					
Crude including native and byproduct		546,783	442,523	1	United Kingdom 158,463; Tunsia 88,422; Algeria 51,450.
Colloidal, precipitated, sublimed		556	356	—	Italy 81; Spain 76; West Germany 56.
Dioxide		2,294	1,197	—	Belgium-Luxembourg 866.
Sulfuric acid		247,595	287,347	—	Belgium-Luxembourg 203,915; United Kingdom 61,070; Ireland 12,742.
Talc, steatite, soapstone, pyrophyllite		141,420	146,352	4,270	West Germany 37,938; Netherlands 31,493; Spain 17,941.
Vermiculite, perlite and chlorite		1,155	700	—	Belgium-Luxembourg 301; Portugal 179; Algeria 58.
Other:					
Crude	thousand tons	1,652	1,371	(2)	Belgium-Luxembourg 1,257; Switzerland 96; West Germany 8.
Slag and dross, not metal-bearing	do.	428	325	36	West Germany 248; Belgium-Luxembourg 52; Switzerland 12.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		28,408	5,063	4	United Kingdom 2,311.
Carbon black		111,321	122,069	2	Spain 31,218; West Germany 27,471; United Kingdom 22,048.
Coal:					
Anthracite		38,351	62,562	9	Belgium-Luxembourg 21,358; West Germany 14,427; Tunisia 10,458.
Bituminous		1,644,505	745,379	—	West Germany 353,660; Norway 99,432; United Kingdom 76,157.
Briquets of anthracite and bituminous coal		17,652	13,361	—	Belgium-Luxembourg 7,291; Italy 5,080.
Lignite including briquets		664	1,022	—	Mainly to Spain.
Coke and semicoke		633,618	489,585	16,000	Norway 107,881; West Germany 91,113; Italy 54,887.
Gas, natural: Gaseous	thousand cubic meters	245,775	557,963	—	West Germany 354,966; Switzerland 101,142; Belgium-Luxembourg 81,805.
Peat including briquets and litter		3,338	3,383	—	West Germany 1,662; Italy 481; Ivory Coast 276.
Petroleum:					
Crude	thousand 42-gallon barrels	967	138	—	Mainly to Netherlands.
Refinery products:					
Liquefied petroleum gas	do.	6,252	8,048	458	Italy 3,172; West Germany 694; Spain 670.
Gasoline, motor	do.	15,241	NA		
Naphtha	do.	1,275	NA		
Mineral jelly and wax	do.	1,025	778	1	West Germany 431; Netherlands 93; United Kingdom 83.
Kerosene and jet fuel	do.	5,681	7,315	739	Switzerland 2,866; West Germany 1,041.
Distillate fuel oil	do.	18,695	11,728	223	Switzerland 5,201; West Germany 3,484; Spain 1,134.
Lubricants	do.	6,329	6,806	49	Belgium-Luxembourg 1,078; West Germany 990; Netherlands 7171.

See footnotes at end of table.

TABLE 3—Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum —Continued					
Refinery products—Continued					
Residual fuel oil	do.	20,546	2,530	2,339	Italy 5,047; United Kingdom 3,933.
Bitumen and other residues	do.	1,535	1,549	—	United Kingdom 429; Spain 323; Switzerland 148.
Bituminous mixtures	do.	172	200	(2)	Algeria 58; Belgium-Luxembourg 28; West Germany 22.
Petroleum coke	do.	4	7	1	West Germany 4; Belgium-Luxembourg 1; Canada 1.

NA Not available.
[1]Table prepared by Ronald L. Hatch.
[2]Less than 1/2 unit.
[3]May contain other precious metals.

TABLE 4

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	631	1,115	366	United Kingdom 391; West Germany 154.
Alkaline-earth metals	340	500	12	U.S.S.R. 238; China 93; West Germany 62.
Aluminum:				
Ore and concentrate	1,069,102	1,348,886	19	Guinea 988,071; Greece 123,519; China 92,525.
Oxides and hydroxides	267,147	410,179	1,301	Greece 175,510; Jamaica 73,031; New Guinea 56,146.
Ash and residue containing aluminum	16,545	10,552	—	West Germany 6,415; Belgium-Luxembourg 2,252; Italy 925.
Metal including alloys:				
Scrap	96,994	122,986	15,859	Netherlands 28,608; Belgium-Luxembourg 26,469; West Germany 20,604.
Unwrought	461,776	484,249	3,043	Norway 111,359; Netherlands 85,346; West Germany 61,731.
Semimanufactures	326,998	379,111	3,032	West Germany 108,102; Belgium-Luxembourg 72,007; Netherlands 28,167.
Antimony:				
Ore and concentrate	9,269	12,806	—	China 5,701; Bolivia 4,148; Australia 1,613.
Oxides	989	772	3	Belgium-Luxembourg 374; China 142; United Kingdom 81.
Ash and residue containing antimony	395	1,741	—	Peru 1,290; Spain 399.
Metal including alloys, all forms	1,080	2,729	(2)	China 1,652; U.S.S.R. 457; Thailand 323.
Arsenic:				
Metal including alloys, all forms	71	250	(2)	China 89.
Beryllium:				
Oxides and hydroxides	5	11	—	All from Spain.
Metal including alloys, all forms	11	2	1	
Bismuth: Metal including alloys, all forms	427	273	(2)	Belgium-Luxembourg 92; Peru 80; United Kingdom 81.
Cadmium: Metal including alloys, all forms	1,180	1,746	53	Netherlands 243; Belgium-Luxembourg 223; Finland 219.

See footnotes at end of table.

TABLE 4—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS—Continued				
Chromium:				
Ore and concentrate	80,910	81,288	—	Turkey 27,143; U.S.S.R. 19,230; Albania 17,409.
Oxides and hydroxides	7,167	8,571	7	United Kingdom 3,889; West Germany 2,977; Italy 1,271.
Metal including alloys, all forms	264	504	4	U.S.S.R. 208; United Kingdom 122; Japan 86.
Cobalt:				
Oxides and hydroxides	286	357	1	United Kingdom 3,889; West Germany 2,977; Italy 1,271.
Ash and residue containing cobalt	—	43	—	Norway 36; Netherlands 7.
Metal including alloys, all forms	1,563	1,518	142	Zambia 327; Zaire 282; United Kingdom 220.
Columbium and tantalum:				
Ore and concentrate	1	—		
Ash and residue containing columbium and tantalum	32	(2)	—	All from West Germany.
Metal including alloys, all forms, tantalum	45	30	22	Austria 2; West Germany 1.
Copper:				
Ore and concentrate	4,566	137	1	Italy 51; Netherlands 48.
Matte and speiss including cement copper	5,446	91	49	West Germany 29.
Oxides and hydroxides	805	1,058	10	Norway 391; Belgium-Luxembourg 349; Italy 211.
Sulfate	6,133	5,176	38	Italy 2,259; Netherlands 931; Spain 371.
Ash and residue containing copper	5,793	3,922	21	Italy 922; Belgium-Luxembourg 504; Switzerland 421.
Metal including alloys:				
Scrap	52,634	67,093	702	West Germany 14,678; United Kingdom 14,186; Belgium-Luxembourg 9,214.
Unwrought	401,037	438,812	2,868	Chile 140,595; Belgium-Luxembourg 136,917; Zambia 67,127.
Semimanufactures	228,069	273,360	2,123	Belgium-Luxembourg 88,382; West Germany 75,889; Italy 62,089.
Germanium:				
Oxides	17	7	—	Italy 6; West Germany 1.
Metal including alloys, all forms	3	11	(2)	Belgium-Luxembourg 9.
Gold:				
Waste and sweepings value, thousands	$1,409	$1,957	$148	Spain $514; Hungary $454; Switzerland $242.
Metal including alloys, unwrought and partly wrought kilograms	133,756	122,983	91,011	Switzerland 8,380; Mexico 6,162; United Kingdom 5,356.
Hafnium: Metal including alloys, all forms	(2)	(2)	—	Mainly from West Germany.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite-thousand tons	18,738	19,907	61	Brazil 5,588; Australia 4,039; Mauritania 2,853.
Pyrite, roasted	74,272	100,876	—	Italy 35,970; Belgium-Luxembourg 29,237; Spain 27,140.
Metal:				
Scrap	801,107	866,003	1,132	West Germany 378,182; Belgium-Luxembourg 236,997; Netherlands 122,711.
Pig iron, cast iron, related materials	321,991	319,837	32	West Germany 179,658; Canada 35,285; United Kingdom 19,709.
Ferroalloys:				
Ferrochromium	181,102	180,031	48	Namibia 90,128; Finland 22,085; Sweden 19,130.

See footnotes at end of table.

TABLE 4—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS—Continued					
Iron and steel:—Continued					
Metal:—Continued					
Ferroalloys:—Continued					
Ferromanganese		64,118	86,508	—	United Kingdom 19,500; Norway 19,304; Namibia 18,177.
Ferromolybdenum		2,093	2,086	—	Belgium-Luxembourg 861; United Kingdom 624; Austria 305.
Ferronickel		54,373	47,359	—	New Caledonia 38,817; Dominican Republic 4,518; Greece 4,139.
Ferroniobium		1,035	1,094	—	Brazil 556; United Kingdom 244; West Germany 220.
Ferrophosphorus		2,874	3,372	63	U.S.S.R. 2,525; Netherlands 303; West Germany 234.
Ferrosilicochromium		225	107	—	Zambia 104.
Ferrosilicomagnesium		2,776	5,144	717	Norway 3,027; West Germany 888.
Ferrosilicomanganese		51,409	45,141	—	Norway 35,408; Italy 6,390; Belgium-Luxembourg 2,325.
Ferrosilicon		57,591	59,029	142	Norway 30,585; West Germany 8,406; Italy 7,901.
Ferrosilicozirconium		76	314	302	NA.
Ferrotitanium and ferrosilcotitanium		1,882	2,582	1	United Kingdom 1,779; U.S.S.R. 254; Belgium-Luxembourg 219.
Ferrotungstun and ferrosilcotungstun		596	601	—	China 490; Austria 65; Netherlands 34.
Ferrovanadium		1,103	851	11	Belgium-Luxembourg 373; Austria 196; West Germany 182.
Silicon metal		12,931	13,341	(2)	Norway 6,018; Brazil 3,384; Sweden 1,610.
Unspecified		4,529	6,227	—	Italy 1,981; WestGermany 1,716; United Kingdom 775.
Steel, primary forms		584,851	551,953	234	West Germany 205,605; Belgium-Luxembourg 141,301; Italy 77,292.
Semimanufactures:					
Flat-rolled products:					
Of iron or non alloy steel:					
Not clad, plated, coated	thousand tons	3,889	4,130	34	Belgium-Luxembourg 2,230; West Germany 801; Italy 395.
Clad, plated, coated	do.	760	875	1	Belgium-Luxembourg 420; West Germany 209; United Kingdom 76.
Of alloy steel	do.	405	447	1	Belgium-Luxembourg 177; West Germany 159; Italy 29.
Bars, rods, angles, shapes, sections	do.	2,720	2,803	1	Italy 723; West Germany 667; Belgium-Luxembourg 646.
Rails and accessories	do.	37	43	(2)	Belgium-Luxembourg 20; United Kingdom 7; West Germany 3.
Wire	do.	309	311	(2)	Belgium-Luxembourg 92; West Germany 73; Italy 72.
Tubes, pipes, fittings	do.	778	783	2	Italy 265; West Germany 186; Belgium-Luxembourg 86.
Lead:					
Ore and concentrate		190,105	186,920	—	Republic of South Africa 43,406; Spain 25,725; Sweden 20,851.
Oxides		3,875	4,355	8	West Germany 3,875; Spain 127.
Ash and residue containing lead		9,059	5,206	—	Italy 3,537; United Kingdom 639; Netherlands 584.
Metal including alloys:					
Scrap		21,444	31,541	—	Netherlands 16,370; Belgium-Luxembourg 7,990.
Unwrought		46,904	47,690	3	United Kingdom 12,866; West Germany 11,999; Belgium-Luxembourg 11,509.
Semimanufactures		9,741	8,250	9	Belgium-Luxembourg 4,892; West Germany 2,504; United Kingdom 468.

See footnotes at end of table.

TABLE 4—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989 United States	Sources, 1989 Other (principal)
METALS—Continued				
Lithium: Oxides and hydroxides	388	378	48	West Germany 138; China 136.
Magnesium: Metal including alloys:				
Scrap	79	176	—	Austria 108; Belgium-Luxembourg 40; West Germany 12.
Unwrought	5,625	5,122	1,548	Norway 3,161; Yugoslavia 130.
Semimanufactures	567	804	14	West Germany 208; Italy 169; Belgium-Luxembourg 80.
Manganese:				
Ore and concentrate, metallurgical-grade	1,485,531	850,594	—	Gabon 603,379; Congo 85,664; Brazil 52,943.
Oxides	13,277	8,854	36	Greece 2,591; Netherlands 2,116; Belgium-Luxembourg 1,694.
Metal including alloys, all forms	2,198	3,376	34	Replublic of South Africa 903; Netherlands 698; China 664.
Mercury	131	129	—	Netherlands 27; Spain 27; China 16.
Molybdenum:				
Ore and concentrate	9,614	9,406	5,619	Belgium-Luxembourg 2,191; Netherlands 397.
Oxides and hydroxides	140	152	—	West Germany 52; Netherlands 48; United Kingdom 32.
Ash and residue containing molybdenum	247	331	95	Netherlands 118; Japan 48.
Metal including alloys:				
Scrap	39	59	(2)	Austria 53.
Unwrought	38	148	87	Austria 39; United Kingdom 16.
Semimanufactures	313	205	51	Austria 63; West Germany 52.
Nickel:				
Ore and concentrate	33	84	—	Netherlands 49; West Germany 26; Finland 5.
Matte and speiss	14,021	14,083	—	New Caledonia 13,934; Canada 88; Belgium-Luxembourg 48.
Oxides and hydroxides	646	204	—	Cuba 100; Canada 50; Finland 22.
Ash and residue containing nickel	955	802	109	Netherlands 368; West Germany 78.
Metal including alloys:				
Scrap	837	1,167	187	United Kingdom 461; West Germany 80.
Unwrought	25,062	26,996	513	U.S.S.R. 9,582; West Germany 3,273; Norway 2,791.
Semimanufactures	12,834	6,058	1,726	United Kingdom 2,253; West Germany 1,167.
Platinum-group metals:				
Waste and sweepings value, thousands	$15,273	$36,620	$11,566	West Germany $9,810; Spain $3,905.
Metals including alloys, unwrought and partly wrought:				
Palladium kilograms	4,028	5,567	431	West Germany 1,870; U.S.S.R. 633.
Platinum do.	6,343	6,746	533	Replublic of South Africa 1,733; United Kingdom 1,245; Switzerland 994.
Rhodium do.	512	544	20	United Kingdom 167; Replublic of South Africa 129; U.S.S.R. 102.
Iridium, osmium, ruthenium do.	22	52	29	United Kingdom 18.
Rare-earth metals including alloys, all forms	228	291	55	Austria 83; Brazil 70; United Kingdom 37.
Selenium, elemental	48	68	1	West Germany 11; Canada 10; United Kingdom 7.
Silicon, high-purity	136	321	4	Netherland 162; West Germany 104; Japan 24.
Silver:				
Waste and sweepings[3] value, thousands	$25,778	$31,811	$6,159	Spain $11,912; Switzerland $6,064.
Metal including alloys, unwrought and partly wrought kilograms	685,864	734,708	198,458	United Kingdom 123,274; Morocco 104,796.
Tellurium, elemental	57	20	(2)	Belgium-Luxembourg 9; West Germany 7; United Kingdom 2.

See footnotes at end of table.

TABLE 4—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989 United States	Sources, 1989 Other (principal)
METALS—Continued				
Tin:				
Oxides	85	77	(2)	United Kingdom 29; Italy 28; West Germany 19.
Ash and residue containing tin	8,346	(2)	(2)	
Metal including alloys:				
Scrap	4	2	—	Mainly from United Kingdom.
Unwrought	8,526	8,750	20	Malaysia 2,675; Belgium-Luxembourg 1,628; Brazil 1,413.
Semimanufactures	410	420	21	Netherlands 168; West Germany 133; United United Kingdom 17.
Titanium:				
Ore and concentrate	246,404	201,028	—	Canada 112,074; Australia 38,670; India 36,443.
Oxides	5,387	6,736	161	United Kingdom 2,092; Belgium-Luxembourg 1,723; West Germany 947.
Ash and residue containing titanium	120,457	23	—	NA.
Metal including alloys:				
Scrap	168	452	47	West Germany 232; United Kingdom 113.
Unwrought	1,613	2,437	89	Japan 1,637; U.S.S.R. 435; United Kingdom 221.
Semimanufactures	1,936	3,128	1,144	Japan 1,282; United Kingdom 356.
Tungsten:				
Ore and concentrate	17,175	4	—	Netherlands 2; United Kingdom 2.
Oxides and hydroxides	24	(2)	—	Mainly from Netherlands.
Metal including alloys:				
Scrap	28	62	—	Netherlands 60.
Unwrought	133	4	—	Netherlands 3; United Kingdom 1.
Semimanufactures	94	149	22	West Germany 76; Austria 13; United Kingdom 11.
Uranium and thorium:				
Ore and concentrate (monazite)	10,825	15,793	772	Australia 12,461; Replublic of South Africa 1,556.
Oxides and other compounds	152	137	(2)	West Germany 95; U.S.S.R. 36; Belgium-Luxembourg 5.
Metal including alloys, all forms, uranium	17,637	13,667	657	Nigeria 4,807; Replublic of South Africa 2,209; Canada 1,084.
Vanadium:				
Ore and concentrate	1	(2)	—	All from West Germany.
Oxides and hydroxides	88	252	(2)	Namibia 91; Netherlands 82; China 51.
Ash and residue containing vanadium	22	220	—	All from West Germany.
Metal including alloys:				
Scrap	53	—		
Unwrought	88	89	19	West Germany 70.
Zinc:				
Ore and concentrate	524,161	533,365	10,876	Canada 152,502; Sweden 76,410; Bolivia 55,627.
Oxides	11,650	12,990	1	Belgium-Luxembourg 3,817; West Germany 3,163; Netherlands 2,930.
Blue powder	7,256	7,083	—	Belgium-Luxembourg 6,291; West Germany 377; Norway 328.
Ash and residue containing zinc	55,624	50,131	3,965	West Germany 16,037; Belgium Luxembourg 15,462; Spain 4,008.
Metal including alloys:				
Scrap	10,029	11,418	18	Belgium-Luxembourg 4,292; Netherlands 2,299; Italy 1,706.
Unwrought	111,133	109,026	—	West Germany 31,949; Belgium-Luxembourg 30,907; Netherlands 26,274.

See footnotes at end of table.

TABLE 4—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS—Continued				
Zinc:—Continued				
Metal including alloys:—Continued				
Semimanufactures	18,548	10,354	258	West Germany 5,620; Belgium-Luxembourg 2,010; Netherlands 961.
Zirconium:				
Ore and concentrate	45,761	52,164	491	Australia 39,965; Namibia 5,908; Brazil 3,993.
Oxides	165	239	18	Unitied Kingdom 56; West Grmany 40.
Metal including alloys:				
Scrap	99	72	32	West Germany 15.
Unwrought	123	20	1	Italy 11; West Germany 5.
Semimanufactures	85	101	87	Sweden 5; Belgium-Luxembourg 2.
Other:				
Ores and concentrates:				
Of base metals	9,916	728	—	Greece 690; Italy 23; West Germany 13.
Of precious metals	1,226	22,716	—	Greece 22,587; Canada 99.
Ashes and residues	9,397	27,678	65	Spain 7,532; Belgium-Luxembourg 4,143; Brazil 1,983.
Base metals including alloys, all forms	22	88	8	West Germany 42; Belgium-Luxembourg 22.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	28,839	26,275	614	Turkey 18,034; Greece 2,412; Italy 1,542.
Artificial:				
Corundum	17,346	18,592	2,339	West Germany 5,110; Italy 4,540; Austria 2,801.
Silicon carbide	24,654	26,032	154	West Germany 6,197; Norway 5,207; Italy 4,056.
Dust and powder of precious and semi-precious stones excluding diamond kilograms	6	1,563	([2])	West Germany 1,548; Switzerland 10; Ireland 3.
Grinding and polishing wheels and stones	13,176	23,421	203	West Germany 11,657; Italy 4,077; Netherlands 2,487.
Asbestos, crude	76,365	66,556	82	Canada 32,641; U.S.S.R. 16,675; Italy 6,779.
Barite and witherite	34,250	45,441	—	China 12,910; Morocco 10,780; Belgium-Luxembourg 8,432.
Boron materials:				
Crude natural borates	128,340	105,905	5,021	Turkey 99,338; United Kingdom 967; Netherlands 257.
Elemental	6	29	2	Belgium-Luxembourg 25; West Germany 2.
Oxides and acids	3,176	2,040	231	Italy 1,396; West Germany 265.
Bromine	6,967	8,314	—	Israel 7,316; East Germany 510; United Kingdom 270.
Cement	545,565	634,106	15	Belgium-Luxembourg 359,785; Greece 99,955; West Germany 77,856.
Chalk	34,164	40,386	—	Belgium-Luxembourg 26,533; West Germany 12,021.
Clays, crude:				
Bentonite	114,725	125,749	7,667	Italy 64,031; Greece 31,734; West Germany 12,441.
Chamotte earth	22,084	29,114	2,518	West Germany 22,829; Czechoslavakia 3,376.
Fire clay	3,387	3,291	342	West Germany 2,443.
Fuller's earth	1,142	2,618	194	Spain 1,628; United Kingdom 652.
Kaolin	373,662	378,275	68,088	United Kingdom 231,785; West Germany 20,302; Czechoslovakia 19,166.
Unspecified	266,958	315,570	1,668	West Germany 226,481; Senegal 53,979; United Kingdom 15,910.
Cryolite and chiolite	748	797	—	Denmark 773.

See footnotes at end of table.

TABLE 4—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Diamond, natural:					
Stones:					
Gem, not set or strung	carats	450,940	314,179	8,565	Belgium-Luxembourg 140,801; India 65,291; Israel 44,772.
Industrial	do.	359,900	557,147	329,497	Belgium-Luxembourg 105,852; Zaire 39,318.
Unsorted	do.	47,454	26,668	—	Belgium-Luxembourg 21,132.
Dust and powder	kilograms	1,427	1,790	851	Ireland 405; Belgium-Luxembourg 297.
Diatomite and other infusorial earth		11,688	14,130	6,496	West Germany 3,815; Spain 2,234; Denmark 768.
Feldspar, fluorspar, related materials:					
Feldspar		29,021	32,008	—	West Germany 21,756; Portugal 5,149; Spain 2,121.
Fluorspar		14,220	21,852	—	Morocco 8,512; China 6,582; West Germany 5,600.
Leucite, nepheline, nepheline syenite		36,043	33,180	465	Norway 24,414; Canada 5,695; Netherlands 2,516.
Fertilizer materials:					
Crude, n.e.s.		84,269	100,802	778	Belgium-Luxembourg 42,417; Netherlands 36,356; Italy 14,813.
Manufactured:					
Ammonia	thousand tons	268	618	—	Trinadad and Tobago 159; Netherlands 142; U.S.S.R. 99.
Nitrogenous	do.	3,169	4,112	620	Netherlands 1,389; Belgium-Luxembourg 878.
Phosphatic	do.	658	848	1	Belgium-Luxembourg 404; Tunisia 160; Morocco 130.
Potassic	do.	1,151	1,428	8	Canada 338; United Kingdom 222; U.S.S.R. 185.
Unspecified and mixed	do.	2,029	2,200	139	Belgium-Luxembourg 920; Netherlands 348; Morocco 221.
Graphite, natural		5,707	6,424	101	China 3,056; West Germany 1,039; Austria 865.
Gypsum and plaster		229,331	185,551	481	West Germany 137,326; Switzerland 14,268; Spain 4,677.
Iodine		860	931	—	Japan 689; Chile 210; United Kingdom 18.
Kyanite and related materials		5,331	5,100	1,850	Replublic of South Africa 1,977; West Germany 573; Netherlands 277.
Lime		110,240	147,214	—	West Germany 75,412; Belgium-Luxembourg 40,525; Spain 17,254.
Magnesium compounds:					
Magnesite, crude		5,844	987	50	Italy 480; Austria 166.
Oxides and hydroxides		210,114	217,808	2,997	Greece 59,395; Spain 44,687; North Korea 33,932.
Sulfate		153,070	187,025	—	West Germany 151,232; East Germany 34,652; Belgium-Luxembourg 1,115.
Mica:					
Crude including splittings and waste		4,225	5,855	105	India 2,719; Brazil 1,400; Morocco 750.
Worked including agglomerated splittings		291	399	1	Belgium-Luxembourg 207; Switzerland 86.
Nitrates, crude		11,544	10,654	—	Belgium-Luxembourg 10,546.
Phosphates, crude		3,655,051	3,578,361	776,932	Israel 902,901; Morocco 654,730; Algeria 242,935.
Phosphorus, elemental		503	962	2	U.S.S.R. 395; Italy 224; West Germany 141.
Pigments, mineral:					
Natural, crude		14,747	1,068	—	West Germany 208.
Iron oxides and hydroxides, processed		42,497	50,341	547	West Germany 38,075; Belgium-Luxembourg 3,951; Italy 2,871.
Potassium salts, crude		58,260	74,040	—	U.S.S.R. 50,883; Israel 13,155; Jordan 10,000.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$93,372	$113,204	$4,717	Switzerland $47,874; Thailand $18,834; United Kingdom $5,450.
Synthetic	do.	$7,347	$9,342	$1,640	Mauritius $2,320; Switzerland $1,716.

See footnotes at end of table.

TABLE 4—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Pyrite, unroasted		1,317	1,188	139	Italy 863.
Salt and brine		181,248	169,210	81	United Kingdom 44,765; Netherlands 40,159; West Germany 26,768.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		68,640	69,110	4,311	West Germany 25,053; Belgium-Luxembourg 15,481; Poland 10,494.
Sulfate, manufactured		73,808	89,222	48	Belgium-Luxembourg 45,387; Spain 30,524; Austria 4,274.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		297,396	335,273	120	Namibia 54,012; West Germany 48,963; Italy 39,778.
Worked		420,848	438,161	37	Spain 218,110; Italy 130,144.
Dolomite, chiefly refractory-grade		368,856	315,935	—	Belgium-Luxembourg 288,323; Italy 17,138; West Germany 2,209.
Gravel and crushed rock		4,281,344	6,090,265	45	Belgium-Luxembourg 5,151,903; United Kingdom 390,346; West Germany 247,243.
Limestone other than dimension		187,241	202,948	—	Belgium-Luxembourg 202,795.
Quartz and quartzite		299,166	257,260	587	Belgium-Luxembourg 240,963; Italy 7,198; West Germany 1,823.
Sand other than metal-bearing		2,049,562	2,178,462	257	Belgium-Luxembourg 1,525,723; West Germany 278,214; United Kingdom 188,339.
Sulfur:					
Elemental:					
Crude including native and byproduct		762,013	636,923	47,896	Poland 273,821; West Germany 121,845; Canada 64,424.
Colloidal, precipitated, sublimed		535	604	(2)	Algeria 500; Spain 53; West Germany 36.
Dioxide		1,260	197	—	Belgium-Luxembourg 139; West Germany 58.
Sulfuric acid		166,896	166,638	—	Belgium-Luxembourg 58,476; United Kingdom 36,625; Spain 33,876.
Talc, steatite, soapstone, pyrophyllite		23,326	25,979	528	China 7,580; Belgium-Luxembourg 7,447; Italy 378.
Vermiculite, perlite, chlorite		92,101	98,429	330	Turkey 26,516; Namibia 22,779; Greece 21,182.
Other:					
Crude		3,510,146	4,126,654	1,669	Switzerland 3,583,027; Norway 211,758; Spain 179,855.
Slag and dross, not metal-bearing		2,490,686	269,573	2,923	Belgium-Luxembourg 114,348; Netherlands 77,944; West Germany 62,887.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		9,584	3,720	1,941	Belgium-Luxembourg 1,600; United Kingdom 73.
Carbon:					
Carbon black		113,674	112,619	1,178	West Germany 37,093; Netherlands 35,282; Italy 11,361.
Coal:					
Anthracite	thousand tons	1,988	1,808	9	Replublic of South Africa 865; Australia 141; U.S.S.R. 126.
Bituminous	do.	10,597	14,067	6,194	Australia 2,473; Columbia 1,303.
Briquets of anthracite and bituminous coal	do.	85	98	—	Mainly from West Germany.
Lignite including briquets	do.	125	136	—	West Germany 122; East Germany 14.
Coke and semicoke	do.	1,495	1,487	(2)	West Germany 551; Belgium-Luxembourg 319; Netherlands 316.
Gas, natural:					
Gaseous	million cubic meters	13,579	17,287	—	U.S.S.R. 8,141; Norway 5,347; Netherlands 3,799.

See footnotes at end of table.

TABLE 4—Continued

FRANCE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Gas, natural:—Continued					
Liquefied	thousand tons	6,751	6,562	—	Mainly from Algeria.
Peat including briquets and litter		479,970	550,410	—	West Germany 244,972; Netherlands 120,329; Belgium-Lexumbourg 93,719.
Petroleum:					
Crude	thousand 42-gallon barrels	488,649	492,275	—	Saudi Arabia 96,091; Norway 57,706; Iran 55,617.
Refinery products:					
Liquefied petroleum gas	do.	15,798	20,736	—	United Kingdom 5,852; Algeria 4,988; Saudi Arabia 4,355.
Gasoline and light oils	do.	42,579	Na		
Mineral jelly and wax	do.	597	695	99	West Germany 184; Netherlands 166.
Kerosene and jet fuel	do.	4,154	4,227	(2)	United Kingdom 1,066; Italy 781; Lybia 554.
Distillate fuel oil	do.	62,465	67,348	50	Netherlands 10,911; United Kingdom 10,062; Italy 7,517.
Lubricants	do.	1,353	1,713	28	Belgium-Luxembourg 435; Sweden 339; West Germany 231.
Residual fuel oil	do.	30,675	44,116	177	U.S.S.R. 12,276; Belgium-Luxembourg 5,162; Netherlands 3,071.
Bitumen and other residues	do.	2,004	2,675	7	Belgium-Luxembourg 980; Spain 698; West Germany 646.
Bituminous mixtures	do.	53	65	(2)	Belgium-Luxembourg 31; West Germany 12; Switzerland 9.
Petroleum coke	do.	7,894	8,773	7,750	West Germany 589; Spain 262.

NA Not available.
[1]Table prepared Ronald L. Hatch.
[2]Less than 1/2 unit.
[3]May include other precious metals.

of raw and partially processed material has forced the reduction of production. Furthermore, mines expected to close in the next few years were operated by Pechiney at Var and Herault and the mine owned by SA des Bauxites et Alumines de Provence at Blanquette, Var. The SA des Bauxites et Alumines operation, which had produced approximately 2,000 mt/a, was reportedly slated for closure in the early 1990's.

The closures of alumina refineries followed the pattern of the bauxite operations. The Gardenne plant, which was opened by Charles Bayer in 1893, remained the only operating refinery in France. Bauxite feedstock was purchased on the open market, as well as from the Aluminium Pechiney's Les Baux operations.

Aluminum.—Pechiney continued with plans to close the Nogueres and Riouperoux primary smelters in 1991. The 38,000-mt/a Nogueres smelter, in the Pyrenees, was one of Pechiney's oldest and would require substantial funds to modernize and implement environmental safeguards. The same situation existed with the 14,000-mt/a Riouperoux smelter.

Pechiney planned on replacing the aforementioned lost capacity with the 200,000-mt/a smelter under construction in Dunkerque. The new smelter was expected to be operational by 1992 at an estimated cost of $850 million.

Pechiney also announced plans to build two specialized foundries for aluminum beverage can recycling. One would be built at Nogueres at the site of the existing primary aluminum smelter. The foundry was scheduled to be operational in 1992 with a capacity to process 20,000 mt/a of cans. Cost of the project was estimated to be $710 thousand.

The second foundry was to be built at Nuef Brisach near Strasbourg. The foundry was also scheduled to be operational in 1992 with the same capacity as Nogueres. Cost of the second foundry was estimated at $1.1 million.

Antimony.—The Gagneraud Mine at Brouzils, Vendee, started limited production in late 1990. BRGM, the owner of the property, was continuing with a testing program to determine whether to go into full production. The ore, with a grade of about 7% antimony, was thought to be comparable in quality to Bolivian ore. If BRGM proceeds with the project, production was expected to be 200 mt/month per month of contained antimony. Most of the output was expected to be shipped to Compagnie Lucette, a BRGM subsidiary that produces antimony trioxide.

Other domestic sources of the metal are from the Societe Metaleurope refining of lead-zinc at Noyelles-Godault, la Societe des Mines de la Lucette works at Genest, and la Societe Industrielle et Chimique de l'Aisne at Chauny. France was importing most of its 4,500 mt/a of antimony metal requirements from Bolivia and China.

Gold.—Gold mining in France was mostly concentrated in two operations, Societe des Mines Produits Chimiques de Saligne's operations near Carcassonne and Societe des Mines du Bourneix's operations in the Saint-Yrieix District south of Limoges.

FIGURE 1

POTASH OPERATION, UNGERSHEIM MINE, MULHOUSE
(Mines de Potasse D'Alsace SA)

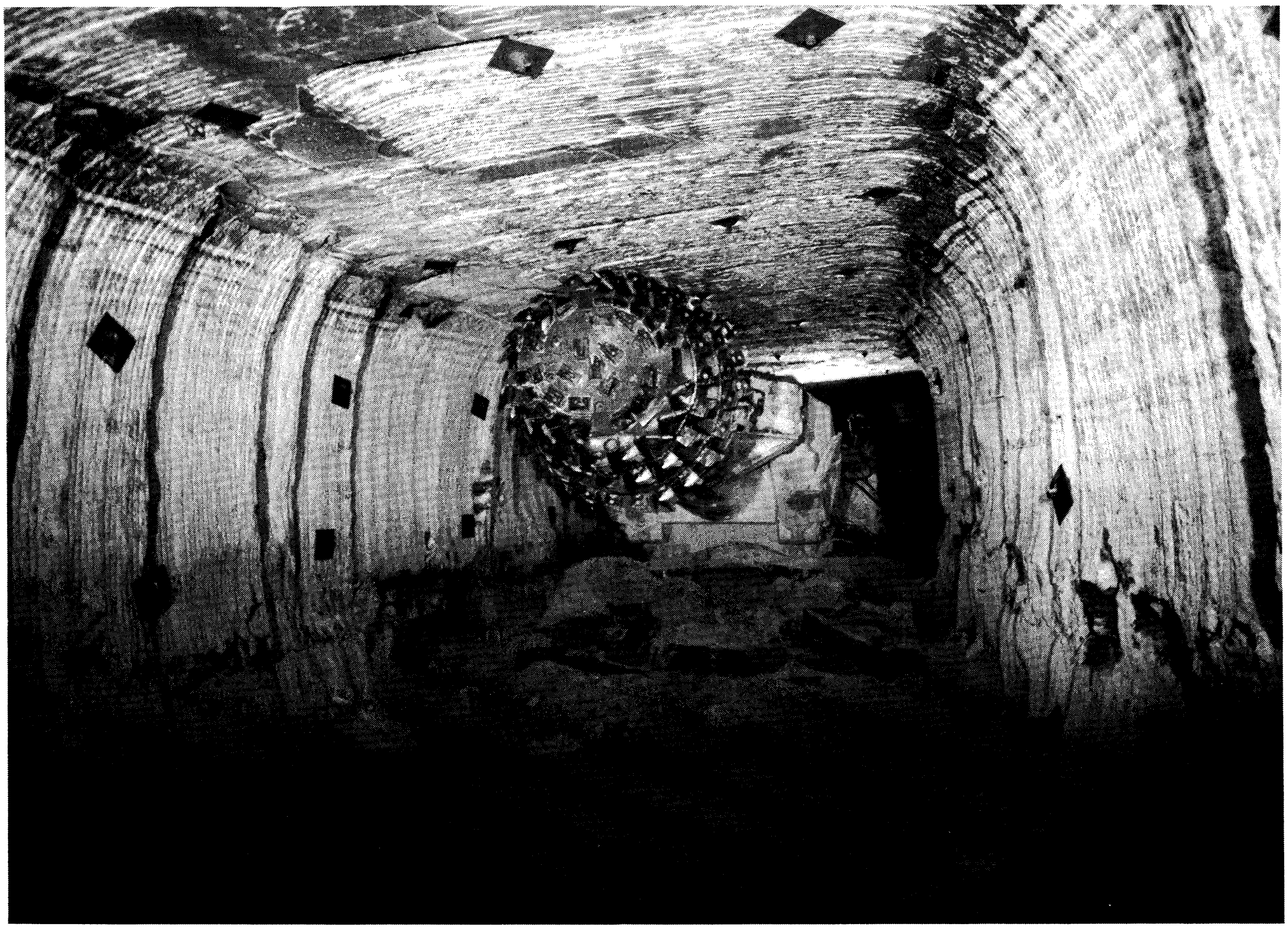


TABLE 5

FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Major commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Aluminium Pechiney	Plant at Gardanne, Bouches-du-Rhone Province	700.
Aluminum	do.	Aluminum smelters at— Saint-Jean-de-Maurienne, Savoie Province	120.
Do.	do.	Noguères, Pyrénées Atlantiques Province	115.
Do.	do.	Lannemezan, Hautes-Pyrénées Province	63.
Do.	do.	Auzat, Ariège Province	44.
Antimony, metal	Société Nouvelle des Mines de la Lucette	Plant at Le Genest, Mayeene Province	10.
Barite	Barytine de Chaillac	Mine and plant at Chaillac, Indre Province	150.
Do.	Société Industrielle du Centre	Mine at Rossignol, Chaillac, Indre Province	100.
Bauxite	Aluminium Pechiney	Mines in Hérault and Var Provinces	900.
Do.	Société Anonyme des Bauxites et Alumines de Provence (S.A.B.A.P.)	Mine at Combecave, Var Province	400.
Cadmium metric tons per year	Compagnie Royale Asturienne des Mines.	Plant at D'Auby-les-Douai, Nord Province	300.
Cement	Eight companies, of which the largest are— Ciments La Farge France	80 plants, including— including— 15 plants	23,233. (7,815).
Do.	do. Société des Ciments Français	Largest at St. Pierre-la-Cour 13 plants Largest at Gargenville	(1,160). (6,190). (1,100).
Coal	Charbonnages de France:	15,000.	 including—
Do.	Basin de Paris	Mines and Washeries	4,500.
Do.	Bassin Nord-Pas-de-Calais	Mines and washeries in northern France	(1,500).
Do.	Bassin de Lorraine	Mines and washeries in eastern France	(10,000).
Cobalt, metal metric tons per year	Société Métallurgique Le Nickel (SLN)	Plant at Sandouville, near Le Havre (treats New Caledonian nickel-cobalt ores)	600.
Copper, metal	Compagnie General d'Electrolyse du Palais.	Electrolytic plant: Palais-sur-Vienne, Haute Vienne Province	45.
Do.	Société Française d' Affinage du Cuivre (Afficuivre)	Smelter at Poissy, Yvelines Province	11.
Do.	Affinerie Sud-Ouest	Fire refinery at Toulouse	2.
Feldspar	Denain-Anzin Minéraux S.A.	Mine and plant at St. Chély d'Apcher, south of Clermont-Ferrand	55.
Ferroalloys	Société du Ferromanganese de Paris, Outreau	Plant at Boulogne-sur-Mer	420.
Do.	Pechiney Electrométallurgie (Pechiney)	12 plants at Bellegarde 27 furnaces	387.
Do.	Chromeurope SA	Plant at Dunkerque	25.
Fluorspar	Société d'Enterprises, Carrières et Mines, de l'Esterel (SECME)	Fonsante Mine near Adrets d'Esterel, Var Province	150.
Do.	Denain-Anzin Mine-aux Orientales Province	Mine and plant at Escaro, Pyrénées-	120.
Do.	Société Générale de Recherches et d'Exploitation Miniére (SOGEREM)	Open cast mine at Montroc, Tar Province	100.

See footnotes at end of table.

TABLE 5—Continued

FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Major commodity	Major operating companies	Location of main facilities	Annual capacity
Flourspar:—Continued	Comifluor S.A.	Plant at Bastide-á-Olette, Pyrénées-Orientales Province	80 concentrate.
Do.	Compagnie Miniere Dong Trieu	Mine at Lussac-les-Eglises	NA.
Do.	Compagnie Française des Minérais d'Uranium (CFMU)	Mine at Autun in Saone-et-Loire	50.
Iron and steel:			
Iron ore	Bassin de Lorraine Aciéres Réunies de Burbach-Eich-Dudelange, (ARBED) and Usinor-Sacilor	Mines in eastern France	10,000.
Do.	Bassin l de l' Ouest: Société Métallurgique de Normandie (SMN)	Mines in Normandy	500.
Steel	Usinor-Sacilor	Dunkerque	7,500.
Do.	do.	Fos-sur-Mer	4,200.
Do.	do.	Seramange	3,000.
Do.	Unimétal, Unsinor-Sacilor	Gadrange, Neuves Maisons, Thonville,	
Do.	do.	Montéreau, Garcenville,	
Do.	do.	Trith-St.-Léper	8,432.
Do.	Asocmétal, Unsinor-Sacilor	Dunkerque, Fos-Sur-Mer, Hagondange,	
Do.	do.	St. Etienne	1,355.
Lead, metal	Société Minière et Métallurgique de Penarroya SA	Imperial Smelter, Noyelles Godault	150.
Lead-zinc, ores	do. Near Granges, Gard Province.	Mines and plants at Les Mailines,	50 (Pb).
Do.	do.	Saint-Salvy, Tarn Province	100 (Zn).
Magnesium metal	Société Française d'Electro-Metallurgie, Pechiney	Plant at Marignac, Haute Garonne	14.
Natural gas million cubic feet per year	Elf Aquitaine	Gasfield and plant at Lacq	700,000.
Nickel	Société Métallurgique le Nickel (SLN)	Sandouville plant, near le Havre (treats nickel mattes from New Caledonia)	16.
Petroleum:			
Crude	Elf Aquitaine	Oilfields in Paris Basin	1,000.
Refined 42-gallon barrels per day	Compagnie Française de Raffinage (Total)	Refineries at Gonfreville, Seine-Maritime Province, and La Mede, Bouches-du Rhone Province	446,000.
Do.	Shell-Française	Refineries at Petite Couronne, in Siene-Maritime Province	285,300.
Do.	do.	Berre, Bouches-du-Rhone Province	270,000.
Do.	Elf-France	Refineries at Feyzin, Rhone Province.	119,000.
Do.	do.	Donges, Loire-Atlantique Province	199,000.
Do.	do.	Grandpuits, Seine-et-Marne Province..	96,000.
Do.	Société Française British Petroleum (S.F.B.P.)	Refineries at Lavéra, Bouches-du Rhône Province	175,000.
Do.	Esso S.A.F.	Refineries at Fos-sur-Mer, Bouches-du Rhône Province	237,000.
Do.	Mobil Oil Française	Refineries at Gravenchon	62,000.
Do.	Cie. Rhenane de Raffinage (CRR)	Refinery at Reichstett, Bas-Rhin	80,000.
Potash	Mines de Potasse d'Alsace S.A. (MDPA)	Mines at Amélie, Marie-Louise, and Théodore in Alsace	1,750 (K_2O).
Salt, rock	Compagnie des Salins du Midi et des Salines de l'Est (C.S.M.S.E.)	Varangeville mine at Saint-Nicolas-de-Port in Neurthe-et-Moselle Province	9,000.

See footnotes at end of table.

TABLE 5—Continued

FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Major commodity	Major operating companies	Location of main facilities	Annual capacity
Sulfur	Société Nationale Elf Aquitaine (SNEA)	Byproduct from natural gas desulfurization at Lacq, Aquitaine	3,000.
Talc	Talcs de Luzenac	Trumouns, near Ariège	400.
Uranium metric tons per year	Cogema, Compagnie Générale des Matières Nucleaires,	Mines at Limousin	1,013 (U_3O_8).
Do.	do.	Vendée	500 (U_3O_8).
Do.	do.	Hérault	377 (U_3O_8).
Zinc metal	Compagnie Royale Asturienne des Mines (Belgium)	Electrolytic plant at Auby-les-Douai, Nord	115.
Do.	Société des Mines et Fonderies de Zinc de la Vieille Montagne (SGB, Belgium)	Electrolytic plant at Viviez, Aveyron	110.

NA Not available.
[1]Metric tons per year.
[2]Million cubic feet per year.
[3]Barrels per day.

Gold mineralization at Bourneix's mines is associated with galena, arsenopyrite, and pyrite within the broad quartzitic lenses covering an area 15 to 20 km in length.

Of the operating mines, the underground operations at Bourneix and Laurieras produce the greatest tonnage of gold ore and the highest gold content. Three smaller surface mines, Les Renartieres, Cros-Gallet Sud, and Les Fouilloux, truck their ores to the concentrator at Bourneix for processing. The original 60,000-mt/a concentrator batch processed the ores depending on the ore source and gold content of the ore.

To increase recovery, a new 35-mt/h concentrator was constructed, which should raise annual gold output to 1,600 kg. There were plans, pending environmental approval, for leaching and smelter facilities.

Iron Ore.—The famous iron ore basin of northern France stretches from Lorraine, France, northward into Belgium. However, for many years the high phosphorus and relatively low iron content of the ores has limited their desirability. The iron content of the ore varies from 30% to 32%. Consequently, iron ore production in Lorraine has been declining for several years because the lower grade ore cannot compete with higher grade imports. Iron ore production has decreased more than 50% in the past 10 years.

France's domestic producers were having a difficult time competing against foreign iron ore sources, which have higher grade ores and lower production costs. In the past, increased use of highly mechanized equipment and the use of Government subsidies have kept many mines in operation. In recent years, the uneconomic mines were closed, and others are to be closed as deposits are depleted.

Lormines announced a further rationalization that would reduce its work force and set production at 5 Mmt/a year for 1990 and 1991 from the company's four open pit mines.

Production from the other two French iron ore-producing basins, Normandy and Anjou, were following a similar trend in dropping to small fractions of previous production levels.

Iron and Steel.—As a result of the consolidation of the French steel industry and of recent purchases of additional production facilities outside of France, Usinor Sacilor S.A., the state steel group, ranks second in world steel production behind Nippon Steel of Japan. Usinor Sacilor was continuing to strengthen the company's market position both in Europe and in the United States by acquiring various activities.

In the United States, Usinor Sacilor acquired Jones & Laughlin Specialty Steel Corp. (J&L) for $270 million. J&L is the second largest U.S. producer of stainless steel sheet. Usinor was negotiating for a minority stake in LTV Steel, the third largest integrated steel producer in the United States. Also, the company agreed to purchase 50% of Georgetown Steel, a wire rod producer. Calvin-Captain, a subsidiary of Usinor Sacilor, entered into a joint-venture agreement with Bethlehem Steel Corp. of the United States. The agreement involved making cast iron mill rolls. In Europe, Usinor entered into a 50-50 joint venture with Arbed SA of Luxembourg to market certain products that both companies produce. These products are beams, joists, and special sections, including mineshaft supports. Also, the company took over Mateco of Italy and purchased 46.5% of Ancofer Feinstahl of Germany. Usinor acquired a 20% interest in the Cockerill subsidiary, Trefileries de Fontaine l'Eveque of Belgium; 51% of Alessio Tubi, an Italian small-diameter tubemaker; and CMB Acier, the Franco-British packaging steel producer.

Compagnie Francaise des Ferrailles (CFF), the largest independent scrap metal processor in Europe, continued with investments in shredders and joint ventures. CFF has investments in 22 shredder operations, including 1 each in Spain andBelgium and 2 in the United States. There were plans to construct four new sites in 1990. Three would be in France and one in Spain. CFF supplies about 4 Mmt of ferrous scrap annually, which is about 40% of the total French market.

Ferroalloys.—Usinor Sacilor S.A. announced plans to build a new 100,000-mt/a high-carbon ferromanganese plant at Dunkerque near its existing steel plant. This new plant, Societe Europeenne d'Alliages pour la Siderurgie (SEAS), was expected to supply one-half of the company's ferromanganese requirements when completed by the end of 1991. A long-term contract with Brazilian manganese producer Compania Vale Rio Doce (CVRD) was signed to supply approximately two-thirds of the plant's ore requirements.

Pechiney Electometallurgie shut down its ferrosilicon plant at Laudun in October and was not planning to resume operations until April 1991. Pechiney cited weak market conditions as the reason. The plant's annual output of 36,000 to 38,000 mt/a of standard-grade ferrosilicon would be reduced by about 10,000 tons. Pechiney was continuing to produce high purity and special grades of ferrosilicon at its Bellegarde plant.

Also, Pechiney ceased production of silicomanganese at the Dunkerque plant for the same period of time. Again, the decision to reduce output was related to the world supply demand situation. The company was continuing with metallurgical efforts and trial runs to produce silico manganese with low residual levels on the order of 0.05% to 0.1% carbon, 0.05% maximum phosphorus, and minimum iron content. If efforts are successful, Pechiney was intending to replace its standard-grade silicomanganese with the new grade material.

Lithium.—The use of lithium in alloying with aluminum is becoming more important, especially in the aerospace and automobile industries. In France, the granites of Beauvoir contain high concentrates of barium, lithium, niobium, tantalum, and tin. Owing to the low grades of lithium in ores and the physical problems of separating the metal from the silica minerals, lithium metal recovery has been difficult. Also, a concentration of approximately 7 kg of LiO_2 per ton of rock make economic exploitation of the deposit difficult. The ores are processed at the Pombliere Saint Marcel refinery facility operated by Metaux Speciaux, which produces lithium and other chemical compounds.

Polymetallics.—The Bureau de Recherches Geologiques et Minieres (BRGM) signed an agreement with Aztec Mining Ltd., the Australian subsidiary of AMAX Inc. of the United States. Aztec agreed to purchase 21.7% of the $50 million polymetallic Chessy project near Lyon, France. The mining operator, Societe Miniere de Chessy, a subsidiary of BRGM, and the major owner, Coframines, another BRGM subsidiary, retained the remaining interest in the project.

Exploration drilling has defined geological reserves of 5.4 Mmt of ore. Minable reserves were estimated to be 4.1 Mmt of ore at average grades of 2.5% copper and 7.8% zinc. The company expects to produce 20,000 mt/a of 28% to 30% metal content copper concentrate, 40,000 mt/a of 55% to 60% metal content zinc concentrate with a byproduct production of 100,000 mt/a of 52% sulfur content pyrite, and 60,000 mt/a of chemical-grade barite. The delineation of the ore body indicated that mining was best suited to a highly mechanized method using the sublevel stoping. In thin zones, stoping is to be followed by cement backfilling, whereas the room-and-pillar method was to be used for the thicker areas. The ore was to be crushed underground and transported to the surface via a 25% gradient conveyor for further processing.

Permits to allow construction of the plant and underground mine work to commence were expected to be obtained by mid-1991. Production was scheduled to begin in early 1993, with an estimated mine life of 14 years.

Metaleurop S.A. operated two lead-zinc mines, one at Les Malines and the other at Noailhac-Saint Salvy. The company increased production at Les Malines to offset the lower metal content of the ore and increased efficiency to reduce operating expenses.

At the Saint Salvy Mine, Metaleurop had production difficulties related to irregular mineralization in the Rouquis East zone. This resulted in a decrease in tonnage mined, lower metal content of the ore processed, and an increase in mining costs. Efforts were underway to cut costs and increase metal content of ore processed. Metaleurop, in collaboration with BRGM, was continuing exploration of the western extension of the main vein of the Saint Salvy deposit.

Uranium.—Cogema, the state-owned uranium mining company, was continuing with the closure of a select number of mines in western France. In recent years, the pace of exploration has decreased, and projected future ore requirements have leveled off. The nuclear energy industry has ceased to expand, as it has done in previous years. In fact, many projects worldwide have been halted or canceled.

The Division Miniere Vendee (DMV) is one of four divisions of Cogema and is based in the Loire-Atlantique region of western France. There were four mines and a 450,000-mt/a processing plant, which produced about 650 tons of metal content of uranium per year. Two of the mines, Ecarpiere and Piriac, were closed in mid-1990, with the remaining two mines, Le Chardon and La Commanderie, scheduled to close in mid-1991. The processing plant at Ecarpiere would also be shut down. Cogema cited the low grade of ore mined by DMV as the reason for the closure of the division. Cogema has two other mining divisions in France, La Crouzille, near Limoges, and Herault in southwest France.

Cogema received permission from the French Ministry to construct a uranium oxide production facility at Tricastin. This would complement an existing plant at Tricastin, which recycles spent uranium hexafluoride.

Electricite de France (EdF), the State electricity utility, signed a draft agreement in mid-1990 to purchase four uranium mines in the United States. Two of the mines are in Texas, and two are in Montana. The mines were being operated by Malapai Resources Co., a subsidiary of Pinnacle West Capital. EDF already has a supply contract with Malapai that expires in 1994. If EDF does acquire the mines, then Total Mining Corp. was expected to operate them on behalf of the electricity group. EDF is the world's largest user of natural uranium and has a legal obligation to maintain a 3-year stockpile. Acquiring U.S. mines is part of a long-term strategy to ensure uranium supplies. The four mines could produce 10% of EDF's requirements.

Zinc.—Two companies operated primary zinc plants in France. The company, Societe des Mines et Fonderies de Zinc de la Vieille-Montagne (VM), Belgium, operated a zinc refinery at Auby-les-Douai with an annual capacity of 210,000 mt/a of zinc. This electrolytic plant is the newest and most modern in Europe and was built at a cost of $70 million in 1987. The other company, Metaleurop S.A., operated a 110,000-mt/a primary smelter and a 15,000-mt/a secondary smelter at Noyelles-Godualt.

Industrial Minerals

Andalusite.—Denain-Anzin Mineraux Refractaire Ceramique (Damrec), a subsidiary of the Imetal Group, was the only producer of andalusite in Europe. Damrec's mining operation is at Glomel, Brittany, and was producing about 75,000 mt/a. This placed France second only to the Republic of South Africa in terms of world output of andalusite. The company produced three grades of andalusite, which were distinguished by different alumina and iron oxide content. These products were sold to the refractory and ceramic industries.

Calcium Carbonate.—Blancs Mineraux de Paris's (BMP) new calcium carbonate plant at Saint-Croix-de-Mareui came onstream in late 1990. The plant, which cost about $8 million, has an annual production capacity of 70,000 tons of calcium carbonate slurry. This production will consist of wet-processed ultrafine ground carbonate for the paper industry.

BMP has four operations, including the new plant, in its carbonate-producing branch. The largest is a plant and quarry at Precy-sur-Oise that produces 170,000 mt/a of paper filler and polymer-grade ground carbonate through both wet and dry processing. The remaining two operations are in southwestern France and Portugal.

Cement.—Lafarge Coppee SA and Societe Des Ciments Francais are the two largest cement producers in France. During the past several years, these two companies have been acquiring a number of companies within France. Each company has gained control of approximately one-third of the domestic market, leaving fewer than eight other companies with the final one-third.

International expansion by Ciments Francais has resulted in the company becoming the world's number three cement producer, with an integrated position in construction materials. Lafarge also strengthened its international holdings by purchasing the Swiss company Cementia AG. This purchase gave Lafarge dominant share ownership of the Spanish company Ashland SA, in which Lafarge additionally purchased another 20% interest. This acquisition raises the company's production capacity to approximately 46 Mmt/a.

Fertilizer Materials.—France was the largest consumer of fertilizer in Europe, of which 97% was in the form of nitrogen and nitrogen compounds. Consumption of nitrogen fertilizers was about 5.5 Mmt, which represented a decrease from that of the previous year. Not only was this the result of bad climatic conditions for agriculture, it also reflected a growing public awareness of environmental issues and the policy of the EC to restrict the use of fertilizer and overproduction in the agriculture sector.

The state-owned chemical company Orkem S.A., formerly called CdF Chimie, was merged with Atochem S.A., a subsidiary of Societe Nationale Elf Aquitaine (SNEA). Orkem's business was split between the two state-controlled oil companies, SNEA and Total Compagnie Francaise des Petroles. SNEA bolstered its fertilizer and petrochemical business by acquiring Orkem's chemical facilities and by the previous purchase of Pennwalt Corp. of the United States during 1989. The increased chemical sales elevated SNEA from 14th to 7th largest chemical producer in the world.

The value added sectors of Orkem and the SNEA subsidiary, La Seignurie, were transferred to Total. These consisted of the adhesives, paints, acrylic, glass, and ink products business. Total, like SNEA, had also acquired companies earlier in the year. The companies purchased were Coates PLC, a United Kingdom industrial inks producer, and Bostik Corp., a U.S. adhesives group.

This reorganization of the French chemical industry was an attempt to eliminate duplication of endeavors and to increase French chemical product competitiveness.

Pyreneenne de Charges Minerales operates a quarry and plant at Saint-Martin-Lys that dry processes high-whiteness saccharoid dolomite. Annual production was around 100,000 mt/a, of which about 50% went to the paint industry and the remainder to the fertilizer and glass industries.

Feldspar.—Production was from five companies. Ets Baux, at Saint Paul de Fenouillet, was the largest and operated three open pit mines and a plant with a production capacity of 180,000 mt/a. Most of the material produced was sold to the glass industry, with the remainder going to the ceramic industry.

Other producers were Ste. des Feldspaths du Midi and Ste. des Feldspaths du Morvan. These companies are part of the Pechiney group and produce for the ceramics industry. Annual capacity was 80,000 mt/a and 50,000 mt/a, respectively.

Societe d'Exploitation de Sables et Mineraux S.A.(Samin) has an open pit mine at Roche en Regnier with a production capacity of 70,000 mt/a. Samin produced phonolite, which is a fined-grained equivalent of nepheline syenite. This can be substituted for feldspar in most glassmaking and ceramic applications.

Fluorspar.—Societe Generale de Rechereches et d'Exploitations Minieres (Sogerem), a Pechiney subsidiary, controlled more than 60% of fluorspar production. The fluorspar vein deposits are found in Hercynian massifs, Massif Central, the Vosges, the axial zone of the Pyrenees, and the outer Alps.

Sogerem's mining operations supplies Comifluor S.A., another Pechiney subsidiary, which operates a plant at Olette. This plant produces acid-grade fluorspar (97% CaF_2) and electrical-grade fluorspar. Total production of both grades is approximately 45,000 mt/a. The Escardo Mine, owned by Denain-Anzin Mineraux, also ships approximately 90,000 mt/a from its surface operation to the Olette plant. The Societe Industrielle du Centre en Indre's mine at Rossignol and Societe des mines du Haut du Then's mine at Maxonchamp are two other fluorspar operations.

Gypsum.—France was one of Europe's largest producers of gypsum. Two-thirds of the production was from the Paris Basin. Four companies produce approximately 95% of the output. In recent years, France has reported increased sales of gypsum products to other European countries. The largest producer was SA de Materiel de Construction, with 2.6 Mmt of the total 5.8 Mmt produced annually. The largest operation was the 1.3-Mmt/a underground mine at Taverny.

Kaolin.—Kaolin deposits derived from the granite massifs in Brittany are the most actively mined in France. The largest mine, operated by Societe Kaoliniere Armoricaine, appeared to be at Quessoy. The mine has a capacity of 120,000 mt/a. Another deposit in this northern area of Brittany is Plemet. In the southern part of the peninsula, at Ploemeur, are the two operations of Societe des Kaolin d'Arvor and Societe Nouvelle d'Exploitation de Morbinan. Reportedly, these operations each have a capacity to produce 75,000 mt/a. The 50,000-mt/a operation in the northwest at Berrien is owned by Societe des Kaolins du Finistere and is used mostly in the paper and ceramics industries. Ball and refractory clays are produced in the Charante Basin to the southwest, producing more than 1 Mmt of crude clay per year.

Mica.—The country's three largest producers of mica have operations in Brittany. The mica produced was a byproduct of kaolin operations. Micarec SA, partially owned by Societe Nouvelle d'Exploitation des Kaolins du Morbihan, operated the kaolin deposit at Ploemuer, as does Kaolins d'Arvor SA, the second largest producer. Kaolins du Finisterre uses flotation at its Berrien deposit to process the mica.

Potash.—Mines de Potasse d'Alsace (MDPA) was the principal producer of potash with two mines, Marie-Louise and Amelie, near Mulhouse, Alsace. MDPA is the world's fifth largest supplier of potash salts. The main products are about 10 Mmt per year of 15.52% K_2O potash rock, which is concentrated to 62% potassium content material, bromine and industrial products, and rock salt for snow clearing. About 90% of the potash production is used by agriculture for fertilizer, and 10% is purified and treated for use in other industries.

The Alsace deposits in the Upper Rhine Valley are in the Mulhouse area where a graben of Late Eocene geologic age was filled with two influxes of seawater. The latter surge of seawater in Early Oligocene time resulted in the deposition of two potash-rich beds. The strata were subsequently folded in Pliocene time into three different basins, the Wittelsheim and Munchausen in France and the Buggingen in Germany. Based on estimated reserves, the French deposit will last into the next century.

In late 1990, the French Government banned the import of Soviet potash into France. In 1988, imports of Soviet potash represented 4% of the French market. By the first half of 1990, the share had risen to 10%. Concern for the French potash industry and its importance to the Alsace region prompted the Government to make its decision, which was approved by the Commission of the European Community.

Rare Earths.—Rhone-Poulenc S.A. is one of the world's leading processors of rare earths. In recent years, there has been growth in the rare-earth market for yttrium, neodymium, samarium, and cerium. This growth is due to developments and applications in permanent magnets, electronics, and superconductivity products.

Salt.—France is a significant European producer of salt. The country produces rock, solar, and vacuum salt as well as brine. Mining of rock salt is from two areas, Varangeville and Nancy, in northeastern France. One company, Cie Industrielle et Miniere, operates an 850,000-mt/a facility at Nancy and a 500,000-mt/a facility at Hautrives. Rock salt's share of crystallized salt production is about 7%.

Solar salt production is concentrated along the Mediterranean coast and on the Island of Corsica. This production accounts for 59% of the 4.7 Mmt/a crystallized salt capacity. Vacuum salt is produced at seven locations representing a capacity of 1.45 Mmt/a. This method of production accounts for the remaining crystallized salt capacity. The largest operation is the 600,000-mt/a facility operated by Cie. des Salins du Midi et des Salins de l'Est (CSME) at Varangeville in northeastern France. Brine salt output is not disclosed.

Talc.—Talc de Luzenac S.A. is not only significant to the domestic market, it is also Europe's largest corporate talc producer. In 1990, the company acquired Steetly Talc PLC of the United Kingdom and Talco e Grafite Val Chisone S.A. of Italy. This is in addition to the earlier acquisition of American French Talc of the United States. The company has majority shareholding in Talkumwerke Naintsche of Austria and Mineraria Valle Spluga of Italy and minority shareholdings in Talcos Pirenaicos of Spain and Luzenac Inc. of Canada.

In 1990, Borax Francais S.A., a subsidiary of RTZ Corp., purchased 92% of Talcs de Luzenac S.A. This purchase, which included the other talc mining interests previously acquired by Talc de Luzenac, has resulted in RTZ Corp. becoming one of the major talc producers in the world.

Talc de Luzenac's open pit mine near Aix-les-Themes is the largest in the company, with production of about 300,000 mt/a with more than 40 different grades of talc. In terms of estimated reserves, the deposit, which was considered one of the largest in the world, could support the current output for another 100 years.

Mineral Fuels

Coal.—All underground coal mines were closed in the Midi-Pyrenees region in southern France. In the northern producing regions, Charbonnages de France (CdF) was proceeding with further rationalizations, which resulted in reduced production. The Lorraine basin produced 8.4 Mmt, the Centre-Midi basin, 1.9 Mmt, and the Nord Pas-de-Calais basin, 200,000 tons. The two remaining mines in the Nord Pas-de-Calais basin, Oignies and l'Escarpelle, were closed at yearend. These closures ended more than 250 years of mining in the basin. CdF planned to stabilize production at 10 to 12 Mmt/a.

CdF and EdF were continuing with plans to add a number of coal-fired generating plants to the electrical utility grid, which was composed mostly of nuclear plants. The objective was to develop a large, pollution-free, coal-fired electric generating plant utilizing the technology present in smaller plants. Initially, a 250-MW plant was planned, which could be upscaled to 600 MW in the future.

Nuclear Power.—France produces more than 70% of its electricity with nuclear power. This nuclear development has reduced dependence on foreign oil, minimized the environmental effects of burning fossil fuels, and stimulated the economy. There were 55 enriched uranium-fueled pressurized water reactors (PWR) in operation that produced 260 billion kW-h of electricity. About 12% of production was exported to neighboring countries.

EdF signed agreements with Soviet agencies for cooperation in various nuclear fields. Areas of possible cooperation were operational safety; accident recovery; design, construction, and decommissioning of nuclear facilities; and enrichment of reprocessed uranium.

EdF plans to shut down its four gas-cooled reactors (GCR) between 1990 and 1994. The first GCR, St. Laurent A1, was closed in 1990. St. Laurent A2 will be shut down after decommissioning of the unit is completed. There were no plans to dismantle these reactors until several decades after their decommissioning.

Petroleum and Natural Gas.—Elf Aquitaine, the 53.9% state- owned oil company, was negotiating with the U.S.S.R. to begin a 5-year petroleum exploration program starting in 1991. The company would explore 10,000 km^2 of territory in the west of Kazakhstan and in Russia. Elf was also planning to eventually develop refinery distribution and petrochemical operations.

The company has been active in amassing reserves elsewhere. Elf's purchase of Occidental Petroleum Corp.'s North Sea petroleum and natural gas holdings has made it the fourth largest North Sea producer after Royal Dutch/Shell Group, Exxon Corp., and British Petroleum Co. PLC.

In 1990, onshore petroleum production was mainly from the Paris Basin, which produced an estimated 13 Mbbl, and the Aquitane Basin, which produced an estimated 8 Mbbl. Since production has started to decline in these areas, the Government was planning to initiate a program to encourage exploration for new deposits in other areas thought to have good potential.

FIGURE 2
LACQ SULFUR AND NATURAL GAS REFINERY, PAU
(Societe National Elf Aquitaine)

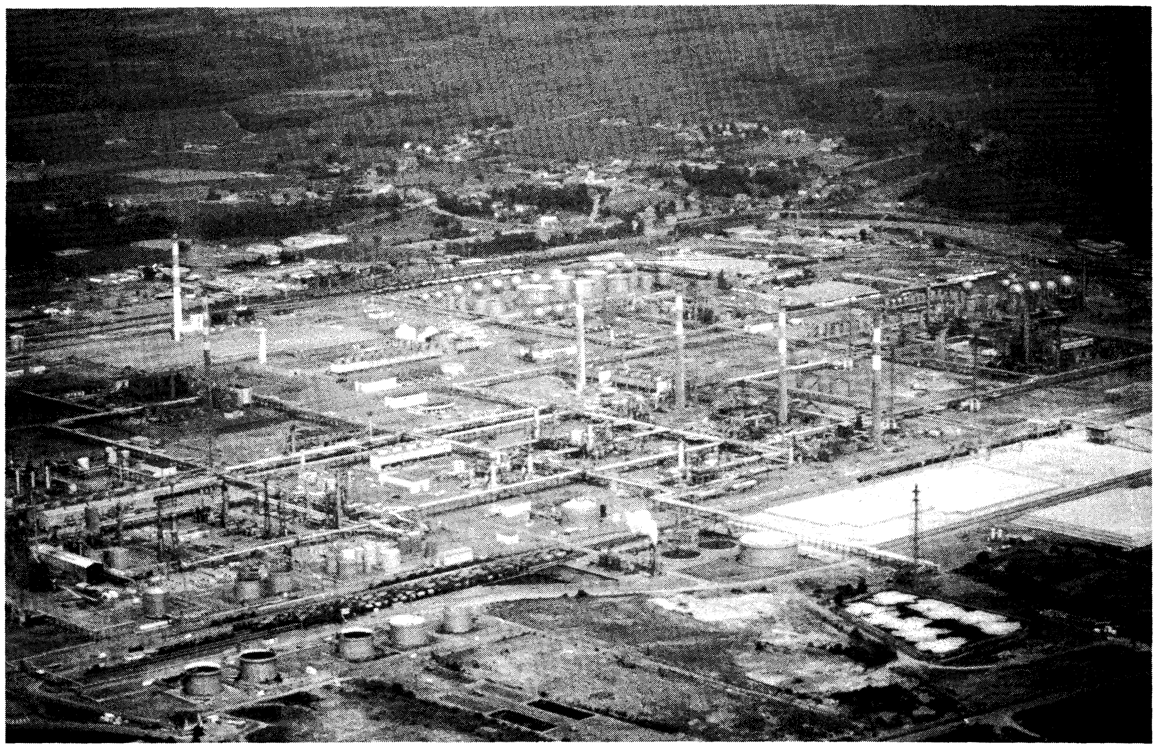


TABLE 6

FRANCE: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1990

(Million metric tons unless otherwise specified)

Commodity		Reserve[e]
Barite		2
Bauxite		5
Bromine	million kilograms	1.6
Coal		284
Copper and/or zinc ore		27
Fluorspar		10
Iron ore		935
Potash		20
Sulfur		10

[e]Estimated.

The Jura Basin was one area under consideration.

There were six companies that operated refineries in France: SNEA, Total CFP, Royal Dutch/Shell Group, British Petroleum Co. PLC, and Mobil Corp. France is a net petroleum products importer because of the structure of its refining industry and its products market.

The structure of the industry is geared to gasoline production. Refining is mainly focused on high octane unleaded gas because a majority of the vehicles in France can use this without engine modifications. There are no units capable of processing heavy fuels nor is there available hydrocracked feedstocks for the production of gas oil. This leaves the process stream short on middle distillates and naphtha.

INFRASTRUCTURE

France has a very modern and well-developed infrastructure. The French National Railways (SNCF) operates 34,568 km of 1.435-m standard gauge, of which 11,674 km was electrified. The system incorporates the use of superfast trains on selected tracks. Similarly, the highways are extensive and modern for the transport of goods and services. The inland waterways are increasingly used to transport more goods; however, they always have been significant avenues of commerce with 6,969 km of the 14,932-km-long waterway heavily used. The major sea ports are as follows: Bordeaux, Boulogne, Brest, Cherbourg, Dunkerque, Fos-Sur-Mer, Le Havre, Marseille, Nantes, Rouen, Sete, and Toulon. One of the most significant infrastructure developments in recent times has been the Channel Tunnel Project. Transportation, not only in France but also in the whole of Europe, will change significantly with the completion of the Channel Tunnel. The tunnel, being constructed underneath the English Channel, will connect Coquelles, near Calais, France, and Folkestone, England.

From these terminals, people will drive their cars and trucks onto high-speed trains that will transport them 49 km to each respective side in about one-half hour.

Completion of the project was scheduled for June 1993, at which time service between Calais and Folkestone would commence. The Channel Tunnel connecting the two countries will be a vital component of Single Market 1992 when the EC becomes one marketplace of 320 million people.

OUTLOOK

One of the world's most developed economies, France was an advocate for the EC and the 1992 common market. The country has had to make considerable changes in the structure of the industries within the country, particularly those controlled by the state. Several state-owned companies have taken the initiative to become leaders with their industries and significant producers in the world markets. Others have additional adjustments under rationalization schemes proposed by the EC or the Government. The depletion of natural resources and/or the cessation of subsidies for uneconomic operations will have impacts on the local communities and their economies. France will have the advantage of plentiful electrical power to attract industrial facilities requiring a good work force and access to the significant markets in Europe.

[1]Physical Scientist, Division of International Minerals.

[2]Where necessary, values have been converted from French francs (f) to U.S. dollars ($) at the rate of f5.45=$1.00, the average rate in 1990.

OTHER SOURCES OF INFORMATION

Agencies

Ministere de la Recherche et de l'Industrei
(Ministry of Research and Industry)
68 rue de Bellechasse
75353 Paris, Cedex 07
France

Bureau de Recherches Geologique et
Minieres (Bureau of
Geological and Mining Research)
Avenue de Concyr - BP 6009
45060 Orleans Cedex 2
France

Publications

Annales des Mines (Mining Chronicle).
Annuaire de Statistique Industrielle (Industrial Statistics Yearbook), annual.
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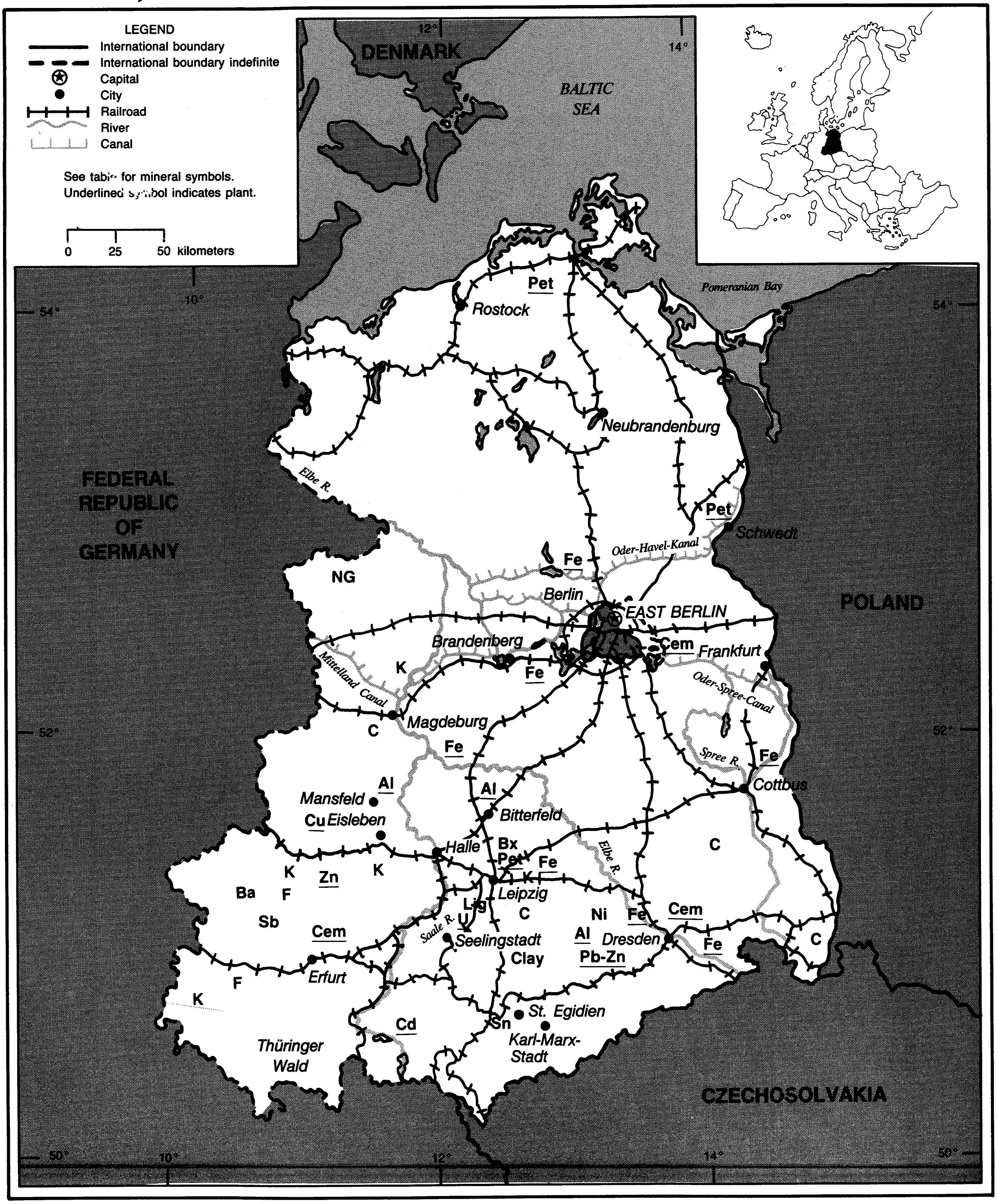
Matieres Premieres Minerales.

GERMAN DEMOCRATIC REPUBLIC

AREA 108,300 km² **POPULATION 16.6 million**



THE MINERAL INDUSTRY OF THE GERMAN DEMOCRATIC REPUBLIC

By George A. Rabchevsky

Lignite was the most significant contributor to the mineral industry of the German Democratic Republic (GDR), followed by potash and rock salt. In 1990, the GDR continued to be the world's leading producer of lignite and the world's third largest producer of potash. Mine output of copper, silver, and tin continued to decline because of decreasing ore grades and depletion of reserves. The GDR imported all its bauxite and iron ore and most of its natural gas and crude oil. The U.S.S.R. continued to be the GDR's chief supplier of mineral commodities.

In 1990, the decline in industrial production in the GDR, following the monetary, economic, and social union with the Federal Republic of Germany (FRG) resulted in a dramatic rise in unemployment, especially in mining and other heavy industries. At the end of the year, the unemployment rate was about 8.5% to 10%. Many of the country's manufactured goods were not considered to be marketable by western standards.

Pollution generated by the GDR's heavy industries was considered to be among the worst in Europe. Bitterfeld, 48 km north of Leipzig between the Elbe and Saale Rivers, was surrounded by chemical plants, metal processing plants, and lignite power stations. Waste from lignite, uranium, and potash mines was discharged directly into the Elbe River drainage basin. An aluminum smelter plant was also operated in Bitterfeld. In addition to copper, lead, phosphates, and zinc, the Elbe River was found to contain significant quantities of mercury. Acid rain has damaged about 45% of the forests. Therefore, the GDR has pledged to lower sulfur dioxide emissions 30% by 1993. In past years the GDR had spent less than one-half of 1% of its budget on environmental protection. It may take more than a decade to clean up the environment.

PRODUCTION

Total industrial output in the GDR fell by as much as 50% in 1990 compared with that of 1989. The production of almost all mineral commodities, including metals, industrial minerals, petroleum, natural gas, and coal, declined in 1990. Even before unification with the FRG, the GDR's industrial production was already declining; by midyear, it had fallen about 10% below its level in 1989. This partly was due to the migration of skilled workers to the FRG after the opening of the country's border as well as to the redirection of the GDR's centrally planned economy to a more market-oriented system.

TRADE

Following German reunification the FRG's Federal Bureau of Statistics released selected trade returns for East Germany. In 1990, exports fell 7.4% and imports fell 45%. Trade, especially with CMEA countries, declined sharply. Trade with the U.S.S.R. also declined. The FRG, Hungary, the U.S.S.R., and Yugoslavia were among the most important exporters of mineral commodities to East Germany.

The GDR traded with CMEA countries, with market-economy countries (predominantly the FRG), and with third world countries. Raw materials and energy products, however, came predominantly from the CMEA countries.

About 60% of the GDR's exports was destined for CMEA countries, one-half of which went to the U.S.S.R. Export trade with the market-economy countries consisted mostly of exports of raw materials, which mainly were composed of refined petroleum products derived from low-priced crude petroleum imports from the U.S.S.R.

STRUCTURE OF THE MINERAL INDUSTRY

The East German mining and mineral processing industry was centrally planned and was administered by Government ministries. In 1990, the structure of the industry began to change, moving away from centrally planned toward private enterprises. Treuhandanstalt trustee agency had the responsibility for organizing the conversion of state-owned industrial enterprises to privately owned firms.

COMMODITY REVIEW

Metals

Aluminum.—VEB Mansfeld Kombinat Wilhelm Pieck was one of the largest companies in the GDR. In addition to aluminum, the company produced cadmium, copper, and nickel metals. There were three operating aluminum smelters in the GDR. Bauxite and almost one-half of the country's aluminum metal requirement were imported primarily from Hungary and Yugoslavia. Aluminum metal was exported mostly to the FRG.

Copper.—The copper mines in Sangerhausen were shut down in 1990. The Mansfeld region has been associated with copper mining for eight centuries. Mansfeld was the center of the GDR's nonferrous metals industry and was the country's largest producer of aluminum, brass, and electrolytic copper.

Metallgesellschaft AG of the FRG reached an agreement with Intrac Handelsgesellschaft GmbH and VEB Mansfeld Kombinat Wilhelm Pieck of the GDR to build a secondary copper smelter in Thuringia. The capacity of the plant was envisioned at 80,000 mt/a of copper, with production to start in 1993. MG had commercial dealings with Intrac, a metal marketing agency, and with Mansfeld for more than 25 years.

Iron and Steel.—The GDR imported iron ore primarily from Krivoy Rog, in Ukraine. Compared with that of 1989, production of crude steel in the GDR dropped by about 29% in 1990. The country had about 15 steel plants operating, largely or-

TABLE 1

GERMAN DEMOCRATIC REPUBLIC: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989[p]	1990[e]
METALS						
Aluminum:						
Alumina:						
For metallurgical use		46,350	50,880	64,000	[r]63,000	[r]27,000
For other use[e]		20,000	20,000	20,000	19,000	18,000
Metal:[e]						
Primary		[r]66,000	[r]67,900	[r]61,200	[r]53,900	[r]21,000
Secondary		[r]10,000	[r]52,000	[r]10,000	[r]8,000	[r]5,000
Total		[r]76,000	[r]77,900	[r]71,200	[r]61,900	[r]26,000
Cadmium metal, primary[e]		18	18	20	15	15
Copper:						
Mine output, Cu content		[r][e]11,500	[r]10,000	[r]6,400	[r]4,500	[r]3,600
Metal:						
Smelter, primary		[r]64,000	[r]64,000	[r]61,000	[r]62,000	[r]39,900
Refined, primary and secondary, including alloys		[r]95,000	[r]95,000	[r]95,100	[r]93,600	[r]56,700
Iron and steel: Metal:						
Pig iron	thousand tons	[r]2,726	[2][r]2,743	2,786	[r]2,732	[3]2,159
Ferroalloys, electric furnace	do.	135	[r]127	131	130	125
Steel, crude	do.	7,967	8,243	[r]8,133	7,829	[3]5,566
Semimanufactures (hot-rolled only)	do.	5,656	5,887	5,708	5,600	4,000
Lead, refined, all sources[e]		[r]66,500	[r]62,100	[r]39,600	[r]40,100	45,500
Nickel:						
Mine output, Ni content, recoverable		2,000	[r]1,800	[r]1,500	1,500	[r]900
Metal, refined[e]		[r]3,000	[r]3,100	[r]2,600	[r]2,700	[r]1,300
Silver, mine output, Ag content, recoverable[e]	kilograms	[r]60,000	[r]60,000	[r]60,000	[3]59,700	[r]20,000
Tin:[e]						
Mine output, Sn content, recoverable		[r]2,200	[r]2,400	[r]2,500	[3]2,360	[r]1,800
Metal:						
Primary		[r]2,400	[r]2,400	[r]2,500	[r]2,500	[r]3,000
Secondary		[r]900	[r]1,000	[r]800	[r]800	[r]500
Total		[r]3,300	[r]3,400	[r]3,300	[r]3,300	[r]3,500
Zinc metal including secondary		[r]21,000	[r]21,000	[r]20,000	18,500	[r]12,700
INDUSTRIAL MINERALS						
Barite[e]		34,000	32,000	32,000	30,000	25,000
Boron materials: Processed borax, $Na_2B_4O_7$ $10H_2O$ content[e]		4,000	4,000	4,000	4,000	4,000
Cement, hydraulic	thousand tons	11,988	12,430	12,510	[r]12,264	[r]7,600
Chalk[e]	do.	40	40	40	35	30
Clay, kaolin:[e]						
Crude	do.	330	320	350	320	250
Marketable	do.	165	150	165	150	115
Fluorspar[e]	do.	100	90	90	90	70
Gypsum and anhydrite:						
Crude[e]	do.	340	320	320	310	300
Calcined	do.	305	299	302	292	250
Lime and dead-burned dolomite	do.	3,545	3,378	3,479	[e]3,400	3,000
Nitrogen: N content of ammonia	do.	1,193	1,176	1,156	[e]1,150	1,000

See footnotes at end of table.

TABLE 1—Continued

GERMAN DEMOCRATIC REPUBLIC: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989[p]	1990[e]
INDUSTRIAL MINERALS—Continued						
Phosphate, P_2O_5 content	thousand tons	309	291	285	[e]280	250
Potash, marketable, K_2O equivalent	do.	3,485	3,510	3,510	3,852	2,650
Salt:						
Marine	do.	59	59	60	[r,e]60	50
Rock[e]	do.	3,075	3,075	3,000	[r]3,084	2,450
Total	do.	3,134	3,134	3,060	[r,e]3,144	2,500
Sodium compounds, n.e.s.:						
Caustic soda	do.	638	577	627	[e]600	500
Soda ash	do.	885	893	914	[e]900	850
Sodium sulfate	do.	181	179	180	[e]175	170
Stone, sand and gravel:						
Crushed stone[e]	do.	15,000	14,500	14,500	14,000	12,000
Sand and gravel	do.	8,163	7,576	8,098	[e]8,000	7,000
Sulfur:						
Byproduct:[e]						
Elemental	do.	75	75	75	70	60
Other forms	do.	240	240	240	230	200
Sulfuric acid	do.	883	867	799	[e]750	650
MINERAL FUELS AND RELATED MATERIALS						
Coal, (lignite)	thousand tons	311,260	308,976	310,314	300,790	300,000
Coke, from brown coal	do.	5,601	5,230	5,447	4,959	4,500
Fuel briquets (from lignite)	do.	50,434	49,514	49,727	47,236	47,000
Gas:						
Manufactured	million cubic meters	7,958	8,104	7,485	[e]7,450	7,000
Natural, marketed production[e]	do.	13,000	13,000	12,000	11,400	10,000
Petroleum:						
Crude[e]	thousand 42-gallon barrels	360	360	360	350	300
Refinery products:						
Gasoline	do.	36,792	39,783	40,498	[e]40,000	35,000
Kerosene, jet fuel, distillate fuel oil	do.	49,013	49,458	48,832	[e]48,500	48,000
Lubricant	do.	3,317	3,365	3,539	[e]3,400	3,000
Residual fuel oil[e]	do.	60,000	65,000	65,000	63,000	62,000
Total[4]	do.	149,122	157,606	157,869	[e]154,900	148,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Oct. 1991.
[2]In addition to the commodities listed, gold, magnesium, peat, platinum-group metals, uranium, and a variety of construction materials were produced, but output was not reported, and available information was inadequate to make reliable estimates of output levels.
[3]Reported figure.
[4]Total of listed products only.

ganized under three combines. Open-hearth steelmaking accounted for about 42% of steelmaking capacity. The GDR's engineering and construction industries were the country's main consumers of steel. The automobile industry in the GDR was a far less significant consumer of steel than automobile producers in market-economy countries, largely owing to fewer units produced on a per capita basis and to greater use of plastics for automobile body construction.

Industrial Minerals

Cement.—The GDR was virtually self-sufficient in cement. VEB Zement Kombinat was the sole producer, with about 30 cement plants throughout the country. Most of the limestone was mined in open pit quarries.

Kaolin.—Most kaolin mines in the GDR operated in Seilitz in the Meissen region. Kaolin deposits in Caminau, Kemmlitz, Meissen, and Salzmunde formed the basis for the country's china and ceramic industry. About 320,000 to 350,000 mt of kaolin were produced annually. The GDR also was a significant exporter of kaolin to Hungary and Yugoslavia.

Kaolin-und Tonwerke Salzmunde GmbH operated two mines on the eastern side of the River Saale, a third mine at Atzdorf, and the fourth at Rossbach. Raw kaolin output from the two mines amounted to about 80,000 mt/a. Raw kaolin was processed at Salzmunde, of which 50% was exported. Industriemineralwerke Friedland GmbH, based at Friedland in the eastern Mecklenburg-Vorpommern region, produced about 75,000 mt/a of kaolin.

Potash.—The GDR remained the third largest producer of potash in the world after the U.S.S.R. and Canada and was a major world supporter of this mineral commodity. In 1990, production of potash declined by about 39% compared with that of 1989.

VEB Kombinat Kali was renamed "Mitteldeutsche Kali AG," a holding company in mid-1990. The three potash combines were also renamed, as "Kali Sudharz AG," "Kali Werra AG," and "Zielitzer Kali AG." The potash sales office was named as "Kali Bergbau/Handelsgesellschaft." Sudharz is the largest producer, followed by Werra and Zielitzer. Only the Volkenroda Mine, operated by Sudharz, was closed in 1990. The GDR's potash industry was a major source of environmental pollution. About 12 Mmt of salt was discharged into the Werra River, representing 90% of the pollution in the river flowing to West Germany.

Mineral Fuels

The GDR was largely dependent on imported gas and petroleum, mainly from the U.S.S.R. In 1990, the country's five nuclear plants were closed because of safety considerations.

The GDR remained the largest lignite producer in the world. About 65% of the country's lignite output was mined in the Cottbus area. Leipzig, one of the country's main lignite mining areas, and Bitterfeld, were among the most polluted areas in the GDR. To reduce pollution, the GDR planned to close many lignite mines and modernize its coal-powered plants.

In 1990, the country obtained about 80% of its primary fuel requirements and generated about 85% of its electricity from lignite. Primary energy consumption in the GDR fell by 14% (to 110 Mmt of standard coal equivalent). Furthermore, 3.4 Mmt of hard coal and coke (one-half the volume of that of the previous year) was imported in 1990.

Two FRG companies, PreussenElektra AG and Bayernwerk AG, announced an agreement with GDR energy cooperatives to build two hard coal powerplants in the GDR. Both plants will operate with imported coal.

TABLE 2

GERMAN DEMOCRATIC REPUBLIC: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Lautawerk GmbH	Plant at Lauta (closed in 1990)	50
Aluminum	Elektrochemische Kombinat (VEB Chemiekombinat)	Smelter at Bitterfeld (196 pots) (closed in 1990)	21
Do.	Lautawerk GmbH	Smelter at Lauta (64 pots) (closed in 1990)	15
Do.	do.	Secondary smelter	15
Do.	VEB Mansfeld Kombinat Wilhelm Pieck	Smelter at Eisleben	30
Barite and fluorspar	Fluss und Schwerspat GmbH	Barite Fluorspar	75 80
Do.	do.	Barite mines at Brunndebra, Steinbach, and Trusetal	NA
Do.	do.	Fluorspar mines at Ilmenau, Rottleberode, Schebrunn, and Steinbach	NA
Do.	do.	Processing plants at Ilmenau, Lengenfeld, and Rottleberode	NA
Cadmium	VEB Mansfeld Kombinat Wilhelm Pieck	Smelter at Eisleben	20
Do.	Electrowerke Weida	Smelter at Weida, Thuringia	10
Cement	Cement plants	About 30 plants, of which the major ones are—	13,000 including-
Do.	Karsdorf Zement GmbH	Plant at Karsdorf	(4,500)
Do.	Rudersdorfer Zement GmbH	Plant at Rudersdorf	(2,800)
Do.	Zementwerke Deuna GmbH	Plant at Deuna	(3,000)
Do.	Zementwerke Bernburg GmbH	Plant at Bernburg	(2,500)
Chalk	Kreidewerke Rugen GmbH	Quarries on Rugen Island	500
Coal, Lignite	Lausitzer Braunkohlen AG (Laubag)	Mines in Cottbus district at Schlabendorf Sud, Schlabendorf Nord, Sees area, and Greifenhain (10 coalfields)	200,000
Do.	Vgte Mitteldeutsche Braunkohlen AG (Mibrag)	Lignite mines and plants at Delitzsch-Kreis and Groitzsch Dreieck area (20 coalfields)	150,000
Copper	Mansfeld Rohhutten GmbH	Mine at Sangerhausen (closed in 1990)	6
Do.	do.	Smelter at Helbra (Eisleben) (closed in 1990)	25

TABLE 2—Continued

GERMAN DEMOCRATIC REPUBLIC: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Do.	Mansfeld Kupfer-Silber-Hutte GmbH	Smelter at Hettstedt	20
Do.	do.	Refinery at Hettstedt	55
Do.	VEB Kupfer und Bleichwalzwerk Michael Niederkirchner	Smelter at Ilsenburg	15
		Refinery at Ilsenburg	25
Do.	VEB Huttenwerk Kayser	Refinery at Berlin-Niederschoneweide	25
Feldspar	Naturstein und Mineralwerke Thuringen GmbH	Production from purchased and imported raw materials	50
Do.	Kahla Porzellan GmbH	Mines in Thuringen	30
Gypsum and anhydrite	Harzer Gipswerke Rottleberrode GmbH	Gypsum mines and plants at Rottleberrode	800
Do.	Leuna Werke AG	Anhydrite mine and plant at Niedersachswerfen	2,500
Do.	do.	Gypsum byproduct	200
Kaolin	Kemmlitzer Kaolinwerke	Major quarries at Frieden, Gluckauf, and Gruppendorf	500
Do.	Kaolin und Tonnewerke Salzmunde	Two quarries at Mderau	80
Do.	do.	Quarry at Rossbach	70
Do.	do.	Three processing plants at:	
		Rblingen	55
		Salzmunde	25
		Spergau	8
Do.	Caminauer Kaolinwerke GmbH	Mine at Caminau	60
Do.	Kaolin und Tonnewerke Seilitz-Lthain	Two mines at Lthain	19
Do.	do.	Quarry at Ockrilla	23
Do.	do.	Mine at Seilitz	8
Lead	VEB Buntmetall	Refinery at Freiberg	60
Do.	Freiberg Mining and Metallurgical Kombinat	Secondary smelting only at Freiberg	20
Do.	Huttenwerk Halsbrucke	Smelters at Halsbrucke and Muldenhuttten	24
Limestone	Harzer Kalk-Werke GmbH	Quarries at Bad Kosen, Hornberg, Kaltes Tal, Rubeland, Schraplau, and others	6,000
Do.	Erzgebirge Kalkwerke GmbH	Quarries at Hammerunterwiesenthal, Hermsdorf, Lengefeld, Oberscheibe, and others	250
Nickel	VEB Mansfeld Kombinat Wilhelm Pieck	Smelters at Mansfeld and Eisleben	2
Do.	Huttenwerk St. Egidien	Smelter at Aue	1.5
Petroleum, refined thousand 42-gallon barrels per day	The major ones are—		480 including—

Reserves

Official statistics on the GDR's reserves were not available. Table 3 presents estimates of reserves of selected minerals. Prospecting activity centered mainly on further delineation of lignite deposits and on development of petroleum and gas resources.

INFRASTRUCTURE

In 1990, the highways in the GDR totaled 124,604 km, about one-half of which were in poor condition. Railroads, 14,025 km in total, were well maintained and carried most of GDR's products, especially bulk freight such as coal and mineral ores. The seaports on the Baltic Sea were inadequate for industrial use, primarily because of the shallow water depth. Crude oil pipelines totaled about 1,300 km, refined products 500 km, and natural gas 2,150 km. Deliveries of Soviet crude oil have flowed through the 3,007-km-long "Friendship" oil pipeline from Almeteevsk (U.S.S.R.), through Poland, to the GDR since 1963.

OUTLOOK

In the GDR, reconstruction will remain the focus of domestic economic policy concerning the minerals industry. The inefficient and polluting plants, such as copper, lead, steel, zinc, and others, will be modernized or totally replaced. The cleanup of the rivers, soils, forests, factories, and cities has been discussed and the work was planned to start as soon as possible.

Industrial output in the GDR should continue to decline, primarily because of inefficient industrial facilities and the diminishing domestic and export markets. Noncompetitive plants would have to be modernized, operating costs and energy consumption sharply reduced, and large numbers of workers retrained. The FRG should also continue to restructure the entire GDR mineral industry and introduce new market-economy policies.

OTHER SOURCES OF INFORMATION

The GDR mining and mineral production agencies (Bundesministerium fur Erzbergbau, Kohle, Energie, and others) are going through a change. The official statistical yearbook (Statistisches Jahrbuch) and other publications were not published in 1990. However, part of

TABLE 2—Continued

GERMAN DEMOCRATIC REPUBLIC: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Petroleum, refined thousand 42-gallon barrels per day	VEB Leuna-Werke "Walter Ulbrecht"	Refinery at Leuna	(225)
Do.	Schwed Petrochemical Kombinat	Refinery at Schwed	(180)
Potash	Mitteldeutsche Kali AG, including—		3,000 (K_2O), including-
Do.	Zielitzer Kali AG	Mine and plant at Zielitz	(1,000)
Do.	Kali Werra AG	Mines and plants at Dornoff, Merkers, and Unterbreizbach	(800)
Do.	Kali Sudharz AG	Mines and plants at Sondershausen and Bischofferode	(700)
Do.	Kali und Steinsalz-betrieb Saak AG	Mine at Saak	(500)
Quartz, sand	Hohenbockaer Quartzwerke GmbH	Quarries at Hohenbocka, Lauta, and others	800
Do.	Sand und Tonnewerke Walbeck-Weferlingen GmbH	Quarries at Weferlingen	600
Do.	Quartzsand GmbH	Quarry at Nudersdorf	200
Salt, rock	Mitteldeutsche Stein- und Siedesalz GmbH	Mines at Stassfurt	3,500
Soda ash	Sodawerke Bernburg GmbH	Quarry at Bernburg	540
Do.	Sodawerke Stassfurt GmbH	Quarry at Frederstedt	100
Steel	EKO Stahl AG	Plant at Eisenhuttenstadt	2,200
Do.	Maxhutte Unterwellenborn GmbH	Plant at Unterwellenborn	2,000
Do.	Stahl-und Walzwerk Brandenburg GmbH	Plants at Brandenburg	1,500
Do.	Hennigsdorfer Stahl GmbH	Plant at Hennigsdorf	1,100
Tin	VEB Bergbau und Huttenkombinat Albert Funk	Mines and processing plants at Altenberg, Sadisdorf, and Ehrenfriedersdorf	3.5
Do.	do.	Smelter and refinery at Freiberg	4
Zinc	VEB Buntmetall	Refinery and smelter at Freiberg	30

TABLE 3

GERMAN DEMOCRATIC REPUBLIC: ESTIMATED RESOURCES[1] OF SELECTED MAJOR MINERAL COMMODITIES FOR 1990

(Million metric tons)

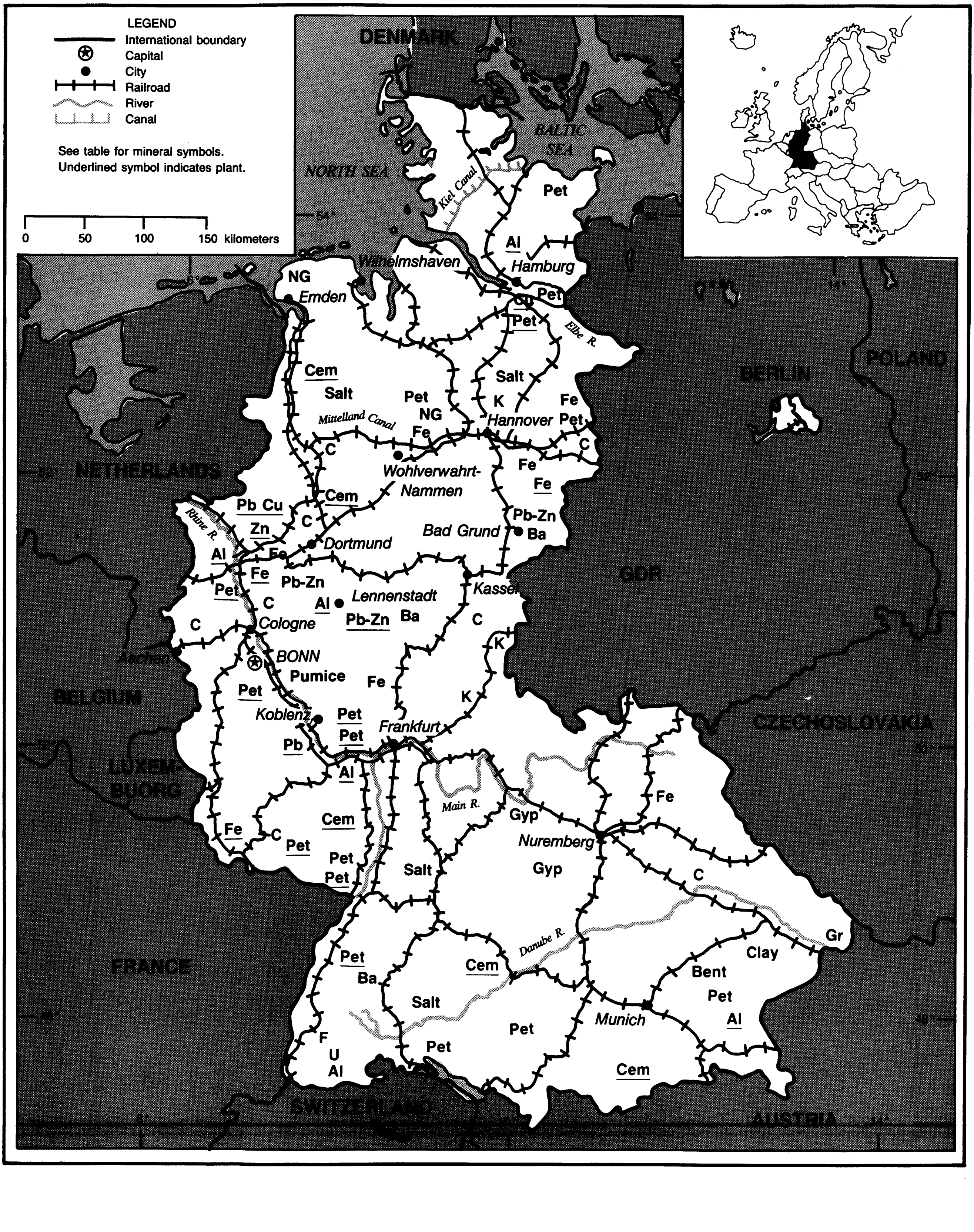
Commodity	Reserves
Anhydrite	120
Barite and fluorspar	1
Chalk	20
Gypsum	75
Kaolin	20
Lignite	30,000
Limestone	3,000
Potash	140
Sand and gravel	1,000
Tin (0.3% Sn)	17
(0.168% Sn)	145

[1]Measured and inferred reserves.

the GDR's mineral production was reported in the FRG's 1991 Yearbook, published by Verlag Gluckauf GmbH, Essen.

FEDERAL REPUBLIC OF GERMANY

AREA 248,900 km² **POPULATION 61.4 million**



THE MINERAL INDUSTRY OF FEDERAL REPUBLIC OF GERMANY

By George A. Rabchevsky

In 1990, the Federal Republic of Germany (FRG) was Western Europe's largest producer of steel, refined copper, refined lead, and refined zinc, and the second largest Western European producer of aluminum and cadmium. This production was based on imported raw materials. The FRG was also Western Europe's largest producer of potash, salt, sulfur and the second largest producer of cement and lignite.

GOVERNMENT POLICIES AND PROGRAMS

The 1982 law, Bergbau-Behinderungsgesetz, regulates the exploration and exploitation of all natural resources and includes health, safety, and environmental regulations. Prospecting and development may be subsidized by Government loans.

PRODUCTION

The FRG continued to be one of the world's major producers, processors, and consumers of minerals and metals. It was a large producer of secondary aluminum, refined copper, iron and steel, zinc metal, and coal. Although there was a plentiful supply of potash and salt, the country has depleted its metallic ore deposits. Much of the metal raw material base had to be imported to supply and maintain the mineral processing industry. The production of cement, dimension stone, limestone, and sand and gravel showed an increase in 1990. These minerals were destined primarily for the construction industry. Natural gas and refinery products generally showed a slight increase over those of 1989.

TRADE

Metallic raw materials were imported mostly from Australia, Canada, Chile, Guinea, the Netherlands, the United Kingdom, and others. Bauxite was imported primarily from Guinea, alumina from Australia, and aluminum metal from Norway and the Netherlands. Lead ore came mostly from Canada and lead metal from the United Kingdom. Copper ore was imported from Chile, Papua New Guinea, and others, while zinc ore was imported primarily from Canada, with some from Australia, Peru, and others. Copper metal was imported primarily from Chile.

STRUCTURE OF THE MINERAL INDUSTRY

Mining, metal, and mineral processing activities are controlled by privately owned companies. The Federal Institute for Geosciences and Natural Resources (Bundesanstalt fur Geowissenschaften und Rohstoffe) in Hannover publishes reports on mining and mineral information and participates in exploration and development. The Ministry of Industry publishes statistics on mining and production through the Statistisches Bundesamt in Wiesbaden.

Table 2 is a 1990 estimate of employment in the mineral industry in the FRG.[1]

The German Association of International Mining (Fachvereinigung Auslandsbergbau e.V.), in Bonn, is an organization of FRG companies with interests in the international mining industry. The association was founded in 1978 as a division of the Federation of the German Mining Industry (Wirtschaftsvereinigung Bergbau e.V.). The purpose of the Association is to provide a forum for an exchange of information for its member companies and to safeguard their interests in Germany and abroad.

COMMODITY REVIEW

Metals

Aluminum.—About 45% of total annual aluminum production in the FRG was from recycled materials. The country was the second largest producer of primary aluminum in Western Europe, after Norway. Vereinigte Aluminium-Werke AG (VAW), owned by Viag AG, is Germany's largest aluminum producer.

Aluminium Oxide Stade GmbH, with estimated capacity of 600,000 mt/a at the Stade plant, was the largest producer of alumina in Europe. Martinswerke GmbH, the second largest, has been involved in the alumina industry since 1914. Its Bergheim plant, with a capacity of 350,000 mt/a of alumina, is near the lignite coalfields in the Cologne area. Martinswerk and VAW were concentrating on the production of more specialty aluminas for the ceramics industry. The companies' markets were primarily in Europe, with specialty aluminas sold around the world. Bauxite was imported primarily from Australia and Guinea.

Copper.—The FRG was the largest producer of refined copper in Western Europe. Mine production of copper was a byproduct of the two lead-zinc mines. The FRG's largest copper smelter and refinery at Hamburg, with a capacity of 290,000 tons of refined copper, was operated by Norddeutsche Affineries AG (NA). Another company, Huttenwerke Kayser AG, operated a smelter and refinery at Lunen. A new tank house at Hamburg produces 160,000 tons of refined copper. Secondary materials are becoming increasingly important to the German copper industry.

Iron and Steel.—The domestic iron ore comes from the Wohlverwahrt-Nammen Mine, owned by Barbara Rohstoffbetriebe GmbH. FRG was the world's second largest importer of iron ore after Japan. About 44 Mmt of iron ore was imported in 1990 mostly from Brazil (44%), but also from Australia (11%), Canada (14%), Liberia (6%), and Sweden (13%).

The FRG was the largest producer of pig iron in Western Europe (30%), followed by France, the United Kingdom, and Italy. The country was ranked fifth in the world in pig

TABLE 1

FEDERAL REPUBLIC OF GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
METALS						
Aluminum:						
Bauxite, gross weight		410	—	—	—	—
Alumina	thousand tons	1,560	1,313	1,163	1,174	[2]1,173
Metal:						
Primary	do.	765	738	753	734	[2]715
Secondary:						
Alloyed	do.	441	470	517	546	[2]555
Unalloyed	do.	39	53	46	32	[2]35
Cadmium metal, smelter		1,218	1,125	1,159	1,208	[2]973
Copper:						
Mine output, Cu content		834	1,482	693	119	—
Metal:						
Smelter:						
Primary[e]		161,900	165,000	171,500	180,000	173,600
Secondary[e]		76,700	42,700	50,000	75,900	80,000
Total		238,600	207,700	221,500	255,900	[2]253,600
Refined including secondary:						
Electrolytic		339,053	308,069	336,450	375,781	376,989
Fired-refined		82,865	91,753	89,999	99,563	99,200
Total		421,918	399,822	426,449	475,344	[2]476,189
Gold: Mine output, Au content[e]	kilograms	37	26	16	16	18
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	717	247	70	102	[2]80
Fe content	do.	212	68	10	14	12
Metal:						
Pig iron	do.	29,018	28,517	32,453	32,777	[2]30,098
Blast furnace ferromanganese, spiegeleisen, ferrosilicon	do.	256	196	274	305	300
Electric furnace ferroalloys	do.	206	172	207	231	[2]191
Steel, crude	do.	37,134	36,248	41,023	41,073	[2]38,435
Semimanufactures	do.	27,540	27,437	30,385	31,699	30,000
Lead:						
Mine output, Pb content		16,736	18,844	14,264	7,710	7,300
Metal:						
Smelter:						
Primary		111,092	113,600	126,358	116,079	115,000
Secondary		255,529	226,778	218,739	234,633	230,000
Total		366,621	340,378	345,097	350,712	345,000
Refined:						
Primary		182,100	167,600	176,600	170,800	180,800
Secondary		184,500	172,800	168,500	179,100	168,000
Total		366,600	340,400	345,100	349,900	348,800
Platinum[e]	kilograms	56	62	68	68	65
Silver:						
Mine output, Ag content	thousand kilograms	28	31	31	9	8
Metal including secondary[e]	do.	622	684	622	[r]600	600
Tin metal including secondary[e]		[2]346	250	150	300	300

See footnotes at end of table.

TABLE 1—Continued

FEDERAL REPUBLIC OF GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	1988	1989[p]	1990[e]
METALS—Continued					
Zinc:					
Mine output:					
Zn content	103,700	98,900	75,625	63,900	[2]58,100
Zn content, recoverable	84,786	80,542	61,619	53,700	49,900
Metal, unwrought, unalloyed:					
Primary	344,319	348,188	309,879	297,514	300,209
Secondary	26,622	29,313	42,537	45,305	[2]37,391
Total	370,941	377,501	352,416	342,819	[2]337,600
INDUSTRIAL MINERALS					
Abrasives: Artificial corundum	88,447	84,576	88,253	91,806	[2]87,374
Barite	201,565	173,356	165,317	144,106	[2]147,776
Bromine[e]	2,500	2,500	2,500	3,000	3,000
Cement and clinker:					
Cement (excluding clinker) thousand tons	26,580	25,268	26,215	28,499	[2]30,456
Clinker do.	599	872	948	1,300	[2]1,310
Clays:					
Bentonite	179	167	197	200	220
Fire clay, excluding klebsand thousand tons	5,534	5,810	6,585	[e]6,800	6,900
Kaolin, marketable do.	512	588	673	777	780
Bleaching do.	1,319	269	300	[e]300	300
Fuller's earth do.	680	677	670	636	[2]653
Other (schieferton) do.	80	93	120	[e]90	80
Diatomite and similar earth, marketable	49,432	47,206	47,184	[e]47,000	47,000
Feldspar, marketable	247,498	310,447	308,776	[e]310,000	315,000
Fluorspar, marketable:					
Acid-grade	79,951	76,681	69,940	[e]67,050	67,000
Metallurgical-grade[e]	[2]8,883	8,520	7,770	7,450	7,500
Total	88,834	85,201	77,710	[e]74,500	74,500
Graphite:					
Crude	23,226	17,255	15,769	[e]14,000	14,500
Marketable[3]	13,233	9,891	9,666	[e]7,000	8,000
Gypsum and anhydrite, marketable thousand tons	1,896	1,707	1,743	1,720	1,800
Lime (hydrated), quicklime, dead-burned dolomite do.	6,476	6,111	6,801	7,033	[2]6,893
Nitrogen, N content of ammonia do.	1,570	1,931	1,824	1,732	[2]1,671
Phosphates: Thomas slag-based fertilizer, P_2O_5 content[e] do.	[2]54	50	45	[r]30	30
Pigments, mineral, natural	11,365	10,003	8,143	7,596	7,500
Potash, K_2O equivalent:					
Crude, marketable thousand tons	85	84	71	80	[2]65
Chemically processed do.	2,076	2,115	2,219	2,102	[2]2,150
Total do.	2,161	2,199	2,290	2,182	[2]2,215
Pumice:					
Crude and washed do.	612	580	265	330	[2]318
Marketable[e] do.	215	205	95	115	110
Pyrites, marketable concentrate, gross weight do.	471	412	313	342	340
Quartz, quartzite, glass sand:					
Quartzite do.	339	290	297	300	[2]283

See footnotes at end of table.

TABLE 1—Continued

FEDERAL REPUBLIC OF GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	1988	1989[p]	1990[e]
INDUSTRIAL MINERALS—Continued					
Quartz sand, ground — thousand tons	317	316	333	338	[2]352
Quartz sand, unground and glass sand — do.	6,557	6,128	5,793	6,018	[2]6,129
Salt, marketable:					
Rock and other — do.	12,498	12,862	11,900	11,256	12,000
Marine — do.	604	604	547	538	550
Sodium compounds:					
Soda ash — do.	1,442	1,448	1,404	1,443	[2]1,436
Sulfate, synthetic — do.	163	164	175	172	[2]167
Stone, sand and gravel:					
Dimension stone[4] — thousand cubic meters	257	264	291	314	315
Limestone, industrial — thousand tons	40,267	41,059	44,402	48,075	[2]48,716
Crushed and broken stone — do.	101,189	99,755	104,183	111,213	[2]114,137
Slate — do.	[e]25	22	27	21	[2]12
Basalt lava and lava sand — do.	7,657	8,023	[e]8,050	8,695	8,700
Grinding stone[e] — cubic meters	40	45	45	45	40
Sand and gravel — thousand tons	142,555	137,050	146,289	158,249	[2]159,091
Sulfur, byproduct:					
Of metallurgy[e] — do.	300	300	310	315	320
Of natural gas — do.	998	1,029	952	[e]1,050	1,000
Of petroleum[e] — do.	190	210	205	210	280
Unspecified[e] — do.	285	285	280	310	300
Total[e] — do.	1,773	1,824	1,747	1,885	1,900
Talc including talc schist — do.	22	20	[e]20	13	[2]12
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	383,666	361,982	379,999	401,853	[2]394,365
Coal:					
Anthracite and bituminous — thousand tons	80,801	76,300	73,304	71,428	[2]70,159
Lignite — do.	114,310	108,799	108,563	110,081	[2]107,525
Total — do.	195,111	185,099	181,867	181,509	[2]177,684
Coke, metallurgical — do.	22,254	19,674	18,274	18,384	[2]17,580
Fuel briquets:					
Of anthracite and bituminous coal — do.	1,199	1,001	825	723	[2]756
Of lignite — do.	3,630	3,188	2,526	2,214	[2]2,397
Gas:					
Manufactured (excluding that from petroleum refineries):[5]					
Blast furnace — million cubic meters	4,525	4,365	5,007	5,231	5,100
Coke oven — do.	5,381	4,723	4,392	4,455	4,400
Natural, gross — do.	13,865	15,871	14,783	14,650	[2]15,700
Peat:					
Agricultural use — thousand tons	2,017	2,002	2,123	1,580	1,600
Fuel use — do.	246	240	232	232	235
Petroleum:					
Crude — thousand 42-gallon barrels	29,015	27,447	28,437	27,231	[2]26,046
Refinery products:					
Liquefied petroleum gas — do.	23,270	24,963	26,483	26,149	[2]26,291
Gasoline, motor — do.	166,054	160,072	167,613	172,690	175,000
Jet fuel (including aviation gasoline) — do.	14,140	14,774	[e]16,000	[e]17,000	18,000

See footnotes at end of table.

TABLE 1—Continued

FEDERAL REPUBLIC OF GERMANY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Kerosene	thousand 42-gallon barrels	543	473	426	318	315
Distillate fuel oil	do.	259,668	242,517	273,305	254,550	257,000
Lubricants	do.	9,988	9,961	10,418	10,585	[2]13,492
Residual fuel oil	do.	65,468	58,355	57,582	46,294	50,000
Bitumen	do.	16,915	16,259	16,257	16,930	17,000
Unspecified[e]	do.	46,576	48,981	56,476	54,194	55,000
Refinery fuel and losses	do.	46,403	45,682	46,543	40,537	42,000
Total	do.	649,025	622,037	671,103	639,247	654,098

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Aug. 1991.
[2]Reported figure.
[3]Includes imported stock.
[4]Incomplete data.
[5]Other types of manufactured gas may be produced, but production data are not reported, and available information is inadequate to make reliable estimates.

TABLE 2

FEDERAL REPUBLIC OF GERMANY: EMPLOYMENT IN THE MINERAL INDUSTRY

Commodity/industry (ownership)	Employment/ work force
METALS	
Alumina Martinswerk GmbH (Alusuisse Deutschland GmbH)	1,030
Vereinigte Aluminium-Werke AG	(see "Aluminum")
Aluminium Oxid Stade GmbH (Vereinigte Aluminium-Werke AG, 50%; Reynolds Aluminium Deutschland Inc. 50%)	480
Aluminum (metal):	
Vereinigte Aluminium-Werke AG (Viag AG)	8,795
Leichtmetall-Gesellschaft AG	850
Hamburger Aluminium-Werk GmbH (VAW or 33.3%)	725
Copper (metal):	
Huttenwerke Kayser AG	[e]880
Lead and zinc (ore and concentrate):	
Preussag AG Metal (Preussag AG)	457
Sachtleben Bergbau GmbH (Meggen) (Metallgesellschaft AG)	384
Lead (metal) Berzelius Metallhutten GmbH (Metallgesellschaft AG)	1,250
Preussag-Boliden-Blei GmbH	[e]1,000
Norddeutsche Affinerie AG	(see "Polymetals")
Precious metals: Degussa AG	13,663
Polymetals:	
Hermann C. Starck Berlin GmbH & Co. KG	2,636
Norddeutsche Affenerie AG	2,906
Steel:	
Hoesch Stahl AG (Hoesch AG)	45,227
Thyssen Stahl AG (Thyssen AG)	41,253
METALS—Continued	
Stahlwerke Peine-Salzgitter AG (Salzgitter AG)	[e]39,000
Klockner-Werke AG (Klockner Stahl GmbH)	34,793
Krupp Stahl AG (Fried. Krupp GmbH)	25,147
Zinc (metal):	
Ruhr-Zink GmbH (Metallgesellschaft AG, 45%; M.I.M. Holdings Deutschland GmbH, 45%; VEW, 10%)	[e]470
Berzellius Metallhutten GmbH (Metallgesellschaft AG)	[e]300
INDUSTRIAL MINERALS	
Barite:	
Deutsche Baryt-Industrie Dr. Rudolf Alberti GmbH & Co. KG	99
Sachtleben Bergbau GmbH	26
Barite and fluorspar:	
Sachtleben Bergbau GmbH	110
Cement	[e]10,200
Fluorspar:	
Barbara Rohstoffbetriebe GmbH Fluss- und Schwerspatwerke	119
Pforzheim GmbH	65
Graphite:	[e]140
Graphitwerk Kropfmuhl AG	[e]20
Gypsum:	[e]1,240
Gyproc GmbH Baustoffproduction & Co. KG	100
Kaolin:	[e]1,600
Otto Schmidt, Kaolinwerk	25
Erbsloh Geisenheim GmbH & Co.	[e]20
INDUSTRIAL MINERALS—Continued	
Kaolin, quartz, feldspar:	
Kaolin- u.Kristallquarzsand-Werke (Gebruder Dorfner)	330
Potash and salt:	
Kali und Salz AG	7,613
Steinsalzbergwerk Borth I/II (Deutsche Solvay-Werke GmbH)	539
Werk Unterelbe (Akzo Zout Chemie GmbH)	270
Wacker-Chemie GmbH (Alexander Wacker Familie GmbH, 50%; Hoechst AG, 50%)	[e]200
MINERAL FUELS	
Hard coal:	124,242, of which -
Ruhrkohle AG	(89,774)
Saarbergwerke AG	(19,609)
Sophia-Jacoba GmbH	(4,006)
Eschweiler Bergwerk-Verein AG	(4,000)
Preussag Anthrazit GmbH	(3,853)
Gewerkschaft Auguste Victoria	(3,000)
Lignite:	18,255, of which -
Rheinische Braunkohlenwerke AG	(15,315)
Braunschweigische Kohlen-Bergwerke AG	[e](2,480)
Preussen Elektra AG	[e](460)
Natural gas and petroleum:	
Veba Oel AG	4,808
Wintershall AG	3,017
Deutsche Texaco AG	[e]2,000
Deutsche Schachtbau- und Tiefbohr GmbH (Salzgitter AG)	826
Mobil Erdgas-Erdol GmbH	532

TABLE 2—Continued

FEDERAL REPUBLIC OF GERMANY: EMPLOYMENT IN THE MINERAL INDUSTRY

Commodity/industry (ownership)	Employment/ work force
MINERAL FUELS—Continued	
Hermann von Rautenkranz Internationale Tiefbohr GmbH & Co. KG Itag (Familie von Rautenkranz)	635
Preussag GmbH Erdol und Erdgas	646
Brigitta Erdgas und Erdol GmbH (Deutsche Shell AG, 50%; Esso AG, 50%)	
Elwerath Erdgas und Erdol GmbH (Deutsche Shell AG, 50%; Esso AG, 50%)	e500
RWE-DEA AG fur Mineraloel und Chemie	e200
C. Deilmann AG (Familie Deilmann, 24.9%; Preussag AG, 75.1%)	e125

iron production, after the U.S.S.R., Japan, China, and the United States.

Most of the FRG's steel was produced in the Ruhr. The FRG was the world's fifth largest steel-producing country, after the U.S.S.R., Japan, the United States, and China. Production in 1990 decreased by 6.4%, the highest drop in the E.C. Ninety percent of all steel produced is continuously cast. Oxygen converter steelmaking accounts for more than 80% of raw steel output, with the rest of the output by electric arc furnaces. More than 65% of FRG's finished steel was sold as flat products. The automotive industry accounts for about 30% of steel domestic consumption. At least 40% of steel production was exported. FRG was the second largest exporter of steel after Japan and the second largest importer of steel (12.5 Mmt in 1990), after the United States.

Thyssen Stahl AG, with 11.5 Mmt production annually, was the eighth largest steel producer in the world. Hoesch AG, Krupp Stahl AG, and Stahlwerke Peine-Salzgitter AG produced more than 4 Mmt each. The company produced about 27% of all crude steel in Germany. The steel company sales were about $5.3 billion in 1990. Thyssen's oxygen steel plants are at Beeckerwerth, Bruckhausen, and Ruhrort. The largest blast furnace is in Schwelgren. Thyssen's exports accounted for about 47% of its earnings. Thyssen reportedly approved the construction of another large blast furnace with annual capacity of 3.5 Mmt of pig iron at the Duisburg-Schwelgern site.

TABLE 3

FEDERAL REPUBLIC OF GERMANY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Vereinigte Aluminium-Werke AG	Plant at Schwandorf	430
Do.	Aluminium Oxid Stade GmbH	Plant at Stade	700
Do.	Martinswerke GmbH	Plant at Bergheim	350
Aluminum	Vereinigte Aluminium-Werke AG	Smelters at Stuttgen, Inwerke (Toging), Stade (Elbewerk), Lippewerke (Lunen), and Rheinwerke (Norf)	385
Do.	Leichtmetall-Gesellschaft mbH	Smelter at Essen-Borbeck	130
Do.	Hamburger Aluminium-Werke GmbH	Smelter at Hamburg	125
Cement	35 companies, the major ones are-	65 plants	35,000, including-
Do.	Heidelberger Zement AG	Plants at Blaubeuren-Schelklingen, Leimen, Hassmersheim, Burglengenfeld, Kiefersfelden, and others	(9,000)
Do.	Dyckerhoff AG	Plants at Amoneburg, Gollheim, Neuwied, Neubeckum, and others	(6,500)
Do.	E. Schwenk, Zementwerke KG	Plants at Allmendingen, Mergelstetten, and Karlstadt	(4,000)
Do.	Anneliese Zementwerke AG	Plants at Ennigerloh-Nord, Ennigerloh-Sud, Geseke, and Paderborn	(3,500)
Coal: Anthracite	Four companies, of which the major ones are-	About 27 mines, including-	75,000, including-
Bituminous	Ruhrkohle AG	17 mines in Ruhr region	(54,000)
Do.	Ruhrkohleniederrhein AG	7 mines	(21,000)
Do.	Ruhrkohle Westfalen AG	14 mines	(33,000)
Do.	Saarbergwerke AG	5 mines in Saar Basin	(11,000)
Do.	Preussag-Anthrazit GmbH	Mine at Ibbenburen	(2,500)
Copper	Norddeutsche Affinerie AG	Smelter and refinery, both at Hamburg	250 290
Do.	Huttenwerke Kayser AG	Smelter and refinery, both at Lunen	110 115
Lead	Sachtleben Bergbau GmbH	Meggen Mine at Lennestadt	3
Do.	Preussag AG Metall	Mine at Bad Grund	5
Lead	Preussag-Boliden-Blei GmbH	Smelter and refinery at Nordenham	120
Do.	Berzelius Metallhutten GmbH	QSL smelter at Duisburg	90
Do.	do.	Refinery at Binsfeldhammer	150
	Norddeutsche Affinerie AG	Refinery at Hamburg	40
Lignite	Rheinische Braunkohlenwerke AG (Rheinbraun)	Surface mines at Garzweiler (Niederaussen), Fortuna/ Bergheim (Niedereaussen), Zukunft/Inden (Eschweiler), and Hambach	105,000
Do.	Braunschweigische Kohlen-Bergwerke AG	Mines at Alversdorf, Helmstedt, and Schiningen	4,500

TABLE 3—Continued

FEDERAL REPUBLIC OF GERMANY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Natural gas million cubic meters		Brigitta Erdgas und Erdol GmbH, and Elwerath Erdgas und Erdol GmbH	Plants at Grossenkneten and Clenze	9,500
Do.	do.	Mobil Erdgas-Erdol GmbH	Plants at Scholen	4,000
Do.	do.	Other companies	Plants at Duste, Rutenbrock, and others	2,000
Petroleum: Crude 42-gallon barrels per day		The largest companies are-	6 areas with about 85 oilfields	80,000, including-
Do.	do.	Elwerath Erdgas und Erdol GmbH	West of Ems River	(30,000)
Do.	do.	Wintershall AG	Weser-Ems Rivers	(21,000)
Do.	do.	Deutsche Texaco AG	Elbe-Weser Rivers	(20,000)
Refined 42-gallon barrels per day		About 25 companies, of which the largest-	About 30 refineries	2,000 including-
Do.	do.	Deutsche Shell AG	Refineries at Godorf, Hamburg, and Monheim	(280)
Do.	do.	Esso AG	Refineries at Cologne, Karlsruhe, and Ingolstadt	(260)
Do.	do.	Ruhr Oel GmbH	Refinery at Gelsenkirchen	(220)
Do.	do.	OMV AG	Refinery at Karlsruhe	(150)
Potash		Kali und Salz AG	Mines at Bergmannssegen-Hugo, Niedersachsen-Riedel, Salzdetfurth, Sigmundshall, Hattorf, Neuhof-Ellers, and Wintershall	2,300 (K_2O)
Salt (rock)		Kali und Salz AG	Mines at Bad Friedrichshall-Kochendorf, Braunschweig-Luneburg, Heilbronn, Riedel, Stetten, and Wesel (Borth)	15
Steel		The major companies are:	About 25 plants including-	45,000
Do.		Thyssen Stahl AG	Plants at Duisburg, Hattungen, Krefeld, Oberhausen and Written	(13,000)
Do.		Stahlwerke Peine-Salzgitter AG	Plants at Peine and Salzgitter	(4,500)
Do.		Krupp Stahl AG	Plants at Bochum and Rheinhausen	(4,500)
Do.		Hoesch AG	Plants at Dortmund	(4,500)
Do.		Klockner-Werke AG	Plants at Bremen and Osnabruck	(4,200)
Zinc		Ruhr-Zink GmbH	Refinery at Datteln	140
Do.		Berzellius Metallhutten GmbH	Imperial smelter at Duisburg	85

Thyssen formed a committee to examine relations with the German Democratic Republic's (GDR) steel industry. Thyssen Stahlunion AG imports basic steel products from GDR and other Eastern Bloc countries and, in turn, exports steel products to these countries from FRG, through its subsidiary Auffermann GmbH in Dusseldorf. Thyssen Edelstahlwerke AG, dealing in stainless steel, opened sales offices and warehouses on July 1990 in Berlin, Freital, and Leipzig. Edelstahlwerke produces about 1.3 Mmt of special steels annually. Stainless, heat resistant, and tool steels account for more than 50% of Edelstahlwerke's output.

Preussag AG merged with Salzgitter AG on July 4, 1990. Stahlwerke Peine-Salzgitter crude steel production totaled 4.17 Mmt in 1990, a decline of 7% from that of the previous year.

Thyssen, Krupp, Peine-Salzgitter, Hoesch, and Mannesmann were involved in technology and production arrangements with the GDR. Mannesmann Handel AG, the Dusseldorf-based trading subsidiary of the Mannesmann AG steel group, formed a trading company in Riesa, GDR, named Mannesmannrohren-und Stahlhandel GmbH. Branches are at Chemnitz, Dresden, Erfurt, Leipzig, and Rostock, specializing in carbon and stainless steel pipes and rolled steel products.

Lead and Zinc.—There were two metal mines in the FRG that produced lead and zinc. These mines also produced byproduct copper, pyrite, and silver. The underground Meggen Mine near Lennestadt was operated by Sachtleben Bergbau GmbH, a wholly owned subsidiary of MG. The underground Meggen Mine produced lead, pyrite, and zinc concentrates. Zinc concentrate was processed at MG's Dateln plant, and lead concentrate was treated at Duisburg. The other lead and zinc mine was operated by Preussag AG Metall in Bad Grund.

Almost 95% of primary lead output was derived from imported concentrates. Three primary lead plants and six secondary lead refineries were operating in West Germany. The construction of a new emission-free Queneau-Schumann-Lurgi (QSL) lead smelter at Binsfeldhammer, operated by Berzelius Metallhutten GmbH, was reportedly proceeding on schedule.

Refined zinc was produced by two electrolytic plants and one imperial smelter plant. About 75% of the primary zinc output was derived from imported concentrates. Ruhr-Zink GmbH in Datteln was expanding its capacity of zinc to 200,000 mt/a. The company was reportedly installing a Sherritt Gordon pressure leaching process.

Nickel.—Vereinigte Deutsche Nickelwerk AG (VDN) in Werdohl, which produces nickel alloys and semis, was renamed Deutsche Nickel AG. VDN operated rolling mills at Werdohl and Altena and a melting plant at Unna. Semifinished nickel products account for 65% of the company's total output. VDN was reportedly considering the possibility of opening production facilities in the GDR.

Industrial Minerals

Cement.—The FRG was the second largest producer of cement in the EC after Italy. There were about 35 companies operating 65 cement plants in the FRG. Heidelberger Zement AG was the largest cement company in the FRG, with a capacity of 9 Mmt/a of production.

Clays.—About 50% of West Germany's high-quality refractory and ceramic clays are produced in the Rhineland-Palatinate area. Bentonite is almost exclusively mined in Bavaria. Sud-Chemie AG in Moosburg is the largest bentonite producer in Western Europe. The second largest company is Erbsloeh-Geisenheim GmbH in Geisenheim. More than 30% of bentonite production is exported, primarily to neighboring countries.

About 75% of FRG kaolin is mined in Bavaria. The country imports about 65% of its domestic consumption, even though FRG is the second largest producer of kaolin in Western Europe after the United Kingdom. Amberger Kaolinwerke GmbH, with about 170,000 tons of kaolin production in 1990, was Western Europe's largest producer. The company has its mines in Hirschau-Schnaittenbach in Bavaria. Amberger also produced crude clay, feldspar, and quartz sand. About 70% of total output was used in the ceramics, enamel, glass, and paper industries.

Fluorspar.—Fluorspar is mined in the FRG in two locations. The Clara Mine at Oberwolfach is operated by Sachtleben. The second mine, Kaeferstelge, in Pforzheim-Wuerm, is owned by Fluss und Schwerspatwerke Pforzheim GmbH. In 1990, the mines provided about 55% of the country's fluorspar consumption.

Graphite.—Graphitwerk Kropfmuhl AG, headquartered in Hauzenberg, was the only graphite mining and processing company in the EC. Graphitwerk operated a graphite mine in Kropfmuhl, Bavaria. The company also operated a processing plant at Werk Wedel in Holstein. Richard-Anton KG operated three production plants in Hagen, Manheim, and Obernzell.

Gypsum.—The FRG was a major producer of crude gypsum. The largest producer was Gebr. Knauf Westdeutsche Gipswerke GmbH. The company operated about 10 mines in Bavaria and others in Baden-Wurttemberg, Hesse, Saarland, and Lower Saxony. The second largest producer was Gigips Baustoffwerke GmbH, with mines in Baden-Wurttemberg and Lower Saxony.

Potash.—The FRG is the world's fourth largest producer of potash. Kali und Salz AG (KS) is the only potash company in the FRG. KS produces potash from seven underground mines. The Salzdetfurth Mine will reportedly be closed at the end of 1991. Mines in the Hesse area produce about 70% of the country's crude potash.

Potassium sulfate, K_2SO_4, is regarded as a specialty fertilizer and is used in the growing of tobacco, grape vines, citrus fruits, vegetables, and also in areas that are deficient in sulfur. Potassium sulfate accounts for about 5% of total world potash (K_2O) consumption. Potassium sulfate is produced at two plants, in Hattorf and Wintershall. The two facilities have a combined capacity to produce about 1 Mmt/a. The largest plant, with a production of 600,000 mt/a of potassium sulfate, is at Hattorf.

Pumice.—About 100 companies are involved in production and processing activities. About 60% of these companies produce pumice and scoria; the rest produce only pumice. The following companies are major producers: Kaan Baustoffwerke GmbH in Bendorf, Geschw. Mohr GmbH & Co. KG in Plaidt, Jakob Stockschlader KG in Ochtendung, Trasswerke Meurin Betriebs GmbH in Andernach, and Gebr. Zieglowski GmbH & Co KG in Kruft.

Rock Salt.—With a capacity of about 15 Mmt/a, the FRG is the largest salt producer in Western Europe. There are at least six companies mining salt. Verein Deutsche Salzindustrie eV, owned by a number of companies, including KS, produces about 6.5 Mmt of rock salt annually. KS operated two rock salt mines: the Braunschweig-Luneburg Mine near Helmstedt and the Niedersachsen-Riedel Mine near Celle. About 50% of rock salt was extracted from three mines in the north. The largest, with a production of 2.5 Mmt/a, was the Borth Mine near Duisberg. Sudwestdeutsche Salzwerke AG produces brine salt and rock salt at Berchtesgaden.

Soda Ash.—Deutsche Solvay-Werke AG and Kali-Chemie AG are important producers of soda ash in the FRG. Soda ash is produced in Heilbronn. Chemische Fabrik GmbH produced soda ash at its plant in Cologne. Mathes und Weber GmbH produced soda ash at its plant in Duisburg.

Sulfur.—A single pyrite mine and flotation facility at Meggen produced about 100,000 tons of sulfur. The FRG produced about 1.2 Mmt of sulfur primarily from sour gasfields in the north of the country. Production of sulfur from oil refineries is about 280,000 tons, mostly from the operations of Shell AG and Esso AG. Sulfur recovered from powerplants is becoming increasingly significant, rising from 10,000 tons in 1987 to more than 60,000 tons in 1990.

Talc.—Hoechst Ceram Tec AG operated a talc mine at Wunsiedel, with an estimated production of about 10,000 mt/a. Johannes Scheruhn GmbH & Co. operated a mine in northern Bavaria, with production about 3,000 mt/a.

Mineral Fuels

Rheinisch-Westfalisches Elektrizitatswerk AG (RWE) is the largest utility company in West Germany, with energy accounting for about 65% of sales. Veba AG is also an important utility and coal producer.

Coal.—The FRG was the second largest producer of hard coal in the EC, following the United Kingdom. Imports of hard coal increased by 69% to 10.9 Mmt in 1990. Deposits of hard coal in West Germany are concentrated in the Aachen, Ruhr, and Saar regions. The coal seams in Ruhr are more than 1,000 m deep. Ruhrkohle AG (RAG) produces more than 70% of Germany's hard coal from the Ruhr area. At the end of 1990, RAG operated 17 underground mines, 6 coking plants, and the Niederberg briquetting plant. German coal mining is one of the largest recipients of Government subsidies, amounting to about $7 billion in 1990.

West of Cologne, and to a lesser extent

in Hessen and Bavaria, deposits of lignite are about 100 m deep and are surface mined. About 95% of lignite was mined in the Rhineland region, followed by Helmstedt (3.5%), Hessen (1%), and Bavaria. Lignite was primarily used as fuel in power stations.

Rheinische Braunkohlewerke AG (Rheinbraun), with headquarters in Cologne, is the largest lignite producer in Western Europe. About 102.2 Mmt of lignite was produced by Rheinbraun in 1990. With a production of more than 34 Mmt of lignite, Rheinbraun's Garzweiler surface mine is the largest lignite mine in West Germany. The company's three remaining mines include Hambach (27 Mmt), Zukunft/Inden (20 Mmt), and Fortuna/Bergheim (18 Mmt).

Natural Gas and Petroleum.—Deposits of natural gas and oil in the FRG occur mainly in the northwest, in the area between the Ems and Weser Rivers and around the mouth of the Ems in Niedersachsen. Reserves of natural gas and crude oil were far below domestic consumption requirements.

The FRG imports most of its natural gas from the Netherlands and the U.S.S.R. In 1990, crude oil was imported from about 30 countries, with about 21% coming from Great Britain, 16% from Libya, and 14% from the Gulf States. FRG crude oil imports rose 8.7% in 1990 to a total of 71.9 Mmt.

Reserves

Statistics on reserves are not published officially in the FRG.

INFRASTRUCTURE

The FRG has a well-developed network of highways (466,305 km), railroads (31,443 km), inland waterways (5,222 kilometers), and canals. There are five major seaports, the largest in Wilhelmshaven. The Ruhr area is connected to the Rotterdam harbor in the Netherlands by the Rhine River. Imported petroleum comes through Wilhelmshaven, and natural gas is imported by pipeline from the Netherlands and the U.S.S.R.

OUTLOOK

At present, priority is being given to the integration of the German Democratic Republic (GDR) into the FRG.

The metal mining industry has declined. Refined metals production and industrial minerals activities are expected to increase. Under its energy program, the FRG will reportedly continue to spend less for nuclear energy and increase its support for research on renewable energy sources. The dependence on raw materials from abroad and expansion of German companies in foreign countries is expected to continue.

[1]Jahrbuch 1991, Verlag Gluckauf GmbH, Essen.

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Bonn, Federal Republic of Germany

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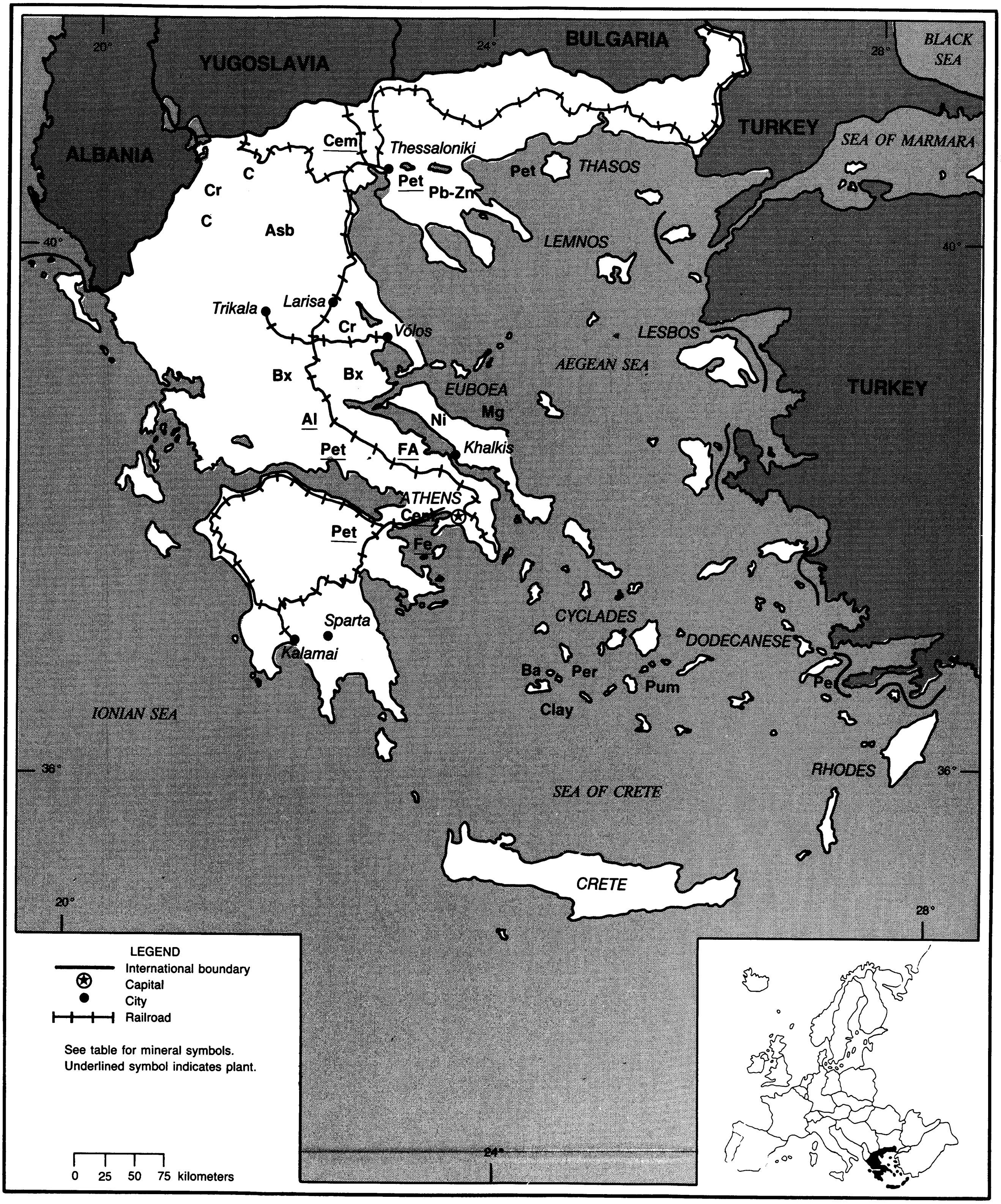
GREECE

AREA 133,000 km² **POPULATION 10.0 million**



THE MINERAL INDUSTRY OF GREECE

By George A. Rabchevsky[1]

Greece was the world's third largest producer of bentonite and perlite and a significant producer of bauxite and magnesite. The country was an important European producer of asbestos, chromite, ferrochromium, ferronickel, marble, perlite, pumice, and salt. The country is also a significant producer of cement.

The country's economy continued a downward trend in 1990. The growth of the GDP declined from about 2.8% in 1989 to 0.8% in 1990, while the rate of inflation increased from about 15% to nearly 23% during this period. Greece's mining, quarrying and mineral processing sectors continued to account for about 5% of the country's GDP.

GOVERNMENT POLICIES AND PROGRAMS

The Greek Mining Code of 1963 provided for exclusive state ownership and exploitation of certain minerals in specific areas of the country. Public Law 1116-81 of 1981 encouraged domestic and foreign investment in the less industrially developed areas of Greece. In 1982, this law was replaced by Law 1262, which introduced state participation in private programs and, in part, provided state grants for energy conservation projects, minerals and energy research, and technological improvement.

To facilitate the transition from public to private control of the minerals industry, the new Government, in its policy declaration (April 24, 1990), outlined basic principles to reverse recession and relieve inflation. The new policy would support private companies and seek to liquidate or sell virtually all bankrupt public companies and subsidiary companies of state-owned banks. The new Law 1892/31-07-90 established incentives for industry to introduce pollution-reducing technology and to relocate high-pollution plants away from urban areas.[1]

PRODUCTION

In 1990, production of the following metals and metal ores increased slightly: alumina, aluminum, bauxite, manganese concentrate, nickel, silver, steel, tin, and zinc mine output. Production of industrial minerals, such as barite, cement, kaolin, magnesite, and nitrogen have also risen slightly. The output of lignite continued to grow, while crude oil production continued to fall.

TRADE

Greece's total exports in 1990 were about 6% higher than those in 1989. General exports to the Federal Republic of Germany, Greece's major trading partner, and to the United States rose by 13% and 32%, respectively. In 1990, Greece continued to export cement, magnesium compounds, and pumice to the United States.

STRUCTURE OF THE MINERAL INDUSTRY

Greece's mineral industry employed about 210,000 workers including 4,000 in metal minerals, 6,000 in the mineral fuels sector, 15,000 in the industrial minerals sector, and 185,000 in metallurgical operations.

The mineral industry of Greece was composed of privately owned and state-owned enterprises. The Ministry of Energy and Natural Resources was the Government agency responsible for exploration, mining, metallurgical, and energy developments. The Government participated in the mineral industry either directly through enterprises such as the Hellenic Industrial and Mining Investment Co. (HIMIC) or through shareholdings in private companies. HIMIC was the principal shareholder in the Lavrion-based lead producer Greek Metallurgical & Mining Co. of Lavrion S.A., in the chromite and ferrochrome producer, Hellenic Ferroalloys S.A., and in Aegean Metallurgical Industries S.A., which conducted exploration and development work for gold, lead, silver, and zinc. The Government also controlled the mining and processing operations under the auspices of the Hellenic Industrial Development Bank, the National Bank of Greece, and the National Bank for Industrial Development.

The major private companies in Greece were Aluminium de Grece S.A., a subsidiary of Pechiney of France; the Bodossakis Group (lead and zinc concentrates, nickel ore, and ferronickel); the Eliopolis-Kyriacopoulos Group (barite, bauxite, and perlite); Magnomin General Mining Co. S.A. (magnesite); and the Titan Cement Co. S.A.

The major production and processing companies in Greece are listed in table 2.

COMMODITY REVIEW

Metals

Aluminum and Bauxite.—Bauxite has provided the basis for the country's aluminum industry, and Greece was well established as a producer and exporter of alumina, aluminum metal, bauxite, and a wide range of products based on aluminum. Underground mining accounted for 50% of Greece's total bauxite mine production. Greek bauxite was exported to Canada, France, the Federal Republic of Germany, Italy, the Netherlands, Romania, the U.S.S.R., and Yugoslavia.

The country's principal deposits of bauxite occurred to the north of the Gulf of Corinth in the areas of Distomon, Elikonas, Ghiona, Itea, and Parnassos. Other deposits were found in the district of Eleusis, Mandra, and Megara to the west of Athens; Oeti near Lamia; Kimi on the island of Euboea; and on the island of Amorgos in the Cyclades. Deposits in the Florina area of central northern Greece are also under investigation.

The largest producer of bauxite, Bauxites Parnasse Mining S.A. (BPM), had the capacity to produce about 2 Mmt/a of processed and graded bauxite from mines at Euboea, Ghiona, Itea, and Parnassos. BPM began its operations in 1924 with the discovery of bauxite deposits in Parnassos-Ghiona-Oiti mountain ranges. The company produced more than 65% of Greece's bauxite output. The company's main processing plant and shipping facility was at

TABLE 1

GREECE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989[p]	1990[e]
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	[r]2,231	[r]2,467	2,443	2,602	2,700
Alumina, gross weight	do.	307	518	515	521	530
Metal:						
Primary		124,400	126,750	150,801	144,833	150,000
Secondary[e]		7,000	7,000	7,000	7,000	7,000
Chromite:						
Run-of-mine ore		217,979	211,599	180,836	187,322	160,000
Marketable products:						
Direct-shipping ore[e]		16,000	16,000	14,000	15,000	13,000
Concentrate		60,063	63,825	49,535	47,324	45,000
Iron and steel:						
Iron ore and concentrate, nickeliferous:[3]						
Gross weight	thousand tons	[e]1,600	[r]1,083	1,573	2,013	2,000
Fe content	do.	[e]650	423	640	820	800
Metal:						
Pig iron[e]	do.	160	160	160	160	160
Ferrochromium		38,260	[e]40,000	44,150	43,500	30,300
Ferronickel		10,324	[e]5,000	44,000	54,000	54,500
Steel, crude	thousand tons	1,010	[r]907	959	958	[4]999
Lead:						
Mine output, Pb content		20,873	[e]20,600	23,060	22,330	23,500
Metal:						
Smelter, primary		15,800	700	15,100	[e]5,700	5,600
Refined: Primary[5]		15,700	700	13,100	5,600	5,200
Secondary		[e]3,600	2,000	2,000	1,400	2,000
Total		[e]19,300	[e]2,700	15,100	7,000	7,200
Manganese:						
Ore, crude:						
Gross weight		32,585	19,010	17,830	18,925	18,500
Mn content		10,759	6,277	5,900	[e]6,000	6,000
Concentrate:						
Gross weight		4,560	4,024	3,725	3,034	3,980
Mn content		2,234	1,932	1,825	1,487	1,950
Nickel:						
Ni content of nickeliferous iron ore[e 6]		14,400	[r]9,740	14,200	18,117	18,500
Ni content of alloys		2,581	[r]9,202	13,131	16,097	16,200
Silver: Mine output, Ag content		54	52	61	60	62
Tin metal, secondary[e]		40	40	40	40	40
Zinc mine output, Zn content		22,257	20,700	21,200	25,025	26,500
INDUSTRIAL MINERALS						
Abrasives, natural: Emery		7,500	7,500	7,500	7,000	7,000
Asbestos:						
Ore	thousand tons	3,927	3,384	4,000	4,500	4,000
Processed		51,355	60,134	71,000	72,500	65,600
Barite:						
Crude ore		2,227	4,800	1,316	1,247	1,300
Concentrate		2,305	[r]1,881	1,407	1,218	1,250

See footnotes at end of table.

TABLE 1—Continued

GREECE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989[p]	1990[e]
INDUSTRIAL MATERIALS—Continued						
Cement, hydraulic	thousand tons	13,341	13,168	13,053	12,535	[4]13,944
Clays:						
Bentonite:						
Crude		1,317,825	[r]1,300,525	730,501	1,096,177	1,000,000
Processed		352,587	360,831	502,537	529,802	500,000
Kaolin:						
Crude		141,210	[r]144,634	127,395	67,234	90,000
Processed		3,532	[r]5,720	4,163	6,946	7,000
Fluorspar, grade unspecified[e]		150	200	200	200	200
Gypsum and anhydrite[e]		500,000	500,000	500,000	450,000	450,000
Magnesite:						
Crude	thousand tons	944	[r]842	848	904	900
Dead-burned		248,114	222,807	237,595	214,945	215,000
Caustic-calcined		126,069	119,096	124,140	111,826	112,000
Nitrogen: N content of ammonia[e]		241,310	254,000	263,000	242,000	257,000
Perlite:						
Crude		357,347	360,831	361,849	390,180	350,000
Screened		184,148	208,352	211,404	217,305	220,000
Pozzolan (Santorin earth)	thousand tons	1,005	814	358	786	785
Pumice		860,047	779,885	752,525	640,152	600,000
Pyrites, gross weight		150,245	148,972	130,129	97,051	97,000
Salt, all types[e]	thousand tons	150	150	150	150	145
Silica (probably silica sand)[e]		38,000	38,000	38,000	[4]61,144	60,000
Sodium compounds:[e]						
Carbonate		1,000	1,000	1,000	900	900
Sulfate		8,000	7,000	7,000	6,000	6,000
Stone: Marble[e]	cubic meters	150,000	150,000	150,000	[4]365,146	300,000
Sulfur:[e]						
S content of pyrites	thousand tons	[4]66	[r 4]65	70	70	70
Byproduct of petroleum	do.	5	5	5	5	5
Natural gas	do.	135	135	135	135	135
Total	do.	206	[r]205	210	210	210
Talc and steatite		1,731	1,507	1,587	1,600	1,600
MINERAL FUELS AND RELATED MATERIALS						
Coal including briquets:						
Lignite	thousand tons	37,976	43,100	48,091	51,903	52,000
Lignite briquets[e]	do.	110	120	120	120	120
Coke:[e]						
Coke oven	do.	305	305	305	300	300
Gashouse	do.	16	18	19	16	16
Gas:						
Manufactured, gasworks[e]	thousand cubic meters	425	425	1,784	1,784	1,784
Natural[e]	million cubic meters	62	62	84	84	85
Petroleum:						
Crude	thousand 42-gallon barrels	[e]9,500	8,798	8,043	6,568	[4]5,997
As reported	thousand metric tons	[e]1,320	1,223	1,118	913	900
Refinery products:						
Gasoline	do.	[e]15,000	23,650	20,596	26,656	[4]28,551

See footnotes at end of table.

TABLE 1—Continued

GREECE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989[p]	1990[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued						
Refinery products—Continued						
Jet fuel	do.	[e]11,000	13,024	15,968	13,976	14,500
Kerosene	do.	[e]300	193	202	116	117
Distillate fuel oil	do.	[e]25,000	28,758	28,407	27,848	27,900
Residual fuel oil	do.	[e]28,000	39,460	40,080	35,211	[4]35,497
Lubricants	do.	[e]800	[e]800	1,281	1,148	1,200
Other[e]	do.	3,500	3,500	3,700	[r]3,700	3,700
Refinery fuel and losses[e]	do.	4,000	4,000	4,620	[r]4,700	4,700
Total[e]	do.	87,600	113,385	114,854	[r]113,355	116,165

[e]Estimate. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 1991.
[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]Reported figure.
[5]Includes antimonial lead and hard lead.
[6]Also includes Co content.

TABLE 2

GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Aluminium de Grèce S.A.	Distomon, in Boeotia area	600
Aluminum	do.	do.	145
Asbestos	Asbestos Mines of Northern Greece S.A.	Mines and plants at Zidani, near Kozani	110
Barite	Silver and Baryte Ores Mining Co. S.A.	Milos Island	10
Bauxite	Bauxites Parnasse Mining Co. S.A. (Kyriacopoulos Group)	Mines in Parnassos-Ghion area; Pasha, Euboea Island	2,000
Do.	Eleusis Bauxites Mines, S.A. (ELBAUMIN)	Plant in Itea. Mines near Eleusis, Itea, Kimi, and Lamia	700
Do.	Delphi-Distomon S.A.; Hellenic Bauxites of Distomon S.A.; Delphi Bauxites S.A.	Opencast mines at Delphi-Distomon area	500
Do.	Greek Helicon Bauxites G.L. Barlos Industrial & Mining Co. S.A.	Mines at Distomon (Elixon), Beotia..	300
Do.	do.	Processing plant at Distomon, Beotia	380
Bentonites:			
Crude	Mediterranean Bentonite Co. S.A.	Surface mines on Milos Island Processing plant at Livorno, Italy	20
Do.	Mykobar Mining Co. S.A.	Mines at Adams, Milos Island	180
Do.	Silver and Baryte Ores Mining Co.	do.	400
Processed	do.	Plants at Adamas Bay, Aghia Anna, and Vouthia Bay, on Milos Island	470
Cement	Halkis Cement Co. S.A.	Micro-Vathi plant, west-central Euboea	3,000
Do.	Halyps Cement S.A.	Paralia Aspropyrgos plant, Athens	800
Do.	Heracles General Cement Co. S.A.	Two plants at Euboea	1,900
Do.	do.	Six plants at Volos	4,600

TABLE 2—Continued

GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement—Continued	Titan Cement Co. S.A.	Eleuis plant, Athens region	1,100
Do.	do.	Kamari plant, Boeotia	2,400
Do.	do.	Patras plant, northern Peloponnesus	1,900
Do.	do.	Salonica plant, Salonica	1,400
Chromite	Financial-Mining Industrial and Shipping Corp. (FIMISCO)	Tsingeli mines near Volos	25
Do.	Hellenic Ferroalloy S.A. (ELSI)	Skoumtsa mines in Vourinos, near Kozani	350
Do.	do.	Concentrator at Skoumtsa	110
Coal, lignite	Public Power Corp. (DEH)	Aliveri Mine, Euboea Island	420
Do.	do.	Megalopolis Mine, central Peloponnesus	7,000
Do.	do.	Ptolemais Mine, near Kozani	28,000
Ferroalloys:			
Ferrochrome	Hellenic Ferroalloy S.A.	Tsingeli near Volos	45
Ferronickel, Ni content	Hellenic Mining & Metallurgical Co. of Larymna (LARCO)	Larymna Metallurgical Plant	16
Lead:			
Metal in concentrate	Hellenic Chemical Products and Fertilizer S.A.	Kassandra mines (Olympias; Stratoni), northeast Chalkidiki	31
Smelter	Greek Metallurgical & Mining Co. of Lavrion S.A. (EMMEL) (closed in 1989)	Lavrion, Attica area near Athens	20
Magnesite, concentrate	Financial-Mining-Industrial and Shipping Corp.	Mines at Gerorema, Kakavos, and Parakevoremma at Mantoudhi, northern Euboea Island	350
Do.	Mining Trading & Manufacturing Ltd. (closed in 1989)	Mines at Tamvakas near Mantoudhi	150
Do.	Grecian Magnesite S.A.	Mines at Yerakini and Kastri in Chalkidiki	300
Do.	Magnomin General Mining Co. S.A.	Mines at Vavdos, Chalkidiki Processing plant at Vavdos	68 66
Do.	Gambino Co.	Underground mine at Kimassi, Euboea Island	100
Manganese (battery grade MnO_2 concentrate)	Eleusis Bauxite Mines S.A.	Nevrokopi, Drama	1
	Christoforidis Mining S.A.	Mines at Neochorion, Chalkidiki	100
Do.	Gambino Co.	Underground mine at Stratoni, Chalkidiki	200
Natural gas million cubic feet per day	Public Petroleum Corp. (DEP) east of Thasos Island	Prinos offshore gasfield and oilfield,	4,416
Nickel, ore	Hellenic Mining & Metallurgical Co. of Larymna	Agios Ioannis mines near Larymna	500
Do.	do.	Mines at Euboea	2,500
Perlite	Silver and Baryte Ores Mining Co. S.A.	Kos and Milos Islands	300
Do.	General Enterprises Sarides S.A.	Milos Island	70
Do.	Milopan S.A.	Milos Island	165
Do.	Peletico Hellas S.A.	do.	20
Do.	N. Bouras & Co.	Kos Island	75
Petroleum, refined barrels per day	Hellenic Aspropyrgos Refinery S.A.	Aspropyrgos	95,000
Do. do.	Motor Oil (Hellas) Corinth Refineries S.A.	Aghii Theodori, Corinth	140,000
Do. do.	Petrola Hellas S.A.	Eleusis	100,000
Do. do.	Thessaloniki Refining Co. A.E.	Thessaloniki	76,000

TABLE 2—Continued

GREECE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Pozzolan (Santorin earth)	Lava Mining & Quarrying Co. Ltd.	Quarries on Ghyali Island	800
Steel, crude	Halyvourgia Thessalias S.A.	Steelworks at Volos (Operates two 35-ton electric arc furnaces)	1,500 300 200
Do.	Halyvourgiki, Inc.	Steelworks at Eleusis (Three 100-ton electric arc furnaces)	1,200
Do.	Helleniki Halivourgia S.A.	Steelworks at Aspropyrgos (Operates two 55-ton electric arc furnaces)	400
Do.	Metallurgiki Halyps S.A. (closed in 1988)	Steelworks at Almyros, near Volos (Operates two 50-ton electric arc furnaces)	300
Do.	Sidenor S.A. (also known as Halivorgia Voviou Ellados S.A.)	Steelworks at Nea Maguisia, near Thessaloniki (Operates two 50-ton and two 30-ton electric arc furnaces)	350
Zinc in concentrate	Hellenic Chemical Products and Fertilizer Co.	Kassandra mines (Olympias, Stratoni), northeast Chalkidiki	25

Itea Bay. About 65% of the company's production was exported, and the remainder sold to Aluminium de Grece S.A.(AIG) under a long-term contract.

Delphi Bauxites S.A., Delphi-Distomon S.A., and Hellenic Bauxites of Distomon S.A. are subsidiaries of AIG, which produced both alumina and aluminum metal. Almost all of the bauxite mined by these companies was consumed by the parent company. Output from the mines in Distomon and Itea amounted to between 400,000 and 500,000 mt/a. AIG has operated a 600,000-mt/a alumina refinery at Distomon since 1965. Exports of alumina amounted to about 200,000 mt/a.

Elikon Bauxites-GL Barlos S.A. mined bauxite in the Elikon Mountains south of Levadia, with a capacity of about 400,000 mt/a.

Eleusis Bauxites Mines S.A. (ELBAUMIN) operated mines primarily at Eleusis and Lamia, which together produced approximately 300,000 mt/a of bauxite. The Eleusis plant produced cement-grade bauxite, while the Lamia plant produced a range of bauxite grades.

AIG operated the only aluminum smelter at Distomon, with a capacity of 145,000 mt/a. About 60,000 tons was exported annually, primarily to France and Italy.

The much delayed Greek-U.S.S.R. alumina plant, at Thisvi in Boeotia, remained under construction in 1990. The U.S.S.R. was to provide technology and some machinery and equipment. The U.S. firm Kaiser Engineering Inc., of California, was to provide construction management services. France and Germany were also participants in this project. It is planned that once the 600,000-mt/a capacity alumina plant is built, the U.S.S.R. will absorb the entire output of the plant for the next 10 years and possibly longer. The alumina plant was scheduled to be in operation by 1994.[2]

Chromite.—Greek chromite production has undergone a major revival in the 1980's in response to the growth of the domestic ferroalloys industry and particularly for the ferrochrome plant established in 1984. Hellenic Ferroalloys S.A. (ELSI), mostly Government owned through HIMIC, produced chromite ore and operated a ferrochrome plant at Tsingeli near Almyros, southwest of Volos. ELSI operated the Skoumtsa Mine in the Vourinos area near Kozani, with a capacity of about 350,000 mt/a of run-of-mine ore and a 110,000 mt/a concentrator at Skoumtsa. Three underground mines and one surface mine were planned for development in the Vourinos area: Aetoraches, Koursoumia, Rizo, and Voidolakkas.[3] The Tsingeli ferrochrome plant began operation in 1983. Reportedly, a new furnace at the plant was under construction, which would more than double its capacity.

Financial-Mining Industrial and Shipping Corp. (FIMISCO) was the only other chromite mining and processing operation in Greece, at Eretria, near Volos. FIMISCO produced refractory-grade chromite from the Kastraki, Domokos-Nezeros, and Rothini mining areas. The capacity was 25,000 mt/a of refractory-grade material. Most of the refractory-grade chromite was used in the refractory plant at Fourni on Euboea island.[4]

About 15,000 tons of chromite was exported mainly to Germany. Greek ferrochrome exports amount to more than 40,000 tons.

Iron and Steel.—The country's steel production was mainly based on the electric arc process using imported scrap as raw material. A significant proportion of steel products was exported. In the ferroalloys sector, Greece was an important producer of ferrochrome and ferronickel, both of which were exported.

There were five major steel plants in Greece. Halyvourgiki Inc., the largest producer of crude steel, started production of concrete reinforcing steel bars in 1948 at Eleusis. Steel was produced in electric arc furnaces, and finished steel capacity amounted to 2 Mmt/a. The company also maintained its own port facility for unloading imported raw materials and for the export of products to Western Europe and the Far East.

Helleniki Halivourgia S.A., the second largest steel producer, Greece's longest established steelmaker, was founded in 1938. At its Aspropyrgos works, steel production was based on two 55-ton electric arc furnaces. Billets were produced in a continuous casting machine and hot-rolled products were produced in mills: The capacity of the plant was rated at 400,000 mt/a.

Other steel producers were Halyvourgia Thessalias S.A., Metallurgiki Halyps S.A., and Sidnor S.A. The latter's plant was at Nea Magnisia near Thessaloniki, operating four electric arc furnaces, with a total raw steel capacity of 350,000 mt/a.

Hellenic Steel Co., with a finished steel capacity of 1 Mmt/a, was second only to Halyvourgiki Inc. in finished steel output in Greece. It operated a cold-rolling mill in Thessaloniki, producing coils, sheets and strips, galvanized sheets, and tinplate. Exports accounted for 60% of total production, destined to Western Europe, the United States, North Africa, and the Middle East.

The largest company operating in the stainless steel sector is Pyramis S.A., in Thessaloniki, producing sinks and tableware. There also were 10 other companies producing stainless steel.

Lead and Zinc.—Greece produced primary lead and manufactured lead-base products. Most of the country's Deposits of mixed sulfide ores are found in the northern provinces of Macedonia and Thrace. The Hellenic Chemical Products and Fertilizer Co. Ltd. operated the Kassandra Mines at Stratoni, northeast of Chalkidiki. Part of lead concentrate output was used domestically, and the remainder, as well as all zinc concentrates, was exported.

Production was based on the mixed sulfide ore deposits at Stratoni on the eastern side of the Chalkidiki peninsula. The Madem Lakkos-Mavres and the Olympiada Mines produced about 800,000 mt/a, yielding about 35,000 tons of lead sulfide concentrate, 45,000 tons of zinc sulfide concentrate, and 170,000 tons of pyrite concentrate. In addition, silver was recovered from the operations.

The Greek Metallurgical & Mining Co. of Lavrion S.A. closed its 20,000 mt/a-capacity lead smelter and refinery at Lavrion.

Manganese.—Greece has deposits of manganese oxide ore, pyrolusite, and rhodochrosite in the Chalkidiki and Drama areas of northern Greece. Exploitation of the Chalkidiki deposits has been sporadic, especially in the Neochorion area. Manganese ore was produced in the Drama area by Elbaumin, with a mine and a beneficiation plant at Nevrokopi and the final processing plant in Drama. The company's principal product is battery-grade manganese dioxide, which was sold under the "Scalma" trade name.

Nickel.—Greece's production of nickel was based on lateritic iron silicate ores having a nickel content of about 1%. Mining operations were based at Pagonda and Vrissakia in the mountainous Psachna region of north-central Euboea island and at the St. John Mine on the mainland near Larymna. A new deposit was discovered in the Kastoria area in northern Greece. Ore from Euboea was crushed, graded, and homogenized before being transferred to barges for shipment to the metallurgical facility at Larymna. All nickel ore produced in Greece was converted to ferronickel. Three electric arc furnaces and two rotary kilns were in operation with an output of 12,000 to 16,000 mt/a of contained nickel in ferronickel product. Two other electric arc furnaces were held on standby for either increased ferronickel output or for the production of other ferroalloy products. All production was exported, primarily to Western Europe.

Operations were handled by Hellenic Mining & Metallurgical Co. of Larymna (LARCO). The 80% Government-owned LARCO was formerly part of the Bodossakis Group.

Industrial Minerals

Cement.—Cement output, which had slumped slightly in recent years, increased to a year high in 1990. About 6 Mmt was exported. There were four major cement-producing companies in Greece. Titan Cement Co. S.A., a privately owned company, was the largest producer. The company had plants at Eleuis, Kamari, Patras, and Salonica. In 1990, Titan produced about 5 Mmt of cement. The Government-owned Heracles General Cement Co. S.A., with plants at Euboea and Olympos, was the second largest cement producer. The production capacities of its facilities totaled about 6 Mmt/a. Halkis Cement Co. S.A. and Halyps Cement S.A. were both privately owned. Most of the kilns operated primarily on coal, and fuel oil was used only to preheat a kiln after a stop.

Clays.—The deposits of bentonite occur on the island of Milos. The island, about 125 km southeast of Athens, was well endowed with industrial minerals. Barite, bentonite, kaolin, and perlite have been mined on the island since 1933. The bentonite operations have expanded considerably in recent years. Bentonite from Greece was exported worldwide as drilling mud, foundry moulding clay, and for iron ore pelletizing.

Most bentonite mines and processing plants were at Vouthia Bay on the northern tip of Milos island. Although Silver & Baryte Ores Mining Co. S.A. (S&B) was the largest operator in Milos, there were several smaller operators, some of which shipped bentonite in crude form.

S&B also produces barite from two mines on the island of Milos, at Kavos and Pikridou. S&B also produces kaolin and perlite. About 90,000 tons of kaolin was produced on Milos in 1990, though the capacity was close to 200,000 t/a. The reason for the disparity between the two figures is that the company anticipated strong growth in demand for kaolin in the ceramics and paper industries. The company was considering plans for establishing a new grinding plant. Of the total production, about 6,000 tons was used for paper filler, 3,000 tons for paint and plastic filler and extender, and 80,000 tons for cement. Domestic markets accounted for about 80% of the total.[5]

Magnesite.—Magnesite deposits in Greece occur on the Chilkidiki peninsula in the north and on the northern tip of Euboea island. There were three companies in operation, with a total crude ore output of about 1 Mmt. Magnesite was mined from open-pit mines at depths of 60 m or more. The largest company, FIMISCO, produced magnesite from a large mine at Mantoudhi on Euboea island. Magnesite mining on Euboea island started in 1860. The magnesite deposits on the island were of vein and stockwork types, occurring in serpentine-peridotites. FIMISCO also had shiploading facilities only a few kilometers from its industrial facilities at Fourni. The second largest company, Grecian Magnesite Ltd., and the Magnomin General Mining Co. S.A. operated mines in the Chalkidiki area, in northern Greece. About 65% of production was exported, while the remainder was consumed by the Fourni basic refractories plant.

Marble.—Dionyssos-Pentelicon, about 15 km northeast of Athens, is the largest marble quarry in Greece. The quarry provided the marble that was used to build the Parthenon. It still produces a dense white marble, which, with time, turns to a faint golden tint. Other Greek marbles show a wide range of colors and patterns. Most of the marble is exported, mainly to Europe and the Middle East, but also to the United States. Marble fabricating mills in Greece are as common as concrete-block plants in other countries. The Lazarides Co., with reportedly the largest export trade, produced 25,000 m^2 of polished architectural stone per day.[6]

Perlite.—Greece continued to be Europe's leading producer of perlite and was third in the world, after the United States and the U.S.S.R. Perlite was exported largely throughout Europe. The most important European deposits of perlite occur on the Aegean island of Milos. These deposits were reported to contain a total of 70 Mmt of measured reserves and 180 Mmt of inferred reserves. One of the longest established perlite producers on Milos was the S&B company of Athens. The company exploited three varieties of perlite from several opencast operations, and its output was transported to the company's primary processing plant at Vouthia Bay.

Perlite also was exploited on other islands, notably around Kefalos on the island of Kos in the Eastern Aegean Sea, close to the Turkish mainland. On the island of Kos, S&B and N. Bouras & Co. mined perlite from a deposit similar to that on Milos.[7] Smaller deposits were also found on the islands of Nisiros and Lesvos, and in Western Thrace.

Pumice.—Pumiceous material is prominent in many of the volcanic islands of Greece. Extensive reserves of pumice were delineated on the islands of Ghyali (Yali) and Nissyros, in the Dodecanese group of islands. Pozzolan (Santorin earth), a devitrified volcanic tuff, occurs on the island of Thera (Santorini) in the Cyclades group of islands. However, production of pozzolan on Thera ceased in 1984. The only company active in the pumice industry in Greece was Lava Mining & Quarrying Co. Ltd., a wholly owned subsidiary of Heracles General Cement Co. operating quarries on the Ghyali island, north of Nissyros island. Lava's principal export markets were the Federal Republic of Germany, Italy, Spain, the United Kingdom and the United States. Other smaller markets included China, the Middle East, and North Africa.[8]

Mineral Fuels

Lignite.—A feasibility study was in preparation during the year for the mining of a lignite deposit containing an estimated 4 Mmt of reserves. The deposit was located in the Kalavryta area of the Peloponnesus. Only the Government-owned Public Power Corp. mined lignite and generated electricity in Greece.

The country's lignite production was generally produced from open pit mines. Lignite production was concentrated mainly in two regions. Ptolemais, in northern Greece was the country's largest open pit lignite mine. The main consumers of lignite from Ptolemais were large thermal power stations, as well as a number of fertilizer and briquetting factories. The Ptolemais industrial area had the largest concentration of thermal powerplants in Greece. The second largest lignite producing area was at Megalopolis in the central Peloponnese region, which had two open pit mines and a powerplant. There were also smaller privately mined lignite deposits in the Florina Basin in Northern Greece.

The major coal users in Greece were the cement, electricity, steel, and ferronickel producers. Lignite accounted for the generation of about 90% of the country's electricity, while hydropower accounted for about 5%, and oil for them accounted for the rest. There were no nuclear powerplants in Greece.

Natural Gas and Petroleum.—The Government-owned Public Petroleum Corp. (DEP) was responsible for the exploration and production of natural gas and petroleum. Greece's gas and oilfields were operated offshore, east of Thasos island. In 1989, additional reserves of natural gas were discovered at Epanomi in the Chalkidiki area of northern Greece. When operational, daily output from this deposit was estimated to be about 200,000 m^3. This would be equivalent to about 1% of the amount that will be imported from the U.S.S.R. Exploitation of this deposit was scheduled to commence by 1992.

Two major contracts have reportedly been concluded by the Government to build a gas pipeline (with the U.S.S.R.) and to buy LNG (from Algeria). The length of the pipeline will be 514 km, and should be completed in 1993.

In 1990, the production of crude petroleum continued to fall. Greece's entire petroleum production came from the Prinos offshore field in the Aegean Sea. DEP has been involved for a long time in the search for oil and gas through seismic work and drilling. Despite these efforts, no new major oilfields have been discovered. About 65% of Greece's crude petroleum requirements were met by imports from the Near East.

Reserves

Greece has sufficient reserves of bauxite, bentonite, chromite, lead, manganese, nickel, perlite, and zinc and a wide range of industrial minerals to satisfy many of the country's domestic and export needs well into the 21st century.

INFRASTRUCTURE

In Greece, there was 38,938 km of highways, of which 16,090 km was paved, 13,676 km consisted of crushed stone and gravel, 5,632 km of improved earth, and 3,540 km of unimproved earth. Railroads, all Government owned, covered 2,479 km in total. There was 80 km of inland waterways, consisting of three coastal canals and three unconnected rivers. Piraeus and Thessaloniki are Greece's major ports.

TABLE 3

GREECE: RESERVES[1] OF MAJOR MINERAL COMMODITIES FOR 1990

(Million metric tons)

Commodity	Reserves
Asbestos	4
Barite	4
Bauxite	750
Chromite	16
Iron	70
Lead, content of ore	.7
Lignite	3,570
Manganese, content of ore	2
Magnesite	50
Nickel, content of ore	2
Perlite	200
Pyrite	6
Zinc, content of ore	1.3

[1]Measured and inferred reserves.

There are 26 km of pipeline for the transportation of crude oil and 547 km of pipeline for the transportation of refined products.

OUTLOOK

The outlook for 1991 and beyond depends on the Government's ability to implement its new policies. Greece's Government plans to privatize about 300 state-owned companies in many sectors, such as chemicals, fertilizers, mining, and industrial abrasives. The economy will probably grow very little in real terms, but that should help to push down inflation and deficits. Industrial production will remain about the same. Greece will continue to export cement to Europe and aims to be a mining center for some items needed by EC industries.

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[1]Trade With Greece. The Athens Chamber of Commerce and Industry (Athens). No. 98, Jan.-Dec. 1990.

[2]Metal Bulletin (London). Mar. 4, 1991, p. 7.

[3]1990 Ferro Alloy Manual (Tokyo). Mar. 1991, p. 115.

[4]Industrial Minerals, Geology and World Deposits. Metal Bulletin Plc, Industrial Minerals Division (London). 1990, p. 47.

[5]Industrial Minerals (London). Feb. 1991, p. 30.

[6]Page 46 of work cited in footnote 6.

[7]Page 186 of work cited in footnote 6.

[8]Industrial Minerals (London). May 1990, p. 31.

OTHER SOURCES OF INFORMATION

Agencies

The Institute of Geology and Mineral Exploration (IGME)
70 Messoghion Street
608 Athens, Greece

Project Studies and Mining Development Corp. S.A. (GEMEE)
15 Valaoritou Street
106 71 Athens, Greece

Hellenic Industrial and Mining Investment Co. (HIMIC)
3 Korai Street
105 64 Athens, Greece

Hellenic Industrial Development Bank (ETVA)
18 El Venizelou Street
196 72 Athens, Greece

National Bank for Industrial Development (ETBA)
14 Amalias Avenue
192 36 Athens, Greece

Public Power Corp. (DEH)
30 Halkocondyli
104 32 Athens, Greece

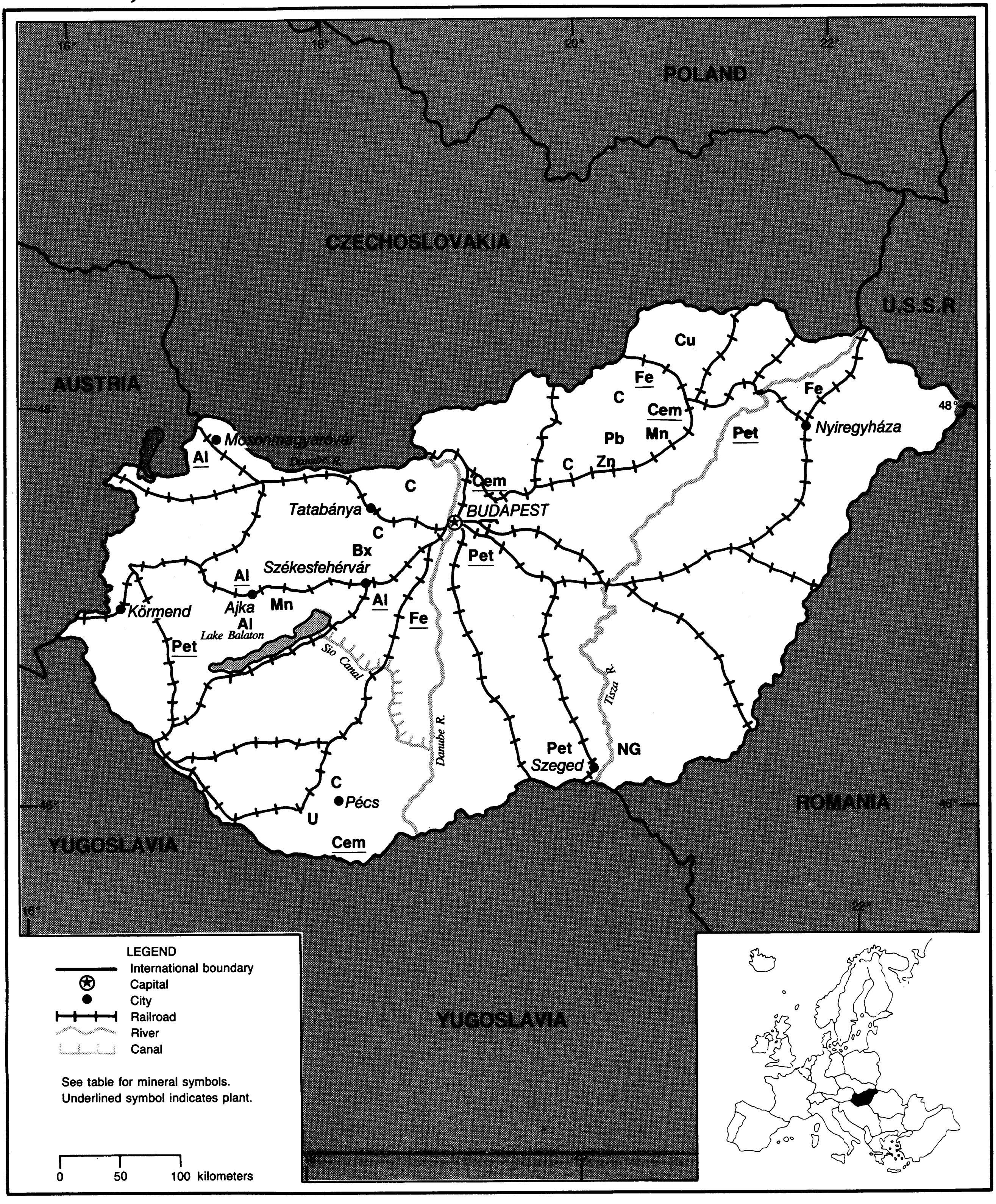
Public Petroleum Corp. (DEP)
119 Kifissias Maroussi
151 24 Attica, Greece

Publication

Statistiki Epeteris Tis Ellados (National Statistical Service of Greece), Statistical Yearbook of Greece, Athens.

HUNGARY

AREA 93,000 km² **POPULATION 10.7 million**



THE MINERAL INDUSTRY OF HUNGARY

By Walter G. Steblez

In 1990, Hungary continued to report modest declines in all the major sectors of its mineral industry: metals, industrial minerals, and mineral fuels. Among the country's chief mineral products, only the production of cement, manganese ore, and crude petroleum showed some gains compared with that of 1989. As in 1989, declines of production in the country's mineral industry in 1990 were largely the result of continuing policies to transform Hungary's economy to a market system. By European standards, Hungary remained a major producer of alumina, aluminum, and bauxite products, although even the future of this industry had become uncertain in light of the emerging market forces within the country.

In 1990, according to the country's official statistical sources, Hungary's GDP declined by about 4% compared with that of 1989, and the value of gross industrial output fell sharply by 11% during this period. Among the factors that contributed to this decline, apart from those directly pertaining to the economic transition to the market system, was the early collapse of the barter-based trading arrangement within the CMEA, which occurred significantly earlier than the official dissolution of this organization. This, as well as the structural changes that occurred within the U.S.S.R during the year, caused cutbacks of deliveries of Soviet natural gas and petroleum to Hungary. Other events that had a negative impact on Hungary's economy were drought and the crisis in the Persian Gulf, which severely restricted the country's ability to import crude petroleum from non-CMEA areas.

GOVERNMENT POLICIES AND PROGRAMS

In 1990, the reduction of subsidies to state-owned enterprises continued to be one of the major economic programs of the Hungarian Government. The reduction of subsidies was one of the major components of the Government's reform since the late 1980's. The Government announced plans to reduce subsidies from 9.6% of the GDP in 1990 to 7% of the GDP in 1991 and to 4% of the GDP in 1993. The reduction of subsidies to the country's state-owned mineral industry in mid-August resulted in an appeal to the Government by Hungary's mining trade unions to take urgent action to save the country's mining industry and more than 60,000 jobs. Eight coal mining enterprises highlighted this issue by reporting an accumulated debt of Ft 35 billion by the beginning of 1990. On the other hand, the net asset value of the enterprises was put at Ft 46 billion.[1]

In 1990, the Government of Hungary devalued the forint by 16% and planned a further devaluation of 13% for 1991. During the year, "internal convertibility" of the forint was introduced. This allowed Hungarian enterprises to hold hard currency accounts and convert forint profits to hard-currency for imports of new technology and equipment from market economy areas.

Domestic commercial banks also were allowed to trade hard currency among themselves instead of transacting solely through the Central Bank of Hungary. In conjunction with these efforts, a stock exchange was formally established on June 19, 1990, which would help establish market values for former centrally planned, state-owned enterprises.

Although, during the year, the Government maintained strong budgetary constraints prescribed by the IMF, funds were allocated for the modernization and development of the country's infrastructure. Apart from accelerating the country's adoption of the EC's and EFTA's standards, the development of infrastructure would add scope and importance to the domestic construction industry and industrial minerals sector. At midyear, the Government of Hungary signed a memorandum of cooperation with EFTA to provide a basis for an eventual free trade agreement. Hungary requested an asymmetrical free trade agreement for the period of time required to establish free market institutions.

In response to declining petroleum imports from the U.S.S.R., the Government of Hungary indicated that future imports of petroleum would be based on world market prices in convertible currency. All new development projects would have to give primary consideration to energy efficiency and environmental concerns, and, owing to limited domestic petroleum resources, more focus was to be given for developing and expanding the domestic coal, natural gas, and nuclear energy sectors.

In early September, the Regional Environmental Center for Central and Eastern Europe was formally opened in Budapest. The center received initial funds, amounting to $10 million, donated by Austria, Canada, the EC, Norway, as well as the United States and Hungary. Bulgaria, Czechoslovakia, Poland, and Yugoslavia also signed the center's original charter prior to opening. The Regional Environmental Center would provide access to technical information and assistance for the development of regional environmental institutions. It would also serve as a clearinghouse for environmental programs and as a resource for education and training. The center's initial objectives would be to promote cost-effective pollution control technology and energy efficiency.

PRODUCTION

Hungary continued to show a downward production trend in 1990 in the metals, industrial minerals, and mineral fuels sectors of the minerals industry. In contrast to the country's previous centrally planned socialist economic system, Hungary's transition to a market economy no longer obligated the Government to produce mineral raw materials at "all cost," maintain full employment, and invest the majority of the available capital in heavy industries. Moreover, as in other branches of the economy, the structural and production profiles of the constituent branches of Hungary's minerals industry should increasingly continue to conform to the demands of the market.

TRADE

In 1990, the apparent collapse of CMEA's ruble-based trading system had become discernible as Hungary's volume

TABLE 1

HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989	1990[p]
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	3,022	3,101	2,593	[r]2,644	2,559
Alumina, gross weight, calcined basis	do.	856	858	873	[r]882	826
Metal:						
Primary		73,877	[r]73,500	74,692	[r]75,195	75,162
Secondary[e]		23,000	24,000	24,000	[r]25,000	25,000
Total[e]		96,877	[r]97,500	98,692	[r]100,195	100,162
Copper, metal:[e]						
Smelter, secondary		100	100	100	100	100
Refined including secondary		12,800	12,500	19,220	19,000	19,000
Gallium, metal	kilograms	4,062	4,103	[e]4,100	[e]4,100	[e]4,100
Gold, mine output, Au content[e]	do.	620	600	600	600	600
Iron and steel: Metal:						
Pig iron:						
For steel industry	thousand tons	1,987	2,051	2,054	[r]1,927	1,682
For foundry use	do.	67	56	39	[r]27	15
Total	do.	2,054	2,107	2,093	[r]1,954	1,697
Ferroalloys:[e 3]						
Ferrosilicon		9,000	10,000	10,000	9,000	9,000
Silicon metal		2,000	2,000	2,000	2,000	2,000
Other		2,000	2,000	1,000	1,000	1,000
Total		13,000	14,000	13,000	12,000	12,000
Steel:						
Crude	thousand tons	3,715	3,621	3,583	[r]3,356	2,963
Semimanufactures, rolled only	do.	2,898	2,831	2,793	[r]2,539	2,176
Lead: Metal, refined, secondary[e]		100	100	—	—	—
Manganese ore:						
Run of mine:						
Gross weight		106,009	125,634	110,908	[r]108,327	118,200
Mn content[e]		20,000	24,000	24,000	[r]20,000	22,000
Concentrate:						
Gross weight		63,000	78,000	80,983	[r]84,000	60,000
Mn content[e]		18,900	25,000	[4]25,915	[r]27,000	18,000
Vanadium, metal[e]		300	300	300	300	300
Zinc: Metal, smelter, secondary		[e]600	[r,e]600	[r]1,565	[r]1,374	[e]1,300
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	3,846	4,153	3,873	[r]3,857	3,933
Clays:						
Bentonite:						
Raw		79,888	98,331	[r]66,014	[r]59,973	36,600
Processed		47,504	52,828	53,250	[r]47,175	28,600
Kaolin:						
Raw		29,837	33,289	[r]29,572	[r]24,824	18,000
Processed		6,032	5,179	5,329	[r]3,788	3,100
Gypsum and anhydrite[e]		20,000	104,400	[r]117,845	[r]113,000	112,000
Lime, calcined	thousand tons	831	831	851	[r]878	831
Nitrogen: N content of ammonia	do.	811	786	[r]692	[r]673	445
Perlite		109,360	112,410	120,562	[r]108,678	93,000

See footnotes at end of table.

TABLE 1—Continued

HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989	1990[p]
INDUSTRIAL MINERALS—Continued						
Refractory materials, n.e.s.:						
Chamotte products	thousand tons	132	116	109	[r]101	77
Chrome magnesite products	do.	42	53	33	[r]32	29
Sand and gravel:						
Gravel	thousand cubic meters	8,179	8,269	7,769	[r]7,720	5,557
Sand:						
Common[e]	do.	400	400	400	400	400
Foundry	thousand tons	519	631	648	[r]649	543
Glass	do.	804	769	690	791	705
Sodium compounds:						
Hydroxide (caustic soda)		201,684	201,167	201,784	[r]204,044	193,063
Sulfate[e]		10,000	9,000	9,000	9,000	8,000
Stone:						
Dimension, all types	thousand tons	5,966	5,537	5,217	[r]4,677	4,025
Dolomite	do.	1,146	1,086	1,005	[r]917	778
Limestone	do.	7,469	7,282	7,091	[r]7,259	6,572
Quartzite	do.	33	30	42	[r]24	31
Sulfur:						
From pyrite[e]		1,000	1,000	1,000	1,000	1,000
Byproduct, elemental, all sources[e]		10,000	10,000	10,000	10,000	9,000
Total[e]		11,000	11,000	11,000	11,000	10,000
Sulfuric acid		539,775	573,323	512,374	[r]482,421	244,051
Talc[e]		16,000	15,000	13,000	12,000	10,000
MINERAL FUELS AND RELATED MATERIALS						
Asphalt, natural		[e]550,000	572,117	552,334	[e]550,000	[e]500,000
Carbon black[e]		5,000	5,000	[r]5,000	[r]5,000	5,000
Coal:						
Bituminous	thousand tons	2,325	2,360	2,255	[r]2,127	1,736
Brown	do.	13,821	13,261	12,986	[r]12,020	10,373
Lignite	do.	6,983	7,223	5,634	[r]5,883	5,469
Total	do.	23,129	22,844	20,875	[r]20,030	17,578
Coke:						
Coke oven:						
Metallurgical	thousand tons	547	669	547	[r]602	564
Other[e]	do.	150	150	150	150	150
Total[e]	do.	697	819	697	[r]752	714
Gashouse[e]	do.	160	160	302	210	200
Total coke	do.	857	979	999	[r]962	914
Fuel briquets	do.	2,006	2,134	2,302	[r]1,983	1,761
Gas:						
Manufactured	million cubic meters	230	151	52	([5])	—
Natural, marketed	do.	7,022	7,126	6,272	[r]6,176	4,932
Natural gas liquids:[e]						
Natural gasoline	thousand 42-gallon barrels	3,700	[4]5,540	5,500	5,500	5,000
Liquefied petroleum gas	do.	3,400	[4]2,444	2,400	2,400	2,300
Peat, agricultural use[e]	thousand tons	75	70	70	70	65

See footnotes at end of table

TABLE 1—Continued

HUNGARY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989	1990[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum:						
Crude:						
As reported	do.	2,005	1,876	1,947	[r]1,966	1,974
Converted	thousand 42-gallon barrels	13,594	12,977	13,025	[r]13,152	13,206
Refinery products:[6]						
Liquefied petroleum gas	thousand 42-gallon barrels	[r]951	[r]1,067	[r]1,253	[r]1,195	[e]1,100
Gasoline, including naphtha	do.	[r]10,778	[r]11,059	[r]11,306	[r]11,033	[e]11,000
Kerosene and other light distillates	do.	[r]2,232	[r]2,581	[r]2,449	[r]2,542	[e]2,500
Distillate fuel oil	do.	[r]24,715	[r]24,200	[r]24,200	[r]22,902	[e]22,000
Lubricants	do.	[r]1,498	[r]1,463	[r]1,323	[r]1,302	[e]1,300
Residual fuel oil	do.	[r]11,501	[r]9,597	[r]11,642	[r]12,075	[e]12,000
Paraffin and petrolatum	do.	[r]268	[r]236	[r]236	[r]236	[e]230
Asphalt and bitumen	do.	[r]3,388	3,466	[r]3,345	[r]3,115	[e]3,000
Total[e]	do.	[r]55,331	[r]53,669	[r]55,754	[r]54,400	53,130

[e]Estimated. [p]Prelimary. [r]Revised.
[1]Table includes data available through Dec. 1991.
[2]In addition to the commodities listed, diatomite 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]Hungary is believed to produce some blast furnace ferromanganese.
[4]Reported figure.
[5]Revised to zero.
[6]Excludes refinery fuel and losses.

of imports from CMEA declined by 18% and exports by 25% compared with those of 1989. Hungary's trade with the U.S.S.R., its principal trading partner within CMEA, declined by 18% in respect to exports and 33% in respect to imports. Debt issues that arose between Hungary and the U.S.S.R. also complicated the trade picture.

The U.S.S.R. had a $2 billion foreign trade debt owed to Hungary, which proved difficult to resolve during the year, owing to both political and economic dislocations in the U.S.S.R. Nevertheless, the U.S.S.R. remained Hungary's principal source of mineral raw material. Table 3 provides details on Hungary's chief mineral imports. Sources of import for 1990 were distributed by accounting area. The U.S.S.R. has been the predominant source of ruble-based mineral imports by Hungary. Hungary's ruble-accounted imports in 1990, with few exceptions such as copper, zinc and sulfur, were substantially greater than those transacted on a hard-currency basis. On the other hand, with the exception of alumina, Hungary's mineral exports were directed largely at the free market, as shown in table 2. In 1990, the EC removed many quantitative restrictions on Hungarian exports and raised quotas on steel textiles and certain agricultural goods. During the year, Hungary's total exports to the EC rose by about 26% compared with those of 1989.

STRUCTURE OF THE MINERAL INDUSTRY

The information provided in table 4 lists the names of administrative bodies as well as subordinate production units of the main branches of the country's mineral industry.

COMMODITY REVIEW

Metals

Aluminum and Bauxite.—The Hungarian Aluminum Corp. (Hungalu) was Hungary's only producer of alumina, aluminum, and bauxite. Hungalu consisted of 14 enterprises that were involved at all levels of activity: mining, refining, smelting, fabrication, and marketing. In the face of discontinuity of ruble trade within CMEA, possible changes and/or cancellation of the Hungary-U.S.S.R. alumina-aluminum agreement, and privatization, Hungalu's strategy, developed in 1990, included the reduction of bauxite and aluminum production capacity to levels that could be sustained by the market. Hungalu's restructuring plan envisaged the operation of only two bauxite mines after the closure of its deep underground operations. Outlays for prospecting and exploration would be reduced by about one-third to meet the corporation's future needs. Hungalu's management planned the cessation of alumina production at Almasfuzito by yearend 1995, and at Masonmagyarovar during the 1994-95 period. The reduction of alumina refining capacity, to a large extent, would parallel the closure of Hungalu's aluminum smelters owing to high energy costs. Potlines at Tatabanya were to close by 1993, and those at Inota and Ajka by yearend 1995. Hungalu would continue to fabricate aluminum after 1995, using imported sources of primary aluminum. It was envisaged that some primary aluminum would be secured from the U.S.S.R., given the resumption of the Hungary-U.S.S.R. alumina-aluminum agreement after 1995. Also, additional sources of primary metal could be secured by means of a long-term partnership arrangement with a foreign aluminum com-

TABLE 2

HUNGARY: EXPORTS OF PRINCIPAL MINERAL COMMODITIES

(Metric tons)

Commodity	Years			1990 Destinations	
	1988	1989	1990	To CMEA Countries	To market economy countries
METALS					
Aluminum:					
Ore and concentrate	379,000	338,000	281,000	277,000	4,000
Oxides and hydroxides	715,000	677,000	613,000	506,000	107,000
Metal:					
Unwrought	59,135	76,479	121,762	4,641	117,121
Castings	4,679	2,767	2,080	12	2,068
Products	64,694	67,683	67,560	9,168	58,392
Scrap	9,850	9,534	11,312	—	11,312
Steel:					
Semimanufactures:					
Hot-rolled products	1,358,171	1,201,663	1,350,730	50,285	1,300,445
Cold-rolled products	110,182	95,772	75,982	3,217	72,765
INDUSTRIAL MINERALS					
Ammonia	57,574	52,556	76,803	—	76,803
Bitumen	7,400	9,400	10,000	—	10,000
Cement	187,000	213,000	219,000	27,000	192,000
Nitrogenous fertilizers					
(active substance)	204,000	259,000	189,000	19,000	170,000
MINERAL FUELS					
Refinery products:					
Gasoline	322,937	126,290	150,813	6,716	144,097
Jet fuel	233,383	200,108	197,803	19,005	178,798
Lubricants	78,849	87,568	75,228	—	75,228

Source: Hungarian Statistical Yearbook 1990. Hungarian Central Statistical Office: Budapest, 1991.

TABLE 3

HUNGARY: IMPORTS OF PRINCIPAL MINERAL COMMODITIES

(Metric tons)

Commodity	Years			1990 Sources	
	1988	1989	1990	From CMEA Countries	From market economy countries
METALS					
Aluminum:					
Ingot, primary and secondary	198,000	205,000	204,000	204,000	—
Products	3,899	4,178	3,219	1,774	1,445
Copper:					
Unwrought	31,338	21,275	14,958	3,774	11,185
Products, scrap, and castings	9,608	7,266	3,680	2,211	1,469
Iron and steel:					
Iron ore, crude	2,326,000	2,251,000	1,691,000	1,636,000	55,000
Pig iron:					
Pig iron for steel	286,000	271,000	180,000	154,000	26,000
Foundry pig iron	60,000	58,000	31,000	30,000	1,000
Cast iron	9,425	18,707	1,984	1,169	815
Ferroalloys	70,500	66,806	64,420	56,685	7,735

See footnotes at end of table.

TABLE 3—Continued

HUNGARY: IMPORTS OF PRINCIPAL MINERAL COMMODITIES

(Metric tons, unless otherwise specified)

Commodity	Years			1990 Sources	
	1988	1989	1990	From CMEA Countries	From market economy countries
METALS—Continued					
Steel:					
Semimanufactures:					
Hot-rolled	982,106	804,063	630,378	585,368	45,010
Cold-rolled	124,252	112,727	96,468	31,349	65,119
Lead, metals:					
Unwrought and semimanufactured	9,267	7,416	5,072	3,127	1,945
Tin, metals:					
Unwrought and semimanufactured	950	657	372	14	358
Zinc, metals:					
Unwrought and semimanufactured	26,358	19,186	12,911	1,260	11,651
Products	2,850	3,685	1,463	131	1,332
INDUSTRIAL MINERALS					
Asbestos, crude	27,681	29,663	33,375	32,855	520
Cement	685,000	483,000	178,000	177,000	1,000
Magnesite, calcined	81,000	76,000	51,000	47,000	4,000
Phosphate, crude	544,000	523,000	328,000	264,000	64,000
Refractories (chrome-magnesite)	19,365	15,491	13,741	7,112	6,629
Sodium compounds:					
Soda ash	215,000	178,000	168,000	142,000	26,000
Caustic soda	43,000	33,000	13,000	3,000	10,000
Sulfur	183,000	155,000	47,000	20,000	27,000
MINERAL FUELS					
Coal:					
Bituminous and anthracite	1,898,000	1,697,000	1,839,000	NA	NA
Briquettes	918,000	937,000	794,000	794,000	—
Foundry coke	78,291	72,600	42,129	19,390	22,739
Blast-furnace coke	690,000	705,000	436,000	436,000	—
Natural gas (million m^3)	5,371	6,005	6,320	6,267	53
Petroleum, crude	6,970	6,321	6,224	4,427	1,797
Refinery products:					
Fuel oil	222,000	92,000	213,000	190,000	23,000
Gasoline	343,000	484,000	500,000	223,000	277,000
Diesel fuel	759,000	813,000	854,000	841,000	13,000
Jet engine fuel	127,000	121,000	129,000	104,000	25,000
Lubricants	23,257	121,697	7,066	2,411	4,655

NA Not available.
Source: Hungarian Statistical Yearbook 1990. Hungarian Central Statistical Office: Budapest, 1991.

TABLE 4

STRUCTURE OF THE MINERAL INDUSTRY OF HUNGARY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies (all state-owned)	Location of main facilities	Annual capacity
Alumina	Magyar Aluminiumipari Tröszt (MAT) (Hungarian Aluminum Corp.)	Ajka Timföldgyár plant, about 120 kilometers southwest of Budapest, near Lake Balaton	450
Do.	do.	Almasfuzitö Timföldgyár plant, near the Czechoslovak border, 63 kilometers northwest of Budapest	350
Do.	do.	Moson-Magyarovar plant, in northwest corner of Hungary, about 12 kilometers from Austrian and Czechoslovak border	75
Aluminum, primary.	do.	Ajka plant, about 120 kilometers southwest of Budapest, near Lake Balaton	27.5
Do.	do.	Inota plant, near Varpalota, 75 kilometers southwest of Budapest	46.0
Do.	do.	Tatabánya plant, Tatabánya	17.0
Bauxite	Magyar Aluminiumipari Tröszt (MAT) (Hungarian Aluminum Corp.): Bakony Mining Enterprise and Nyirád Darvastó and Halimba Mining Complexes.	Bakony District, extending roughly 100 kilometers northeast along Lake Balaton	1,900
Do.	Fejér County Mining Enterprise	Fejér County, Vértes District, about 60 kilometers south of Budapest	1,060
Cement	Cement es Mészmüvek	Bélapátfalva, near Miskolc, 125 kilometers northeast of Budapest	1,200
Do.	do.	Beremend, 45 kilometers south of Pécs	1,100
Do.	do.	Hejöcsaba, 150 kilometers northeast of Budapest	1,600
Do.	do.	Lábatlan, 20 kilometers north of Tatabánya	500
Do.	do.	Selyp, 50 kilometers north of Budapest	60
Do.	do.	Tatabanya, 80 kilometers west of Budapest	500
Do.	do.	Vác, 50 kilometers north of Budapest	1,200
Coal: Bituminous and lignite.	Magyar Szénbányászati Tröszt (MSZT) (Hungarian Coal Mining Trust)	Tatabánya and Oroszlány coal mining region, 45 kilometers west of Budapest	8,957
Do.	do.	Mecsek coal mining region, near Pécs and Komló, north of the Yugoslav border	3,100
Do.	do.	Borsod coal mining region, 130 kilometers northeast of Budapest	5,200
Lignite	do.	Thorez opencast mine at Visonta, 80 kilometers northeast of Budapest	7,000
Manganese ore	do.	Urkut manganese ore mines, 120 kilometers southwest of Budapest	160
Natural gas. million cubic feet per year	National Petroleum and Gas Industrial Trust.	Szeged and Algyö gasfields, southern Hungary	151,960
Do.	do.	Hajduszoboszó gasfield, 180 kilometers east of Budapest	49,440
Do.	do.	Smaller gasfields: Szánk, Kardoskut, Békés, Berefurdö, and others	38,740
Petroleum: Crude million barrels per year	do.	Szeged-Algyö field, near Romanian-Yugoslav border; 50% of total capacity	7
Refined	National Petroleum and Gas Industrial Trust:		
Do.	Danube Petroleum Refining Co.	Százhalombatta	54.8
Do.	Tisza Petroleum Refining Co.	Leninaváros	21.9
Do.	Zala Petroleum Refining Co.	Zalaegerszeg	3.7
Steel	Dunaujváros (Danube Steel Works)	60 kilometers south of Budapest	1,400
Do.	Ozd Metallurgical Works	120 kilometers northeast of Budapest	1,100
Do.	Lenin Metallurgical Works	Diosgyör, 145 kilometers northeast of Budapest	1,300

pany, as well as Hungalu's investment in an aluminum smelting operation outside Hungary that could produce metal at competitive costs. The restructuring of Hungalu also envisaged a reduction of the corporation's labor force from 19,370 workers in 1990 to about 13,000 in 1995. Reductions in the labor force would be accomplished through routine retirements, early retirements, and retraining for occupations outside the aluminum industry.

In April, Hungary and the U.S.S.R. renewed the alumina for aluminum agreement through the end of 1995. The renewed agreement called for Hungary to supply the U.S.S.R. with 530,000 mt/a of alumina in exchange for 205,000 mt/a of primary aluminum. At yearend, Hungalu closed the Nyirad underground bauxite mine, near Lake Balaton, because of pressure from environmental groups concerned with the excessive removal of water from the karst strata at the mine. The potential depletion of water threatened nearby resort areas. Operations at Nyirad stopped in June, and all materials and equipment were removed during the balance of the year to prevent contamination of the karst water after the flooding of the facility.

Hungalu reported concluding a $6 million contract to supply customers in Japan with hot-rolled strip from the Szekesfehervar aluminumworks. Hungalu's aluminum exports of aluminum ingot, sections, foil, and high-purity wire to Japan in 1990 reached a value of $30 million.

Gold.—In early 1990, Metaloglobus of Hungary and Valme, the French precious-metals scrap recycler, formed a joint venture to set up a precious-metals treatment and refining plant in Budapest. The new plant was expected to start operations by midyear.

Iron and Steel.—Following negotiations in 1989 and early 1990, Metallgesellschaft AG and Korf AG finalized the acquisition of one of Hungary's major steelworks, Ozki Kohazati Uzemok (OKU), in May 1990. Under the provisions of the acquisition agreement, Korf and Metallgesellschaft were each to own 30% of the steelworks, renamed Ozder Stahlwerke AG (Ostag); 40% was to be owned by OKU, now in the role of a Government-owned holding company. The main modernization program at Ostag involved the installation of a Korf-designed 90-ton cokeless energy optimizing furnace (EOF) that would replace the existing 100-ton open-hearth furnaces. The new EOF would be supplied by Korf Lurgi Stahl GmbH and would be financed entirely through a credit line extended to Hungary by the Federal Republic of Germany. With new capacities, Ostag would produce 650,000 mt/a of wire rod and bar and 600,000 mt/a of finished steel products. Two-thirds of Ostag's output was to be earmarked for domestic sales and one-third for export.

The Dunaferr integrated steelworks (formerly, Dunai Vasmu at Dunaujvaros) reported the completion of reconstruction work on the No. 1 furnace with Soviet assistance during the year.

Dunaferr also announced plans to restructure itself into a holding company, which would allow eventual privatization through sales of stock. Dimag (formerly, the Lenin Iron and Steel Works), reportedly, awarded a contract to Voest Alpine Industrieanlagenbau in midyear to build a new 3-strand bloom caster at Miskolc. The 600,000-mt/a caster was to become operational in 1991.

Tungsten.—In June, Hungary's Wolframinvest Ore Mining Joint Enterprise reportedly declared bankruptcy. Wolframinvest was established by the Salgotarjan Alloy Works, the Central Mining Development Institute, and the Mecsek Ore Mining Institute to develop the mining and processing of tungsten at Cagandavaa in Mongolia in joint venture with the Mongolian Government. Owing largely to the practical dissolution of CMEA's barter-based trade system and the introduction of market functions, the company was not able to sustain extended losses. The price of tungsten concentrate had declined by more than 40% since the mine and beneficiation plant became operational in 1988. Although the Mongolian Government was willing to extend an old CMEA barter-based credit line to maintain production at the Cagandavaa operation, the National Bank of Hungary rejected the offer, claiming that it would be difficult to find Mongolian goods that would be marketable in Hungary.

Industrial Minerals

In contrast to Hungary's heavy industries, including metal mining and processing, which showed a declining production trend and a need for extensive rationalization, industrial minerals were seen as having a brighter future. This was mainly because of the future needs of the construction, pharmaceutical, and chemical sectors of the country's economy. Hungary's desire to eventually join the EC would necessitate the adoption of EC standards, including those relative to infrastructure. In 1990, bentonite, cement, perlite, and sulfuric acid continued to play an important role in satisfying both domestic and export needs.

Nitrogen.—In May, Tectrade, a subsidiary of the Occidental Petroleum Co., reported the acquisition of a 10% share in the Hungary's Pet Nitrogen Works PLC. The Pet Nitrogen Works accounted for about one-half of Hungary's nitrogenous fertilizer and one-third of the country's phosphatic fertilizer output.

Perlite.—Hungary continued to be an important European producer of perlite, ranked third after the U.S.S.R. and Greece. Perlite ore was mined by Orrszagos Erc-es Asvanybanyak (OEA) at the Palhaza Mine in the Tokaj mountains, near the border of Czechoslovakia and the U.S.S.R.. Widely used as a medium for heat and sound insulation in concrete, boards, and plasters, perlite is a glassy volcanic rock of rhyolitic composition (essentially, an aluminum silicate).

Perlite may expand up to 20 times its original volume when heat treated to release the mineral's water. After mining, milling, and sizing by OEA, perlite ore was shipped for downstream processing and fabrication to a number of domestic firms to manufacture concrete, insulation materials, and filter aids. Apart from meeting domestic needs, Hungary's perlite industry has exported both raw and expanded perlite to Western European market economy countries, as well as to Czechoslovakia and Yugoslavia.

Mineral Fuels

Coal.—In 1990, the Government of Hungary indicated that the restructuring plan for the country's coal industry would likely include the closure of 12 of the country's 32 operating coal mines. The mines proposed for closure were mainly deep sub-bituminous coal mines, which were put on-stream in the late 1970's and early 1980's. The debt accumulated by these operations, inclusive though 1990, reportedly, amounted to about $645 million, and, in 1990 alone, their collective losses were put at about $48 million.

In July, miners at the Markushegy Mine of the Oroszlany coal mining complex went on strike. The striking workers demanded reductions in administrative staffing, pension reforms, a 50% pay increase, and a dismissal of mine officials who were considered to be unfit. Following negotiations, the Government and the striking workers reached a compromise agreement in which most of the workers' demands were met.

Natural Gas and Petroleum.—Hungary remained an net importer of petroleum and natural gas. More than 80% of the country's import needs of petroleum have been met historically by barter-based shipments from the U.S.S.R. Similarly, all of Hungary's import needs of natural gas had been met by shipments from the U.S.S.R. In 1990, contracted deliveries of Soviet natural gas to Hungary were fulfilled, but, owing to internal economic and technical problems in the U.S.S.R., Hungary received only 4.5 Mmt of petroleum, instead of the 6.29 Mmt called for by contract. To make up the shortfall, Hungary imported about 1.5 Mmt of petroleum from producers outside the CMEA, at a cost of $400 million. In December, the Hungarian Mineralimpex and the Soviet Soyuzgasexport foreign trade organizations reached an agreement regarding petroleum and natural gas sales to Hungary for 1991. In 1991, Hungary was to receive 2 Mmt of petroleum from the U.S.S.R., which was considerably less than the 6.5 Mmt/a received in past years. The agreement also called for the delivery of 5.19 Mm^3 of natural gas to Hungary by the U.S.S.R.

In view of the changing commercial situation within CMEA, Hungary explored alternative sources of supplies of natural gas during the year. The feasibility for constructing new pipelines was discussed, including those that would extend from Yugoslavia and Norway's North Sea deposits.

Reportedly, a gas pipeline linking Hungary with the North Sea oilfields through Western Europe was found to be the more attractive alternative, and negotiations on this project were started late in the year.

Nuclear Energy.—In 1990, Mecseki Ercbanyaszati Vallalat (MEV), Hungary's state-owned uranium mining enterprise at Pecs, and Glencar Explorations PLC of Dublin, Ireland, reached an agreement calling for Glencar to provide management and technical assistance to MEV's mining operation. During the year, Glencar conducted detailed studies of the Pecs operation that covered the status of reserves at the mine, as well as the restructuring program at this facility already in progress. MEV's restructuring program involved the closure and sale of the enterprise's peripheral commercial activities, a substantial reduction in labor force, the introduction of new technology and equipment, and the reorganization of mineral processing and maintenance work. Glencar indicated that the restructuring program at Pecs should return the operation to profitability by 1991. The profitable operation of the Pecs uranium mine could, in turn, clear the way for Glencar and MEV to form a joint venture to operate the mine in which Glencar would have a majority interest.

Reserves

Taking into consideration Hungary's transition to a market economy system, the country's mineral resources would have to be reevaluated from the perspective of market economics. Reserves, as defined by market economies, are those mineral deposits that can be mined at a profit, under existing conditions with existing technology. In CMEA countries, including Hungary, the previous policies for centrally planned industrial development often had more to do with political considerations than real economic sense. The chief principle of industrial development was to attain self-sufficiency at all costs. Centrally planned directives to discover exploitable resources may have resulted in possible overevaluations of collected field data. Consequently, it would probably take Hungary a number of years to determine its real mineral reserves from a market economy standpoint.

The system that was used to measure reserves was based on two cross-imposed classification schemes, one relating to the suitability od the material in question for exploitation and the other relating to the reliability of the information on the quantity of material in place. The first system determined whether or not the deposit was exploitable given current technological capability and industrial need. The second classification related to the reliability of data gathered on the quantity of material in situ.

The second classification designated deposits into "reserve" (resource) categories A, B, C1, and C2, where sufficient geological data had been gathered relative to the size of the deposit and its mineral grade. Taking this system into account, Hungary's major mineral resources in categories A+B+C1 are provided in table 5.

TABLE 5

HUNGARY: APPARENT RESOURCES OF MAJOR MINERAL COMMODITIES FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Resources
Bauxite	124
Copper content of ore	1.9
Manganese ore	18.2
Lead, content of ore	0.8
Zinc, content of ore	0.2
Coal, bituminous	86.3
Coal, brown and lignite	3193.3
Natural gas..million cubic meters	126.7
Petroleum	158.0
Bentonite	15.9
Kaolin	15.7
Perlite	18.1

INFRASTRUCTURE

Railways carried a substantial amount of Hungary's mineral freight. The railroad network consisted of 7,779 km of track, of which 7,513 km was 1.435-m standard-gauge track. In 1990, of the total volume of mineral freight carried in Hungary, railroads carried 44.8% of the fuels, 18.8% of ores and other mining products, 26% of the construction materials, and 74% of the total amount of iron and steel and nonferrous metal products.

Hungary also had maritime port access on the Baltic Sea in Poland at Gdansk and Gdynia, as well as at Rostock in the Federal Republic of Germany. Major ports on the Danube were at Budapest and Dunaujvaros. In 1990, marine transport carried 0.7% of the fuels, 2.8% of the ores and mining related products, 0.7% of the construction industry's products, and 6.4% of the iron and steel and nonferrous metals.

Hungary's highways had a total length of 130,000 km, of which 28,701 km was part of the national highway system. In 1990, the country's highway system carried 14.2% of the fuels, 78.4% of the ores and mining-related products, 73.1% of the construction industry's products, and 19.6% of the iron and steel and nonferrous metals.

The country's pipeline network consisted of a 1,204-km line to carry crude oil, a 600-km line for refinery products, and a 3,800-km pipeline for natural gas. In 1990, Hungary's pipelines carried 40.3% of the total fuel transport.

The total net installed electric generating capacity as of 1987 amounted to 6,629,000 KW, of which 4,940,000 KW were generated by thermal electric generating plants, 1,643,000 KW by nuclear powerplants, and 46,000 KW by hydroelectric power facilities.

OUTLOOK

The continuing reduction of subsidies to state-owned enterprises and the orientation of Hungary's economy toward compliance with market norms has eliminated almost all elements of certainty regarding the future structure and/or production profile of the mineral industry. However, some trends were discernible by yearend 1990. Given the Hungarian Government's objective to bring the country into conformity with standards that are current within EFTA and the EC, greater investment can be envisaged for the reconstruction and modernization of the country's infrastructure: transportation networks, commercial *buildings, and private and publicly owned dwellings, etc. To accommodate most of these objectives, the country's industrial minerals and construction materials sectors would increase in importance as the demand for cement, quarry products, and other industrial minerals increases.

To respond to growing domestic market demands for structural steels, as well as the Government's plans to increase both energy efficiency and minimize environmental degradation, the country's steel industry may be forced to adopt the more efficient minimill approach rather than reliance on the outdated large-scale integrated steel mills that are common in Europe's CMEA areas.

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[1]Where necessary, values have been converted from Hungarian Forint (Ft) to U.S. dollars at the rate of Ft 62.5=US$1.00, the exchange rate for 1990.

OTHER SOURCES OF INFORMATION

Agencies

Iparugyi Miniszterium (Ministry of Industry)
Budapest, Hungary

Publications

Magyar Aluminium (Hungarian Aluminum), Budapest; published monthly.
Statistikai Evkonyv (Statistical Yearbook), Budapest.
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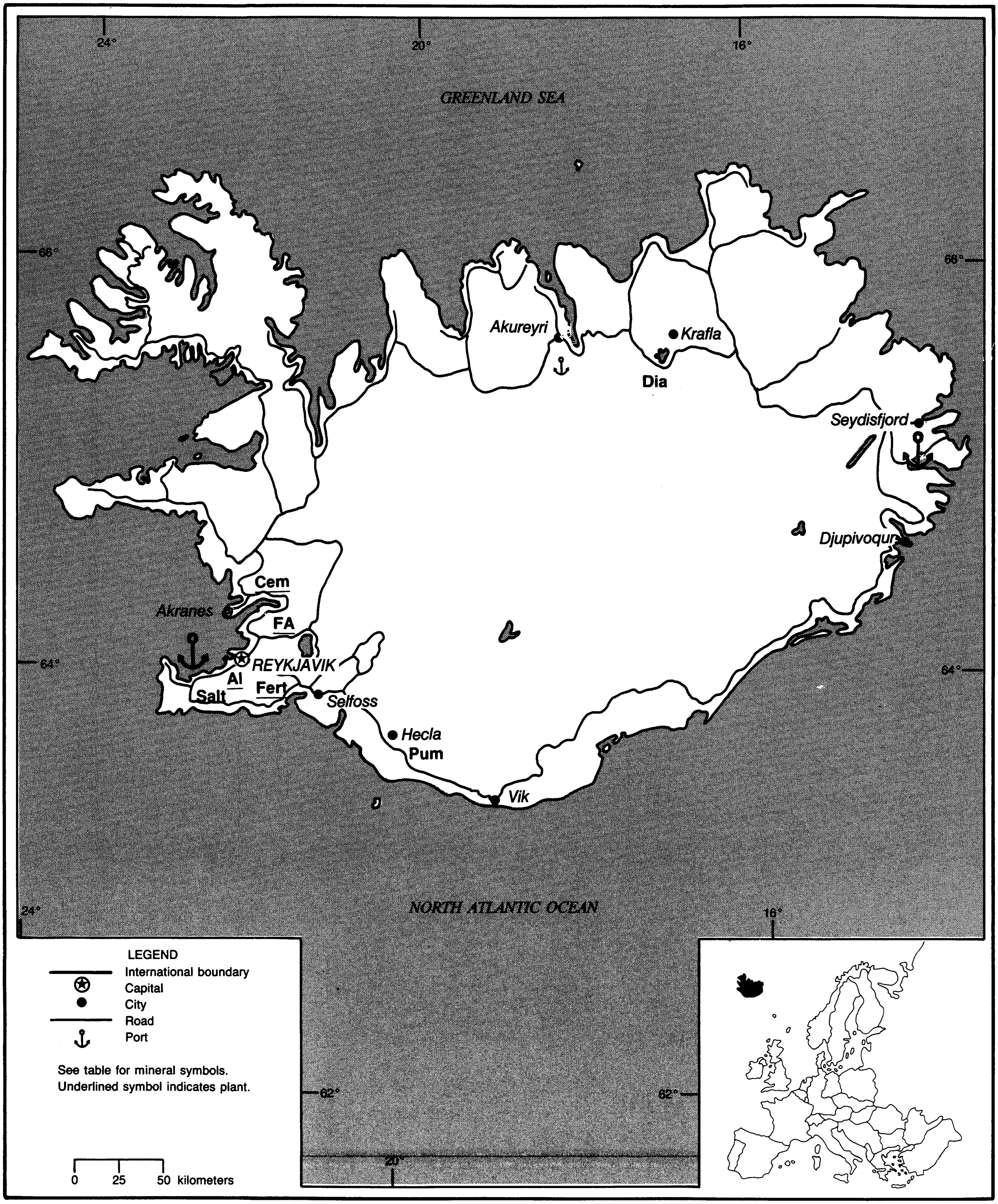
ICELAND

AREA 103,000 km² **POPULATION 252,000**



THE MINERAL INDUSTRY OF ICELAND

By Donald E. Buck, Jr.

Iceland is a mid-Atlantic volcanic island of about 103,000 square kilometers. As part of the Mid-Atlantic Ridge, Iceland has an almost exclusively igneous geologic structure and lacks a significant mineral resource base. Minerals and metals are processed with the abundant hydroelectric and geothermal energy resources of the country. The domestic consumption of minerals and hydrocarbons is small, but almost totally dependant on imports. The Icelandic economy is mostly dependent on the fishing industry. Fishery products account for about 75% of exports and are a major influence on economic performance. In recent years, the Government has continued development of the hydroelectric energy potential to attract more mineral processing companies. Though small on a worldwide basis, the metal production on a per capita basis for aluminum and ferrosilicon is significant.

In 1990, Iceland's GDP was $5.8 billion.[1] The GDP showed no growth over that of 1989,[2] but represented an improvement over the 3.2% decline between 1988 and 1989. Owing to a drop in the world market prices and the depreciation of the krona against the dollar, some of Iceland's industries were not as profitable as those in previous years. The decrease in the world metal prices reduced the export and terms of trade gains to a 2.6% increase.

GOVERNMENT POLICIES AND PROGRAMS

Both private and Government-owned enterprises exist in the mineral and mineral processing industry. The Ministry of Public Works controls prospecting and mining rights under the amended Mining Law of 1906. The Museum of Natural History and the Iceland Geologic Survey collect mineral information. Also, the national and municipal governments control a large share of the financial resources available to business firms in Iceland. The Icelandic Energy Marketing Unit (IEMU) was set up in 1988 as a joint venture between the Ministry of Industry and Energy and the National Power Co. (Landsvirkjun). IEMU's continuing mandate includes market research into possible large-scale energy buyers, feasibility studies for power intensive industries, and energy sales to ventures in Iceland or export of power by underwater cable. Three partly or wholly foreign-owned power-intensive projects, Icelandic Aluminium Co. (ISLA), Icelandic Alloys Ltd., and Kisilidjar Corp., contracted for one-half the energy production of the National Power Co. National Power Co. has an installed hydroelectric power generating capacity of 4,200 gigawatt hours.[3] IEMU solicited foreign companies in the mineral industry to develop major industrial projects. Iceland's competitive advantages are its lower energy costs and economic position in the European Economic Space.

The low cost of energy and the Government's policy to exploit its energy resource have resulted in two new businesses and discussions for the capacity expansion at another. In the fall of 1990, Islenska Stalfelagid (Icelandic Steel Co.) started melting operations in the country's first electric furnace.[4] The initial production rate was 80 tons per day. An increase in the production to 120 tons per day was planned in the near future.

PRODUCTION

Production of aluminum and ferrosilicon decreased slightly as did cement sales because of the continued decline in construction activity. Iceland's most important overall export markets were the United Kingdom (25%), the Federal Republic of Germany (13%), and the United States (10%).

TRADE

The value of 1990 exports was $1,586 million,[5] an increase of 9% over that of 1989. For 1990, exported industrial goods totaled $323 million, of which $164 million was primary aluminum, $42 million was ferrosilicon, and $8.3 million was diatomite.[6] These products represented 13.5% of the total value of commodity groups exported (f.o.b.). The value of imports (c.i.f.) and exports (f.o.b.) with EFTA countries accounted for 16.3% of Iceland's total trade. The United States had a 14.4% share of Iceland's total trade.

STRUCTURE OF THE MINERAL INDUSTRY

Iceland's mineral industry consists mainly of one privately owned aluminum plant and a 55% Government-owned ferrosilicon plant, both of which use imported raw materials. The aluminum industry employs close to 700 persons, and the ferroalloy industry employs close to 200 persons. Labor is unionized. The unions have historically had a powerful political influence. The Government also owns and operates a cement plant and a salt plant.

COMMODITY REVIEW

Metals

Iceland's main mineral commodities produced were aluminum metal and ferrosilicon. Production of aluminum at ISAL continued to be profitable, despite a drop in the world market price for aluminum. While quality and quantity continue to improve at the plant, ISAL's main disadvantage is related to the distance from its markets. However, the lower cost of energy in Iceland is a definite advantage, especially when energy costs are rising in Europe and the United States.

The Icelandic Government and the Atlantal group [Alumax Inc., (United States), Hoogovens BV, (The Netherlands), and Granges AB, (Sweden)] signed a memorandum of understanding for the construction of a new $1 billion aluminum smelter near Reykjavik.[7] The 200,000-ton-per-year project represents Iceland's largest construction project to date. The smelter will require the construction of a new 200-MW hydroelectric plant[8] and a deep-draft port. Iceland's National Power Co. will build the powerplant, which will reportedly cost $536 million in addition to the $1 billion smelter. One of the projected advantages

TABLE 1

ICELAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
Aluminum metal, primary[2]		75,929	83,485	82,034	88,477	85,000
Cement, hydraulic[3]	thousand tons	111	127	134	116	115
Diatomite		22,897	[r]23,345	25,142	24,900	25,000
Iron and steel: Ferrosilicon		66,787	60,184	70,051	72,007	[4]62,791
Nitrogen: N content of ammonia		7,980	9,039	8,812	9,482	9,300
Pumice and related volcanic material:						
Pumice		52,500	58,792	65,444	56,845	57,000
Scoria		[e]375	271	351	367	355
Salt		704	1,830	[e]2,000	2,500	2,400
Sand:						
Basaltic	cubic meters	[e]5,000	5,400	2,300	2,100	2,000
Calcareous, shell	thousand cubic meters	129	115	135	119	115
Sand and gravel	do.	4,088	4,816	4,517	4,421	4,200
Silica dust[5]		13,886	12,131	[e]14,234	12,240	[4]11,222
Stone, crushed:						
Basaltic	thousand tons	77	114	91	91	90
Rhyolite		23,114	22,700	28,300	25,811	25,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 31, 1991.
[21]Ingot and rolling billet production.
[31]Sales.
[4]Reported figure.
[5]Byproduct of ferrosilicon.

TABLE 2

ICELAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
Abrasives, n.e.s.: Corundum, emery, pumice, etc.		65,444	56,845	—	West Germany 9,139; Denmark 8,399; Norway 5,506.
Aluminum: Metal including alloys:					
Scrap		86	261	—	Netherlands 200; Norway 23; Sweden 20.
Unwrought		81,071	89,657	—	Switzerland 38,549; West Germany 27,693.
Semimanufactures		302	—		
Cement	kilograms	200	—		
Copper: Metal including alloys, scrap		267	152	—	Netherlands 129; Denmark 16.
Diatomite and other infusorial earth		25,840	23,553	—	West Germany 4,971; Italy 3,111; Denmark 2,485.
Iron and steel: Metal:					
Scrap		4,507	3,656	—	Netherlands 3,250; United Kingdom 303; Denmark 93.
Ferrosilicon		73,236	64,192	12,561	Japan 22,692; West Germany 14,295.
Lead: Metal including alloys, scrap		144	178	—	All to Netherlands.
Petroleum refinery products: Distillate fuel oil	42-gallon barrels	2,141	37	—	All to Canada.
Salt and brine		300	—		
Stone, sand and gravel:					
Dimension stone, crude and partly worked		—	8	—	All to Denmark.
Gravel and crushed rock		352	369	—	West Germany 173; Denmark 65.
Sand other than metal-bearing		—	12	—	All to Greenland.
Zinc: Metal incuding alloys, scrap		47	105	—	West Germany 40; Netherlands 38; Norway 15.

[1]Table prepared by staff, International Data Section.

TABLE 3

ICELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	(2)	NA		
Alkaline-earth metals	(2)	NA		
Aluminum:				
Oxides and hydroxides	140,525	160,763	—	Australia 160,756.
Metal including alloys:				
Unwrought	42	52	—	Sweden 36; United Kingdom 6.
Semimanufactures	1,357	1,368	34	West Germany 268; Denmark 234; Norway 206.
Antimony: Metal including alloys, all forms	(2)	NA		
Cadmium: Metal including alloys, all forms	(2)	NA		
Chromium:				
Oxides and hydroxides	4	2	—	Netherlands 1; West Germany 1.
Metal including alloys, all forms	(2)	(3)	—	All from West Germany.
Cobalt: Oxides and hydroxides value, thousands	$1	—		
Copper:				
Ore and concentrate	90	451	—	West Germany 450.
Matte and speiss including cement copper	(2)	—		
Oxides and hydroxides	13	—		
Sulfate	(2)	—		
Metal including alloys:				
Unwrought	7	5	—	Mainly from Denmark.
Semimanufactures	611	28	—	Denmark 15; Finland 3; Norway 2.
Gold: Metal including alloys, unwrought and partly wrought value, thousands	$199	NA		
Iron and steel:				
Iron ore and concentrate, excluding roasted pyrite	22,682	16,818	—	All from Norway.
Metal:				
Pig iron, cast iron, related materials	74	29	—	Norway 15; United Kingdom 7.
Ferroalloys:				
Ferromanganese	1	9	—	West Germany 8; Denmark 1.
Ferrosilicon	(2)	—		
Ferrovandium	(2)	—		
Silicon metal	26	126	—	All from Norway.
Unspecified	8	(2)	—	Do.
Steel, primary forms	133	55	—	Netherlands 38; Sweden 7.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	6,567	5,865	—	Norway 1,382; Netherlands 1,126; Belgium-Luxembourg 1,123.
Clad, plated, coated	5,871	5,234	60	West Germany 1,516; Sweden 1,365.
Of alloy steel	757	531	1	Denmark 132; West Germany 116; Sweden 81.
Bars, rods, angles, shapes, sections	23,375	18,361	2	Poland 7,580; Norway 3,850; Netherlands 1,119.
Rails and accessories	75	27	—	West Germany 15; Netherlands 6; Yugoslavia 4.
Wire	343	270	2	Belgium-Luxembourg 111; Denmark 49.
Tubes, pipes, fittings	11,672	8,710	11	West Germany 3,041; Netherlands 1,908; Finland 1,456.

See footnotes at end of table.

TABLE 3—Continued

ICELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS—Continued				
Lead:				
Oxides	11	11	—	West Germany 7; Denmark 3.
Metal including alloys:				
Unwrought	188	159	—	Denmark 76; United Kingdom 60; Sweden 18.
Semimanufactures	34	23	—	West Germany 12; Belgium-Luxembourg 9.
Magnesium: Metal including alloys:				
Scrap	(2)	—		
Unwrought	29	NA		
Semimanufactures	1	—		
Manganese: Oxides	(2)	—		
Mercury kilograms	100	(4)	—	NA.
Molybdenum: Metal including alloys, unwrought including scrap value	$230	—		
Nickel:				
Oxides and hydroxides	(2)	—		
Metal including alloys, all forms value, thousands	$8	$14	—	West Germany $10; Denmark $2.
Platinum-group metals:				
Waste and sweepings value, thousands	$3	$3	—	All from Denmark.
Metals including alloys, unwrought and partly wrought do.	$201	$154	$2	Switzerland $96; Netherlands $26.
Selenium, elemental	(2)	(2)	—	All from West Germany.
Silver:				
Waste and sweepings[5] value	$280	—		
Metal including alloys, unwrought and partly wrought value, thousands	$97	$111	$3	Denmark $39; Switzerland $34.
Tellurium, elemental[6]	(2)	—		
Tin: Metal including alloys:				
Unwrought	(2)	1	—	Mainly from United Kingdom.
Semimanufactures	4	4	—	Denmark 2; United Kingdom 1.
Titanium:				
Oxides	508	397	—	United Kingdom 356; West Germany 41.
Metal including alloys, semimanufactures	(2)	—		
Tungsten: Metal including alloys, all forms value	$885	$1,000	—	All from Sweden.
Uranium: Oxides and other compounds	(2)	—	—	
Zinc:				
Oxides	9	7	—	Netherlands 3; West Germany 2; Norway 1.
Blue powder	5	12	—	Denmark 6; Norway 4.
Metal including alloys:				
Unwrought	131	128	3	Norway 78; West Germany 28.
Semimanufactures	51	16	1	France 11; West Germany 3.
Other:				
Oxides and hydroxides	2	NA		
Ashes and residues	(2)	NA		
Base metals including alloys, all forms	(2)	—		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	41	39	11	Netherlands 16; Norway 8.
Artificial:				
Corundum	7	21	—	Denmark 20.
Silicon carbide	1	—		

See footnotes at end of table.

TABLE 3—Continued

ICELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989 United States	Sources, 1989 Other (principal)
INDUSTRIAL MINERALS—Continued					
Abrasives, n.e.s.:—Continued					
Grinding and polishing wheels and stones		28	29	2	West Germany 8; Netherlands 5; Finland 3.
Barite and witherite		14	6	—	West Germany 4; Denmark 2.
Boron materials:					
Crude natural borates		—	10	—	United Kingdom 8; Denmark 2.
Oxides and acids		1,000	NA		
Bromine		(2)	NA		
Cement		2,184	1,523	(2)	Belgium-Luxembourg 1,373; United Kingdom 64.
Chalk		260	263	—	Norway 154; United Kingdom 45; France 33.
Clays, crude:					
Bentonite		60	78	—	United Kingdom 76; Norway 2.
Chamotte earth		62	NA		
Fuller's earth		(2)	NA		
Fire clay		30	NA		
Kaolin		34	63	6	Netherlands 46; United Kingdom 9.
Unspecified		171	234	—	United Kingdom 211; West Germany 16.
Cryolite and chiolite		100	—		
Diamond, natural:					
Gem, not set or strung	value, thousands	$42	$59	—	Belgium-Luxembourg $32; Switzerland $11.
Industrial stones	do.	$66	$54	$1	Belgium-Luxembourg $35; Netherlands $9.
Diatomite and other infusorial earth		7	4	(2)	West Germany 2; Denmark 1.
Feldspar	kilograms	300	2,000	—	All from Sweden.
Fertilizer materials: Manufactured:					
Ammonia		3,470	2,223	—	France 2,171; Denmark 31.
Nitrogenous		1,919	1,626	—	West Germany 1,520; Norway 71.
Phosphatic		1,421	1,137	—	All from Sweden.
Potassic		5,950	9,203	—	East Germany 8,703; Belgium-Luxembourg 500.
Unspecified and mixed		12,509	10,702	—	Netherlands 10,637; Denmark 37.
Graphite, natural		31	11	(2)	France 9; West Germany 1.
Gypsum and plaster		9,993	5,633	—	Sweden 5,444; East Germany 100.
Iodine		1	NA		
Lime		318	493	—	United Kingdom 268; West Germany 203.
Magnesium compounds:					
Magnesite, crude		(2)	(2)	—	All from Italy.
Oxides and hydroxides		5	5	—	All from United Kingdom.
Mica:					
Crude including splittings and waste		11	14	—	Norway 12; Sweden 2.
Worked including agglomerated splittings		(2)	NA		
Nitrates, crude		60	15	—	Netherlands 10; West Germany 5.
Phosphates, crude		3	1	—	All from Netherlands.
Pigments, mineral:					
Natural, crude		(2)	—		
Iron oxides and hydroxides, processed		35	41	—	Denmark 15; United Kingdom 9; West Germany 8.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$24	$40	$6	West Germany $18; Brazil $8.
Synthetic	do.	$7	$11	—	West Germany $4; Denmark $3; United Kingdom $3.
Pyrite, unroasted		2	—		
Salt and brine		67,923	130,609	(2)	Tunisia 69,225; Spain 56,358.

See footnotes at end of table.

TABLE 3—Continued

ICELAND: IMPORTS OF MINERAL COMMODITIES[1]

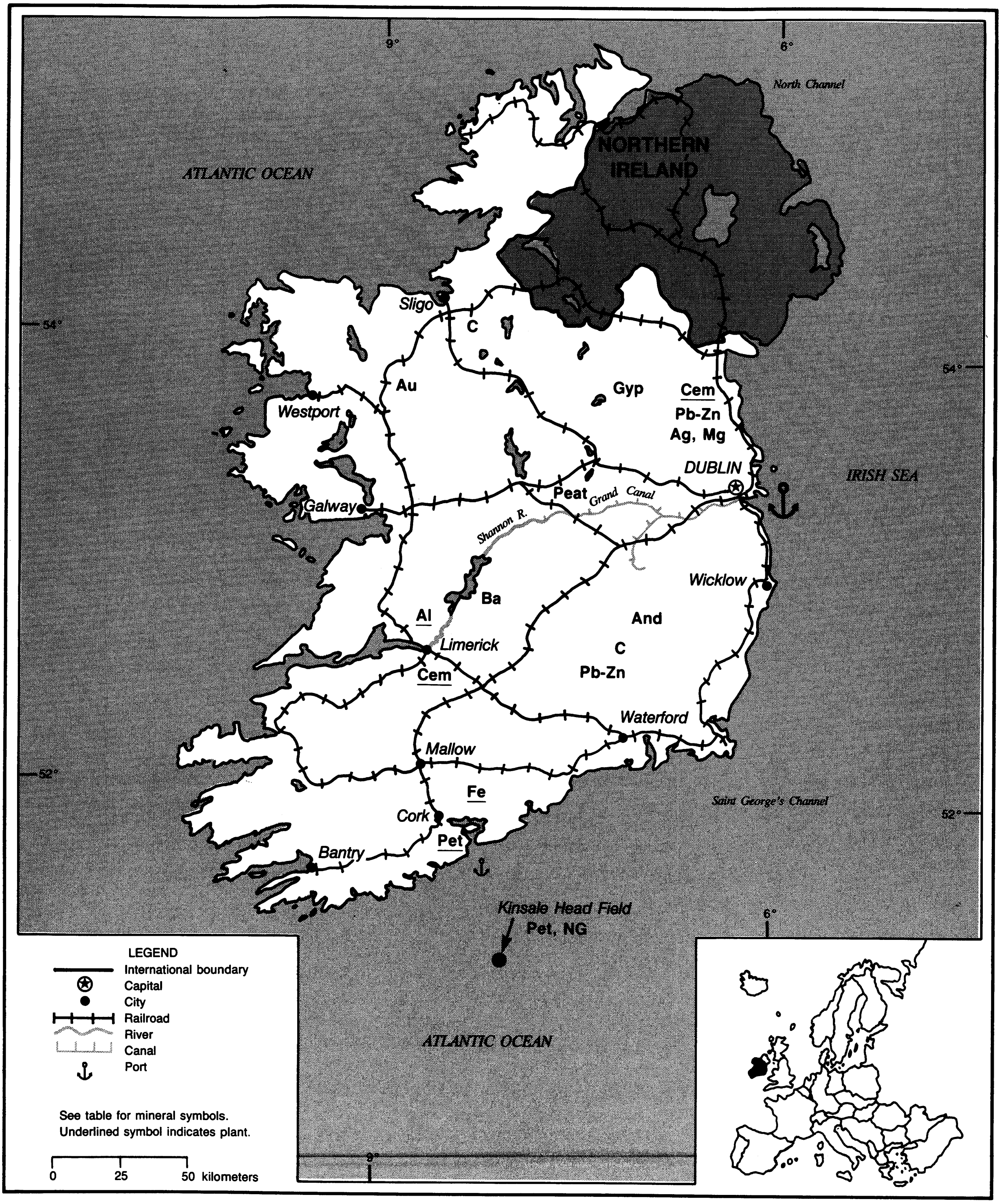
(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
INDUSTRIAL MINERALS—Continued				
Sodium compounds, n.e.s.:				
Soda ash, manufactured	962	1,020	—	Poland 764; West Germany 118; Sweden 39.
Sulfate, manufactured	135	174	—	Sweden 100; West Germany 60.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	228	367	—	Portugal 181; Norway 69; Italy 39.
Worked	469	561	(2)	Italy 335; Portugal 76.
Dolomite, chiefly refractory-grade	348	215	—	Norway 203; Sweden 12.
Gravel and crushed rock	66	9,383	—	Norway 5,070; Ireland 4,200.
Limestone other than dimension	141	13	—	All from Netherlands.
Quartz and quartzite	118,796	107,611	34	Spain 107,556; Denmark 20.
Sand other than metal-bearing	401	544	—	Denmark 224; United Kingdom 130; Japan 70.
Sulfur:				
Elemental:				
Crude including native and byproduct value	$2,325	—		
Colloidal, precipitated, sublimed	25	21	—	Denmark 20; West Germany 1.
Sulfuric acid	380	358	—	Netherlands 155; Norway 150.
Talc, steatite, soapstone, pyrophyllite	89	71	2	Norway 63; Denmark 2.
Vermiculite	1	[7]3	—	All from Norway.
Other:				
Crude	16	160	—	United Kingdom 159; Denmark 1.
Slag and dross, not metal-bearing	(2)	6	—	All from West Germany.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	86	1,026	1	Netherlands 1,020; Belgium-Luxembourg 5.
Carbon black	1	(2)	(2)	
Coal:				
Anthracite	42,564	52,243	52,241	United Kingdom 2.
Bituminous	23,603	19,291	—	All from United Kingdom.
Briquets of anthracite and bituminous coal	10	3	1	United Kingdom 2.
Lignite including briquets	(2)	—		
Coke and semicoke	26,515	27,487	—	West Germany 14,500; United Kingdom 8,409.
Peat including briquets and litter	290	343	—	Finland 179; Sweden 65; Norway 36.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	13	9	—	Mainly from Sweden.
Gasoline do.	1,062	NA		
Mineral jelly and wax do.	2	1	(2)	United Kingdom.[2]
Kerosene and jet fuel do.	536	NA		
Distillate fuel oil do.	2,020	NA		
Lubricants do.	50	NA		
Residual fuel oil do.	601	NA		
Bitumen and other residues do.	90	64	12	Netherlands 29; West Germany 22.
Bituminous mixtures do.	2	9	—	Netherlands 7; Norway 1.

NA Not available.
[1]Table prepared by staff, International Data Section.
[2]Less than 1/2 unit.
[3]Unreported quantity valued at $1,000.
[4]Unreported quantity valued at $4,000.
[5]May include other precious metals.
[6]Includes boron.
[7]Includes perlite.

IRELAND

AREA 69,000 km² **POPULATION 3.6 million**



THE MINERAL INDUSTRY OF IRELAND

By Harold R. Newman

Ireland continued as one of Europe's major producers of zinc and a significant producer of alumina, barite, lead, and peat in 1990. The country produced about 18% of the total zinc mine production and 10% of total lead production in the EC. Although the range of minerals exploited has been limited, exploration activity continued to increase, with the main emphasis on gold. The country's mineral processing industry was relatively small, as was the demand and consumption of mineral resources.

Ireland continued with a strong economy in 1990. Output performance and private-sector employment increased, whereas inflation, at 3.25%, continued at a low level and the balance of payments continued into surplus. The real GNP growth was estimated to have been 4.8%. The Irish economy has shown a very creditable performance in the past few years, with sustained rates of growth and substantial trade surpluses.

GOVERNMENT POLICIES AND PROGRAMS

As a member of the EC, Ireland is a full participant in the program to complete the single European market by the end of 1992.

The Government was expected to continue to receive EC funding support to assist in constructing and upgrading infrastructure projects, including roads, ports, telecommunications, and indigenous energy development. The EC Directive on Environmental Impact Assessment requires that projects in the extractive industry, including mining of minerals and ores, be subjected to an assessment of their environmental impact before development is granted. The Government responded to this by finalizing comprehensive environmental regulations in relation to mining. Criteria to address environmental concerns will be incorporated into mining licenses prior to issuance. Also, prospectors are required to complete an environmental audit. The public and other interests will have an opportunity to comment on the environmental audit before planning permission is given.

PRODUCTION

Ireland's base metals production, centered mainly on Tara Mines Ltd.'s zinc-lead mine near Navan, County Meath, continued strong. Industrial mineral production, including barite and gypsum, also continued. The largest barite deposit at Ballynoe, near Silvermines in northern Tipperary, was changed over from open pit to underground operations. The owner of the Ballynoe "B" Mine, Magcobar (Ireland) Ltd., contracted the operation to South Western Mining and Tunnelling Ltd. (SWMT), a United Kingdom company. Production capacity was estimated to be 6,000 tons per month. Natural gas production continued from an area off the southern coast of Ireland near Cork. Reserves were not disclosed, and production from the fields was being carefully managed to extend the life of the area.

TRADE

Ireland's trade sector continued to perform well in 1990. Exports of goods and services grew by more than 8%, whereas imports rose by 9%. Exports of industrial goods were particularly strong, posting an increase of 10% over that of 1989. As a result, the trade surplus grew from $3.2 billion[1] in 1989 to $3.9 billion in 1990. This represented 11% of GNP.

Ireland continued in its participation in efforts to create a single European market by the end of 1992. Although Ireland was supportive of the single market effort and European economic integration, it has drawn attention to special needs and problems that integration may present to peripheral and less developed regions. EC measures most likely to impact on Ireland's interests are fiscal harmonization and proposals for economic and monetary union. Ireland has been a full participant in the European Monetary System (EMS) since its inception in March 1979. This has provided a framework for improving the economy by stabilizing the Irish pound, containing wage increases, reducing inflation, and encouraging exports.

Ireland's main trading partners for exports were the United Kingdom ($4.5 billion); the Federal Republic of Germany ($1.6 billion); France ($1.4); and the United States ($1.1 billion). For imports, the main trading partners were the United Kingdom ($4.7 billion), the United States ($1.8 billion) the Federal Republic of Germany ($1 billion) and France $(0.5 billion).

STRUCTURE OF THE MINERAL INDUSTRY

Ireland has traditionally been a rural-based economy, and farm products contributed more than 30% of the total export value in 1990. However, Government economic strategy during the past several years has concentrated on building up indigenous industries, including mineral resource development. Under the Minerals Development Acts 1940 to 1979, the Minister for Energy was empowered to grant licenses and mining rights for prospecting as well as subsequent development. Most mineral exploration and development is subject to state regulation. The Geologic Survey of Ireland is responsible for the development of mineral information as well as technical management of the state mineral licensing and leasing system. The Survey also provided technical assistance to the exploration and mining industry.

Ireland is fortunate in respect to mineral resources and has a proven geological potential for a variety of minerals. In 1990, the country was a world-ranked producer of barite, lead, and zinc. There was considerable interest in gold exploration. This has been the impetus for the revitalization of the exploration sector within the past few years. The discovery of the Curraghinalt gold deposit in Co. Tyrone and the discovery of a new zinc-lead deposit at Galmoy in Co. Kilkenny make a total of 11 significant mineral discoveries since 1981. This includes four gold deposits, three lead-zinc deposits, two gypsum deposits, one talc deposit, and one andalusite prospect. This has been highly encouraging to Ireland's minerals sector despite the closure of four base metal mines in the intervening period.

TABLE 1

IRELAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
METALS						
Alumina	thousand tons	686	784	843	841	885
Iron and steel: Steel, crude	do.	208	220	271	324	[2]326
Lead:						
Mine output, Pb content		36,400	33,800	32,500	[e]32,100	[2]35,300
Metal, refined, secondary		10,200	9,600	[e]10,000	[r e]12,000	15,000
Silver, mine output, Ag content	thousand kilograms	8,149	7,185	5,590	[e]7,247	8,000
Zinc, mine output, Zn content		181,700	177,000	173,200	[e]168,800	[2]166,500
INDUSTRIAL MINERALS[3]						
Barite	thousand tons	128	70	83	82	[2]101
Cement, hydraulic	do.	1,398	1,448	1,685	[e]1,600	1,625
Gypsum	do.	289	284	326	314	[2]394
Lime		87,600	77,000	96,800	[e]111,300	112,000
Magnesia[e 4]	thousand tons	65	70	—	—	—
Nitrogen: N content of ammonia	do.	355	399	415	386	395
Sand and gravel[5]	do.	6,550	5,564	6,163	[e]7,400	7,500
Stone and other quarry products:						
Limestone[5]	do.	7,865	6,970	9,680	8,874	9,000
Other[5 6]	do.	2,041	1,953	1,615	1,967	2,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, anthracite and bituminous	do.	54	45	42	43	25
Gas, natural: Marketed	million cubic meters	1,679	1,668	2,017	[e]1,980	2,040
Peat:						
For agricultural use	thousand tons	97	81	[e]85	293	330
For fuel use:						
Sod peat[7]	do.	782	410	1,147	1,053	1,570
Milled peat[8]	do.	3,928	6,765	3,230	6,714	4,950
Total	do.	4,710	7,175	4,377	7,767	6,520
Peat briquets	do.	460	505	378	355	400
Petroleum refinery products:[9]						
Liquefied petroleum gas	thousand 42-gallon barrels	302	255	210	[e]225	[2]294
Naphtha	do.	378	387	245	[e]250	[2]497
Gasoline, motor	do.	2,762	2,528	1,850	[e]2,000	[2]3,022
Distillate fuel oil	do.	3,788	3,945	3,160	[e]3,000	[2]4,602
Residual fuel oil	do.	3,744	3,556	3,075	[e]2,800	[2]4,049
Refinery fuel and losses	do.	685	390	400	[e]400	425
Total	do.	11,659	11,061	8,940	[e]8,675	12,889

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 1, 1991.
[2]Reported figure.
[3]Ireland also produces significant quantities of synthetic diamond and is the major overseas supplier of this material to the United States. However, output is not quantitatively reported, and available general information is inadequate to make reliable estimates of output levels.
[4]Based on exports.
[5]Excludes output by local authorities and road contractors.
[6]Includes clays for cement production, fire clay, granite, marble, rock sand, silica rock, and slate.
[7]Includes production by farmers and by Bord Na Mona.
[8]Includes milled peat used for briquet production.
[9]From imported crude oil.

TABLE 5

IRELAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkaline metals	—	2	—	All to United Kingdom.
Alkaline-earth metals	1	(2)	—	All to West Germany.
Aluminum:				
Oxides and hydroxides	901,093	915,349	26,022	Norway 335,657; United Kingdom 305,975; West Germany 172,653.
Metal including alloys:				
Scrap	11,147	11,028	21	United Kingdom 7,351; France 1,430.
Unwrought	1,902	2,574	—	United Kingdom 2,573; Israel 1.
Semimanufactures	3,103	2,981	27	United Kingdom 1,710; West Germany 350; France 234.
Chromium:				
Oxides and hydroxides	10	2	—	All to Republic of South Africa.
Metal including alloys, all forms	21	8	—	All to United Kingdom.
Cobalt:				
Oxides and hydroxides	18	39	—	Mainly to Finland.
Metal including alloys, all forms	—	203	59	Finland 118; Netherlands 18.
Columbium and tantalum: Tantalum metal including alloys, all forms	36	58	1	West Germany 57.
Copper:				
Ore and concentrate	—	5,424	—	All to West Germany.
Matte and speiss including cement copper	—	60	—	Do.
Sulfate	103	146	—	United Kingdom 143; Israel 3.
Metal including alloys:				
Scrap	10,121	10,061	—	West Germany 2,841; Belgium-Luxembourg 2,186; Netherlands 2,071.
Unwrought	280	74	—	West Germany 39; United Kingdom 35.
Semimanufactures	991	1,087	22	United Kingdom 616; Belgium-Luxembourg 157; West Germany 114.
Gold:				
Waste and sweepings value, thousands	$2,283	$1,977	—	United Kingdom $1,927; West Germany $50.
Metal including alloys, unwrought and partly wrought kilograms	20	1,748	—	Saudi Arabia 1,500; United Kingdom 157; West Germany 75.
Iron and steel: Metal:				
Scrap	32,429	33,827	1	United Kingdom 33,008; West Germany 275.
Pig iron, cast iron, related materials	56	42	—	United Kingdom 32; Switzerland 5; West Germany 3.
Ferroalloys:				
Ferrochromium	—	25	—	Japan 17; Singapore 5; Belgium-Luxembourg 3.
Ferrosilicomanganese	—	18	—	All to United Kingdom.
Ferrosilicon	2	—		
Silicon metal	—	3	—	Italy 2; United Kingdom 1.
Unspecified	23	—		
Steel, primary forms	r640	468	(2)	Belgium-Luxembourg 211; Denmark 84; Italy 69.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	3,849	5,110	—	United Kingdom 5,007; West Germany 64; Sweden 21.

See footnotes at end of table.

TABLE 2

IRELAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989	
			United States	Other (principal)
METALS—Continued				
Semimanufactures —Continued				
Flat-rolled products —Continued				
Of iron or nonallay steel —Continued				
Clad, plated, coated	3,045	3,292	(2)	United kingdom 3,287; West Germany 4.
Of alloy steel	652	914	—	United Kingdom 866; Seden 48.
Bars, rods, angles, shapes, sections	227,746	295,433	47	United Kingdom 130,241; Netherlands 45,109; West Germany 34,789.
Rails and accessories	2,853	1,268	—	All to United Kingdom.
Wire	2,163	1,953	84	United Kingdom 1,006; France 725.
Tubes, pipes, fittings	6,219	6,750	(2)	United Kingdom 6,314; West Germany 127.
Lead:				
Ore and concentrate	49,516	58,501	—	West Germany 20,386; France 14,675; Spain 12,071.
Oxides	1	119	—	All to United Kingdom.
Metal including alloys:				
Scrap	3,651	4,596	—	United Kingdom 1,715; Belgium-Luxembourg 1,534; Republic of Korea 611.
Unwrought	353	103	—	All to United Kingdom.
Semimanufactures	8,095	11,388	—	United Kingdom 11,032; Netherlands 153.
Magnesium: Metal including alloys:				
Scrap	47	21	—	United Kingdom 20; West Germany 1.
Unwrought	9	63	—	All to United Kingdom.
Manganese: Oxides	406	262	—	Spain 83; United Kingdom 83; West Germany 76.
Molybdenum: Metal including alloys, semimanufactures	—	(2)	—	All to Australia.
Nickel: Metal including alloys:				
Scrap	330	315	—	United Kingdom 288; West Germany 155; Netherlands 12.
Unwrought	260	90	1	United Kingdom 75; France 14.
Semimanufactures	274	498	29	United Kingdom 279; Switzerland 69; France 59.
Platinum-group metals:				
Waste and sweepings value, thousands	—	$242	—	All to United Kingdom.
Metals including alloys, unwrought and partly wrought kilograms	2,006	608	—	Do.
Silver:				
Waste and sweepings[3] value, thousands	$1,648	$897	—	West Germany $527; United Kingdom $291; Switzerland $79.
Metal including alloys, unwrought and partly wrought kilograms	72	925	110	United Kingdom 641; West Germany 156.
Tin:				
Ore and concentrate	1,000	2,000	—	All to United Kingdom.
Ash and residue containing tin	—	445	—	United Kingdom 365; Netherlnads 62.
Metal including alloys:				
Scrap	1,495	1,782	—	United Kingdom 1,686; West Germany 96.
Unwrought	31	183	—	All to United Kingdom.
Semimanufactures	143	110	—	Mainly to United Kingdom.
Titanium:				
Oxides	35	35	—	Jordan 20; United Kingdom 15.

See footnotes at end of table.

TABLE 2—Continued

IRELAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989	
			United States	Other (principal)
METALS—Continued				
Titanium—Continued				
Metal including alloys, all forms	(2)	15	11	West Germany 3; United Kingdom 1.
Tungsten: Metal including alloys:				
Scrap	5	3	3	
Unwrought	(2)	(2)	—	Mainly to Albania.
Semimanufactures	(2)	31	31	
Uranium and thorium: Oxides and other compounds value, thousands	$1	—		
Zinc:				
Ore and concentrate	347,856	336,092	—	Belgium-Luxembourg 102,564; Italy 94,011; France 53,625.
Oxides	43	66	(2)	Mainly to United Kingdom.
Blue powder	65	231	—	All to Belgium-Luxembourg.
Metal including alloys:				
Scrap	432	315	—	United Kingdom 293; Belgium-Luxembourg 22.
Unwrought	—	126	—	United Kingdom 105; Italy 20; Sweden 1.
Semimanufactures	725	237	—	Belgium-Luxembourg 231; United Kingdom 4.
Zirconium: Metal including alloys, all forms value, thousands	—	$8	—	All to Belgium-Luxembourg.
Other:				
Oxides and hydroxides	53	61	11	United Kingdom 43; Spain 6.
Ashes and residues	1,245	639	—	United Kingdom 373; West Germany 185; Netherlands 62.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	14	17	—	All to United Kingdom.
Artificial:				
Corundum	25	—		
Silicon carbide	5	4	—	All to United Kingdom.
Grinding and polishing wheels and stones	74	117	40	United Kingdom 46; Japan 49.
Asbestos, crude	78	54	—	United Kingdom 34; France 20.
Barite and witherite	69,969	74,764	—	Nigeria 27,900; Norway 25,950; United Kingdom 17,060.
Bromine	(2)	8	—	All to United Kingdom.
Cement	491,043	517,740	—	United Kingdom 516,673.
Chalk	24	(2)	—	All to China.
Clays, crude:				
Bentonite	28	428	NA	NA.
Dinas earth	1	—		
Kaolin	36	1	—	All to United Kingdom.
Unspecified	54	63	—	Do.
Diamond:				
Gem, not set or strung carats	62	1,112	112	Belgium-Luxembourg 1,000.
Industrial stones do.	2,431	663,582	629,540	United Kingdom 22,359; Netherlands 10,000.
Dust and powder kilograms	8,406	—		
Fertilizer materials:				
Crude, n.e.s.	882	366	—	United Kingdom 356; West Germany 10.
Manufactured:				
Ammonia	157,619	128,871	—	United Kingdom 68,654; France 12,322; Italy 9,037.

See footnotes at end of table.

TABLE 2—Continued

IRELAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Fertilizer materials.—Continued				
Manufactured –Continued				
Nitrogenous	377,357	420,765	25,992	United Kingdom 143,682; West Germany 72,682.
Phosphatic	48	194	—	All to United Kingdom.
Potassic	322	558	—	Mainly to United Kingdom.
Unspecified and mixed	21,548	25,518	—	United Kingdom 25,514; Netherlands 4.
Graphite, natural	31	—		
Gypsum and plaster	56,015	69,132	—	United Kingdom 69,128; U.S.S.R. 4.
Iodine	37	13	—	Denmark 6; United Kingdom 6.
Lime	2,742	2,234	—	All to United Kingdom.
Magnesium compounds:				
Magnesite, crude	381	464	—	Spain 233; United Kingdom 231.
Oxides and hydroxides	97,322	6,243	—	United Kingdom 5,631; Austria 348; Spain 264.
Mica:				
Crude	—	18	—	United Kingdom 14.
Worked including agglomerated splittings	—	(2)	—	All to United Kingdom.
Nitrates, crude	83	1,369	—	West Germany 1,299; United Kingdom 70.
Phosphates, crude	937	—		
Phosphorus, elemental	—	3	—	All to United Kingdom.
Pigments, mineral:				
Natural, crude	5	—		
Iron oxides and hydroxides, processed	49	5	(2)	United Kingdom 4; Italy 1.
Potassium salts, crude	180	—		
Precious and semiprecious stones other than diamond:				
Natural kilograms	45	1,680	—	Kuwait 30; United Kingdom 4; unspecified 1,644.
Synthetic do.	59	52	—	Mainly to Belgium-Luxembourg.
Salt and brine	754	1,595	—	United Kingdom 1,512; Finland 82; Iraq 1.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	15	123	—	All to United Kingdom.
Sulfate, manufactured kilograms	NA	20	—	United Kingdom 19; Zaire 1.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	28,746	938	33	United Kingdom 846; France 59.
Worked	8,002	7,332	467	United Kingdom 3,596; Belgium-Luxembourg 1,722; Netherlands 583.
Gravel and crushed rock	510,240	450,071	—	United Kingdom 318,681; West Germany 131,367.
Limestone other than dimension	2,148	4,124	—	United Kingdom 2,887; Netherlands 1,055.
Quartz and quartzite	428	550	—	United Kingdom 462; France 86; Greece 2.
Sand other than metal-bearing	540	1,301	—	All to United Kingdom.
Sulfur:				
Elemental: Crude including native and byproduct	3,504	3	—	Do.
Dioxide	37	—		
Sulfuric acid	146	178	9	United Kingdom 166; Denmark 3.
Talc, steatite, soapstone, pyrophyllite	20	—		

See footnotes at end of table.

TABLE 2—Continued

IRELAND: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Other:					
Crude		156	25	—	All to United Kingdom.
Slag and dross, not metal-bearing		52	—		
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		57	810	—	All to United Kingdom.
Carbon: Carbon black		33	13	—	Do.
Coal:					
Anthracite		5,407	3,380	—	Do.
Bituminous		25,048	19,785	—	United Kingdom 19,761; Malta 24.
Briquets of anthracite and bituminous coal		530	1,869	—	All to United Kingdom.
Lignite including briquets		25	112	—	Do.
Coke and semicoke		—	64	—	Do.
Peat including briquets and litter		348,401	321,073	478	United Kingdom 239,443; France 51,396.
Petroleum refinery products:					
Liquefied petroleum gas	42-gallon barrels	75,272	69,948	—	Mainly to United Kingdom.
Gasoline	do.	407,057	470,993	—	United Kingdom 248,081; Netherlands 222,904.
Mineral jelly and wax	do.	1,905	936	8	United Kingdom 228; China 205; Australia 142.
Kerosene and jet fuel	do.	—	2,131	—	United Kingdom 2,108; West Germany 23.
Distillate fuel oil	do.	38,695	86,208	—	United Kingdom 42,843; France 42,492.
Lubricants	do.	18,172	9,792	—	United Kingdom 8,463; Belgium-Luxembourg 301.
Residual fuel oil	do.	3,251,912	2,384,363	219,633	United Kingdom 1,891,407; Netherlands 539,520.
Bituminous mixtures	do.	551	1,763	—	Mainly to United Kingdom.
Petroleum coke	do.	—	429	—	Do.

[r]Revised. NA Not available.
[1]Table prepared by staff, International Data Section.
[2]Less than 1/2 unit.
[3]May include other precious metals.

TABLE 3

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals:					
Alkali metals		9	11	—	United Kingdom 10; West Germany 1.
Alkaline-earth metals		133	117	24	United Kingdom 88; West Germany 5.
Aluminum:					
Ore and concentrate	thousand tons	1,747	1,606	—	Guinea 1,602; China 4.
Oxides and hydroxides		4,355	5,142	605	United Kingdom 2,842; France 577.
Metal including alloys:					
Scrap		588	987	270	United Kingdom 509; Netherlands 100.
Unwrought		2,812	3,711	11	United Kingdom 2,080; West Germany 1,994.
Semimanufactures		38,099	35,049	726	United Kingdom 19,667; West Germany 4,203; France 2,133.

See footnotes at end of table.

TABLE 3—Continued

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS—Continued				
Antimony:				
Oxides	54	62	3	United Kingdom 52; West Germany 6.
Metal including alloys, all forms	2	1	—	All from United Kingdom.
Arsenic:				
Oxides and acids	5	(2)	—	Do.
Metal including alloys, all forms	54	11	—	Do.
Beryllium: Metal including alloys, all forms	(2)	(2)	(2)	
Bismuth: Metal including alloys, all forms	1	8	—	All from United Kingdom.
Cadmium: Metal including alloys, all forms	—	1	—	Do.
Chromium:				
Ore and concentrate	13	22	—	All from Netherlands.
Oxides and hydroxides	50	124	(2)	United Kingdom 84; West Germany 38.
Metal including alloys, all forms	54	154	11	United Kingdom 112; West Germany 24.
Cobalt:				
Oxides and hydroxides	7	7	—	Finland 5; West Germany 1; United Kingdom 1.
Metal including alloys, all forms	59	78	76	Belgium-Luxembourg 1; Zaire 1.
Columbium and tantalum: Tantalum metal including alloys, all forms	7	3	3	
Copper:				
Matte and speiss including cement copper	—	25	—	United Kingdom 21; Sweden 4.
Oxides and hydroxides	2	23	—	All from United Kingdom.
Metal including alloys:				
Scrap	127	437	—	Norway 325; United Kingdom 112.
Unwrought	551	194	1	United Kingdom 181; West Germany 8.
Semimanufactures	23,851	28,419	268	United Kingdom 13,080; Belgium-Luxembourg 6,664; France 2,449.
Germanium: Metal including alloys, all forms	—	(2)	—	All from United Kingdom.
Gold:				
Waste and sweepings value, thousands	$3	$59	—	All from United Kingdom.
Metal including alloys, unwrought and partly wrought kilograms	2,830	1,756	31	United Kingdom 1,310; Japan 365.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	11	37	—	Netherlands 22; United Kingdom 15.
Pyrite, roasted	1,543	2,500	—	All from Sweden.
Metal:				
Scrap	179,594	220,254	—	United Kingdom 187,664; France 29,880.
Pig iron, cast iron, related materials	4,418	1,846	1	United Kingdom 1,763; Norway 22.
Ferroalloys:				
Ferrochromium	8	46	3	United Kingdom 34; Sweden 8.
Ferrocolumbium	20	—		
Ferromanganese	22	22	—	United Kingdom 21; Belgium-Luxembourg 1.
Ferromolybdenum	2	(2)	—	All from United Kingdom.
Ferronickel	17	—		
Ferrosilicomanganese	2,989	3,830	—	Norway 2,560; France 1,230; United Kingdom 40.
Ferrosilicon	807	832	—	Belgium-Luxembourg 496; United Kingdom 130; Norway 108.

See footnotes at end of table.

TABLE 3—Continued

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989	
			United States	Other (principal)
METALS—Continued				
Iron and steel[1]—Continued				
Metal —Continued				
Ferroalloys —Continued				
Silicon metal	228	231	(2)	France 143; United Kingdom 63; Sweden 20.
Unspecified	42	62	(2)	United Kingdom 48; West Germany 14.
Steel, primary forms	r2,413	1,867	82	United Kingdom 1,421; Belgium-Luxembourg 170.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	104,100	107,303	168	United Kingdom 80,014; Finland 6,196; France 5,466.
Clad, plated, coated	71,209	79,986	64	United Kingdom 56,090; Belgium-Luxembourg 7,590; Sweden 7,333.
Of alloy steel	11,264	11,865	21	United Kingdom 5,874; France 1,874; Sweden 1,225.
Bars, rods, angles, shapes, sections	154,852	199,189	89	United Kingdom 129,746; Spain 25,248.
Rails and accessories	1,961	411	—	United Kingdom 261; West Germany 148.
Wire	20,464	24,657	97	United Kingdom 9,390; Republic of South Africa 4,288; Belgium-Luxembourg 2,493.
Tubes, pipes, fittings	68,506	69,826	219	United Kingdom 35,019; Netherlands 13,708.
Lead:				
Ore and concentrate	1	—		
Oxides	3,161	3,767	—	United Kingdom 3,008; Netherlands 758.
Metal including alloys:				
Scrap	10,139	13,106	(2)	United Kingdom 9,296; France 2,194.
Unwrought	1,030	1,940	—	United Kingdom 762; West Germany 587; Sweden 528.
Semimanufactures	336	2,131	1	Sweden 1,687; United Kingdom 256.
Lithium: Oxides and hydroxides	11	40	20	United Kingdom 20.
Magnesium: Metal including alloys:				
Unwrought	89	87	73	Netherlands 14.
Semimanufactures	199	324	—	Canada 173; United Kingdom 129.
Manganese:				
Ore and concentrate, metallurgical-grade	27,467	36,977	—	Ghana 36,238; Brazil 402.
Oxides	443	257	3	United Kingdom 198; Belgium-Luxembourg 57.
Metal including alloys, all forms	8	41	—	United Kingdom 37; West Germany 4.
Mercury	7	14	8	Netherlands 6.
Molybdenum:				
Oxides and hydroxides	1	2	—	All from United Kingdom.
Metal including alloys:				
Unwrought	—	$13	$12	United Kingdom $1.
Semimanufactures	1	2	1	West Germany 1.
Nickel:				
Matte and speiss	1	(2)	—	All from West Germany.
Oxides and hydroxides	5	—		
Metal including alloys:				
Scrap	29	41	—	United Kingdom 40; Brazil 1.
Unwrought	515	615	61	United Kingdom 475; U.S.S.R. 54.
Semimanufactures	974	896	647	West Germany 142; United Kingdom 75.

See footnotes at end of table.

TABLE 3—Continued

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS—Continued				
Platinum-group metals: Metals including alloys, unwrought and partly wrought kilograms	2,569	375	96	United Kingdom 272; West Germany 64.
Rare-earth metals including alloys, all forms	2		5	— All from West Germany.
Selenium, elemental	—	20	—	United Kingdom 19; West Germany 1.
Silicon, high-purity	([2])	59	—	United Kingdom 39; Sweden 20.
Silver:				
Waste and sweepings[3] value, thousands	$93	$59	—	All from United Kingdom.
Metal including alloys, unwrought and partly wrought kilograms	26,422	25,841	9,653	United Kingdom 15,783; Italy 246.
Tin: Metal including alloys:				
Scrap	44	14	—	All from United Kingdom.
Unwrought	70	59	21	United Kingdom 37; West Germany 1.
Semimanufactures	237	95	2	United Kingdom 59; Norway 17; Belgium-Luxembourg 16.
Titanium:				
Ore and concentrate	61	—		
Oxides	1,553	1,419	1	West Germany 454; France 440; United Kingdom 300.
Metal including alloys:				
Scrap	2	—		
Semimanufactures	29	81	46	United Kingdom 22; Norway 10.
Tungsten: Metal including alloys:				
Unwrought	5	4	4	
Semimanufactures value, thousands	—	$130	$26	United Kingdom $95; Canada $6.
Uranium and thorium: Oxides and other compounds do.	$9	$75	$43	United Kingdom $31.
Zinc:				
Ore and concentrate	102	42	—	Mainly from United Kingdom.
Oxides	1,178	1,040	141	United Kingdom 842.
Blue powder	18	33	—	United Kingdom 32; West Germany 1.
Metal including alloys:				
Scrap	188	347	—	United Kingdom 279; France 44; Romania 24.
Unwrought	1,877	2,830	—	Netherlands 1,431.
Semimanufactures	78	316	2	United Kingdom 291; Norway 10.
Zirconium:				
Ore and concentrate	69	151	38	West Germany 40; Netherlands 40.
Oxides and hydroxides	15	—		
Metal including alloys:				
Unwrought value, thousands	—	$3	$1	United Kingdom $2.
Semimanufactures	9	2	2	
Other:				
Oxides and hydroxides	397	514	39	United Kingdom 366; Netherlands 45.
Ashes and residues	20	122	—	Netherlands 100; United Kingdom 22.
Base metals including alloys, all forms	([2])	12	—	All from United Kingdom.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	629	510	5	United Kingdom 310; Turkey 171.
Artificial:				
Corundum	231	225	—	United Kingdom 172; West Germany 41; Spain 11.
Silicon carbide	28	18	—	Norway 17; United Kingdom 1.

See footnotes at end of table.

TABLE 3—Continued

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
METALS—Continued					
Dust and powder of precious and semiprecious stones excluding diamond	value, thousands	$260	$1	—	All from West Germany.
Grinding and polishing wheels and stones		3,679	4,101	9	United Kingdom 3,433; Italy 288; West Germany 144.
Asbestos, crude		5,752	4,529	—	Canada 4,343; Zimbabwe 180; United Kingdom 5.
Barite and witherite		4,737	2,379	—	United Kingdom 2,322; West Germany 57.
Boron materials:					
Crude and natural borates		—	1	—	All from United Kingdom.
Oxides and acids		152	147	([2])	France 139; West Germany 5.
Bromine		135	183	—	All from United Kingdom.
Cement		114,101	247,285	1	United Kingdom 157,106; Poland 31,871; Spain 30,794.
Chalk		1,439	857	—	United Kingdom 607; Belgium-Luxembourg 110; France 86.
Clays, crude:					
Bentonite		1,177	1,166	6	United Kingdom 1,160.
Chamotte earth		30	36	—	All from United Kingdom.
Fuller's earth		153	127	—	Do.
Fire clay		272	195	22	United Kingdom 133; Spain 40.
Kaolin		6,590	7,302	123	United Kingdom 5,667; Spain 1,486.
Unspecified		5,129	4,599	259	United Kingdom 4,259.
Cryolite and chiolite		28	2	—	All from United Kingdom.
Diamond:					
Gem, not set or strung	carats	32,801	3,989	—	United Kingdom 3,811; Belgium-Luxembourg 137.
Industrial stones	do.	1,024	11,193	2,000	United Kingdom 9,047; Italy 100.
Dust and powder	kilograms	2,600	1,932	1,831	West Germany 40; Japan 18.
Diatomite and other infusorial earth		149	269	232	United Kingdom 33.
Feldspar, fluorspar, related materials:					
Feldspar		3,262	3,683	—	Norway 2,775; United Kingdom 908.
Fluorspar		39	65	—	All from United Kingdom.
Unspecified		3,565	3,612	—	Norway 2,775; United Kingdom 837.
Fertilizer materials:					
Crude, n.e.s.		1,462	1,982	1	United Kingdom 1,964; Singapore 17.
Manufactured:					
Ammonia		263	17,318	1	United Kingdom 10,421; Netherlands 6,834.
Nitrogenous		312,418	307,093	—	Netherlands 113,590; West Germany 88,411; Belgium-Luxembourg 55,071.
Phosphatic		106,328	115,080	10,999	Morocco 31,865; Tunisia 23,984; Sweden 18,177.
Potassic		221,974	259,828	2	West Germany 138,852; East Germany 36,201; Israel 32,703.
Unspecified and mixed		661,469	725,463	35,592	United Kingdom 323,116; Netherlands 136,180; France 65,226.
Graphite, natural		11	17	1	United Kingdom 8; West Germany 5; Sri Lanka 3.
Gypsum and plaster		6,884	6,186	4	United Kingdom 5,742; West Germany 248.
Iodine		49	48	1	United Kingdom 5; unspecified 42.
Kyanite and related materials: Andalusite, kyanite, sillimanite		100	246	—	Belgium-Luxembourg 162; West Germany 60.
Lime		1,520	3,936	—	United Kingdom 3,906; West Germany 26.
Magnesium compounds:					
Magnesite, crude		16,448	25,310	—	United Kingdom 12,978; China 9,841; Netherlands 2,492.

See footnotes at end of table.

TABLE 3—Continued

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
INDUSTRIAL MINERALS—Continued				
Magnesium compounds:—Continued				
Oxides and hydroxides	10,923	12,050	—	Spain 4,598; Greece 2,759; United Kingdom 2,687.
Sulfate	350	562	—	West Germany 487; Belgium-Luxembourg 36; Netherlands 34.
Mica:				
Crude including splittings and waste	207	686	23	United Kingdom 525; Norway 133.
Worked including agglomerated splittings	44	23	3	United Kingdom 12; Belgium-Luxembourg 6.
Nitrates, crude	107	219	—	United Kingdom 218; Finland 1.
Phosphates, crude	1,495	6,128	—	Morocco 3,156; Tunisia 1,496; West Germany 636.
Phosphorus, elemental	23	10	—	United Kingdom 9; West Germany 1.
Pigments, mineral:				
Natural, crude	34	19	—	All from United Kingdom.
Iron oxides and hydroxides, processed	2,605	2,456	38	West Germany 2,033; United kingdom 318.
Potassium salts, crude	20	—		
Precious and semiprecious stones other than diamond:				
Natural kilograms	202	210	1	United Kingdom 187; West Germany 7.
Synthetic do.	1	—		
Salt and brine	94,940	107,767	27	United Kingdom 47,161; West Germany 24,901.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	22,426	25,572	2	United Kingdom 15,939; Poland 6,603; Netherlands 3,184.
Sulfate, including cadmium, manufactured	387	1,233	—	West Germany 616; Belgium-Luxembourg 338; United Kingdom 196.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	6,340	6,773	19	United Kingdom 2,494; Italy 1,081; Republic of South Africa 971.
Worked	8,189	9,606	3	Italy 3,040; United Kingdom 2,992; Spain 2,317.
Dolomite, chiefly refractory-grade	1,939	2,225	—	United Kingdom 1,828; Sweden 206; Netherlands 191.
Gravel and crushed rock	243,973	302,386	1	United Kingdom 301,248; France 700.
Limestone other than dimension	13,992	16,278	2	United Kingdom 16,276.
Quartz and quartzite	61	224	([2])	Portugal 120; United Kingdom 60; Belgium-Luxembourg 21.
Sand other than metal-bearing	159,682	209,655	114	United Kingdom 159,732; Belgium-Luxembourg 44,556.
Sulfur:				
Elemental:				
Crude including native and byproduct	295	274	24	West Germany 220; United Kingdom 16.
Colloidal, precipitated, sublimed	85	15	—	All from United Kingdom.
Dioxide	90	—		
Sulfuric acid	74,166	86,031	3	Norway 36,170; United Kingdom 28,851; France 13,827.
Talc, steatite, soapstone, pyrophyllite	1,647	1,646	106	United Kingdom 511; Belgium-Luxembourg 393; Italy 342.
Vermiculite, chlorite, perlite	3,573	4,122	—	Republic of South Africa 2,450; Italy 1,400.
Other:				
Crude	4,603	5,437	1	United Kingdom 4,116; West Germany 1,250.
Slag and dross, not metal-bearing	5,566	17,998	651	United Kingdom 13,826; Belgium-Luxembourg 3,498.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,869	36,884	—	United Kingdom 36,266; Trinidad and Tobago 457; Italy 161.

See footnotes at end of table.

TABLE 3—Continued

IRELAND: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Carbon black		41,906	4,393	2	United Kingdom 4,148; Netherlands 130.
Coal:					
Anthracite		96,526	109,099	5,817	Republic of South Africa 41,105; United Kingdom 27,070; West Germany 16,721.
Bituminous	thousand tons	3,361	3,221	1,284	Poland 601; United Kingdom 317.
Briquets of anthracite and bituminous coal	do.	11,448	12,081	159	West Germany 6,894; Netherlands 1,489; Belgium-Luxembourg 1,010.
Lignite including briquets	do.	7,231	10,227	—	West Germany 6,218; East Germany 2,886; United Kingdom 1,123.
Coke and semicoke		5,604	10,617	1,344	Republic of South Africa 2,624; Belgium-Luxembourg 2,551; United Kingdom 2,383.
Gas, natural: Gaseous	thousand cubic meters	57	12	—	All from United Kingdom.
Peat including briquets and litter		1,198	1,412	—	United Kingdom 1,272; U.S.S.R. 785.
Petroleum:					
Crude	thousand 42-gallon barrels	9,812	10,416	—	United KIngdom 9,631; U.S.S.R. 785.
Refinery products:					
Liquefied petroleum gas	do.	1,194	1,252	—	United Kingdom 1,249; France 1.
Gasoline	do.	5,197	5,329	—	United Kingdom 4,748; Belgium-Luxembourg 187.
Mineral jelly and wax	do.	27	31	1	United Kingdom 20; West Germany 7; Netherlands 2.
Kerosene and jet fuel	do.	3,428	3,550	(2)	United Kingdom 2,619; U.S.S.R. 721.
Distillate fuel oil	do.	7,604	8,132	—	United Kingdom 7,569; U.S.S.R. 563.
Lubricants	do.	325	297	4	United Kingdom 275; Netherlands 6.
Residual fuel oil	do.	5,075	3,923	320	United Kingdom 2,695; France 614.
Bitumen and other residues	do.	498	660	—	United Kingdom 536; Belgium-luxembourg 67.
Bituminous mixtures	do.	17	21	(2)	United Kingdom 19; Canada 1.
Petroleum coke	do.	123	299	236	Denmark 30; Netherlands 20.

[1]Table prepared by staff, International Data Section.
[2]Less than 1/2 unit.
[3]May include other precious metals.

Employment in mining and quarrying, including turf, was about 8,000.

COMMODITY REVIEW

Metals

Alumina.—Aughinish Alumina Ltd. (AAL) continued with its $10 million expansion plan to increase the capacity of its plant from the initial and current 800,000 tons per year to 1 million tons per year by 1991. The refinery was designed so that production could be doubled or trebled if the world market for alumina improves sufficiently. The refinery continued to operate beyond its rated capacity as it has been doing since 1987.

Gold.—Exploration for gold continued at a high level throughout 1990. Most activity continued to be focused on four districts in the Caledonides that are known to contain significant gold mineralization. Rocks of Caledonian age are the major hosts for known gold deposits in Ireland. These districts are Avoca and Clontibret in the paratectonic Caledonides, in the east of Ireland. The other two districts occur in the west of Ireland and southern Mayo in the paratectonic Caledonides and Connemara in the orthotectonic Caledonides. The first minable gold deposit was discovered by Ennex International in Northern Ireland; however, mine development continued to be delayed because of the local security situation. Ennex has been unable to secure a permit from the Government for the use of explosives. Alternate methods of mining were being investigated.

Two other discoveries, made in 1989 in County Mayo by Burmin PLC and Glencar PLC, were under development. Burmin applied for planning permission for its underground mine at Lecanvey. The project consisted of two main quartz vein structures cutting through Silurian feldspathic quartzites. Additional gold-bearing veins were reported to have been intersected. The deposit was reported to contain an estimated 248,000 tons of probable and 250,000 tons of possible ore grading 1.5 grams of gold per ton. Production was planned to start in 1991. Glencar reported favorable results from its gold project at Cregganbaun where three zones of gold mineralization had been reported. The mineralization appeared to be related to a quartz porphyry intrusion within a zone of ultramafic rocks. At yearend, the company reported that drilling had delineated about 500,000 tons of ore grading 6 grams of gold per ton.

TABLE 4

IRELAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facility	Annual capacity
Alumina	Aughinish Alumina Ltd.	Aughinish Island, County Limerick	800
Barite	Magcobar Ireland Ltd.	Silvermines, County Tipperary	240
Cement	Irish Cement Ltd.	Plants in Limerick and Platin	2,000
Lead-zinc	Tara Mines Ltd.	Mine at Navan, County Meath	215
Natural gas. million cubic feet	Marathon Oil Co.	Kinsale Head Field, Celtic Sea	75,000
Peat	Bord Na Mona (Government Peat Board)	Production mainly in flat midlands	4,200
Petroleum, refined barrels per day	Irish Refining Co.	Refining at Whitegate, near Cork	56,000
Steel	Irish Steel Ltd.	Plant at Haulbowline, near Cork	350

Navan Resources PLC of Ireland and MIM Holdings of Australia, under a joint-venture agreement, have undertaken an exploration program in the Central Irish Midlands. In late 1990, the companies formed another joint-venture agreement to explore for gold in the Scottish Highlands, United Kingdom. MIM would have a 50% interest in a 255-square-kilometer area near Strathclyde, which was under license to Navan.

Lead and Zinc.—Tara Mines Ltd. was continuing with its major plant renewal and also on investigations to expand its mining activities. The SW ore body was the main area of activity, with grades of zinc reportedly ranging from 8% to 12%. Mining was becoming increasingly further away from the two existing shafts, so Tara is faced with a decision on whether to construct a new shaft or move the ore underground to the existing shafts. Sinking of a new shaft would require an environmental assessment and planning permission. The Tara Mine, at Navan, is one of the largest lead-zinc producers in Europe and has had an annual output of 180,000 tons of zinc and 35,000 tons of lead in concentrates.

Conroy Petroleum and Natural Resources PLC's discovery of a third lead-zinc zone, the K zone, at its Galmoy Project in County Kilkenny has caused the company to raise the output of the proposed Galmoy Mine from 550,000 to 650,000 tons per year. At that rate, the mine would have an estimated life of about 10 years. The reported estimated cost of bringing the Galmoy Mine into production was $70 million. Outokumpu Oy, the Finnish state mining concern, has agreed to furnish technical, financial, and marketing support for the mine development. Outokumpu has a 20% shareholding position in Conroy and is also owner of Tara Mines Ltd. at Navan. Oliver Resources PLC was developing a new lead-zinc mine at Ballinalack, Co. Westmeath. The company was applying for a state mining lease and planning permission with an expected start of development in 1991. Ore reserves were estimated by the company to be 6 million tons at 7.4% combined lead and zinc. Oliver was continuing with exploration and drilling in an effort to define further reserves.

Steel.—Irish Steel Ltd., the only steel producer in Ireland, announced its 1990 results, which showed a 12% increase in sales over those of the previous year. Export sales increased by 24% and accounted for 87% of total sales. Strong EC steel demand resulted in an increase in sales and exports of finished products, although the decline in international steel prices decreased profits.

Negotiations, which have been ongoing for the past 2 years, were continuing at yearend between Korf AG of the Federal Republic of Germany and the Government of Ireland for Korf to buy 100% of Irish Steel. Korf was still pursuing plans to acquire Irish Steel despite the death of Willy Korf in November 1990. Another major contender for Irish Steel was North Star Steel Co. of the United States. The Irish Government expressed concern, however, over North Star's proposed rationalization plan, which involved loss of jobs. With a relatively high unemployment rate in Ireland, the Government is very sensitive to any issue that would involve layoffs. The third contender is the Ispat Group, which has steel facilities in India, Indonesia, and Trinidad.

The Irish Government blocked the takeover of Walkers Steel Group in Ireland by British Steel. The reason given was that the acquisition would lead to an unacceptable degree of concentration in the market with the risk of reduced competition, which could have an adverse effect on consumers. The Walker Group consists of six branches mainly involved in steel stockholding of carbon steel, stainless steel, and alloy steel products. The European Commission EC was reviewing the proposed merger. A decision was expected in early 1991 on whether or not the Commission would confirm the Irish Government's position or overturn the action.

Industrial Minerals

There was continued success in the industrial mineral sector, with one andulusite and two gypsum deposits awaiting development. A talc deposit in Co. Mayo and dolomite and slate deposits in Co. Tipperary were being evaluated. Irish Gypsum Ltd. began open pit mining of the Knocknacram deposit in Co. Monaghan. There were estimated reserves for a mine life of 20 years operating at a mine capacity of 300,000 tons per year.

Ireland produced significant quantities of synthetic diamonds; however, output was not quantitatively reported, and information was not available to make reliable estimates of production.

Mineral Fuels

Coal production was mainly semibituminous high-ash coal from the Connaught Field, which was used for electricity generation. Marathon Petroleum (Ireland) Ltd. continued with the development of the Ballycotton natural gasfield off Ireland's coast in the Celtic Sea. The plan calls for a single subsea well connected with the company's Kinsale Head Platform Bravo 9 miles to the south. Startup was scheduled for the fourth quarter of 1991. The company agreed to sell production from the gasfield to Bord Gais Eireann, Ireland's gas board. Kinsale Head, which has a production rate of 220 MMcfd, is Ireland's only source of natural gas.

INFRASTRUCTURE

Ireland has a good network of roads supplemented by a Government-owned railroad. There are the deepwater ports of Cork and Dublin and 10 secondary ports. Most mine sites are easily accessible and no more than 600 kilometers from a deepwater port.

TABLE 5

IRELAND: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1990

(Million metric tons unless otherwise specified)

Commodity (In situ resources)		Reserves[e]
Barite		1.5
Coal		70
Lead		2
Natural gas	trillion cubic feet	1.5
Zinc		5

[e]Estimated.

OUTLOOK

Ireland has a proven geologic potential for a variety of minerals. The mineral industry is expected to utilize the opportunities created by the boom in gold exploration and renewed interest from multinational companies to continue mineral developments. The provision in the 1990 Finance Act allowing exploration expenditure to be offset against other taxable income was welcomed by the industry. At yearend, however, the Government had not fully defined the terms of mineral exploration and development, and this was slowing the progress of some projects.

The Geological Survey of Ireland has had an active data collecting program through mapping and resource-related studies and offers technical assistance. This should continue to be a significant benefit and encouragement to companies engaged in mineral resource activities.

[1]Where necessary, values have been converted from Irish pounds (I£) to U.S. dollars at the rate of I£1=US$1.65, the average for 1990.

OTHER SOURCES OF INFORMATION

Agencies

Central Statistics Office
Ardee Road
Rathmines
Dublin 6, Ireland

Central Bank of Ireland
Dame Street
Dublin 2, Ireland

Geologic Survey of Ireland
Beggars Bush
Haddington Road
Dublin 4, Ireland

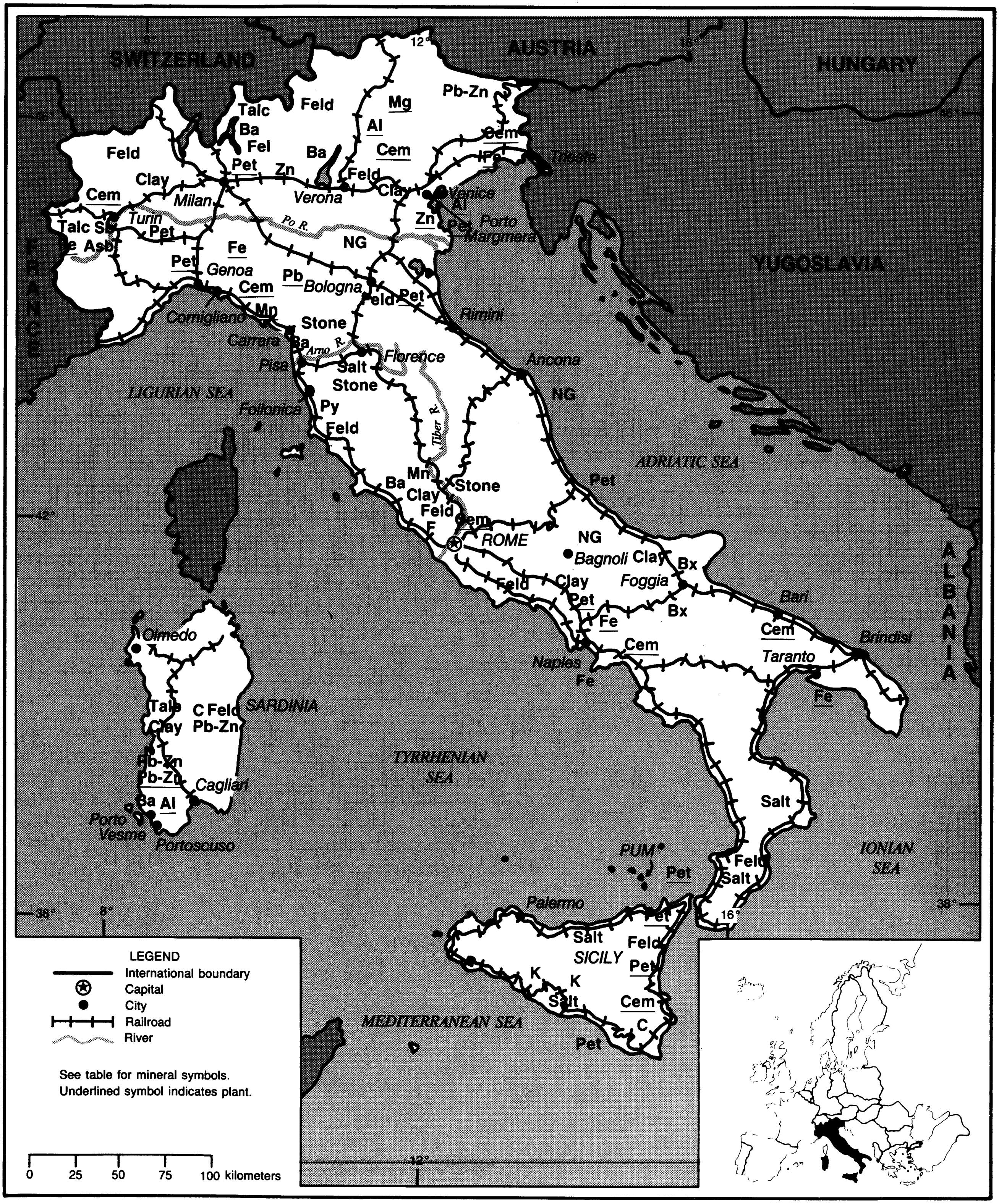
Publications

Central Statistics Office, Dublin: Statistics Bulletin.

Central Bank of Ireland, Dublin: Quarterly Bulletin.

ITALY

AREA 301,300 km² **POPULATION 57.7 million**



The Mineral Industry of Italy

By George A. Rabchevsky

By European standards Italy has been a significant processor of imported raw materials as well as a significant consumer and exporter of mineral and metal semimanufactured and finished products. The country was Western Europe's top cement producer and also produced about one-half of the world's pumice and 30% of the world's feldspar. Moreover, Italy was an important world producer of marble and dimension stone. Additionally, the country's mine output of barite, bentonite, cement, fluorspar, potash, and steel products was also of world significance.

GOVERNMENT POLICIES AND PROGRAMS

The basic mining legislation of Italy is Royal Decree No. 1443 of July 29, 1927, as amended by Law No. 1360 of November 7, 1941. This law vests ownership of subsoil minerals to the state. With certain limitations, quarried minerals are the property of the private landowner. Foreigners are permitted to explore, own, and operate mines, but must incorporate under Italian laws. Petroleum activities are governed by Law No. 6 of January 1957, as amended by Title II of Law No. 613 of July 21, 1967. Ownership of petroleum and gas is also vested in the state. Concessionaires are required to turn over 9% of all of extracted hydrocarbons to the state or pay an equivalent sum.

Law No. 752, regulating mining in Italy, was approved by the parliament on June 10, 1982. In general, the law strengthens involvement of the Government in the mineral industry. The concessionaires will have to reimburse the state for its contributions, starting after the property has been in production for 3 years. Mining of strategic minerals will be kept operational at the Government's expense. No stockpiling programs are underway in Italy except normal industrial stocks and stocks of crude oil for 90 days of consumption.

In 1990, a new mining law and policy was under discussion in the Italian Parliament, which partly confirmed traditional issues and introduced new provisions for restructuring mining and environmental protection acts. The law was expected to cover the period 1989 to 1991. Following passage in July of a national mining policy law, copper, gold, lead, manganese, molybdenum, nickel, tungsten, zinc, and zirconium were identified as minerals considered essential for the Italian economy and to be given priority in funding Italian companies for exploration abroad.[1]

In 1990, the Government reportedly intended to place more environmental controls on polluting industries. Strict enforcement of regulations was expected to induce private and public industries to install more pollution-control devices. Deforestation, soil erosion in the Alps, and the pollution of the Po Valley are among the main environmental problems in Italy. The Po Valley is threatened by water pollution, in the form of high levels of nitrates and phosphates coming from fertilizers. From the 1980's, there has been increasing sensitivity to environmental problems and resistance to the construction of new coal-fired and nuclear electricity generating plants.

PRODUCTION

The aggregated growth in the extractive industries was minimal. Among the metallic ores, only bauxite, lead, magnesium, manganese, and zinc were mined in Italy in 1990. Industrial mineral production remained the most important extractive sector, although reportedly the value of total production in this sector declined slightly in 1990 compared with that of 1989. Domestic production of natural gas and petroleum increased slightly, while output of lignite continued to decrease. Italy's most notable contributions to global mineral commodity supplies, however, continued to be its output of processed materials based on imports. In 1990, the country ranked sixth in the world in steel production, and was second after the Federal Republic of Germany (FRG), among EC producers. Italy ranked sixth globally in cement output and sixth in production of refined oil, having surpassed the FRG in 1989.

STRUCTURE OF THE MINERAL INDUSTRY

Mainly private and public companies own facilities for the production and processing of minerals, metals, fuels, and products. However, some state-owned enterprises are often retained for economic and employment reasons. The Government bank allocates credit to state-owned corporations to avoid the social impact of closure of uneconomic ventures. The primary minerals administrative agency is the Direzione Generale delle Miniere, which also collects mineral statistics.

COMMODITY REVIEW

Metals

Aluminum.—Italian bauxite production totaled more than 200,000 tons in 1970 but gradually declined thereafter.

Alumina in Italy was produced only by Eurallumina S.p.A., at Portoscuso in Sardinia. The company was owned jointly by Alumix S.p.A. (52.1%) and by Australian interests. Almost all alumina in Italy was produced from imported bauxite, which was obtained from Australia and Guinea. The production of alumina has risen constantly over the past 5 years.

Alumix S.p.A., part of the state holding company Eute Fiere Italiane Atacchine, was the only primary aluminum producer in Italy. The company operated five smelters: one at Portoscuso in Sardinia, one at Bolzano, one at Porto Marghera, and two at Fusina, all near Venice. More than 80% of the production was used domestically. Italy has imported about 50% of its total aluminum requirements.

Among Italy's several secondary aluminum producers, details on output and/or capacity were not readily available except for Nuova Samim S.p.A., which produced about 43,000 tons of secondary aluminum, 6,500 tons of primary alloys, and 500 tons of billets in its Carisio plant.

Copper.—Italian refined copper production has been rising for the past 3 years.

TABLE 1

ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
METALS						
Aluminum:						
Alumina		618,374	699,635	708,158	722,226	752,000
Bauxite		—	16,557	17,125	11,700	[2]300
Metal:						
Primary		242,632	232,600	226,300	219,500	[2]231,900
Secondary		301,000	335,000	378,000	390,000	[2]349,600
Antimony:						
Mine output, Sb content		305	86	24	—	—
Oxides, gross weight[3]		715	879	731	603	600
Bismuth metal		66	43	32	46	30
Cadmium metal, smelter		411	320	705	[e]710	700
Copper: Metal, refined, all kinds		65,400	65,000	75,400	83,300	[2]86,000
Iron and steel: Metal:						
Pig iron	thousand tons	11,916	11,335	11,349	11,761	[2]11,883
Ferroalloys:						
Blast furnace:						
Ferromanganese		48,002	19,469	27,169	26,738	26,500
Spiegeleisen		1,151	491	251	—	—
Silicon pig iron (10% to 12% Si)[e]		[2]968	1,000	1,000	1,000	1,000
Electric furnace:						
Ferrochromium		55,939	59,045	77,123	81,331	81,000
Ferromanganese		11,653	17,067	12,280	14,220	14,000
Ferrosilicon		62,799	47,075	51,131	65,171	65,000
Silicomanganese		66,083	75,192	[e]75,000	[e]75,000	70,000
Silicon metal[e]		[2]18,904	19,000	18,000	19,000	18,000
Other[e]		[2]14,022	14,500	14,500	15,000	14,500
Total[e]		[2]279,521	252,839	[r]276,454	[r]297,460	290,000
Steel, crude	thousand tons	[r]22,985	[r]22,819	23,760	22,180	[2]25,439
Semimanufactures	do.	[r]19,900	[r]19,800	20,700	22,000	22,300
Lead:						
Mine output, Pb content		11,119	11,994	16,503	17,544	15,000
Metal, refined:						
Primary		29,333	62,285	72,204	74,205	[2]73,000
Secondary		101,700	111,400	111,600	112,000	100,000
Total		131,033	173,685	183,804	186,205	173,000
Magnesium:						
Mine output, Mg content		9,046	8,805	6,878	7,096	7,200
Metal, primary		12,417	7,626	5,436	5,469	[2]5,700
Manganese, mine output:						
Gross weight		6,396	3,802	9,701	5,899	5,000
Mn content		1,689	1,141	2,538	1,475	1,250
Silver metal	kilograms	56,338	82,031	91,563	97,036	98,000
Zinc:						
Mine output, Zn content		26,303	33,099	37,150	43,258	43,000
Metal, primary		229,397	247,000	242,117	259,481	[2]264,000
INDUSTRIAL MINERALS						
Asbestos		115,208	118,352	94,549	54,500	35,000
Barite		114,132	81,643	85,650	75,640	[2]36,500

See footnotes at end of table.

TABLE 1—Continued

ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
INDUSTRIAL MINERALS—Continued						
Bromine[e]		450	450	450	400	400
Cement, hydraulic	thousand tons	35,938	37,257	37,884	39,385	39,500
Clays, crude:						
Bentonite	do.	300	313	301	220	205
Refractory excluding kaolinitic earth	do.	381	375	454	559	560
Fuller's earth	do.	31	39	39	44	45
Kaolin	do.	35	57	71	69	70
Kaolinitic earth	do.	21	22	19	20	20
Diatomite[e]		27,000	27,000	28,000	25,000	25,000
Feldspar		1,237,058	1,188,700	1,367,776	1,350,733	[2]1,590,000
Fluorspar:						
Acid-grade		90,900	77,800	81,700	66,600	[2]82,000
Metallurgical-grade		54,536	56,600	58,157	59,679	[2]43,000
Total		145,436	134,400	139,857	126,279	[2]125,000
Gypsum	thousand tons	1,245	1,215	[e]1,300	[e]1,250	1,250
Lime, hydrated, hydraulic and quicklime	do.	3,601	3,894	[e]3,900	[e]3,900	3,850
Nitrogen: N content of ammonia	do.	1,553	1,435	1,561	1,446	[2]1,197
Perlite[e]		73,000	70,000	70,000	71,000	71,000
Pigments, mineral: Iron oxides, natural[e]		875	850	850	850	850
Potash, crude salts:						
Gross weight	thousand tons	1,261	1,403	1,577	1,730	[2]661
K_2O equivalent	do.	158	178	197	208	80
Marketable product, K_2O equivalent	do.	119	134	148	156	60
Pumice and related materials:[e]						
Pumice and pumiceous lapilli	do.	700	725	730	700	725
Pozzolan	do.	4,500	5,000	5,000	4,500	4,500
Pyrite, all types, gross weight	do.	761	690	774	836	[2]806
Salt:						
Marine, crude[4]	do.	574	571	680	[e]685	680
Rock and brine	do.	3,433	3,694	3,609	3,501	[2]3,750
Sand and gravel:[e]						
Volcanic sand	do.	100	100	100	100	100
Silica sand	do.	4,200	4,300	4,300	4,500	4,300
Other sand and gravel	do.	123,000	122,000	123,000	124,000	124,000
Sodium compounds:[e]						
Soda ash	thousand tons	590	612	612	615	610
Sodium sulfate	do.	75	80	127	130	125
Stone:						
Dimension:[e 5]						
Calcareous:						
Alabaster	do.	20	20	20	25	20
Marble in blocks:						
White	do.	1,600	1,600	1,600	1,650	1,700
Colored	do.	1,800	1,800	1,800	1,900	1,950
Travertine	thousand tons	1,100	1,100	1,100	1,150	1,150
Other:						
Granite	do.	2,500	2,500	2,500	2,500	2,500

See footnotes at end of table.

TABLE 1—Continued

ITALY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
INDUSTRIAL MINERALS—Continued						
Stone—Continued						
Other—Continued						
Sandstone	thousand tons	1,800	1,800	1,800	1,800	1,800
Slate	do.	120	120	120	120	120
Crushed and broken:[e]						
Dolomite	do.	850	850	850	900	900
Limestone	do.	110,000	110,000	110,000	120,000	120,000
Marl for cement	do.	[2]10,574	11,000	11,000	10,500	10,500
Serpentine	do.	1,500	1,500	1,500	1,500	1,500
Quartz and quartzite	do.	250	250	250	250	250
Strontium minerals: Celestite		4,667	177	—	—	—
Sulfur: Recovered as elemental and in compounds:						
S content of pyrite	thousand tons	309	[r]314	310	325	[2]290
Byproduct, oil refining and other sources[e]	do.	[r]165	[r]250	[r]310	[r]315	[2]297
Total	do.	[r]474	[r]564	620	640	[2]587
Talc and related materials		151,206	150,718	158,722	146,000	[2]159,000
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bituminous rock, natural		65,889	71,429	56,907	[e]60,000	60,000
Carbon black[e]		155,000	156,000	155,000	155,000	155,000
Coal:						
Lignite	thousand tons	1,573	1,642	1,600	1,530	[2]1,480
Subbituminous (Sulcis coal)		13,708	15,356	48,408	69,000	[2]60,000
Coke, metallurgical	thousand tons	6,213	5,893	5,884	[e]5,900	5,800
Gas, natural	million cubic meters	15,963	16,324	16,634	16,978	[2]17,296
Natural gas liquids[e]	thousand 42-gallon barrels	400	400	400	400	400
Petroleum:						
Crude	do.	17,230	26,625	32,784	31,197	[2]31,619
Refinery products:						
Liquefied petroleum gas	do.	21,274	28,314	30,712	24,638	26,000
Gasoline, all kinds	do.	131,538	137,989	139,102	135,498	136,500
Naphtha	do.	33,932	18,921	15,806	16,168	16,000
Jet fuel	do.	11,336	11,056	14,128	16,624	17,000
Kerosene	do.	27,729	28,760	30,349	31,007	31,500
Distillate fuel oil	do.	203,046	190,946	188,685	191,140	200,000
Residual fuel oil	do.	156,916	156,090	156,783	154,898	155,000
Other	do.	45,150	46,263	49,287	61,292	63,000
Refinery fuel and losses	do.	29,407	37,443	45,367	40,089	41,500
Total	do.	660,328	655,782	670,219	671,354	686,500

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

[1]Table includes data available through Sept. 1991.

[2]Reported figure.

[3]Antimony content is 83% of gross weight.

[4]Does not include production from Sardinia and Sicily estimated at 200,000 tons annually.

[5]Output of limestone and serpentine for dimension stone use is included with "Stone: Crushed and broken." In addition to the commodities listed, a variety of other dimension stone was produced and previously listed, but available general information was inadequate for continued reliable estimation of output levels.

TABLE 2

ITALY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Eurallumina S.p.A.	Plants at Portoscuso, Sardinia; at Porto Marghera, Venice	720
Aluminum	Alumix S.p.A.	Smelters at Portoscuso, Sardinia; at Bolzano, Porto Marghera, and two at Fusina, all near Venice	255
Asbestos	Amiantifera di Balangero S.p.A.	Mine at Balangero, near Turin	100
Barite	Bariosarda S.p.A.	Mines at Barega, and Mont'Ega, in Sardinia	100
Do.	Edem S.p.A.	Mines at Val di Castello, in Lucca	20
Do.	Edemsarda S.p.A.	Mines at Su Benatzu, Sto Stefano, and Peppixeddu, in Sardinia	20
Do.	Minieraria Baritina S.p.A.	Mines at Marigole, Monte Elto, and Primaluna, near Milan	20
Cement	52 companies, of which the largest are—	97 plants, of which the largest are—	45,000, including-
Do.	Italcement-Fabbriche Riunite Cemento S.p.A.	19 plants, of which the largest are—Calusco, Monselice, and Collefero	(16,003)
Do.	"Cementir"-Cementerie del Tirreno S.p.A.	Plants at Arquasta Scivia, Livorno, Maddaloni, Napoli, Spoleto, and Taranto	(6,250)
Do.	Unicem S.p.A.	Plants at Guidonia, Luganano, Morano, Piacenza, S'Arcangelo di Romagna, and Settimello	(4,630)
Copper, refined	Nuova Samim S.p.A.	Refineries at Porto Marghera, and Pieve Vergonte	46
Do.	Europa Metalli-LMI S.p.A.	Refineries at Campo Tizzoro, Fornaci di Barga, and Villa Carcina	26
Do.	Chimet S.p.A.	Refinery at Arezzo	13
Feldspar	At least 5 companies, of which the largest are—		1,500, including-

Nuova Samim S.p.A. was the largest producer of refined copper, lead, and zinc metal in Italy, employing about 3,350 workers. Samim produced about 55% of Italian copper metal. Virtually all of the country's output was derived from scrap, ashes, slags, and other residues. Samim also produced antimony metal, bismuth, gold, and silver. All sources of Nuova Samim's scrap, from copper and aluminum cables to batteries, were handled by two subsidiaries, Nonfermet S.p.A. and Eurobatex S.p.A., which selected and sorted the material before passing it on to the refining plants. Secondary copper was produced by Samim at Paderno Dugnano, near Milan, using alloy scrap and low-grade copper scrap as raw materials. Plant capacity for secondary copper was about 50,000 mt/a. Copper scrap from European sources was refined by Samim at Porto Marghera copper-zinc plant, near Venice. Copper cathode capacity at the plant was 45,000 mt/a in 1990 and would reportedly increase to 60,000 mt/a in 1991. In an attempt to reduce the cost of scrap metal, a new furnace using Boliden technology will produce 25,000 mt/a of blister copper from lower grade dusts, which will then be fed into the existing Maerz anode furnace.

Lead and Zinc.—Italy imported most of its supplies of lead and zinc concentrates, obtaining them from a variety of sources. Canada ranked as the largest single source for lead and zinc concentrates. Within Italy, most of lead and zinc concentrate production came from Nuova Samim's mines in Sardinia. Samim's lead and zinc smelters were also in Sardinia, and the zinc electrolytic plant was near Venice. The Porto Vesme smelter in Sardinia produced primarily lead and zinc metal and cadmium, while the San Gavino complex, near Porto Vesme, produced refined lead and byproducts, such as bismuth, gold, and silver. Secondary lead, including soft lead and alloys, is produced by Samim at Paderno Dugnano and Marcianise plants, with annual capacity of about 50,000 tons at Paderno and 35,000 tons at Marcianise.

In 1989, Pertusola Sud S.p.A. operated the country's largest zinc smelter in Crotone. The company also produced cadmium and germanium. However, in 1990, Nuova Samim acquired Pertusola, thus expanding its control over the country's lead and zinc industry. Samim operated four zinc plants, with a total capacity of 349,000 mt/a.

Steel.—Italy was the second largest producer of crude steel in the EC, after Germany. About 44% of steel in Italy was produced by basic oxygen furnaces and 56% was produced by electric arc furnaces. In Italy about one-half of the steel was produced by private companies, with the rest by Government-owned enterprises. All iron ore, about 17 Mmt, was imported in 1990, about 37% of which came from Australia and 35% from Brazil. Also in 1990, Italy imported about 11.2 Mmt of steel. The country's steel industry imports about 3.5 Mmt/a of scrap, mostly from France and Germany.

Ilva S.p.A. was the country's largest steel company. All the profitable activities and assets of the Finsider companies—Italsider, Nuova Deltasider, and Terni Acciai Speciali—were transferred to Ilva. The 1990 results mark the end of Ilva's 3-year restructuring plan, drawn up in 1988 by the Italian government and the EC Commission. With a crude steel output of about 11.5 Mmt, Ilva was the eighth largest steel producer in the world and the fourth in the EC. Flat products were the company's main strength, with Taranto one of the largest flat-rolling centers in the world. Table 3 lists Ilva's major operating plants. Ilva employed about 49,500 workers in 1990. About 20% of the company's steel was exported. Ilva continued to be a major importer of metallurgical coal, primarily from the United States.

Twelve Ilva plants were closed down, and 10 others were sold to the private sector in 1990. Ilva closed its steel plant at Bagnoli, shutting down the blast furnaces and converters. Part of the plant would later be used to roll steel produced at the company's Taranto plant. The land would also be used to install tinplate and other products plants.[2]

The second largest steel company in Italy, Riva S.p.A., with a 1990 production of more than 3.5 Mmt of raw steel, was privately owned.

Industrial Minerals

Asbestos.—Amiantifera di Balangero S.p.A. was the only company in Italy producing asbestos. The San Vittore Mine was the only significant asbestos producer in Western Europe. The surface mine was in the village of Balangero near Lonzo, about 50 km north of Turin. Reserves were estimated to be large, and the grade of asbestos averages more than 6% fiber. Tailings were stored in a valley about 4 km from the mill. Production started to decline in the late 1970's, from 165,000

TABLE 2—Continued

ITALY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Feldspar	Maffei S.p.A.	Surface mines at Pinzolo, Sondalo, and Campiglia Marittima; underground mine at Vipiteno	(200)
Do.	Miniera di Fragne S.p.A.	Surfcae mine at Alagna Valsesia	(60)
Do.	Sabbie Silicee Fossanova S.p.A.	Surface mine at Fossanova	(30)
Lead-zinc	Nuova Samim S.p.A.	Mines at Masua, Monteponi (Montevecchio, San Giovanni, San Benedetto) in Sardinia; at Raibl, in Veneto region	60
Do.	Others	do.	10
Lead metal	Nuova Samim S.p.A.	Refinery at San Gavino, Sardinia	80
Do.	do.	Kivcet smelter and Imperial smelter at Porto Vesme, in Sardinia	114
Zinc metal	Nuova Samim S.p.A.	Plants at Crotone and Porto Vesme, in Sardinia; and Porto Marghera, near Venice	349
Lignite	Ente Nazionale per L'Energia Elettrica	Surface mines at Pietrafitta (in Umbria) and San Barbara (in Tuscany)	1,500
Magnesium metal	Societa Italiana Magnesio S.p.A.	Dosseni Mine	65
Do.	do.	Plant at Bolzano	7
Marble, white	A number of companies-including—	Quarries mostly at Carrara and Massa	2,000, including-
Do.	Mineraria Marittima Srl	Quarry at Carrara	(500)
Do.	Industria dei Marmi Vicentini S.p.A.	Quarries in the Carrara area	(300)
Do.	Figaia S.p.A.	do.	(100)
Petroleum: Crude thousand 42-gallon barrels per day	Ente Nazionale/Idrocarburi	Oilfields: Offshore Sicily and in the Adriatic Sea; onshore in Po River Valley	90
Refined do.	do.	About 30 refineries	2,000
Potash ore	Industria Sali Potassici e Affini per Aziono S.p.A.	Underground mines at Corvillo, Pasquasia, Racalmuto, and San Cataldo, in Sicily	1,300

TABLE 2—Continued

ITALY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Potash ore	Sta Italiana Sali Alcalini S.p.A.	Undergound mines at Casteltermini and Pasquasia, in Sicily	700
Pumice	Pumex S.p.A.	Quarries on the Lipari Island, north of Sicily	650
Do.	Sta Siciliana per l'Industria ed il Commercio della Pomice di Lipari—Italpomice S.p.A.	do.	200
Pyrite	Solmine S.p.A.-Sta Lavorazione Minerali e Derivati S.p.A.	Underground mines at Campiano and Niccioleta	900
Salt rock	Italkali Societa Italiana S.p.A.	Underground mines at Petralia, Racalmuto, and Realmonte, in Sicily	4,000
Do.	Solvay S.p.A.	Underground mines at Buriano, Ponteginori and Querceto in Tuscany	2,000
Steel crude	Ilva S.p.A.	34 steel plants, of which—	13,000
Do.	do.	Plant at Taranto	(8,000)
Do.	Riva S.p.A.	About 5 plants	5,000
Do.	Others	Various locations	10,000
Talc	Talco e Grafite Val Chisone S.p.A.	Mines at Pinerolo, near Turin, and at Orani in Sardinia	120
Do.	Industria Mineraria Italiana S.p.A.	Mine at Largone Predaccia	20
Do.	Talco Sarda S.p.A.	Mine at Orani in Sardinia	20

TABLE 3

ILVA S.P.A.'S MAJOR OPERATING PLANTS

Products	Location of plants
Flat	Bagnoli, Cornigliano, Novi Ligure, Racconigi, Taranto, Turin.
Long	Condove, Piombino.
Special steel long	Aosta.
Special steel flat	Terni, Turin.
Pipes and tubes	Costa Volpino, Dalmine, Piombino, Racconigi, Sabbio, Taranto, Torre Annunziata.
Other activities	Various locations.

tons in 1977 to about 35,000 tons in 1990. Reportedly, on May 18, 1990, Balangero declared bankruptcy. The future of the mine was reportedly uncertain because of environmental problems.[3]

Barite.—Most barite in Italy came from the island of Sardinia. There were four operating companies in Italy producing barite: Bariosarda S.p.A., owned by the Sardinian regional government's holding company Ente Mineraria Sarda, with mines at Barega (Iglesias Province), Mont 'Ega (Narcao Province), and Monte Tamara Province in Sardinia; Edem S.p.A., Government-owned, with mines at Val di Castello, in Tuscany; Edemsarda S.p.A., with mines at Su Benatzu, Sto Stefano and Peppixeddu in Sardinia; and Mineraria Baritina S.p.A., with mines at Marigole, Monte Elto, and Primaluna, East of Milan. The Barega Mine yielded about 35,000 tons of 91% to 92% $BaSO_4$ granulated barite used in drilling, and the Mont 'Ega Mine yields about 24,000 mt/a of ore containing 97% barite which is used in the chemical industry.

Cement.—Italy was the major EC producer of cement, second only to the U.S.S.R. in Europe, and sixth in the world. Italcementi S.p.A. was the largest of Italy's 50 cement producers, with about 40% of the Italian market.

Clays and Refractory Materials.—Unimin S.p.A., based in Milan, was the largest supplier of raw materials for the abrasive and refractory markets in Italy with production facilities in the city of Massa, in the Carrera area. Unimin imported bauxite from Brazil and China, kyanite from Brazil, flint clay and kaolin from China, and andalusite from South Africa to augment their domestic raw material production.

Most of Italy's bentonite mining took place on the island of Sardinia, with processing plants on the mainland. More than one-half of the country's bentonite production comes from Industria Chemica Carlo Laviosa S.p.A. The company's main mining activity was in the Pedra de Fogu and Puntenuova areas of Sardinia. Production from these areas fed the processing plants at Oristano in Sardinia and at Livorno, south of Pisa. White bentonite, montmorillonite clay, was quarried at S'Aliderru in northwestern Sardinia. Caffaro S.p.A. was Italy's only producer of acid-activated montmorillonite, operating in Sardinia. The clay was shipped to the company's plant at Porto Marghera in Venezia. Several small bentonite producers operated on the mainland, at Foggia in the district of Puglia and at Pietracuta di S. Leo in the Pesaro district.

Acdal S.p.A., a subsidiary of Industria Generale Ceramiche S.p.A., produced about 150,000 mt/a of clay from its Cave del Mastro operation at Lozzolo, near Gattinara, in the Province of Vercelli. About 80% of the clay was used in tile manufacture. Industria Chimica Carlo Laviosa S.p.A. produced clay at Cagliari in Sardinia. The company operated several quarries in the Province of Nuoro, with production amounting to about 130,000 mt/a.

Feldspar.—Italy was the world's leading producer of feldspar and feldspathic minerals. These materials were important constituents of ceramic tile. Italy accounted for 30% of world tile output and more than 50% of the tile produced in the EC. In Italy there were more than 350 small companies producing tiles, employing about 30,000 workers. Clay was imported from the FRG, with some imported from France and the United Kingdom. The largest producer of albite was Maffei S.p.A., which operated a surface mine at Pinzola in the Trentin district. Miniera di Fragne S.p.A. also produced albite from its surface mine at Mud di Mezzo and processed the material at its processing plant at Aladna Valsesia in Vercelli.

Fluorspar.—Production of fluorspar in Italy has been declining since 1984. The main fluorspar-producing area was near Gerrai, about 40 km from Cagliari, Sardinia. Six mines were in operation in 1990: two in Sardinia, operated by Mineraria Silius S.p.A. at Genna Tres Montes, and Muscadroxiu; and four in the Latium/Lazio area; Soricom S.p.A. operated the mine at Pianciano, and IPIM S.p.A. operated mines at Prato del Casone and Acquaforte e Valentano. Production capacity of Mineraria Silius was about 110,000 mt/a of fluorspar, 30,000 mt/a of barite, and 15,000 mt/a of lead concentrate.[4]

Marble.—Marble and travertine production from the world-famous quarries at Massa and Carrara have increased slightly in the past 2 years.

Italian marble occurred in many localities, from the Alps to Sicily, and was quarried at hundreds of operations. The most important white marble-producing area was in the Apuan Alps in Tuscany, particularly near the town of Carrara. The Lazio region, Lombardy, the Po Valley, Puglia, Sicily, and Venice were important colored marble-producing areas. About one-half of the output was in block form, and 45% of the total was exported. Annual output of the Carrara district is about 700,000 tons, or about 35% of the country's total white marble production. Industrial Marmi Apuani S.p.A. produced about 90,000 mt/a. Other major areas included the Valle di Susa, near Turin in the northwestern Italian Alps; the valley of the Po River in Lombardy; the Verona-Vicenza area of Venice; and the vicinity of Benevento, northeast of Naples in southern Italy. Reserves are considered essentially unlimited.

Perlite.—Since the closing of the perlite mines on the island of Ponza off the coast of Naples, most of the perlite produced in Italy comes from Sardinia. Perlite was produced by Perlite S.p.A. at Monti Arci in the volcanic zone of that name in west-central Sardinia, with processing facilities at Torre Grande near the port of Oristano.

Potash.—The production of potash had been rising steadily since 1987, but dropped from 1.73 Mmt in 1989 to 660,000 tons in 1990. The decline was the result of a severe drought that restricted availability of process water to the plants. One plant was closed. Three underground mines were operating in Sicily at Pasquasia, Racalmuto, and Realmonte.

Pumice and Pozzolan.—Italy was the world's leading producer of pumice and pozzolan. The Mediterranean island of Lipari, 40 km off the northern coast of Sicily, was the focus of the Italian pumice industry. Two companies in Italy quarried pumice for world markets—Italpomice S.p.A. and Pumex S.p.A. Pumex, with about 650,000 mt/a capacity, was Italy's largest pumice producer. The company quarried the Mount Pelato deposit on Lipari. Most pumice was exported to the United Kingdom. W.R. Luscombe Ltd., formerly an equity partner, became a wholly owned subsidiary of Pumex. Italpomice produced pumice at Acqualcalda on island Lipari, with an annual output of about 70,000 tons.[5]

Pyrite.—Pyrite was mined almost exclusively by the Solmine S.p.A. at Compiano and Niccioleta underground mines in Tuscany. Societa Edem S.p.A. produced small amounts of pyrite in its Val de Castello mine.

Salt.—Italy's three major producers of salt were Italkali Societa Italiana, Amministrazione Autonoma dei Monopoli de Stato, and S.p.A. Ing. Luigi Conti-Vecchi. Salt was produced at seven areas in Italy. Italkali, based in Sicily, was a major producer of salt rock, with underground mines at Racalmuto and Realmonte in Agrigento, Petralia in Palermo, and Pasquasia in Enna. In addition, Solvay S.p.A. operated mines in Tuscany at Buriano, Ponteginori, and Querceto. Compart S.p.A. operated the Timpa del Salto salt brine chamber at Calabria.

Sulfur.—Italy, once the world's leading mine sulfur producer, was a modest producer of sulfur in 1990, obtaining one-half or more of its output as a byproduct of petroleum refinery operations. Other sources were iron and cupreous pyrite deposits in the Maremma district of Tuscany. Elemental sulfur was obtained from pyrite from two mines operated by Solmine S.p.A. in southern Tuscany. Elemental sulfur production amounted to 587,000 tons in 1990, 297,000 tons of which were derived from oil refining and 290,000 tons from pyrite. Of the 297,000 tons of sulfur produced from oil refining, 177,000 tons were produced from operations on the island of Sicily from four producers. Sulfuric acid was produced at the Torviscosa plant near Porto Marhgera.[6]

Talc.—Italian talc, mined from metamorphic rocks, has been of very high quality. Talco e Grafite Val Chisone S.p.A. operated two underground mines at Pinerolo, with an output of about 45,000 tons of primary quality talc. It also owned a 10% interest in the Orani surface talc mine, with production of 20,000 mt/a; the other 90% belonged to the Sardinian Mining Board. Talco Sarda S.p.A. operated a mine at Orani in Sardinia. Talco Val Chisone S.p.A. operated an underground mine at Fontane, and Industria Mineraria Italiana S.p.A. (IMI) worked mines at Largone and Predaccia in Val Malenco, northern Italy, with production amounting to about 80,000 mt/a. About 35% of IMI's production was reportedly exported to France, the FRG, and the Netherlands. Other small mines also operated throughout the country.

Mineral Fuels

The country relied heavily on imported energy, satisfying 80% of total demand with purchases from abroad. Energy was the largest deficit item in the trade account. ENEL, the state electricity corporation, imported about 15% of its electricity from France and Switzerland.

Coal.—Domestic production of lignite in Italy was based on two surface mines in Umbria and Tuscany, operated by Ente Nazionale Electrica (ENEL) for use in domestic electricity production. The only operational subbituminous underground coal mine in Italy was in Sardinia, owned by Carbosulcis S.p.A. Italy was heavily dependent on imports to meet its coal requirements.

Geothermal Energy.—Most Italian geothermal energy is produced in the Larderello, Monte Amiata, and Travale areas in Tuscany.

Natural Gas and Petroleum.—There were more than 100 natural gas fields in operation, of which 70% were located offshore. Natural gas supplied almost 25% of Italy's total energy needs. About 35% was produced domestically. More than 25% was imported from Algeria through a 1,070-km-long gasline to Mazzara del Vallo in Sicily. In 1990, Algeria reportedly wanted to use the pipeline as the conduit for expanded deliveries of gas to Central and Eastern Europe via Italy. The U.S.S.R. supplied 25% of the country's natural gas through a pipeline, across Austria and Czechoslovakia.

About 20% of Italy's very small domestic petroleum production came from Sicily. With an annual consumption of about 94.5 Mmt of petroleum, Italy, after the FRG, was the EC's second largest petroleum consumer.

Unione Petrolifera represented the country's private oil companies. The Saras refinery was the largest in Italy and reportedly was the most competitive in the Mediterranean area.

Italy was almost totally dependent on imported petroleum. With no large coal or gas industries, petroleum accounted for 75% of the country's energy needs.

Reserves

Statistics on Italian reserves have not been published. Italy was considered to have sufficient reserves of asbestos, feldspar, marble, potash, pumice, salt, talc, and travertine, while deposits of coal, oil, and natural gas were insufficient to meet domestic needs. There were also smaller reserves of bauxite, magnesium, manganese, pyrite, silver, and a number of other minerals.

TABLE 4

ITALY: ESTIMATED RESERVE[1] OF MAJOR MINERAL COMMODITIES FOR 1990

(Thousand metric tons)

Commodity	Reserves
Asbestos	35,000
Barite	2,000
Fluorspar	6,000
Ilmenite	9,000
Marble	2,000,000
Potash	20,000
Rutile	20,000
Salt	1,000,000
Sulfur	10,000
Talc	45,000
Travertine	450,000

[1]Measured and inferred reserves.

INFRASTRUCTURE

A total of 20,085 km of railroad track was operational in 1990. Highways totaled 294,410 km. Superhighways totaled 5,900 km, and 7,010 km of Italy's roads were unpaved, mostly in the southern half of the country. There were 1,203 km of crude oil pipelines in service, 2,143 km of refined product pipelines, and 13,740 km of gas pipelines.

OUTLOOK

Public and private spending on pollution control will continue to grow, particularly in the areas of water treatment and transport equipment and services, urban and industrial waste disposal, soil contamination, and emissions. Mining of metallic ores will decline slightly. The metals processing industry, based primarily on imported stocks, will continue to play an important role in Italy's economy. Italy will remain the second largest producer of secondary aluminum in Europe and the second largest producer of crude steel in the EC. The industrial minerals quarrying industry and preparation plants will remain significant in Italy, especially the production of barite, cement, clays, fluorspar, marble, and talc. Italy will remain the world's leading producer of feldspar, feldspathic minerals, and pumice. Domestic output of natural gas, crude petroleum, and petroleum refinery products are expected to grow, while Italy will continue to depend on imported coal, gas, and petroleum.

[1]Gazzetta Ufficiale (Rome). No. 302, Dec. 20, 1990, pp. 73-75.
[2]Metal Bulletin (London). July 19, 1990, p. 21.
[3]Industrial Minerals (London). Nov. 1990, p. 48.
[4]Mining Annual Review (London). 1991, p. 164.
[5]Industrial Minerals (London). May 1990, p. 28.
[6]Sulphur (London). May/June 1991, No. 214, pp. 15-16.

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(Ministry of Industry, Commerce and Small Business) Rome, Italy
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(General Directorate of Mines)
Corpo delle Miniere (Bureau of Mine Inspection)

Publications

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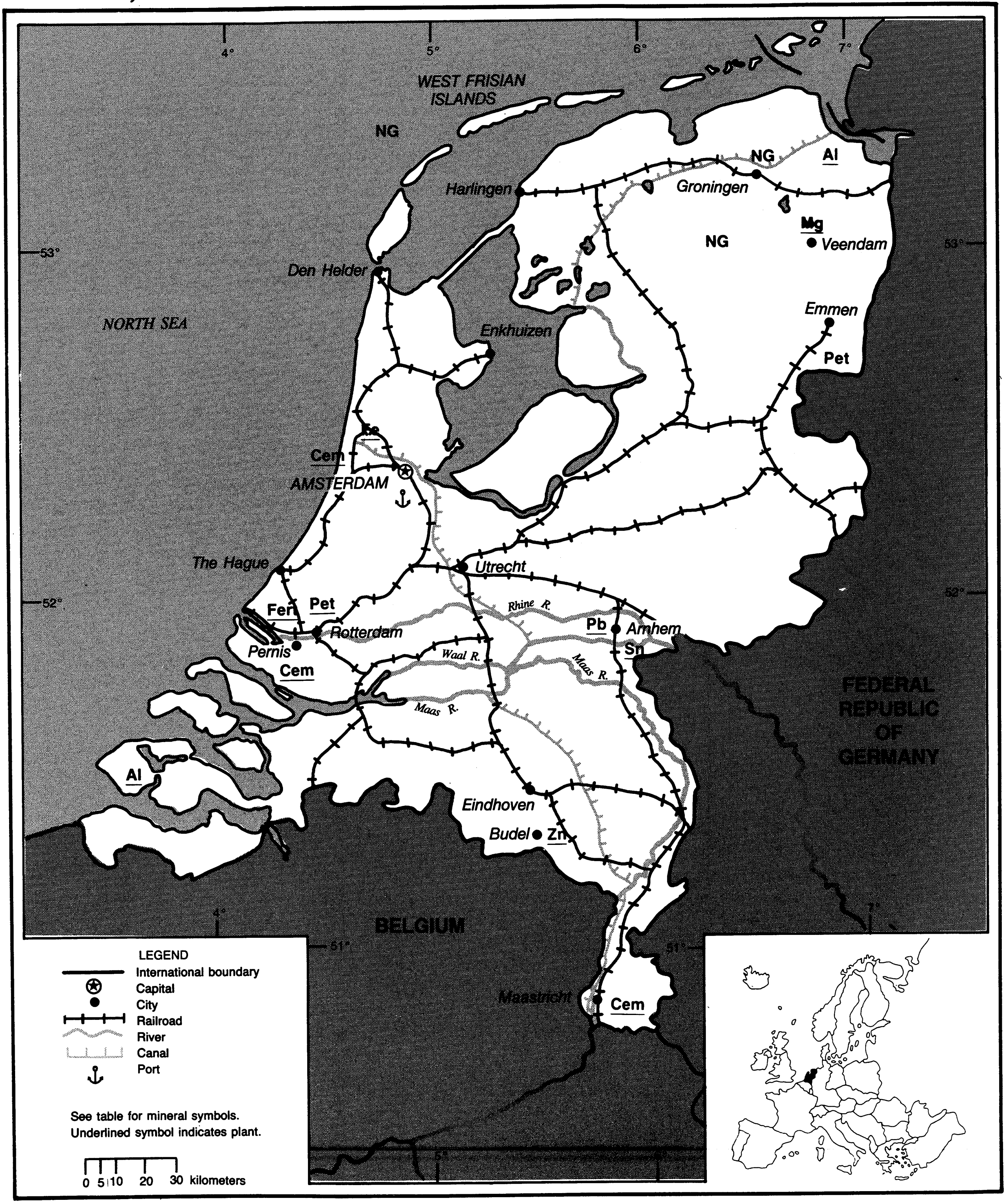
NETHERLANDS

AREA 34,000 km² **POPULATION 14.8 million**



THE MINERAL INDUSTRY OF THE NETHERLANDS

By George A. Rabchevsky

The metals industries of the Netherlands, especially those involved in the production of aluminum, cadmium, lead, steel, and zinc, contributed significantly to the country's economy. The Netherlands was the leading producer in Western Europe of natural gas, and also produced significant quantities of cement raw materials and salt. Chemical and refining industries dominate in the Netherlands because of excellent port facilities and abundant supplies of natural gas.

The production and sale of natural gas and processed metals to neighboring countries made up a sizable portion of the country's income. The redistribution and transshipment of commodities to the interior portion of the continent also constituted a large portion of the industrial and economic base of the country. Raw materials and processed minerals were handled through Rotterdam, the world's largest port; Amsterdam; and other ports, for reexport around the world.[2] Ore and scrap cargoes handled in 1990 amounted to 41.3 Mmt, a 9.1% drop from the 45.4 Mmt handled in 1989.[3] However, 17.6 Mmt of coal, 29% more than that in 1989, were handled in 1990. Hoogovens IJmuiden BV (HI), the Netherlands only steel producer, is on the coast with its own docking and shipping facilities.

The Netherlands GNP grew at the rate of 3.25% in 1990 to $275 billion[4] at current prices, with more than 26% being contributed to the GNP by the industrial sector. The inflation rate was 2.5%. The budget deficit of the country was one of Europe's largest. Mining, quarrying, and natural gas contributed about 3% to the national income.

GOVERNMENT POLICIES AND PROGRAMS

The new Government intends to tighten environmental policies further.[5] Environmental policy actions taken in the 1970's and 1980's distinguished the Netherlands as one of the countries with a comprehensive and elaborate set of policies. The National Environmental Policy Plan (NEPP) of Netherlands, introduced in May 1989, is aimed at reducing all pollution levels over the next 20 years.

The Netherlands minerals industry is subject to the Napoleonic Code of April 21, 1810, as supplemented by the Mining Code of 1903, and the Mineral Exploration Law of May 3, 1967. There is also the Continental Shelf Mining Law of 1965, covering licensing regulations and safety standards. The Minister of Economic Affairs has primary responsibilities for administering the mining laws.

PRODUCTION

The production of pig iron, crude steel, and steel semimanufactures declined slightly in 1990, after posting significant gains in 1989. The production of natural gas and petroleum products decreased slightly. The Netherlands lacked facilities for production of special and rare metals.

TRADE

The Netherlands is a trading nation with a long and a remarkable history. The Netherlands continued to be a major exporter of indigenous natural gas to neighboring countries. The Netherlands exported steel worldwide. Most raw materials, other than industrial minerals, were imported. In addition to the port of Rotterdam, other Dutch ports provided facilities for storage and stockpiling of raw materials.

U.S. trade with the Netherlands is important to both countries, with the United States having the higher bilateral trade surplus.

The Middle East is the Netherlands' largest regional market after Europe and Asia. Although only 3% of total exports go to the region, it is given greater emphasis because the Netherlands' dependence on oil from the Middle East is expected to grow considerably in the 1990's. Saudi Arabia remained the Netherlands' top trading partner.

STRUCTURE OF THE MINERAL INDUSTRY

Most Netherlands companies are privately held, and many have international holdings. The Directorate of Mines of the Ministry of Economic Affairs regulates mining and petroleum operations. The Geological Survey compiles data on the mining and mineral industry and advises the Minister on the status of reserves. The Central Bureau of Statistics collects information on minerals production.

COMMODITY REVIEW

Metals

Aluminum.—The Delfzijl aluminum plant was operated by Aluminium Defzijl NV, and the Vlissingen aluminum plant by Pechiney-Nederland NV, 85% owned by the French company Pechiney. The Delfzijl smelter was constructed in 1964, and Vlissingen in the early 1970's. Production of secondary aluminum in the Netherlands started in the late sixties. In 1990, there were basically three companies producing secondary aluminum and a number of rolling and extrusion companies. The largest secondary producer, Aluminium Hardenberg NV, also processed slag waste from the primary industry and from other secondary smelters.

Hoogovens Groep's expansion activities resulted in the company becoming a leader in the integrated aluminum and steel industries. Hoogovens operated two aluminum divisions, Alumined Beheer BV and Hoogovens Aluminium GmbH in Dusseldorf, employing about 7,000 people. Hoogovens is the fourth largest producer

TABLE 1

NETHERLANDS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989	1990[p]
METALS						
Aluminum metal:						
Primary		265,768	275,939	278,198	279,243	257,884
Secondary		96,794	101,403	115,866	130,158	134,221
Total		362,562	377,342	394,064	409,401	392,105
Cadmium metal		565	517	563	505	[e]610
Iron and steel:						
Ore sintered (from imported ore)	thousand tons	3,706	3,682	3,935	4,042	4,061
Metal:						
Pig iron	do.	4,628	4,575	4,994	5,163	4,960
Steel, crude	do.	5,286	5,082	5,518	5,681	5,412
Semimanufactures	do.	4,799	4,709	[r]5,034	5,116	5,055
Lead metal, refined, secondary[e]		[r]36,000	[r]40,000	[r]39,000	[r]43,000	42,000
Tin metal, refined:						
Primary		5,104	3,834	3,478	4,529	[e]5,500
Secondary[e]		200	180	180	190	200
Zinc (slab), primary		196,156	207,111	211,019	202,962	207,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	3,100	2,929	[r]3,418	3,541	3,729
Nitrogen: N content of ammonia	do.	2,185	2,287	2,699	2,906	3,194
Salt, all types	do.	3,763	3,979	3,693	3,756	3,653
Sand, industrial	do.	22,841	22,274	25,999	25,647	25,137
Sodium compounds, n.e.s.:[e]						
Carbonate, synthetic	do.	380	380	400	400	400
Sulfate, synthetic	do.	[r]15	[r]15	[r]15	[r]15	15
Sulfate, natural	do.	22	22	22	22	22
Sulfur:						
Elemental byproduct:[e]						
Of metallurgy	do.	—	—	125	125	120
Of petroleum and other forms	do.	250	211	[r]215	[r]260	[3]285
Total	do.	250	211	[r]340	[r]385	405
Sulfuric acid, 100% H_2SO_4	do.	1,209	1,043	1,144	[e]1,150	[e]1,150
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		104,700	105,500	107,500	114,000	112,100
Coke, metallurgical	thousand tons	2,867	2,736	2,908	2,898	2,736
Gas:						
Manufactured[4]	million cubic meters	7,700	9,216	9,445	10,016	10,272
Natural, gross	do.	74,037	74,247	[r]65,610	71,715	72,238
Natural gas liquids	thousand 42-gallon barrels	4,221	4,278	3,707	[e]3,800	[e]3,800
Peat[e]	thousand tons	400	400	300	300	300
Petroleum:						
Crude	thousand 42-gallon barrels	34,046	29,243	30,056	26,073	27,100
Refinery products:						
Liquefied petroleum gas	do.	25,230	27,457	26,576	30,357	31,412
Gasoline, motor	do.	60,189	62,254	68,757	70,890	76,930
Naphtha	do.	65,986	75,944	[r]90,773	88,710	82,808
Jet fuel	do.	30,808	31,120	38,408	42,848	40,048
Kerosene	do.	4,658	3,891	4,720	4,123	3,386

See footnotes at end of table.

TABLE 1—Continued

NETHERLANDS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989	1990[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued						
Refinery products—Continued						
Distillate fuel oil	do.	147,305	133,549	137,488	129,521	116,689
Residual fuel oil	do.	85,901	92,154	95,464	93,720	88,877
Lubricants	do.	5,117	5,000	5,712	6,223	6,223
Bitumen	do.	5,048	4,545	4,721	4,938	4,951
Total[5]	do.	[r]430,242	435,914	[r]472,619	471,330	451,324

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 1991.
[2]In addition to the commodities listed, a variety of crude construction materials (clays, stone, and gravel) are also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.
[3]Reported figure.
[4]Coke oven and blast furnace gas only.
[5]Total of listed products only; other products not included; refinery fuel and losses included in listed products.

TABLE 2

NETHERLANDS: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Aluminum	Aluminium Delfzijl BV	Smelter at Delfzijl	105
Do.	Pechiney-Nederland NV	Smelter at Vlissingen	185
Cadmium	Kempensche Zink Maat-schappij NV	Plant at Budel-Dorplein	650
Cement	Eerste Nederlandse Cement Industrie NV	10 plants	2,700
Do.	Cement Fabriek-IJmuiden BV	3 plants at IJmuiden	1,400
Do.	Cement Fabriek-Rozenburg BV	2 plants at Rozenburg	920
Lead	Hollandsee Metallurgische Industrie Billiton BV	Electrolytic plant at Arnhem	37
Do.	Billiton Witmetaal BV	Electrolytic plant	6
Magnesia	Noodelijke Zoutwinning BV, and Magnesia International BV	Plants at Veendam	91
Natural gas trillion cubic feet per year	Nederlandse Aardolie Maatschappij BV	Groningen, Leeuwarden, Assen, and other onshore gasfields, and several offshore wells in the North Sea	2.5
Petroleum: Crude barrels per day	do.	About 500 oil-producing wells, including—	83,500
Do.	do.	North Sea fields: Helm, Helder, Horn, Kotten, Rijn, and others	(63,000)
Do.	Nederlandse Aardolie maatschppij BV	Onshore Fields: Berkel, Schoonebeek, Wassenaar, Ysselm, and others	(20,500)
Refineries barrels per day	7 companies, of which the major ones are—		1,700,000
Do.	Shell Nederland Raffinaderij BV	Refinery at Pernis	(493,000)
Do.	BP Raffinaderij Nederland NV	Refinery at Rotterdam	(476,000)
Do.	Chevron Petroleum Maatschappij (Nederland) BV	Refinery at Rotterdam	(272,000)

TABLE 2—Continued

NETHERLANDS: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Petroleum—Continued Refineries barrels per day—Continued	Esso Nederland BV	Refinery at Rotterdam	(238,000)
Salt	Akzo Zout Chemie BV	4 plants, including—	4,850
Do.	do.	Hengelo	(2,000)
Do.	do.	Delfzijl	(2,000)
Do.	do.	Mariager	(500)
Do.	do.	Stadte (Germany)	(350)
Sodium, carbonate	do.	Plant at Delfzijl	450
Sulfate, natural	do.	Plant at Delfzijl; salt brines at Arnhem	25
Steel	Hoogovens IJmuiden BV	Plant at IJmuiden	6,000
Tin	Budelco BV	Smelter and refinery at Arnhem	7
Zinc	do.	Electrolytic plant at Budel-Dorplein	220

of aluminum semimanufactures in Europe. The Netherlands is mainly an exporter of primary aluminum.

Iron and Steel.—Hoogovens IJmuiden BV operated virtually the only steel production plant in the Netherlands, employing about 15,500 people. The world output of crude steel decreased by about 2% in 1990, and the EC production fell by 1.3%. The production of steel by HI in the Netherlands declined by about 5%, caused by a series of operational problems in blast furnaces in the second half of the year.[6] Hoogovens Groep BV, the Netherlands steel and aluminum producer, has reported group profits down by more than 35%, with profits for the steel division falling even further by almost 54%.[7]

HI signed an agreement with the Czechoslovakia's Vychodoslovenske Zeleziarne s.p. (VSZ) steelworks in East Slovakia, taking its first steps toward entering the East European market. Hoogovens had previous contacts with VSZ. Hoogovens plans to supply VSZ with technical know-how, business management and planning skills, and advice on investment and antipollution matters.[8]

Lead and Zinc.—Hollandsee Metallurgische Industrie Billion BV (HMIB) operated an electrolytic smelter at Arnhem. HMIB was the Netherlands principal lead recycling plant in 1990, handling 95% of the country's scrap vehicle batteries. Billiton Witmetaal BV was another secondary lead producer in the Netherlands.

Budelco BV, owned jointly by Royal Dutch Shell's Billiton Nederland BV and Australia's Pasminco company, was the only company producing zinc in the Netherlands in 1990. The electrolytic smelter, at Budel, about 40 km south of Eindhoven, had a capacity of zinc of about 220,000 mt/a. At least 600 people were employed at Budel. Budelco's waste product, primarily jarosite, a complex of iron sulfate, has been stored in three large ponds since 1973. Capacity is considered sufficient until 1993. Reportedly, one pond was known to be leaking heavy metals into the ground water. A fourth pond has been licensed and will be built provided a jarosite treatment plant will become operational by 1995. Budelco agreed to set up a $18 million water containment and purification system to deal with the pond pollution, however meeting the full cost of about $165 million for the jarosite treatment plant could be difficult. Budelco is conducting a feasibility study into utilizing various technologies to treat the waste product.[9]

Molybdenum.—Climax Molybdenum BV, a division of AMAX Inc., the U.S. diversified minerals company, operates a 9,100-mt/a molybdenum concentrate roasting and chemicals plant at Rozenburg, west of Rotterdam. The plant treats concentrates from the company's Climax and Henderson Mines in Colorado to produce molybdic oxide for the iron and steel industries, ammonium and sodium molybdates, and pure molybdic oxide for the chemical and molybdenum metal industries.

Industrial Minerals

Limestone, industrial sand, gravel, and salt were the only industrial minerals in the Netherlands mined on a sizable scale.

Cement.—There were three cement companies operating 15 plants in 1990 in the Netherlands. Cement production capacity exceeded 5 million mt/a. Production has remained about the same for the past 20 years. The Eerste Nederlandse Cement Industrie NV, which operated 10 plants and has a capacity of 2.7 million tons per year, is the largest cement producer. Most raw materials were imported from Belgium and the Federal Republic of Germany.

Fertilizer Materials.—In a world market context, the Netherlands is only of marginal significance as a phosphate manufacturer, trader, and consumer. The Netherlands, however, is a key supplier to Western Europe of phosphorus pentoxide (P_2O_5) for fertilizer needs.

Concern over cadmium is high in the Netherlands. It is estimated that cadmium concentrations in Dutch soils are 0.3 Cd per kg for sandy soil and 0.4 Cd per kg for clayey soils. Phosphate fertilizer producers were forced to limit the output of cadmium waste from their plants and invest in research to develop new production processes that will result in cleaner waste. The problem is especially acute in the Netherlands where the phosphate issue also focuses on the effects on the environment of the amount of animal manure produced on farms and used as fertilizer. There are about 20 plants processing manure in the Netherlands. The Netherlands Government has enacted legislation to control the country's animal manure surplus.[10]

Magnesia.—Magnesia production came from mined salts by the deep solution method at Veendam in the northern Netherlands. Noordelijke Zoutwinning BV and Magnesia International BV, both owned by Billiton Refractories Inc., produced refractory-grade MgO and accounted for about 105,000 mt of magnesia, representing about 70% of the entire Billiton worldwide production.

Salt.—In 1990, the Akzo BV was the only company producing salt in the Netherlands, with a capacity of about 4 Mmt/a. The plant at Delfzijl, in the Groningen area in the north, and another plant at Hengelo in the central-east area, have a capacity of 2 Mmt/a. Akzo also operated plants in Denmark and the Federal Republic of Germany, with total production capacity of about 15 Mmt/a. Of the Akzo's domestic output, about 65% was exported.[11] About 70% of salt production was used for industrial purposes. The company also produced chemicals, fibers, polymers, coatings, and health care products, employing about 69,800 people; the Salt and Basic Chemicals Div. employed 6,500 people. In 1990, the company's sales totaled about $9 billion, with net income of about $365 million, a 30% drop from the previous year income; the Salt Div.'s sales accounted for $1.3 billion. No major changes in the Division occurred in 1990.

Mineral Fuels

More than 50% of natural gas was used in the Netherlands to produce primary energy, 35% of oil, more than 12% of coal, and about 2% from nuclear plants. All of the Netherlands coal requirements were imported, mostly through the Port of Rotterdam, primarily from Australia and the Republic of South Africa. Coal use in industry was relatively modest, mainly because of the strong competition from gas and from restrictive environmental considerations.

Netherlands produced about 20% of its oil requirements. The production of crude oil increased for the 15th year in 1985, and in 1986, the production was at its highest level. The decline in production started in 1987, and in 1990, the output fell back to that of the year 1985. The Netherlands operated seven refineries, based on imported oil, primarily from Libya, Saudi Arabia, and the United Kingdom.

The reserves of natural gas, mostly in the Groningen Field, were estimated to be 3 trillion m_3. The reserve estimates climbed steadily from 2.2 trillion cubic meters earlier in 1990.

INFRASTRUCTURE

The advanced transportation infrastructure, ideal proximity to major markets, and extensive experience made the Netherlands an ideal marketplace and entry port to the EC. Amsterdam and Rotterdam ports, at the intersection of the Rhine, Europe's major river, and the sea lanes of the North Atlantic, became the Netherlands' most important contribution to the world mineral industry. Rotterdam, the world's busiest port redistributes many important raw materials. The strategic location of the port was reflected in the trade flow of raw materials from developing countries to the refining plants in developed countries of Europe that were dependent on overseas supplies. The deepened Eurochannel and ports at the Botlek and Maasvlakte districts were other locations for transport of raw materials. Other ports have important mineral and metal distribution systems. The products and services are provided to the rest of the continent by an efficient system of waterways and canals, as well as by highways, pipelines, and railroads, all of which are well developed.

OUTLOOK

The country's geographical position, with access to an important waterway, means it is well placed to benefit from the economic boom forecast for the continent with the advent of the single market in 1993. Changes in East Europe and abundant energy stocks in the Netherlands are also advantageous to the country.

Opening eastern Europe meant that a whole new trade route with the Middle East through Turkey opened up. The use of natural gas from the Netherlands is expected to increase, requiring the development of new fields and infrastructure to meet those demands. Salt caverns at Veendam in the north are to be constructed to store natural gas underground.

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[1]Industrial Minerals (London). Apr. 1990, pp. 57-59. Metal Bulletin Monthly (London). Feb. 1991, pp. 52-55.

[2]Metal Bulletin (London). Apr. 15, 1991, p. 35.

[3]Where necessary, values have been converted from Netherlands guilder (f.) to U.S. dollars at the rate of f.1.82=US $1.00, the average for 1990.

[4]Organization for Economic Co-Operation and Development (Paris). June 29, 1990, p. 7.

[5]Metal Bulletin (London). Jan. 6, 1991, p. 27.

[6]________________.Apr. 8, 1991, p. 21.

[7]________________. Jan. 14, 1991, p. 27.

[8]________________. Mar. 21, 1991, p. 9.

[9]Phosphorus & Potassium (London). Mar.-Apr., 1991, pp. 18-22.

[10]Industrial Minerals (London). Apr., 1990, p. 27.

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Postbus 157
2000 AD Haarlem

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Inspecteur-Generaal der Mijnen
(Ministry of Economic Affairs, Inspector General of Mines)
Bezuidenhoutseweg 30, 2594 AV
The Hague

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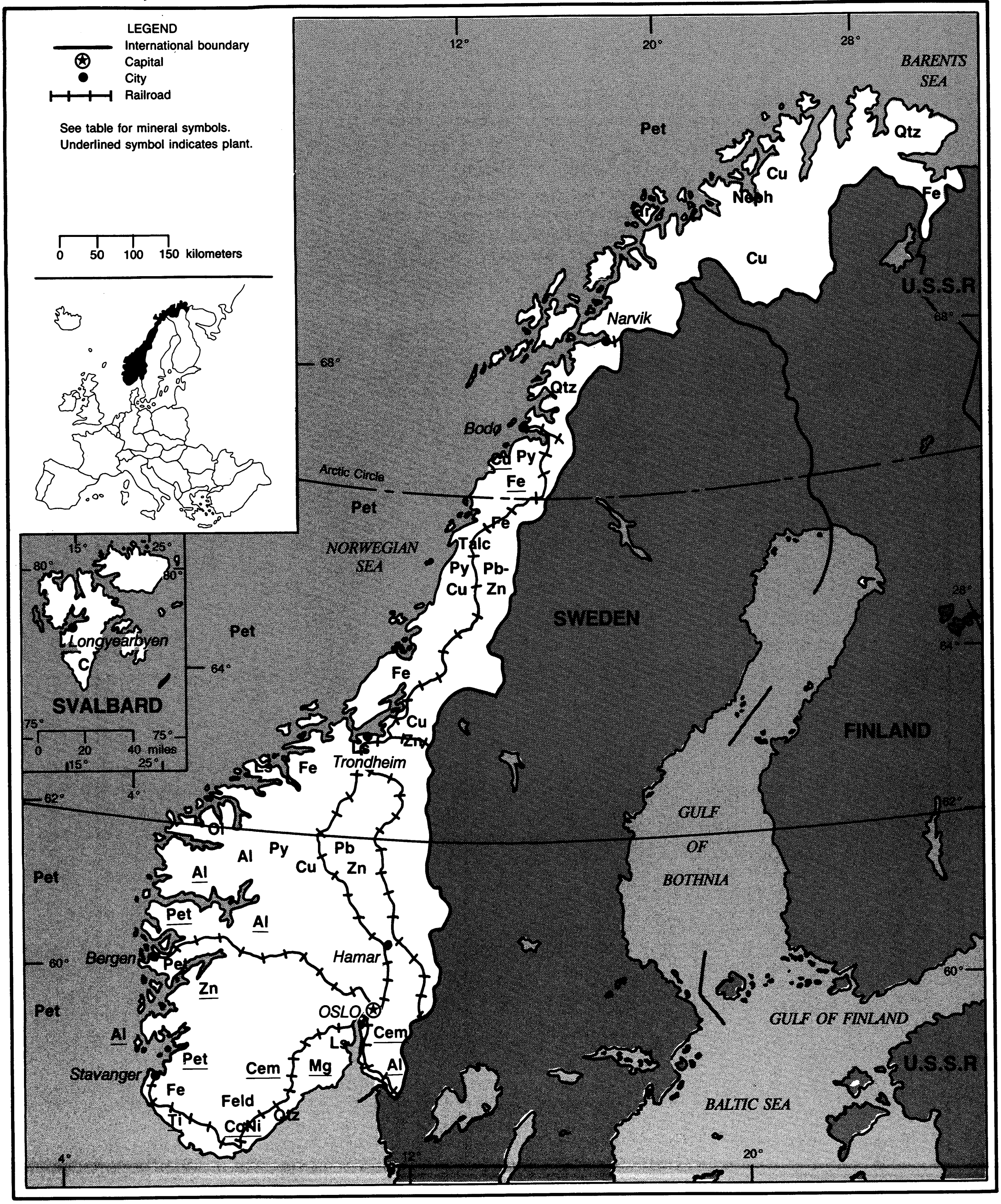
Maandschrift: Centraal Bureau voor de Statistiek (Monthly of the Central Bureau of Statistics), Voorburg/Heerlen.

De Nederlandse Energiehuishouding (Energy Economy of the Netherlands) published monthly by Centraal Bureau voor de Statistiek, Voorburg/Heerlen.

NORWAY

AREA 324,000 km² **POPULATION 4.2 million**



THE MINERAL INDUSTRY OF NORWAY

By Donald E. Buck, Jr.

The Norwegian minerals industry contributes significantly to the economy of Norway. The backbone of this industry is energy-related. Inexpensive hydroelectric energy is readily available and is utilized in the production of metals, such as aluminum, magnesium, nickel, and silicon, whose production is particularly energy intensive. Furthermore, the discovery and development of petroleum and natural gas resources in the North Sea in the past 20 years has increased the importance of Norway's energy-related base. The petroleum resources have permitted Norway to develop an important petrochemical industry and have greatly increased Norway's mineral-related exports.

GOVERNMENT POLICIES AND PROGRAMS

The Government has maintained a policy of controlled development of North Sea petroleum resources. The state has operational control in offshore fields and onshore facilities through the state-owned oil company Den norske stats olieselskap A/S (Statoil).

In 1990, the Norwegian State Pollution Control Authority requested that A/S (Norzink) expand its central water-treatment plant. A monitoring project discovered heavy-metal contaminates in the fjord sediments, which could be traced to a previous Norzink emergency spillage of polluted water. The company has excavated six caverns to store jarosite and leach residues, with Cavern No. 5 used as temporary storage for untreated water. Norzink was also to map the deposits in Eitrheimsvågen before the end of 1991.

Privatization of the previously state-owned (100%) Norsk Jern Holding A/S was one of the most extensive changes in ownership of a Norwegian company. Elkem A/S purchased a 45% interest in the company, and a group of investors purchased 35%. The remaining 20%, which was owned by the state, was to be sold at the best possible terms.

PRODUCTION

The Norwegian aluminum industry maintained near-record capacity utilization levels for the fourth year. Primary aluminum production was only 2% below the record production of 864,190 metric tons, set in 1988. A strong demand for the metal and the modernization of Norwegian plants in recent years facilitated capacity utilization and output.

The ferroalloy industry was strongly impacted by the downturn in the world's economy and the increased competition from Brazil, China, and Eastern Europe. Elkem, Norway's largest ferroalloy producer, reported losing market share to these countries as a result of the ferrosilicon minimum price accord agreed to by Elkem concerning trade with EC countries. Average capacity utilization for Elkem's ferrosilicon plants was 78%. To adjust to the market conditions, Elkem decided to reduce production capacity. The two plants, at Thamshavn in Orkanger, Norway, and Ashtabula in Ohio, in the United States, reportedly were reportedly to operate with only one furnace each.

TRADE

Norwegian exports totaled $34.2 billion, of which the largest percentage, 41%, was petroleum.[1] Metals and metal products represented 13% of exports, and chemicals and other raw materials represented 20%. Gas deliveries were projected to increase as a result of increasing popular support for environmetal "green issues," especially the mitigation of acid rain.

STRUCTURE OF THE MINERAL INDUSTRY

The Norwegian Government has historically exerted significant control on the petroleum and other natural resource industries of the country. In recent years, however, the Government, in search of greater efficiency, has privatized many operations. Notable examples are Norsk Jern A/S and Norsk Hydro A/S, which were both rationalized and privatized in the past year. Norway is amenable foreign investment as a matter of policy, but some restrictions apply to foreign ownership in mining and acquisition of property.

COMMODITY REVIEW

Metals

Aluminum.—In 1990, the two Elkem A/S (Elkem) aluminum plants in Norway reached a production record of 198,250 tons of aluminum or more than 99% capacity utilization. Record production levels of 269,000 tons were also established at the plants' casthouses. The additional ingots required were purchased from other suppliers for reprocessing at Elkem's plants into extrusion billets and rolling slabs. During the year, the company was adversely affected by lower aluminum prices and higher alumina prices. The latter was caused by the worldwide shortage of alumina. Elkem has had a corporate commitment to long-term contracts and relationships with suppliers and customers.[2] However, the alumina contract terminated at the end of 1989 and could not be renewed at acceptable terms in 1990. Thus, Elkem Aluminium had extremely high raw material costs for the year.

Aluminum production from Norsk Hydro A/S (Hydro aluminum) four wholly owned and one partially owned (49%) aluminum plants in Norway provided 60% of the company's requirements for primary aluminum. The 638,000 tons of primary aluminum was produced in the form of rolling slabs, billets, wire, and foundry alloys. These were utilized in the company's semifabricating plants in 10 countries—mainly in Western Europe.

Hydro Aluminium made concerted efforts during 1990 to improve the competitiveness of its operations. By improving efficiency at its plants, the company increased production by approximately 8,000 tons. The extensive plans for modernization of its Årdal and Sunndal smelters were submitted for Government approval. Also submitted was a proposal for a gas-fired electric generating powerplant to be constructed using the natural gas from offshore gasfields in the Haltenbank area.

TABLE 1

NORWAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
METALS						
Aluminum:						
Primary		725,813	[r]853,213	864,190	863,354	[2]845,068
Secondary[e]		6,000	[r]7,200	[r]67,305	49,036	50,000
Cadmium, smelter		154	147	169	207	[2]286
Cobalt		1,574	1,576	1,951	1,946	[2]1,830
Copper:						
Mine output, Cu content		21,887	21,984	15,877	16,497	[2]19,745
Metal, primary plus secondary:						
Smelter		35,202	30,101	31,729	34,980	[2]36,458
Refined		30,459	29,386	31,729	34,980	[2]36,458
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	3,659	3,140	2,644	2,358	[2]2,081
Fe content	do.	2,377	2,040	1,718	1,532	[2]1,352
Metal:						
Pig iron	do.	564	365	367	240	—
Ferroalloys:						
Ferromanganese		195,257	191,992	361,345	220,591	[2]213,266
Ferrosilicomanganese		223,490	237,277	232,501	270,305	[2]223,310
Ferrosilicon (75% basis)		352,572	336,168	380,976	398,744	[2]397,520
Total		771,319	765,437	974,822	889,640	[2]834,096
Steel, crude	thousand tons	836	837	869	678	[2]376
Semimanufactures, rolled[e]	do.	[2]687	700	700	[r]556	350
Lead, mine output, Pb content		3,366	3,100	2,801	3,188	[2]3,017
Magnesium, primary		56,864	56,907	50,317	49,827	[2]48,222
Nickel:						
Mine output, Ni content		438	496	[e]500	780	[2]3,100
Metal, primary		38,202	44,565	52,547	54,886	[2]57,812
Platinum-group metals[e 3]	kilograms	[2]1,654	1,555	1,555	1,555	1,500
Silicon metal		[e]100,000	[r]81,460	[r]88,854	[r]100,194	[2]76,601
Zinc:						
Mine output, Zn content		27,508	22,164	17,783	15,023	[2]17,546
Metal, primary		90,475	116,468	121,156	120,404	[2]125,052
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	1,750	1,639	1,428	1,375	[2]1,261
Feldspar[e]		[2]87,257	90,000	90,000	90,000	90,000
Gallium[e]	kilograms	—	1,000	1,000	1,000	1,000
Gold[e]	do.	933	[r]937	[r]677	[r]703	[2]802
Graphite		—	—	—	1,800	5,000
Lime, hydrated, and quicklime[e]	thousand tons	100	100	100	100	100
Mica, flake[e]		3,000	3,000	3,000	3,000	3,000
Nepheline syenite	thousand tons	218	242	262	262	250
Nitrogen: N content of ammonia	do.	300	347	424	467	431
Olivine sand	do.	2,537	1,912	[e]2,000	[e]2,000	2,000
Pyrite	do.	380	358	304	244	200
Stone, crushed:[e]						
Dolomite	do.	550	550	550	550	525
Limestone	do.	4,000	4,000	4,000	4,200	4,000

See footnotes at end of table.

TABLE 1—Continued

NORWAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
INDUSTRIAL MINERALS—Continued						
Stone, crushed:[e]—Continued						
Quartz and quartzite	thousand tons	800	800	800	800	800
Sulfur:						
Pyrite, S content	do.	181	179	152	122	125
Byproduct of:[e]						
Metallurgy	do.	[2]67	85	80	75	75
Petroleum	do.	13	10	10	13	15
Total	do.	261	274	242	210	215
Talc, soapstone, steatite[e]	do.	100	100	100	100	100
Titanium:						
Ilmenite concentrate	do.	804	852	898	930	[2]814
TiO_2 content	do.	357	378	398	412	361
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades	thousand tons	437	448	275	413	[2]358
Coke, all grades	do.	313	284	161	[e]50	—
Gas, natural:						
Gross	million cubic meters	31,690	34,437	31,520	31,964	27,817
Marketed[4]	do.	[r]25,700	[r]28,800	[r]28,400	[r]28,700	[2]25,400
Peat:[e]						
For agricultural use	thousand tons	30	30	30	30	30
For fuel use	do.	1	1	1	1	1
Petroleum:						
Crude[5]	thousand 42-gallon barrels	295,700	344,000	397,947	560,252	609,381
Natural gas liquids	do.	21,720	22,470	27,230	22,707	33,060
Refinery products:						
Naphtha	do.	3,618	4,419	3,363	4,504	4,200
Gasoline	do.	10,548	12,248	11,968	14,917	[2]27,134
Kerosene	do.	5,549	6,402	5,786	6,682	[2]8,327
Distillate fuel oil	do.	27,199	33,756	32,764	34,072	[2]44,502
Residual fuel oil	do.	5,934	6,973	8,032	11,102	[2]9,444
Other	do.	3,380	4,050	[e]4,200	[e]4,300	4,093
Refinery fuel and losses	do.	3,823	3,795	[e]4,000	[e]4,000	4,000
Total	do.	60,051	71,643	[re]70,113	[e]79,577	101,700

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Sept. 1991.
[2]Reported figure.
[3]Data represent exports, part of which may be derived from imported materials.
[4]Reported as total methane sales.
[5]Excluding natural gas liquids.

Since its closure in 1985, 1990 was the first full year of operation of the Alpart alumina refinery in Jamaica. Norsk Hydro purchased a 35% interest in the Alpart refinery and a 10% interest in the Friguia refinery in Guinea, Africa, in an attempt to secure more dependable supplies of alumina for its smelters. The two plants provide Hydro with approximately 530,000 tons of alumina. The planned 30% expansion of the Alpart refinery production capacity to 1.45 Mmt would also increase Hydro's supply of alumina. The additional alumina required by the company's smelters was mainly secured under long-term contracts.

Hydro's Extrusion Group is the largest producer of aluminum profiles in Europe. In 1990, the group increased its sales by 7.4% to 240,000 tons. The new extrusion plant in Ulm, Federal Republic of Germany, was completed in 1990 and added 10,000 tons of additional production capacity. A new 3,500-ton press was installed in Luce, France, to upgrade that facility.

The program to increase production efficiency, reduce costs, and improve quality was achieving results.[4] In 1990, a 9.3% increase in rolled products was reported at the Holmestrand and Karmy plants with 82,000 tons of output. Furthermore, Hydro was attempting to encourage aluminum recycling and was expanding recycling capacity at several plants. The importance and success of recycling has increased in recent years, and companies like Hydro aluminum, for example, started to report

TABLE 2

NORWAY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Aluminum tons per year	Norsk Hydro AS	Smelter at Årdal, Sunndals·ra, Karmoy and Højanger	677.
Do.	Elkem AS	Smelter at Mosjøen, Lista	170.
Do.	Sor-Norge Aluminium AS	Smelter at Husnes	72.
Cadmium tons per year	Norzink AS	Smelter at Odda	150.
Cement	Norcem AS	Plants at Dalen and Kjøpsvik	2,300.
Coal	Store Norske Spitsbergen Kulkompani AS	Mines at Longyearbyen and Svea, both on Svalbard Island	350.
Cobalt	Falconbridge Nikkelverk AS	Smelter at Kristiansand	2.
Copper:			
Ore, metal content	AS Bidjovagge Gruber	Mine at Bidjovagge	3.
Do.	Foldal Verk AS	Mine at Hjerkinn, Dovre	5.
Do.	Grong Gruber AS	Mine at Røyrvik	8.
Do.	AS Sulitjelma Gruber	Mine at Fauske	8.
Metal	AS Sulitjelma Gruber (Elkem)	Smelter at Sulitjelma	9.
Do.	Falconbridge Nikkelverk AS	Refinery at Kristiansand	30.
Ferroalloys	Elkem AS	Plants at Svelgen, Kristiansand, Porsgrunn, Straumen, Kopperå, Orkanger and Sauda	245.
Do.	Fesil Group	Plants at Finnsnes, Sarpsborg, Trondheim, Meraker, and Ålvik	200.
Do.	Tinfoss Jernverk	Plants at Notodden and Kvinesdal	70.
Gold kilograms	AS Bidjovagge Gruber	Mine at Bidjovagge	850.
Graphite	AS Skåland Grafitverk	Mine on Senia Island	40.
Iron ore	AS Sydvaranger	Mine at Sør-Varanger	2,300.
Do.	AS Norsk Jernverk	Mine at Mo i Rana	1,200.
Lead in ore	AS Bleikvassli Gruber	Mine at Hemnes	4.
Lime	Hylla Kalkverk	Verdal/Trondheim	100.
Do.	AS Norsk Jernverk	Plant at Mo i Rana	48.
Do.	Mjoendalen Kalkfabrik	Plant at Åsen/Drammen	7.
Magnesium	Norsk Hydro AS	Smelter at Porsgrunn	50.
Natural gas million cubic meters	(See petroleum)	(See petroleum)	28,700.
Nickel, metals and products	Falconbridge Nikkelverk AS	Smelter at Kirstiansand[1]	50.
Nickel in ore	Titania AS	Mine at Sokndal	1.
Petroleum, crude barrels per day	Phillips Petroleum Co. Norway (operator), 36.96%; Norske Fina AS, 30%; Norsk AGIP AS, 13.0% Elf Aquitaine Norge AS, 8.904%; Norsk Hydro Produksjon a.s., 6.7% others, 5.2%	Ekofisk area (Ekofisk, West Ekofisk, Cod, Tor, Albuskjell, Edfisk, and Edda)	357,000.
Do. do.	Den norske stats oljeselskal a.s. (Statoil), 42.05%: Mobil Exploration Norway AS, 12.614%; Norske Conoco AS, 8.41%; Esso Norge a.s., 8.41%; AS Norge Shell, 8.41%	Statfjord Field	163,000.
Do. do.	British Petroleum Co. (operator), 57.5%, and Conoco, 25%; Statoil, 12.5%; Pelican, 5%	Ula Field	70,000.
Do. do.	Statoil (operator), 85%; Norsk Hydro, 9%; Saga Petroleum, 6%	Gullfaks Field	360,000
Do. do.	Den norske stat oljeselkap a.s., 65.04%; Norsk Hydro Produksjon a.s., 13.75%; Saga Petroleum a.s., 8.61%; others 12.6	Oseberg Field	240,000.
Do. do.	Others[2]		

See footnotes at end of table.

TABLE 2

NORWAY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Titanium	K/S Ilmenittsmelter	Titanium dioxide plant at Frederikstadt	25 (TiO_2).
Do.	Titania AS	Ilmenite mine at Sokndal	850 (ore).
Zinc: Ore, metal content	Folldal Verk AS	Mine at Dovre	10.
Do.	AS Bleikvassli Gruber	Mine at Hemnes	5.
Do.	Grong Gruber AS	Mine at Røyrvik	5.
Metal	NorZink AS	Smelter at Odda	90.

[1]Treats Canadian matte.
[2]Fact Sheet, The Norwegian Continental Shelf, 1990, The Royal Ministry of Petroleum and Energy, 1990.

recycling production figures (see secondary aluminum in table 1).

In 1990, the Norwegian authorities set new emissions limits for the Årdal smelter.[5] The approximate 18 kg/hour fluoride emissions were mandated to be reduced to 16 kg/hour by July 1993. The company also planned to install a new sulfur scrubbing unit for the Årdal plant to reduce sulfur dioxide emissions. In the past, the country's environmental authorities stipulated that emissions of fluorides at the Sunndal plant were to be reduced 50% within 4 years. The company, in cooperation with other companies and academic institutions, planned to research the effects of aluminum smelter emissions on the environment and take steps to lessen the impact of those problems.

Ferroalloys.—In July 1990, Elkem A/S purchased Norsk Ferrokrom A/S and Norsk Ferro A/S for a reported $11 million. These companies were at the former steelworks in Mo i Rana.[6] The Ferrokrom facility included two new electric furnaces (only one was in operation) and a briquetting facility, producing 300,000 to 400,000 tons of chromite ore furnace feed. The two new furnaces, built by the Macalloy Corp., have a total capacity of almost 150,000 mt/a of 62%-chromium, high-carbon ferrochrome. Elkem decided to invest another $5 million to prepare the No. 2 furnace to begin production in late 1991. The two furnaces of Norsk Ferro A/S were installations from the previous steel operations of Norsk Jern.

Magnesium.—Norsk Hydro AS is a major producer of magnesium with 100,000 tons capacity in Norway and Canada.[7] By the end of 1990, the company reported that capacity utilization was only 80%, in response to lower metal demand. Also, it was initially reported that most of the unused capacity could be reactivated when market conditions warranted. In September 1990, the oldest production units of the Porsgrunn plant were taken out of service. Extensive modernization and rationalization substantially increased productivity and production capacity in the remaining units at the formerly 60,000-mt/a Progrunn plant.[8] As part of this plant modernization, a large waste-treatment plant and new emissions-control facility were placed into service. The treatment equipment was to remove or reduce chlorinated hydrocarbon emissions and dioxins. Progress has been made to recycle or use the waste, thereby reducing the amount of material required to be stored in refuge sites.

Magnesium powder consumption for desulfurization purposes in iron and steel production is continuing to increase. To meet this demand, a new production unit was placed into operation at Immingham, United Kingdom, to produce magnesium powder.

Zinc.—Norzink AS, jointly owned by Boliden Mineral AB of Sweden and Rio Tinto Minerals Development Ltd. of the United Kingdom, reported weaker operating results than in 1989 owing to lower zinc prices.[9] At Larvik Pigmentfabrikk, the Norzink zinc pigment plant, utilization of capacity was at record levels. Recycling of 12,523 tons of zinc resulted in the production of 10,133 tons of zinc pigments. A new furnace and dust recycling unit were put into operation at the end of the year. This new equipment was placed into service sooner than expected and was projected to increase annual zinc pigment production by 20%.

The Norzink zinc smelter at Eitrheim reached a record production of 125,050 tons, even though the plant had some problems at the beginning of the year.[10] The lower power consumption at the new casting facility was reported by the company as encouraging, as were the results from the roasting and sulfuric acid plants. Modernization of the casting line, including the installation of a new zinc alloy casting machine, progressed with completion projected for 1991.

Industrial Minerals

Cement.—In 1990, Norcem A/S produced about 1.26 Mmt of cement at two plants, Dalen in the south, and Kjopsvik in the north. The capacity of the Dalen plant was 1 Mmt and that of the Kjopsvik plant, which was modernized with state assistance, was 500,000 tons.

Fertilizers.—Norsk Hydro reported that new production records were set by the plants at Porsgrunn and Glomfjord.[11] However, the need for rationalization within the industry resulted in the closure of Norsk Hydro's calcium ammonium nitrate plant in Herne, Germany; its phosphorus and nitric acid plants at Ambarès, France; and the company's ammonia plant at Glomfjord, Norway. Also, the plant producing nitric acid at Rjukan, Norway was scheduled for closure in 1991. Other plants had new or modernized units placed into service during the year. During the year, a new joint-venture mining operation was formed by Norsk Hydro with P.O. Apatit of the Soviet Union to produce phosphate rock on the

Kola Peninsula, in the U.S.S.R. This would give Norsk Hydro access to high-quality raw material for its plants.

Olivine.—Norway's largest producer of olivine was A/S Olivin. Olivin's deposit in the Aaheim area of Norway had estimated ore reserves of 2 billion tons of 90% to 95% olivine covering 6.5 km². Most of the production came from two open pit mines. The southern pit produced 1.3 Mmt/a and is a slightly harder material than that from the northern pit. The northern open pit mine produced approximately 400,000 tons of larger grained and more friable rock material than the southern operation.

Nor-Mineral operated an underground mine (room-and-pillar) at Byggja, a few kilometers south of Olivin's operations. The company, a subsidiary of Bjorum Trading AS, mined 600,000 mt/a. Ore was transported from an adit just above sea level to a crushing plant several kilometers down the fjord and loaded onto ships of up to 60,000 dwt.

Mineral Fuels

Norwegian crude production continued to rise gradually and was projected to reach approximately 2.15 Mbbl/d by the mid-1990's. Official projection indicated that a decline should begin toward the end of the century. Gas production was projected to increase from the present 30 billion m³/a to between 50 to 60 billion m³/a. The reserves for gas were projected to last well into the next century, while oil production could cease in 20 years. Norwegian companies were increasingly engaged in downstream activities, thoroughly integrating their product line.

The 13th Round of Licensing was announced and was to include 52 blocks or areas.[12] Twenty-four companies filled applications for 36 of the blocks. Twenty-two production licenses were approved for participation: 12 in the North Sea, 3 on the mid-Norwegian Shelf, and 7 in the Barents Sea.

Drilling increased over that of 1989 with 36 exploration wells initiated in the Norwegian continental shelf. Twenty-six were wildcats and 10 were delineation wells. The large majority of wells were drilled in the North Sea (27); only one was drilled in the Barents Sea.

The Norwegian Parliament, the Storting, approved several requests for new 'Plans for Development and Operations' (field development approval) from the petroleum industry in 1990. Statfjord East, Statfjord North, Embla, and a revised development plan for Troll Field were approved during the year. Nine fields were under development, and 22 were under consideration for development. For the year, the total investment, excluding exploration and onshore-based activities, was reported to be $4.3 billion, including 1990 exploration expenses of $799 million.

The 22 fields on the Norwegian Shelf produced approximately 107.3 Mmt petroleum equivalent of product, which equates to 611 Mbbl of petroleum, 30 Mbbl of condensate, and 25.4 billion m³ of gas. The Mime and Troll Fields contributed to this total, but were actually on long-term production testing. The Troll-Oseberg gas injection project (TOGI) was scheduled to begin in early 1991.

Natural Gas.—In 1990, natural gas production eased moderately from about 31 billion m³/a in 1989 to about 29 billion m³/a. This decrease was largely due to the impact of slowing production from the Frigg and Ekofisk Fields. The reduction in gas sales was most affected by the 30% reduction from Frigg Field. Previous estimates of production, based on contracts concluded to date, suggested that the annual Norwegian gas production was to hold at 28 to 30 billion m³/a until the end of the century. These production estimates were low as the demand for Norwegian natural gas has already increased and options for additional gas have been exercised. For example, the German buyers (Ruhrgas, Thyssengas, and BEB) under the Troll agreements exercised options for increased deliveries of gas volumes as did Gaz de France. At present, the total Norwegian commitments have reached 41 billion m³/a, after Sleipner East Field (1993) and Troll Field (1996) are brought on-stream.

Petroleum.—Norwegian crude petroleum production rose strongly in 1990. Crude production (including natural gas liquids) rose 10.5% to 1.68 Mbbl/d (81.9 Mmt oil equivalent) from 1.52 Mbbl/d in 1989.[13] The increase was largely from the increased production from Oseberg Field and four smaller fields: Veslefrikk, Troll Vest, Gyda, and Hod. Veslefrikk actually started production in December of 1989 with the petroleum transported through the Oseberg Transportation System. Statoil, operator for the Veslefrikk Field, projected the field would produce between 65,000 and 70,000 bbl/d. Two more oil platforms started production in June (Gyda) and October (Hod) of 1990. Gyda field was tied into the Ula pipeline, and Hod was the first unstaffed platform on the Norwegian continental shelf. Production has been remotely controlled from the Valhall Field, 13 km further north.

British Petroleum Norway Ltd. U.A. projected the Gyda Field to rapidly reach a production level of 60,000 bbl/d of oil and 1 Mm³/d of natural gas. Gyda Field, 30 km south of the Ula Field and north of Ekofisk center in the North Sea, was declared commercial in October 1988. The field has estimated reserves of 190 Mbbls of petroleum and 6 billion m³ of natural gas.

Phillips Petroleum Co. Norway, operator for Embla Field, projected that reserves were 87 Mbbl of oil and 5 billion m³ gas. Production was to be transported to Ekofisk Center for export to Emden and Teeside.

Reserves

Proven North Sea crude petroleum reserve estimates were increased by 9% to approximately 10 Bbbls, including NGL. The reserve estimates of North Sea natural gas were increased slightly to 2.3 trillion m³. About 60% of the North Sea petroleum reserves was in the Statfjord, Gullfaks, Oseberg, Snorre, and Ekofisk Fields, in order by volume. Discovered resources in the Haltenbanken area of the Norwegian Sea, northwest of Trondheim, were estimated to be 2.3 Bbbl of petroleum and NGL and 309 Bm³ of natural gas.

Resources in the Tromsoflaket area of the far northern Arctic coast were estimated to be 232 billion m³. Total Norwegian gas resources appeared sufficient to last at least to the middle of the 21st century.

Reserves for many of the other minerals with the exception of olivine have been depleted after years of mining.

INFRASTRUCTURE

Norway's land transportation system is better developed in the southern portion of the country. The northern half of the country is bisected by many fjords, and arctic conditions hinder transportation, especially in the winter. Norway's roads are adequate to transport goods, although more than one-half of the 79,540 km of roads is gravel or unpaved. The railroad system, with 4,223 km of standard-gauge track, is almost completely electrified, with 96 km of double track. Oslo, Bergen, Kristiansand, Stavanger, and Trondheim, all in the southern portion of the country, are important ports, as is Narvik in the northern half of the country. Petroleum

TABLE 3

NORWAY: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1990

(Million metric tons unless otherwise specified)

Commodity	Reserves
Copper-zinc ore	27
Iron ore	935
Nepheline syenite	300
Olivine billion metric tons	2

Petroleum field	Initially recoverable: Oil (million barrels)	Initially recoverable: Gas (billion cubic meters)	Initially recoverable: NGL (million barrels)	Remaining: Oil (million barrels)	Remaining: Gas (billion cubic meters)	Remaining: NGL (million barrels)
Albuskjell	62.9	22.0	13.5	20.1	8.5	4.2
Brage	290.6	3.5	—	290.6	3.5	—
Cod	17.6	7.0	5.2	.3	1.1	—
Draugen	427.7	5.0	—	427.7	5.0	—
Edda	38.4	2.3	2.1	15.1	.5	—
Ekofisk	1,736.0	150.0	135.2	788.8	83.0	73.8
Eldfisk	471.8	58.0	48.9	201.9	42.0	29.1
Frigg	.3	107.0	—	—	3.5	—
Gullfaks	1,446.7	16.0	22.9	1,247.3	14.0	20.8
Gyda	195.0	3.0	26.0	195.0	3.0	26.0
Heimdal	36.5	36.0	—	20.8	22.6	—
Hod	25.2	.9	3.1	25.2	.9	3.1
Murchison	12.0	.3	4.2	13.8	—	—
Nord						
øst-Frigg	.6	11.0	—	—	1.6	—
Odin	.6	33.0	—	—	14.7	—
Oseberg	1,484.4	79.0	62.4	1,348.6	79.0	62.4
Sleipner						
øst	119.5	51.0	104.0	119.5	51.0	104.0
Snore	666.4	5.8	28.1	666.7	5.8	28.1
Statfjord	2,547.5	48.0	156.0	1,125.9	35.6	116.5
Tommeliten	40.3	18.4	10.4	32.1	16.6	9.4
Tor	169.8	18.0	20.8	58.5	8.3	9.4
Troll	257.9	1,288.0	—	257.9	1,288.0	—
Ula	421.4	4.6	35.4	312.6	3.4	26.0
Valhall	333.4	10.0	34.3	194.4	6.0	22.9
Veslefrikk	226.4	3.0	13.5	223.3	3.0	13.5
Vest						
Ekofisk	81.8	28.0	15.6	9.4	4.5	2.1
øst Frigg	—	7.5	—	—	5.9	—
30/6 Gamma						
Nord	8.2	7.1	—	8.2	7.1	—
Total	10,882.4	2,023.4	741.6	7,603.7	1,718.1	551.3

Source: Information based on the Fact Sheet, The Norwegian Continental Shelf, 1990, The Royal Ministry of Petroleum and Energy Ministry, 1990.

pipelines from the North Sea fields make landfall at Kårst and Sture.

The Statpipe consists of a 910-km-long pipeline system with two riser platforms and a terminal at Kårst. Rich gas from Statford and Gulfaks is shipped to Kårst, where the gas is fractionated and the dry gas returned to the riser at Block 16/11 and on to Emden, Federal Republic of Germany. Heimdal Field is tied into the system via a 90-cm pipeline to Block 16/11. The gas from Veslefrikk and Gulfaks II Fields is to be phased in during 1990. In 1993, the dry gas from Sliepner and Troll Fields is to be added to the system, as well as the condensate from Sleipner Field. The rich gas pipeline to Kårst has a 9-billion m^3 capacity. The 13-billion m^3-capacity line from Block 16/11 and the Ekofisk Complex is for dry gas transport. The system's capacity may be increased by installing additional compression equipment.

Petroleum from Oseberg Field is transported through the 70-cm, 132-km Oseberg Transport System line to Sture. The pipeline was completed in December 1988, and the petroleum was the first landed in Norway from offshore fields. An agreement was made to transport petroleum from Veslefrikk and Brage Fields via Oseberg A Field. This pipeline has a 600,000-bbl/d capacity and a 5,000,000-bbl storage capacity.

Pipelines to Belgium, the Federal Republic of Germany, and the United Kingdom transport offshore Norwegian production to shore. Norpipe connects the Ekofisk Field with the gas market on the European Continent and an oil terminal in the United Kingdom. The 91-cm, 455-km gasline terminates in Emden, Federal Republic of Germany. The Frigg Transportation System is composed of two 81-cm, 362-km pipelines terminating in St. Fergus, Scotland. The Zeepipe ia a planned 102-cm gasline to be built from Troll and Sleipner Fields to Zeebruggle, Belgium, and is expected to be operational in 1993.

OUTLOOK

The production of petroleum and natural gas will continue to be an important part of the mineral economy of Norway. The export of these products, either primary or processed, will provide substantial income and be a source of employment for the country. Increasing demand for Norway's natural gas largely will come from European countries. Aluminum, ferroalloy, and magnesium production will also continue to be important to the country's economy. Mining, except for a few commodities, will decrease as reserves are depleted or domestic costs render the local resources uncompetitive with foreign supplies.

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[1]Where necessary, values were converted from Norwegian kroner (NKR) to U.S. dollars at the rate of NKR6.26=US$1.00, the average for 1990.
[2]Elkem A/S, 1990 Annual Report.
[3]Work cited in footnote 2.
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P.O. Box 8148, Dep.
0033, Oslo 1, Norway

Norges geologiske underskelse
(Geological Survey of Norway)
P.O. Box 3006,
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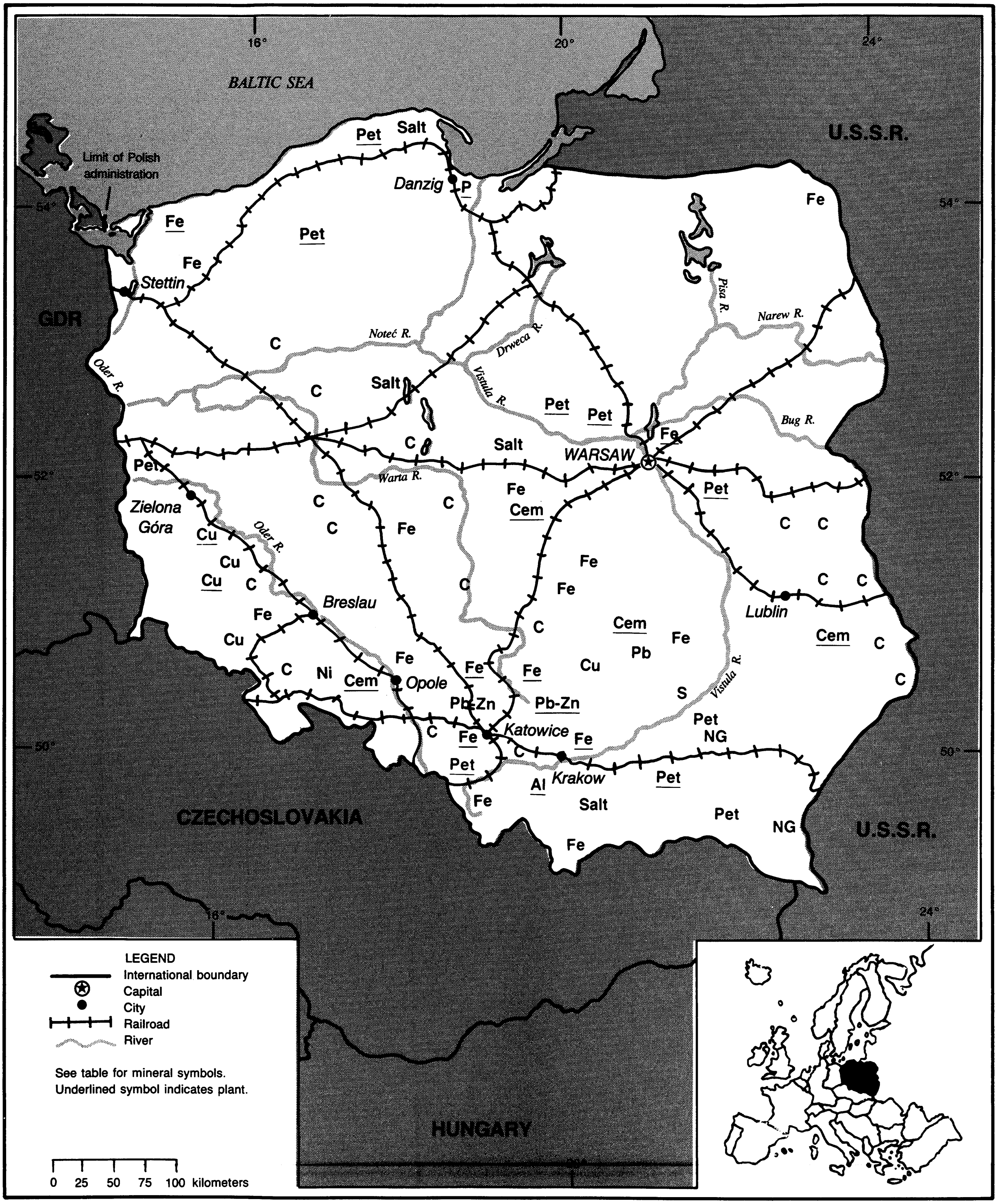
POLAND

AREA 312,000 km² **POPULATION 38 million**



The Mineral Industry of Poland

By Walter G. Steblez

In 1990, the transition by Poland's economy from a centrally planned to a market system again was accompanied by a decline in the country's output of such major mineral products as aluminum, coal, copper, lead, salt, sulfur, and zinc. This trend largely resulted from the dissolution of state price controls and most subsidies, which contributed to unemployment and further rationalization within the entire industrial sphere. Moreover, major shifts in the country's employment pattern were also apparent in 1990. Compared with employment levels of 1989, employment in Poland's state-owned and cooperative sectors declined by about 950,000 workers, while employment in the country's private sector increased by 400,000 employees. In 1990, the private sector of Poland's economy employed 11.6% of the total workforce, compared with 8.8% of the total in 1989. During this period, total employment in industry fell by about 3.4%. Within the mineral industry sector, from 1985 to 1990, employment fell by 5.8% in the coal, 15.2% in the iron and steel industries, 12% in the nonferrous metals sector, and 19.3% in the construction materials industry. However, a 4.9% growth in the workforce was registered in the mineral fuels and processing industry, which encompassed natural gas, petroleum and refinery goods output. The country's total industrial output in 1990 fell by 23% compared with that of 1989.

The major events within Poland's mineral industry included strikes at the country's coal and copper mines, facility expansion at the Huta Lebedy steel mill, and the discovery of new reserves of petroleum and natural gas in the Gorzow region.

GOVERNMENT POLICIES AND PROGRAMS

Poland's Government continued to direct its efforts at reorganizing the country's economy and implementing a democratic political agenda. To stabilize the economy and create a stable zloty-dollar exchange rate, Government policies established a correlation between net changes in lending interest rates and price increases. Policies that had a direct impact on the country's mineral industry involved the breakup of state-owned industrial monopolies and their future privatization. These functions were administered by the Agency for Ownership Transformation. Following a decision by the Ministry of Finance to privatize a state-owned enterprise, the enterprise would come under the control and ownership of the State Treasury until its final sale. The Agency for Ownership Transformation handled the actual mechanics of privatization, which included the sale to employees of 20% of the state-owned enterprise's stock; the balance of the stock would be available to all buyers at market prices.

Early in the year, in preparation for future privatization, 19 former monopoly industrial complexes were reorganized in this manner to form 201 new companies. The major share of these companies (101 companies) were established from organizations belonging to the country's coal industry. Also, 17 companies were created from Poland's nonferrous metals mining and processing industry and 7 from the Kambud Building Stone Quarrying Complex. Furthermore, in 1990, it was announced that the country's electric power generating and lignite mining industries would seek independent corporate status and operation.

Since January 1, 1990, two significant items of legislation were in effect that were designed to streamline Poland's economy, including the mineral industry: legislation on customs and tariffs and legislation on foreign exchange. To expedite Poland's eventual integration into the EC, the new customs legislation stipulated that Poland's customs procedure and classification system be compatible with those used by the EC by 1992. To this end, the foreign exchange law would allow for the internal convertibility of the zloty at market rates.[1] The repatriation of profits generated in zlotys by foreign companies would be allowed for up to 15% of the net zloty profits in 1990, but by 1995, 100% would be allowed.

Environmental pollution remained a critical issue facing Poland's mineral industry in 1990. The country's largest polluters were the steel, cement, and chemical industries. The stock of untreated solid waste from these industries reached 1.5 billion metric tons in 1990, to which about 100 Mmt had been added annually. Some of the short-term solutions proposed by the Ministry of Environmental Protection, Natural Resources and Forestry would involve conducting studies of the top industrial polluters to determine compliance standards and schedules. Reportedly, the worst polluters would be subject to closure. Moreover, the location of new heavy-industrial sites, including mines and metallurgical facilities, would be chosen with greater care. "Protected," or priveleged zones would be abolished. This was designed to remove built-in disincentives to compliance with established pollution standards and codes by mineral and other heavy-industrial enterprises. Longer term goals of the Ministry of Environmental Protection, Natural Resources and Forestry included the planned expenditure of $10 billion over a 10- to 20-year period for both new water and air treatment facilities.

PRODUCTION

In 1990, the continuing transformation of Poland's formerly centrally planned economy to a market-based system resulted in a further production decline in the country's mineral output. Although a tight monetary policy helped to slow-down the country's rate of inflation, an ensuing serious recession contributed to a decline in domestic demand and a substantial drop in Poland's total industrial output compared with that of 1989. All sectors of Poland's mineral industry showed a marked decline of production in 1990 compared with that of 1989. Within the metals sector, mine output of copper declined by only 4%, but smelter and refined copper fell by 25% and 10%, respectively, and the production of byproduct silver fell by 17%. The output of crude steel, rolled products, and pipes declined by about 10%, 12%, and 42%, respectively. Among industrial minerals, barite and cement had the steepest production declines of 26% and 56%, respectively, compared with those of 1989. In the mineral fuels sector, total coal output fell by 14% and that of bituminous coal by 17%.

TRADE

Although the value of Poland's foreign trade turnover (imports plus exports) remained at about the level of 1989, the country's total exports increased by 15%, while imports fell by 15.6%. This change in Poland's foreign trade pattern resulted largely from the replacement of centrally planned import-export policies with those that permitted individual enterprises to determine their own needs and independently transact foreign commerce. Owing partly to a substantial decline in domestic demand, the exports of most mineral commodities (table 2) showed greater growth compared with those of 1989. Among metals, aluminum, ferroalloys, steel semimanufactures, and zinc showed substantial export gains. The only notable declines were reflected in lead and steel scrap exports. Exports of industrial minerals and mineral fuels also rose in 1990 with cement, manufactured fertilizer materials, and refined petroleum products showing the greatest increases. However, exports of anthracite and bituminous coal declined by 40% and about 3%, respectively, presumably reflecting the 17% production decline in an industry constrained by strikes during the year. Conversely, mineral imports showed significant declines during this period (table 3). Notable import cutbacks among the metals were primary aluminum, antimony, manganese, nickel, precious metals, rolled steel, silicon, and tin. The few exceptions to this trend included import increases of molybdenum ore, pig iron, and scrap steel. Among industrial minerals and fuels, only imports of asbestos, calcined magnesite, and natural gas rose in 1990 compared to those of 1989.

The decline in Poland's domestic demand for most minerals in 1990 was also reflected in the growth of the country's exports as a share of domestic output levels compared to those of 1989 (table 4). Aluminum, cement, copper, and zinc showed the most significant export increases as a percentage of domestic production.

In 1990, a structural change in the distribution of Poland's exports and imports showed a marked shift toward developed market economy countries, which accounted for 62% of Poland's exports and 60% of imports. Within this group, the EC accounted for 43% and 38% of the country's exports and imports, respectively. During this period, the foreign trade share of Poland's CMEA partners, excluding the U.S.S.R., fell to 10% and 9% of Poland's total exports and imports, respectively.

The U.S.S.R., which was Poland's largest single trading partner for more than 40 years, in 1990, became Poland's second most important trading partner, after the Federal Republic of Germany (table 5). The U.S.S.R. accounted for about 15% of Poland's total exports and 20% of imports. However, despite the overall structural shift in Poland's trading pattern, the U.S.S.R. continued to be Poland's chief supplier of mineral raw materials and fuels. Although in 1990 Poland's imports of most mineral commodities declined, including import components from the U.S.S.R., the U.S.S.R.'s share of total world mineral exports to Poland remained stable. Compared with those of 1989, the U.S.S.R.'s exports of apatite, chromite, ferroalloys, and iron ore to Poland as a percentage of Poland's mineral imports in 1990 actually increased. The U.S.S.R. continued to supply 100% of Poland's import needs of natural gas and a substantial share of Poland's imports of petroleum and refined products. The mounting economic crisis in the U.S.S.R., stemming from that country's reform policies of "perestroyka" and "glasnost," was accompanied by strikes and shortages of oilfield parts and equipment, which led to decline in petroleum production in the U.S.S.R. The decline in Soviet petroleum deliveries to Poland and the suspension during the Persian Gulf crisis (Iraq's invasion of Kuwait) of Iraq's planned delivery of 1 Mmt of petroleum to Poland as partial payback of its outstanding debt resulted in Poland's hard currency purchases of petroleum at a cost that was about 3.5 times greater than those in 1989.

To some extent, this cost increase was mitigated by a 16% lower transferable ruble rate for Soviet exports of crude petroleum to Poland than that in 1989 owing to the CMEA policy of using a 3-year moving average of world prices to determine the sales price of Soviet petroleum to CMEA-member states within a given time period. Similarly, the decline in the U.S.S.R.'s output of manganese ore and that country's increasing reliance on imported manganese ore and concentrate resulted in the sharp cutback of Poland's imports of Soviet ore.

STRUCTURE OF THE MINERAL INDUSTRY

The information provided in table 6 lists the names of administrative bodies as well as subordinate production units of the main branches of the country's mineral industry in 1990.

Metals

Aluminum.—Lacking a domestic raw material base, Poland's aluminum smelter at Konin has relied on imported alumina feedstock. Within the framework of CMEA's soft currency trading arrangements, Hungary accounted for about 30% of Poland's alumina requirements. However, in 1990, Hungary suspended further alumina shipments to Poland on the ruble accounting basis and demanded payment in hard currency for all future transactions. This added further pressure on the country's aluminum industry to earn a greater share of hard currency through exports.

Copper.—Kombinat Gorniczo Hutniczy Miedzy (KGHM) continued to be the largest European producer of mined copper, outside the U.S.S.R., despite the decline in the production of mine and smelter output of copper. Consonant with almost all other sectors of the mineral industry, exports of refined copper increased both in absolute terms and as a share of production. Exports of copper represented 60% of total copper sales by yearend. Reportedly, in 1990, KGHM was able to draw on stocks to make up the production differential between mined and refined copper.

In midyear, miners and other employees at KGHM's mining and beneficiation operations in the Lubin area went on strike for about 1 week, citing a sharp decline in real income and growing unemployment in their industry as major reasons for the protest. KGHM's management and the striking mine workers reached an agreement that promised the workers higher wages following KGHM's eventual denationalization. Moreover, the Federation of Miners' Trade Unions would represent the copper miners' interests during negotiations on proposed new pension legislation.

Early in 1990, Polish officials indicated that the country's copper industry would accept the terms of reference of the International Copper Study Group (ICSG). However, the only possible drawback to Poland's copper producers and foreign trade organizations formally joining the ICSG reportedly involved the hard currency cost of membership.

Iron and Steel.—With a capacity to produce more than 18 Mmt tons of steel per

TABLE 1

POLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1986	1987	1988	1989	1990[e p]
METALS					
Aluminum metal, primary	47,500	47,500	47,700	47,800	[3]45,974
Cadmium metal, primary	500	[e]620	642	485	[3]373
Copper:					
Mine output, Cu content, recoverable[e]	434,000	438,000	437,000	384,000	[3]370,000
Metal:					
Smelter, including secondary	366,400	367,300	469,560	460,519	[3]346,000
Refined, including secondary	388,000	[r]390,200	400,560	390,268	[3]352,000
Gold:[e]					
Mine output, Au content, recoverable thousand kilograms	35	35	30	30	30
Metal, smelter[4] kilograms	180	180	177	175	175
Iron and steel:					
Iron ore and concentrate, gross weight	[r]8,800	[r]6,300	6,300	7,400	2,000
Metal:					
Pig iron thousand tons	10,574	10,476	10,264	9,488	9,000
Ferroalloys:[e]					
Blast furnace do.	83	85	80	75	75
Electric furnace do.	176	180	175	175	140
Steel:					
Crude do.	17,144	17,145	16,873	15,094	[3]13,625
Semimanufactures:					
Rolled excluding pipe do.	12,340	12,410	12,424	11,272	[3]9,905
Pipe do.	1,027	1,038	1,053	971	[3]567
Lead:					
Mine output, Pb content, recoverable	[e]53,500	[e]48,800	64,000	66,000	[3]61,344
Metal, smelter	88,300	[r]89,800	90,700	78,200	[3]64,812
Silver, mine output, Ag content, recoverable thousand kilograms	829	831	1,063	1,003	[3]832
Zinc:					
Mine output, Zn content[e]	185,000	184,000	184,000	[r e]179,000	[3]178,000
Metal, refined, including secondary	179,000	177,000	174,000	164,000	[3]132,000
INDUSTRIAL MINERALS					
Barite	77,100	73,100	63,100	57,900	[3]25,316
Cement, hydraulic thousand tons	15,831	[r]16,090	16,984	17,125	[3]12,600
Clays and clay products:					
Crude:					
Bentonite[e] do.	75	75	80	70	70
Fire clay do.	1,076	1,104	1,032	856	[3]523
Kaolin[e] do.	[3]49	49	59	50	[3]48
Products[e] do.	600	600	600	550	300
Feldspar[e]	57,200	55,000	50,000	50,000	45,000
Gypsum and anhydrite, crude[5] thousand tons	1,107	1,127	1,097	1,133	[3]755
Lime, hydrated and quicklime do.	4,108	4,265	4,430	4,421	[3]3,194
Magnesite, crude	20,900	22,300	23,900	24,100	[3]23,000
Nitrogen: N content of ammonia thousand tons	2,124	2,177	2,338	2,360	[3]2,006
Salt:					
Rock do.	1,222	1,234	1,247	995	[3]556
Other do.	4,197	[r]4,941	4,932	3,675	[3]3,499
Total do.	5,419	6,175	6,179	4,670	[3]4,055

See footnotes at end of table.

TABLE 1—Continued

POLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989	1990[e p]
INDUSTRIAL MINERALS—Continued						
Sodium compounds, n.e.s.:						
Carbonate (soda ash)	do.	963	930	956	1,005	1,000
Caustic soda (96% NaOH)	do.	445	440	463	452	[3]404
Stone: Dolomite	do.	3,333	3,390	3,422	4,000	[3]4,989
Sulfur:						
Native:						
Frasch	do.	4,437	4,410	4,411	4,276	[3]4,027
Other than Frasch	do.	457	[r]550	589	588	[3]637
Total	do.	4,894	[r]4,960	5,000	4,864	[3]4,664
Byproduct:[e]						
From metallurgy	do.	170	170	150	150	140
From petroleum	do.	30	25	30	20	20
Total	do.	200	195	180	170	160
From gypsum[e]	do.	20	22	20	20	10
Total sulfur	do.	5,114	[r]5,177	5,200	5,054	4,834
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	thousand tons	192,080	[r]193,011	193,015	177,628	[3]147,669
Lignite and brown	do.	[r]67,259	[r]73,196	73,489	71,816	[3]67,584
Total	do.	[r]259,339	[r]266,207	266,504	249,444	[3]215,253
Coke:						
Coke oven	do.	[r]16,398	[r]17,066	17,071	16,584	[3]13,713
Gashouse	do.	383	363	[r e]350	[r e]350	350
Total	do.	[3]16,781	[3]17,429	[r e]17,421	[r e]16,934	14,063
Fuel briquets, all grades	do.	1,309	1,379	1,460	632	[3]199
Gas:						
Manufactured:[e]						
Town gas	million cubic meters	182	176	133	109	[3]122
Coke oven gas	do.	6,140	6,468	6,593	6,456	[3]5,475
Natural, marketed	do.	5,824	5,781	5,713	5,368	[3]3,866
Natural gas liquids:[e]						
Natural gasoline	thousand 42-gallon barrels	[3]40	[3]50	[r]50	[r]50	30
Propane and butane	do.	[r]30	[r]40	[r]40	[r]30	30
Peat: Fuel and agricultural[e]	thousand tons	[r]60	[r]60	[r]60	[r]50	50
Petroleum:						
Crude:						
As reported	thousand tons	167	149	163	159	[3]163
Converted	thousand 42-gallon barrels	1,239	1,105	1,209	1,180	[3]1,209
Refinery products[6]	do.	[r]89,932	[r]89,982	94,397	95,844	[3]80,874

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Oct. 1991.
[2]In addition to the commodities listed, antimony, cobalt, germanium, 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]Based on official Polish estimates.
[5]Includes building gypsum, as well as an estimate for gypsum used in production of cement.
[6]Includes virtually all major products; excludes some minor products as well as refinery fuel and losses.

TABLE 2

POLAND: EXPORT OF SELECTED MINERAL COMMODITIES FOR 1990

(Thousand metric tons unless otherwise indicated)

Commodity	Quantity	Compared with 1989 (in percent)
METALS		
Aluminum:		
Unwrought metal	16.3	878.4
Copper:		
Unwrought metal and semimanufactures	198.9	101.5
Iron and steel:		
Scrap:		
Iron	32.3	—
Steel	392.3	89.2
Ferroalloys	28.1	443.4
Semimanufactures	515.5	188.1
Lead:		
Unwrought metal	6.0	82.4
Silver tons	678.0	100.9
Zinc:		
Unwrought metal, alloys and semimanufactures	33.6	143.5
Unwrought only	31.3	177.4
INDUSTRIAL MINERALS		
Cement	903.1	121.8
Fertilizer materials:		
Manufactured:		
Nitrogenous	511.9	422.0
Phosphate	41.6	552.9
Lime	75.9	100.4
Sodium compounds:		
Calcined soda	516.7	130.8
Caustic soda	117.9	219.8
Sulfur	3,815.2	104.9
MINERAL FUELS		
Coal:		
Anthracite	40.0	40.0
Bituminous	28,026.0	97.1
Lignite	28,348.7	NA
Coke and semicoke	3,661.0	116.0
Refined petroleum products	1,655.4	134.1

NA Not available.
[1]Sources: Selected mineral export data compiled from Handel Zagraniczny, Warsaw, 1991, and Maly Rocznik Statystyczny, Warsaw, 1991.

TABLE 3

POLAND: IMPORT OF SELECTED MINERAL COMMODITIES FOR 1990

(Thousand metric tons unless otherwise indicated)

Commodity	Quantity	Compared with 1989 (in percent)
METALS		
Aluminum:		
Oxides hydroxides:		
Alumina, calcined	130.0	70.9
Alumina, hydrated	19.4	88.9
Metal:		
Unwrought and semimanufactures	58.1	48.9
Antimony, metal tons	838.0	37.2
Chromite	147.4	92.7
Cobalt:		
Metal; ingot and powder tons	77	46.4
Gold and platinum-group metals kilograms	9	1.3
Iron and steel:		
Ore and concentrate	12,066.3	89.3
Metal:		
Scrap	8.4	143.1
Pig iron	1,283.5	107.0
Ferroalloys	44.6	79.1
Rolled steel	728.5	47.4
Lead, metal	2.5	N/A
Magnesium, metal tons	300	20.3
Manganese:		
Ore and concentrate	103.2	18.4
Metal tons	384	43.4
Mercury, metal tons	33	76.7
Molybdenum, ore and concentrate (tons)	617	62.5
Nickel, metal	3.6	48.8
Silicon, metal	1.7	22.0
Tin, metal (tons)	890	29.8
Titanium:		
Ore and concentrate:		
Ilmenite	54.7	58.5
Rutile	1.9	36.4
INDUSTRIAL MINERALS		
Asbestos	65.6	117.1
Boron, ore and concentrate	3.1	37.4
Cement	35.1	46.0
Fertilizer materials:		
Manufactured:		
Potassic	592.1	53.1
Kaolin	102.8	71.1
Magnesite, calcined	178.1	106.1
Phosphates, crude	506.4	43

See footnotes at end of table.

TABLE 3—Continued

POLAND: IMPORT OF SELECTED MINERAL COMMODITIES FOR 1990

(Thousand metric tons unless otherwise indicated)

Commodity	Quantity	Compared with 1989 (in percent)
MINERAL FUELS		
Coal:		
Anthracite	20.0	95.2
Bituminous	540.0	52.1
Natural gas		
million cubic meters	8,410.0	106.4
Petroleum:		
Crude	13,008.0	86.8
Refined:		
For consumption	2,365.2	82.4
For reexport	3.1	38.3

NA Not available.
Sources: Selected mineral export data compiled from Handel Zagraniczny, Warsaw, May 1991, and Maly Rocznik Statytyczny, Warsaw, 1991.

TABLE 4

POLAND: EXPORT OF SELECTED MINERAL COMMODITIES AND FUELS AS A PERCENTAGE OF OUTPUT FOR 1989 AND 1990

Commodity	1989	1990
Aluminum, primary	4.0	36.2
Cement	4.1	6.0
Coal, bituminous	16.3	18.2
Copper, refined	40.2	52.0
Electric power	2.1	2.4
Heating oil	19.9	33.3
Steel, rolled	18.6	24.4
Sulfur	74.7	78.0
Zinc	11.0	24.2

Sources: *Rzeczpospolita*, Warsaw, Feb. 2, 1991, and *Maly Rocznik Statystyczny*, Warsaw, 1991.

TABLE 5

POLAND: IMPORTS OF MAJOR MINERAL AND MINERAL FUEL COMMODITIES FROM THE U.S.S.R.

(Thousand metric tons unless otherwise indicated)

Commodity	1986	1989	1990
Apatite:			
Total	992	1,105	400
From the U.S.S.R.	212	204	150
Percent	21.4	18.5	37.5
Chromite:			
Total	146	159	125
From the U.S.S.R.	136	150	120
Percent	93.2	94.3	96.0
Ferroalloys:			
Total	56	56.4	45
From the U.S.S.R.	48	46.9	40
Percent	85.7	83.2	88.9
Iron ore:			
Total	9,563	8,103	6,700
From the U.S.S.R.	8,071	7,122	6,300
Percent	84.4	87.8	94.0
Pig iron:			
Total	1,389	1,201	1,200
From the U.S.S.R.	1,336	1,199	1,180
Percent	96.2	99.8	99.3
Manganese ore			
Total	671	572	120
From the U.S.S.R.	570	471	5.5
Percent	84.9	82.3	4.6
Natural Gas: million cubic meters			
Total	7,135	7,905	8,800
From the U.S.S.R.	7,135	7,905	8,800
Percentage	100.0	100.0	100.0
Petroleum:			
Crude:			
Total	14,140	14,985	13,000
From the U.S.S.R.	12,750	12,750	10,200
Percentage	90.2	85.1	78.5
Refined:			
Diesel fuel:			
Total	1,297	1,348	1,220
From the U.S.S.R.	1,122	1,175	1,120
Percentage	86.5	87.2	91.8
Fuel oil			
Total	1,150	512	200
From the U.S.S.R.	251	220	150
Percentage	21.8	43.0	75.0
Gasoline:			
Total	561	921	750
From the U.S.S.R.	529	499	350
Percentage	94.3	54.2	46.7
Potash:			
Total	203	1,074	650
From the U.S.S.R.	927	844	500
Percentage	80.8	78.6	76.9

Source: Compiled from data provided in Polish Foreign Trade (Chief Statistical Office), Warsaw, 1991.

year, Poland had vied with Czechoslovakia for second place in the production of steel in the CMEA, after the U.S.S.R., throughout most of the 1980's. In contrast to past centrally planned economic directives to produce steel in terms of gross weight output at all costs, in 1990, the downturn of steel production, especially in comparison with production levels of 1987, 1988, and 1989, was indicative of the steel industry's gradual transformation to a market-based system. In 1990, three significant issues faced the industry: (1) environmental pollution, (2) modernization, and (3) funding, necessary to address issues 1 and 2. At the start of the year, 36% of Poland's total steel output was done in open-hearth furnaces; 48% in oxygen converters, and 16%, in electric furnaces.

By contrast, open-hearth furnace operations have been nearly eliminated in the EC countries, and whereas continuous casting reached about 81% on an EC-wide basis, in Poland it represented only 6% of total steel casting output. Consequently, the efficiency of Poland's steel production was significantly lower than comparable operations in the EC. Since centrally planned state subsidies to industry were abolished during the year, publicly owned enterprises were forced to seek funds in the financial markets. Large-scale foreign investment in Poland's traditional industries, however, did not appear to be probable. To meet the funding requirements for substantial perspective costs of modernizing the steel industry, both in terms of pollution control and improved production efficiency, in 1990, Poland's steel industry began stressing exports to market economy countries. This policy, moreover, was facilitated by the abolition of export restrictions. Compared with that of 1989, in 1990, the volume of Poland's steel exports to developed market economy countries rose by 17.7%. However, exports of low-value semimanufactures rose by about 92% during this period, raising this component of total steel exports from 13% in 1989 to 21.4%. The average export price of Poland's rolled products to the West European market was about $250/ton; while the import price for similar products from this market was approximately $600/ton. This, in part, explains the continuing inability of Poland's relatively large steel industry to meet the needs of domestic users, who had to rely on more expensive imports to meet their requirements.

The price differential between imported and exported steel pipes was even higher with imports costing four times more per ton of steel pipe than exports.

The uncompetitive nature of Poland's steel industry was compounded by continuing quality problems in respect to domestic sales. In midyear, the country's machine tool industry reported that about 30% of all steel products delivered to this sector was substandard. Other purchasers had even more serious complaints concerning the quality of steel used in the manufacture of plates for ships and mining cables and chains. Because of the long-term need to upgrade Poland's infrastructure and supply new housing, the demand for basic structural steels should ensure a ready market for the domestic steel industry. Apart from rationalization at existing iron and steelworks, further development in the industry could eventually involve the construction of minimills to efficiently meet Poland's reconstruction requirements.

In May, the Nowa Huta Lenin Iron and Steel Works, Poland's largest steel producer, was renamed Nowa Huta im. Tadeusza Sendzimira (Sendzimir Iron and Steel Works) to honor the late Tadeusz Sendzimir, an American citizen prominent in the U.S. steel industry. Also, the firm's new management began to address issues relative to both pollution and rationalization. Two open-hearth furnaces were decomissioned during the year. The remaining three open-hearth furnaces would be replaced by oxygen converters. Continuous casters and pollution abatement technology would be added to the operation.

Additionally, Nowa Huta's 28,000 employee work force initially would be reduced by about 10,000 workers by disaggregating the enterprise's service-oriented units for privitization.

At yearend, the Huta Labedy Steelworks at Gliwice, near Czechoslovakia, completed the installation of a 75,000-mt/a rolling mill to produce rebars ranging from 6 mm to 32 mm, largely from rails supplied by Poland's railroad system. The new rolling mill was financed by Ferropol Ltd., a subsidiary of Poland's Impex Metal and West European investors which included the Pittini steel group of Italy.

Lead and Zinc.—Poland remained one of Europe's most important producers of lead and zinc. Lead and zinc ore has been mined in the southeastern part of the country at three underground mines. The Boleslaw mining concentrating and zinc refining complex at Bukowino has been producing about 1 Mmt of ore per year grading about 0.6% lead and 3.4% zinc. The Olkuz-Pomorzany Mine, near Olkusz, part of the

TABLE 6

POLAND: STRUCTURE OF THE MINERAL INDUSTRY

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Aluminum:			
Primary	Huta Aluminium	Konin	50.
Secondary	do.	do.	20.
Coal:			
Bituminous	Hard Coal Association in Liquidation State Coal Agency	71 mines at Upper Silesian Basin, Lower Silesian Basin, and Lublin Basin	200,000
Lignite	State Coal Agency	4 open pit mines at Turow, Belchatow, Konon, and Adamow	75,000.
Copper:			
Concenetrate (gross weight)	Kombinat Gorniczo Hutniczy Miedzi (KGHM)	Mines and concentrators at Konrad, Lubin, Polkowice, Rudna, and Sieroszowice	1,900.
Metal, refined	KGHM	Refineries at Glogow I, Glogow II, and Legnica	430.
Ferroalloys	Ministry of Industry	Plants at Laziska, Bobrek, Siecznice, and Pokoj producing FeMn, FeSiMn, FeSi, FeCr, FeW	270.
Lead-zinc:			
Concentrate	Ministry of Industry	Nonferrous Metals Association (Mines and concentrators at Bolelaw, Olkuz-Pomorzany, and Trzebionka)	125 Pb. 225 Zn.
Metal:			
Pb, refined	do.	Smelters and refineries at Miasteczko Slaskie, Szopienice, and Orzel Bialy	115.
Zn, refined	do.	Smelters and refineries at Boleslaw, Silesia, and Szopienice	145.
Natural gas	Ministry of Mining and Energy	Gasfields at pre-Carpathian foot-hills, Carpathian Mountains Lowlands, near Ostrow Wielko-polski, Poznan, and Trzebnica, north of Wroclaw	6,000.[1]
Petroleum:			
Crude	do.	Oilfields northern lowlands, near the Baltic Sea; sub-Carpathian and Carpathian Mountains	1.4.[2]
Refined	do.	Refineries at Glinik, Mariampolski, Jasto, Jealicze, Warinsky, Czechowice, Gdansk, etc.	125.[2]
Salt, all types	Ministry of the Chemical Industry	Main mines at Inowroclaw, Klodowa, and Wapno in central Poland	6,500.
Silver	Zaklady Metalurgiczne Trzebinia	Refined from doré produced by the Szopienice Pn-Zn smelter-refinery largely from KGHM supplied slimes	1.
Steel	Ministry of Metallurgy	Main facilities include integrated ironworks and steelworks at Krakow, Katowice, and Warsaw	18,000.
Sulfur	Ministry of the Chemical Industry	Kopalne i Zaklady Przetworcze Siarki im. M. Howotki "Siarkopol" at Tarnobrzeg operates the Grzybow Jeziorko and Machow mines	5,700.

[1]Million cubic meters.
[2]Million barrels per year.

Boleslaw operation, produced more than 2.5 Mmt of ore grading about 1.2% lead and 3.5% zinc. The Trzebinia Mine and concentrator, at Trzebinia, near Chrzanow, produced almost 2 Mmt of ore grading 3.7% lead and 2% zinc. In January, the lead and zinc industry began to operate as independent and/or semiprivate enterprises. Smelters and refineries were generally seperate enterprises with the exception of the zinc refinery, which was part of the Boleslaw mining and refining complex.

Pollution was the most serious issue facing the lead and zinc industry during the year. Reportedly, lead and zinc mining and processing had generated about 3 Mmt of solid waste per year. Substantial ground subsidence associated with mining was yet another serious problem. Extensive ground water contamination in the lead and zinc mining areas led to efforts to introduce closed-loop water circuits at beneficiation plants as well as ground cleanup efforts and public usage restrictions around mining areas. The scope of planned investment for pollution abatement in this industry would in most cases preclude the short-term development of additional production facilities. For example, the environmental damage caused by years of unregulated lead and zinc mining, beneficiation, and smelting in the vicinity of Zawiercie resulted in public opposition that stopped new mining development in the region.

Industrial Minerals

Cement.—Early in the year, Poland and Japan announced plans to form a joint venture to produce cement at the port city of Szczecin. The joint venture would involve a 51% investment by Japan's International Investment Corp. and Japanese cement producers that would include Toyo Menka Kaisha (Tomen) and the Onoda Cement Co. A designated domestic cement producer and the country's Industrial Development Foundation would contribute 49% of the investment. The proposed plant, with a rated cementmaking capacity of 2 Mmt/a, would be fitted with pollution-free technology imported from Japan.

The plant's operation was expected to begin in 1992, and planned cement exports to Europe and the United States would be instrumental in paying off the cost of the project.

Sulfur.—Poland remained among the largest producers of sulfur in the world. With an output of almost 4.9 Mmt of sulfur in 1990, the country's production represented about 8% of total world sulfur production. Approximately 87% of Poland's total sulfur production was generated at the Jeziorko and Grzybow borehole mines in the Tarnobrzeg region using a modified Frasche process. Approximately 13% was produced at the Machow open pit mine. As in other branches of the mineral industry, sulfur mining has been a serious source of both air and water pollution. In the Tarnobrzeg, the sulfur industry has contributed just under 90 Mm^3/a of industrial sewage, or 70% of the total amount of industrial sewage generated in the region. Cleanup costs after years of neglect reportedly would be substantial. In March, the sulfur industry decided to cease all soft currency transactions with the U.S.S.R. and other CMEA-member countries. To some extent, this was brought about by the Persian Gulf war, which had the effect of stimulating demand owing to Iraq's withdrawl from the sulfur market. In view of the increase of the price of sulfur to nearly $100/mt, exports to CMEA-member states would effectively yield only 250,000 zlotys/mt as opposed to almost 900,000 zlotys/mt of exports to Western Europe on a dollar basis. The change in policy to export sulfur on a hard currency basis was also aimed at sufficiently increasing profits to help pay for environmental cleanup, on the one hand, and reduce overall mine output, on the other. Early in the year, Poland's mineral foreign trade organization Ciech signed a 5-year contract with Morocco's Office Cherifien des Phosphates to export 3.5 Mmt of sulfur to Morocco.

Mineral Fuels

Coal.—In terms of output, consumption, and export trade, coal remained the country's chief mineral product. Poland's resources of bituminous coal and anthracite were in Upper and Lower Silesia and in the Lublin district. Mining operations in the Upper Silesian coal basin, the largest and most productive of the three areas, were performed within an area of about 4,500 km^2. Approximately 41% of this area was worked in 1990, 31% was either worked out or designated as uneconomic, and 28% was set aside for future development. Mining was conducted at increasingly greater depths; in some cases exceeding 1,000 m. At the more recently developed Lublin basin, exploration has been systematically performed since 1974. Indicated resources were delineated within a 754-km^2 area. Inferred resources were bounded within an area of 9,100 km^2. Total demonstrated resources at Lublin were reported to be 7.7 billion tons of bituminous coal.

Mining at Lublin also has been conducted at increasingly greater depths, which in 1990 ranged from 800 to 1,000 m. At the Lower Silesian basin, the total area worked by four mines amounted to 108 km^2. Demonstrated resources in the area amounted to about 500 Mmt of coal and workings ranged in depth from 800 to 1,100 meters. The total demonstrated resources at the three basins amounted to about 65.2 billion tons of hard coal. The portion of these resources under exploitation in 1990 amounted to about 29.6 billion tons, and of this amount approximately 12.4 billion tons were considered commercial-grade resources during the year. Poland's commercial-grade coal resources were distributed as follows: Upper Silesia—11.9 billion tons, Lublin—0.3 billion tons, and Lower Silesia—0.2 billion tons. The three basins incorporated 71 mines, of which 70 were operational in 1990. Three mines were under study for possible closure.

As in all other forms of industrial activity, Poland's coal industry was significantly less efficient than similar operations in market economy countries. Productivity was generally low. Nearly one-third of the longwalls at most coal mines was unproductive, having been held in reserve. In contrast to the practice in market economy countries, which measure productivity on the basis of tons of washed or cleaned coal produced per worker-hour, Poland's coal mines have been measuring productivity on the basis of unwashed run-of-mine coal.

Also, large amounts of equipment were stocked on the surface. By not requiring capital to pay for itself, the country's formerly centrally planned economic system allowed the treatment of capital as a consumable. The time value of money was not a component of investment decision-making, which, in part, explains the large stockpiles of some types of machinery, parts, and equipment while inefficiencies in the system have created shortages of other types of essential machinery and equipment. Past centrally planned full employment policies resulted in a proportion of nonworkface underground workers to workface workers that reached and in some cases exceeded 10:1. Moreover, coal mining enterprises devoted substantial energies operating service-oriented facilities such as resorts, soft drink bottling enterprises, and construction materials plants. The Government inadvertently contributed to distorting the gradually emerging values of the market system by maintaining subsidies for domestic coal sales throughout the year, ranging from 16,000 to 20,000 zlotys/mt. During the year, the International Bank for Reconstruction and Development (IBRD) proposed a plan to reorganize Poland's coal industry. The plan involved the creation of 10 to 12 coal mining companies, each consisting of 4 to 6 mines. The Government of Poland accepted this concept and signed a letter of intent with the IBRD stating agreement to undertake this task.

To prepare for this project, the Government of Poland initiated studies to determine which coal mines would be unprofitable and subject to closure following a reorganization of the industry. In January, miners at the Thorez, Walbrzych, and Victoria coal mines went on strike mainly to protest nonpayment of additional moneys promised to them for December by mine management. The strike ended with an agreement that satisfactorily addressed the miners' pay claims and reaffirmed their earlier agreed-upon privileges. In November, miners at 20 hard coal mines initiated a 24-hour strike to protest the slow pace of converting the coal industry to a market-based system. In other developments, the Mieszko coking plant in the Walbrzych area was closed down in midyear owing to severe pollution in the Walbrzych area, as well as to the depletion of coal deposits in the vicinity.

Natural Gas and Petroleum.—Owing to cutbacks of Soviet petroleum deliveries to Poland during the year and indications that deliveries after January 1, 1991 would be transacted on a hard currency basis, Poland's mineral foreign trade organization, Ciech, began to look for petroleum import opportunities in the world market. Possible petroleum purchases were explored with producers in Algeria, Iran, Nigeria, and Tunisia. In October, Poland reached an agreement with Iran to import between 18.3 and 21.9 Mbbl of petroleum in 1991.

Poland's domestic exploration program revealed a deposit of petroleum and natural gas near Slubice in the Province of Gorzow. Preliminary analysis revealed the presence of at least several million tons of petroleum and several billion cubic meters of natural gas. A deposit of petroleum was also discovered near Szczecin. The size of this deposit was not fully determined during the year. In April, a deposit containing 1.3 trillion cubic meters of natural gas was reportedly discovered in Silesia.

Nuclear Energy.—In 1990, the construction of Poland's Zarnowiec nuclear powerplant was stopped until 1991 owing to a lack of funds and a review of the country's overall energy policy. Reportedly, the installation of Soviet-built reactor blocks 1 and 2 was 40% complete at the time of the stoppage, and construction of reactor blocks 3 & 4 had not yet begun. Also, in 1990, experts from Belgium, the Federal Republic of Germany, and The International Atomic Energy Agency were asked to review the construction effort at the Zarnowiec facility to determine whether or not construction there should be completed. Studies would focus on such technical aspects of the project as a lack of containment and the level of seismic activity risk at the site. Reportedly, the cost of care and maintenance of the site and the payment of wages to about 1,000 employees at the Zarnowiec facility amounted to approximately 235 million zlotys/d.

Reserves

Taking into account Poland's efforts at transition to a market economy, the country's mineral reserves would have to be reevaluated from a market economy perspective. As defined in market economy countries, reserves are those mineral deposits that can be mined at a profit under existing conditions with existing technology. In CMEA countries, including Poland, the prior policies for centrally planned industrial development often had more to do with political than economic considerations. Centrally planned economic directives to discover exploitable resources may have resulted in possible overestimates and other distortions of collected field data. Consequently, it will probably take Poland a number of years to establish its real mineral reserves from a market economy standpoint. The system that was used to measure "reserves" was based on two cross-imposed classification schemes, one relating to the exploitability of the mineral in question, and the other relating to the reliability of the information on its quantity and grade. The first system determined whether or not the deposit was suitable for exploitation, given the current technological capability and industrial need. The second classification related to the reliability of the data gathered on the quantity of the mineral in situ.

The second classification designated deposits into "reserve" categories A, B, C1, and C2, based on the Soviet classification system, where sufficient geological data had been gathered relative to the size of the deposit and its mineral grade. Taking this system into account, Poland's mineral resources in categories A+B+C1 are given in table 7.

TABLE 7

POLAND: APPARENT RESOURCES OF MAJOR MINERALS

(Thousand metric tons)

Commodity	Resources
Barite	5,061
Coal:	
Bituminous	65,800,000
Lignite	12,900,000
Copper, contained in ore	34,000
Dolomite	590,000
Gypsum and anhydrite	303,000
Iron, contained in ore	600,000
Lead, contained in ore	5,900
Nickel, contained in ore	117
Rock salt	75,000,000
Silver, contained in Cu/Pb-Zn ores	196
Sulfur	700,000
Zinc, contained in ore	13,000

Source: Bilans Zasobow Kopalin i Wod Podziemnych w Polsce, Warsaw, 1990. (Official Polish data, valid for Dec. 1989).

INFRASTRUCTURE

Poland's inland transportation system consisted of 331,129 km of railroads, highways, and waterways. The railroad system consisted of 24,333 km of 1.435-m standard-gauge, 397 km of 1.524-m broad-gauge, and 2.515 km of narrow-gauge track. Of the total railroad system, 8,986 km were double-tracked, and 10,000 km electrified track. The highway system consisted of 130,000 km of improved hard-surface roads, 24,000 km of unimproved hard-surface roads (crushed stone, gravel), 100,000 km of earth roads, and 45,887 km of various urban roads. Poland had 3,997 km of navigable rivers and canals, with ports at Gliwice on Kanal Gliwice, Wroclaw on the Oder, and Warsaw on the Vistula. In 1990, freight haulage by rail amounted to 280.7 Mmt—about 37% less than that in 1989. The decline was largely attributed to cutbacks of deliveries of coal, cement, sand and gravel, and dimension stone, as well as to the greater use of truck haulage for certain types of bulk freight. By yearend, the country's merchant fleet consisted of 247 ships totaling 4,164,665 dwt tons. Maritime ports (Gdansk, Gdynia, Szczecin, and Swinoujscie) handled 44.2 Mmt of cargo in 1990. Compared with that of 1989, the handling of all categories of cargo declined almost 4%. Coal and coke handling, however, actually increased.

In 1990, Poland had 4,500 km of pipeline for natural gas, 1,986 km of pipeline for crude petroleum, and 360 km of pipeline for refined products. By yearend, pipelines carried 33 million tons of crude petroleum and refined products - a 19.9% decline compared with that of 1989.

OUTLOOK

To ensure maximum interim employment during the country's economic transition to a market economy, near-term Government policies probably will continue to direct subsidies to some state-owned heavy industries such as coal mining and steel production. Crude steel production should continue to decline in 1991 and 1992 owing to continued rationalization (including environmental factors) of the industry and the decline in domestic demand. The steel industry's production profile in the longer term should tend toward the output of higher value specialty steels. Poland's coal, copper, lead, sulfur, and zinc industries, because of their developed infrastructures and operations and relatively well-assured mineral resources, should continue their mining and processing activities (with improved pollution controls) for at least another 10 to 15 years. Also, the country's mineral industries will most likely maintain and even increase their levels of exports to market economy areas to ensure adequate funds for modernization.

[1]The exchange rate, yearend 1990, for the zloty (Zl) was Zl 9,500=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

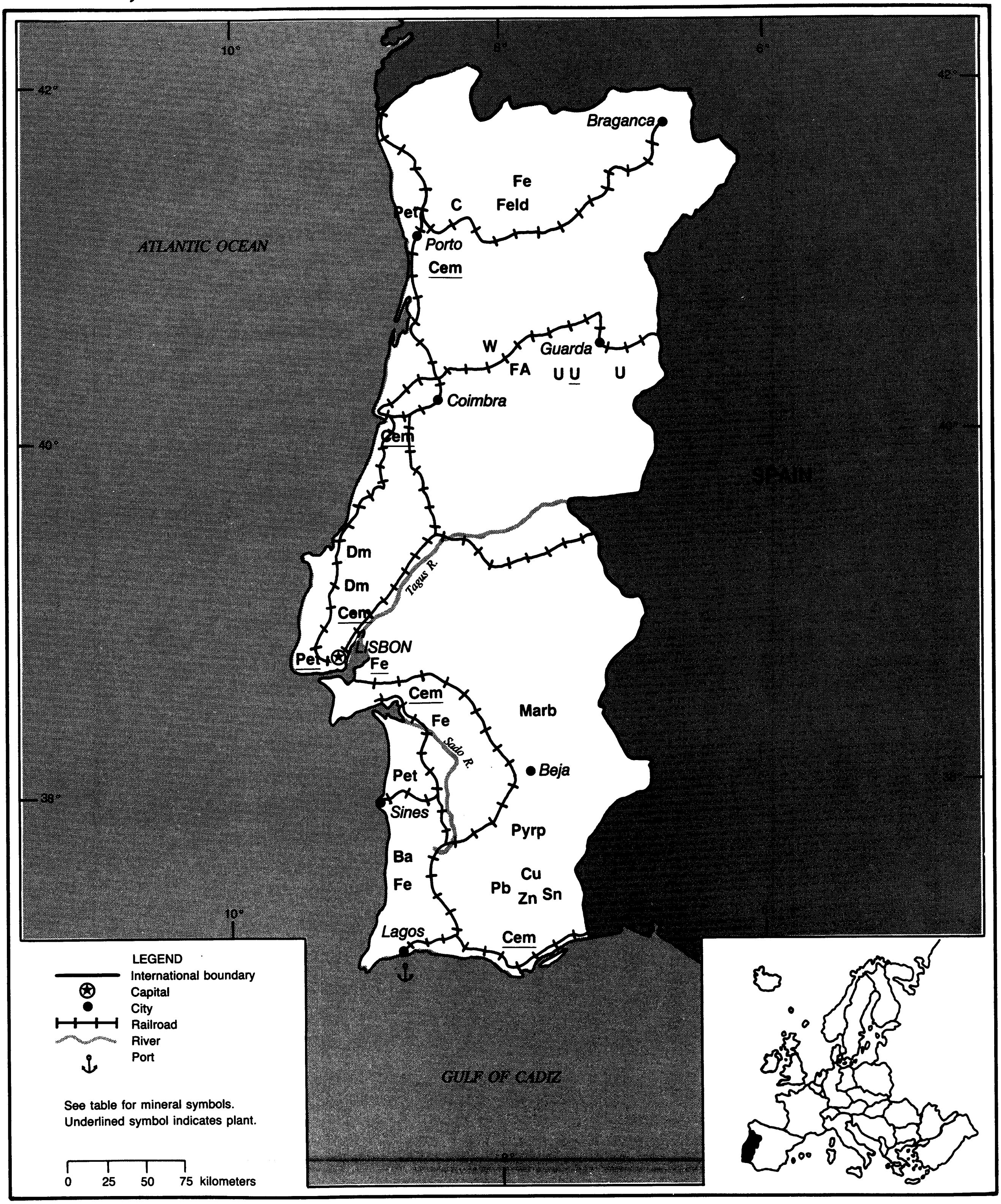
Ministry of Industry
Warsaw, Poland
Ministry of the Environment, Forestry, and Natural Resources
Warsaw, Poland
Kombinat Gorniczo Hutniczy Miedzi
Lubin, Poland

Publications

Przeglad Gorniczy (Mining Review), Warsaw, annually.
Przeglad Geologiczny (Geology Review), Warsaw, annually.
Rocznik Statystyczny Przemyslu (Statistical Handbook for Industry) Glowny Urzad Statystyczny (Main Statistical Directorate), Warsaw, annually.
Rocznik Statystyczny (Statistical Abstract) Glowny Urzad Statystyczny (Main Statistical Directorate), Warsaw, annually

PORTUGAL

AREA 91,640 km² **POPULATION 10.5 million**



THE MINERAL INDUSTRY OF PORTUGAL

By Harold R. Newman

Portugal, whose land area includes a portion of the Iberian peninsula, is in one of the most mineralized areas of Western Europe. The Iberian peninsula has a diverse mining history that goes back to Phoenician times, and its abundant mineral resources were one of the considerations that precipitated the Roman conquest of the region.

The mineral resource industry of Portugal is modest by world standards; however, the industry is undergoing important changes with the continued development of the rich copper and tin deposit at Neves-Corvo. When the mine reaches full production of 150,000 tons per year of copper in concentrate and 5,000 tons per year of tin in concentrate in 1991, it will represent a major increase in European copper and tin production. The country is also a significant tungsten producer.

The country posted a reported overall growth of about 4%, with investment continuing to expand as a result of fiscal incentives and foreign interest in the country. The annual inflation rate was about 13%, more than twice the EC average. The unemployment rate continued at about 5.5%. Portugal has been one of the fastest growing economies in the EC over the past 5 years and was expected to grow at a rate above the average for the EC in the medium-term outlook.[1] This growth was due, in no small part, to a massive modernization program backed by EC funds.

GOVERNMENT POLICIES AND PROGRAMS

The Government continued with legislation that would privatize many public companies. Petroleos de Portugal, S.A. (Petrogal), the state oil group, and Siderugia Nacional, E.P. (SN), the state steel company, were being considered for privatization. The planned privatization of Cimentos de Portugal, E.P. (Cimpor) and Cia. Geral de Cal e Cimento, S.A. (Secil), the country's two cement producers, was delayed until sometime in the future. The privatization issue is part of a broader program to reduce the role of the state and restructure the Portuguese economy from one that is state-controlled to one that is market-driven. On the revenue side, income from the privatizations would help pay off some of the Government debt. The value of Cimpor was estimated at about $900 million; Petrogal at about $800 million; and SN at close to $425 million.[2]

Portugal is also addressing its nationalized industries in other ways. It was spending an estimated $1.5 billion to restructure and streamline SN in order to meet the EC's steel industry quotas and regulations. This was part of a program placed at the disposal of industries for the modernization of plants and development of infrastructure to increase competitiveness and was financed by a joint program of the EC and the Government.

PRODUCTION

Sociedade Mineira de Neves-Corvo S.A.R.L. (Somincor) continued to produce copper and tin at the Neves-Corvo Mine. Piritas Alentejas S.A.R.L. was the largest producer of pyrite; Siderúrgia Nacional, E.P., produced iron and steel; Beralt Tin and Wolfram Ltd. remained a significant tungsten producer; and Cimentos de Portugal, S.A., was an important producer of cement. With the exception of copper, ferroalloys, dimension stone, tin, and tungsten, production of minerals and related materials was significant only domestically. There was potential for increased production of granite, marble, and slate.

TRADE

In 1989, the latest year for which complete data were available, Portugal's major markets were France, the Federal Republic of Germany, and the United Kingdom, while its major suppliers were the Federal Republic of Germany, Spain, and France. Overall, EC countries accounted for about 73% of exports and 68% of imports in 1988, which were somewhat higher than those of the previous year. The growth in exports was attributed to the continued devaluation of the escudo against other EC currencies while imports rose owing to strong demand for EC consumer goods and light machinery. Portuguese trade with Spain continued to increase because of mutual tariff and nontariff liberalization.

STRUCTURE OF THE MINERAL INDUSTRY

By world standards, the mineral industry of Portugal is modest; however, the country was a significant producer of copper and tin as Somincor's Neves-Corvo Mine came on-stream. The mine is considered to be one of the richest copper deposits in the world and, when fully developed, will be the largest copper mine of any type in Europe.

Most of the large mineral resource companies are owned or controlled by the Government although there are some privately owned operations. The Government was engaged in efforts to privatize some state-owned industries, which included mineral resource companies. However, with the exception of Neves Corvo, the present structure of the mineral industry is not likely to change in the near future.

Ownership of minerals is vested in the Government by the Constitution. Any person, Portuguese or foreigner, may explore for and, if a mineral deposit is found, apply for a concession. The Directorate of Mines and Geological Services of the Ministry of Industry regulates the mineral industry and collects statistics. About 50,000 people are employed by the mineral industry, including mining and processing.

COMMODITY REVIEW

Metals

Copper.—The Neves-Corvo Mine continued to increase production in 1990. The mine, which started operations in 1989, was operating at about 95% capacity at yearend. Somincor, the operating company, is 51% Government-owned through the Portuguese Mineral Development Agency (EDM). The minority partner is RTZ Corp., a United Kingdom company, which owns 49% of the joint venture.

TABLE 1

PORTUGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	1988	1989[p]	1990[e]
METALS					
Arsenic, white	[r]197	218	214	199	200
Beryl concentrate, gross weight	—	4	4	[e]4	4
Columbite and tantalite concentrates, gross weight	6	—	—	—	—
Copper:					
Concentrate:					
Gross weight	865	800	42,483	411,836	[2]651,750
Cu content	184	100	3,739	103,718	[2]162,938
Metal:[e]					
Smelter:					
Primary	3,000	2,000	2,500	688	1,000
Secondary	3,000	2,000	2,000	2,000	2,000
Total	6,000	4,000	4,500	2,688	3,000
Refined, primary	5,300	5,300	6,000	6,000	6,000
Gold, mine output, Au content kilograms	192	248	267	[e]295	360
Iron and steel:					
Iron ore and concentrate:					
Gross weight:					
Hematite and magnetite	22,412	9,142	3,450	—	—
Manganiferous	28,200	18,316	23,300	13,178	12,480
Total	50,612	27,458	[re]26,750	13,178	[2]12,480
Fe content:					
Hematite and magnetite	9,413	[e]4,000	8,296	[e]1,106	—
Manganiferous	9,447	[e]5,000	1,957	4,689	4,443
Total	18,860	9,000	10,253	[e]5,795	4,443
Metal:					
Pig iron thousand tons	429	435	445	[e]377	[2]339
Ferroalloys:					
Ferromanganese[e]	20,000	[r]17,000	[r]10,000	[2]13,170	12,480
Silicomanganese[e]	10,000	[r]8,000	[r]5,000	—	—
Ferrosilicon[e]	5,000	[r]2,000	—	—	—
Silicon metal[e]	7,000	[r]3,000	[r]2,500	—	—
Ferrotungsten	17	—	—	—	—
Total[e]	42,017	[r]30,000	[r]17,500	[r]13,170	12,480
Crude steel thousand tons	708	530	802	762	[2]747
Lead: Refined, secondary[e]	6,000	6,500	6,500	[r]7,000	7,000
Manganese: Mn content of iron ore	2,087	2,059	1,782	[e]1,800	1,200
Silver, mine output, Ag content kilograms	529	755	877	[e]815	900
Tin:					
Mine output, Sn content	197	64	81	63	4,680
Metal, primary and secondary	194	22	58	[e]62	1,404
Titanium, concentrates:					
Gross weight	232	141	59	[e]111	45
Content of TiO_2	116	70	30	[e]55	22
Tungsten, mine output, W content	1,637	1,205	1,382	1,376	1,400
Uranium concentrate: U content	109	142	189	124	130
Zinc: Smelter, primary	5,700	5,800	[e]6,000	[e]5,000	5,000
INDUSTRIAL MINERALS					
Barite	120	660	1,740	[e]1,729	1,220

See footnotes at end of table.

TABLE 1—Continued

PORTUGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	1988	1989[p]	1990[e]
INDUSTRIAL MINERALS—Continued					
Cement, hydraulic thousand tons	5,444	[e]5,800	5,900	[e]6,000	6,000
Kaolin[3]	54,841	66,736	71,200	58,297	[2]73,849
Refractory[e]	250,000	240,000	[2]50,253	50,000	50,000
Diatomite	2,120	2,880	2,070	[e]2,990	2,190
Feldspar	33,740	40,729	51,903	65,854	[2]43,954
Gypsum and anhydrite	[e]230,000	—	338,029	[e]300,000	300,000
Lime, hydrated and quicklime[e]	200,000	200,000	200,000	200,000	200,000
Lithium minerals: Lepidolite	—	—	212	274	[2]159
Nitrogen: N content of ammonia	118,000	153,900	190,500	[e]151,000	198,200
Pyrite and pyrrhotite (including cuprous), gross weight	327,966	279,061	244,175	199,018	[2]144,190
Salt:					
Rock	450,908	513,203	535,942	[e]583,670	523,300
Marine[e]	110,000	[2]123,000	[r]138,784	[r]150,000	125,000
Total[e]	560,908	636,203	[r]674,726	[r]733,670	648,300
Sand[e]	5,000	5,000	5,000	5,000	5,000
Sodium compounds, n.e.s.:[e]					
Soda ash	155,000	160,000	155,000	155,000	150,000
Sulfate	52,000	55,000	52,000	55,000	50,000
Stone:[e]					
Basalt thousand tons	65	65	[2]87	[2]86	85
Calcareous:					
Dolomite do.	100	100	[2]105	100	100
Limestone, marl, calcite do.	10,000	10,000	[2]15,418	15,000	14,000
Marble do.	[r]509	[r]570	[2]672	700	650
Diorite do.	1,600	1,600	1,600	1,500	1,500
Gabbro do.	50	50	50	50	50
Granite do.	[2]5,838	[2]6,393	[2]7,071	[2]6,752	6,800
Graywacke do.	1	1	[2]28	[r]18	20
Ophite do.	50	50	[2]64	[r]58	60
Quartz do.	130	130	[2]11	[r]10	10
Quartzite do.	600	600	[2]568	600	575
Schist do.	50	50	[2]105	100	100
Slate do.	100	100	[2]27	[r]32	30
Syenite do.	75	75	[2]23	25	25
Sulfur:					
Content of pyrites	[r]141,466	[r]122,787	111,344	90,752	95,000
Byproduct, all sources[e]	5,000	5,000	3,000	3,000	3,000
Total[e]	[r]146,466	[r]127,787	114,344	[r]93,752	98,000
Talc	4,141	7,702	7,187	8,063	[2]7,926
MINERAL FUELS AND RELATED MATERIALS					
Coal, anthracite thousand tons	212	254	241	[e]258	276
Coke, metallurgical do.	280	160	[e]160	[e]160	160
Gas, manufactured[e] million cubic meters	133	136	136	136	136
Petroleum refinery products:[e]					
Liquified petroleum gas thousand 42-gallon barrels	[2]3,577	3,500	3,600	3,600	3,500
Gasoline do.	[2]10,632	8,500	8,900	9,000	9,200

See footnotes at end of table.

TABLE 1—Continued

PORTUGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum refinery products[e]—Continued						
Jet fuel	thousand 42-gallon barrels	[2]5,111	4,900	4,700	5,000	4,800
Kerosene	do.	[2]227	220	230	225	230
Distillate fuel oil	do.	[2]16,550	16,800	17,500	17,000	18,000
Residual fuel oil	do.	[2]17,289	15,600	16,200	16,000	16,000
All other products	do.	[2]10,389	8,800	9,300	9,000	8,800
Refinery fuel and losses	do.	[2]3,995	3,900	4,100	4,000	3,600
Total	do.	[2]67,770	62,220	64,530	63,825	64,130

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 1, 1991.
[2]Reported figure.
[3]Includes washed and unwashed kaolin.

TABLE 2

PORTUGAL: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Cimentos de Portugal S.A. (Cimpor)	10 plants, various locations	6,000
Coal	Empressa Carbonifera de Duro S.A.S.L.	Mine at Pajao	250
Copper	Sociedade Minera de Neves-Corvo S.A.R.L. (Somicor)	Neves-Corvo Mine, near Castro Verde	150
Diatomite	Sociedade Anglo-Portugesa de Diatomite Lda.	Mines at Obidos and Rolica	5
Feldspar	A.J. da Fonseca Lda	Seixigal Quarry, Chaves.	10
Ferroalloys	Electrometalurgia S.A.R.L. (Eurominas).	Plant at Setubal	100
Petroleum, refined, barrels per day	Petroleos de Portugal, (Petrogal)	Refineries at Lisbon, Porto, and Sines	300,000
Pyrite	Piritas Alenejanas S.A.R.L.	Mines at Aljustrel	500
Steel, crude	Siderúrgia Nacional S.A.R.L.	Ironworks and steelworks at Seixal and Maia	1,000
Tin	Sociedade Minerera de Neves-Corvo S.A.R.L. (Somicor)	Neves-Corvo Mine near Castro Verde	5
Tungsten	Beralt Tin and Wolfram (Portugal) Ltd.	Mine and plant at Panasqueira	1,600
Uranium, metric tons per year	Empresa Nacional de Uranio (ENU)	Mines and plant at Guarda	170
Zinc, refined	Quimigel E.P.	Electrolytic plant at Barreiro	11

The mine is designed to produce 1.3 million tons of raw ore per year, which was expected to yield 150,000 tons of copper in concentrate per year. The estimated life of the mine, based on proven reserves, was 20 years. Total investment in the project was estimated to be $400 million.

The Neves-Corvo complex consists of four proven ore bodies: Graca, reported to be averaging 10% copper; Corvo, ranging from 7% to 10% copper; Neves, averaging 1% copper; and Zambujal, a complex sulfide ore of copper, lead, and zinc. Zinc is also associated with the other three deposits, reportedly averaging 10% in the Graca ore body.

Outokumpu Oy, a Finnish company, was continuing with its feasibility study, including financial and marketing arrangements, toward building a copper smelter and refinery in Portugal. The joint venture, known as the Metalurgia do Cobre (Metcob) Project, is 60% owned by Outokumpu, with the remaining interest held by a consortium of Portuguese companies, including the state-owned Investimentos e Participacoes do Estado (IPE). Preliminary plans called for the construction of a 200,000 mt/a capacity smelter and a 100,000 mt/a capacity refinery. The proposed site of the project would be near the natural harbor of Sines.

In 1990, Outokumpu started the purchase of 110,000 mt/a of concentrates from the Neves-Corvo operation for a period of 12 years. The concentrates were to furnish about 25% of the feed for Outokumpu's Harjavalta smelter in Finland.

Iron and Steel.—The Portuguese iron and steel operation was nationalized in 1975 and continues to function as a public entity incorporated as Siderúrgia Nacional, E.P. (SN). The main goal of SN is to ensure its viability beyond the transition period of 1991, as mentioned in Portugal's Act of Accession to the EC. Achievement of this required a reorganization of SN's financial situation and a modernization plan for the production plants to ensure that SN would be competitive within an open market in the EC.

SN had almost completed its restructuring and modernization program at yearend. The program was intended to improve product quality, reduce production costs, increase energy efficiency, and implement a 40% rationalization of personnel. In other actions, the Government changed SN into a public limited company as a major step toward privatization. If SN is privatized, the Government was expected to retain a minority share of 25% to 30% to maintain an effective role in the company's affairs.

Tin.—Somincor's tin concentrator was inaugurated in May 1990. The facility includes three stages of crushing, grinding, tabling, and flotation and filtration. The project also included related infrastructure, utilities, a loadout facility, and a 5-kilometer long tailings pipeline. The plant was considered to be unique in that it was designed to process two types of ore, one type is a shale and the other a sulfide, to produce three grades of tin concentrate ranging from 25% to 55% metal content. Plant capacity is 5,000 metric tons per year of tin in concentrate, which should make Portugal one of the world's top 10 tin producers. Somincor stated it would initially produce two grades of concentrate: one with a grade of 50% to 55% tin and the other with a lower grade of 30% to 35% tin. Also, although plant capacity was 5,000 mt/a, recovery levels would fluctuate from year to year because of the complex nature of the ore body. In 1990, mining was restricted to the Upper Corvo and Graca deposits.

Tungsten.—In late 1990, Charter Consolidated Ltd. sold its 60% interest in Beralt Tin and Wolfram (Portugal) Ltd. to Minorco S.A., of Luxembourg. Beralt was the only producer of tungsten in 1990 and was proceeeding with development work at its Panasqueira Mine near Fundao. The work is to improve efficiency and increase the life of the mine beyond the current estimate of 5 years. Most of the work was directed toward accessing lower levels where proven reserves were estimated to be sufficient for a 40-year mine life at the current production rate of 1,500 mt/a of tungsten in concentrate.

Industrial Minerals

Demand for cement continued as the building and construction industry maintained its levels of activity. This situation was expected to continue given the substantial volume of work expected in coming years to develop Portugal's infrastructure. The Portuguese Government was continuing to examine measures to privatize the country's cement industry.

CIMPOR, the leading cement producer, signed an agreement with Ciments Français of France creating a joint-venture company, PREFASA, to develop industrial concrete activities in Portugal.

The dimension stone industry continued as a very important segment of the mining industry in terms of value. Marble is the most valuable of the stone products and accounts for about 68% of stone production. The main area for marble mining contined to be the district of Evora.

Mineral Fuels

Coal accounts for about 4% of total energy consumption. Although there are some domestic reserves, most coal is imported. There is a growing demand for coal because the electricity sector is switching away from oil. There are no gas reserves and no nuclear powerplants. Hydropower accounts for about 45% of electricity generation. The Government was seeking to diversify its energy sources and increase electrical power capacity to meet consumption growth. To that end, the Government was considering major energy projects. One was the construction of a liquefied natural gas pipeline, originating in Setubal, 50 kilometers south of Lisbon, and going north 300 kilometers to Oporto. A gas-fired electric generating plant would be linked to the pipeline. The total project cost was estimated to be about $750 million. A four-unit, 1,200-megawatt (MW), coal-fired station is to be built at Pego. The first unit, generating 300 MW, is scheduled to be on-line in 1992 and the total project completed by mid-1994.

Construction was nearly complete on the four-unit, coal-fired powerplant at Sines. When completed, the station will have a capacity of 1,200 MW. Domestic production of coal is relatively low, and Portugal is dependent on imported energy sources.

INFRASTRUCTURE

The transportation network includes 3,613 kilometers of railroad, most of

TABLE 3

PORTUGAL: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1990

(Million metric tons)

Commodity (ore)	Reserves[e]
Copper	32.5
Lead	5.0
Tin	3.0
Zinc	3.5

[e]Estimated.

which is operated by the state-owned Portuguese Railroad Co. Most of the trackage is single-track, 1.665-meter gauge, of which about 15% is electrified. Portugal has about 74,000 kilometers of usable highways, of which 84% is paved. Goods are also moved by waterborne coastal shipping. Major seaports are Lisbon, Porto, and Sines.

OUTLOOK

With the discovery and development of major sulfide deposits in the south, mineral resources are an important concern of the Government. Tax incentives and other stimuli should encourage further interest by mineral resource companies, which in turn should cause discovery and development of other mineral resources and modernization of existing industries. In the short term, however, Portugal is expected to remain a net importer of mineral-related products, especially mineral fuels.

[1]Barclays Bank PLC. Country Report-Portugal, Economics Dep., Sept. 1990, p. 5.

[2]Financial Times (London). June 6, 1991, p. 14.

[3]Where necessary, values have been converted from Portuguese escudos (Esc) to U.S. dollars at the rate of Esc142.60=US$1.00, the average exchange rate for 1990.

OTHER SOURCES OF INFORMATION

Agencies

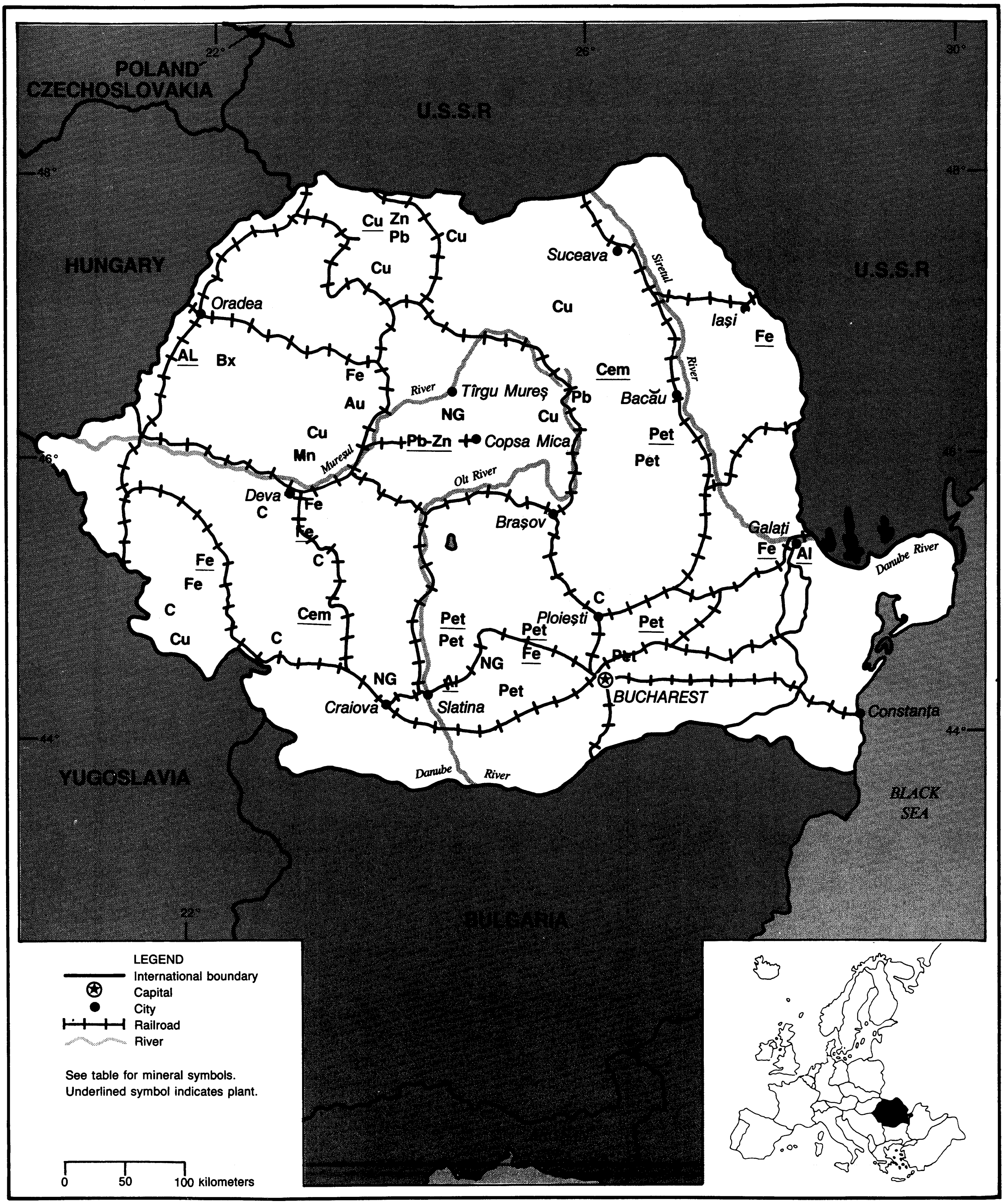
Ministry of Industry, Energy, and Exports
General Direction of Geology
Av. António José de Almeida
1078 Lisboa Codex
Lisbon, Portugal

Publications

Bulletins listed are published by the Ministry of
Industry, Energy, and Exports, Lisbon:
Bulletin of Industrial Statistics, monthly.
Bulletin of Statistics, monthly.
Bulletin of Mines, quarterly.

ROMANIA

AREA 238,000 km² **POPULATION 23.4 million**



THE MINERAL INDUSTRY OF ROMANIA

By Walter G. Steblez

Following the revolution of December 1989, which overthrew more than 40 years of communist rule, Romania's economy experienced a severe economic recession. The political and social disturbances that occurred throughout 1990 brought some industries to a virtual halt for extended periods of time and affected the country's entire economy. The dissolution of harsh discipline at the workplace and the lack of real economic incentives for hard work resulted in very high absenteeism during the year. Industrial production fell sharply in 1990 and was accompanied by a high increase in prices. In 1990, the country's GDP, measured in constant prices, fell by almost 9%. Similarly, the value of industrial production declined by 19.2%.

Romania's mineral industry continued to produce modest amounts of bauxite, copper, iron, lead-zinc, and manganese ores. The output of petroleum also remained on a declining trend because of dwindling reserves. Romania, once among the leading world petroleum producers, had to import substantial amounts of crude petroleum to meet the needs of its refineries.

GOVERNMENT POLICIES AND PROGRAMS

During the decade that led to the revolution at the end of 1989, one of the main aspects of the Government's economic policy was to rapidly repay the country's convertible currency foreign debt.

From 1981 to 1989, Romania carried out a program of import reduction from market economy countries, while accelerating exports of all commodities and goods marketable on a hard currency basis. As in other centrally planned economy countries, Romania set centrally planned production targets in terms of gross weight of output indicators that often resulted in the production of goods that were not suited to the needs of the end user.

Despite Romania's claim to be a leading world producer and exporter of mining equipment, the country's mining industry was perennially short of spare parts for its capital equipment. Mining enterprises were often supplied with spare parts that could not be used in repair and maintenance, and stockpiles of goods, reportedly, overcrowded storage facilities.

In 1990, Romania's new Government, headed by the National Salvation Front (NSF), instituted a reform program to orient the country's economy to a market economy system. The main facets of the proposed new Government policy were the abolition of central planning; the reduction of the number of Government ministries by one-half; the abolition of state-owned monopoly foreign trade organizations; and the conversion of most state-owned enterprises to mixed Government and private ownership.

Among the most serious problems facing the Romanian Government in 1990 was the 40-year legacy of uncontained environmental pollution. Romania's record of industrial pollution was perhaps the worst among the former centrally planned economy countries in Europe.

Despite the claim by the former Government to have had the most comprehensive environmental regulations in Europe, these regulations practically were not enforced. The country's steelworks, nonferrous metals processing plants, low-rank-coal-fired powerplants, cement factories, and petroleum refineries were among the heaviest polluters in the industrial sector. According to estimates by the Romanian Ministry of the Environment, the country's annual discharge of pollutants included 138 Mmt of noxious emissions, which included 134 Mmt of carbon dioxide, 1.8 Mmt of sulfur dioxide, 8,500 tons of ammonia, and 2,300 tons of phenol.

PRODUCTION

In 1990, production declined in nearly every category of mineral production chiefly because of political and social instability in the country throughout the year. Other factors that contributed to the decline of production were shortages of foreign exchange required for imports of raw materials (largely natural gas and petroleum), as well as the rapid dissolution of CMEA, which was an important source of barter-based trade in minerals. Romania's mineral industry remained state owned and operated during the year despite formal structural changes instituted by the Government to allow a transition to a market system.

TRADE

Although detailed statistics for Romania's foreign trade in 1990 were unavailable, the Government's National Commission for Statistics reported summary trade data on both exports and imports, valued in U.S. dollars. The value of minerals traded during the year was summarized under the designation of fuel, mineral raw materials, and metals.

In 1990, the value of Romania's mineral exports amounted to more than $ 1.9 billion or 33.7% of total exports. Presumably, the substantial mineral export share of the country's total exports reflected a sizable refined petroleum products component. Additionally, mineral exports continued to be the highest value component of total exports to market economy countries, representing 48.7% of total exports to this area. Mineral exports to former centrally planned economy countries were modest by comparison, comprising about 10% of total exports to this block. Mineral imports in 1990 amounted to 47.6% of Romania's total imports. Again, the major component of Romania's mineral imports presumably consisted of crude petroleum designated for the country's relatively large refining industry. Imports of mineral raw materials transacted on a hard-currency basis represented 57% of all imports on that basis. Similarly, Romania's non-hard-currency-based mineral imports represented 35% of all imports transacted on that basis in 1990.

STRUCTURE OF THE MINERAL INDUSTRY

The information provided in table 2 lists the names of administrative bodies as well as subordinate production units of the chief branches of the country's mineral industry.

TABLE 1

ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1986	1987	1988	1989	1990[e]
METALS					
Aluminum:					
Bauxite, gross weight	500,000	480,000	[r]500,000	[r]313,000	[3]204,000
Alumina, calcined, gross weight	555,000	584,000	620,000	611,000	[3]440,000
Ingot including alloys:					
Primary	253,000	260,000	265,600	269,100	[3]178,000
Secondary[e]	16,000	15,000	15,000	15,000	10,000
Total	269,000	275,000	[e]280,600	284,100	188,000
Bismuth, mine output, Bi content[e]	80	75	65	65	40
Cadmium metal, smelter[e]	55	50	48	46	20
Copper:[e]					
Mine output, Cu content	35,000	38,000	40,000	[3]42,912	[3]24,700
Metal:					
Smelter:					
Primary	35,000	38,000	40,000	42,900	[3]28,325
Secondary	1,000	1,000	1,000	1,500	1,000
Total	36,000	39,000	41,000	44,400	29,325
Refined:					
Primary	40,900	39,500	40,000	42,900	[3]24,700
Secondary	3,100	3,000	3,000	5,100	3,000
Total	44,000	42,500	43,000	48,000	27,700
Gold, mine output, Au content[e] kilograms	1,870	1,870	1,870	2,020	2,000
Iron and steel:					
Iron ore:					
Gross weight thousand tons	2,431	2,281	[e]2,400	2,482	2,200
Content (26% Fe) do.	632	595	[e]624	645	580
Metal:					
Pig iron do.	9,329	8,673	9,502	[e]9,500	6,500
Ferroalloys:[e]					
Ferrochromium	44,000	42,000	42,000	42,000	20,000
Ferrosilicon	51,000	50,000	50,000	50,000	26,000
Ferromanganese	82,000	81,000	80,000	80,000	40,000
Silicomanganese	40,000	39,000	40,500	40,000	20,000
Silicon metal	4,500	4,500	4,500	4,400	1,500
Steel:					
Crude thousand tons	14,276	13,885	14,496	14,415	9,787
Semimanufactures:					
Castings and forgings, finished[e] do.	[3]1,336	1,400	1,300	1,300	1,000
Pipes and tubes do.	1,565	1,394	[e]1,500	1,360	900
Rolled products do.	10,207	9,675	[e]9,500	10,263	8,000
Lead:					
Mine output, Pb content[e]	36,300	30,200	32,800	[3]37,679	16,000
Smelter, primary	45,500	37,700	38,000	[e]41,100	19,800
Refined:					
Primary[e]	45,500	37,700	38,000	41,100	13,000
Secondary[e]	6,000	[3]5,486	6,000	3,900	2,000
Total	51,500	43,186	44,000	45,000	15,000
Manganese:[4]					
Ore, gross weight[e] thousand tons	250	250	235	219	200

See footnotes at end of table.

TABLE 1—Continued

ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989	1990[e]
METALS—Continued						
Manganese[4]—Continued						
Concentrate:						
Gross weight	do.	67	68	60	48	40
Mn content[e]	do.	19	19	17	12	10
Silver, mine output, Ag content[e]		23	20	23	26	12
Zinc:						
Mine output, Zn content[e]		43,000	40,000	42,000	[3]54,467	15,000
Metal, smelter, primary and secondary		53,000	51,000	50,000	[e]49,500	11,000
INDUSTRIAL MINERALS						
Barite[e]		25,000	25,000	25,000	[3]25,250	15,000
Cement, hydraulic	thousand tons	14,216	13,583	[e]14,000	[e]14,000	7,500
Clays:[e]						
Bentonite		185,000	180,000	180,000	180,000	150,000
Kaolin		410,000	400,000	400,000	400,000	250,000
Diamonds, synthetic industrial	thousand carats	—	—	5,000	[e]5,000	3,000
Diatomite[e]		65,000	55,650	55,000	[3]49,975	39,000
Feldspar[e]		70,000	65,000	65,000	[3]59,960	45,000
Fluorspar[e]		20,000	18,000	18,000	18,000	12,000
Graphite[e]		12,000	12,000	12,000	[3]10,000	6,000
Gypsum[e]		1,600	1,600	1,600	1,400	800
Lime	thousand tons	3,959	3,936	[e]4,000	[e]4,000	3,000
Nitrogen: N content of ammonia	do.	3,041	2,788	[e]2,800	2,700	2,000
Pyrites, gross weight[e]	do.	975	850	930	[3]897	400
Salt:						
Rock salt[e]	do.	2,000	2,000	2,000	3,365	2,000
Other	do.	3,355	3,395	[e]3,400	3,306	2,000
Total	do.	5,355	5,395	5,400	[r]6,671	4,000
Sand[e]	do.	2,500	2,500	2,450	2,400	2,000
Sodium compounds, n.e.s.:						
Caustic soda	do.	846	817	821	[e]820	600
Sodium carbonate, manufactured, 100% Na_2CO_3 basis	do.	895	894	918	[e]890	700
Sulfur:[e]						
S content of pyrites	do.	390	340	370	[3]359	150
Byproduct, all sources	do.	410	350	380	[3]375	200
Total	do.	800	690	750	[3]734	350
Sulfuric acid	do.	1,971	1,693	1,825	[e]1,800	900
Talc[e]		64,000	55,000	50,000	[3]45,638	35,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		105,802	88,790	[e]90,000	[e]85,000	65,000
Coal:						
Run-of-mine:						
Anthracite and bituminous	thousand tons	11,074	11,693	11,700	8,294	8,200
Brown	do.	858	897	870	844	800
Lignite	do.	39,400	43,109	50,600	52,200	52,000
Total	do.	51,332	55,699	63,170	61,338	61,000

See footnotes at end of table.

TABLE 1—Continued

ROMANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989	1990[e]
MINERAL FUELS AND RELATED MATERIALS-Continued						
Coal—Continued						
Washed (produced from above):						
Anthracite and bituminous:						
For coke and semicoke production	do.	3,276	3,474	9,160	6,450	6,000
For other uses	do.	5,420	5,625	2,540	1,884	1,000
Brown	thousand tons	810	846	840	[e]800	750
Lignite	do.	38,012	41,579	48,800	50,350	50,000
Total	do.	47,518	51,524	[r]61,340	[r]59,484	57,750
Coke:						
Metallurgical	do.	5,088	5,326	5,228	[e]5,000	4,000
Other	do.	582	500	[e]500	[e]500	200
Total	do.	5,670	5,826	[e]5,728	[e]5,500	4,200
Fuel briquets (from brown coal)[e]	do.	750	750	750	750	500
Gas, natural:						
Gross:						
Associated	million cubic meters	12,608	12,117	11,900	[e]11,600	8,000
Nonassociated	do.	26,763	25,301	24,900	[e]25,400	20,000
Total	do.	39,371	37,418	36,800	[e]37,000	28,000
Marketed[e]	do.	31,500	29,900	29,400	29,500	21,000
Petroleum:						
Crude:						
As reported	thousand tons	10,125	9,504	10,896	9,237	8,900
Converted	thousand 42-gallon barrels	76,545	71,850	82,374	69,832	65,000
Refinery products[e]	do.	185,500	184,000	185,000	185,000	140,000

[e]Estimated. [r]Revised.
[1]Includes data available through May 1991.
[2]In addition to the commodities listed, antimony, asbestos, and a variety of crude construction materials are produced, and molybdenum may have been produced as a byproduct of copper from 1987 on, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.
[3]Reported figure.
[4]Estimated series were based on published data on concentrate production.

COMMODITY REVIEW

The profile of Romania's mining, processing, and fabricating industries in 1990 reflected the economic priorities dictated by the previous regime. In concert with the rest of the member countries of the CMEA, Romania's policy for industrial development was structured on the U.S.S.R.'s model of industrial development. Centrally planned economic policy, relative to raw materials, stipulated self-sufficiency at all costs, and where possible, total independence of the world market in respect to imports. The profit motive was eliminated, and an economywide system of subsidies was established. Heavy industries such as mining, metallurgy (steel and nonferrous), and machine building were given priority allocations of capital for both development and modernization. Romania's post-1989 minerals industry, however, was under the twin clouds of unacceptable rates of environmental pollution and questionable economic viability.

Metals

Aluminum and Bauxite.—Romania continued both open pit and underground bauxite mining operations at Dobresti-Oradea. Domestic bauxite was blended with small quantities of bauxite imported from Yugoslavia to be used as a feedstock at the Oradea alumina refinery. Imported feedstock was used exclusively at the Tucea refinery. Bauxite traditionally imported from Greece for the Tulcea refinery was in recent years largely replaced by bauxite imported from Australia and Guinea.

The Tulcea refinery exclusively produced metallurgical-grade alumina, whereas the Oradea refinery produced a small quantity of hydrated alumina in addition to metallurgical-grade alumina. Romania's only primary aluminum smelter was at Slatina in the southeastern part of the country. In 1990, the shortage of electric power was the chief reason for the substantial decline of aluminum production compared to the output levels of past years. Additionally, owing to a shortage of hard currency, imports of bauxite were reduced during the year.

The rescission of the former Government's strict control of domestic consumption should increase domestic aluminum use. However, the long-term viability of the country's aluminum industry would depend on its ability to compete in the world market and ability to find the capital necessary to retrofit its facilities with pollution abatement technology. The

TABLE 2

ROMANIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Ministry of Metallurgical Industry.	Plant at Oradea, near Hungarian border	270
Do.	do.	Plant at Tulcea, Danube Delta	270
Aluminum, primary	do.	Slatina Aluminum Enterprise, 120 kilometers west of Bucharest	270
Barite	Ministry of Mines	Ortra mine, Rosia Montana, southwest of Cluj	100
Bauxite	do.	Oradea-Dobresti Mining Complex, near Hungarian border	350
Cement	Ministry of Industrial Construction	Tasca-Bicaz plant, near Piatra Neamt	3,000
Do.	do.	Cimpulung plant, about 60 kilometers north of Pitesti	2,000
Do.	do.	Medgidia plant, west of Constanta	1,000
Do.	do.	Pieni plant, 20 kilometers north of Tirgoviste	600
Coal:			
Bituminous	Ministry of Mines	Valea Jiului Mining Complex, near Hunedoara	10,400
Lignite	Ministry of Mines, Oltenia Mining Complex, including Rovinari Mining Enterprise	Jiu Valley, Oltenia County, north of Craiova	20,300
Do.	Ploesti Mining Complex	About 50 kilometers north of Bucharest.	8,700
Copper:			
Ore (concentrate)	do.	Baia Mare, Baia-Sprie, and Cavnic mines, northwest area near U.S.S.R. border; Rosia Montana, Noud, Borsa, Balan, and Lesul-Ursului mines—in east-west arc along Carpathian range; Rosia Poieni mines; and Moldova Noua mines, southwest near Danubian border with Yugoslavia	180
Metal	Ministry of Metallurgical Industry Metallurgical Enterprise for Nonferrous Metals	Baia Mare, in northwest near U.S.S.R. and Hungarian borders	35
Do.	do.	Zlatna smelter, Apuseni, in northwest Romania	13
Ferroalloys	Ministry of Metallurgical Industry	Complex at Tulcea	280
Iron ore	Ministry of Mines	Mining complex at Hunedoara, in west-central Romania	1,320
Do.	do.	Resita Mining Complex, southwestern Romania, near Yugoslav border	660
Do.	do.	Napoca-Cluj Mining Complex, northwestern Romania on the Somesul River	990
Lead in ore	do.	Baia Mare Mine, near U.S.S.R. and Hungarian borders	24
Do.	do.	Balan Mine, 50 kilometers southwest of Piatra Neamt	10
Lead metal	Ministry of Metallurgical Industry, Uzina Chimica Metallurgica	Smelter at Copsa Mica, central Romania, on the Tirnava Mare River	42
Natural gas million cubic feet per year	Ministry of Petroleum and Gas	Tirgu Mures Field at Tirgu Mures, north-central Romania	996,000
Do.	do.	Ploesti Field, 50 km north of Bucharest	249,000
Petroleum, crude barrels per day	Ministry of Petroleum and Gas	Ploesti-Teleajen, Pitesti, and Tirgoviste Fields, in Prahova Valley around Bucharest; Bacau Field at Bacau, east-central Romania near the Siretul River; and West Carpathian Field, southeast Carpathian Range, between the west bank of the Olt River and Tirgu Jiu	250,000

TABLE 2—Continued

ROMANIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Petroleum products barrels per day	Ministry of Petroleum and Gass	Refineries at Brazi, Pitesti, Suplacu, Bacau, Borzesti, Brosov, Cimpina, Darmanesti, G. Gheorghiu Dej-Onesti, Ploesti, Telajen, and Navodari	533,000
Steel	Ministry of the Metallurgical Industry: Galati Steel Complex	Danube River, north of Braila, near the U.S.S.R. border	10,000
Do.	Hunedoara Steel Complex	West-central Romania, near Calan	4,000
Do.	Resita Steel Plant	Southwestern Romania, about 20 kilometers southwest of Caransebes	1,200
Do.	Calarasi Steel Plant	Near the Bulgarian border close to the Danube	600
Zinc in ore	Ministry of Mines, Baia Mare Mining Complex	Baia Mare, near the U.S.S.R. and Hungarian borders	60
Zinc metal	Ministry of Metallurgical Industry, Uzina Chimica Metalurgica	Imperial Smelter at Copsa Mica, Tirnava River, central Romania	66

Slatina aluminum enterprise was among the major industrial polluters in the country. Apart from noxious gases, the Slatina aluminum enterprise, reportedly, emitted significant quantities of flourine into the air.

Copper.—Copper was mined largely in two districts: the northern-northeastern part of the country that included mines at Baia Sprie, Cavnic, and Lesul Ursului, and in the western-southwestern part of the country, with major mines at Moldova Noua, Rosia Poieni, and Rosia Montana.

Generally, the grade of ore has been low, with major producing mines (Moldova Noua and Rosia Poieni) hoisting ore grading about 0.35% Cu or less. Concentrates from these areas were smelted and refined at Baia Mare and Zlatna. In 1990, the future of Romania's copper industry remained uncertain because of the country's low copper ore grades, the more modern smelters and refineries in nearby Yugoslavia (Bor) and Bulgaria (Damyanov), and excessive pollution generated by the copper industry. Baia Mare was among the most heavily polluted areas in Romania. Reportedly, Baia Mare's smelting and refining operations annually emitted between 30,000 tons and 50,000 tons of sulfur dioxide and in excess of 3,000 tons of metallic dust, which included more than 450 tons of lead and several dozen tons of arsenic, cadmium, and zinc. Within a 24-km radius of Baia Mare, the average life expectancy of the residents was reportedly 58 years, or 12 years below the national average. Reportedly, the incidence of cancer was 300 times that of other areas of the country. Similarly, but to a lesser extent, the Zlatna copper smelter and refinery, reportedly, has been releasing "hundreds" of tons of lead and copper into the atmosphere annually. Reconstructed in the mid-1980's, the Zlatna operation was somewhat better equipped than that of Baia Mare to handle copper concentrates containing relatively high cadmium, lead, and zinc values.

Iron and Steel.—The output of iron ore from the country's two operating mines at Hunedoara and Cluj Napoca, generally, has been declining since 1970. Moreover, domestically produced ore and concentrate did not significantly contribute to the feedstock requirements of the country's steel industry. Slightly more than 2 Mmt of low-grade ore (26% Fe) annually were washed and concentrated to produce about 400,000 tons of concentrate, grading 50% Fe. More than 95% of the iron and steel industry's iron ore requirements were met through imports. The U.S.S.R. traditionally has been Romania's chief supplier of iron ore, accounting for more than 50% of total imports of iron ore. However, major supplies of iron ore from Australia may become available to Romania's steel producers when the countertrade arrangement between Hancock Mining of Australia and Romania becomes fully implemented.

In 1990, political instability effectively prevented the formulation of a comprehensive restructuring plan for the country's steel industry. Industry experts viewed the Galati and Calarasi steel mills as well as the Tirgoviste specialty steel works as potentially viable operations, given adequate investment for modernization. The country's remaining steelmaking facilities, representing about 50% of the country's total steelmaking capacity, were considered uneconomic by Western standards and subject to eventual closure. One of the major problems that faced the steel industry in 1990 was unfinished investment, initiated by the previous regime, for new facilities as well as the modernization and expansion of existing ones.

All new and ongoing capital projects would undergo a reevaluation that would utilize criteria different from those used in the past. Factors such as real costs, an enterprise's financial status, the evaluation of current and potential markets, and social requirements would have to be considered. In May, the Ministry of Industry, having conducted a detailed study of several ongoing investment projects, decided to cancel the hot strip mill project at the Tirgoviste steel complex as well as work on the second fabricating unit at the Calarasi steel complex. Construction work on the Macin silica refractory plant and the Caransebes refractories enterprise was canceled as well. Another major issue that concerned Romania's steel industry was environmental pollution. The Calan, Calarasi, Galati, and Hunedoara steel mills were among the worst industrial polluters in the country, emitting large quantities of noxious gases, dust, and ash into the air. Industrial waste was also discharged into the local streams and aquifers.

In midyear, Romania ratified a Voluntary Restraint Agreement (VRA) with the United States. The VRA allowed Romania to ship 120,000 tons of steel to the United States through the balance of the year. Romania was also permitted to ship an additional 105,000 tons of steel to make up for delivery shortfalls during the 1984-89 period.

Lead and Zinc.—The problems associated with Romania's lead and zinc industry were considered more serious than those of other branches of the country's nonferrous metals sector. Low-grade ore was produced at underground mines in the Baia Mare, Borsa, Certej, and Rodna districts, grading from 0.4% Pb and 0.6% Zn to 1.0% Pb and 1.2% Zn. Moreover, Romania's lead and zinc ores also contained copper (0.35%), as well as associated antimony, bismuth, cadmium, gold, and silver. Owing to the complex mineralogy of the lead and zinc ores, concentrates produced from these ores were of uneven quality. Lead and zinc recovery in concentrate reportedly ranged between 50% to 75% PbS and ZnS.

Apart from a minor lead refining operation at Ferneziu Firiza, the bulk of Romania's lead-zinc concentrates was smelted and refined at the Imperial smelter and refinery at Copsa Mica. Because of the past Government directives that restricted imports of industrial goods and spare parts from market economy countries, efforts to use domestically designed spare parts at the Copsa Mica facility proved to be largely unsuccessful. The lack of reliable spare parts and modern pollution control equipment at the lead-zinc smelter was the major reason for the severe pollution generated at Copsa Mica, which was considered one of the most polluted areas of Europe. Approximately 30,000 mt/a of pollutants, containing formic and sulfuric acids as well as lead, zinc, cadmium, and copper bearing dust, have been released into the atmosphere at Copsa Mica by the lead-zinc smelter and a natural gas and petroleum refinery. In 1990, pressure from the country's environmental movement forced the new Government to order the lead-zinc smelter and refinery at Copsa Mica to operate at 50% of capacity, pending the installation of pollution abatement equipment.

Industrial Minerals

Romania's extensive output of industrial minerals apparently was sufficient to meet most domestic needs. Barite, bentonite, diatomite, feldspar, graphite, gypsum, kaolin, and limestone, among others, were mined at about 60 deposits throughout the country. Industrial minerals should play an increasingly more important role in the country's economy. The need to modernize the country's economy and infrastructure will increase demand for asbestos, cement, clays, dimension stone, and other industrial minerals.

Mineral Fuels

Coal.—In midyear, more than 10,000 coal miners initiated a strike in the country's major coal mining area in the Jiu Valley in central Romania. Reportedly, the strike resulted from the failure of the Government to meet the demands of the miners concerning pay increases and improved work conditions. In December, the League of Jiu Valley Miner's Free Unions, with 60,000 members, declared that it would no longer recognize the official Romanian Federation of Miner's Unions and appealed to all miners in the country to unify into a new organization based on democratic principles.

Petroleum.—Romania's petroleum industry came under severe criticism during the year because of past policies concerning the industry's development.

An evaluation of Romania's petroleum refining industry conducted in 1990 by specialists of the Ministry of Chemical and Petrochemical Industry concluded that excessive petroleum refining capacities were installed in the 1970's and 1980's, a period marked by declining domestic output. By 1989, Romania had a 34-Mmt/a design petroleum refining capacity that only very rarely reached a 90% operational level. The value of refined petroleum products reportedly was not able to cover the cost of imported crude petroleum. Losses from 1982 to 1989 stemming from the differential between the value of imported crude petroleum and refined petroleum products reportedly amounted to $77 million.

Reserves

In view of Romania's efforts to orient its economy to a market-based system, the country's mineral resources will have to be reevaluated from a market economy perspective. Reserves, as defined by market economies, are mineral deposits that can be mined at a profit under existing conditions with existing technology. In centrally planned and other non-market-economy countries, such as Romania, political rather than economic consideration was paramount in formulating policies for industrial development. Political directives to discover exploitable mineral resources may have resulted in possible overestimations and other distortions of collected field data. The system that was used to measure "reserves" was based on two cross-imposed classification schemes, one relating to the exploitability of the mineral in question and the other relating to the reliability of the information on its quantity and grade.

The first system determined whether or not the deposit was suitable for exploitation, given the current technological capability and need. The second classification related to the reliability of the data gathered on the quantity on the mineral in situ. The second classification scheme designated deposits into "reserve" categories A, B, C1, and C2, based on the Soviet classification system, where sufficient geological data had been gathered relative to the size of the deposit and its mineral grade. Taking this system into account, Romania's mineral resources are given in table 3.

INFRASTRUCTURE

Most of Romania's raw materials were transported by railroad. The country had more than 11,200 km of standard-gauge tracks. Of this amount, 3,328 km were electrified and 3,060 km were double tracks. The country has only 72,783 km of roads, of which 9,010 km were unpaved.

In recent years, the country improved the river transportation system, building new canals, port facilities, etc., to make more efficient use of its 1,726 km of inland waterways. The 2,808 km of crude and 6,417

TABLE 3

ROMANIA: APPARENT RESOURCES OF MAJOR MINERAL COMMODITIES FOR 1990

(Metric tons unless otherwise specified)

Commodity		Reserves[e]
Bauxite		2,550,000
Copper		1,462,500
Lead		585,000
Natural gas	billion cubic meters	120
Zinc		1,440,000

[e]Estimated.

km of natural gas pipelines have been expanded with the inclusion of offshore lines laid in recent years. These figures, however, do not include the U.S.S.R. pipeline across the country. Several Soviet gas and electric lines also enter the country, some of which extend to Bulgaria.

OUTLOOK

Because of low ore grades and severe environmental damage caused by the country's metals mining, processing, and smelting industries, long-term prospects for this sector of the country's mineral industry do not appear to be favorable. However, the rationalization of the country's existing economic structure would include the modernization of its infrastructure, giving added value and importance to the country's industrial minerals sector.

OTHER SOURCES OF INFORMATION

Agencies

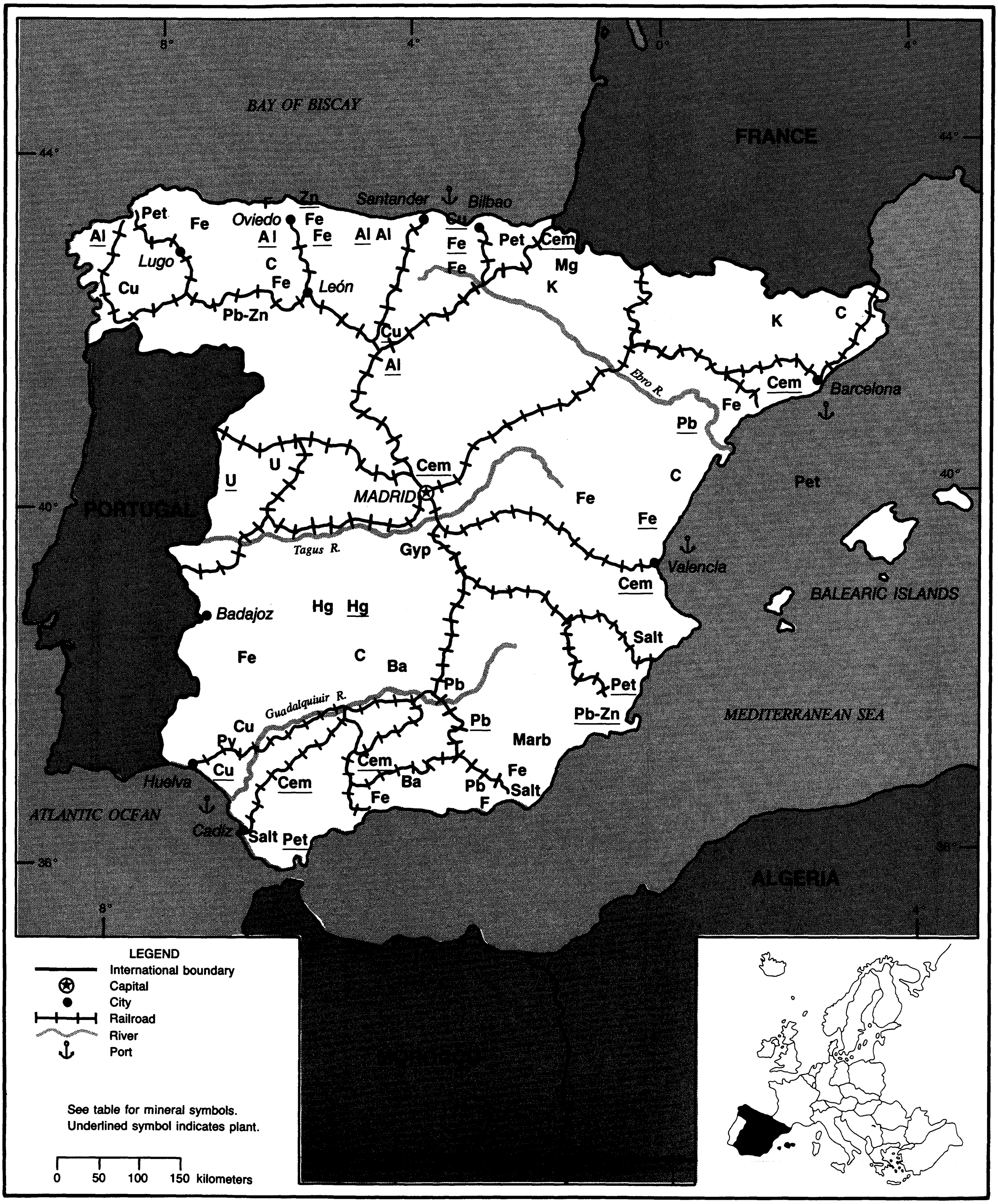
Ministerul Industriei Metalurgice (Ministry of Metallurgy), Bucharest, Romania
Ministerul Minelor (Ministry of Mines)
Bucharest, Romania
Ministerul Geologiei (Ministry of Geology)
Bucharest, Romania
Ministerul Petrolului (Ministry of Petroleum)
Bucharest, Romania

Publications

Annuarul Statistic al Romaniei (Statistical Abstract of Romania).
Revista de Statistica (Statistical Review, monthly).

SPAIN

AREA 505,000 km² **POPULATION 39.3 million**



THE MINERAL INDUSTRY OF SPAIN

By Harold R. Newman

Spain, whose land area includes a major portion of the Iberian Peninsula, is one of the most mineralized areas of western Europe. The Iberian Peninsula has a diverse mining history that goes back to Phoenician times. Since that time, there have been exploitations to extract a wide range of minerals. However, it was not until the middle of the 19th century that intense mining activities were initiated owing primarily to the influx of English and French foreign capital.

Spain continued as one of Europe's most important mineral producers of base metals and industrial minerals. The country remained the EC's sole producer of mercury and tantalite and the only significant producer of natural sodium sulfate. The country's entry into the EC meant that many industries had to adjust to economic realities and prepare to compete in the 1992 European "Common Market." Industries particularly effected by this were coal, fertilizer, and steel. Spain's economic growth in recent years has been largely due to the availability of plentiful natural resources, labor costs lower than most other EC countries, and access to EC markets. This growth in the economy, despite a slowdown in activity that affected several industrial sectors, resulted in a real GDP increase of about 3.5% in 1990.

GOVERNMENT POLICIES AND PROGRAMS

The Government has fostered economic growth, but has had to rationalize some of the Government-controlled industries. The steel industry had to reduce production capacity in accordance with Spain's acceptance into the European Coal and Steel Community. The resulting loss of jobs increased the rate of unemployment, which already was higher than the EC average unemployment rate. Unemployment at yearend was more than 2.3 million or more than 15.5% of the working population.

Investment-led economic growth has provided some relief to the unemployment problem. Owing the past 5 years, Spain has enjoyed the highest, investment-led output growth in the Organization for Economic Cooperation and Development (OECD) area. The Government continued consultations to improved relationships with labor and business in an attempt to maintain competitive advantages and control inflation. The Government sees challenges to competitive advantages if inflation and wages are not managed and market-oriented reforms are not continued.

Because of the very high oil dependency ratio, energy supply was a high priority of the Government. The National Energy Plan (NEP), 1990-95, seeks to reduce this ratio by shifting to natural gas and using renewable sources of energy more intensively. Incentives and information were provided to industry and the transportation sector. Indirect taxes on oil were scheduled to be raised in 1991.

PRODUCTION

The mineral industry operated in numerous regions throughout the country, and although Spain produced significant amounts of certain important minerals, it was not self-sufficient and was a net importer of minerals and energy. Although domestic demand for natural resources increased, there was a decline in output of some of the main minerals. In some cases, the decline exceeded 50% as was the case with copper and wolfram, which fell by 56% and 53.4%, respectively. Output of iron ore fell by 36% while lead and zinc fell by 6.5% and 4.1%, respectively. Uranium was the only major mineral to have increased its output.

Demand for quarried products used for infrastructure construction increased significantly in the country; the industrial growth in the EC contributed to the increased demand for these mineral products from Spain. Quarried natural stone accounted for 15% of the total value of Spanish mining. With the exception of coal, it was the most important mining sector in dollar value in the country.

TRADE

Liberalization of foreign trade flows has proceeded quickly since EC entry. Almost 40% of the difference between Spanish tariffs and Common Market external tariffs has been removed, with complete elimination planned by 1992. Table 2 shows the impact of selected classes of mineral commodities on Spain's balance of payments position in relation to the EC and the world.

Spain produced significant amounts of selected minerals. However, it was not self-sufficient in all its mineral requirements. In 1989, imports of U.S. coal were strong at 2.6 Mmt/a. The United States was the second largest exporter of coal to Spain after the Republic of South Africa (4.4 million tons). Spain was a large importer of mineral fuels, and it was expected that this situation would continue as the demand for energy grows.

STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry is composed of both state-owned and privately-owned entities. Minerals belong to the state under an arrangement known as the "Regalian Principal." The Mining law of July 19, 1944, as amended, and the Hydrocarbon law of December 26, 1950, as amended, governed the mineral industry. The Ministry of Industry implements the mineral laws, regulates the private sector and manages, through the Instituto Nacional de Industria (INI), most of the State-owned companies. INI and Instituto Geologico y Minero are the principal Government mineral resource agencies. Since joining the EC in 1986, foreign investment has resulted in substantial growth in the mineral industry.

COMMODITY REVIEW

Metals

Aluminum.—Alumina and primary aluminum were produced almost entirely by the Industria Espanola del Aluminio SA (Inespal) Group. INI is Inespal's major shareholder. Alumina Espanola, a subsidiary near San Ciprian, produced alumina, primary aluminum in standard and special

TABLE 1

SPAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
METALS						
Aluminum:						
Bauxite		3,000	1,050	[e]2,000	[e]3,000	3,000
Alumina[2]		748,006	800,654	880,500	949,000	900,000
Metal:						
Primary		354,687	340,972	323,100	352,435	350,000
Secondary[e]		54,000	70,000	80,000	85,000	82,000
Antimony, mine output, Sb content		45	[r]20	20	—	—
Cadmium metal		247	297	306	361	300
Copper:						
Mine output, Cu content		51,084	16,300	18,100	24,554	11,000
Metal:						
Blister:						
Primary		100,000	115,700	111,000	[e]120,000	110,000
Secondary		35,200	33,000	34,600	[e]32,300	32,000
Total		135,200	148,700	145,600	[e]152,300	142,000
Refined:						
Primary		130,575	100,410	108,756	[e]115,700	116,000
Secondary		24,600	51,000	50,000	[e]50,000	50,000
Total		155,175	151,410	158,756	[e]165,700	166,000
Gold, mine output, Au content	kilograms	5,200	7,752	8,034	[e]8,200	8,400
Iron and steel:						
Iron ore and concentrates (including byproduct concentrate):						
Gross weight	thousand tons	6,054	4,499	4,212	4,566	3,030
Fe content	do.	2,761	2,109	1,925	2,120	[3]1,394
Metal:						
Pig iron	do.	4,803	4,901	4,691	5,535	[3,5]5,542
Ferroalloys, electric furnace	do.	[e]300	146	250	256	250
Steel:						
Crude	do.	11,977	[r]11,691	11,886	12,765	[3]12,718
Castings and forgings[e]	do.	150	140	[3]160	182	180
Total	do.	12,127	[r]11,831	12,046	12,947	[3]12,898
Semimanufactures	do.	[e]11,000	[e]11,000	8,843	11,012	[3]11,173
Lead:						
Mine output, Pb content		82,057	[r]83,269	74,672	62,600	58,300
Metal:						
Primary		88,000	71,400	68,800	62,032	60,000
Secondary		42,000	51,300	52,000	[e]50,000	45,000
Mercury:						
Mine output, Hg content	kilograms	2,757,393	1,085,203	1,715,629	[e]1,500,000	—
Metal	do.	1,470,379	1,570,971	1,614,586	[r,e]967,000	425,000
Silver, mine output, Ag content	do.	289,185	409,048	550,812	[r,e]530,000	500,000
Tantalum minerals (tin byproduct):						
Gross weight	do.	12,500	9,980	10,890	[e]11,000	10,000
Ta content	do.	3,071	2,720	2,725	2,720	2,700
Tin:						
Mine output, Sn content		296	77	66	64	[3]49
Metal, primary		[r]1,965	[r]1,671	806	[e]800	600

See footnotes at end of table.

TABLE 1—Continued

SPAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity	1986	1987	1988	1989[p]	1990[e]
METALS—Continued					
Titanium dioxide[e]	35,000	36,000	37,000	37,000	36,000
Tungsten, mine output, W content	495	101	102	58	[3]49
Uranium, mine output, U_3O_8 content	376	372	323	[e]325	[3]369
Zinc:					
Mine output, Zn content	233,307	272,556	281,724	266,724	255,000
Metal, primary and secondary	202,000	224,000	256,000	246,400	265,000
INDUSTRIAL MINERALS					
Barite	49,678	7,776	6,585	[e]6,600	6,000
Bromine[e]	280	300	300	300	300
Cement, hydraulic, other than natural[e] thousand tons	[3]24,201	25,000	25,000	25,000	26,000
Clays:					
Attapulgite	67,820	40,818	43,585	[e]45,000	40,000
Bentonite	114,972	103,420	103,753	[e]104,000	100,000
Kaolin, marketable:					
Crude	259,572	17,891	150,840	[e]125,000	125,000
Washed	314,094	433,077	438,160	[e]435,000	430,000
Refractory, not further described	549,457	484,608	506,456	[e]500,000	500,000
Other thousand tons	9,244	9,949	[e]10,000	[e]10,000	10,000
Diatomite and tripoli	128,050	66,217	81,331	[e]80,000	81,000
Feldspar	135,526	161,631	195,668	[r,e]155,000	150,000
Fluorspar:					
Gross weight:					
Acid-grade	257,108	147,757	137,140	154,493	140,000
Metallurgical-grade	25,352	3,670	5,435	6,799	5,600
Total	282,460	151,427	142,575	161,292	145,600
CaF_2 content:					
Acid-grade	250,374	144,052	133,727	[e]125,000	120,000
Metallurgical-grade	22,404	3,126	4,598	[e]4,000	3,500
Total	272,778	147,178	138,325	[e]129,000	123,500
Gypsum and anhydrite, crude thousand tons	5,062	6,684	7,469	[r,e]5,500	5,000
Kyanite, andalusite, related materials	3,304	3,916	3,360	[e]3,500	3,600
Lime, hydrated and quicklime[e] thousand tons	1,200	1,200	1,200	1,200	1,200
Magnesite:					
Calcined	177,681	127,375	151,216	[e]150,000	150,000
Crude[e]	700,000	710,000	700,000	[r]470,000	500,000
Mica	325	370	2,233	350	300
Nitrogen: N content of ammonia thousand tons	512	495	477	552	[3]485
Pigments, mineral:					
Other	7,697	7,765	8,394	[e]8,400	8,200
Red iron oxide[e]	20,000	20,000	20,000	20,000	20,000
Potash, K_2O equivalent	794,586	741,240	855,466	[r,e]841,000	782,000
Pumice	968,116	1,053,914	909,625	[e]925,000	900,000
Pyrite, including cuprous, gross weight thousand tons	2,614	2,177	2,281	[e]2,200	2,100
Salt:					
Rock, including byproduct from potash works do.	2,101	2,250	2,455	[e]2,500	2,100
Marine and other do.	1,006	944	1,425	[e]1,300	1,000
Sand and gravel: Silica sand[4] do.	2,403	2,434	2,420	[e]2,400	2,500

See footnotes at end of table.

TABLE 1—Continued

SPAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
INDUSTRIAL MINERALS—Continued						
Sepiolite		455,194	482,784	507,782	[e]500,000	370,000
Sodium compounds; n.e.s.:						
Soda ash, manufactured[e]	thousand tons	525	550	550	550	500
Sulfate:						
Natural:						
Glauberite, Na_2SO_4 content		288,714	266,885	269,518	[e]270,000	230,000
Thenardite, Na_2SO_4 content		162,197	208,370	209,700	[e]210,000	200,000
Manufactured[e]		150,000	160,000	160,000	160,000	150,000
Stone:						
Calcareous:						
Chalk	thousand tons	427	345	361	[e]360	350
Dolomite	do.	2,192	2,240	2,829	[e]2,800	3,000
Limestone	do.	77,050	85,522	100,222	[e]100,000	125,000
Marble	do.	955	948	1,369	[e]1,400	1,500
Marl	do.	5,326	5,474	5,106	[e]5,700	6,000
Basalt	do.	3,476	1,352	2,109	[e]2,000	2,000
Granite	do.	10,843	11,433	9,635	[e]10,000	12,000
Ofite	do.	1,050	1,552	1,905	[e]1,900	1,800
Phonolite	do.	593	[e]600	763	[e]765	750
Porphyry	do.	715	721	805	[e]800	800
Quartz	do.	568	532	977	[e]975	900
Quartzite	do.	744	910	715	[e]715	700
Sandstone	do.	2,620	1,549	1,768	[e]1,800	1,800
Serpentine	do.	417	544	422	[e]425	400
Other	do.	26,660	[e]26,000	37,232	[e]37,000	38,000
Strontium minerals:						
Gross weight		34,500	28,867	45,631	[e]45,000	40,000
Sr_2O_4 content		31,740	26,496	41,981	[e]41,000	31,000
Sulfur:						
S content of pyrites	thousand tons	1,192	1,011	1,057	894	[3]748
Byproduct:[e]						
Of metallurgy	do.	105	110	110	110	100
Of petroleum	do.	8	8	8	8	8
Of coal (lignite) gasification	do.	2	2	2	2	2
Total	do.	1,307	1,131	1,177	[r]1,014	858
Talc and steatite		73,914	75,307	[e]75,000	[e]75,000	80,000
MINERAL FUELS AND RELATED MATERIALS						
Coal (marketable):						
Anthracite	thousand tons	5,610	5,361	5,276	5,519	[3]5,809
Bituminous	do.	10,286	13,607	13,609	13,605	[3]13,780
Lignite	do.	22,425	15,627	12,960	17,275	[3]16,373
Total	do.	38,321	34,595	31,845	36,399	[3]35,962
Coke, metallurgical[e]	do.	3,000	3,000	3,000	3,000	3,000
Gas, natural (marketed)	million cubic meters	384	710	952	1,150	[3]1,553
Peat		63,869	67,401	75,434	[e]75,000	77,000
Petroleum:						
Crude	thousand 42-gallon barrels	13,154	14,207	15,949	[e]15,000	14,000

See footnotes at end of table.

TABLE 1—Continued

SPAIN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued						
Refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	19,116	18,850	20,497	[e]20,000	20,000
Naphtha	do.	25,160	21,224	20,336	[e]20,000	20,000
Gasoline, motor	do.	66,164	68,629	68,655	[e]68,000	70,000
Jet fuel	do.	25,192	24,344	27,600	[e]27,000	30,000
Kerosene	do.	26,862	24,986	29,613	[e]28,000	29,000
Distillate fuel oil	do.	91,825	89,385	95,757	[e]90,000	90,000
Residual fuel oil	do.	107,572	98,801	93,220	[e]95,000	96,000
Other	do.	39,592	38,836	37,709	[e]38,000	38,000
Refinery fuel and losses	do.	14,637	12,957	12,026	[e]12,000	12,000
Total	do.	416,120	398,012	405,413	[e]398,000	405,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Sept. 1991.
[2]Reflects aluminum hydrate.
[3]Reported figure.
[4]Includes sand obtained as a byproduct of feldspar and kaolin production.

TABLE 2

SPAIN: BALANCE OF PAYMENTS, SELECTED MINERAL COMMODITIES[1]

(Hundred dollars)

Mineral commodity	Exports to European Community	Imports from European Community	Net gain or (loss)	Exports to the world	Imports from the world	Net gain or (loss)
Crude industrial minerals:						
Feldspar	$328	$3,858	($3,530)	$369	$5,716	($5,347)
Magnesite	1,587	15	1,572	2,015	486	1,529
Slate	296	48	248	812	48	764
Other	153,464	158,803	(5,339)	320,561	404,184	(83,623)
Total	155,675	162,724	(7,049)	323,757	410,434	(86,677)
Metalliferous ores:						
Copper	10,015	34,202	(24,187)	22,577	203,437	(180,860)
Lead	8,040	12,910	(4,870)	13,183	16,678	(3,495)
Tin	—	1,443	(1,443)	2	12,194	(12,192)
Zinc	31,278	6,963	24,315	51,222	24,169	27,053
Other (including waste and scrap)	157,949	649,114	(491,165)	196,531	1,300,227	(1,103,696)
Total	207,282	704,632	(497,350)	283,515	1,556,705	(1,273,190)
Nonmetallic mineral manufactures	209,151	79,493	129,658	401,576	169,366	232,210
Metals:						
Iron and steel	1,250,923	1,677,300	(426,377)	2,388,087	2,164,819	223,268
Mercury	3,608	94	3,514	5,631	266	5,365
Other nonferrous metals	726,779	794,104	(67,325)	925,609	1,116,493	(190,884)
Total	1,981,310	2,471,498	(490,188)	3,319,327	3,281,578	37,749
Mineral fuels	918,729	735,022	183,707	2,349,336	8,458,825	(6,109,489)

[1]Table prepared by Harold Willis, Section of International Data.

TABLE 3

SPAIN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Alumina Española S.A.	Alumina plant San Ciprián, Lugo	800.
Aluminum	Aluminio Española S.A.	Electrolytic plant at San Ciprián, Lugo	180.
Do.	Empresa Nacional del Aluminio (Endasa) S.A.	Electrolytic plant at Avilés	110.
Do.	do.	Electrolytic plant at Valladolid	25.
Do.	Aluminio de Galicia S.A.	Electrolytic plant at La Coruña	78.
Do.	do.	Electrolytic plant at Sabiñánigo	14.
Coal:			
Anthracite	Approximately 95 producers, including—		6,100. including—
	65 producers in Province of León, of which the largest are—		(3,400).
	Antracitas Gaiztarro S.A.	Mines at María and Paulina	(385).
	Minero-Siderúrgica de Ponferrada S.A.	NA	(230).
Do.	13 producers in Province of Oviedo, of which the largest are—		(1,900).
	Antracita de Gillón S.A.	NA	(500).
	González y Diez S.A.	Mines at Grupo Minero de Tineo	(130).
Do.	14 producers in Province of Palencia, of which the largest are—		(600).
	Antracita de Gillón S.A.	Mines at La Velilla	(135).
	Sdad. Minera San Luis	Mines at Trueno and Cecilia	(61).
Do.	Nacional de Carbon del Sur (Encosur)	Rampa 3 and Pozo San Jose Mines, in Province of Córdoba-Empresa	(200).
Bituminous	88 producers, of which the largest is—	Mines and plants in Provinces of Ciudad Real, Córdoba, León, Oviedo, Palencia, and Seville	14,000. including—
	Hunosa S.A.	Various mines and plants	(3,300).
Lignite	Empresa Nacional de Electricidad Endesa	Mines at Grupo Minero de Puentes, La Coruna	25,000.
Barite	Minas de BAritina S.A.	Mine and plant in Espiel area, Córdoba	50.
Cement	Approximately 36 cement companies, of which the largest is—	54 plants, including—	44,000. including—
	Asland S.A.	5 (Asland) plants, of which the largest ones are—	(6,600).
		Plant at Puerto de Sagunto, Valencia	(2,000).
		Plant at Villaluenga de la Sagra, Toledo	(2,000).
Copper:			
Metal	Rio Tinto Minera S.A.	Smelter at Huelva	85
Do.	do.	Electrolytic refinery at Huelva	105
Do.	Industrias Reunidas de Cobre	Smelter at Asua-Bilbao	30
Do.	Electrolítico y Metales S.A.	Fire and electrolytic refinery at Asua-Bilbao	36
Do.	Electrólisis de Cobre S.A.	Smelter at Barcelona	24
Do.	do.	Electrolytic refinery at Palencia	32
Ore	Rio Tinto Minera S.A.	Mines and plant at Arientero, near Santiago de Compostela, Galicia	12
Do.	do.	Corta Atalay opencast mine, Cerro Colorado opencast mine and plant, and Alfredo underground mine—all in Rio Tinto area	30
Fluorspar	Fluoruros S.A.	Plant at Caravía, near Colunga, Asturias	400 ore.

See footnotes at end of table.

TABLE 3—Continued

SPAIN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Fluorspar	do.	Opencast mines at San Lino and Val Negro and underground mine at Eduardo, near Caravía—all in Asturias	350 ore.
Do.	do.	Plant at Collada, Gijón	200 ore.
Do.	do.	Mines at Veneros Sur and Corona, Gijón	
Iron ore	Compañía Andaluza de Minas S.A.	Mine at Marquesado, Granada	4,000.
Do.	Altos Hornos de Viscaya S.A.	9 mines in Province of Vizcaya	4,000.
Do.	Compañía Minera Siderúrgica de Ponferrada S.A.	8 mines in Province of León	3,000.
Do.	Minera del Andévalo S.A.	Opencast mine at Coba, Huelva	2,000.
Lead:			
Metal	Sociedad Minera y Metalúrgica de Peñarroya de España, S.A.	Smelter at Cartagena, Murcia	60.
Do.	do.	Refinery at Cartagena, Murcia	60.
Do.	Compañía La Cruz, Minas y Fundaciones de Plomo S.A.	Smelter at Lineares, Jaén	40.
Do.	do.	Refinery at Lineares, Jaén	40.
Do.	Tudor S.A.	Secondary smelter at Saragoza	16.
Do.	Ferroaleaciones Españolas, S.A.	Secondary smelter at Medina del Campo.	12.
Do.	Derivados de Minerales y Metales	Secondary smelter at Barcelona	5.
Ore	Sociedad Minera y Metalúrgica de Peñarroya España, S.A.	Opencast mine at Montos de los Azules, near Unión, Murcia	25.
Do.	Andaluza de Piritas S.A. (APIRSA)	Open pit mine at Aznalcóllar, Sevilla.	21.
Do.	Exploración Minera International España S.A. (EXMINESA)	Underground mine at Rubiales, Lugo	16.
Magnesite	Magnesitas de Rubián S.A.	Plants at Zubiri	100.
Do.	do.	Mines and plant near Sarria, south of Lugo	220.
Mercury flasks	Minas de Almadén y Arrayanes S.A.	Mine and smelter at Almadén	70,000.
Petroleum:			
Crude barrels per day	Chevron S.A.	Oilfield at Casablanca	300.
Refined barrels per day	Empresa Nacional del Petróleo S.A. (Enepetrol)	Refineries at Escombreras Puertollano	200,000. 140,000.
Do.	do.	Tarragona	260,000.
Do.	Refineria de Petróleos del Norte S.A. (Petronor)	Refinery at Somorrostro	240,000.
Do.	Compañía Española de Petróleos S.A. (Cepsa)	Refinery at Santa Cruz de Tenerife Refinery at Algeciras	160,000. 160,000.
Do.	Petróleos del Mediterraneo S.A. (Petromed)	Refinery at Castellón de la Plana	120,000.
Do.	Compañía Iberica Refinadora de Petróleos S.A. (Petroliber)	Refinery at La Coruña	140,000.
Potash	Potasas de Navarra S.A.	Mines and plant near Pamplona	3,000 ore.
Do.	Minas de Potasas de Suria S.A.	Mines at Suria	1,000 ore.
Do.	Unión Explosivos Rio Tinto S.A.	Mines at Balsareny/Sallent and Cardona	2,000 ore.
Pyrite	Compañía Española de Minas de Tharsis	Mines and plants at Tharsis and Zarza, near Seville	1,300.
Do.	do.	Plant at Huelva	600.
Do.	Rio Tinto Minera S.A.	Mines and plant at Rio Tinto, near Seville	900.
Sepiolite	Tolsa S.A.	Mine at Vicalvaro, near Toledo	100.
Do.	do.	Plant at Vicalvaro, near Toledo	100.
Do.	Silicatos-Anglo-Ingleses S.A.	Mine at Villecas near Madrid	200.
Do.	do.	Plant at Villecas near Madrid	200.

See footnotes at end of table.

TABLE 3—Continued

SPAIN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Steel	Empresa Siderúrgica S.A. (Ensidesa)	Plants at Avilés, Veriña, and Mieres in Oviedo, and Moreda, Gijón	6,000.
Do.	Altos Hornos de Viscaya S.A.	Iron and steel works at Sestao, Bilbao	1,500.
Uranium metric tons	Government	Mines and plant near Ciudad Real	500. U3O8.
Zinc:			
Metal	Real Cia. Asturiana de Minas S.A.	Electrolytic zinc plant at San Juan de Nueva	200.
Ore	do.	Reocín mines and plants near Torrelavega, Santander	500 ore.
Do.	Andaluza de Piritas S.A. (APIRSA)	Open pit mine at Aznalcóllar, Sevilla.	3,500 ore.
Do.	Exploración Minera International España S.A. (EXMINESA)	Underground mine at Rubiales, Lugo	500 ore.
Do.	Sociedad Minera y Metalúrgica de Peñarroya-España S.A.	Mines and plants at Montos de los Azules y Sierra de Lujar, San Agustín	220 ore.

NA Not available.

alloys, ingots, and sheet ingots. Inespal's share of the Spanish market for primary aluminum was about 94% in 1990.

It was a difficult year for Inespal because of increased electricity cost, increases in Spanish interest rates, an appreciating peseta, and a decrease in world aluminum prices. To overcome some of these problems, Inespal has initiated a program of specialization within the plants of the group. Also, theoretical alumina capacity at the Alumina Espanola plant was increased from 800,000 mt/a to 1 Mmt/a. These efforts have had a positive effect on controlling costs; however, it was reported that production costs at yearend were still higher than the selling price of aluminum.

Aluminum Co. of Canada Ltd. (Alcan) sold its 23.9% financial share of Inespal to INI, a state holding company. Alcan will continue to offer technical assistance to INI on specific problems. After divesting its interest in Inespal, Alcan established a subsidiary, Alcan Iberica, to market its products in Spain and Portugal from Alcan plants in the Federal Republic of Germany, Switzerland, and the United Kingdom.

Inespal's plant at Amorebieta in Viscaya Province, with an initial hot-rolling capacity of 128,000 mt/a, started up in 1990. The plant's capacity could be expanded to 200,000 mt/a depending on future demand. Another project started at the plant was the increase of production capacity at the cold-rolling mill from 80,000 mt/a to 120,000 mt/a.

In 1990, Spanish aluminum consumption was 9.2 kg per person compared with a 16.5-kg-per-person average for the EC. About 34% of production was exported.

Copper.—RTZ Corp. sold its 49% share of Rio Tinto Minera (RTM) to the Ercros Group, one of Spain's largest chemical groups. The purchase price was estimated to be $100 million.[1] Ercros's activities include potash mining, copper refining, petroleum and petrochemicals, fertilizers, and explosives.

RTM operates a smelter and refinery at Huelva with a capacity of 120,000 mt/a of copper cathodes, 150 mt/a of refined silver, and 5 mt/a of gold. The copper smelter is the second largest in Europe, which, under terms of the agreement, RTZ would continue to use.

Gold.—Orminex S.A. was issued a license to prospect for gold at Suspiron in the Provinces of Castille and Leon, in northern Spain. Bedrock panel sampling reportedly identified gold grades of 4.4 g/mt, and Orminex has plans to start an exploration program at that site. Also, Orminex S.A. planned to explore a 100-km^2 area at Brana Seita, northwest of Leon. Soil geochemical surveys located an area with anomalous values for antimony, arsenic, copper, and gold. The same geological horizon has copper mineralization and is mined at Penas Negra, 3 km to the west.

Filon Sur and Thorco Resources continued processing gold ore at Europe's first heap-leach gold project in Spain. The project, near the southwestern Spanish Port of Huelva, focused on processing tailings to recover gold. The ore was produced from Minas de Tharsisis mining operations, which originally recovered copper, sulfur from pyrite deposits, and zinc.

Glamis Gold and Biomet Technology Inc. executed a joint venture agreement with Charter Exploraciones to develop and exploit the Salave gold property in the Province of Oveido. Mineralization at Salave was reported to consist of gold bearing sulfide ore with a high arsenopyrite content within a large area of intrusive rock. Reserves were estimated to be about 9 Mmt, with an average grade of 3 g/mt. Bioheap-leach processing will be used to recover the gold.

An Irish company, Navan Resources PLC, reached an agreement with Tolsa SA for a gold exploration project. The area covers about 150 km^2 in the Almeria Province of southeast Spain. Previous exploration by others had defined estimated reserves of 750,000 tons grading about 2 g of gold per ton. Navan would participate as operator and have an 80% interest in the project.

It was reported that the EC Directorate-General for Science and Research has given the first grant ever to a mining consortium exploring for gold in Spain. Partners in the consortium, known as Empisa, include Europa Minerals Group, which owns the mineral rights to the lands at Pepon in

Badajoz in the Iberian Peninsula; the Portuguese Dereccao Geral de Geologia e Minas; Instituto Technologico Geominera de Espana; the University of South Hampton, United Kingdom; British Geologic Survey; and the National Engineering Research Council, United Kingdom.

Iron Ore.—Compania Andaluza de Minas SA (CAM) is the largest iron ore producer in Spain. In addition to an open pit mine that produces about 3.3 Mmt/a, CAM operated a 90,000-dwt-capacity shiploader at the Port of Almeira. This facility was severely damaged by a storm in December 1989, which obliged CAM to declare force majeure on all shipments until repairs were completed. Production and shipments resumed in May 1990.

Iron and Steel.—Spain gained full membership into the European Coal and Steel Community (ECSC) as of January 1, 1989. The Spanish steel industry was continuing in its efforts to adapt to the economic environment and realities of the 1992 Common Market in Europe. The industry is now completely integrated into the EC except for some minor issues such as residual tariffs, which remain in effect until the end of 1992. However, the industry remained under heavy pressure because of an excess in supply in the Spanish market.

Spain's steel plants operated at an average of 65% of their crude steel capacity; however, electric furnaces operated at only 56% of capacity while converters reached 81% of capacity. In 1990, apparent consumption of semimanufactured steel was estimated at just over 11 Mmt. The ECSC stressed the need for the industry to improve productivity and reduce both capacity and work force. In conjunction with that, the EC approved a Community credit of about $156 million to assist the state steel group Empresa Nacional Siderurgica SA (Ensidesa) in its $420 million restructuring program. Ensidesa was to construct a galvanizing plant and continuous casting line at a cost of $138 million; modernize its Gijon steelworks ($52 million), and expand its electrogalvanized sheet capacity to 180,000 mt/a at Sidmed, at a cost of $83 million, in response to Spanish automobile industry demand.

Also, Altos Hornos de Viscaya (AHV) received EC credit worth $120 million toward its $460 million capital investment program. This credit meets the last of AVH's financial requirements for restructuring. AHV was also planning to further develop its commercial network in Europe, particularly France.

Tubos Reunidos, the leading seamless tube manufacturer in Spain, announced plans to construct a controlled cooling plant for alloy steel bar, two drawing lines for seamless steel, and a finishing plant for reformed bar. A 20% increase in demand in Spain for seamless tube contributed to the investment decision. The project was estimated to cost $16 million. Tubos also reported investments of $4 million in the Amurrio steel plant, $3 million in the Amurro tube plant, and $1.5 million in the Galindo plant.

Mercury.—The world's over-supply of mercury during the year hurt the profitability of mercury producers. The drop in both mercury sales and prices aggravated economic problems at Minas de Almaden y Arrayanes SA (MAYASA). The company was reported to have stopped production and was selling from its stockpile of an estimated 2.1 Mkg of mercury. The company's employment at the end of 1990 was 600 workers.

Work was continued on MAYASA's Las Cuvas Mine at Almaden, in southern Spain. The new mine, expected to begin production in 1991, contained estimated reserves of 140,000 tons of ore with a grade of 5% mercury.

Tungsten.—The private bank, Banco Espanol de Credito, and the state-owned bank, Banco de Credito Industrial, have each taken a 50% interest in the Grupo Minera La Parilla. They were proceeding with plans to reopen the La Parilla Mine in the Province of Extremadura. The mine produced scheelite and small quantities of cassiterite. Wolframite occurs in the deposit, although not in economic quantities. It was estimated that $36 million would be required to reopen the mine. The banks indicated that the new company would be eligible for financial assistance from the Government's Regional Development Commission and have applied for a $16 million grant.

Reserves at La Parrilla were estimated at 32 Mmt containing about 45,000 tons of metal, which would be sufficient for 10 to 12 years of operation.

Zinc.—Asturiana de Zinc S.A., with approximately 4% of the world's zinc production, was continuing with its expansion project. By midyear 1991, the company planned to have a new roasting unit on-stream with a capacity of 850 mt/a. This, along with the two existing roasting units, would be sufficient to cover the planned zinc production of 320,000 mt/a. Also, a new electrolytic section with a capacity of 100,000 mt/a was under construction.

The Asturiana smelter is better suited than most European operations to increase output. The proximity of the company's Reocin Mine supplies 45% of the feed concentrates, and long-term contracts with Exminesa's two other mines provide another 40%. More reserves of zinc have been reported in Santillana de Mar and Vive da Queveda, near Reocin operations.

Curragh Resources Ltd., of Canada, purchased a 20% interest in Asturiana de Zinc S.A. Reportedly, this acquisition would provide Curragh Resources Ltd. with smelting capacity for its mines in Canada. In turn, Asturiana purchased a 5% interest in Curragh to have an ensured supply of concentrates. This would further justify its on-going refinery expansion. Also, the two companies reportedly were to jointly develop the Cirque lead-zinc mine in British Columbia, Canada. Asturiana has a 30% stake in the project.

Penarroya Espana SA's 40,000-mt/a primary lead smelter and refinery and Espanola del Zinc's 30,000-mt/a zinc refinery were closed at yearend by the Murcia regional government. The government stated the closure was due to the companies' non-conformance to environmental legislation, which resulted in sulfur and heavy-metal emissions over Cartagena in southern Spain. There was no indication of how long the plants would remain closed.

Industrial Minerals

Ammonia.—The major Spanish nitrogen producer, Feritilizantes Espanoles SA (Fesa), continued with the closure of several plants. Under the company's rationalization plan, the less competitive ammonia-producing units were closed. Primarily, these were plants with annual outputs less than 100,000 tons. As a result, ammonia production was to be concentrated at three large plants: Fesa's plant at Huelva, with an annual capacity of 246,000 tons, and Empresa Nacional de Fertilizantes SA (Enfersa) plants at Cartagena and Puertollano. These two plants had a combined capacity of 380,000 mt/a.

The annual capacity of the Puertollano plant was to be increased from 217,000 mt/a to 228,000 mt/a, and production of the

Huelva plant was to increased to 307,000 mt/a. Also, energy consumption was made more efficient by converting plant's feedstocks from naphtha to natural gas.

With the completion of the rationalization plan, ammonia capacity in Spain would be about 700,000 mt/a, well below the high of 900,000 mt/a per year produced over the preceding decade.

In Spain, a significant effort was made to focus on ammonium nitrate production, which accounts for most of Spain's nitrogen fertilizer capacity. To this end, many ammonium sulfate plants were closed, while investment in ammonium nitrate plants was increased.

Cement.—Major construction projects such as the Seville Expo 92, the Barcelona Olympics, and associated infrastructure projects have contributed to growth in the cement industry in all sectors except export. Demand increased by 10% between 1989 and 1990 while output increased only 2.6%. Because domestic production was unable to keep up with demand, there was an increase in imports.

Societe des Ciments Francais SA purchased the controlling interest in the Spanish cement producer Sociedad Financiera y Minera. While Financiera y Minera had only 3% of the domestic market, the company had interests in foreign countries, including Greece and Morocco. Ciments Francais had indicated that it desired a 10% share of the Spanish cement market and acquired interest in two other Spanish cement operations: a 75% stake in Cementos Rezola SA and a 25% interest in Cementos Molinas SA.

Other foreign companies had an interest in the Spanish cement market. The French company Lafarge Coppee SA acquired a controlling interest in Spain's largest cement producer, Ashland SA, through the acquisition of the Swiss company Cementia.

Kaolin.—Kaolin deposits occur in two different geological environments in Spain. The first occurs as hydrothermal alteration of Pre-Hercynian granites in the northwestern part of Spain. The other source in eastern Spain was derived from the weathering of crystalline rocks of the Lower Cretaceous age.

These two areas in the country produce more than 400,000 mt/a kaolin and have resulted in Spain becoming one of the larger kaolin producers in Europe. Most operations are small, and all are mined by open pit methods.

Potash.—Fesa reported it would close the Ercros Mine at Cardona at yearend. Another ore body, Salitrera Victoria, was evaluated for development to replace the depleted Ercros Mine. The potash seam analyzed 25% K_2O as compared to 12% at Cardona. Several difficulties, including irregularities in the seam, at the new deposit raised questions about the economic viability of the proposed new mine. The company reportedly had decided not to develop the deposit and was looking for other projects to replace Ercros.

Mineral Fuels

Coal.—Spain is endowed with coal and lignite resources. In the past, domestic production had provided the coal requirements of the steel and power generation industries. In 1989, one-third of Spain's coal needs was imported, and future plans call for increased coal usage in the electric generating industry. More coal was expected to be imported because Spanish coal, particularly lignite, has a high sulfur content. Compliance with environmental legislation would require significant investments by most companies in order for them to utilize lignite in their operations.

Hulleras Vasco-Leonesa was to initiate construction for the basic infrastructure for a new colliery in the Cinera-Matallan zone. The first phase of development at the colliery would involve sinking two shafts, one at Santa Lucia and the other at Tabliza. Estimated investment in the new project was reported to be $323 million.

The Spanish Government presented to the European Commission for Energy its coal mines redevelopment plan. The plan was expected to cost about $940 million over the next 4 years. Greater mechanization of the mines would be provided, along with some closures and the reported elimination of an estimated 4,600 jobs. In conjunction with this, the Government created a state company, Empresa Nacional de Innovation, which was set up to alleviate unemployment in mining areas by channeling investments.

Spain's largest coal producer, state-owned Empresa Nacional Hulleras del Norte (Hunosa), has invested $104 million in modernization and general improvements in its mines. Ten mines were being closed by the company as part of its restructuring plan.

Petroleum.—Spain has very little domestic crude production, and that accounts for a small percentage of the country's requirements. Casablanca, an offshore field, and Ayoluengo, an onshore field, were the only two producing fields. There has been little effort to discover new reserves since Amoco and Chevron withdrew from Spanish exploration in 1989.

The Royal Dutch/Shell Group was reported to be shutting down its Amposta Field, Spain's first offshore producer. The field's cumulative production since 1973 was reported to be 55 Mbbl. The field was producing only 1,000 bbl/d during the last part of the year.

Natural Gas.—The energy contribution of domestic natural gas has historically been small, contributing only 3% of the country's energy requirements. The Spanish Government's NEP has indicated that gas was expected to contribute 5% of Spain's energy requirements in the early 1990's. There have been significant gas discoveries, and the country has embarked on a drilling program to bring these resources to market. The Gaviota Field in the Cantabrian Sea provides most of Spain's natural gas. The resources were estimated to provide 1.7 m^3/a.

A new planned pipeline will initially deliver 1.3 m^3 of natural gas from Algeria. This volume would reportedly increase to 2.8 m^3 by the mid-1990's. The 775 km, 120 cm pipeline would cross the Strait of Gibralter and enter Spain at a point to be determined.

Uranium.—Empressa Nacional del Uranio (Enusa) approved the construction of a uranium concentrate plant at El Chico in the Province of Salamanca. The capacity of the plant was 950 mt/a and was expected to be in operation in 3 years. The moratorium on construction on nuclear powerplants was continued and this has effected several projects that were more than one-half completed. Hidroelectrica Espanola and Sevillana Utilities were the plants most impacted with the termination of work on the Valdecaballeros powerplant in western Spain.

INFRASTRUCTURE

The Spanish National Railways (RNFE) operates on 13,500 km of 1.668-m-gauge track and 1,820 km of 1-m-gauge track. Most of the 150,000 km of highways is paved; however, only a small portion is limited-access divided highways. Infrastructure improvements were one of the Government's priorities. The main ports are

Bilbao, Gijon, Barcelona, Tarragona, Cartagena, Cadiz, and Huelva.

OUTLOOK

The mineral resource base in Spain has not been fully exploited, and this mineral resource rich country is expected to continue to contribute these resources for the continued development of Spain and the EC. For example, mercury and zinc are important export commodities, and continued exploration may lead to additional reserves of these commodities.

The lower labor costs in Spain and the abundant natural resources have fueled growth above the EC average growth rate. The fears of an overheated economy have resulted in the tightening of the country's fiscal policy by the Government. Industrial growth has been above the EC average, and the projected economic advantages of Spain's entry into the EC would appear to indicate a strong near-term outlook for the country. By joining the EC, Spain gained virtually unrestricted access to a market that was 15 times larger in terms of purchasing power than its own.

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[1]Where necessary, values have been converted from Spanish pesetas (Ptas) to U.S. dollars at the rate of Ptas 96=US$1.00, the average exchange rate in 1990.

OTHER SOURCES OF INFORMATION

Agencies

Instituto Geological y Minero, annual
(Mining and Geological Institute)
Rios Rosas 23
Madrid 3, Spain

Ministerio de Industria y Energia (Ministry of Industry and Energy)
Doctor Fleming, 7.28036
Madrid, Spain

Direccion General de Minas y Industrias de la Construccion
Ministerio de Industria y Energia
Serrano 37
Madrid, Spain

Publications

Estadistica Minera de Espana (Mineral Statistics of Spain).

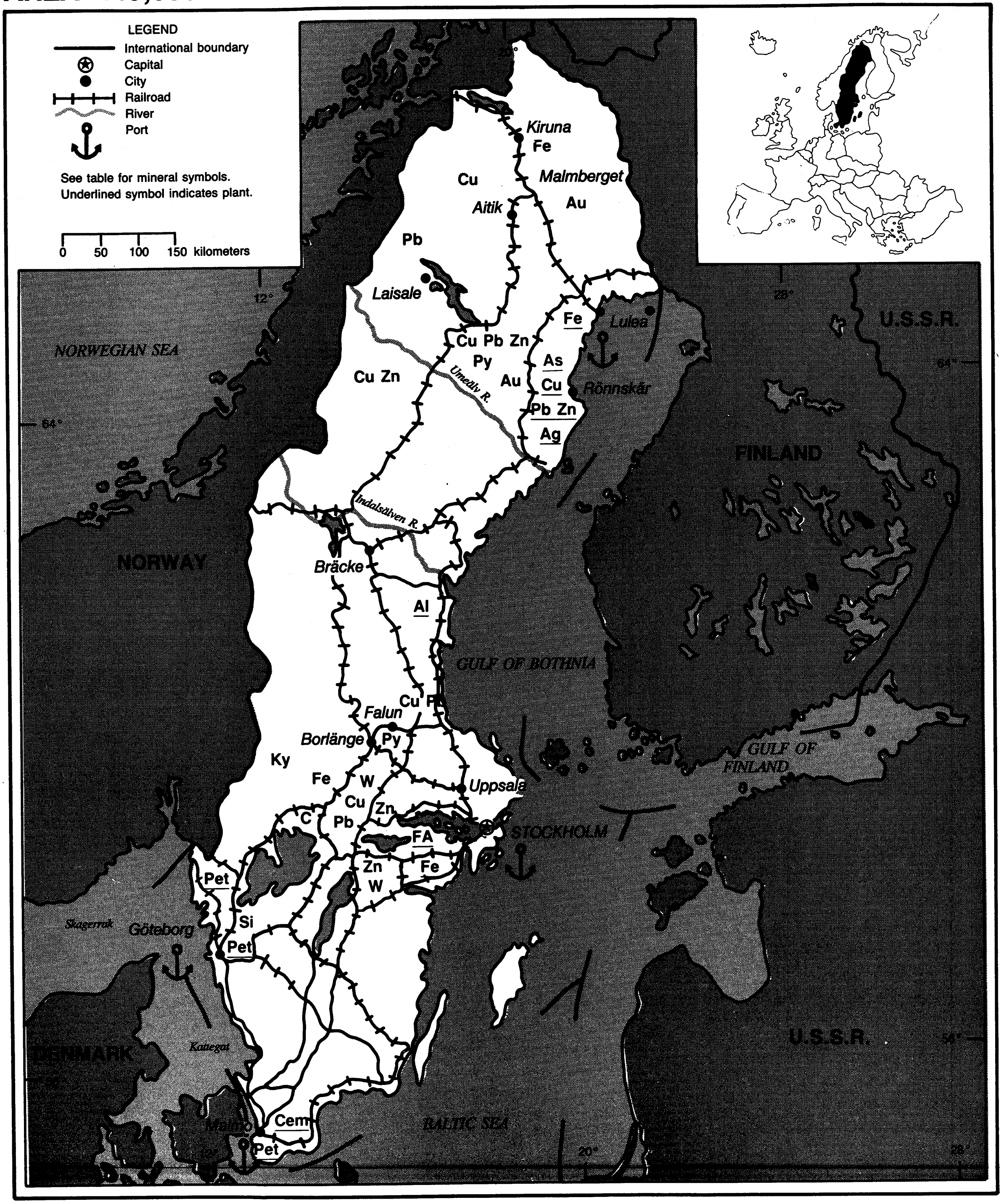
Industria Minera (Mineral Industry).

La Industria Siderurgica Espanola.

Annual reports from various mineral resource companies: Altos Hornos de Vizcaya; Asturiana de Zinc; Rio Tinto Minero; Repsol Petroleos; et al.

SWEDEN

AREA 449,000 km² **POPULATION 8.5 million**



THE MINERAL INDUSTRY OF SWEDEN

By Donald E. Buck, Jr.

Sweden is an industrialized country with a high utilization of its resources and production capacity. Metal mining accounts for 1.7% of industrial production or 0.4% of the GDP.

The mineral deposits of Sweden are found in a number of distinct geographic regions. Iron ore and base metal sulfides are mostly in central Sweden. The iron ore district of Norrbotten in the north also contains some copper deposits. Between Norrbotten and central Sweden is the Skellefteå District containing base metal sulfide ores. All of these deposits occur in Precambrian rocks. In southern Sweden, the vein deposits of lead, manganese, and silver also occur in the Precambrian. The youngest metallic ores in Sweden are the Jurassic iron ores in Scania in southern Sweden.

Industrial minerals occur throughout the country in various geologic environments; however, exploitation of these deposits was mainly in the more densely populated southern part of the country. Because much of Swedish geology is covered by glacial till it is difficult to determine the industrial minerals beneath, and much detailed mapping is required.

GOVERNMENT POLICIES AND PROGRAMS

Sweden's mineral industry is in the form of private enterprise; however, the industry is dominated by state-owned holding companies mainly in iron, steel, and energy. The mineral industry is one of the important basic industries in Sweden, and as such, the state maintains a strong interest. Government incentive programs stimulate exploration, development, and research in mining projects and metallurgical processing techniques.

PRODUCTION

In 1990, Sweden mined 65% of Western European iron ore, 26% of Western European copper, 37% of mined lead, and 19% of mined zinc. With regard to refined metal production, however, Sweden only produced 6% of Western European copper, 4% of refined lead, and no refined zinc. In particular, Sweden was a major producer of specialty steels but had to import the necessary ferroalloys.

TRADE

Sweden was strongly dependent on foreign trade. Many of Sweden's largest industries export well over one-half of their output. Swedish iron ore product exports decreased from 17.5 Mmt in 1989 to 16.4 Mmt in 1990. The decrease was due to the closure of the Grängesberg Mine and the limited production capacity at Kiirunavaara AB (LKAB). Exports to the former CMEA countries increased by 14%, a result of the proximity to the Baltic ports. For other domestic industries, substantial quantities of raw material or feed material was imported. Alumina, chromite, copper, kaolin, and salt were raw materials imported in large quantities. Conversely, zinc concentrate and stone products were some of the larger exports. Imports also play a role in complementing domestic production, stimulating efficiency in the domestic economy, and exerting a downward pressure upon prices.

Free trade was a fundamental principle in Swedish trade policy. Sweden was a founding member of EFTA, whose present membership also includes Austria, Finland, Iceland, Norway, Switzerland, and Liechtenstein. Sweden acceded to the GATT in 1950 and has since participated in all negotiating rounds.

The impending formation of the single European Market in 1992 has caused some concern for the Swedish Government because the EC is a major consumer of Swedish products, accounting for more than one-half of Swedish exports. The Government was taking action to bring Sweden as closely as possible in line with the EC by harmonizing regulations and practices and opening up the economy to competition. Sweden, with other EFTA members, is currently negotiating with the EC to form a European Economic Space (EES) to allow free movement of goods, services, capital, and persons among the member countries.

STRUCTURE OF THE MINERAL INDUSTRY

Sweden's mineral industry consists mainly of state-owned iron ore and iron and steel companies, one privately owned metal mining and metallurgical company, two foreign-owned metal mining companies, and various private specialty steel and industrial minerals producers. Prospecting and mining rights are granted under the Mining Act, 1974; the Act Concerning Certain Mineral Deposits, 1974; and the Continental Shelf Act, 1966. Any person may acquire the right to explore for and exploit mineral deposits containing metalliferous ores or graphite, apatite, and magnesium on his or her land or on land belonging to another party. Industrial minerals, except for the aforementioned three, are not covered in the Mining Act and as such belong to the landowner.

Government agencies involved in the mineral industry are the Swedish Geologic Survey (SGU), which carries out a general bedrock mapping and mineral information function and prepares detailed geologic maps; the State Mining Property Commission (NSG), which is a Government vehicle for exploration financing of potentially economic ore deposits; and the Swedish Geologic Co. (SGAB), which acts as a consultancy to the minerals industry, both domestic and foreign, and also to the NSG and the Geologic Survey. Another Government authority is the National Board for Technical Research, which is responsible for the financing of research into mineral extraction and exploration techniques.

Sweden's metal-based industries, primary metals and metalworking, are important in terms of employment and output.

COMMODITY REVIEW

Metals

The Trelleborg Group continued with its international investments and acquisitions to improve and expand its infrastructure. In

TABLE 1

SWEDEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
METALS						
Aluminum metal:						
Primary		77,667	81,480	98,597	96,982	[2]96,300
Secondary		18,144	8,820	14,101	[e]16,000	[2]25,500
Arsenic, trioxide, refined[e]		10,000	10,000	10,000	10,000	10,000
Copper:						
Mine output, Cu content		87,387	85,016	74,548	69,489	[2]74,283
Metal:						
Smelter:						
Primary		83,358	92,909	93,653	87,125	[2]84,203
Secondary		19,142	12,669	22,247	24,623	[2]23,797
Total smelter		102,500	105,578	115,900	111,748	108,000
Refined:						
Primary		72,800	79,905	68,300	69,977	[2]66,278
Secondary[e]		19,100	12,000	22,000	24,623	31,000
Total refined[e]		91,900	91,905	90,300	94,600	[2]97,278
Gold:						
Mine output, Au content	kilograms	4,514	4,108	3,590	5,120	[2]6,326
Metal, primary[3]	do.	3,640	3,620	3,339	4,403	4,300
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	20,489	19,707	20,440	21,763	[2]19,877
Fe content	do.	[r]13,246	[r]12,809	13,392	14,124	[2]12,901
Metal:						
Pig iron and sponge iron	do.	2,539	2,314	2,527	2,638	[2]2,736
Ferroalloys:						
Ferrochromium		126,144	111,815	143,055	151,697	120,000
Ferrochromium-silicon		17,024	—	—	—	—
Ferrosilicon		19,969	19,949	20,622	19,303	12,000
Total		163,137	131,764	163,677	171,000	132,000
Steel, crude	thousand tons	4,710	4,595	4,779	4,692	[2]4,454
Semimanufactures, rolled[e]	do.	[2]4,005	4,000	4,100	4,200	4,000
Lead:						
Mine output, Pb content		[r]91,729	[r]95,141	91,579	88,967	[2]98,259
Metal:						
Smelter:						
Primary:						
Crude		6,512	1,439	1,257	1,294	1,200
Refined		49,160	61,229	[e]62,000	[e]58,000	55,800
Total		55,672	62,668	[e]63,257	[e]59,294	57,000
Secondary		27,783	30,185	[e]32,000	[e]30,000	27,500
Total smelter		83,455	92,853	[e]95,257	[e]89,294	84,000
Refined:						
Primary		49,160	61,229	57,764	48,694	[2]47,466
Secondary		27,783	30,185	26,936	22,706	[2]22,134
Total		76,943	91,414	84,700	71,400	[2]69,600
Molybdenum, oxide, roasted, Mo content		2,170	2,121	3,371	3,082	3,000
Selenium, elemental, refined	kilograms	24,000	31,000	19,000	[e]20,000	[2]27,000
Silicon metal[e]		[2]19,156	20,000	17,059	10,000	10,000

See footnotes at end of table.

TABLE 1—Continued

SWEDEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
METALS—Continued						
Silver:						
Mine output, Ag content	kilograms	262,708	254,107	207,804	227,715	[2]242,685
Metal, primary[3] [e]	do.	168,000	151,000	149,000	152,000	[2]288,000
Tungsten: Mine output, W content		357	574	420	[e]80	—
Zinc: Mine output, Zn content		[r]227,648	[r]229,353	200,393	173,515	[2]164,128
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	[r]2,052	[r]2,253	[r]2,200	[r]2,250	2,550
Clays: Kaolin		60	[e]100	92	[e]100	100
Feldspar, salable, crude and ground		35,160	34,226	[e]36,000	40,000	[2]40,000
Fluorspar concentrate		265	220	225	150	150
Kyanite[e]		5,000	5,000	6,000	6,000	6,000
Lime, mostly quicklime	thousand tons	656	590	589	670	—
Nitrogen: N content of ammonia	do.	46	41	—	—	—
Phosphate rock (byproduct):						
Gross weight	do.	192	221	142	71	7
P_2O_5 content	do.	71	82	52	26	3
Pyrite, gross weight	do.	447	429	355	301	252
Quartz[e]		17,000	17,000	[2]15,206	18,000	18,000
Sodium sulfate, synthetic[e]		100,000	100,000	100,000	100,000	100,000
Stone:						
Dimension, mostly unfinished:						
Granite	thousand tons	169	135	89	[e]100	100
Limestone[e]	do.	15	15	20	15	15
Sandstone[e]	do.	3	3	[r]3	5	5
Slate	do.	21	20	28	[e]20	20
Crushed:						
Dolomite	do.	780	606	[e]600	[e]600	600
Granite	do.	6,888	7,313	4,978	[e]6,000	6,000
Limestone:						
For cement manufacture	do.	913	943	1,064	[e]950	950
For lime manufacture[e]	do.	2,000	2,000	2,000	2,000	2,000
For other construction and industrial uses[e]	do.	2,100	2,100	[2]1,878	2,000	2,000
Chalk (ground)	do.	39	37	[e]38	[e]40	40
Marl[e]	do.	2,500	2,500	2,500	2,500	2,500
For agricultural uses (ground)[e]	do.	300	300	[2]122	150	150
For other uses (ground)[e]	do.	100	100	100	100	100
Total[e]	do.	7,952	7,980	[r]7,702	[r]7,740	7,740
Quartzite	do.	1,425	1,317	1,220	[e]1,200	1,200
Sandstone	do.	52	47	58	[e]50	50
Other[e]	do.	700	700	700	700	700
Sulfur:						
S content of pyrite	do.	310	215	286	233	230
Byproduct:[e]						
From metallurgy	do.	[2]125	130	125	125	125
From petroleum	do.	[2]49	50	45	40	40
Total[e]	do.	[2]484	395	456	398	395
Sulfuric acid	gross weight	1,001	985	962	[e]900	900

See footnotes at end of table.

TABLE 1—Continued

SWEDEN: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
INDUSTRIAL MINERALS—Continued						
Talc, soapstone		2,000	800	16,550	—	—
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]		30,000	30,000	30,000	30,000	30,000
Coke, metallurgical	thousand tons	1,176	1,096	893	[e]800	800
Peat, for agricultural use[e]		60,000	60,000	60,000	60,000	60,000
Petroleum:						
Crude	thousand 42-gallon barrels	30	24	[e]15	19	18
Refinery products:						
Liquefied petroleum gas	do.	2,714	2,448	[e]2,500	1,856	1,500
Naphtha	do.	1,530	1,726	[e]2,640	1,632	1,500
Gasoline, motor	do.	26,868	32,989	[e]37,600	32,122	34,000
Jet fuel	do.	3,544	3,275	[e]6,600	4,130	5,000
Kerosene	do.	170	311	[e]395	245	250
Distillate fuel oil	do.	40,761	41,552	[e]44,230	52,551	52,500
Residual fuel oil	do.	28,025	28,731	[e]25,785	26,855	27,000
Other	do.	5,485	5,872	[e]6,000	4,488	4,500
Refinery fuel and losses	do.	6,630	7,448	[e]7,500	[e]11,300	11,300
Total	do.	115,727	124,352	[e]133,250	[e]135,179	137,550

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 1, 1991.
[2]Reported figure.
[3]Includes only that recovered from indigenous ores excluding scrap.

TABLE 2

SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	27	1	—	All to Denmark.
Oxides and hydroxides	356	147	—	Denmark 114; West Gernmany 23.
Ash and residue containing aluminum	1,761	2,660	—	Norway 771; Finland 682; Spain 653.
Metal including alloys:				
Scrap	11,069	13,665	—	Finland 3,627; Norway 2,578; West Germany 2,161.
Unwrought	59,887	58,813	7	West Germany 27,081; United Kingdom 8,416; Norway 7,413.
Semimanufactures	60,049	60,545	1,999	Denmark 13,211; United Kingdom 12,520; Norway 7,518.
Antimony:				
Oxides	36	45	—	Mainly to Norway.
Metal including alloys, all forms	—	6	—	Denmark 3; Finland 3.
Bismuth: Metal including all forms value, thousands	—	$3	—	All to Denmark.
Cadmium: Metal including alloys, all forms do.	—	$2	—	All to Norway.
Chromium:				
Ore and concentrate	—	652	—	U.S.S.R. 513; Spain 138.

See footnotes at end of table

TABLE 2—Continued

SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
METALS—Continued					
Chromium—Continued					
Oxides and hydroxides		137	19	—	Denmark 6; Norway 6; Finland 4.
Cobalt:					
Oxides and hydroxides		155	141	—	Finland 140.
Metal including alloys, all forms		319	217	42	Netherlands 53; United Kingdom 33.
Columbium and tantalum: Metal including alloys, all forms	value, thousands	—	1	—	All to United Kingdom.
Copper:					
Ore and concentrate		55,190	75,144	—	Finland 39,480; Norway 18,790; East Germany 11,630.
Matte and speiss including cement copper		NA	1	—	Mainly to Norway.
Oxides and hydroxides		—	21	—	Mainly to Yugoslavia.
Ash and residue containing copper		3,377	1,986	—	Belgium-Luxembourg 1,925.
Metal including alloys:					
Scrap		3,658	6,347	—	Denmark 2,212; West Germany 2,105; Poland 776.
Unwrought		50,699	40,720	35	Finland 14,114; United Kingdom 11,258; West Germany 6,592.
Semimanufactures		86,956	194,787	3,889	Finland 11,812; Norway 8,772; United Kingdom 7,832.
Germanium: Metal including alloys, all forms		—	1	1	
Gold:					
Waste and sweepings	value, thousands	$16,785	$13,291	—	West Germany $6,474; United Kingdom $3,299; Switzerland $1,813.
Metal including alloys, unwrought and partly wrought	do.	$94,759	$83,669	$10	Switzerland $31,128; West Germany $25,741; Spain $10,976.
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite	thousand tons	17,722	17,473	65	West Germany 6,315; Belgium-Luxembourg 3,074; Finland 1,918.
Pyrite, roasted		—	11,231	—	All to United Kingdom.
Metal:					
Scrap		87,490	141,758	24	Italy 75,604; Spain 21,244; Denmark 19,814.
Pig iron, cast iron, related materials		132,203	134,675	192	Italy 7,229; United Kingdom 4,154; unspecified 116,983.
Ferroalloys:					
Ferrochromium		96,031	99,346	NA	NA.
Ferrocolumbium		14	22	NA	Finland 18.
Ferromanganese		867	762	NA	Italy 186; United Kingdom 147; France 139.
Ferromolybdenum		27	229	NA	Netherlands 164; Finland 41; Norway 22.
Ferronickel		19	—		
Ferrosilicomanganese		146	86	NA	East Germany 52.
Ferrosilicon		14,931	13,678	NA	NA.
Ferrotitanium		—	53	NA	Finland 41.
Silicon metal	value, thouands	$21,028	$16,663	NA	NA.
Unspecified		144	140	105	NA.
Steel, primary forms		430,403	330,943	57,221	West Germany 74,943; United Kingdom 47,785.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		741,038	822,461	63,857	West Germany 159,124; Denmark 136,851; Norway 101,710.
Clad, plated, coated		236,972	240,873	2,648	Denmark 50,264; United Kingdom 42,415; Norway 34,790.
Of alloy steel		397,613	408,128	37,159	West Germany 102,025; United Kingdom 39,997; Italy 37,337.

See footnotes at end of table.

TABLE 2—Continued

SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued					
Metal—Continued					
Semimanufactures—Continued					
Bars, rods, angles, shapes, sections		803,270	691,128	33,381	West Germany 177,735; United Kingdom 95,669; Denmark 62,711.
Rails and accessories		38,225	28,187	698	Italy 10,711; Norway 7,841; United Kingdom 4,088.
Wire		65,839	65,151	6,583	West Germany 13,903; Finland 8,134.
Tubes, pipes, fittings		247,200	245,375	NA	NA
Lead:					
Ore and concentrate		60,885	71,527	4,000	West Germany 46,595; Belgium-Luxembourg 15,060.
Oxides		—	35	—	East Germany 21; United Kingdom 7; West Germany 4.
Ash and residue containing lead		2,926	—		
Metal including alloys:					
Scrap		3,379	875	—	Denmark 544; United Kingdom 209.
Unwrought		69,532	49,120	—	Norway 10,876; Finland 8,901; West Germany 7,373.
Semimanufactures		723	817	1	United Kingdom 449; Finland 205; Ethiopia 68.
Magnesium: Metal including alloys:					
Scrap		1,391	1,301	—	West Germany 562; Netherlands 459; United Kingdom 257.
Semimanufactures		4	4	—	Denmark 2; West Germany 1; Norway 1.
Manganese:					
Ore and concentrate, metallurgical-grade		—	26	—	All to Italy.
Oxides		—	62	—	Norway 36; Thailand 21.
Metal including alloys, all forms		273	150	—	Finland 74; Norway 34.
Mercury		8	59	—	Netherlands 58.
Molybdenum:					
Ore and concentrate, roasted		1,725	2,647	—	United Kingdom 1,116; Netherlands 451; West Germany 418.
Oxides and hydroxides		—	102	—	Belgium-Luxembourg 59; Finland 23; Netherlands 20.
Metal including alloys:					
Unwrought including waste and scrap		19	1	([2])	Mainly to United Kingdom.
Semimanufactures		2	2	—	Japan 1.
Nickel:					
Ore and concentrate		26	—		
Metal including alloys:					
Scrap		642	769	([2])	Netherlands 258; United Kingdom 195; West Germany 174.
Unwrought		1,802	133	20	Norway 103.
Semimanufactures		1,653	1,540	449	West Germany 273; Italy 194.
Platinum-group metals:					
Waste and sweepings	value, thousands	$10,152	$11,834	$5,163	Norway $2,111; Belgium-Luxembourg $2,034.
Metals including alloys, unwrought and partly wrought:					
Palladium	do.	$248	$263	—	Norway $185.
Platinum	do.	$2,078	$3,958	$6	Netherlands $1,697; Switzerland $1,008; United Kingdom $423.
Silicon, high-purity		1	—		
Silver:					
Waste and sweepings	value, thousands	$8,636	$5,949	—	West Germany $2,627; Norway $1,314; United Kingdom $989.
Metal including alloys, unwrought and partly wrought		301	317	NA	Finland 33; Unspecified 277.

See footnotes at end of table.

TABLE 2—Continued

SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989	
			United States	Other (principal)
METALS—Continued				
Tellurium and boron, elemental	7	5	—	United Kingdom 3; West Germany 2.
Tin: Metal including alloys:				
Unwrought	158	174	—	Finland 82; Norway 47; West Germany 27.
Semimanufactures	124	96	—	Denmark 38; Norway 37; Finland 17.
Titanium:				
Oxides	72	86	—	West Germany 49; Turkey 22.
Metal including alloys:				
Unwrought including waste and scrap	329	279	—	United Kingdom 247; West Germany 31.
Semimanufactures	121	257	126	Canada 46; Finland 37.
Tungsten:				
Ore and concentrate	688	598	—	West Germany 564; Brazil 18; India 16.
Metal including alloys:				
Unwrought	90	7	—	West Germany 3; United Kingdom 2.
Semimanufactures	6	4	(2)	West Germany 1; Japan 1.
Uranium and thorium: Oxides and other compounds	50	83	(2)	Mainly to West Germany.
Zinc:				
Ore and concentrate	373,196	327,410	—	Belgium-Luxembourg 112,329; Norway 87,419; Finland 66,327.
Oxides	602	697	1	West Germany 520; Finland 87.
Matte	37,811	32,800	—	All to Norway.
Ash and residue containing zinc	1,953	2,011	—	Norway 1,276.
Metal including alloys:				
Scrap	3,156	4,628	—	Taiwan 1,591; West Germany 481; United Kingdom 476.
Unwrought	833	202	—	Norway 120; Finland 42; United Kingdom 31.
Semimanufactures	157	128	—	Norway 92; Finland 18.
Zirconium:				
Oxide including germanium	1	10	—	United Kingdom 9; Japan 1.
Metal including alloys:				
Unwrought including waste and scrap	17	29	(2)	United Kingdom 27; France 2.
Semimanufactures	65	60	(2)	West Germany 33; Romania 18; Japan 5.
Other:				
Ores and concentrates	101	1,007	—	West Germany 1,005; United Kingdom 1.
Oxides and hydroxides	242	1	—	Mainly to United Kingdom.
Ashes and residues	3,451	5,208	20	Belgium-Luxembourg 2,836; Norway 1,003; France 403.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	155	46	—	Portugal 36; Norway 3.
Artificial: Corundum	—	79	NA	NA.
Dust and powder of precious and semiprecious stones excluding diamond value, thousands	$81	—		
Grinding and polishing wheels and stones	2,182	2,134	15	United Kingdom 358; France 331; U.S.S.R. 256.
Boron materials:				
Crude natural borates	460	13	—	All to Denmark.
Oxides and acids	155	—		
Cement	441,516	198,072	(2)	United Kingdom 141,080; Nigeria 25,510; Bahamas 23,223.

See footnotes at end of table.

TABLE 2—Continued

SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Chalk		8,732	4,963	—	Finland 2,646; Norway 1,780.
Clays, crude:					
Bentonite		922	567	—	Finland 517.
Kaolin		1,706	639	—	Finland 289; Norway 287; West Germany 22.
Unspecified		83	—		
Diamond:					
Natural:					
Gem, not set or strung	value, thousands	$2,411	$1,824	$47	Netherlands $624; Belgium-Luxembourg $367; Denmark $276.
Industrial stones	do.	$96	$71	1	Argentina $16; Finland $16; Denmark $11.
Dust and powder	do.	$343	$382	—	Finland $148; Norway $84; Ireland $74.
Synthetic, industrial	do.	[3]$37,004	NA		
Diatomite and other infusorial earth		125	112	—	Belgium-Luxembourg 38; Denmark 31; Norway 30.
Feldspar, fluorspar, related materials:					
Feldspar		26,386	20,070	—	United Kingdom 12,757; Italy 2,921; Austria 2,481.
Fluorspar		2,108	1,576	—	Finland 1,440.
Fertilizer materials:					
Crude, n.e.s.		1,320	666	—	West Germany 307; Norway 176; Japan 168.
Manufactured:					
Ammonia		1,256	1,643	NA	Norway 1,415; Denmark 155.
Nitrogenous[4]		206,100	163,548	NA	West Germany 55,576; Denmark 43,614; Norway 37,336.
Phosphatic		102,416	81,748	—	United Kingdom 44,116; Ireland 15,712; Netherlands 8,397.
Potassic		11,932	33,594	—	Norway 33,568.
Unspecified and mixed		211,499	272,178	—	United Kingdom 86,790; West Germany 49,538; Norway 17,831.
Graphite, natural		68	32	—	Republic of Korea 13; Japan 8; Yugoslavia 2.
Gypsum and plaster		279	636	—	Finland 343; Denmark 135; Norway 77.
Iodine		4,218	—		
Kyanite and related materials		2,559	3,274	—	Italy 1,664; United Kingdom 597; France 420.
Lime		4,857	27,913	—	Denmark 13,270; Finland 10,865; Norway 3,320.
Magnesium compounds:					
Magnesite, crude		185	518	—	Norway 420; Netherlands 35.
Oxides and hydroxides		346	532	—	Norway 433; Denmark 51; Finland 38.
Mica: Worked including agglomerated splittings		—	1	—	Mainly to Australia.
Nitrates, crude		22	328	—	Finland 275; Norway 49; Denmark 4.
Phosphates, crude		72,363	80,328	—	All to Norway.
Pigments, mineral: Iron oxides and hydroxides, processed		5,444	5,747	181	Republic of Korea 2,180.
Precious and semiprecious stones other than diamond:					
Natural	kilograms	4,000	1,000	([2])	Mainly toBelgium-Luxembourg.
Synthetic	do.	9,000	10,000	—	Mainly to Ireland.
Pyrite, unroasted		7	76	—	Norway 56; Colombia 20.
Salt and brine		1,792	1,879	([2])	Norway 560; Finland 546; Denmark 416.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		116	7,739	—	United Kingdom 7,231; Norway 475.
Sulfate, manufactured		83,825	51,296	NA	NA.

See footnotes at end of table.

TABLE 2—Continued

SWEDEN: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		277,914	304,557	2,466	Denmark 122,409; West Germany 63,183; Italy 32,221.
Worked		12,173	9,392	88	Denmark 5,112; Norway 2,741.
Dolomite, chiefly refractory-grade		43,133	49,645	9	Denmark 14,305; Netherlands 14,095; Norway 10,332.
Gravel and crushed rock		1,284,289	1,076,529	—	Denmark 674,263; West Germany 302,549.
Limestone other than dimension		890,512	1,019,765	—	Finland 890,686;Denmark 73,935.
Quartz and quartzite		316,133	384,374	—	Norway 366,790; Denmark 10,811.
Sand other than metal-bearing		101,630	113,844	—	Denmark 45,863; Norway 41,538; West Germany 24,329.
Sulfur:					
Elemental:					
Crude including native and byproduct		15,597	36,528	—	France 35,583; Finland 916.
Colloidal, precipitated, sublimed		2,363	3,077	—	All to Norway.
Dioxide		37,261	43,891	NA	Finland 23,289; Norway 19,935.
Sulfuric acid		19,611	11,362	NA	Netherlands 11,163.
Talc, steatite, soapstone, pyrophyllite		14,684	17,094	—	Netherlands 12,255; United Kingdom 2,287; Norway 1,485.
Vermiculite		254	261	—	Mainly to Norway.
Other:					
Crude		4,220	2,054	—	Norway 943; West Germany 352; Denmark 328.
Slag and dross, not metal-bearing		108,604	212,138	(2)	United Kingdom 50,127; Denmark 43,612; West Germany 41,357.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		1,659	215	—	Norway 120; Denmark 85.
Carbon:					
Carbon black		21,538	24,161	—	East Germany 8,260; Norway 5,541; Finland 3,848.
Gas carbon		6,517	1,300	—	All to Netherlands.
Coal:					
Anthracite		2	4	—	All to Norway.
Bituminous		35,353	7,328	—	Ireland 5,111; Norway 1,202; Denmark 706.
Coke and semicoke		85,236	51,552	—	Finland 38,786; Norway 12,725.
Peat including briquets and litter		49,513	53,383	—	Norway 21,534; Netherlands 16,011; Denmark 13,808.
Petroleum:					
Crude	thousand 42-gallon barrels	22	405	—	All to the Netherlands.
Refinery products:					
Liquefied petroleum gas	do.	954	986	—	France 391; Norway 125; Denmark 96.
Gasoline	do.	8,189	8,906	(2)	Norway 3,577; Denmark 2,846; Poland 971.
Mineral jelly and wax	do.	795	1,346	55	Denmark 393; Poland 283; Belgium-Luxembourg 142.
Kerosene and jet fuel	do.	1,208	654	(2)	Norway 354; Denmark 286.
Distillate fuel oil	do.	19,278	23,492	487	Denmark 7,277; West Germany 6,533; France 5,355.
Lubricants	do.	1,549	1,874	(2)	Netherlands 400; Norway 359; France 337.
Residual fuel oil	do.	19,247	23,071	3,106	United Kingdom 7,461; Italy 6,449; West Germany 2,578.
Bitumen and other residues	do.	1,619	1,694	—	Norway 800; Denmark 430; Finland 311.
Bituminous mixtures	do.	37	32	1	Belgium-Luxembourg 6; Denmark 4; Finland 2.

NA Not available.

[1]Table prepared by staff, International Data Section.

[2]Less than 1/2 unit.

[3]May include other synthetic precious and semiprecious stones.

[4]Totals exclude unreported quantities valued at $3,875,000 in 1988 and $4,362,000 in 1989.

TABLE 3

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	41	54	—	West Germany 24; Austria 21; Netherlands 4.
Alkaline earth-metals	45	17	1	Austria 6; U.S.S.R. 5; France 2.
Aluminum:				
Ore and concentrate	51,108	56,593	—	Greece 14,425; West Germany 14,084; Australia 11,424.
Oxides and hydroxides	253,716	310,110	27,026	Australia 118,525; West Germany 49,306; Jamaica 28,575.
Ash and residue containing aluminium	9,366	14,478	—	Norway 6,955; West Germany 5,283; France 1,491.
Metal including alloys:				
Scrap	3,592	5,193	176	Norway 2,471; Denmark 1,112.
Unwrought	58,819	56,141	10	Norway 22,907; Canada 8,650; Finland 5,098.
Semimanufactures	98,255	99,542	1,047	West Germany 32,521; France 12,935; Norway 12,935.
Antimony:				
Oxides	652	561	20	United Kingdom 202; France 146; Belgium-Luxembourg 111.
Metal including alloys, all forms	112	65	—	China 62; Netherlands 1.
Arsenic: Metal including alloys, all forms	143	—		
Beryllium: Metal including alloys, all forms value, thousands	$3	$22	$8	Japan $7; United Kingdom $5.
Bismuth: Metal including alloys, all forms	19	15	—	United Kingdom 9; China 2; Ireland 2.
Cadmium: Metal including alloys, all forms	177	181	([2])	Finland 119; Norway 51; Netherlands 11.
Chromium:				
Ore and concentrate	435,595	398,811	NA	NA
Oxides and hydroxides	450	447	11	West Germany 263; United Kingdom 79; Poland 43.
Metal including alloys, all forms	220	271	([2])	United Kingdom 146; France 63; U.S.S.R. 51.
Cobalt:				
Oxides and hydroxides	12	5	([2])	France 2; West Germany 2; United Kingdom 1.
Metal including alloys, all forms	580	599	36	Zambia 156; Finland 122; West Germany 108.
Columbium and tantalum: Tantalum: Metal including alloys, all forms	1	1	—	Mainly from United Kingdom.
Copper:				
Ore and concentrate	83,977	47,017	—	Chile 25,018; Finland 7,821; Greece 7,032.
Matte and speiss including cement copper	3,441	1,957	—	Mainly from France.
Oxides and hydroxides	778	723	—	Yugoslavia 546; West Germany 170.
Sulfate	942	1,111	—	U.S.S.R. 511; Israel 240; Czechoslovakia 122.
Ash and residue containing copper	48,034	37,604	19	West Germany 31,797; United Kingdom 2,993.
Metal including alloys:				
Scrap	16,494	9,195	2,648	France 2,671; United Kingdom 1,481.
Unwrought	66,610	73,381	1,444	Chile 13,604; Finland 13,484; Canada 10,818.
Semimanufactures	43,445	41,909	276	West Germany 18,133; France 5,379; Finland 5,025.
Germanium: Metal including alloys, all forms value, thousands	$1	—		
Gold:				
Waste and sweepings do.	$808	$553	—	Finland $345; Denmark $96; Norway $71.
Metal including alloys, unwrought and partly wrought do.	$21,415	$21,108	$520	West Germany $8,944; Switzerland $5,571; Norway $2,785.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	129,332	254,968	—	Canada 183,133; Norway 71,183.

See footnotes at end of table.

TABLE 3—Continued

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS—Continued				
Iron and steel—Continued				
Iron ore and concentrate—Continued				
Pyrite, roasted	163	—		
Metal:				
Scrap	801,197	625,427	13,178	West Germany 192,896; U.S.S.R. 133,666; Canada 6,650.
Pig iron, cast iron, related materials	81,794	60,831	3,252	Poland 15,936; U.S.S.R. 13,666; Canada 6,650.
Ferroalloys:				
Ferrochromium	44,420	41,714	22	Finland 12,967; Yugoslavia 6,001; West Germany 4,723.
Ferrocolumbium	266	371	—	Brazil 231; Netherlands 55; United Kingdom 45.
Ferromanganese	31,104	26,959	40	Norway 14,760; France 6,440; Belgium-Luxembourg 5,100.
Ferromolybdenum	2,039	3,455	39	China 1,122; Belgium-Luxembourg 586; Netherlands 585.
Ferronickel	9,283	12,179	28	Greece 4,211; Dominican Republic 2,975; Colombia 2,906.
Ferrosilicochromium	2,455	2,453	—	Zimbabwe 1,214; U.S.S.R. 1,049; West Germany 190.
Ferrosilicomanganese	17,336	14,755	—	Norway 10,721; Belgium-Luxembourg 4,000.
Ferrosilicon	24,142	23,324	—	Norway 17,922; U.S.S.R. 4,422.
Ferrotitanium	1,876	1,391	44	West Germany 606; U.S.S.R. 308; United Kingdom 213.
Ferrotungsten	697	860	—	China 810; Netherlands 25.
Ferrovanadium	1,097	1,151	—	West Germany 408, Belgium-Luxembourg 289; Austria 281.
Steel, primary forms	122,357	119,800	2	Finland 53,046; France 20,796; West Germany 13,039.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	595,377	551,178	27	West Germany 152,709; Belgium-Luxembourg 101,912; Denmark 76,667.
Clad, plated, coated	416,496	399,705	22	West Germany 98,887; France 70,697; Belgium-Luxembourg 54,061.
Of alloy steel	80,480	91,565	167	West Germany 55,332; Japan 9,076; France 8,399.
Bars, rods, angles, shapes, sections	497,076	583,283	4,129	West Germany 107,490; Finland 97,914; Kingdom 91,200.
Rails and accessories	7,066	14,374	([2])	Austria 5931; United Kingdom 3,115; France 2,294.
Wire	34,139	32,378	50	Belgium-Luxembourg 9,259; United Kingdom 6,663; Finland 5,214.
Tubes, pipes, fittings	341,901	328,060	414	West Germany 76,867; Finland 56,327; Norway 36,683.
Lead:				
Ore and concentrate	3,301	—		
Oxides	4,553	3,931	—	West Germany 3,334; United Kingdom 311.
Ash and residue containing lead	968	376	—	Finland 315.
Metal including alloys:				
Scrap	23,244	17,373	—	Norway 8,914; United Kingdom 6,058; Denmark 1,194.
Unwrought	2,886	2,385	([2])	United Kingdom 1,465; Denmark 431; West Germany 252.
Semimanufactures	1,039	972	([2])	West Germany 648; Netherlands 169; United Kingdom 138.
Magnesium: Metal including alloys:				
Unwrought	2,310	2,545	186	Norway 1,687; West Germany 464.
Semimanufactures	146	115	27	France 26; West Germany 16.
Manganese:				
Ore and concentrate, metallurgical-grade	11,683	13,398	—	Brazil 13,199; Netherlands 146.
Oxides	326	512	349	Netherlands 65; West Germany 61.
Metal including alloys, all forms	1,593	2,079	314	France 1,021; China 583.

See footnotes at end of table.

TABLE 3—Continued

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
METALS—Continued					
Mercury		2,539	13	—	Spain 5; West Germany 3.
Molybdenum:					
Ore and concentrate:					
Roasted		3,872	3,515	600	Chile 817; Netherlands 794.
Unroasted		3,998	4,042	1,426	Canada 1,752; Mexico 555.
Oxides and hydroxides		234	243	28	West Germany 156; East Germany 38.
Metal including alloys:					
Unwrought including scrap		98	321	16	West Germany 262; United Kingdom 26.
Semimanufactures		185	166	33	United Kingdom 26; Austria 21.
Nickel:					
Ore and concentrate		2,866	2,212	—	Norway 1,627; Brazil 585.
Matte and speiss		2,319	1,729	—	Mainly form Australia.
Oxides and hydroxides		4	53	—	Australia 51.
Metal including alloys:					
Scrap		11,665	11,029	4,636	West Germany 5,348; United Kingdom 640.
Unwrought		14,176	13,751	400	United Kingdom 3,655; Canada 2,383; Norway 1,873.
Semimanufactures		1,478	2,188	366	United Kingdom 988; West Germany 378.
Platinum-group metals:					
Waste and sweepings	value, thousands	$368	$339	—	Norway $161; Finland $137.
Metals including alloys, unwrought and partly wrought:					
Palladium	do.	$2,634	$6,063	$1,107	Switzerland $3,201; United Kingdom $1,001.
Platinum	do.	$39,059	$30,324	$3,350	Switzerland $11,890; West Germany $5,124.
Iridium, osmium, ruthenium	do.	—	$134	—	Ireland $94.
Rare-earth metals including alloys, all forms		31	13	—	Austria 6; United Kingdom 1.
Selenium, elemental		22	26	NA	NA.
Silicon, high-purity		16	18	—	West Germany 7; Denmark 6; Japan 5.
Silver:					
Ore and concentrate	value, thousands	NA	$16,402	—	Chile $8,273; Peru $6,419; Belgium-Luxembourg $1,710.
Waste and sweepings	do.	$4,948	$9,030	$5,136	Finland $2,386; France $1,235.
Metal including alloys, unwrought and partly wrought		174	191	1	West Germany 80; Spain 46; United Kingdom 17.
Tellurium and boron, elemental		7	6	—	U.S.S.R. 5; West Germany 1.
Tin: Metal including alloys:					
Scrap		153	128	—	Denmark 99; Netherlands 22.
Unwrought		549	564	—	Malaysia 277; Netherlands 91; Brazil 87.
Semimanufactures		126	139	(2)	Netherlands 74; West Germany 32; United Kingdom 22.
Titanium:					
Ore and concentrate		1,376	1,809	—	Australia 1,540; Netherlands 185.
Oxides			4,725	4,300	105 Norway 2,388; Finland 585; West Germany 337.
Metal including alloys, semimanufactures		567	1,005	163	Japan 564; West Germany 115.
Tungsten:					
Ore and concentrate		756	659	—	China 250; Thailand 236; Australia 100.
Metal including alloys:					
Unwrought including scrap		200	184	13	West Germany 63; China 33; United Kingdom 29.
Semimanufactures		33	73	11	West Germany 33; China 18.

See footnotes at end of table.

TABLE 3—Continued

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS—Continued				
Uranium and thorium: Oxides and other compounds	334	433	24	France 149; U.S.S.R. 144; United Kingdom 81.
Vanadium: Metal including alloys, all forms	8	41	28	West Germany 13.
Zinc:				
Ore and concentrate	—	6	—	West Germany 5.
Oxides	1,795	1,409	—	West Germany 506; Netherlands 225; United Kingdom 224.
Blue powder	331	307	—	Norway 285.
Ash and residue containing zinc including hard zinc	27,011	12,385	—	West Germany 7,192; United Kingdom 4,859.
Metal including alloys:				
Scrap	117	107	—	All from Norway.
Unwrought	43,316	43,094	—	Finland 21,077; Norway 19,606.
Semimanufactures	254	319	([2])	West Germany 189; Belgium-Luxembourg 75.
Zirconium:				
Ore and concentrate	232	32	—	Australia 24; West Germany 8.
Oxides including germanium	9	—		
Metal including alloys:				
Unwrought including scrap	134	152	51	France 55; United Kingdom 14.
Semimanufactures	130	121	40	France 78; United Kingdom 2.
Other:				
Ores and concentrates	5,329	4,667	2	Saudi Arabia 4,660; Norway 5.
Oxides and hydroxides	64	40	14	West Germany 18; United Kingdom 6.
Ashes and residues	2,335	4,497	282	United Kingdom 2,033; Peru 1,579.
Base metals including alloys, all forms	6	5	1	U.S.S.R. 1.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	3,346	1,429	NA	Ireland 1,189.
Artificial:				
Corundum	6,494	6,487	170	West Germany 3,036; United Kingdom 1,118; Austria 519.
Silicon carbide	5,996	5,834	NA	Norway 5,441; West Germany 258.
Dust and powder of precious and semiprecious stones excluding diamond value, thousands	$75	$325	—	United Kingdom $231; Ireland $67.
Grinding and polishing wheels and stones	3,010	3,138	49	Austria 1,075; West Germany 512; France 372.
Asbestos, crude	972	967	—	Canada 962; West Germany 5.
Barite and witherite	5,440	5,006	3	West Germany 3,922; China 967.
Boron materials:				
Crude natural borates	12,093	12,110	—	Turkey 11,318; Netherlands 770.
Oxides and acids	696	821	154	Turkey 293; France 260.
Bromine	10	11	NA	NA.
Cement	216,701	312,210	370	Poland 108,870; Denmark 78,548; East Germany 50,267
Chalk	63,320	128,004	([2])	West Germany 89,776; Denmark 34,905.
Clays, crude:				
Bentonite	7,693	9,961	119	Cyprus 5,400; West Germany 1,793;
Chamotte earth	1,111	1,687	—	Czechoslovakia 816; West Germany 572; France 228.
Fuller's earth	7,570	6,595	—	West Germany 3,855; United Kingdom 2,565.
Fire clay	8,022	7,944	836	Czechoslovakia 3,228; United Kingdom 2,272; West Germany 1,011.

See footnotes at end of table

TABLE 3—Continued

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Clays, crude—Continued				
Kaolin	441,212	352,791	61,239	United Kingdom 270,214; Czechoslovakia 15,318.
Unspecified	22,638	22,192	863	United Kingdom 16,517; West Germany 3,358; China 1,400.
Diamond: Natural:				
Gem, not set or strung value, thousands	$10,228	$9,768	$56	Belgium-Luxembourg $6,021; Switzerland $1,270; Israel $718.
Industrial stones do.	$970	$819	$380	United Kingdom $147; Netherlands $105.
Dust and powder	2	1	(2)	Mainly from Ireland.
Diatomite and other infusorial earth	2,810	2,656	678	Denmark 1,205; Spain 276.
Feldspar, fluorspar, related materials:				
Feldspar	10,035	8,410	—	Norway 6,774.
Fluorspar	11,670	13,915	(2)	Mexico 10,369; United Kingdom 2,402.
Unspecified	6,245	5,900	—	Norway 5,866.
Fertilizer materials:				
Crude, n.e.s.	97	144	—	U.S.S.R. 108; Denmark 22; United Kingdom 10.
Manufactured:				
Ammonia	222,737	223,081	(2)	U.S.S.R. 104,163; Poland 69,053; Netherlands 33,396
Nitrogenous	678,912	500,404	—	NA.
Phosphatic	1,163	6,331	—	Netherlands 3,055; West Germany 2,017; Poland 1,259
Potassic	173,611	164,119	957	West Germany 75,831; East Germany 55,640; U.S.S.R. 21,351.
Unspecified and mixed	289,306	268,886	14	West Germany 102,210; Norway 76,823; Netherlands 38,285.
Graphite, natural	599	456	1	West Germany 278.
Gypsum and plaster	502,072	531,422	32	Spain 257,339; East Germany 240,510; Denmark 19,224
Iodine	6	10	NA	Japan 4.
Kyanite and related materials:				
Andalusite, kyanite, sillimanite	305	2,222	257	France 1,909.
Mullite	89	45	—	All from United Kingdom.
Lime	8,941	17,413	—	Poland 5,538; Norway 4,228; U.S.S.R. 2,692.
Magnesium compounds:				
Magnesite, crude	17,712	23,191	8	China 8,413; United Kingdom 4,114; Austria 3,084.
Oxides and hydroxides	21,058	21,602	59	Greece 8,811; Norway 4,146; China 4,050.
Sulfate	17,141	9,778	—	West Germany 9,777.
Mica:				
Crude including splittings and waste	398	510	2	France 191; Norway 141; United Kingdom 82.
Worked including agglomerated splittings	85	95	1	Switzerland 39; Austria 16; West Germany 11.
Nitrates, crude	7,489	4,633	—	Chile 2,329; Belgium-Luxembourg 924; West Germany 672.
Phosphates, crude	693,305	714,694	146,072	U.S.S.R. 290,337; Morocco 278,285.
Phosphorus, elemental	30	24	—	West Germany 23.
Pigments, mineral: Iron oxides and hydroxides, processed	5,349	5,520	(2)	West Germany 5,065; United Kingdom 142.
Potassium salts, crude	4,934	5,259	—	All from West Germany.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$7,620	$9,202	$421	Sri Lanka $5,587; Belgium-Luxembourg $1,108; Switzerland $665.
Synthetic do.	$236	$217	$8	Switzerland $59; West Germany $51.
Pyrite, unroasted	125,817	187,820	4	Finland 184,834; Poland 2,757.

See footnotes at end of table.

TABLE 3—Continued

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
INDUSTRIAL MINERALS—Continued				
Quartz crystal, piezoelectric value, thousands	$18	$20	$2	Switzerland $12; France $2.
Salt and brine	1,342,486	1,098,909	241	Netherlands 376,644; Denmark 207,070; West Germany 162,282.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	135,415	124,898	24,636	East Germany 47,515; Poland 17,290.
Sulfate, manufactured	7,305	6,940	NA	U.S.S.R. 3,303; East Germany 2,089; Netherlands 619
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	6,690	5,772	(2)	Finland 2,848; Norway 2,067.
Worked	20,459	31,779	(2)	Portugal 15,623; Italy 7,926.
Dolomite, chiefly refractory-grade	155,960	172,100	—	Belgium-Luxembourg 62,527; United Kingdom 61,055; Norway 41,066.
Gravel and crushed rock	68,391	97,002	2	Finland 28,216; Norway 27,384; Denmark 18,218.
Limestone other than dimension	63,246	81,918	—	Norway 38,444; Denmark 35,179.
Quartz and quartzite	43,872	38,315	12	Spain 35,987; Finland 1,738.
Sand other than metal-bearing	863,282	346,026	70	Denmark 167,650; Belgium-Luxembourg 138,637.
Sulfur:				
Elemental:				
Crude including native and byproduct	8,171	5,574	—	Poland 5,129; West Germany 222.
Colloidal, precipitated, sublimed	7,935	11,315	—	Poland 11,513; West Germany 146.
Dioxide	16,912	15,637	—	West Germany 8,973; Poland 6,345.
Sulfuric acid	13,908	12,346	—	Norway 7,004; United Kingdom 5,005.
Talc, steatite, soapstone, pyrophyllite	32,650	33,919	9	Finland 20,761; Belgium-Luxembourg 5,148; Norway 4,843.
Vermiculite, perlite, chlorite	667	902	—	Belgium-Luxembourg 354; Norway 211; U.S.S.R. 162.
Other:				
Crude	175,503	198,812	388	Norway 195,150; West Germany 1,014.
Slag and dross, not metal-bearing	98,200	113,581	25	Finland 60,791; Norway 15,886; Denmark 7,758.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,112	1,430	150	West Germany 1,036.
Carbon black	13,590	14,439	186	Netherlands 7,173; West Germany 3,703.
Coal:				
Anthracite	31,181	26,454	—	China 17,924; Poland 5,186.
Bituminous thousand tons	3,808	3,663	791	Australia 1,025; Poland 756.
Briquets of anthracite and bituminous coal	33,879	1,769	—	Netherlands 1,716; West Germany 28.
Lignite including briquets	257	6,542	—	All from East Germany.
Coke and semicoke	350,093	473,453	24,775	Belgium-Luxembourg 82,667; United Kingdom 73,071; France 40,316.
Gas, natural: Gaseous-million cubic meters	383	677	—	All from Denmark.
Peat including briquets and litter	32,763	27,766	—	Finland 16,778; United Kingdom 8,176; Denmark 2,600
Petroleum:				
Crude thousand 42-gallon barrels	104,942	115,092	—	Norway 53,248; U.S.S.R. 13,773; United Kingdom 13,019.
Refinery products:				
Liquefied petroleum gas do.	5,453	6,547	—	Norway 2,838; United Kingdom 1,253; Saudi Arabia 1,142.
Gasoline do.	22,417	20,486	(2)	Denmark 5,112; Netherlands 4,064; Finland 3,570.
Mineral jelly and wax do.	111	101	1	West Germany 73; United Kingdom 11.
Kerosene and jet fuel do.	3,749	4,724	(2)	Netherlands 1,462; Finland 807; United Kingdom 656.
Distillate fuel oil do.	18,605	14,190	—	U.S.S.R. 5,105; Denmark 2,498; Finland 2,367.

See footnotes at end of table.

TABLE 3—Continued

SWEDEN: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued					
Refinery products—Continued					
Lubricants	thousand 42-gallon barrels	1,487	1,809	17	Belgium-Luxembourg 413; Netherlands 413; United Kingdom 371.
Residual fuel oil	do.	11,020	7,026	—	U.S.S.R. 2,798; United Kingdom 987; East Germany 714.
Bitumen and other residues	value, thousands	$9,150	$15,168	$52	Finland $6,952; Venezuela $2,868.
Bituminous mixtures	thousand 42-gallon barrels	38	32	1	Denmark 7; United Kingdom 6; France 5.
Petroleum coke	do.	841	385	100	Netherlands 194; Japan 42.

NA Not available.
[1]Table prepared by staff, International Data Section.
[2]Less than 1/2 unit.

1989, the Trelleborg Group, in a partnership deal with Noranda Inc., acquired a 50% interest in Falconbridge Ltd. of Canada, which was refinanced in September 1990. The Trelleborg Group subsidiary, Boliden International Mining, made preliminary agreements for purchases in Africa, Central America, and Canada. These purchases were in response to the company's objective to expand via acquisition of mines or known deposits with majority ownership and management responsibility.[2] Another subsidiary, Boliden Mineral AB, closed several domestic mines and was planning to concentrate on prospecting around the Skellefteå Field, spending $41.4 million over 5 years. In 1990, the company spent $7.45 million on prospecting, $5.96 million on areas around existing operations, and of that amount, spent $5.79 million or 97% on the Skellefteå Field.

A large number of new deposits were being investigated. During 1990, 33 mining concessions or claims were filled in the Petiknas area in the easter part of Skellefteå Field. In the central and western part of the field, six areas were being surveyed. Some of these high zinc content deposits, which also contain some gold, were to be evaluated more extensively in 1991.

Boliden Mineral AB operated 18 mines in Sweden, producing 16.3 Mmt of crude ore. Zinc extraction was slightly lower than that in 1989, while lead was about equal. The Langsele and Udden Mines were closed during 1990, but the new mines, Akerberg and Kankberg, were opened. The Kristineberg concentrator and smaller mines in that area were planned to be closed in 1991. However, the program to assure Boliden's domestic mines and smelter operations into the 2000's was progressing.

Copper.—Effective January 1, 1991, Outokumpu Oy restructured the activities of Metallverken AB, its Swedish subsidiary. The new companies formed were: Outokumpu Copper Tubes, Outokumpu Copper Brass Rod, Outokumpu Copper Radiator, Outokumpu Copper Partner, and Outokumpu Rawmet.

Boliden Mineral AB invested $89.4 million in the Aitak Mine in northern Sweden, 100 km north of the Arctic Circle. The investment was toward a reported 25% extension, and a change in the method of transportation of ore from the open pit was undertaken. Mining started in the mid-1960's and now Aitik is Sweden's largest mine. The copper content was reported to be less than 0.4%, which was somewhat offset by the recoverable content of gold and silver. The pit modernization involved crushing the ore in the pit and then transporting the ore via belts to the surface. The projected result was the extension of the mine for another 20 years, producing at the rate of approximately 15 Mmt/a. In 1990, the amount of rock extracted was 20.3 Mmt, of which 12 Mmt was copper ore. The Rönnskår refinery was 60% dependent on the Aitik Mine for feedstock; the rest was from imported sources. The mine employs 420 persons. Boliden reported mineral production as follows: 50,000 tons of copper, 1,700 kg of gold, and 38 tons of silver.

Ferroalloys.—SwedeChrome AB, which produced ferrochromium, closed its plant in Malmö in January 1990. In the previous years, the plant had overcome several operational problems, and in 1989, SwedeChrome was increasing production up to 50,000 mt/a toward the plant capacity of 80,000 mt/a. SwedeChrome stated that the declining price of ferrochromium, the uncertainty of electrical power rates, and the Swedish embargo of South African chromite had placed it in an unfavorable cost position that required the termination of production. The remaining ferro-chromium producer, Vargön Alloys AB, has an annual capacity of about 160,000 mt/a. The plant, by the Port of Göteborg, was also dependent on imported ores.

During 1990, Svenska Forshammar AB was purchased by Höganäs AB. Svenska Forshammar manufactured refractory bricks, castables, mortars, and prefabricated products. The company had annual sales of $23 million, of which 90% was overseas. Also, purchased by Höganäs AB was the steelworks in Halmstad from the Fundia Group. Invested in the plant was $23 million to make it the world's largest atomization facility and increase the company's production capacity of atomized powder from 40,000 to 200,000 tons.

Gold.—In 1990, Boliden Mineral's Akerberg Mine in the Skellefteå Field in northern Sweden extracted 710,442 tons of rock, of which 117,979 tons was gold ore. The estimated $4.7 million development cost for the Akerberg Mine was to allow

TABLE 4

SWEDEN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Aluminum	Gränges AB	Smelter at Kubikenborg	92
Arsenic, white	Boliden Mineral AB	Smelter at Rönnskär	15
Cement	Cementa AB	Plants at Degerhamn, Skövde, and Slite	3,400
Copper: concentrate	Boliden Mineral AB	Mines at Aitik and Skellefteå Field	60
Do.	Outokumpu Oy	Mine at Viscaria	28
Copper: refined	Boliden Mineral AB	Refinery at Rönnskär	100
Feldspar	Forshammars Mineral AB	Mine and plant at Riddarhyttan	40
Ferroalloy	Vargon Alloys AB	Plant at Vargon	180
Do.	Sandvik AB	Plant at Trollhättan	50
Do.	SwedeChrome AB	Plant at Malmo	80
Gold kilograms	Terra Mining AB	Björkdal Mine at Skellefteå	2,100
Do. do.	Boliden Metall AB	Mines at Enåsen & Åkerberg	4,000
Do. do.	do.	Refinery at Rönnskär	9,000
Iron ore	Luossavaara Kiirunavaara AB (LKAB)	Mines at Kiruna, Malmberget, and Svappavaara	21,000
Do.	Sventskt Stal AB, (SSAB)	Mines at Dannemora	650
Iron and Steel	Sventskt Stal AB, (SAAB)	Steelworks at Luleå, Oxelösund, and Domnarvet	3,000
	Several smaller steelmakers mostly privately owned	Plants in various locations	30
Kyanite	Svenska Kyanite AB	Quarry at Hålsköberg	40
Lead: Concentrate	Boliden Metall AB	Mines at Boliden, Kedtrask, Laisvall, Långdal, and Renström	62
Smelter	do	Smelter at Rönnskär	85
Lime	Euroc Mineral AB	Plants at Limham, Köping, and Storugns	270
Do.	SMA Svenska Mineral AB	Plants at Rättvik and Boda	250
Petroleum, refined barrels per day	Skandinaviska Raffinaderi AB	Refinery at Lysekil	210,000
Do. do.	BP Raffinaderi AB	Refinery at Göteborg	100,000
Do. do.	Shell Raffinaderi AB	Refinery at Göteborg	82,000

for the extraction of 1 Mmt of ore per year with 3 g of gold per ton. The mine was designed to produce 600 kg/a of gold from an open pit operation over a 5-year period.

Boliden was also conducting drilling and seismic studies at Petiknas and Petiknas II deposit, in the eastern and western portions of Skellefteå Field, respectively. In Petiknas, the company indicated it had outlined areas with very high zinc content, up to 15% in places. Gold mineralization was reported with the zinc. The upper stratum started at 300 m underground and the depth of the ore had not yet been determined.[3] Two of six gold-carrying zones were surveyed in detail with the results being evaluated. In Petiknas II, 33 mining concession claims were made with 6 complex ore deposits being further surveyed. These deposits were also reported to have high zinc content and gold association.

Iron Ore.—Iron ore production decreased by 0.8 Mmt to 19 Mmt, down 3.4% from that of 1989. Most of the production came from LKAB's Kiruna and Svappavaara Mines in Swedish Lapland. Technical problems at Kiruna, due mainly to a transition to a large-scale underground mining operation, resulted in a 5% decrease in production, down to 17.7 Mmt. Finished products amounted to 13.3 Mmt, 0.7 Mmt lower than that of last year. Pellet production exceeded 50% of the salable product for the first time and amounted to 6.7 Mmt. Low phosphorus production was 3.1 Mmt and high phosphorus production was 3.5 Mmt. Almost $335 million was allocated over the next 5 years toward future production systems at the mine involving the up-scaling in hauling, processing, and other infrastructure facilities. The above-mentioned investment did not include $250 million for a new pelletizing plant at Kiruna. LKAB indicated that construction of the 1 Mmt/a plant had not been finalized; however, the planned start of the operation was slated for 1994-95. Demand for the company's olivine and direct reduction (DR) pellets was good, and the new plant would increase chances for long-term cooperative agreements with customers.

At the Kiruna dressing plant, dephosphorization began after a year's hiatus. There was a change in the raw material mix at the mine and reduced deliveries of high-phosphorus ore. Demand for high-phosphorus ore decreased to 3.3 Mmt, down from the 3.5 Mmt in 1989. The conversion to low-phosphorus operations in Normandy, France, was one reason for the decreased

TABLE 4—Continued

SWEDEN: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Petroleum, refined barrels per day—Continued	AB Nynas Petroleum	Refineries at Göteborg, Malmö, and Nynäshamn	54,000
Phosphate, apatite concentrate	Luossavaara Kiirunavaara AB (LKAB)	Plant at Kiruna	200
	Svensk Stal AB	Plant at Grängesberg	130
Pyrite	Boliden Mineral AB	Mines at Kedträsk, Långsele, and Udden	400
	Stora Kopparbergs AB	Mine at Falun	50
Silica sand	Ahlsell Mineral AB	Southern Sweden	600
Silicon	KemaNord AB	Plant at Ljungaverk	24
Silver	Boliden Metall AB	Refinery at Rönnskär	250,000 kg
Zinc, concentrate	Vieille Montagne Sverige AB	Zinkgruvan Mine, Åmmeberg	80
	Boliden Mineral AB	Mines at Boliden, Garpenberg, Kristeneburg, Laisvall, Långdalen, Langsele and Renstrom	130

deliveries. In the Svappavaara plant, improvement in the gas flow lead to a marked improvement in the product quality.

A fire at the Malmberget Mine destroyed the conveyor system between the mine and the dressing plant. After a few days, limited production resumed using trucks to transport ore between the old shaft and the plant's intake system. By using this transport system, production increased to 80% of the previous rate within a few weeks. Construction of a new raw material transport system between the mining operations and the dressing plant was underway and expected to be completed by March 1991. For 1990, 8.7 Mmt was produced via the new main level at 815 m. The total production of finished products was 5.8 Mmt, 2.6 Mmt low-phosphorus fines and 3.2 Mmt pellets. The fire actually only decreased production by 100,000 tons. Investments were being made to increase the pellet production capacity from 3.2 Mmt to 3.7 Mmt. Also, an organic binder was tested in the pellet manufacturing process to replace bentonite. The trial was successful, and the organic binder will continue to be used.

Reserves for Sventskr Stal AB (SSAB) iron ore mines in central Sweden were mostly depleted, and no new exploration or development work was underway. The Grängesberg Gruvor Mine closed at the end of 1989, and the Dannemora Gruvor Mine was scheduled to cease production at the end of 1991. This will bring to a close more than 400 years of iron ore mining in the area. At Dannemora, the low-phosphorus manganese ore products are lump, sinter fines, and sinter concentrate. Approximately 70% of the output was used at SSAB's Oxelösund plant, which produced quenched heavy plate. In 1990, 644 kt of ore was produced, and production of 600 kt could be possible for 1991.

The unloading stations at Narvik and Luleå were modernized to handle "rolling unloading," thereby improving the turnaround time by two-thirds. Shipments to Narvik, Norway, was 13.8 Mmt. LKAB and SSAB shipped a total of 5.3 Mmt to Luleå, of which 2.2 Mmt was from the mines in central Sweden.

For the iron ore industry, one of the most important projects is the Kuj 2000, where large development resources were being concentrated at Kiruna. The decision to be made in 1991 concerns the future mining method, hauling system, and ore processing structure. The goal of the project was to reduce the production costs by 25% and plan for the extraction of iron ore into the next century. Along with this increased resource base and increased size of operation was the requirement for increased ore processing. Sak 2000 is the preliminary study involving the future ore processing structure in Kiruna. This includes increasing sinter fines, concentration and pelletizing capacity, and a new layout for crushing, dressing, and concentration plant, along with the incorporation of new milling technology. The aim was to improve sinter fines and pellets at a lower cost and at a higher quality.

Steel.—The steel industry is important to the Swedish economy. However, after years of rationalization, there were 14 producing steel mills in Sweden. The largest of the steel companies, the state-owned SSAB, has a production capacity of 3 Mmt/a from two blast furnace locations, Luleå and Oxelösunds. SSAB was Scandinavia's leading producer of commercial steel, and its product range concentrated on the production of sheet steel and plate. Avesta AB, Fundia Steel AB, and Ovako AB were the next largest producers, with each producing more than 300,000 tons. Most of these mills were geared toward specialty and high-quality steels.

Sweden recycles approximately 800,000 tons of scrap steel annually. There were five facilities recycling auto scrap with an estimated 300,000-mt/a capacity. Steel represents 70% of the initial weight of the auto; the rest is plastic, rubber, etc. To supplement the domestic production, Sweden imports more than 500,000 mt/a (see table 3). As indicated on that table, most of the scrap steel comes from the Federal Republic of Germany and the U.S.S.R.

One of the most active sectors of the industry is in powder metallurgy. Sweden is the most powder metal (PM) intensive producer in the world. Swedish producers lead the world with ownership or interests in one-half of the world's iron powder production, 40% of the world's hard metal production, and as much as 70% of the world's full-density PM steel production.

Höganäs AB is the leading producer of PM's. In 1990, the steel smelting plant at Halmstad was purchased from Fundia AB and was being modified to produce the highest quality atomized powder. The modifications required involved the installation of equipment for the fire separation of molten steel to powder particles using high-pressure water. The investment of $23 million in the facility represents new capacity and production was to begin in 1992.

Also in 1990, production of alloyed powder was begun at the new Distaloy facility. A new process was developed for the plant, and a new alloyed powder grade was available to customers.

SSAB was concentrating on restructuring the sheet steel processing stage of the company and improving the downstream processing and distribution operations. After the purchases of the sheet operations in Korrugal in 1989 and in Dobel in 1990, the SSAB subsidiary, Plannja, has become the dominant building sheet processing company in Sweden.

Industrial Minerals

Cement.—Cementa AB is the sole producer of cement in Sweden. During the year, activity started out optimistically and ended with a downturn and concern about the construction industry. In 1990, large investments were made in the domestic infrastructure, replacing old and building new modern facilities. While the construction industry remained active, problems with some of the new plants and equipment made it difficult for the company to repeat the same return as last year. Production remained approximately the same at 2.5 Mmt. The silo capacity was expanded at Slite by 20,000 tons and an estimated $3 million was spent to increase the raw materials mill. During 1990 and 1991, $10 million was to be invested to increase capacity by 250,000 tons in the No. 8 kiln line. Also, investments were made in the Degerhamn and Varberg locations.

The parent company, Industri AB Euroc (Euroc), was continuing to invest in the modernization of infrastructure to meet the future demand from the construction industries. Euroc with the privately owned Norwegian company, Aker AS, purchased interest in Spain's largest cement company, Valenciana de Cementos Portland.

Other Industrial Minerals.—The dimension stone industry also benefited from the buoyant construction sector. Production, mostly granite, has increased over the past 3 years. Finely ground dolomite production also increased, responding to environmental market demands. The material is used for desulfurization of fumes. Lime production increased, responding to demands from the paper and pulp industry. Dulakalk AB added a new plant for the production of lime hydrate to its existing plant at Rättvik, which produces quicklime and ground limestone. Partek AB, in an agreement, was to take over most of Euroc's mineral operations, except those at Limhamn and of Dulakalk AB at Rättvik.

NSG identified a crystalline flake graphite deposit at Kringeltjärn Lake in central Sweden. The deposit is in an extended graphite schist horizon with stratabound graphite mineralization. Reserves were estimated to be 1 Mmt of material grading 10% to 12% carbon. NSG was also investigating a kaolin deposit at Hultserod in southern Sweden. Reserves of 2.5 Mmt of filler-quality kaolin have been identified. This is not enough material to economically justify development; however, NSG was exploring other adjacent deposits to determine if sufficient reserves are available to make the project economically viable.

Mineral Fuels

Energy is a major problem facing the country. Sweden has no significant indigenous fuels except for some small oilfields and low-grade coal deposits in southern Sweden, which are not mined. Acting on a 1980 referendum, Parliament made three decisions. The first decision was to close all 12 nuclear reactors by the 2010. About 45% of Sweden's energy is produced by nuclear power. The second decision was to prohibit exploitation of the four major rivers in northern Sweden. This prevents any further development of hydroelectric power, which makes up most of the rest of the country's energy supply. The third decision was to limit carbon dioxide emissions to the level recorded in 1988. This impacts on the use of coal, natural gas, or oil for energy generation. This has not only created a dilemma for the Government, but also has caused consternation in industry, particularly since the cost of electricity is expected to rise by 50% in 1995.

Sweden has a total capacity of 33,100 MW. The steel industry had expressed concern about the first two nuclear power stations to be closed in 1995-96. The industry would be hard to adjust to the increased costs of alternate power sources. Competitive electric costs are necessary for the Swedish steel industry to compete in the EC market place. Furthermore, a large percentage of the steel production is exported, and competitive electric costs are vital to these industries future.

Prospecting for gas and oil has centered mainly in the Baltic Sea sector and on the island of Gotland. According to the SGU, Gotlandsolja AB, a subsidiary of Grauten Oil AB, has a few small fields (17). Most of the fields were discovered in the late 1970's to early 1980's, with the last reported fields listed as discovered in 1983 at the peak of the domestic production.

INFRASTRUCTURE

The country has a well-developed transportation system, especially in the southern part. There is 98,000 km of highway, of which 52,000 km is paved. Swedish State Railways (SJ) operates 12,000 km of railroad, including 10,819 km 1.435-m standard gauge, 6,955 km electrified, and 1,152 km double track; 182 km 0.891-m gauge; and 117 km of rail ferry service. There are several major ports, including Gavle, Goteborg, Malmo, and Stockholm, and numerous minor ports. There is 2,100 km of inland waterways navigable by small steamers and barges.

OUTLOOK

Sweden is an advanced, industrialized country with a high standard of living and an extensive social services system. As a trading nation, Sweden is dependent on world economic developments and must adjust to them. The country has accomplished this quite adequately in the past and is expected to continue to do so in the future. The formation of the single European Market is an economic concern to the country since the EC is a major consumer of Swedish exports.

Although Sweden has a select portfolio of minerals, especially iron and steel, many minerals have to be imported. Active ex-

TABLE 5

SWEDEN: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1990

Commodity (ore)	Reserves[e] (million tons)
Iron ore	3,000
Copper	150
Lead	50
Zinc	20

[e]Estimated.

ploration and development work is being carried out by the Swedish Geologic Survey, NSG, SGAB, and others to find alternatives and other mineral sources within Sweden.

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[1]Where necessary, values have been converted from Swedish kroner (SKr) to U.S. dollars at the rate of SKr6.09=US$1.00, the average for 1990.

OTHER SOURCES OF INFORMATION

Agencies

National Board for Technical Development
Stockholm, Sweden
State Mining Property Commission (NSG)
Stockholm, Sweden
Swedish Geological Company (SGAB)
Stockholm, Sweden
Swedish Geologic Survey
Uppsala, Sweden
Swedish Iron Industry Association
Stockholm, Sweden
Swedish Mining Association
Stockholm, Sweden

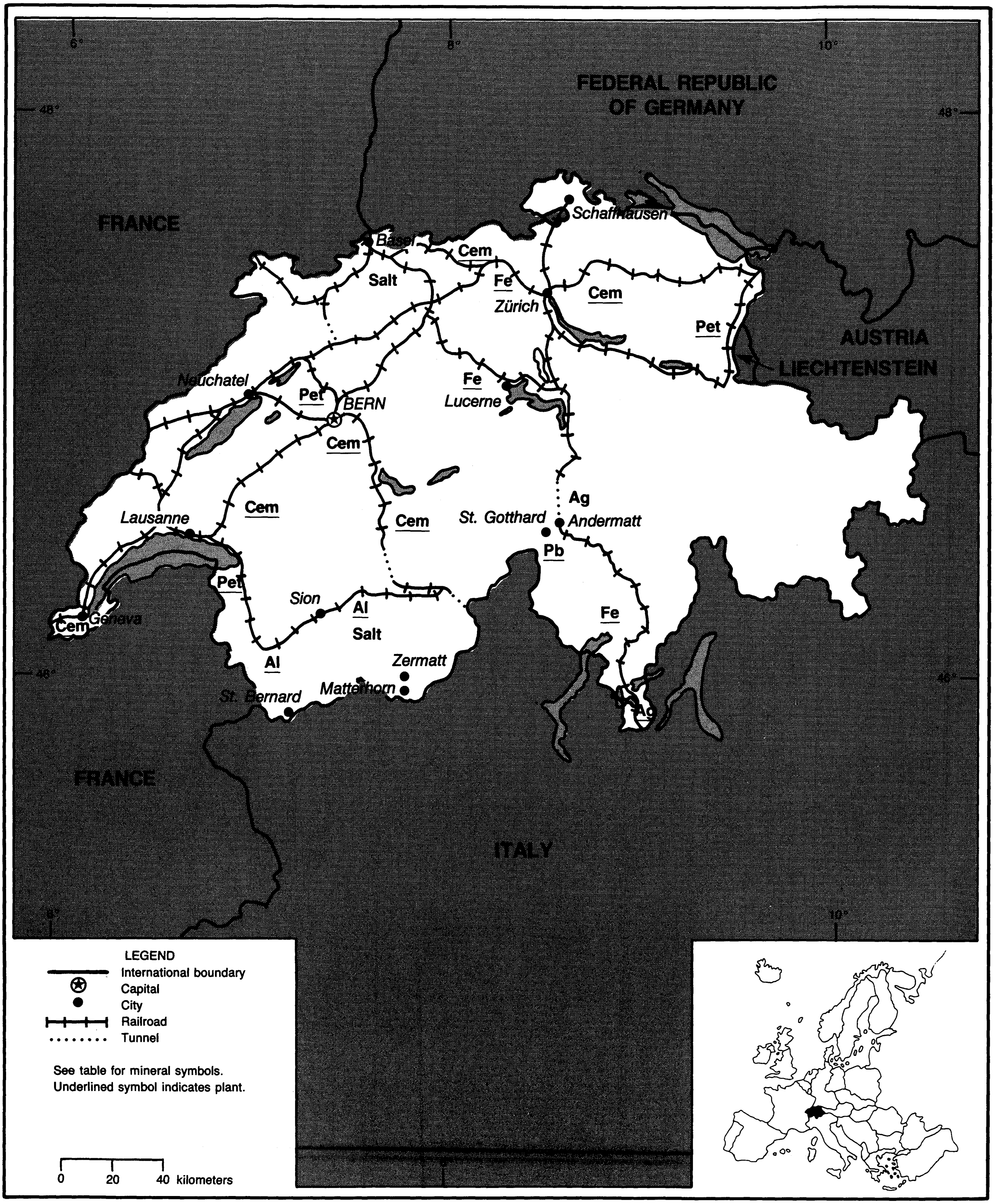
Publications

Jerkontorets Annaler (Scandinavian Journal for Steel and Metal Industries), Stockholm; annual.
Statistics Sweden, Stockholm:
Bergshantering (Mining and Mineral Industries); annual.
Industri; monthly.
Digest of Swedish Statistics Report; monthly.
Annual Reports from Swedish companies: Industri AB Euroc, Kanthal Höganäs, Sandvik AB, Svenskt Stål AB, Trelleborg AB.

SWITZERLAND

AREA 41,000 km²

POPULATION 7.1 million



THE MINERAL INDUSTRY OF SWITZERLAND

By Donald E. Buck, Jr.

Switzerland has attempted to utilize the limited mineral resources available in this mountainous country. The small, diversified deposits were exploited in the past, and most metalliferous mining activity ceased long ago. While the general geology of Switzerland has been studied in detail, the mineral exploration to assess the remaining potential of the country's mineral grades of ores and reserves has remained incomplete. Presently, exploration in the country is limited to petroleum and gold. Mining of industrial minerals, gypsum, and sand and gravel are from surface pits. In 1990, the real GDP recorded a growth of 2.6%[1] down from the 3.5% posted in 1989.

GOVERNMENT POLICIES AND PROGRAMS

The Swiss Government, a longtime supporter of "Green Issues," has adopted a new energy policy, "Energy 2000." This is a policy to maintain the present growth rate for electricity. To accomplish this, the plan stresses energy conservation, since the hydroelectric resources are fully exploited. Furthermore, the public voted for a 10-year moratorium on new nuclear powerplant construction. Nuclear power is the second most important component of domestic power production. However, concerns of nuclear power increased after the Chernobyl accident in the U.S.S.R. Therefore, the country's options were either to build more CO_2 emitting plants or import more power to meet future requirements. The concern about the greenhouse effect and local pollution swayed the public to vote for a policy of importing more electricity. Under the "Energy 2000" policy, one guideline still to be decided on is the limits on energy use. The specific legislation, when defined between 1995 and 1999, could affect the energy consuming, metal-producing plants in the country.

Another issue up for Government and public review is whether to join the Economic Community or remain in the European Free Trade Association (EFTA). The neutral status of Switzerland has made the country a popular site for the headquarters of international organizations, such as EFTA, for which it is a founding member. Switzerland's desire to maintain its neutrality and sovereignty has precluded its membership in the EC and other organizations. However, the country recently applied for membership in the International Monetary Fund and World Bank, which, if accepted, would then need public approval. The outcome of these applications and the application of other EFTA members to the EC would greatly influence future governmental policies. EC acceptance could require substantial changes to the structure of the banking industry and possibly the Swiss Government and its staunch position of neutrality, politically and economically.

PRODUCTION

The value of the output of the Swiss mineral industry was modest. All metallic commodities, such as aluminum, steel, and secondary lead, were produced from recycled and/or imported raw materials. The mining industry was limited to construction materials and salt. Except for a small natural gas field, from which production is rapidly declining, mineral fuels were imported.

TRADE

Switzerland's famous jewelry industry is dependant on importation of gold as the country does not have a domestic source. Most metals, minerals, and fuels needed for the domestic industries have to be imported. Its most important trading partners were the Federal Republic of Germany, France, Great Britain, Italy, and the United States.

STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry is either privately owned or owned by cantons. The Swiss national government is limited by the Constitution in its ability to impose a particular economic policy. Cantonal or communal governments operate electrical generating facilities, water resources, gas utilities, and local transportation facilities. Mining also comes under the jurisdiction of cantonal authorities.

COMMODITY REVIEW

Metals

Aluminum.—Swiss Aluminium Ltd. (Alusuisse) changed its name to Alusuisse-Lonza Holding AG on January 1, 1990. Alusuisse produced primary aluminum metal, fabricated products, and chemicals from imported alumina and bauxite. The company operates three plants, two smelters, and one rolling mill in Switzerland. Bauxite comes from company-operated mines at Var in France, at Gove in Australia, and in Sierra Leone. Alusuisse also owns three plants in the United States: aluminum rolling facilities in Hannibal, Ohio, and Jackson, Tennessee, and an aluminum recycling plant in West Virginia.

Metallwerke Refonde AG, at Niederglatt, recycles aluminum in Switzerland. The production of secondary aluminum is small (28,000 tons), but increasing.

Lead.—All lead refined in Switzerland is from scrap. Metallum AG was overhauling its battery scrap plant at Pratteln to reduce sulfur dioxide emissions to increase the level of automation and to improve working conditions. This modernized smelter will process used batteries at a rate of 5 mt/h without the problems caused by sulfur dioxide emissions. March 1991 is the planned startup date.

Precious Metals.—Mineral exploration in the Anterior Rhine region is traced to the Middle Ages. Historically, gold mining was mainly focused on placier deposits, with a few lode gold operations. Between 1986 and 1988, International Micham (VSE) under a joint venture with Narex International Exploration, prospected in a 119 km^2 permit area around Disentis for gold. The company reportedly has spent $1.3 million on a 41-km-long zone of discontinuous gold mineralization, consisting of gold-bearing sulfides. A two-hole diamond drilling

TABLE 1

SWITZERLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989[p]	1990[p]
METALS						
Aluminum, smelter, primary	tons	80,259	73,169	71,816	71,328	71,602
Iron and steel:						
Pig iron and blast furnace ferroalloys		79	70	[e]70	[e]70	[e]70
Electric-furnace ferroalloys[e]		5	5	5	5	5
Steel, crude		1,075	870	988	916	970
Semimanufactures, rolled products		980	[e]1,000	[e]1,300	[e]1,100	
Lead, refined, secondary	tons	2,500	2,500	[e]1,400	1,500	
INDUSTRIAL MINERALS						
Cement, hydraulic		4,393	4,617	4,965	5,461	5,206
Gypsum[e]		200	230	230	230	230
Lime		35	40	42	[e]40	[e]40
Nitrogen: N content of ammoniae		30	39	[r]32	[r]32	32
Salt		389	390	309	243	254
Sodium compounds, n.e.s.: Carbonate[e]	tons	43	23	—	—	—
Sulfur, from petroleum refining	do.	3,201	3,533	[e]3,550	[e]3,700	[e]3,700
MINERAL FUELS AND RELATED MATERIALS						
Gas:						
Manufactured	million cubic meters	[r]13	[r]15	14	11	[e]10
Natural	do.	[r]17	[r]9	8	5	5
Petroleum refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	1,546	1,817	1,986	1,518	1,612
Gasoline, all kinds	do.	8,723	8,765	8,695	6,180	6,460
Naphtha	do.	31	51	77	60	43
Jet fuel	do.	2,099	2,286	1,949	2,018	2,074
Kerosene	do.	31	30	19	15	17
Distillate fuel oil	do.	13,521	12,863	11,887	9,134	8,706
Residual fuel oil	do.	4,579	3,917	4,322	2,827	3,343
Bitumen	do.	892	931	904	926	920
Other refinery products	do.	2	1	1	1	1
Refinery fuel and losses	do.	1,291	1,311	1,133	882	882
Total	do.	32,715	[r]31,972	30,973	23,561	24,058

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 1991.
[2]In addition to the commodities listed, a variety of crude construction materials (common clay, sand and gravel, and stone) were produced, but output was not reported, and available general information was inadequate to make reliable estimates of output levels.

program reportedly resulted in the identification of gold mineralization of approximately 0.95 g/mt over a 75-m zone and 0.60 g/mt over 92-m.

With limited mining activity in many parts of Switzerland and the changes in the technology and character of mining, many Cantons have no established laws or guidelines. For example, the Graubunden Canton did not have an appropriate mining law to cover a gold mining license requested by several Canadian companies. The Canadian companies, International Micham and Narex International Exploration, because of the delays and problems of being granted approval to develop the gold deposit, elected to terminate their joint-venture agreement and split their interests in the Disentis area exploration permit. One problem foreseen was the requirement that a plebiscite was required before any exploitation activities could commence. Although exploitation approval is difficult, exploration permission was less problematic. Micham sought and was granted an exploration permit for gold at the Val Plattas gold showing in the Medel area.

Switzerland, known for its jewelry, especially watches, has a well-established precious metals industry. Gold bullion was imported from all over the world, and domestic gold scrap was refined for the industry. Other precious metals were processed in the country in support of the jewelry and precision equipment industries, for which Switzerland is renowned. Metaux Precieux SA Metalor, headquartered in Neuchatel and owned by the Swiss Bank Corp., manufactures gold wire, sheet, strip, profiles, and other semifinished products.

TABLE 2

SWITZERLAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Aluminum	Swiss Aluminium Ltd.	Smelter at Steg	45
Do.	do.	Smelters at Chippis and Sierre	25
Do.	Usine Aluminium Martigny SA	Smelter at Martigny	10
Cement	17 companies, of which the largest is-	18 plants, of which the largest is-	6,000 including
Do.	Vigier Cement Ltd.	Reuchenette--Pery	(800)
Petroleum, refined	The major refineries are-		[1]92,000, including-
Do.	Raffinerie du Sud	Refinery at Collombey	([1]40,000)
Do.	Raffinerie de Cressier SA	Refinery at Cressier	([1]36,000)
Do.	Raffinerie Rheintal AG	Refinery at Senwald	([1]12,000)
Salt	Government of Vaud Canton	Mine at Bex	5
Do.	Schweizerische Rhein Salined	Salines at Ridburg	220
Do.	do.	Salines at Rheinfelden	220
Steel	Ferrowohlen AG	Plant at Wohlen	150
Do.	Von Moos Stahl AG	Plant at Lucerne	300
Do.	Von Roll Ltd	Plant at Gerlafingen	300
Do.	do.	Plant at Monteforno	380

The Chemicals Div. carried out research and development in the manufacture of precious-metal salts, electroplating solutions, and high-purity precious metals and alloys for the chemical, electroplating, and other industries.

Other refiners of precious metals in Switzerland included Cendres & Metaux SA; Valcambi SA, owned by Credit Suisse; and Argor-Heraeus SA. H. Hilderbrand et Cie SA, in Geneva, produced atomized powders of gold, silver, and platinum solder alloys.

Steel.—All raw materials necessary for steel production, aside from some domestic scrap, must be imported. About 250,000 tons of ferrous scrap was imported in 1989, which is the last year for which data were available. Production of crude steel has averaged, for the past 5 years, at 964,000 mt/a. In 1990, the steel production of 970,000 tons was only slightly above the average production level.

Von Roll AG, the largest Swiss engineering and steel production company, has two plants operating in the country. The plant at Monteforno has a capacity of 380,000 mt/a. It includes an 85-ton electric arc furnace, a continuous castor, and rolling mill. The plant produces blooms, billets, reinforcing bars, and round bars. The headquarters plant at Gerlafingen has a capacity of 300,000 mt/a using a 60- to 70-ton, 50-MVA electric arc furnace. The carbon steel products are processed into flats, channels, angles, etc. Also, at this facility are a reinforcing mesh plant and a forging plant.

The Von Moos Stahl AG plant at Lucerne also has a capacity of 300,000 mt/a. The products include galvanized wire, alloy steel (excluding stainless), annealed wire, and other types of bars and flats. At Wohlen, which has a capacity of 150,000 mt/a produces bar and other rolled products. The Wohlen plant, owned by Ferrowohlen AG, reportedly was under consideration for closure. Permits that would have allowed the plant to install new equipment were not initially granted owing to the environmental concerns raised by the local populous. However, the Wohlen city council finally approved the installation of the second hand hot-rolling mill, new reheat furnace, slab caster, and a taller chimney. The mechanical parts for the rolling mill and the reheat furnace had been purchased from Hoogovens, of the Netherlands. In the first part of 1991, it was anticipated that the hot-rolled mill could begin operations. Prior to the installation of the continuous slab casting equipment, the company was reportedly planning to import slabs for the rolling mill.

Industrial Minerals

Construction materials and gypsum were the only commodities mined in Switzerland. The country has a few processing plants of industrial minerals, but depends heavily on neighboring EC countries for many commodities.

Cement.—In 1989, the French company, Lafarge Coppee, acquired control of the Swiss firm, Cementia Holding AG. Cementia Holding Ag has considerable operations outside Switzerland, especially in Spain. For 1990, the domestic production of cement decreased to 5.2 Mmt down slightly from the high of 5.5 Mmt posted in 1989.

Lime.—The production of lime has decreased since 1986, when 35 kmt was produced, to the present 25.7 kmt. Kalkfabrik Netstal AG and Cementfabrik Holderbank AG produced virtually all of Switzerland's lime. Kalkfabrik Netstal operated a plant at Netstal, producing burned, ground, and hydrated lime. Cementfabrik produced lime at its Lausanne, Unterterzen, and Holderbank facilities.

Salt.—Salt production in Switzerland was a monopoly of several cantons. The largest solution mining operation in the Rhine Valley produced 350,000 mt/a. The second largest produced 50,000 mt/a.

Mineral Fuels

Extensive Alpine precipitation, glacial water storage, and the great range of altitudes made hydroelectric power widely available. The Swiss Government did not own electric utilities, but 85% of electric utilities was under public (cantonal or municipal) control. The electrical industry has become an essential branch of the Swiss economy, with more than 400 large hydroelectric powerplants and numerous low-pressure plants on the lower courses of rivers. The highest dams in Western Europe, Mauvoisin (256 m) and Grande Dixence (308 m), are located in the Valais Canton on the Rhone River. This area has a large hydroelectric power consumption primarily by the aluminum industry.

Hydroelectric power accounted for close to 60% of Switzerland's electric power generation. Domestic nuclear and imported power each contributed about 23 billion kW.h to the electrical supply, while thermal plants contributed 1.1 billion kW.h. Five nuclear power stations supplied about 40% of the country's energy needs. In 1988, the Government dropped its longstanding plans to build a sixth nuclear plant at Kaiseraugst (near Basel) because of pressure from environmentalists. Two other nuclear plants, which were in the early planning stages, were, reportedly, unlikely to be constructed in the coming years.

The only domestic natural gas production came from the Finsterwald Field, in Lucerne Canton. The rest was imported from the Netherlands, the Norwegian sectors of the North Sea, and from the U.S.S.R. Switzerland has discouraged the burning of coal as well as the use of other hydrocarbons. All crude oil and the vast majority of oil-refined products were imported.

Reserves

Numerous small ore deposits were mined in the past in Switzerland, mainly for iron, nickel-cobalt, gold, and silver. These small-scale operations have not been economic for some time.

INFRASTRUCTURE

Switzerland was a highly developed country with an excellent network of about 72,000 km of paved roads, 5,200 km of operating railroads, and 1,400 km of oil and gas pipelines. Several of Europe's most important waterways originate in Switzerland, as runoff from the mountain glaciers. The Rhone, Rhine, and Danube waterways has given Switzerland a key position in intra-European traffic. Furthermore, these rivers provide the links to some of the most important ports in the world, through which goods are transshipped to Switzerland.

OUTLOOK

Major increases in the mineral industry of Switzerland were not expected in the near future. The environment was becoming an important issue, and environmental protection politics were likely to become a greater force affecting the mineral industry in the future. Switzerland's relationship with the EC will continue to be an international concern for the country, while energy and environmental policies will dominate the domestic scene. It seems unlikely that any new nuclear power stations will be built in Switzerland in the next decade due to the citizens prevalent concerns on nuclear power and construction lead-time. The burning of coal and hydrocarbons was being discouraged. Work will continue on a partial revision of the labor law, including new rules on working hours and night and Sunday work for women.

[1]Where necessary, values have been converted from Swiss francs (SWF or Sfr) to U.S. dollars at the rate of SWF1.30=US$1.00. OECD Economic Surveys, Switzerland, 1991, p. 11.

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Agency

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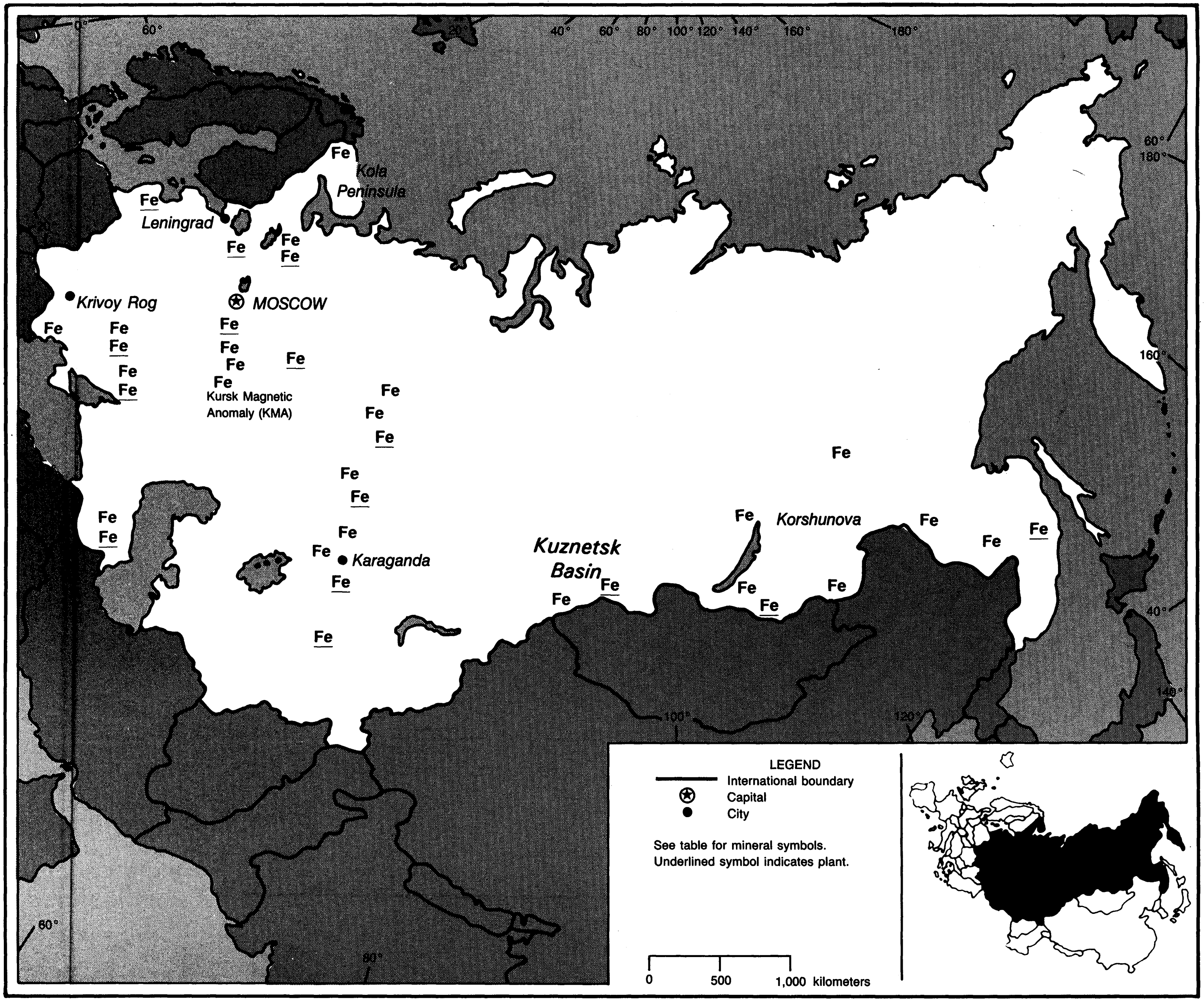
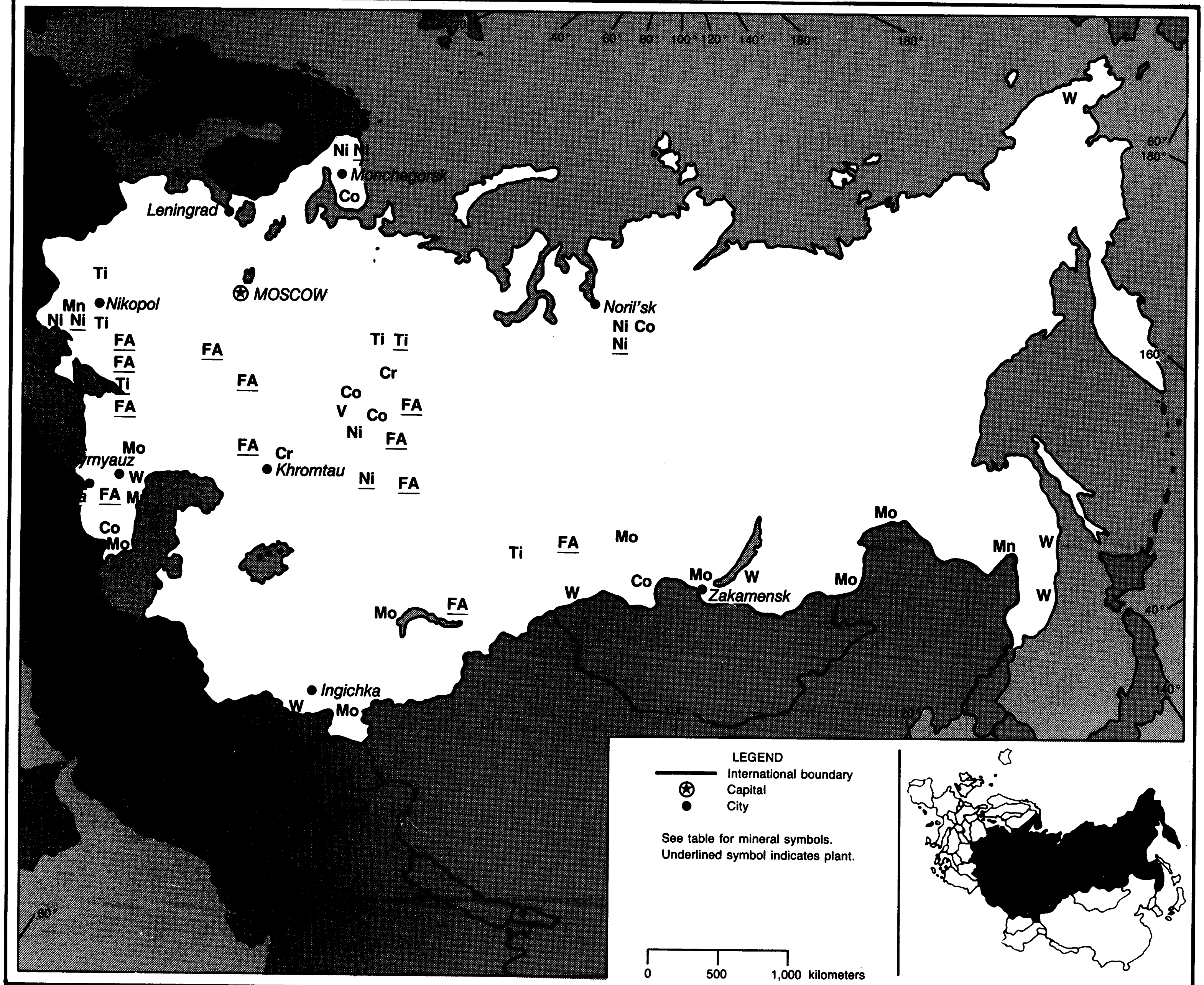
U.S.S.R.

AREA 22,400,000 km² | **IRON ORE AND STEEL** | **POPULATION 280 million**



U.S.S.R.

AREA 22,400,000 km² — **FERROALLOY METALS** — **POPULATION 280 million**

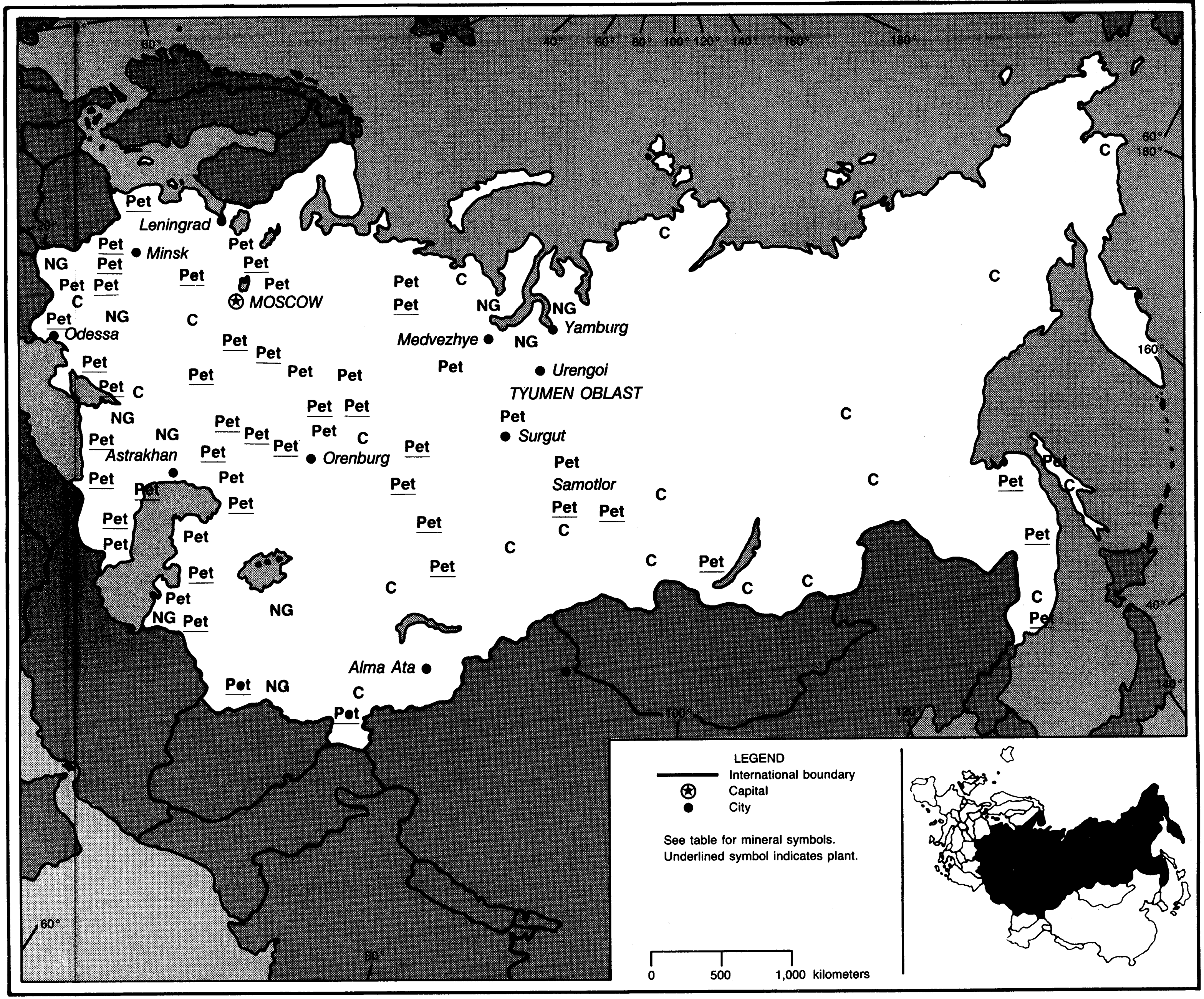


U.S.S.R.

AREA 22,400,000 km²

MINERAL FUELS

POPULATION 280 million

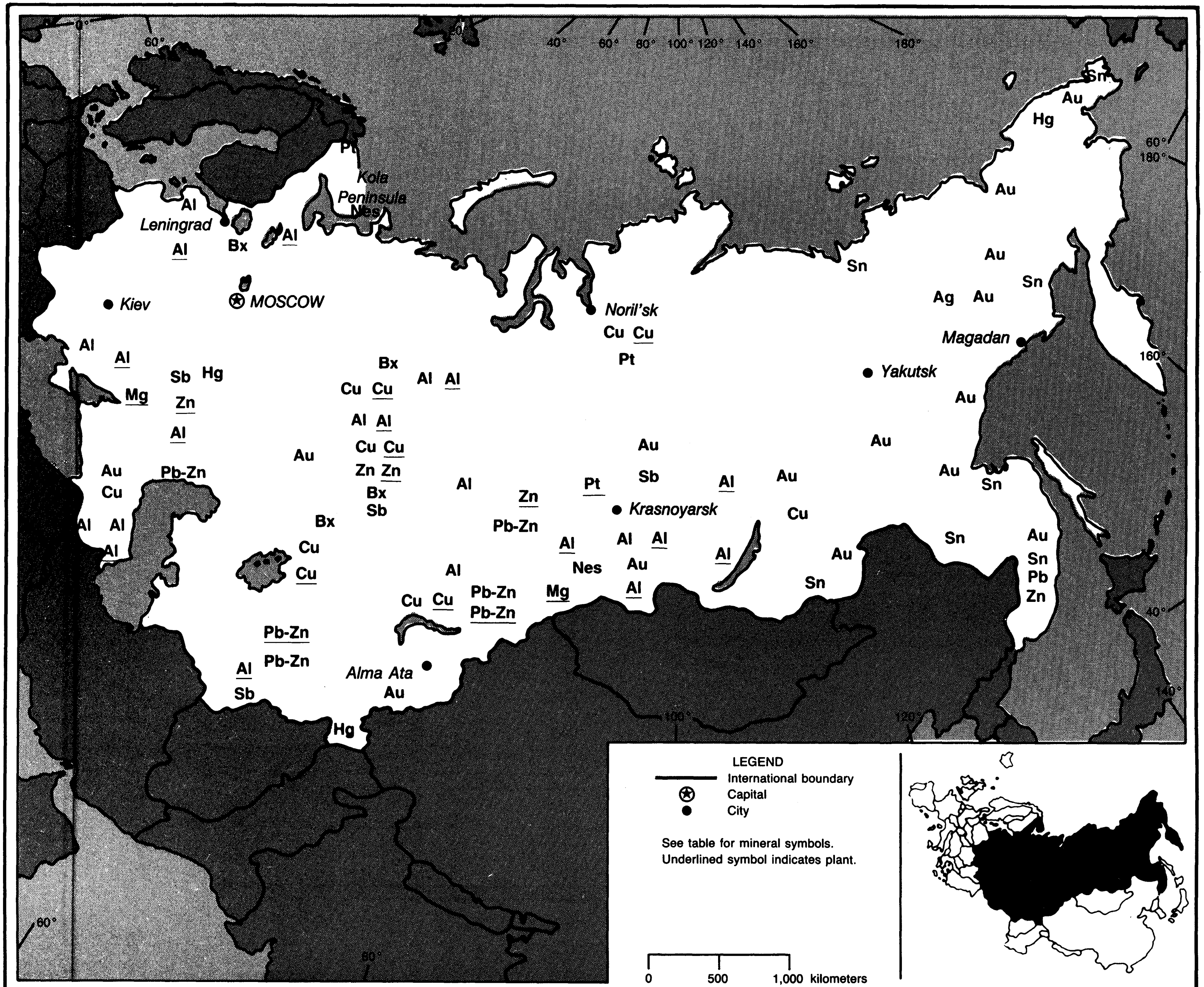


U.S.S.R.

AREA 22,400,000 km² | **INDUSTRIAL MINERALS** | **POPULATION 280 million**

U.S.S.R.
NONFERROUS AND PRECIOUS METALS

AREA 22,400,000 km² **POPULATION 280 million**



THE MINERAL INDUSTRY OF U.S.S.R.

By Richard M. Levine

GOVERNMENT POLICIES AND PROGRAMS

According to the annual report by the U.S.S.R. State Committee for Statistics, in 1990, "the economic situation in the country deteriorated significantly. The crisis began to grow, encompassing all spheres of the economy. Inflationary pressures increased, there were major disruptions in the consumer and producer goods markets, and domestically barter exchanges began to more frequently replace monetary transactions between enterprises".[1]

During the process of changing from a centrally planned to a market economy, growth occurred in the creation of private business. There was a significant growth in the number of cooperative and leased enterprises, although their ability to supply the overall consumer market was still weak.

In 1990, the U.S.S.R.'s GNP national product reportedly decreased by 2%, national income by 4%, and industrial output by 1.2%.[2] Decreases in output were reported in the mineral sector. Information still remained sparse as, despite glasnost', there were no major changes in Soviet secrecy in reporting mineral industry data. Regarding reported data, in the energy sector output of crude oil decreased 6% and coal 5%, and an increase of 2% in natural gas production was not adequate to offset this decline. In the ferrous metals sector output of iron ore fell 2%; crude steel, 4%; rolled steel, 3%; and steel pipes, 5%. Regarding nonferrous metals, reportedly, decreases occurred in the production of refined copper, magnesium and magnesium alloys, nickel, lead, titanium, and zinc. Output of basic chemical raw materials, including synthetic ammonia, caustic soda and soda ash, in 1990 was only between 91% and 96% of the 1989 production level, and there was a significant decrease in the production of mineral fertilizers. Construction materials output also decreased, with a reported 2% decrease in cement production.[3]

In comparison with that of 1989, there was a decline in output of cold-rolled steel, low-alloy steels, high-strength drilling and casing pipes, heat-treated steels, and other steel products. Production problems were intensified by disruptions in supplies of coking coal, scrap metals, diesel fuel, and other materials. Disruptions in the transport of raw materials led to raw material inventories at many metallurgical enterprises decreasing to critical levels. Labor problems complicated matters, as reportedly there was a lack of a highly skilled work force at enterprises, a decline in labor discipline, and an increase in the shutdown of production facilities because of accidents.[4]

There was a further move to remove mineral production enterprises from the central control of ministries by the creation of a new form of mineral industry management known as a "Concern" (Kontsern). The degree of independence of these Concerns from ministerial control varied from total independence in some cases to only the renaming of previous subbranches of ministries in others. In 1989, the majority of the country's natural gas production entities were formed into the gas Concern "Gazprom." Additional Concerns were created, including the cement Concern "Tsement," the asbestos Concern "Asbest," the reinforced concrete Concern "Soyuzzhelezobeton," the steel pipe Concern "Truboprom," the specialty steel Concern "Tspetsstal," the metal goods Concern "Metizi," the secondary metals Concern "Soyuzvtormet," and others.

Part of the iron ore sector was reorganized to give the enterprises greater independence from central control. In November 1989, mining and beneficiation complexes, production associations, mines, transport repair organizations, and scientific research institutes from the Kursk Magnetic Anomaly (KMA) iron ore mining district formed the concern "Rudprom." Only the Lebedi iron ore mining and beneficiation complex from the KMA did not join Rudprom. Along with these enterprises, the concern Rudprom embraced chrome and manganese ore production enterprises. Enterprises comprising Rudprom produced more than 50% of the country's marketable iron ore, all of the country's chrome ore, and about 20% of the country's manganese ore.[5] Rudprom, however, still appeared to be under the general control of the Ministry of Metallurgy, unlike other newly formed enterprises such as Noril'sk Nikel, which was independent of the control of the Ministry of Metallurgy.

With the new openness of discussion, a large amount of information was published on the country's environmental problems. The U.S.S.R. State Committee for Statistics (Goskomstat), in 1989, began publishing a statistical handbook on the environment entitled, "Okhrana okruzhayushchey sredy i ratsional'noye ispolzovaniye prirodnykh resursov v SSSR, Statisticheskiy sbornik" (Environmental Protection and the Rational Use of Natural Resources in the U.S.S.R.—Statistical Compendium), which contains tables quantifying environmental conditions throughout the country.[6] Metallurgical enterprises were chief contributors to pollution, and a program for the 1991-95 period called for introducing new technologies for alleviating this problem at 93 metallurgical enterprises.[7]

Issues regarding control of mineral resources were key factors in the debates concerning the political and economic future of the U.S.S.R. Regional issues concerning control of minerals included ownership of land and mineral reserves, retention of profits from mineral sales, ecological impacts, renumeration, retention, and composition of the labor force, and a host of other administrative and economic issues.

In 1990, there was a sharp intensification of the political and economic struggle for the control of resources. This struggle was waged between the Republics and the central government; within the Republics between administrative subunits and enterprises with both national and republic authorities; among Republics with each other and the central government; and among any of the aforementioned with all of the aforementioned concerning control of minerals. Decrees were promulgated by Republic and lesser administrative subdivisions asserting control of minerals, but the actual extent of these proclaimed controls was not clear.

Many Western businesses, in order to achieve maximum protection in their negotiations, were trying to achieve concurrence in their contracts at all levels that could conceivably attempt to exert control over the involved minerals. This added a significant degree of uncertainty in negotiating business dealings.

The geological sector was experiencing financial cutbacks as a result of "perestroyka" (rebuilding), and funding for scientific research was reduced. During the year, the Ministry of Geology was active in recruiting foreign firms to invest in the development of Soviet mineral deposits. The Ministry of Geology prepared a list of 120 deposits available for development by foreign investors. These deposits cover a wide variety of precious, ferrous, nonferrous, and industrial minerals, including asbestos, chromite, copper, gold, graphite, iron ore, kaolin, lead-zinc, silver, manganese, nickel, phosphate, tin, and other minerals. However, there was no assurance that these deposits met Western investment criteria. The Ministry of Geology was also active in conjunction with the government of Turkmenistan in offering tracts in Turkmenistan for competitive bidding for oil and gas leases by foreign firms, and the Ministry of Geology was involved in a number of other efforts to engage foreign participation in the development of Soviet fuel and nonfuel mineral resources.

Labor unrest continued to be a major problem in 1990, particularly in the coal mining sector. These strikes affected output in many other sectors, including steel production. Also, during this year, an independent national miner's union was formed with membership composed of the regional independent miner's unions. The miners combined economic demands with calls for political reform. The miners also called for improved safety in mines. The strikes followed a series of strikes in 1989 when numerous concessions were made to the miners, which the miners complained were never fulfilled. The miners' economic complaints centered on inadequate housing and the lack of food and consumer goods in mining regions. Although the miners, who are relatively well paid, were given raises, there were few goods available in stores. Health and safety issues involved the amount of nonmechanized labor in mines and the high accident rates. Because of poor working conditions, miners suffered poorer health and had shorter life expectancies than the average Soviet worker.

The strikes, although primarily occurring in the major coal mining regions, also occurred in other mineral development sectors, including the oil, gold, and oil shale production sectors. In Tyumen' Oblast, the country's main oil production region, strikes occurred in the spring of 1990 over the poor supply of consumer goods and inadequate housing construction. A large percentage of the country's independent gold mining cooperatives termed "artels" struck by refusing to sign production contracts because they did not believe they were being adequately compensated for their gold output given the increases that had occurred in the domestic procurement price for gold. Also, strikes were threatened in the aluminum sector by workers demanding improvements in their wages and housing.

TRADE

The U.S.S.R. was granted observer status in the GATT in May. According to GATT's Director General, Soviet admission was in recognition of the sweeping transformation underway in the Soviet economy.

In 1990, plans called for the dissolution of CMEA[8] trading bloc, which was officially disbanded in January 1991. This bloc, which had existed for 41 years, conducted trade in nonhard currency transactions and had isolated and insulated its members from participation in the world market. With the dissolution of CMEA, the Soviets could now conduct the majority of their trade in hard currency prices and could thus receive the world market price for their minerals exports that had comprised a large percentage of their exports to the CMEA countries. Despite the dissolution of CMEA, the Soviets, it appeared, believed they were under an obligation to extend some preferential trade in minerals to Cuba, Vietnam, and possibly other former CMEA countries that were not financially able to purchase their mineral supplies at world market prices. Despite efforts to form a successor organization to CMEA, no such organization has yet been formed.

Statistics on foreign trade in nonferrous metals had been secret for the past 15 years. However, excluding precious metals, aluminum was, reportedly, the leading Soviet nonferrous metal export during the 1980's in terms of volume and value. Table 2 shows the percentage that selected nonferrous metals comprised the total volume and value of nonferrous exports.

Table 2 shows, in part, the structure of Soviet nonferrous metal exports in terms of ruble value. It is difficult to use Soviet ruble value prices as definitive economic indicators as ruble prices were administratively set rather than determined by market forces. Also, it is not always possible to determine which prices were being used as there appears to have been differences between the ruble value of goods for export and the same goods used domestically; there are additional problems determining the significance of quoted rubles prices for domestic goods. Nevertheless, the Soviet quoted prices for nonferrous metals in rubles per ton given (in table 3) indicate how the Soviets valued their nonferrous metals.

COMMODITY REVIEW

Metals

Aluminum.—In the U.S.S.R., consumption patterns for aluminum were different from advanced industrial countries as only 6% of aluminum was consumed in construction, 15% in transport machine building, and 5.9% in packaging.[9]

A program for increasing aluminum production to meet the country's demands envisaged constructing two primary aluminum plants in Kazakhstan. One would be in the Pavlodar region where plans existed for constructing a plant based on the Kustanay bauxite deposits since the 1960's, and the other would be in the Ekibastuz region where there are large subbituminous coal mines. In Kazakhstan, it also was envisaged to renovate and expand the Pavlodar alumina plant.

Beryllium.—Prior to Glasnost' there was practically no reporting on the Soviet beryllium industry, including even mentioning facilities producing beryllium. However, in September 1990, an accident occurred at a beryllium processing plant that was widely reported because of the detrimental effects on people's health and the environment.

The accident occurred at the Ulbinskiy Metallurgical Plant, (UMZ) in Ust'-Kamenogorsk, Kazakhstan, that produced nuclear fuels. The plant previously had been referred to only as Post Office Box No. 10. In September, a fire occurred in the beryllium processing shop, releasing highly toxic beryllium and beryllium compounds into the atmosphere. The UMZ plant, reportedly, is the country's only beryllium producer and also produces 80% of the country's rare-earth and radioactive products. Dozens of other plants reportedly produced the remaining 20%.[10]

TABLE 1

U.S.S.R.: ESTIMATED[1] PRODUCTION OF MINERAL COMMODITIES[2]

(Thousand metric tons unless otherwise specified)

Commodity	1986	1987	1988	1989	1990
METALS					
Aluminum:					
Ore and concentrate:					
Bauxite, 26% to 57% alumina	4,600	4,600	4,600	4,600	4,200
Nepheline concentrate, 25% to 30% alumina[3]	1,638	1,660	1,639	1,697	1,650
Alunite ore, 16% to 18% alumina	620	625	625	600	550
Alumina	4,400	4,400	[r]4,400	[r]4,200	4,000
Metal, smelter:					
Primary	2,400	2,400	2,400	2,200	2,000
Secondary	400	400	425	400	375
Total	2,800	2,800	2,825	2,600	2,375
Antimony, mine output, recoverable Sb content tons	9,500	9,600	9,600	9,600	9,000
Arsenic, white (As_2O_3) do.	8,100	8,100	8,100	8,100	7,800
Beryllium: Beryl, cobbed, 10% to 20% BeO do.	2,000	2,000	2,000	2,000	1,600
Bismuth, mine output, recoverable Bi content do.	84	85	85	85	80
Cadmium metal, smelter do.	3,000	3,000	2,900	2,900	2,600
Chromium:					
Chrome ore, crude[3]	4,033	4,060	4,131	4,200	[e]4,200
Chrome ore, marketable[3]	3,640	3,570	3,700	3,800	3,800
Cobalt:					
Mine output, recoverable Co content tons	2,800	2,900	3,000	3,000	2,500
Metal, smelter do.	5,300	5,300	5,400	5,200	4,500
Copper:					
Ore:					
Gross weight, 0.5% to 2% Cu	89,000	91,000	93,000	93,000	87,000
Cu content, recoverable	620	630	640	640	600
Metal:					
Blister:					
Primary	770	790	800	800	750
Secondary	145	147	150	150	140
Refined:					
Primary	830	840	850	[r]850	800
Secondary	145	147	150	150	140
Gold, mine output, Au content thousand kilograms	275	275	280	285	240
Iron and steel:					
Iron ore, 55% to 63% Fe[3]	249,959	250,874	249,754	241,348	236,000
Iron ore, Fe content[3]	137,252	138,216	138,217	134,789	[e]132,000
Agglomerated products:					
Sinter[3]	154,466	154,000	154,000	151,000	[e]148,000
Pellets[3]	66,476	67,500	68,000	68,700	[e]67,000
Metal:					
Pig iron and blast-furnace ferroalloys:					
Pig iron for steelmaking[3]	105,881	106,026	107,008	106,723	[e]104,000
Foundry pig iron[3]	7,313	7,214	6,903	6,550	[e]5,500
Spiegeleisen[4]	[3]20	[3]19	20	20	[e]18
Ferromanganese[4]	600	[3]593	600	600	[e]575
Ferrophosphorous	[3]26	[3]25	25	25	[e]20
Total[3,5]	113,840	113,877	114,558	113,928	110,000
Electric-furnace ferroalloys	4,800	4,900	5,100	5,000	4,900

See footnotes at end of table.

TABLE 1—Continued

U.S.S.R.: ESTIMATED[1] PRODUCTION OF MINERAL COMMODITIES[2]

(Thousand metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989	1990
METALS—Continued						
Iron and steel: Metal—Continued						
Crude steel[3]		160,550	161,887	163,037	r160,096	154,000
Finished rolled steel[3]		111,996	114,081	115,958	115,550	111,826
Semimanufactures:						
Wire rods[3]		8,715	8,800	6,535	6,158	e5,800
Pipe stock[3]		6,565	6,878	6,934	6,817	e6,500
Tubes from ingots[3]		1,963	1,929	1,947	1,889	1,868
Selected end products:						
Total pipes and tubes[3]		19,817	20,346	20,840	20,567	19,500
Cold-rolled sheet[3]		10,516	10,795	11,214	11,346	11,178
Lead:						
Mine output, recoverable Pb content		440	440	440	440	400
Metal, smelter:						
Primary		485	475	447	465	420
Secondary		270	275	280	280	260
Magnesium metal, including secondary		89	90	91	91	88
Manganese concentrate:[3]						
Gross weight		9,300	9,400	9,100	9,100	8,500
Mn content		2,800	2,800	2,800	2,740	e2,500
Mercury metal, including secondary	tons	r2,300	2,300	2,300	2,300	2,200
Molybdenum, mine output, Mo content	do.	11,400	11,500	11,500	11,500	11,000
Nickel:						
Mine output, Ni content		260	270	280	280	260
Metal, smelter		275	285	290	295	275
Platinum-group metals, mine output, Pt content	tons	121	124	128	128	120
Silver metal including secondary	do.	1,500	1,510	1,520	1,520	1,400
Tin:						
Mine output, recoverable Sn content	do.	14,500	16,000	16,000	16,000	15,000
Metal, smelter:						
Primary	do.	16,000	18,500	18,500	18,000	16,000
Secondary	do.	3,800	4,000	4,000	4,000	3,700
Total	do.	19,800	22,500	22,500	22,000	19,700
Titanium:						
Concentrates:						
Ilmenite	do.	450,000	455,000	460,000	460,000	420,000
Rutile	do.	10,000	10,000	10,000	10,000	9,500
Metal	do.	43,500	44,000	46,000	46,000	43,000
Tungsten concentrate, W content	do.	9,200	9,200	9,200	9,200	8,800
Vanadium metal	do.	9,600	9,600	9,600	9,600	9,000
Zinc:						
Mine output, recoverable Zn content		810	810	810	810	750
Metal:						
Primary		900	910	848	862	780
Secondary		105	110	115	115	110
Zirconium metal		85	90	90	90	85
INDUSTRIAL MINERALS						
Asbestos, grades I-VII		2,400	[3]2,552	2,600	2,600	2,300
Barite		540	540	540	540	500

See footnotes at end of table.

TABLE 1—Continued

U.S.S.R.: ESTIMATED[1] PRODUCTION OF MINERAL COMMODITIES[2]

(Thousand metric tons unless otherwise specified)

Commodity	1986	1987	1988	1989	1990
INDUSTRIAL MINERALS—Continued					
Boron minerals and compounds:					
Gross weight	200	200	200	200	190
B_2O_3 content	40	40	40	40	35
Bromine	65	65	65	65	60
Cement, hydraulic[3]	135,119	137,404	139,499	140,436	137,322
Clays: Kaolin including china clay	2,000	2,000	2,000	2,000	1,700
Corundum, natural tons	8,700	8,700	8,700	8,700	8,000
Diamond:					
Gem thousand carats	7,400	7,500	7,500	7,500	7,500
Industrial do.	7,400	7,500	7,500	7,500	7,500
Total do.	14,800	15,000	15,000	15,000	15,000
Diatomite	250	255	260	260	250
Feldspar	330	330	330	330	300
Fluorspar, ore	[3]1,400	1,400	1,400	1,400	1,350
Fluorspar, concentrate (55% to 96.4% CaF_2) tons	[3]410,500	410,500	410,500	410,500	400,000
Graphite	84	84	84	84	80
Gypsum[3]	4,599	4,781	4,902	4,900	[e]4,700
Iodine tons	2,000	2,000	2,000	2,000	1,800
Lime, dead-burned[3]	30,122	30,121	30,577	30,378	[e]30,000
Lithium minerals, not further specified	55	55	55	55	50
Magnesite:					
Crude	4,300	4,300	4,200	4,200	4,000
Marketable product	1,925	1,875	1,825	1,825	1,700
Mica	50	50	50	50	45
Nitrogen: N content of ammonia	19,600	20,000	20,200	19,500	18,500
Perlite	600	600	600	600	550
Phosphate rock:					
Crude ore:					
Apatite, 15% P_2O_5[3]	51,316	51,840	52,298	[e]51,000	[e]49,000
Sedimentary rock[3]	23,409	24,915	26,245	[e]25,000	[e]24,000
Total	74,725	76,755	78,543	76,000	73,000
Concentrate:					
Apatite, 37% to 39.6% P_2O_5	20,700	20,900	21,200	21,100	20,000
Sedimentary rock, 19% to 30% P_2O_5	15,500	16,100	15,800	15,900	15,300
Total	36,200	37,000	37,000	37,000	35,300
Potash:					
Ore, gross weight[3]	63,475	68,710	68,410	[e]62,000	[e]55,000
K_2O equivalent[3]	10,228	10,888	11,301	10,233	9,000
Pyrite, gross weight	[3]4,769	[3]4,893	4,900	4,800	4,600
Salt, all types[3]	15,300	15,400	14,800	15,000	14,500
Sodium compounds, n.e.s.:					
Carbonate[3 6]	5,032	5,051	4,989	4,809	4,359
Sulfate:					
Natural	360	360	375	375	350
Manufactured	260	260	270	270	250
Sulfur:					
Frasch	1,100	1,100	1,100	1,100	1,000
Other native	2,400	2,400	2,400	2,350	2,000

See footnotes at end of table.

TABLE 1—Continued

U.S.S.R.: ESTIMATED[1] PRODUCTION OF MINERAL COMMODITIES[2]

(Thousand metric tons unless otherwise specified)

Commodity	1986	1987	1988	1989	1990
INDUSTRIAL MINERALS—Continued					
Sulfur—Continued					
S content of pyrite[3,7]	[r]2,150	[r]2,150	[r]2,150	[r]2,150	1,900
Byproducts:					
Of metallurgy	1,050	1,250	1,375	1,350	1,200
Of natural gas[3]	[r]1,625	[r]2,400	[r]3,290	[e]2,500	[e]2,500
Of petroleum	400	450	450	450	425
Total	[r]8,725	[r]9,750	[r]10,765	[r]9,900	9,025
Sulfuric acid[3]	27,847	28,531	29,372	28,276	27,267
Talc	520	530	530	530	500
MINERAL FUELS AND RELATED MATERIALS					
Coal:[3]					
Anthracite	71,420	71,544	72,274	68,043	[e]65,000
Bituminous	516,278	523,338	527,212	508,754	[e]478,000
Lignite and brown coal	163,412	164,490	172,395	163,523	160,000
Total[8]	751,110	759,372	771,881	740,320	703,000
Coke: Coke oven, beehive, breeze, gas coke[3]	83,135	83,038	81,916	80,424	[e]75,000
Fuel briquets:[3]					
From anthracite and bituminous coal	781	771	762	751	[e]700
From lignite and brown coal	4,090	4,238	5,448	5,628	[e]5,300
Total	4,871	5,009	6,210	6,379	6,000
Gas, natural, marketed: As reported[3] million cubic meters	686,000	727,000	770,000	796,000	815,000
Oil shale[3]	30,099	30,081	28,061	28,076	26,000
Peat:					
Agricultural use	160,000	160,000	160,000	160,000	150,000
Fuel use[3]	19,500	11,400	17,500	16,800	11,200
Petroleum:					
Crude:					
As reported, gravimetric units[3]	614,753	624,177	624,323	607,254	570,000
Converted, volumetric units					
thousand 42-gallon barrels	4,520,000	4,590,000	4,590,000	4,460,000	4,190,000
Refinery products[9]	461,334	472,053	475,000	470,000	440,000

[e]Estimated. [r]Revised.
[1]Production estimated unless otherwise specified.
[2]Includes data available through Oct. 1991.
[3]Reported in Soviet sources.
[4]Estimate based on total of spiegeleisen and blast-furnace ferromanganese reported by United Nations sources.
[5]Data may not add to total shown because not all items comprising total are listed.
[6]Excludes potash.
[7]Pyrite series derived from reported Soviet data for pyrite production in gross weight.
[8]Run-of-mine coal.
[9]Not distributed by type and therefore not suitable for conversion to volumetric units. Data apparently include all energy and nonenergy products but exclude losses.

The accident was being widely covered in the Soviet press because of the serious health issues for the population and was being compared in many ways to the Chernobyl accident. After the accident, discussions occurred concerning closing the beryllium production plant, but the chief engineer of the UMZ replied "Even disregarding our customers abroad, we have links with thousands of enterprises in the Union. They cannot do without beryllium."[11]

Glasnost also affected the beryllium mining industry. Mention was made of the Malyshev beryllium mines in the Urals where consideration was being given to switching some production capacity to civilian use, including mining emeralds found in the deposits.

Cobalt.—There was a reported decrease in nickel production in 1990, and a large percentage of the country's cobalt output is associated with nickel. Ethnic unrest also affected cobalt production in 1990. In the

TABLE 2

U.S.S.R.: STRUCTURE OF EXPORTS OF NONFERROUS METALS, BY VOLUME AND VALUE[1]

(Percentage)

Metal	Value				Volume			
	1975	1980	1986	1988	1975	1980	1986	1988
Aluminum	37.3	52.9	47.6	39.8	57.0	61.0	50.9	53.6
Aluminum, secondary	—	—	8.0	6.6	—	—	12.4	10.2
Nickel	13.6	19.7	21.0	31.5	3.5	3.1	7.4	7.4
Copper (including cable)	32.5	14.2	15.5	15.9	19.4	14.2	14.5	18.8
Zinc	4.8	5.2	2.4	1.5	5.2	9.6	4.6	3.7
Lead	4.8	4.7	2.3	0.8	13.6	11.4	7.7	3.3
Magnesium	1.8	0.5	0.2	0.8	1.1	0.4	0.1	0.6
Titanium	1.7	0.0	0.0	0.0	0.04	0.0	0.0	0.0
Total	100	100	100	100	100	100	100	100

[1]Value calculated in current ruble value prices. Sources: Tsvetnye Metally (Nonferrous Metals), Moscow, No. 12, Dec. 1990, p. 13.

TABLE 3

PRICES FOR NONFERROUS METALS

(Rubles per ton)[1]

Metal	Value
Aluminum	849.5
Copper	1,057
Nickel	4,159
Lead	891
Zinc	816
Tungsten[2]	7,690
Molybdenum[3]	7,653
Titanium	2,409
Magnesium	1,193

[1]Prices quoted in 1982 ruble wholesale prices.
[2]60% tungsten concentrate.
[3]51% molybdenum concentrate.

Tuva Autonomous Republic in the Russian Republic, ethnic disturbances and violence over the past 2 years between the Tuvinian people and other Soviet ethnic groups had led to the emigration of more than 3,000 Russian speaking people from the Tuva Autonomous Republic. At the Tuva cobalt mining and beneficiation complex that exploits a cobalt-arsenide deposit, mining was occurring at only 30% capacity. The Tuva complex had lost a large numbers of its skilled workers. A further loss of specialists would reportedly stop work at the complex.[12]

Copper.—In 1990, Soviet copper exports increased significantly, with Soviet sales resulting in increased copper inventories accumulating from other suppliers in London Metals Exchange warehouses. Soviet exports appeared to be driven by the need to generate hard currency earnings. Also, Soviet copper supplies, which in the past had been sent to East Europe in barter style transactions, were now available for export to the world market.

With the recent development of open discussion of environmental problems, much public attention focused on the mineral sector. Owing to environmental problems, the furnaces at the Karabash copper complex in Chelyabinsk Oblast in the Urals were shut down. Karabash, which was built at the beginning of the century, had been operating almost continuously without major renovations. Although copper production had been increasing continuously at Karabash, no significant environmental control measures had been undertaken. Karabash was being converted to producing bronze from copper waste, which was considered environmentally more benign, and it was not reported when or if the shutdown blister copper production capacities would resume operation.[13]

With glasnost', reporting was covering not only present but also past problems in the copper industry. The story emerged of an unorthodox planned experiment in the mid-1960's at the Udokan deposit in Chitinskaya Oblast to mine the deposit with nuclear explosives. It was planned to quickly develop part of the deposit by blowing away a mountain top, thus opening access to the ore body. At great effort and expense and with little or no understanding or consideration of the effects of such explosions on the environment, all preparations were made for using nuclear explosives, including the evacuation of surrounding settlements.

Then, in 1966, after the explosives were almost in place, orders came from the highest political levels in Moscow not to proceed, with one stated concern being the affect this experiment would have on the newly signed nuclear test ban treaty.[14]

During the year, initiatives were undertaken to expand copper reserves using foreign assistance. Finland's Outokumpu Oy signed an agreement with officials from the Karelian A.S.S.R. to explore copper-nickel deposits in Soviet Karelia. Outokumpu has a 50% interest in this venture and would maintain a 50% share in any subsequent mining operations.

Gold.—Soviet gold remained an area of interest in 1990 as Western companies explored areas of possible cooperation with the Soviet gold mining industry and investors in gold tried to ascertain how the uncertain economic situation in the U.S.S.R. would affect Soviet gold sales and thus affect the world market price for gold. Interest was also high in ascertaining the size of Soviet gold bullion reserves as an indicator of Soviet credit worthiness and for assessing possibilities for using Soviet gold stocks to help promote the transition to a market economy.

In an apparent information breakthrough regarding Soviet gold trade data, both the Soviet Prime Minister and the Minister of Foreign Economic Relations were quoted in the Western press as stating that the U.S.S.R. exported 234 tons of gold in 1990. The reason for the release of this trade data appeared related to accusations made by officials from the Russian Republic that the central government was conducting large sales of gold at unfavorable terms. The majority of this gold would have been produced by the Russian Republic.

This gold sales figure, however, may not have included a significant quantity of Soviet gold delivered to the West in gold swaps, a type of fixed-term loan where gold is delivered as collateral. Soviet gold swaps in excess of 100 tons were reported in the Western press.

Glavalmazzoloto, the organization that controlled the majority of the country's gold and diamond mining, processing, and jewelry making facilities, reported that about 40 tons of gold annually was used in making jewelry. The largest domestic industrial user of gold in the U.S.S.R., however, has traditionally been the electronics industry.[15] It was also revealed that Glavalmazzoloto had about 350,000 employees.

In the summer of 1990, Glavalmazzoloto applied to become a member of the World Gold Council (WGC). Glavalmazzoloto reportedly was intending to become a major exporter of gold jewelry and believed that membership in the WGC would be of assistance.

Issues regarding the control of mineral resources, particularly gold, were major sources of contention between the Republics and the central government, within Republics, and even among Republics. The major gold-producing Republics, the Russian Republic, Uzbekistan, Kazakhstan, and Armenia, all made claims of ownership of their natural resources. Within the vast Russian Republic, which comprises two-thirds of the country's territory and includes, besides Russians, there are more than 80 officially recognized nationalities, 16 of which inhabit their own autonomous Republics, and a number of these other administrative units were claiming control of their mineral resources. For example, the Yakut Autonomous Republic within the Russian Republic, which is a major gold-producing region as well as the country's source of diamonds, was contending with the Russian Republic over ownership of mineral resources.[16] Not only ethnic administrative subunits of Republics, but also political administrative subunits were claiming control of their mineral resources. Magadan Oblast in the Russian Republic, (an Oblast' may be compared to a state in the United States), which may produce as much as one-third of total Soviet gold production, proclaimed ownership of all its mineral resources.[17]

Ownership of mineral resources, particularly gold, was viewed by a number of Republics as a means for achieving partial, or even total, economic and political independence. In 1990, it was announced that there were significant undeveloped gold reserves in the Ukraine. Controlling the sale of large gold resources appeared as one of the shortest routes for achieving economic viability for certain Republics. These gold deposits were cited explicitly as evidence of the Ukraine's economic viability as a separate entity. The head of the South Ukraine Geological Prospecting Association that was exploring this deposit stated "I would say that on the whole the country does not need Ukrainian gold. As such the country has sufficient gold reserves and has a developed gold extraction industry in the east of the country. But for the people of the Ukraine, for the republic as a whole under conditions of sovereignity, ... it has a certain significance."[18] The development of Ukrainian gold deposits was further linked with the possibility of the Ukraine issuing its own currency.

The gold fields that were referred to in the Ukraine had actually been discovered more than 20 years ago, but their economic viability had not been determined. A significant sum was recently allocated for completing exploration of these gold fields.

Not only were the Ukrainians looking for gold in the ground, but they were also looking to find it in deposits of the Bank of England. According to Ukrainian claims, Pavlo Polubotok, an 18th century Ukrainian Cossack leader had sent gold to England 300 years ago with the stipulation that the money should be returned to the Ukraine when the Ukrainian people won political independence. The gold now, according to the calculations of the Ukrainian Supreme Soviet Deputy Prime Minister, would be worth, including interest, 16 trillion pounds sterling. Officials from the Bank of England, who reportedly were dusting off old ledgers, had not reported finding any evidence of this gold deposit.

While some Republics were trying to keep their gold, others without gold were trying to acquire gold. Lithuania, which lacked any stocks of gold, was experiencing difficulties in obtaining gold from the central government or from other Republics.[19]

The Soviets, in another effort to raise hard currency revenues from gold, announced that they would use 145,000 troy ounces of gold for minting "Glasnost-Perestroika" commemorative coins. The coins, which would have a total market value of $100 million, would be struck in 1-ounce, 1/2-ounce, and 1/4-ounce pieces of 99.9% purity.

In addition to the problems that affected the entire economy, problems were reported throughout the country in major gold mining areas. Also, there were reported production decreases for nonferrous metals from which gold is produced as a byproduct. One of the country's largest gold production associations, "Severovostokzoloto," which mined gold in the Soviet Far East, reportedly was not achieving its planned output, and mining was behind schedule.[20] At the Murantau deposit in Uzbekistan, which produced an estimated 50 to 60 tons of gold annually, production problems were also reported. Also, serious environmental problems were reported at Muruntau associated with the deposit and storage of wastes and tailings.[21]

Labor problems beset the gold mining sector. Many of the country's artels, a type of independent gold mining company that works under contract with state enterprises, refused to conclude contracts because it was claimed the state's procurement prices were too low to conduct profitable gold mining. The artels traditionally produced about one-third of the country's gold.

Regarding new development, the Soviets reported discovering the world's northernmost gold deposit on Bolshevik Island in the Severnaya Zemlya archipelago. People and supplies were parachuted to the island in November to begin preparation for gold mining. However, difficulties were being encountered in acquiring the necessary cargo planes, which was delaying development.[22]

The U.S.S.R. announced plans to develop a hard-rock gold mine in Khabarovsk Kray in the Soviet Far East. Development was slated to take 10 years. The deposit, which reportedly has substantial quantities of gold and also contains significant quantities of platinum-group metals, is in the Kender Region. This region was described as having about 300 rich gold deposits. Some of these deposits, according to the Soviet Ministry of Geology, would be made available for development by joint ventures. Australian firms had been approached by the Soviets regarding participation in this new hard-rock gold mine. Much potential existed for the Soviets to increase gold output by initiating hard-rock gold mining in this region. Development of hard-rock gold mining, however, had only lately been promoted.

Another area being considered for development was processing gold from tailings. For many years large volumes of tailings had accumulated containing substantial amounts of gold. Glavalmazzoloto was evaluating proposals from Western investors to recover gold from these tailings through either heap leaching or conventional enrichment. Preference, it was claimed, would be given to investors providing ecologically acceptable technology. While the U.S.S.R. was hosting Western investors interested in developing Soviet gold resources, the Soviets were also soliciting gold development opportunities in the West. The U.S.S.R.'s Central Research Institutes for Geological Prospecting for Base and Precious Metals (TSNIGRI) was reported to be discussing the possibility, with the Tri-Valley Corp. of Bakersfield, California, of engaging in a venture to explore 64 square miles (103 square kilometers) of leased property in Alaska's Richardson district about 70 miles (113 kilometers) south of Fairbanks with TSNIGRI receiving stock in the venture in exchange for its participation.

Iron and Steel.—In 1990, reported raw steel production fell 4% to 154 million tons. Finished steel production decreased 3% to 112 million tons, and steel pipe production decreased 5% to 19.5 million tons. In addition, production of higher quality steel products, including cold-rolled steel, low-alloy rolled steel, heat-treated steel products, high-strength drilling and casing pipes, iron powders, and other products also decreased in comparison with that of the previous year.

Production problems were intensified by shortages in the supply of coking coal, scrap metal, diesel fuel, and other materials. Transportation problems resulted in disruptions in delivery of metallurgical raw materials, with inventories dropping to critical levels at many enterprises. The iron and steel industry, reportedly, was also adversely affected by a lack of skilled workers, a breakdown in labor discipline, and increased downtime at facilities because of an increased accident rate.[23] Steel suppliers, in turn, were not meeting commitments for shipments to domestic customers, with certain sectors of the economy severely affected. For example, the manufacture of practically all grain harvesting combines reportedly stopped because of disruptions in deliveries of cold-rolled steel. The problem was exacerbated by the switching from state allocations of steel to a system of steel producers signing contracts directly with their customers.[24]

In the U.S.S.R., there were 65 enterprises producing crude steel, with 9 producing more than 5 Mmt/a and 2 of the 9 producing more than 12 Mmt/a. In addition, 10 machine building plants had their own steelmaking operations, and 70% of machine building enterprises had their own casting and forging shops, which accounted for a significant percentage of the country's output of castings and forgings.

Although steel output fell in 1990 because of a host of problems, the Soviet's long-term goal was to stabilize and then reduce output of finished steel while increasing the percentage of higher quality steel products, including coated sheet and tin plate. Modernization plans for the Soviet steel industry called for a number of developments, including introducing equipment to prevent pollution, applying technologies for minimizing coke consumption in blast furnaces, proceeding with the installation of continuous casting equipment, eliminating open-hearth production, and proceeding with installing capacity for direct reduction processes.

Soviet plans called for a 60% increase in stainless steel production by the year 2000. Soviet representatives, speaking at the East European Special Steel Conference in Prague, were quoted as stating that the U.S.S.R. was producing 1.2 million tons per year of finished stainless steel. Increases in stainless production would require expansion of a number of plants, including Dneprospetstal, Azovstal, Beloretsk, Orsk-Khalilovo, and Zaporozhstal. The biggest expansion, however, would be at the Chelyabinsk steel mill, which already produced a significant percentage of the country's stainless steel. The technical director of Chelyabinsk told the conference that Chelyabinsk planned to increase stainless steel output from 140,000 tons per year to 500,000 tons per year by 1995-96.

During the 1986-90 period, plans did not call for building new steel mills. Fifty percent of investment in the steel industry was used to renovate existing enterprises, 30% toward improving product variety and quality, and 20% toward financing capacity expansion, including commissioning projects begun in the 1970's. Improving rolling mills was considered the key to producing new types of steel products during the 1986-90 period. Seventy rolling mills were planned to be renovated and 38 decommissioned during the 1986-90 period.

Soviet imports of steel were primarily composed of pipe, tube, plate, and sheet from West Europe and Japan. Soviet steel exports were primarily composed of ingots, blooms, and hot-rolled coils. Imports were primarily used in oilfield and gasfield development for hydrocarbon transport systems. In 1990, the U.S.S.R. experienced problems paying Asian and European suppliers for steel imports. Owing to payment difficulties, some Western suppliers stopped shipping steel products to the U.S.S.R., and the U.S.S.R. in turn rescinded orders that they had with their Western suppliers.

As a way out of their hard currency cash-flow problems in purchasing steel products, the Soviets were seeking countertrade deals to acquire steel. The Soviets also were having difficulty fulfilling some of their export commitments, parcticularly for scrap.

Lead and Zinc.—Lead and zinc production was being affected by the depletion of reserves, insufficient energy resources as well as the increased price for energy raw materials, and the enactment of more stringent environmental laws.

Environmental issues were of primary concern. The country was, therefore, interested in switching to autogenous smelting, which reduces emissions using the Soviet-developed Kivtset-CS process. This process was introduced at the Ust'-Kamenogorsk lead-zinc plant in Kazkahstan in 1986. In 1987, an 80,000-ton-per-year capacity Kivtset-CS smelter was installed under license at the Porto Vesma plant in Italy. Plans call for continuing the installation of Kivtset-CS units at the Chimkent lead plant and the Dal'polimetal production association.

The country was making greater use of secondary lead, which accounted for 38.2% of lead output. Use of secondary lead had increased 50% from 1980 to 1988.[25] The major secondary lead processors were the Leninogorsk polymetallic plant in Kazakhstan and the Ukrzink plant in the Ukraine.[26]

Secondary lead was still considered inadequate in quantity and of poor quality. Improved secondary processing capacity was needed as well as improved processing technology for environmental protection. Consideration was being given to constructing minisecondary lead processing plants throughout the country for processing batteries.

In the U.S.S.R., the majority of zinc was produced by hydrometallurgical processes. Technologically, however, Soviet plants were lagging behind their Western counterparts and in need of renovation. Without basic renovation, it was claimed, the profitability of Soviet zinc plants could not be increased.[27]

One problem the Soviets were confronting was changing their consumption patterns for lead and zinc, both or which were in short supply. (Consumption patterns for lead and zinc are given in table 5).

For example, high-quality lead-calcium batteries produced abroad lasted about two and one-half times longer then Soviet lead-antimony batteries. The suggestion was made in the journal Nonferrous Metals (Tsvetnye Metally) of inviting foreign firms to construct battery production shops at lead enterprises.[28] Also, the Soviets imported a large portion of their lead- base chemical compounds and were seeking ways to increase their domestic production. Instead

TABLE 4

U.S.S.R.: PRODUCTION OF IRON ORE, PIG IRON, CRUDE STEEL, AND ROLLED STEEL, BY REPUBLIC

(Million tons)

Republic	Iron ore			Pig iron			Crude steel			Rolled steel		
	1980	1988	1989	1980	1988	1989	1980	1988	1989	1980	1988	1989
Armenia	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Azerbaidzhan	1.1	0.7	0.7	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Byelorussia	—	—	—	—	—	—	(1)	1.1	1.1	(1)	(1)	(1)
Estonia	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Georgia	—	—	—	0.8	0.7	0.7	1.3	1.5	1.4	1.2	1.2	1.2
Kazakhstan	25.8	24.3	23.8	4.8	4.9	5.3	6	7	7	4.1	4.9	5.0
Kirgiziya	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Latvia	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Lithuania	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Moldavia	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Russia	92.4	109	107	55.2	61.5	61.5	84	94	93	59.7	66.4	65.4
Tadzhikistan	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Turkmenistan	—	—	—	—	—	—	(1)	(1)	(1)	(1)	(1)	(1)
Ukraine	125	116	110	46.5	47.4	46.5	54	56	55	36.0	40.0	39.9
Uzbekistan	—	—	—	—	—	—	(1)	1.0	1.1	(1)	(1)	(1)
U.S.S.R. total	245	250	241	107	115	114	148	163	160	103	116	116

[1]Reported production less than 1 million tons.

Source: Promyshlennost' SSSR, Statisticheskiy sbornik (U.S.S.R. Industry, Statistical Compendium), Moscow, State Committee for Statistics, 1990.

TABLE 5

CONSUMPTION OF LEAD AND ZINC IN THE U.S.S.R. IN 1987

Lead consumption	Percentage	Zinc consumption	Percentage
Battery production	47.1	Galvanized steel	24.3
Dyes and other chemical compounds	11.3	Brass and bronze	5.3
Rolled metal and products formed by extrusion	3.0	Zinc alloys	13.4
Cable casings	12.1	Chemicals	24.8
Lead alloys and castings	9.8	Zinc semi-finished products	26.2
Additives to gasoline	2.3	Zinc powders and dusts	5.0
Ammunition and other goods	14.4	Other uses	1.0
U.S.S.R. total	100	U.S.S.R. total	100

Source: Tsvetnye metally (Nonferrous Metals), Moscow, No. 12, Dec. 1990, p. 29.

of increasing lead smelting capacity, the Soviets were seeking alternative technologies for making lead compounds from processing lead batteries with hydrometallurgical processes. The Soviets were also seeking to employ more modern technologies for coating steel to reduce consumption of zinc in galvanized steel production.

The need was expressed for developing a new zinc plant in Kazakhstan at the Zhayrem mining and beneficiation complex. A shortage of zinc was foreseen in the 1991-95 period in Kazakhstan, which could be alleviated through the construction of the new zinc plant.[29]

Nickel.—In 1990, the U.S.S.R. State Committee for Statistics (Goskomstat) reported a decrease in nickel production. Actual figures were not reported as nickel production and trade data were still secret. The Soviets appeared, however, to maintain their high level of exports in 1990.

During the year, the newly formed Soviet nickel company Noril'sk Nikel, which controlled more than two-thirds of the country's nickel production, appeared to sever most of its ties with the Soviet foreign trade company, Raznoimport, which for decades had monopolized the sale of all Soviet nickel. Noril'sk began marketing nickel with the aid of the Soviet foreign trade company Technoexport. Noril'sk made this change based on a series of recently passed rulings by the Soviet Government declaring that most Soviet enterprises were free to contract, if they so desired, with the trading company of their choice, rather than being forced to sell through the foreign trade companies that previously monopolized control of all Soviet exports.

Although Raznoimport lost its exclusive right to export nickel from Noril'sk, Raznoimport still controlled exports of nickel produced in the Ural Mountains region. It was not, however, clear how the determination was being made concerning the quantity of nickel that Noril'sk could export and the quantity of nickel that Noril'sk would have to provide for domestic needs. It also was not clear how the determination was being made concerning the percentage of its nickel export profits that Noril'sk could keep for its own use and the percentage that Noril'sk would deliver to the central government.

After banning all imports of Soviet nickel into the United States in late 1983 because the Soviets would not certify that their exports did not contain Cuban nickel, the U.S. Department of the Treasury, in July 1989, declared that Soviet nickel exports produced by production facilities controlled by Noril'sk Nikel would be permitted to be imported into the United States. It was determined that the Noril'sk enterprises were not processing Cuban material. The U.S. Department of the Treasury decided that Soviet nickel imports to the United States would have to be accompanied by certificates of origin stating that the nickel was produced by enterprises controlled by Noril'sk Nikel. The agency issuing the certificates would have to be the Soviet foreign trade company Raznoimport. Despite the Department of the Treasury ruling, no Soviet nickel entered the United States in 1990 as Noril'sk Nikel appeared to not be able to arrange an agreement with Raznoimport concerning issuing certification for its exports.

Pollution problems from the nickel industry remained a primary concern, with pollution from the nickel enterprises on the Kola Peninsula affecting not only the U.S.S.R., but neighboring Scandinavian countries. In a matter of domestic environmental concern, an explosion occurred in mid-May at the Severonikel complex on the Kola Peninsula, releasing chlorine gas. The wind dispersed the gas before serious problems occurred in the nearby town of Monchegorsk.[30]

The Finnish firm Outokumpu Oy agreed in principle to modernize the Soviet Pechenga and Monchegorsk nickel complexes on the Kola Peninsula near the Finnish border. Both smelters would be replaced, and Outokumpu's flash smelting technology would be introduced. This was expected to increase sulfur recovery from the current level of 39% to 98%. Work was planned to begin in 1991 and to be completed in 1994. Norway's Elkem and other Western firms would also participate in this project. Reportedly, the Finnish, Swedish, and Norwegian Governments agreed to extend credits to finance those renovations that would reduce environmentally harmful emissions from nickel enterprises on the Kola Peninsula.[31]

Outokumpu further signed an agreement with representatives of the Karelian ASSR in the Russian Republic to develop copper-nickel deposits in Karelia. The agreement called for further exploration of the copper-nickel deposits in the Kivijarvi region of Karelia. According to Soviet geological information, the copper-nickel ore reserves grade 0.9% nickel. If the project were to lead to mining, Outokumpu would, reportedly, have a 50% share in the subsequent mining ventures.

Platinum-Group Metals.—In 1990, changes occurred in the Soviet marketing of platinum-group metals. The Soviets began marketing platinum-group metals in June on New York's NYMEX and Tokyo's Tocom exchanges. Furthermore, Salomon Brothers and the Soviet trading company Almazyuvelirexport (Almas) formed a joint business venture, Salmaz, to supply platinum-group metals for industrial use on the American market. Almazyuvelierexport is a foreign trade company that is a subsidiary of Glavalmazzoloto, which controls practically all gold and diamond mining, processing, and jewelry manufacturing. However, although Glavalmazzoloto does not market gold bullion but only gold jewelry, Glavalmazzoloto, through Almazyuvelierexport, engages in the sale of platinum-group metals in not only jewelry, but also in ingots and powder as well as in industrial articles. All gold bullion sales are channeled through the Foreign Economic Bank, Vnezhekonombank. Vnezhekonombank, which along with Almas engages in the sales of platinum group metals, divides total sales in an unspecified manner.

As occurred in 1989 and again in 1990, the rhodium market was buffeted by uncertainties over Soviet supplies. Soviet platinum sales in 1990, according to an article in Izvestya, were in the range of 375,000 troy ounces, and the Izvestya article stated that Soviet platinum sales in 1991 would increase because of the country's economic difficulties.[32] The Izvestya article's sales figure for 1990 is considerably below Western estimates, which range above 575,000 ounces for Soviet platinum sales. The Izvestiya article, however, cannot necessarily be considered official information as, unlike the past, Soviet publications were publishing information on matters such as platinum sales, which were still state secrets, by supplying estimates from Western or other sources.

Industrial Minerals

Although never maintained with the strict secrecy as data on nonferrous and precious metals, reserves, production, and trade data for the majority of nonmetallic minerals appeared only rarely over the years, if at all. Such data also usually was buried in articles rather than appearing in any statistical format or compendium. However, during the past 2 years, the Soviets began publishing considerably more data for nonmetallic minerals. Table 6 lists newly published production data on nonmetallic minerals.

TABLE 6

REPORTED PRODUCTION OF SELECTED NONMETALLIC MINERALS

(Million tons unless otherwise indicated)

		Quantity
Apatite, crude ore[1]	thousand tons	52,298
Barite, crude ore[2]		2.18
Graphite ore[2]	thousand tons	100
Kaolin ore[2]		12.5
Magnesite, crude ore[2]		4.64
Mica (muscovite)[1]	thousand tons	10.2
Phosphate sedimentary rock, crude ore[1]	do.	26,245
Potash, crude ore[1]	do.	68,410
Sulfur from pyrites:[1]	do.	
From rock		108
From flotation concentrate (41.5% S)		4.515
Sulfur (native)[2]		3.4
Vermiculite[2]	thousand tons	97

[1]1988 data from Okhrana okruzhayushchey sredy i ratsional'noye ispol'zovaniye prirodnykh resursov v SSSR, Statisticheskiy sbornik (Environmental Protection and the Rational Use of Mineral Resources in the U.S.S.R., Statistical Compendium) Moscow, Finansy i Statistika, 1989, pp. 140, 141.

[2]Data from Geologicheskaya sluzhba i mineralno-syr'yevye resursy SSSR, Materialy k soveshchaniyu po gornodobyvayushchey promyshlennosti stran Vostochnoy Evropy, Madrid, 3-5 Oktyabrya, 1990 (The Geological Service and the Mineral Raw Material Resources of the U.S.S.R. Material for a Conference on the Mining Industry of East European Countries, Madrid, October 3-5, 1990.) Moscow, U.S.S.R. Ministry of Geology, 1991. This data, presumably would be no later than 1989.

[3]1989 data from Promyshlennost' SSSR, Statisticheskiy sbornik (U.S.S.R. Industry, Statistical Compendium) Moscow, State Committee for Statistics, 1990, p. 183.

Barite.—Although the U.S.S.R. occupies first place in the world in barite reserves, only about 6% of these reserves is in the European part of the country. Most barite production was associated with the mining of barite containing polymetallic ore deposits in Kazakhstan and deposits of barite ore in Georgia. Preparations were underway to develop the Khoylinskoye deposit (in the Ural Mountains above the Arctic Circle) with reported barium sulfate reserves of 2 million tons. Additional reserves, it was reported, could be discovered at deeper depths of this deposit. The ore reportedly was of high quality and suitable for use with practically no beneficiation. Ores near the lesser Khoylinskoye deposit

(Malokhoylinskoye) were, reportedly, of suitable quality for use in smelting special steels and ferroalloys. Based on these reserves it was considered feasible to construct a barite plant with a capacity for producing 100,000 to 110,000 tons per year of barite concentrate.

The first reported Soviet data on crude barite production lists national output at 2.18 million tons. Although no date is given for this figure, it is presumably for 1989.

Clays.—The U.S.S.R. reported producing 2.9 million tons of lump bentonite annually.[33] It was reported that there are 93.1 million tons of proven bentonite reserves in the European part of the country, with mining occurring at three large enterprises in the European part; the Cherkasskoye, with 54.5 million tons of reserves; the Biklyanskoye, with 16.6 million tons of reserves, and the Tarn Varksoye, with 63.2 million tons of reserves. These three enterprises produced 1.1 million tons of lump bentonite. Development was occurring at the Verkhne-Nivilotskoye bentonite deposit in the Volga Region with reserves of 4 million tons.

Among the bentonite clays, there are five deposits of palygorskite clay with total economic reserves reported as 54 million tons. The Cherkasskoye deposit in the Ukraine has reported reserves of 11.4 million tons, and the Borshchevskoye deposit has reported reserves of 20.6 million tons. Approximately 60% of the palygorskite reserves are in the Central and Southwestern Economic regions. The Dashukovskiy complex, which exploits the Cherkasskoye deposit, reportedly, mines 20,000 tons of palygorskite clays annually.

There are four factories for processing bentonite into powder in the European part of the country, the Dashukovskiy and the Konstantinovskiy in the Ukraine, the Il'skiy in the North Caucasus, and the Al'metevskiy in the Tatar A.S.S.R. These plants produced 350,000 tons of bentonite powder, or 35% of the national output of about 1 million tons.[34]

According to the Ministry of Geology, increasing bentonite output, including producing bentonite for export, would be possible if new deposits were developed in the Transcarpathian and Donets Basin regions and in the Volga region.

Reported annual production of kaolin ore, presumably for 1989, was 12.5 million tons with 6.9 million tons mined in the European part of the country. The European part of the country contains large, high-quality kaolin reserves comprising 50% of the country's total. Kaolin concentrate production was centered in the Ukraine where 90% of the country's output was produced.

The Ministry of Geology claimed that the volume of extraction and production of high-quality enriched kaolin could be increased by expanding output at the Prosyanovskoye and Glukhovetskoye enterprises and by attracting foreign capital and technology to develop large deposits such as the Veliko-Gadominetskoye and Belyayevskoye deposits.

In the other parts of the country, the Soyuznoye kaolin deposit in the Uralo-Mugodzharskiy region had reported explored reserves of 80 million tons. Developing this deposit, it was stated, would be of great significance for supplying high-quality kaolin ceramic products to industry in the Asiatic part of the country.

The highest quality refractory clay deposits are in the European part of the country in the Donets Basin in the Ukraine, with 90% of the country's reserves. Output from the Novo-Rayskoye and Chasov-Yarskoye deposits was used in the metallurgical industry and output from the Veselovskoye deposit in the ceramics industry.

Diamonds.—According to a Soviet representative interviewed by Jewellery News Asia in Hong Kong in June 1990, the U.S.S.R. produces about 15 million carats of rough diamonds annually, of which about 7.5 million carats is excellent gem quality. He stated that the Soviets export about 6 million carats of gem- quality diamonds annually. However, the Head of Glavalmazzoloto, which controlled all diamond mining in the country, in February 1991 stated that diamond production figures were still secret. He stated, however, that Western estimates of Soviet output were in the range of 10 to 12 million carats.

While kimberlite deposits in Yakutia were the principal source of Soviet diamonds, other deposits had been discovered in Kazakhstan near Lake Balkhash and near Arkhangelsk in the European North. Diamonds were reportedly of good quality in both regions.

A deposit composed of five kimberlite pipes in the Arkhangelsk region, about 1 kilometer northeast of Arkhangelsk in the area of the Zolotitsa River, was proclaimed as the "discovery of the century" in the Soviet publication Soviet Union.[35] The Soviet newspaper Izvestiya declared that the diamond deposit in Arkhangelsk is "richer than Yakutia." Up to one-half of the diamonds is of jewel quality.[36] Soviet Geologists stated their discoveries near Arkhangelsk were "only the first link in a chain of new deposits in the European part of the Soviet Union."[37] Reportedly, the Pomor Almaz enterprise was engaged in developing six diamond mines in this region, with first output planned for the late 1990's.

In a break with the past policy of not openly associating with the Republic of South Africa's De Beers regarding diamond sales, Glavalmazzoloto publicly signed an agreement in 1990 with De Beers Centenary AG of Lucerne, Switzerland, a subsidiary of South Africa's De Beers Consolidated Mines Ltd., to market uncut Soviet diamonds. Under the terms of the agreement, De Beers would advance $1 billion to the Soviets against future deliveries of uncut stones. The diamonds would be sold through De Beers Central Selling Organization (CSO) in London. The Soviet deal with De Beers, which extends for a 5-year period, has an estimated total value of 5$ billion.

According to the head of Glavalmazzoloto, in 1959 when the U.S.S.R. began exporting diamonds, it sold them through De Beers; then in 1963, when U.N. sanctions were imposed against the Republic of South Africa, the U.S.S.R. transferred its business to the British firm City West East Ltd. in London, which could then sell the diamonds through De Beers' London-based Central Marketing Organization (CMO).

The De Beers deal did not pass without controversy in the U.S.S.R., where issues arose concerning which administrative divisions owned the diamond resources that are in the Yakut Autonomous Republic within the Russian Republic. At first, the Russian Republic's Parliament declared the deal invalid, arguing that the diamonds were the property of the Russian Republic and that their sale required the consent of the Russian Republic. Then the Yakut Autonomous Republic declared that these diamonds belonged to it and not the Russian Republic. It appears that the De Beers' deal was carried through, but with both the Russian Republic and Yakut Autonomous Republic claiming part of the hard currency earnings.

The Yakut A.S.S.R. was concerned not only with issues of sharing in the profits, but also with the serious environmental impact created by diamond mining in the region.[38] Pollution had reached the level where the issue was raised of shutting down some of the production facilities at the Udachniy mining and dressing complex.[39]

Emeralds.—The Malyshev mines in the Urals are the country's sole source of emeralds and produced some of the world's largest emeralds. Also, beryllium mines in this region were found to contain high-quality emeralds, and consideration was being given to converting some capacity to emerald production as part of the Soviet policy of converting defense-related industrial projects to civilian use.

Magnesite.—Reported 1990 crude magnesite production was 4.64 million tons, of which 4.59 million tons was produced in the European part of the country.[40] The European part of the country reportedly contains 21% of total magnesite reserves. The Satkinskaya group of magnesite deposits in Chelyabinsk Oblast already have been exploited for 100 years with their output used in the production of refractory products. The Ministry of Geology reported significant potential for increasing magnesite output through the development of high-quality deposits in Bashkiriya.[41]

In the eastern part of the country, the Savinskoye deposit 90 kilometers southwest of the city of Chevemkhovo, in Irkutsk Oblast', reportedly has 275 million tons of proven reserves of industrial-quality magnesite awaiting development. This deposit is reportedly the largest in the country in terms of proven and probable reserves.

Phosphate.—Production of phosphate rock from mined ore in the past was not regularly reported. However, a recent Soviet publication lists production for 1988 of P_2O_5 in sedimentary rock as 1.173 million tons and P_2O_5 in apatite concentrate as 7.732 million tons.[42]

The U.S.S.R. claimed to rank third in the world in phosphorite reserves. In the European part of the country, the phosphorite deposits (Kingisep, Kabala, Maardu, Toolse in the Baltic region, Vyatsko-Kamskoye and Yegor'yevskoye in the Volga Basin, and the Unechskoye in the central region) are exploited to produce ground phosphate for direct application. The chief phosphorite-producing region remains the Karatau group of deposits in Kazakhstan, which account for 66% of the country's annual production of phosphate rock from phosphorites.[43]

Apatite deposits are of the greatest significance for Soviet phosphate production, of which the Khibiny deposit on the Kola Peninsula accounted for almost the entire national output. Mined ore from Khibiny averaged 14% P_2O_5 from which concentrate, with a 39.4% P_2O_5 content, was produced. About one-fourth of the apatite concentrate produced from the Khibiny deposit was exported. Apatite concentrate production also occurred at the Kovdor and Sebl'yavskoye deposits on the Kola Peninsula, but the apatite concentrate from these deposits was not considered suitable for the world market owing to its magnesium oxide and iron oxide content.

TABLE 7

U.S.S.R.: PHOSPHATE ROCK PRODUCTION, 1988

(Thousand tons)

	Quantity
Crude ore:	
Apatite[1]	52,298
Sedimentary rock[1]	26,245
P_2O_5 content of apatite crude ore[2]	10,100
P_2O_5 content of sedimentary rock crude ore[2]	4,400
Concentrate:	
Apatite, P_2O_5 content[1]	7,732
Sedimentary rock[1 3]	1,248

[1]Data from Okhrana okruzhayushchey sredy i ratsional'noye ispol'zovaniye prirodnykh resursov v SSSR, Statisticheskiy sbornik (Environmental Protection and the Rational Use of Natural Resources in the USSR, Statistical Compendium) Moscow, Finansy i Statistika, 1989.

[2]Data from Geologicheskaya sluzhba i mineral'no-syr'yevye resursy SSSR (The Geological Service and the Mineral Raw Materials of theUSSR), Moscow, USSR Ministry of Geology, 1990. No date is given for the date which is presumably for 1988 or 1989.

[3]A significant percentage of sedimentary rock crude ore production is ground for direct application, and the P2O5 content of this material is not included in this number.

The Seligdar apatite deposit in the eastern part of the country was awaiting development. The ore averages 6.72% P_2O_5 and contains rare-earth elements, including strontium and thorium. As of January 1, 1989, reported proven reserves at Seligdar suitable for open pit mining were 1.277 billion tons of ore containing 85.6 million tons P_2O_5.

In the Maymecha-Kotuyskiy region 650 kilometers west of Noril'sk, there are a number of apatite deposits, possibly suitable for development, but in a remote area with an extreme climate.

In 1990, the Apatite production association mining the Khibiny deposit on the Kola Peninsula reportedly entered into an agreement with Norway's Norsk Hydro to increase production capacity at the Kirovsk mine at Khibiny.

Potash.—Although the U.S.S.R. annually reported national potash production, for the first time a statistical compendium listed potash production by the three major potash-producing enterprises, the Uralkaliy and Silvinit associations, which mine the Verkhnekamsk sylvite deposit in the Solikamsk-Berezniki region of the Urals and the Byeloruskaliy complex which mines the Starobinsk sylvite deposit in the Soligorsk region of Byelorussia.

Production from these three enterprises is reported in Table 8. Also, a small amount of potash is produced from the Stebnik and Kalush-Golynskiy potassium sulfate deposits in the Transcarpathian region of the Ukraine.

In the eastern part of the country, consideration was being given to developing the Nepskoye potash basin in the Katangskiy Rayon in Irkutsk Oblast. The deposit is 280 kilometers from the Ust'-Kut railway station. This deposit contains very large perspective reserves reportedly averaging about 21% K_2O.

Vermiculite.—U.S.S.R. reported vermiculite production was 97,000 tons per year, which was all produced in the European part of the country. The U.S.S.R. claims to rank first in the world in vermiculite reserves, 80% of which is in the European part of the U.S.S.R. Vermiculite mining occurs at two of six explored deposits, the Kovdor deposit on the Kola Peninsula and the Potaninskoye deposit in Chelyabinsk Oblast'.

Reserves at these two deposits were reported adequate for 100 years. Perspective deposits for development included the Altyntasskoye and Karatsskoye in the Mugodzharskiy region and the Inaglinskoye in Yakutia.

Mineral Fuels

The economic crisis that was affecting the U.S.S.R. in 1990 was in many ways affecting energy production in the country. Reduction in energy production resulted in a reduction in energy consumption. Energy consumption in 1990 was 2% below the 1989 level. In all mineral fuel sectors, production could be either increased or made more efficient through the introduction of state-of-the-art technologies available in Western countries. This applied in all stages of development from exploration through processing and consumption of mineral fuel. The Soviets were trying to attract Western investors to participate in the development of their vast energy resources with the promise for investors of gaining access to significant quantities of

TABLE 8

U.S.S.R.: POTASH PRODUCTION, BY ENTERPRISE

(Thousand tons)

Enterprise	1980	1985	1986	1987	1988
Uralkaliy:					
Crude ore	25,460	20,384	15,347	16,074	17,807
K_2O	3,477	3,385	2,473	2,770	3,108
Silvinit:					
Crude ore	—	11,768	13,584	15,811	16,276
K_2O	—	1,418	1,893	2,110	2,167
Byeloruskaliy:					
Crude ore	25,879	31,290	32,570	32,841	33,268
K_2O	4,173	5,086	5,384	5,552	5,606
U.S.S.R. total:					
Crude ore	53,875	65,501	63,475	66,710	68,410
K_2O	7,735	9,930	9,916	10,476	10,880

Source: Okhrana okruzhayushchey sredy i ratsional'noye ispol'zovaniye prirodnykh resursov v SSSR, Statisticheskiy sbornik (Environmental Protection and the Rational Use of Mineral Resources in the USSR, Statistical Compendium) Moscow, Finansy i Statistika, 1989, p. 140

mineral fuels in exchange for capital and technology.

Coal.—In 1990, coal production fell by 5% to 703 million tons of raw coal, continuing the decline in coal production. In 1990, along with the wave of strikes in the coal mining sector, production was also affected by railroad worker strikes. Coal production decreased at all coal-producing enterprises with the exception of the Vorkut coal production association in the European North, the Krasnoyarsk coal production association in East Siberia, and the Raspadskaya Mine, the country's largest, in the Kuznetsk Basin. The Raspadskaya Mine in 1990, now that it was operating as a private leased concern, had higher labor productivity and lower operating costs.[44]

In 1990, production of coking coal fell to 191 million tons in comparison with 199 million tons in 1989. Also, there was a lack of consumers for the coal from the large lower grade coal deposits being developed. At the Ekibastuz subbituminous coal deposit under development in Kazakhstan, where the ash content of the coal often exceeds 50%, there was great difficulty in finding consumers for this type of coal. At the massive Kansk Achinsk lignite deposit in East Siberia, far from industrial consumers, production remained hampered by a lack of means for transporting the coal or energy derived from the coal to consumers. Projects had been under study for a number of years for developing long- distance slurry pipelines, developing methods for coal liquefaction, and constructing large electric powerplants near the mines connected to long-distance electric power lines. The construction of powerplants was reportedly underway, but delays in commissioning powerplant capacity was further hampering development of Kansk Achinsk. Technical problems associated with using low-grade Kansk Achinsk lignite in powerplants, including environmental problems, were causing delays in electric powerplant construction.

In 1990, South Korea's Hyundai company agreed to participate in the development of a coal field in Yakutia and also build a 320-kilometer rail line to transport the coal. Projected exports for 1991 were 850,000 tons and, for 1992, 1 million tons. The Japanese had already been active for more than a decade in coal mine development in Yakutia.

Natural Gas.—In 1990, natural gas production increased by 2% to 815 billion cubic meters. This 2% increase in natural gas production was far below the average increases experienced during the past decade when gas production generally grew annually at a rate of 6% per year or more. Problems persisted in the development of large gas deposits on the Yamal Peninsula in West Siberia where new production was intended to compensate for production that was leveling off at the giant Urengoy Field in West Siberia south of the Yamal Peninsula. Problems were also reported in utilizing casing head gas because of inadequate transport facilities, particularly compressors. In 1990, preliminary Soviet data assessed natural gas exports at 104 billion cubic meters, with 52 billion cubic meters exported to Eastern Europe and the other 52 billion cubic meters to Western Europe.[45] This was a slight increase over the 1989 export level.

TABLE 9

U.S.S.R.: EXTRACTION OF GAS, OIL, COKING COAL, OIL SHALE, AND PEAT FUEL, BY REPUBLIC, 1989

Republic	Gas (million) (cubic meters)	Oil (thousand) (metric tons)	Coking coal (thousand) (metric tons)	Oil shale (thousand) (metric tons)	Peat fuel (thousand) (metric tons)
Armenia	—	—	—	—	—
Azerbaidzhan	11,112	13,159	—	—	—
Byelorussia	293	2,075	—	—	4,706
Estonia	—	—	—	23,331	872
Georgia	59	188	844	—	—
Kazakhstan	6,710	25,388	30,286	—	—
Kirgiziya	105	165	—	—	—
Latvia	—	—	—	—	419
Lithuania	—	—	—	—	172
Moldavia	—	—	—	—	—
Russia	615,784	552,226	95,031	4,745	8,267
Tadzhikistan	195	190	—	—	—
Turkmenistan	88,303	5,751	—	—	—
Ukraine	30,828	5,442	72,640	—	2,366
Uzbekistan	41,091	2,673	—	—	—
U.S.S.R. total	796,000	607,000	198,801	28,076	16,760

Source: Promyshlennost' SSSR, Statisticheskiy sbornik (U.S.S.R. Industry, Statistical Compendium), Moscow, U.S.S.R. State Committee for Statistics, 1990.

In 1989, the Ministry of the Gas Industry was abolished, and the major natural-gas-producing associations became part of a new type of organization termed the Gasprom Concern. The Ministry of the Oil Industry was renamed the Ministry of Oil and Gas, but this change appeared more to signify the role of associated gas in oil production than the incorporation of natural-gas-producing enterprises in the oil ministry.

According to the Soviet gas industry journal Gazovaya promyshlennost, the Soviet gas industry for a long time was considering acquiring the experience of leading foreign firms as one of the elements of its program of scientific technical progress.[46] The importance of foreign technology was more critical with the projected development of sour gasfields in the Caspian depression and Kazakhstan. The All-Union foreign economic firm "Zarubezhgaz," which was the main agent of the Gasprom Concern for conducting foreign business relations, was engaged in forming joint ventures as well as organizing seminars for foreign firms possessing technologies needed to develop Soviet deposits.

Oil.—Oil production in 1990 fell by 6% to 570 million tons, the lowest level of output since 1977. In the country's main producing region, Tyumen Oblast in West Siberia, production had fallen by 40 million tons in the past 2 years. Oil exports also decreased, and shortages of petroleum products occurred within the country. Labor unrest also affected production with strikes occurring in the major West Siberian oilfields. Oil workers were seeking not only better housing and better supplies of consumer goods, but also were seeking to retain a share of the hard currency generated by their oil exports. Problems with equipment breakdowns, inadequate infrastructure, and inefficient equipment were affecting not only production, but also the environment. In West Siberia, pipeline breaks were common, causing river and lake pollution as well as giant fires on the taiga.[47]

Projections, if current trends continued, envisaged significant decreases in both Soviet oil production and oil exports. Much of the Soviet oil industry's problems could be attributed to lack of state-of-the-art technology and equipment and prior development strategies mandated by central planning rather than market efficiencies. The U.S.S.R. was looking for infusions of Western capital, equipment, and technology to increase productivity at existing oilfields and to develop new oilfields. Western companies, in turn, were exploring investment opportunities in the Soviet oil industry while trying to assess the economic, political, and legal factors affecting investment decisions.

Western firms were displaying interest in new oilfield development, improving productivity at existing fields, and downstream processing of hydrocarbon products. The Soviets considered upgrading the product mix from oil refineries as well as better utilization of petrochemical feedstocks as important measures to add value to their production of hydrocarbon raw materials. Many of the projects being considered by Western investors were not finalized, with the possibility of both reevaluation as well as cancellation by the Soviet or Western partners.

In a significant shift in its export pattern, the U.S.S.R. sharply reduced oil exports to its former CMEA partners; this trade had been conducted in barter style transactions. Instead, the Soviets were seeking hard currency for their oil exports, which was causing severe strains on the economies of the former CMEA states. These countries previously had geared manufacturing to producing goods suitable only for the Soviet market in exchange for raw materials. Along with decreasing oil exports, the U.S.S.R. in the summer discontinued reexporting Iraqi oil that it received in payment for arms shipments. In an attempt to better integrate trade with the world market, not only the U.S.S.R., but also the Russian Republic were expressing an interest in joining OPEC.

Uranium.—Information on the Soviet uranium industry was for many decades one of the most secretive areas of the Soviet mineral industry, and very little descriptive information, let alone data, appeared in Soviet publications on their uranium industry. However, in 1989,with the policy of glasnost', descriptive information on this industry began to be published. Following is a brief synopsis of a description of the Soviet uranium industry that appeared in an article in the Soviet journal Atomnaya Energiya.[48]

"Extensive geological prospecting began for uranium in 1946. Prior to that, only one deposit, Taboshary, near Tashkent, had been known in the U.S.S.R. It was opened in 1931 and a pilot radium plant operated on its base. Industrial deposits on the territory of the Soviet Union are characterized by a diversity of conditions and types. Many deposits, which have no analogs in the world, have been detected.

TABLE 10

PARTIAL LISTING OF FOREIGN FIRMS CONSIDERING SOVIET OIL FIELD DEVELOPMENT PROJECTS, BY REGION

Region	Companies
Timan Pechora in the European Far North	Occidental, Texaco, Conoco, Petrofina, Total, and Respoe.
Tengiz Field, Kazakhstan, northeast of of Caspian Sea	Chevron considering development of massive Tengiz Field containing possible 25 billion barrels of reserves of deep oil at high pressure.
West Kazakhstan, north of Caspian Sea	Elf Aquitaine.
Caspian Sea	British Petroleum.
West Siberia	Amoco, Anglo Suisse, Phibro Energy, Conoco.
Turkmen Republic in Soviet Central Asia	U.S.S.R. Ministry of Geology and Turkmen Republic officials accepting bids for developing tracts within 90,000-square-kilometer-area of Turkmenistan.
Chukotka Penninsula and Magadan Oblast' in Soviet Far East	Arco.
Sakhalin Island	McDermott International, Mitsui.

The most important industrial deposits occur in sandstones. There are large deposits confined to underwater-delta and coastal sea depositions, for example, the Uch-Kuduk deposit in Uzbekistan. Deposits confined to marine clay are unique—for example, the deposits near Shevchenko on the Caspian Sea.

Mining is carried out by various methods, that is, by underground and open-pit methods, or by underground leaching.

Uranium ores are processed at large hydrometallurgical plants of the U.S.S.R. Ministry of Atomic Power and Industry with output of pure U_3O_8 and of useful byproducts (molybdenum, rhenium, scandium, vanadium, gold, copper, rare earth elements, and phosphorus, complex, and nitrate fertilizers).

Plants, where centrifugal technology of uranium enrichment is used, form the basis for the Soviet uranium enrichment industry. The first laboratory models of centrifuges were developed in the U.S.S.R. in 1952 and the first pilot plant equipped with centrifuges was put into operation in 1957. An evaluation of this operation resulted in a decision to proceed with the development of the centrifugal method of uranium enrichment.

The first industrial gas centrifuge unit was put into operation in 1959. The first industrial plant equipped with gas centrifuges in the U.S.S.R. was built and put into operation in three modules in 1962-1964.

Modern designs of gas centrifuges differ significantly from the first developments both in productivity and reliability. Domestic industrial gas centrifuges now form the bulk of the country's separating capacities.

A specialized foreign trade organization—the All-Union Tekhsnabeksport Association—which is part of the Ministry of Atomic Power and Industry, is engaged in the export of nuclear materials (enriched uranium and fuel for nuclear power plants) and services connected with uranium processing and enrichment.

The provision of services connected with uranium enrichment forms the export basis of Tekhsnabeksport. Tekhsnabeksport entered the world market in services connected with uranium enrichment in the early 1970's. In order to diversify its commercial activity, in 1988 Tekhsnabeksport began deliveries of enriched uranium produced from Soviet natural uranium to clients. Along with long-term transactions, there are short-term contracts and, if needed, contracts for one delivery.

Recently the problem of enrichment of regenerated uranium has acquired ever greater importance. Tekhsnabeksport has already begun negotiations on this matter. Necessary research and full-scale industrial tests have been conducted. They have fully confirmed the suitability of centrifugal technology for the enrichment of such regenerated uranium and the production of a product suitable for fuel production.

Until recently, Tekhsnabeksport did not sell natural uranium. Based on market analyses, in the second half of the 1990's there could be a demand for new uranium production capacities and new suppliers. Tekhsnabeksport could export up to 2,000 to 3,000 tons of natural uranium annually with the possibility of a subsequent increase in the volume of deliveries provided that there is a sufficient market capacity and volume of unmet demand in the world. Tekhsnabeksport is prepared to widen its role as both a supplier of natural and enriched uranium, preferably on a long term basis."

In 1990, the U.S.S.R. Ministry of Nuclear Power Generation reportedly received permission from the U.S.S.R. Council of Ministers to sell natural uranium for hard currency.[49] Expectations were that the Soviets could become a major supplier of both natural and enriched uranium. The Soviets showed evidence of greater participation in the uranium market by agreeing to a 10-year contract to supply South Korea with up to 400 tons of enriched uranium annually.

According to a study of the Soviet uranium industry by the Nuxeco International Corp., uranium was produced in nine major regions. Four of these mining regions accounted for the majority of the output. Also, in the U.S.S.R. an important source of uranium is uranium recovered from wastewater generated during petroleum refining. Ten or more plants produced uranium concentrate, which were processed at three conversion plants—Zheltyye Vody in the Ukraine, Chkalovsk in the southern Fergana district, and Kara-Bel in Kirgiziya, with the first two areas also containing enrichment plants.

Descriptions began to appear in the Soviet press of individual uranium production facilities. An article appeared describing the Prikaspiyskiy uranium mining and beneficiation complex on the Mangyshlak Peninsula, which was commemorating its 30th year of operation. Development of the complex began in 1959, and industrial beneficiation facilities were commissioned in 1964.

Along with mining facilities, the complex also contains a chemical-hydrometallurgical plant that includes facilities for producing sulfuric acid and a nitrogenous fertilizer plant that produces ammonia, nitric acid, and mineral fertilizers.[50]

With the emphasis on converting defense industry production to civilian use, a number of uranium mining facilities were being required to either reduce or stop production. At the Tselinogorsk uranium mining chemical complex in Kazakhstan, it was decreed that in 1991 the volume of uranium production should be significantly curtailed with the possibility, in the not too distant future, of stopping production entirely. Production had actually started to decrease in 1988, and according to the director of the complex, would be decreasing yearly as the change over to civilian-oriented production occurred.[51]

The Tselinigrad complex is based on the Stepnogorsk underground mine north of Tselinigrad where uranium is associated with porphyry-type copper. Despite plans to shut down, the Stepnogorsk mine also was being considered as a possible site for in situ leaching, which, according to assessments, could be used much more widely in the country.

It was reported that plans also called for stopping uranium mining in the mountains near the reknowned mineral water resort of Kavminvody in the Caucasus. The decision was made, to a large extent, to protect the regional environment, even though, reportedly, the mined uranium ore was the least costly in the country to produce.[52]

The Mayak chemical complex in the southern Urals, one of the earliest enterprises of the Soviet nuclear industry, stopped producing weapons-grade plutonium. Originally, plans called for the plant to have functioned until 1995, but improved relations with the United States resulted in an earlier dismantling of the facility. The dismantling was implemented with the verification of U.S. specialists under a bilateral program.[53]

Reserves

The U.S.S.R. used a reserve classification system that was not comparable to that in the United States, and data on reserves for the majority of minerals was a state secret.

According to the Soviet classification system, approved in 1982, deposits of all solid mineral materials are classified under two cross-imposed systems, one relating to the economic viability of the material in question and the other relating to the reliability of the information on the quantity of material in place.

Under the first system, the Soviets separate deposits into one of two categories, "balansovyye" or "zabalansovyye." The former word literally translated means balance, this term referring to the fact that materials so classified are included in studies relating to mineral reserves in places that are suitable for exploitation. This "balansovyye" material, in effect, is that which currently is regarded as viable for economic development or exploitable. The other category term, "zabalansovyye," translates literally as beyond balance, the term implying that materials so classified are not regarded as suitable for economic exploitation at present.

The second classification system relating to the reliability of information on the quantity of material in place assigns each occurrence to one of seven categories, the traditional A, B, C_1, C_2, and three more, P_1, P_2, and P_3. The first four categories are regarded as reserves by the Soviets, but some materials reported in each of these classes may not correspond to the Western concept of reserves (i.e., material economically exploitable under present market prices with existing technology). The final three categories, "prognoznyye resursy" (prognosticated resources), together with "zabalansovyye" material from categories A, B, C_1, and C_2, correspond very roughly to the Western term "resources."

Mining and construction of mining enterprises and the appropriate capital investment are authorized in the U.S.S.R. on the basis of the economic ("balansovyye") reserves in place in categories A + B + C_1, which must be in prescribed ratios. Reserves in the C_2 category are also taken into account in project planning for mining enterprises to provide a general perspective of the development, but they do not constitute a justification for project planning.

All of these four categories (A, B, C_1, and C_2) are based on the data obtained on an exploration grid of prescribed density (or by its equivalent) and on certain types of chemical and other tests according to regulations. Density of the grid in each of the reserves categories is different for different kinds of ore and for five different types of ore bodies, depending on geolgoical formation.

According to Soviet classification, the reserves and resources of solid mineral raw materials in place are divided into explored ("razvedannyye")—A + B + C_1 categories—and perspective ("perspektivnyye")—C_2—category. The categories P_1, P_2, and P_3 are prognosticated resources ("prognoznyye resursy"). There are appropriate specifications for the four traditional categories.

Category A means that the reserves in place are known in detail. The ore body boundaries are outlined by trenching, exploratory boreholes, or exploratory workings; the depositional environment, the proportion of different commercial grades of the ore, and the hydrogeologic conditions of the exploitations are ascertained; quality and technological properties of the ore are ascertained in detail, ensuring the reliability of the projected beneficiation and production operations.

Category B means that the reserves in place are explored. The ore bodies are outlined by exploratory workings or by exploratory boreholes; the depositional environment is known, and types and industrial grades of the ore are ascertained, but without details of their distribution; quality and technological properties of the ore is known sufficiently well to ensure the conditions of the exploitation, and the hydrogeologic environment, as a whole, are known in fair detail.

Category C_1 means that the reserves in place are estimated by a sparse grid of exploratory boreholes or exploratory workings. This category also includes reserves adjoining the boundaries of the A and B categories of ore as well as the reserves of the very difficult deposits in which the distribution of the values or of mineral cannot be ascertained even by a dense exploratory grid; quality, types, industrial grades, and technology of beneficiation are ascertained tentatively by means of analyses and laboratory tests and by analogy with known deposits of the same type; general conditions of exploitation and general hydrogeological environment of the deposit are known tentatively.

Category C_2 means that the reserves in place are adjoining the explored reserves of A + B + C_1, categories and reserves are indicated by geologic and geophysical evidence confirmed by boreholes.

Depending on the nature of deposits, various boring and excavation methods are used in the determination of ore reserves for all solid minerals in the U.S.S.R. Deposits are divided into five major groups.

The First Group Deposits are simple in form and have large dimensions and uniform distribution of minerals (such as coal deposits, many deposits of iron ore, and disseminated copper deposits). The high category reserves of such deposits can be determined by boring with a normal density grid of boreholes. Excavation is used only for controlling the data of samples from boreholes and for taking bulk samples.

The Second Group Deposits include large deposits of different and sometimes complicated forms, with uneven distribution of mineral content. A combination of both drilling and exploratory workings is required to determine ore reserves. With a normal grid of boreholes, only B category reserves might be revealed by drilling. With close-spaced drilling and control by exploratory workings, it is possible to establish A category reserves.

The Third Group Deposits include deposits of medium dimensions with irregular distribution of ore minerals, such as vein or dyke deposits. Reserves of A and B categories can be revealed only with the help of openings. Drilling alone can establish reserves only of C_1 category.

The Fourth Group Deposits include deposits similar to The Third Group Deposits, but with smaller ore bodies of more complicated forms. It is impossible to establish category A reserves under a normal grid of openings. Exploratory openings and underground drilling are needed to determine ore reserves of category B.

The Fifth Group Deposits are small pocket deposits of categories A and B that could not be established by systematic prospecting. Only category C reserves can be established.

Oil and gas reserves are classified according to a similar letter system using the A, B, C_1, and C_2 categories for reserves and the categories C_3, D_1, and D_4 for the determination of the prognosticated resources. Categories and the criteria for development are similar to those for other minerals except based on the specific characteristics of oil and gas deposits.

Data on Soviet reserves has been located for only a small number of minerals. Table 11 shows estimated Soviet reserves for a selected number of minerals.

INFRASTRUCTURE

The U.S.S.R., in 1990, had a total of 146,100 kilometers of rail lines, including 51,700 kilometers of electrified lines; 1,609,900 kilometers of highway, of which 413,900 kilometers are dirt roads; 122,500 kilometers of navigable inland waterways, excluding the Caspean Sea; 81,500 kilometers of crude oil and products pipelines;

and 195,000 kilometers of natural gas pipelines. The U.S.S.R. had 4,530 usable airports, with 1,050 with permanent surface runways, 30 with runways more than 3,659 kilometers, 40 with runways 2,440 to 3,659 meters, and 660 with runways 1,220 to 2,439 meters.

TABLE 11

U.S.S.R.: ESTIMATED ECONOMIC RESERVES, 1990

(Thousand metric tons unless otherwise specified)

Mineral		Reserves
Antimony	metric tons	4,200
Asbestos		125,000
Barite		10,000
Bauxite		300,000
Boron (B_2O_3 content)		54,000
Bromine		1,400
Chromium		129,000
Cobalt		140
Copper		37,000
Diamond, industrial	million carats	40
Diatomite[1]	million cubic meters	139.8
Flourspar		98,600
Gold		6,220
Gypsum		2,000,000
Ilmenite (TiO_2 content)		5,900
Indium	kilograms	187,000
Iodine	do.	400,000
Iron ore	million metric tons	100,000
Lead		9,000
Magnesite		650,000
Manganese		325,000
Mercury	metric tons	10,000
Molybdenum		500
Nickel[1]		7,300
Peat[1]		5,320,000
Phosphate rock		1,330,000
Platinum-group metals	kilograms	5,900,000
Potash (K_2O equivalent)		3,800,000
Rare-earth metals		450
Rhenium	pounds	1,310,000
Rutile (contained TiO_2)		2,500
Silver	metric tons	4,000
Sodium sulfate[1]		2,000,000
Sulfur		250,000
Tin		300
Tungsten		280
Vanadium	thousand pounds	5,800,000
Yttrium	metric tons of yttrium oxide	9,000
Zinc		10,000
Zirconium (ZrO_2 content)		4,000

[1]Data in short tons.

TABLE 12

U.S.S.R.: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

Commodity	Apparent main production centers
Aluminum	Mining areas: Alunite: Alunitdag deposit in Azerbaidzhan; supplies Kirovabad alumina plant, Azerbaidzhan. Bauxite: Tikhvin area in Leningrad Oblast', Turgay area in Kazakhstan, and Ural Mountains. Nepheline syenite: Belogorsk area in East Siberia, and Kola Peninsula. Alumina plants: Achinsk in East Siberia, Bogoslovsk and Kamensk-Ural'sk in Urals; Dneprovsk and Nikolayevsk in Ukraine, Kirovabad in Azerbaidzhan, Pavlodar in Kazakhstan, and Pikalevo and Volkhov in Leningrad Oblast'. Aluminum plants: Bogoslovsk and Kamensk-Ural'sk in Urals; Bratsk, Irkutsk, Sayansk, Krasnoyarsk, and Novokuznetsk in Siberia; Dneprovsk in Ukraine; Kandalaksha, Nadvoitsy, and Volkhov in European North; Regar (Takzhik) in Tadzhik S.S.R.; Sumgait in Azerbaidzhan S.S.R. (possibly closed for environmental reasons); and Volgograd in lower Volga region.
Antimony	Dzhidzhikrutskiy complex in Tadzhik S.S.R., Kadamzhay complex in Kirgiz S.S.R., and Nikitovskiy complex in Ukraine.
Arsenic	Deposit in Tadzhik S.S.R. Byproduct production in Kazakhstan and in Urals.
Asbestos	Uralasbest complex in central Urals (produces about 50% of country's output); Dzhetygara complex in Kazakhstan; Kiyembay complex in Orenburg Oblast'; and Tuvaasbest complex in Ak-Dovurak, Tuva A.S.S.R.
Barite	Iri and Madneuli areas in Georgia, Kazakhstan, and West Siberia.
Beryllium	Deposits in Altay region of West Siberia, Kazakhstan, Kola Peninsula, Transbaykal, Soviet Far East, Urals, and western Ukraine. Beryllium metal production at Ulbinsky metallurgical plant in Ust-Kamenogorsk, Kazakhstan.
Bismuth	Deposits in Kantarkhana and Taryzkan areas (copper-bismuth) in Tadzhik S.S.R. and Chatkal Mountains (bismuth ore concentrates shipped to Chimkent lead plant, Kazakhstan) in Kirgiz S.S.R. Byproduct production from lead-zinc smelting in Kazakhstan, from dust and crude metal at Balkhash copper complex in Kazakhstan, and from Kirovgrad and Mednogorsk copper complexes in Urals.
Cadmium	Production at lead-zinc smelters and at some copper-zinc complexes; a large producer is Leninogorsk complex in Kazakhstan.
Chromium ore	Donskoye complex in Khrom-Tau, Kazakhstan (95% of total production), and Saranov mining enterprise in middle Urals.
Coal	Donets Basin in Ukraine, Ekibastuz and Karaganda Basins in Kazakhstan, Kansk-Achinsk Basin in East Siberia, Kuznetsk Basin in West Siberia, Moscow Basin, Pechora Basin in European North, and Yakutsk Basin in Yakutia.
Cobalt	Production (associated mainly with nickel) in Norilsk in East Siberia, Monchegorsk and Pechenga on Kola Peninsula, southern Urals, and Tuva A.S.S.R. in Siberia (cobalt- arsenide ore).
Copper	Mining areas: East Siberia (Noril'sk and others), Kazakhstan, Transcaucasus, Urals, and Uzbekistan. Smelters and/or refineries: Almalyk in Uzbekistan (smelter and refinery); Alaverdi in Armenia (smelter and refinery, possibly closed for environmental reasons); Balkhash, Dzhezkazgan, and Irtysh in Kazakhstan (smelters and refineries); Karabash (possibly closed for environmental reasons), Kirovgrad, Krasnoural'sk, Mednogorsk, Sredneural'sk (smelters), Kyshtym, and Verkhnaya Pyshma in Urals (refineries); Moscow (secondary smelter and refinery); and Pechenganikel and Severonikel on Kola Peninsula (smelters and refineries).
Diamond	Mirnyy, Aykhal, and Udachnaya areas in Yakut A.S.S.R.
Fluorspar	Abagaytuy, Kalanguy, Solonechnyy, and Usugli areas in Chita Oblast', East Siberia.
Gold	Aldan, Allakh-Yun, and Indigirka regions of Yakut A.S.S.R.; Magadan Oblast' and Khabarovsk Kray in Soviet Far East; Muruntau deposit in Uzbekistan; also Armenia; Kazakhstan; Siberia; and Urals.
Iron ore	Dneprovsk complex in Ukraine; Gubkin, Lebedi, Mikhaylovsk, and Stoylensk complexes in Kursk Magnetic Anomaly, European R.S.F.S.R.; Ingulets, Novokrivoy Rog, Severnyy, Tsentral'nyy, and Yuzhniy complexes in Krivoy Rog Basin, Ukraine; Kachar, Kachkanar, Lisakovsk, and Sokolovo-Sarbay complexes in Kazakhstan; Korshunovo complex in Irkutsk Oblast', East Siberia; Kostamush complexd in Karelia; and Olenegorsk complex in European North.
Lead and zinc	Mining areas: Akhtala region in Armenia; Alma-Ata Oblast', Chimkent Oblast', Dzhezkazgan Oblast', East Kazakhstan Oblast', Karaganda Oblast', Semipalatinsk Oblast', and Taldy Kurgan Oblast' in Kazakhstan; Chita Oblast',

TABLE 12—Continued

U.S.S.R.: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

Commodity	Apparent main production centers
Lead and Zinc—Continued	Khabarvosk Kray, and Primorskiy Kray in Soviet Far East; Degtyarsk, Gay, Karabash, Kirovgrad, and Krasnoural'sk regions in Urals; Krigiz S.S.R.; Kvaisi and Madneuli regions in Georgian S.S.R.; North Ossetian A.S.S.R. in North Caucasus; Tadzhik S.S.R.; Turkmen S.S.R.; Uzbek S.S.R.; and West Siberia. Smelters and/or refineries: Chimkent, Leningorsk and Ust-Kamenogorsk in Kazakhstan (smelters and refineries); Karlyuk in Uzbekistan (refinery, lead only); Konstantinov in Ukraine, (smelter and refinery); Ordzhonikidze in North Caucasus (smelter and refinery); and Tetyukhe in Primorskiy Kray, Soviet Far East (smelter, lead only).
Magnesite	Satka deposit in Chelyabinsk Oblast', Urals (produces majority of output); and Talskoye deposit in Krasnoyarsk Kray, East Siberia (very small producer).
Magnesium	Berezniki and Solikamsk plants in Urals, Dneprovsk plant in Ukraine; Leningrad plant, and Ust-Kamenogorsk plant in Kazakhstan.
Manganese	Chiatura Basin in Georgia, Kazakhstan, and Nikopol Basin in Ukraine.
Mercury	Dzhidzhikrutskiy complex in Tadzhik S.S.R., Khaydarkan complex in Kirgiz S.S.R., and Nikitovskiy complex in Ukraine.
Mica	Aldan complex in Yakut A.S.S.R.; Karel complex in Chupa and Ambarnyy areas, of Karelia; Kovdor complex in Murmansk Oblast'; and Mam complex in Mamsko-Chuyskiy Rayon in Irkutsk Oblast', East Siberia.
Molybdenum	Agarsk, Dastakert, and Zangezur complexes in Armenia; Almalyk complex in Uzbekistan; Akchatau and Balkhash complexes in Kazakhstan; Chorukhdayransk complex and South Yashransk deposit in Tadzhik S.S.R.; Dzhida complex in Zakamensk area, Buryat A.S.S.R.; Sorsk complex in Krasnoyarsk Kray, East Siberia; Tyrny-Auz complex in Kabardino-Balkar A.S.S.R., North Caucasus; and Zhireken complex in Chita Oblast', East Siberia.
Natural gas	Astrakhan region in lower Volga, Komi A.S.S.R., Orenburg Oblast' in southern Urals, Turkmen S.S.R., Ukraine, Uzbek S.S.R., and West Siberia (principally Tyumen' Oblast' at Urengoi and Yamburg deposits.
Nickel	Mining areas: Noril'sk in East Siberia, Orsk in southern Urals, Pechenga and Monchegorsk on Kola Peninsula, Pobugskoye in Ukraine, and Verkhniy Ufaley in southern Urals. Smelters: Khalilovo, Rezh, and Verkhniy Ufaley in Urals; Monchegorsk and Pechenga on Kola Peninsula; Noril'sk in East Siberia; and Pobugskoye in Ukraine. (Noril'sk Monchegorsk, and Pechenga are part of the new Noril'sk Nikel association)
Oil shale	Estonia and Leningrad regions in Baltic Basin (97% of output) and Kashpirskoye region in Volga Basin.
Petroleum	Bashkir A.S.S.R.; Caspian Sea (offshore); Komi A.S.S.R.; Kuybyshev Oblast', middle Volga; Mangyshlak Peninsula in Kazakhstan; Orenburg Oblast' and Perm Oblast' in Urals; Tatar A.S.S.R.; Turkmen S.S.R.; and West Siberia (principally Tyumen' Oblast').
Phosphate	Karatau phosphorite complex in Kazakhstan, Khibiny apatite complex and Kovdor iron ore complex on Kola Peninsula, Kingisepp complex in Leningrad Oblast', Lopatino and Yegorevsk deposits in Moscow Oblast', Maardu deposit in Estonia, Polpinskoy deposit in Bryansk Oblast', and Verkhenkamsk deposit in Urals.
Platinum-group metals	Noril'sk complex in East Siberia (smelter at Krasnoyarsk) and Pechenga nickel complex and Severonikel complex on Kola Peninsula.
Potash	Uralkaliy and Silvinit complexes in Urals, Kalush and Stebnikov enterprises in Ukraine, and Byeloruskaliy complex in Byelorussia. (Urals and Byelorussia each contribute about 50% of output. Small amount from Ukraine.)
Salt	Artemsol' complex in Donets Basin and Lake Baskunchak in Astrakhan Oblast'.
Silver	Byproduct or secondary operations in Armenia, Kazakhstan, Moscow plant (secondary), Noril'sk in East Siberia, Soviet Far East, and Urals. Hard-rock gold-silver mining at Dukat Mine in Magadan Oblast', Soviet Far East.
Soda ash	Uralkaliy and Silvinit plants in Urals; Krym, Lisichansk, Saki, and Slavyansk plants in Ukraine; Mikhaylovskiy plant in Siberia (produces natural soda ash from alkaline brine lakes); and Pikalevo plant in Leningrad Oblast' (byproduct of alumina production from nepheline syenite).
Steel	Enterprises: Chelyabinsk, Magnitogorsk, Nizhniy Tagil, and Orsko-Khalilovo in Urals; Cherepovets in northwest; Karaganda in Kazakhstan; Dneprodzerzhinsk, Kommunarsk, Krivoy Rog, Makeyevka, Zaporozhstal, Zhdanov Azovstal, and Zhdanov Il'ich in Ukraine; Novokuznetsk and Zapsib in West Siberia; and Novolipetsk in European Center. Mini mills at Rybnitsa in Moldavia, Zhlobin in

The U.S.S.R. had the longest coastline of any country, with more than 15 open sea ports and a large number of inland ports, including Astrakhan, Baku, Kuybyshev, Nizhniy Novgorod, Kazan, Khabarovsk, Krasnoyarsk, Moscow, Rostov, Volgograd, and Kiev. The greater portion of the sea coasts, however, are in sparsely populated or uninhabited regions along the Arctic Ocean. There are only a few good natural ports, and year-round access to the open seas is available only along the temperate coast in the extreme northwest.

The U.S.S.R. faced the problem of depleting older deposits in areas with developed infrastructure while new deposits are in remote eastern and northern areas with severe climates and lack of infrastructure. Despite the statistics quoted on the U.S.S.R.'s extensive transportation network, the country had no cross-country road system and practically no developed road networks in most of the northern and northeastern portions of the country. Furthermore, practically the entire rail network was concentrated in the western part of the country. There were only two rail lines transversing the eastern part of the country, the trans-Siberian and the Baikal Amur Mainline (BAM), with the BAM only partially operational and lacking connecting lines to areas of potential mineral development. Air transportation played a vital role in passenger and industrial transport owing to the vast distances and the lack of other transport means.

In the eastern and northern parts of the country, the Soviets relied on a combinaton of road, rail, river, and sea transport for minerals transport and had developed a number of deposits depending primarily on air transport for freighting supplies and shipping minerals. For mineral fuels, the Soviets had developed extensive pipeline networks that were now in great need of expensive maintenance and repair.

Given the subsidized nature of Soviet economic activity, and the Soviet transport system in particular, it was not possible to assess the costs of mineral transport. However, these costs would play a much larger factor as the country switched from a policy of central planning that promoted mineral development at almost any cost to a market economy system where production costs could be a crucial factor. In 1990, problems with labor unrest and fuel shortages affected the functioning of the transport network which, in turn, hampered the supply of inputs to and delivery of output from the country's mining and metallurgical enterprises.

TABLE 12—Continued

U.S.S.R.: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

Commodity	Apparent main production centers
Steel—Continued	Byelorussia, and Komsomol'skna Amure in Soviet Far East. Direct reduction plant for iron at Oskol in Kursk region.
Sulfur (native)	Deposits: Alekseyevka in Kuybyshev Oblast' in middle Volga, Gaurdak in Turkmen S.S.R., and Rozdol and Yavorov in Ukraine.
Talc	Deposits: Kirgiteysk in Krasnoyarsk Kray, East Siberia; Miass and Shabrovsk in Urals; and Ontosk in Irkutsk Oblast', East Siberia.
Tin	Mining areas (all in Soviet Far East): Khingan complex and Solnechnyy complex in Khabarvosk Kray and Khrustal'nyy complex in Primorskiy Kray; Iul'tin complex in Magadan Oblast'. Smelters: Novosibirsk in West Siberia and Podol'sk and Ryazan in European Center.
Titanium	Mining areas (deposits, all in Ukraine): Irshanskoye, Streminogorskoye, and Zelenogorskoye in Zhitomir Oblast'; Tarasovskoye in Kiyev Oblast'; and Samotkanskoye and Volchanskoye in Dnepropetrovsk Oblast'. Plants (metal): Berezniki in Urals, Moscow and Podol'sk in European Center, Khar'kov and Zaporozh'ye in Ukraine, and Ust'-Kamenogorsk in Kazakhstan. Plants (titanium dioxide): Armyansk in Crimea and Sumy in Ukraine.
Tungsten	Deposits under exploitation: Akchatau, Karaoba, and Verkhnye-Kayraktin in Kazakhstan; Chorukh-Dayron and Yubileynoye in Tadzhik S.S.R.; Ingichka and Lyangar in Uzbekistan; Dzhida in Buryat A.S.S.R.; Iul'tin in Magadan Oblast', Soviet Far East; Kul'gutin in Altay region, Siberia; Lermontov and Vostok in Primorskiy Kray, Soviet Far East; and Tyrny Auz in North Caucasus. Production facilities: Akchatau complex in Kazakhstan; Iul'tin complex in Magadan Oblast', Soviet Far East; Nal'chik plant in Kabardino-Balkar A.S.S.R., North Caucasus (tungsten metal producer); and Primorskiy Kray and Vostok complexes in Soviet Far East.
Vanadium	Raw material suppliers: Kachkanar iron ore complex and other small deposits in Urals. Processing plants: Chusovoy and Nizhniy Tagil in Urals.
Zinc (not primarily associated	Mining areas: Sibay and Uchaly in Bashkir A.S.S.R., and Urals. Refineries: Almalyk with lead) complex in Uzbekistan, Belovo plant in Kuznetsk Basin, Siberia, and Chelyabinsk plant in Urals.

OUTLOOK

The outlook for the Soviet mineral industry was uncertain as was the political and economic future of the country. Further disruptions in mineral production and supply did, however, appear certain.

It was not possible to predict developments within the mineral industry of the country in the coming year or near future given the process of political and economic disintegration occurring in the country. It was apparent that production of most mineral commodities would decline with the disruptions in and reductions of needed inputs to maintain mineral production. It was also apparent that, given the need for hard currency and the breakdown in traditional supply networks, enterprises and organizations would attempt to export as much of their mineral output as possible for hard currency, despite declining domestic production and disruptions in supplying domestic enterprises. This situation would prevail until political decisions or economic conditions resulted in creating a different system for controlling the distribution of the the supply of minerals.

It was also apparent that the former system of management of the mineral industry by central ministries would evolve into other forms of management embodying varying forms of Republic control and privatization of enterprises. The outlook for foreign investment remained uncertain, as foreign firms would have to engage in a process of evaluating the effects of the ongoing political and economic changes on investment strategy. Nevertheless, the country, occupying one-sixth of the world's land surface, would remain one of the world's largest mineral producers, and possessing vast resources, would have a significant impact on the world balance of the supply of minerals.

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[1]Ekonomika i zhizn' (The Economy and Life), Moscow, No. 5, Jan. 1991, pp. 9-13.

[2]Work cited in footnote 1.

[3]Work cited in footnote 1.

[4]Work cited in footnote 1.

[5]Gornyy zhurnal (Mining Journal), Moscow, No. 1, Jan. 1990, pp. 3-4.

[6]Okhrana okruzhayushchey sredy i ratsional'noye ispol'zovaniye prirodnykh resursov v SSSR. Statistcheskiy sbornik (Environmental Protection and the Rational Use of Natural Resources in the U.S.S.R.), Moscow, Finansy i statistika, 1989.

[7]Tsvetnye metally (Non-ferrous Metals), Moscow, No. 10, Oct. 1990, p. 3.

[8]Council for Mutual Economic Assistance (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 1961, Cuba in 1972 and Vietnam in 1978. Yugoslavia obtained permanent observer status in 1965. Other countries that have participated as observers are Afghanistan, Angola, Ethiopia, Laos, Mozambique, Nicaragua and South Yemen.

[9]Referativnyy zhurnal, Ekonomika i organizatsiya tyazheloy promyshlennosti (Journal of Abstracts, The Economics and Organization of Heavy Industry), Moscow, 9B 72, 1990).

[10]Kazakhstanskaya Pravda, Alma Ata, Sept. 22, 1990, p. 3.

[11]Izvestiya, Moscow, Nov. 5, 1990.

[12]Ekonomika i zhizn' (The Economy and Life), Moscow, No. 31, July 1990, p. 4. Izvestiya, Moscow, Aug. 3, 1990, p. 2.

[13]Summary of World Broadcasts (SWB), Reading, U.K., May 18, 1990, p. A/9 (Moscow, 2230 gmt, May 8, 1990).

[14]Gudok (The Whistle), Moscow, Dec. 27, 1990, p. 4.

[15]Promyshlennost', stroitel'tvo i arkhitektura Armenii (Industry, Construction and Architecture of Armenia), Yerevan, No. 4, 1990, p. 69.

[16]Foreign Broadcast Information Service (FBIS), Washington, DC, Oct. 3, 1990, p. 76 (Moscow World Service in Russian, 1035 gmt, Oct. 2, 1990).

[17]Foreign Broadcast Information Service (FBIS), Washington, DC, Oct. 2, 1990, p. 87 (Moscow Domestic Service in Russian, 1400 gmt, Oct. 1, 1990).

[18]———, Feb. 25, 1991, p. 91 (Moscow Central Television Vostok Program and Orbita Networks in Russian, 1530 gmt, Feb. 24, 1991).

[19]———, Sept. 28, 1990, p. 84 (Vilnius International Service in Lithuanian, 2100 gmt, Sept. 26, 1990).

[20]Summary of World Broadcasts (SWB), Reading, U.K., Jan. 4, 1991, p. A/16 (Magadan, 0700 gmt, Aug. 16, 1990).

[21]Priroda i Chelovek (Nature and People), Moscow, No. 9, Sept. 1990, pp. 12-13.

[22]Summary of World Broadcasts (SWB), Reading, U.K., Feb. 1, 1991, p. A/13 (Tass in English, 0601 gmt, Jan. 25, 1991).

[23]Ekonomika i zhizn' (The Economy and Life), Moscow, No. 5, January 1991, pp. 9-13.

[24]Sel'skaya Zhizn' (Village Life), Moscow, Feb. 25, 1990, p. 2.

[25]Tsvetnye metally (Non-ferrous Metals), Moscow, No. 12, Dec. 1990, pp. 27-30.

[26]Work cited in footnote 25.

[27]Work cited in footnote 25.

[28]Work cited in footnote 25.

[29]Referativnyy zhurnal, Ekonomika i organizatsiya tyazheloy promyshlennosti (Journal of Abstracts, The Economics and Organization of Heavy Industry), Moscow, 9B 72, 1990.

[30]Summary of World Broadcasts (SWB), Reading, U.K., May 25, 1990, p. A/14 (Tass in Russian for Abroad, 1744 gmt, May 14, 1990).

[31]Pravda, Moscow, Aug. 30, 1990, p. 5.

[32]Izvestiya, Moscow, Mar. 6, 1991.

[33]Geologicheskaya sluzhba i mineral'no-syr'eyvye resursy SSSR, Materialy K soveshchaniyu po gornodobyvayushchey promyshlennosti stran Vostochnoy Evropy, Madrid, 3-5 Oktyabrya, 1990 (The Geological Service and the Mineral Raw Material Resources of the U.S.S.R. Material for a Conference on the Mining Industry of East European Countries, Madrid, Oct. 3-5, 1990), Moscow, U.S.S.R. Ministry of Ge-

ology, 1991, p. 87.

[34]Work cited in footnote 33.

[35]Soviet Union, Moscow, Sept. 25, 1990, p. 2.

[36]Izvestiya, Moscow, Sept. 25, 1990, p. 2.

[37]Soviet Union, Moscow, No. 11, Nov. 1990, pp. 5-8.

[38]Sovetskaya Rossiya, Moscow, July 29, 1990, p. 3.

[39]Summary of World Broadcasts (SWB), Reading, U.K., Feb. 4, 1991).

[40]Geologicheskaya, sluzhba i mineral'no-syr'yevye resursy SSSR, Materialy k soveshchaniyu po gornodobyvayushchey promyshlennosti stran Vostochnoy Evropy, Madrid, 3-5 Oktyabrya, 1990 (The Geological Service and the Raw Material Resources of the U.S.S.R. Material for a Conference on the Mining Industry of the Countries of Eastern Europe, Madrid, Oct. 3-5, 1990), Moscow, U.S.S.R. Ministry of Geology, p. 83.

[41]Work cited in footnote 40.

[42]Okhrana okruzhayushchey sredy i ratsional'noye ispol'zovaniye prirodnykh resursov v SSSR, Statisticheskiy sbornik (Environmental Protection and the Rational Use of Natural Resources in the U.S.S.R., Statistical Compendium), Moscow, Finansy i Statistika, 1984, p. 141.

[43]Work cited in footnote 42, p. 72.

[44]Foreign Broadcast Information Service (FBIS), Washington, DC, June 15, 1990, p. 80 (Moscow Television Service in Russian, 1430 gmt, June 8, 1990).

[45]Gazovaya promyshlennost' (Gas Industry), Moscow, No. 1, Jan. 1991, p. 6.

[46]———, No. 4, Apr. 1990, p. 6.

[47]Pravda, Moscow, Aug. 4, 1990, p. 2.

[48]Atomnaya energiya (Atomic Energy), No. 4, Apr. 1990, pp. 227-229.

[49]Sovetskaya Kirgiziya (Soviet Kirgiziya), Oct. 3, 1990.

[50]Gornyy zhurnal (Mining Journal), Moscow, No. 11, Nov. 1990, p. 15.

[51]Gudok (The Whistle), Feb. 2, 1991, p. 3.

[52]Komsomol'skaya Pravda, May 12, 1990, p. 2.

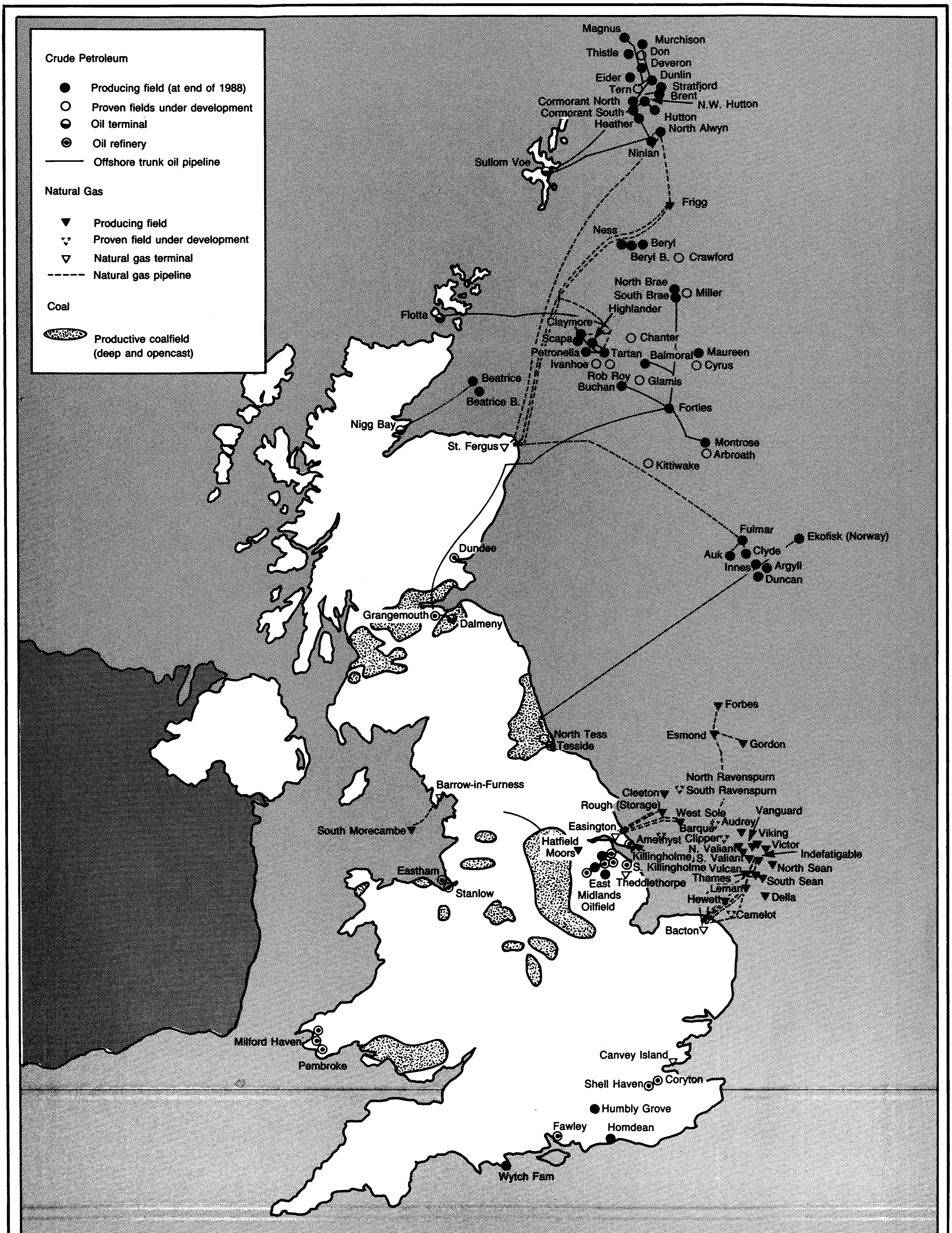
[53]Foreign Broadcast Information Service (FBIS), Washington, DC, July 16, 1990, p. 61 (Moscow domestic service in Russian, 1300 gmt, July 14, 1990).

OTHER SOURCES OF INFORMATION

Official Soviet information on production and trade in minerals was limited to some data on ferrous metals, fuels, and nonmetallics; and, even for some of these, data was sparse. The annual Soviet statistical publications on production and trade were as follows:

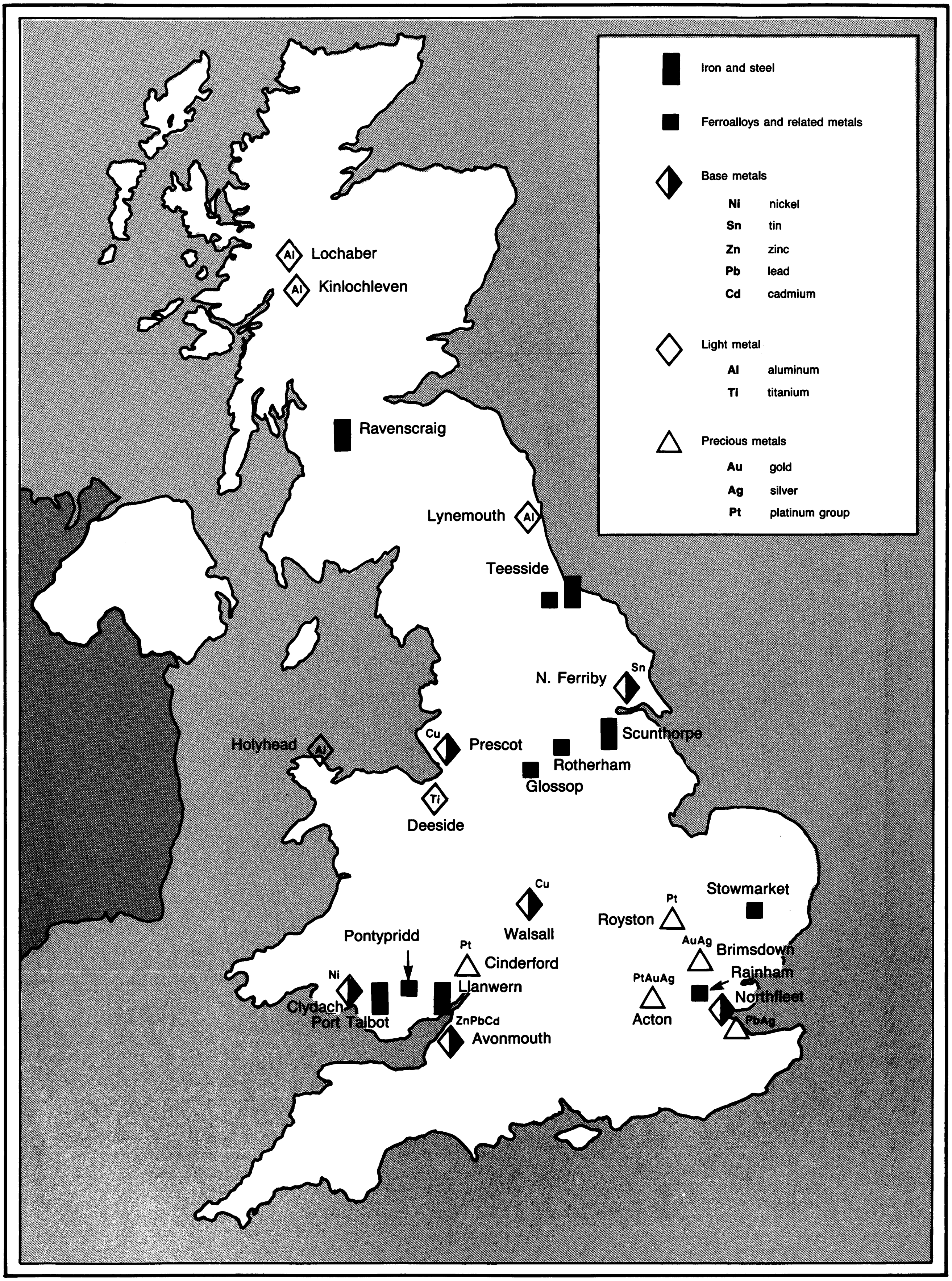
Narodnoye Khozyaystvo S.S.R. (The National Economy of the U.S.S.R.).
Vneshnyaya Torgovlya S.S.R. (Foreign Trade of the U.S.S.R.).
Promyshlennost' SSSS (U.S.S.R. Industry).

Statistics on capacity, output, and production plans for nonferrous, precious, and rare metals and many nonmetallic minerals were regarded by the Soviets as secret. Soviet trade data on precious metals had not been available for decades; and, in 1976, publication of trade statistics for nonferrous metals ceased. Although the U.S.S.R. possesses large mineral resources, reserve figures were also secret for most minerals.



Source: British Geologic Survey, United Kingdom Minerals Yearbook 1989

Figure 1. United Kingdom: Mineral Fuel Resources

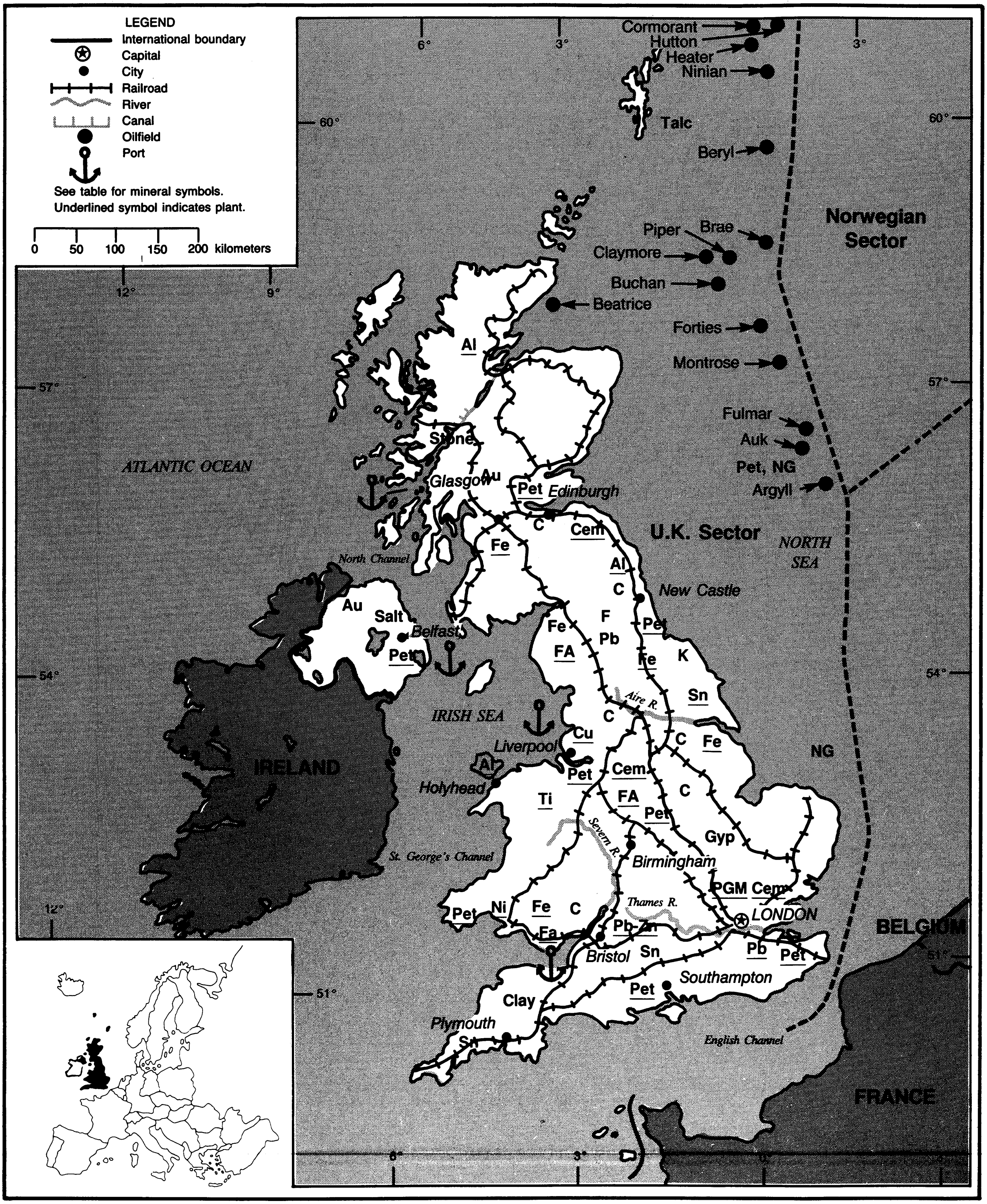


Source: British Geologic Survey, United Kingdom Minerals Yearbook 1989

Figure 2. United Kingdom: Primary Metal Smelters and Refineries 1989

UNITED KINGDOM

AREA 244,000 km² **POPULATION 57.4 million**



The Mineral Industry of the United Kingdom

By Harold R. Newman

As a result of a rather complex geologic history, the United Kingdom has historically been well endowed with mineral resources. Metallic ore deposits were typically small and of relatively high grade. Mining of nonferrous minerals, particularly copper and tin, has been ongoing since the Bronze Age. Mine production of nonferrous minerals has been declining over the past 20 years because deposits are being depleted. Although the exploitation of nonferrous minerals has become less significant, the processing of these minerals is the basis of a large and economically important industry. Because most ore bodies have been exhausted, the industry requires imports to satisfy its metallurgical requirements.

The industrial minerals sector has provided a significant base for expanding the extractive industries and, in recent years, provided a shift in balance from the metallic mineral sector. United Kingdom companies have a substantial interest, both domestic and foreign, in the production of industrial minerals such as aggregates, ball clay, china clay (kaolin), and gypsum.

The country has the 10th largest petroleum refining capacity in the world. The offshore United Kingdom sector of the North Sea Oilfield, now in its 26th year of activity, continues to be a significant player in the international oil and gas sector. As a result, the country has become a base for international oil companies and a major energy supplier to other countries. The real GDP growth rate in 1990 was 0.6%, making the United Kingdom one of the slowest growing economies among the industrialized nations. The United Kingdom joined the European Exchange Rate Mechanism (EMR) on October 8, 1990, which represents a commitment to attaining low inflation. The unemployment rate was 5.8% of the labor force at midyear.

GOVERNMENT POLICIES AND PROGRAMS

The development and working of mineral deposits are subject to laws and regulations dating back to 1948 when the Town and Country Planning Act of 1947 introduced general planning control over the development of land. The current statute is the 1971 Act, as amended, which consolidates all earlier planning legislation and has been amended by various statutes. Mineral development was specifically addressed in the Town and Country Planning (Minerals) Regulations, 1971, and the Town and Country Planning (Minerals) Act, 1981. Minerals are defined in section 209 of the 1971 act to include all minerals and substances in or under land of a kind ordinarily worked for removal by underground or surface workings, except it does not include peat cut for purposes other than for sale.

Mineral rights to mineral fuels such as coal, petroleum, and uranium belong to the state. British Coal Corp. (BC), a state-owned company, controls almost all the mineral rights to the national coal reserves. However, BC is authorized to license open pit and underground mines to the private sector subject to restrictions on size and the payment of royalty on the amount of coal produced.

Most other mineral rights in the United Kingdom are privately owned. The exception is gold and silver, the rights to which are vested in the Royal Family and are referred to as Crown Rights. A different situation regarding mineral rights applies to Northern Ireland where, under the Mineral Development Act (Northern Ireland), 1969, the right to work minerals and the right to license others to do so is vested in the state as opposed to private ownership.

Currently there is no national registry for mineral rights in the United Kingdom except for hydrocarbons. This has created problems and is a matter of concern for the mining industry. Locating current owners of mineral rights on some properties can be a costly and time-consuming process.

After the successful privatization of British Steel PLC, formerly British Steel Corp., in late 1988, the Government was proceeding with privatization of the Central Electric Generating Board (CEGB), which held the monopoly for generating electric power in the United Kingdom. On March 31, 1990, in preparation for privatizing, CEGB was split into two fossil-fueled companies, National Power and PowerGen, and one nuclear generating company, Nuclear Electric. A fourth company, National Grid, operates the transmission system and owns two pumped storage stations. These companies will compete with each other and any other power-generating company that wishes to produce electricity.

As a result of the Government's privatization efforts, independent power producers were continuing with plans to build new plants. Enron Power Corp. of the United States and Imperial Chemical Industries (ICI) of the United Kingdom signed final contracts to construct one of the world's largest gas-fired power stations. The station, to be at ICI's petrochemical complex at Wilton on Teeside, would have a capacity of 1,725 MW and was expected to cost more than $1.3 billion[1] to construct. It was the largest private gas-fired power project in progress in 1990.

Another company being prepared for privatization was BC. The Coal Industry Act of 1990 was given Royal Assent in March 1990. The act allowed the writeoff of BC's massive debt burden increased the limitations on licenses for private company open pit coal operations from 25,000 tons to 250,000 tons; and increased the number of personnel permitted to work in private underground coal mines from 30 to 150 workers per mine.

In late 1990, the Government announced that the strategic minerals and metals stockpile set up by the Department of Trade and Industry (DTI) was to be sold over an extended period of 2 to 3 years to avoid disrupting the market. Contents of the stockpile were not officially released.

PRODUCTION

The sluggish economy was reflected in the industrial production index, which rose less than 1% during the year. The steel sector operated at less than full capacity throughout 1990 as the downturn in the construction industry depressed the demand for general steels. Output of ferromanganese and refined nickel increased slightly. Production of tin concentrate increased although marginal mines were closed. Underground coal production decreased when reserves were depleted. Eleven collieries ceased production in 1990. Open pit coal production, on the other hand, was at a record high. Production of crude petroleum remained depressed owing to the continuing effects of the Piper Alpha drilling rig disaster in 1988 and the gas explosion on the Cormorant A drilling platform in 1989. Redevelopment of these areas was expected to be completed by 1992.

TRADE

The United Kingdom has shifted from being a net exporter as recently as 1986 to being a net importer in 1989-90. Part of the reason for the weaker export performance during the past 3 years has been problems, as aforementioned, in the United Kingdom sector of the North Sea oilfields. It was expected that the economy will continue to slow further, which should cause the demand for imported consumer goods to decline. The trade balance deficit at yearend was almost $29 billion, down from 1989's deficit of $32 billion.

Table 2 below shows the impact of selected classes of mineral commodities on the United Kingdom's balance of payments position in relation to the EC and the world. The figures, in thousand dollars, are for 1989, which was the latest year that data were available.

STRUCTURE OF THE MINERAL INDUSTRY

The Department of Trade and Industry (DTI) has the responsibility to ensure a continuing supply of minerals for the country's industry. DTI's overview includes all nonenergy, nonconstruction minerals. These include metallic ores and such industrial minerals as barite, china clay (kaolin), fluorspar, high-grade limestone, potash, salt, and silica sand.

The Department of Energy (DOE) is responsible for mineral fuels that include coal, natural gas, and petroleum. DOE is also responsible for the issuing of licenses for the exploration, appraisal, and production of natural gas and petroleum.

The Department of the Environment is responsible for minerals used in the construction industry. These include aggregates, brick and brick clay, cement and its raw material, dimension stone, gypsum for plaster, and sand and gravel. Both state and privately owned corporations produce minerals and mineral-based products. State ownership is mostly in the mineral fuels and nuclear power industry.

In 1990, direct employment in the mineral industry, including quarrying, was about 120,000 workers.

COMMODITY REVIEW

Metals

Aluminum.—There are four primary aluminum smelters in the United Kingdom. Three of these are owned and operated by British Alcan Aluminium Ltd. The fourth smelter, Anglesey Aluminium Ltd., is 51% owned by RTZ Corp. Ltd. and 49% owned by Kaiser Aluminum and Chemical Corp. These smelters produce about 60% of domestic requirements for aluminum metal. The remaining 40% is imported from various countries, mainly Norway. All of the aluminum smelters depend on imported alumina for feedstock.

The secondary aluminum metal industry in the country treats recycled aluminum and low-grade aluminum scrap such as swarf. One such company is Trent Alloys, which is a member of the Cookson Group. Cookson is said to be the largest buyer of aluminum scrap in the United Kingdom. Trent Alloy's new secondary aluminum operation in North Cave, Humberside, came on-stream in late 1989. The plant produces 10,000 mt/a of aluminum alloys. The alloys are produced to customers' specifications and supplied in 5 kg ingots. Trent reportedly initiated a $475 million capital investment program to ensure compliance with strict environmental regulations expected in the near future.

British Alcan Aluminium PLC announced the initiation of construction of a 50,000-mt/a-capacity recycling plant near Warrington for the recovery of aluminium from beverage cans. Cost was estimated at $48 million.

Copper.—Anglesey Mining PLC was continuing with the development of its polymetallic mine on Parys Mountain at Anglesey, North Wales. The area has a long history of mining activity and was considered the largest copper-producing region in the world in the 1850's. Archeological investigations have identified evidence of mining during Roman times. The company reported that a feasibility study by Kilborn Engineering of Vancouver, Canada, had confirmed the viability of the project. It was also reported that about 900 m of development work had been completed, and drilling had indicated estimated geological reserves of 6 Mmt of ore grading 2.3% copper, 2.6% lead, 5.4% zinc, 39 g of silver per ton, and 0.32 g of gold per ton. Anglesey's parent company, Imperial Metals Corp., was evaluating the results and would make a decision whether to seek funding arrangements for further construction and development. The main domestic source of copper concentrates was Carnon Consolidated's Wheal Jane tin mine in Cornwall where concentrates of copper, lead, and zinc were recovered as byproducts. This mine was scheduled to cease production at yearend.

Gold.—Interest in gold was reflected in the continuing activity in gold exploration and development in the United Kingdom. Northern Ireland, Scotland, and Wales were three areas of concentration by companies. At yearend, it was reported that 6 Mines Royal leases and 51 exploration permits had been issued as follows: England, 3; Northern Ireland, 13; Scotland, 25; and Wales, 10.[2]

Ennex International PLC was continuing exploration and development efforts on its Cononish Project in Scotland about 360 kilometers north of Scotland. The company completed an exploration adit on the gold-silver vein structure. Sampling and drilling of the deposit was reported by the company to have lowered the estimated minable reserves from 900,000 tons to about 513,000 tons of ore, with an average grade of 9.25 g of gold per ton and 52.81 g of silver per ton. The exploration and development program is continuing into wider sections of the ore body in an attempt to define additional reserves.[3]

TABLE 1

UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
METALS						
Aluminum:						
Alumina from imported bauxite		109,940	109,800	114,600	116,200	115,000
Metal:						
Primary		275,876	294,382	300,166	297,313	[2]293,678
Secondary		116,406	116,744	105,764	109,695	[2]120,854
Cadmium: Metal including secondary		379	498	399	395	400
Copper:						
Ore and concentrate, Cu content		602	750	732	508	945
Metal, refined:						
Primary		62,368	54,023	[e]49,258	48,643	[2]46,991
Secondary		63,206	68,264	[e]74,700	[e]70,390	[2]74,643
Total		125,574	122,287	123,958	119,033	[2]121,634
Iron and steel:						
Iron ore:						
Gross weight		289,000	262,700	224,100	34,297	30,000
Fe content		61,000	58,000	49,302	[r,e]8,000	6,000
Metal:						
Pig iron	thousand tons	9,686	12,017	13,056	12,638	[2]12,277
Ferroalloys, blast-furnace: Ferromanganese	do.	100	92	107	143	145
Steel, crude	do.	14,725	17,414	18,950	18,813	[2]17,908
Rolled products	do.	11,594	18,606	[e]20,909	15,165	[2]14,502
Lead:						
Mine output, Pb content		648	691	1,185	[e]600	600
Metal:						
Smelter:						
Bullion from imported concentrate		37,798	35,200	34,901	34,523	[2]42,728
Secondary (refined)[3]		172,537	201,100	[e]201,600	[e]200,000	200,000
Total		210,335	236,300	[e]236,501	[r,e]234,523	242,728
Refined:						
Primary[4]		156,093	145,823	172,213	156,983	[2]156,483
Secondary[3]		172,537	201,131	201,632	[e]193,500	[2]177,801
Total		328,630	346,954	373,845	[e]350,483	[2]234,284
Magnesium metal, secondary including alloys[e]		1,000	1,000	1,200	1,000	900
Nickel metal, refined[5]		30,900	29,500	[e]27,700	[e]26,100	26,800
Silver: Mine ouptut, Ag content	kilograms	1,773	2,031	2,113	1,689	1,500
Tin:						
Mine output, Sn content		4,276	4,003	3,454	3,846	4,200
Metal:						
Primary		9,227	12,135	9,014	3,584	6,100
Secondary (refined)		5,676	4,871	7,757	7,184	5,900
Zinc:						
Ore and concentrate, Zn content		5,605	6,522	5,502	5,771	[2]6,594
Metal, smelter		85,902	81,360	76,028	79,773	[2]93,309
INDUSTRIAL MINERALS						
Barite[6]		86,754	77,000	76,253	70,026	75,000
Bromine		26,000	26,184	27,128	29,907	28,000
Cement, hydraulic	thousand tons	13,465	14,311	16,500	[e]15,000	14,000

See footnotes at end of table.

TABLE 1—Continued

UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
INDUSTRIAL MINERALS—Continued						
Clays:						
Fire clay[e]	do.	[2]940	900	1,060	1,000	1,000
Fuller's earth[7] [e]	do.	202	213	213	210	[2]204
Kaolin (china clay)	do.	2,913	3,059	3,278	[e]3,140	[2]3,037
Ball clay and pottery clay	do.	611	679	[e]716	[e]780	820
Other including shale	do.	17,565	18,262	18,899	[e]18,500	17,000
Diatomite[e]		300	350	320	270	300
Feldspar (china stone)		7,304	5,692	6,267	6,470	6,500
Fluorspar, all grades[8]		133,420	120,400	103,800	122,057	120,000
Gypsum and anhydrite[e]	thousand tons	[2]3,416	3,500	3,700	4,000	4,000
Lime: Quicklime and hydrated[e]	do.	2,600	2,800	2,800	2,800	2,800
Nitrogen: N content of ammonia	do.	1,388	1,415	1,105	1,037	[2]1,148
Potash, K_20 equivalent		416,965	431,256	463,268	[e]465,000	508,000
Salt:						
Rock	thousand tons	2,040	1,855	877	594	600
From brine	do.	1,510	1,554	1,426	[e]1,500	1,500
In brine, sold or used as such	do.	3,305	3,672	3,827	[e]3,600	3,600
Sand and gravel:						
Common sand and gravel	do.	112,043	117,827	136,404	[e]135,000	122,000
Industrial sand	do.	4,108	3,265	[e]4,300	[e]4,500	4,300
Sodium compounds, n.e.s.: Carbonate, synthetic[e]	do.	1,000	[2]765	1,000	1,000	1,000
Stone:						
Crushed:						
Calcite	thousand tons	10	[e]10	23	[e]17	19
Chalk	do.	12,511	13,444	14,516	[e]15,000	12,500
Chert and flint[e]	do.	[2]14	15	11	12	10
Dolomite	do.	15,851	17,000	[e]19,900	[e]21,000	20,500
Igneous rock	do.	34,038	39,529	[e]51,959	[e]55,000	53,500
Limestone	do.	97,056	110,641	[e]105,816	[e]112,000	109,000
Sandstone including ganister	do.	11,337	13,824	18,901	19,593	19,000
Slate including fill	do.	242	322	[e]708	590	600
Total	do.	171,059	[r]194,785	211,834	223,212	215,129
Dimension:						
Igneous[e]	do.	100	100	128	100	100
Limestone	do.	127	244	[e]233	[e]200	200
Sandstone	do.	120	142	[e]183	[e]200	200
Slate[e]	do.	35	35	40	50	50
Strontium minerals-		14,700	22,655	25,553	20,885	21,000
Sulfur, byproduct:						
Of metallurgy		58,319	51,398	[e]55,000	[e]52,000	50,000
Of petroleum refining		105,000	119,000	129,000	[e]130,000	125,000
Total		163,319	170,398	[e]184,000	[e]182,000	175,000
Talc, soapstone, pyrophyllite		12,352	12,529	14,182	15,413	[2]14,781
Titania[9]		229,900	225,600	[e]230,000	[e]225,000	225,000
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand tons	1,985	2,091	1,827	[e]2,000	1,900

See footnotes at end of table

TABLE 1—Continued

UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	1988	1989[p]	1990[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Coal—Continued						
Bituminous including slurries, fines, etc.	do.	106,107	102,344	101,964	[e]98,300	100,980
Lignite	do.	7	6	[e]18	[e]20	20
Total		108,099	104,441	[e]103,809	[e]100,320	102,900
Coke:						
Metallurgical	do.	7,795	7,585	[e]7,610	[e]7,572	7,600
Breeze, all types	do.	344	273	[e]277	[e]200	200
Fuel briquets, all grades	do.	1,599	1,637	[e]1,464	[e]1,500	1,500
Gas, natural:						
Marketable[10]	million cubic meters	45,289	47,623	45,729	44,711	46,000
Marketed[11]	do.	41,454	43,690	41,761	41,228	42,000
Natural gas liquids[12]	thousand 42-gallon barrels	67,442	66,039	58,035	[e]56,000	50,000
Petroleum:						
Crude[13]	do.	905,162	878,099	820,515	655,530	660,000
Refinery products:						
Liquefied petroleum gases	do.	16,484	17,110	[e]19,129	[e]19,200	18,360
Naphtha including white spirit	do.	22,542	18,123	16,728	[e]18,500	15,985
Gasoline	do.	198,560	209,780	224,477	[e]231,500	227,150
Jet fuel	do.	46,504	48,504	53,800	[e]56,800	60,328
Kerosene	do.	16,639	17,592	17,740	[e]18,000	17,895
Distillate fuel oil	do.	167,171	159,828	178,480	[e]173,700	174,475
Residual fuel oil	do.	83,403	85,228	83,217	[e]97,130	91,950
Lubricants	do.	6,363	6,202	6,790	[e]7,350	6,820
Bitumen	do.	11,435	12,459	13,908	[e]14,500	14,870
Petroleum coke	do.	2,827	2,844	[e]2,976	[e]3,100	3,225
Petroleum wax	do.	456	449	[e]496	[e]425	315
Unspecified	do.	2,051	2,100	3,563	[e]3,570	3,985
Refinery fuel and losses	do.	49,321	44,889	47,626	[e]40,700	3,830
Total	do.	623,756	[r]625,108	[e]668,930	[e]684,475	639,188

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes data available through Sept. 1, 1991.
[2]Reported figure.
[3]Includes a small quantity of primary lead from domestic concentrate.
[4]Produced entirely from imported bullion and includes the lead content of alloys.
[5]Refined nickel and nickel content of ferronickel.
[6]Includes witherite.
[7]Salable product.
[8]Proportions of grades not available; probably about two-thirds acid grade.
[9]Sales.
[10]Methane excluding gas flared or reinjected.
[11]Marketable methane excluding that used for drilling, production, and pumping operations.
[12]Includes ethane, propane, butane, and condensates.
[13]Excludes gases and condensates.

TABLE 2

UNITED KINGDOM: BALANCE OF PAYMENTS, SELECTED MINERAL COMMODITIES[1]

(Thousand U.S. dollars)

Mineral commodity	Exports European community	Imports European community	Net gain or (loss)	Exports to the world	Imports from the world	Net gain or (loss)
Crude industrial minerals:						
Feldspar	$146	$62,239	($62,093)	$211	$118,032	($117,821)
Magnesite	81	1,357	(1,276)	205	2,438	(2,233)
Slate	1,200	253	947	1,423	864	559
Other	313,606	212,399	101,207	601,371	469,384	131,987
Total	315,033	276,248	38,785	603,210	590,718	12,492
Metalliferous ores:						
Copper	246	163	83	684	267	417
Lead	1,280	3,147	(1,867)	1,280	9,848	(8,568)
Tin	91	2,512	(2,421)	8,336	42,943	(34,607)
Zinc	5,204	15,000	(9,796)	5,234	87,050	(81,816)
Other (including waste and scrap)	825,773	362,652	463,121	1,148,045	2,436,274	(1,288,229)
Total	832,594	383,474	449,120	1,163,579	2,576,382	(1,412,803)
Nonmetallic mineral manufactures	1,562,453	730,346	832,107	3,557,289	3,811,956	(254,667)
Metals:						
Iron and steel	2,746,189	3,333,660	(587,471)	4,731,103	4,563,972	167,131
Mercury	486	706	(220)	920	728	192
Other nonferrous metals	1,823,395	2,275,938	(452,543)	3,217,011	5,025,640	(1,808,629)
Total	4,570,070	5,610,304	(1,040,234)	7,949,034	9,590,340	(1,641,306)
Mineral fuels	5,929,240	2,461,522	3,467,718	9,431,058	10,207,409	(776,351)

[1]Table prepared by Harold Willis, Section of International Data.

TABLE 3

UNITED KINGDOM: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Major commodity	Major operating companies	Location of main facilities	Annual capacity
Aggregate	ARC Ltd.	50 quarries in various locations	50,000
Do.	Foster Yoeman Ltd.	Glensanda quarry at Oban	15,000
Aluminum, primary	British Alcan Aluminium Ltd.	Lochaber, Kinlochleven, and Lynemouth	175
Do.	Angelesy Aluminium Ltd.	Holyhead, Wales	113
Aluminum, secondary	Trent Alloys Ltd.	North Cave, Humberside	10
Ball clay	Watts, Blake, Bearne & Co. PLC	Various operations in north and south Devon	500
Celestite	Bristol Minerals Co. Ltd.	Yate, Avon	30
Cement	Aberthaw & Bristol Channel Portland Cement Co. Ltd.	East Aberthaw, Glamorgan and Rhoose, Glamorgan	1,000
Do.	Blue Circle Industries PLC	Main plants at Couldon, Dunbar, Hope, Northfleet, Weardale, Westbury	11,300
Do.	Castle Cement Ltd.	Main plants at Ketton, Ribblesdale, Pades, and Pitstone	4,000
China clay (kaolin)	ECC Group	Mines and plants in Devon	3,000
Copper	IMI Refiners Ltd.	Refinery at Walsall, West Midlands	80
Ferroalloys	British Steel PLC	Teesside, Cleveland	80
Do.	Murex Ltd.	Rainham, Essex	25
Do.	London and Scandinavian Metallurgical Co. Ltd.	Rotherham, South Yorkshire	30

TABLE 3—Continued

UNITED KINGDOM: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons unless otherwise specified)

Major commodity	Major operating companies	Location of Main facilities	Annual capacity
Fluorspar	Deepwood Mining Co. Ltd.	Mines in Derbyshire	50
Do.	Laporte Industries	Mill at Stoney Middleton, mines in Derbyshire	70
Gypsum	British Gypsum Ltd.	Mines in Midlands, Cumbria, and Sussex	3,500
Lead, refined	Britania Refined Metals Ltd.	Northfleet, Kent	165
Lead, secondary	H. J. Enthoven and Son Ltd.	Darley Dale, Derbershire	60
Lead, smelter	Pasminco Ltd.	Avonmouth, Avon	40
Natural gas, billion cubic feet	Amoco Ltd., British Petroleum Ltd., Esso (United Kingdom) Ltd., Phillips Petroleum Co. PLC, Shell (United Kingdom) Ltd.	North Sea gasfields	1,250
Nickel, refined	INCO Europe Ltd.	Clydach, Wales	30
Petroleum, crude, billion barrels	Amoco Ltd., British Petroleum Ltd., Chevron Ltd., Esso (United Kingdom) Ltd., Occidental Petroleum Co. Ltd., Shell (United Kingdom) Ltd., Texaco Ltd., Unocal, Inc.	North Sea oilfields	2.1
Petroleum, refined	British Petroleum Ltd., Conoco Ltd., Mobil Oil Co. Ltd., and others	11 refineries in various locations	2.3
Platinum-group metals	Johnson Matthey PLC	Enfield (London) and Royston, Cambridgeshire	20
Do.	INCO Europe Ltd.	Acton (London)	6
Potash	Cleveland Potash Ltd.	Boulby Mine, Yorkshire	500
Salt, rock	Imperial Chemical Industries PLC	Mines at Winsford, Chesire	3,000
Do.	Irish Salt Mining & Exploration Co.	Carrick Fergus, Northern Ireland	300
Sand and gravel	TMC Pioneer Aggregates Ltd.	Chelmsford, Essex	1,000,000
Silica sand	Hepworth Minerals and Chemicals Ltd.	Operations in Cambridgeshire, Cheshire, Humberside, and Norfolk	6,000
Steel	British Steel PLC	5 integrated steel-works in Gwent, Lanark, South Humberside, and Cleveland	16,800
Talc	Alex Sandison & Unst	Shetland Islands	15
Do.	Shetland Talc Ltd. Ventures Ltd., 50%)	Cunningsburg, Shetland Islands	35
Tin, ore	Carnon Consolidated Tin Mines Ltd.	Wheal Jane Mine and South Crofty Mine, Cornwall	3,600
Do.	Geevor PLC	Geevor Mine, Cornwall	1,600
Tin, refined	Capper Pass Ltd.	North Ferriby, North Humberside	14
Titanium, sponge	Deeside Titanium Ltd.	Plant at Deeside, Clyde.	5
Zinc, smelter	Pasminco Ltd.	Avonmouth, Avon	90

Ennex's other project, the Curreghinalt gold deposit in Northern Ireland, remained stalled at yearend. Use of explosives has been precluded by the Government because of security reasons; therefore, the company is unable to use conventional drill-and-blast mining methods to exploit the underground deposit. Alternate mining methods were investigated after attempts to use rock cutters in the unweathered sections of the deposit were unsuccessful. At yearend, Ennex suspended all development work on the project.

In other gold-related activities, Andaman Resources PLC was continuing with its exploration program covering 530 m^2 in the Highlands of Scotland. Exploration emphasis was mainly on alluvial gold localities. Navan Resources and MIM Holdings of Australia entered into a joint-venture agreement to explore for gold in the Strathclyde, Grampian, and Tayside regions, which are also in the Highlands.

Iron and Steel.—Production of iron ore was limited to Peter Bennie Ltd.'s mine in Alberton, Oxfordshire, and a small amount of hematite ore mined by Egremont Mining Co. at the Florence Mine in Cumbria. Primary steel production was based almost entirely on imported iron ore.

British Steel PLC's (BS) five integrated steelworks were producing at less than planned levels owing to the downturn in the economy in the latter part of 1990. The downturn in the building industry was worse than expected, and home market deliveries were significantly reduced. The demand for plate and sections was particularly depressed although there was a generally lower level of activity in all principal steelmaking areas.

BS announced the approval of both the British Government and the EC for the takeover of the Walker Stockholdings Group, which is the largest steel distribution company in the United Kingdom. Not only will the acquisition increase the market share of finished steel products for BS, it will also significantly increase BS's existing distribution network. EC approval came

TABLE 4

UNITED KINGDOM: RESERVES OF MAJOR MINERAL COMMODITIE FOR 1990

(Million metric tons unless otherwise specified)

Commodity		Reserves[e]
Clays:		
Ball clay		300
Fire clay		15,000
Kaolin (china clay)		2,000
Coal (all)		5
Fluorspar	thousand metric tons	2,000
Natural gas	billion cubic meters	1,265
Petroleum, crude		1,790
Potash (K_2O content)	thousand metric tons	25,000
Tin (Sn content)	do.	90
Tungsten (W content)	do.	20

[e]Estimated.

with the stipulation that BS report annually to the EC on the prices it charges to its own distribution subsidiaries and to competing distributors.

BS also announced that it intended to buy a 45% interest in Grupo Jose Maria Aristrain SA, Spain's third largest steel company, as part of a joint venture. The cost was estimated to be about $223 million. The deal was part of BS's strategy to expand its European base and would enlarge the company's presence in the European market for heavy sections and presumably would also allow it access to Aristrain's steel distribution network, which is active in the Federal Republic of Germany, France, Spain, and the United States.

Tin.—The continued low price for tin in the world market, the lowest for 35 years, has caused rationalization in the industry. Carnon Consolidated Ltd. announced that the Wheal Jane Mine would be shut down by the end of 1990. The mill at Wheal Jane would continue operating to treat ore from the South Crofty Mine, which would remain in operation. Geevor PLC's mine near Land's End ceased operation in early 1990.

Capper Pass Ltd.'s tin smelter at North Ferriby, Humberside, reduced its capacity from 16,000 mt/a to 12,000 mt/a in a restructuring effort to reduce operating costs. Capper Pass was experiencing difficulties obtaining tin concentrates. The company's source of tin concentrates is mainly from Bolivia, with some additional amounts from China and Peru. At yearend, the parent company, RTZ Corp., was considering closing the smelter in mid-1992. Capper Pass also produced small amounts of bismuth, copper, indium, lead, silver, and zinc from secondary materials.

Industrial Minerals

Aggregates.—The United Kingdom, with production of about 22 Mmt/a, is the second largest marine aggregate producer in the world after Japan. These aggregates are derived from six main areas—Humber, east coast, Thames estuary, south coast, Bristol Channel, and Liverpool Bay. Production is derived almost entirely from 6 companies operating a total of 50 dredges. Marine aggregates play a major role in the supply of material to southern England where there is a lack of crushed aggregate.

Cement.—Demands of the construction industry continued to exceed the capacity of the cement industry. Imports were required to meet consumption levels. Construction of the English Channel tunnel was expected to keep demand levels high.

Castle Cement Ltd. invested almost $200 million to expand capacity at its Padeswood plant in North Wales to 1.5 Mmt/a from 500,000 mt/a. The capacity increase was scheduled to come on-line in 1994. The company was also constructing a cement terminal on the Thames River in West Thurrock, Essex, at an estimated cost of $34 million. The terminal will be the largest of its kind in Europe with a design capability to handle vessels of up to 30,000 dwt and will have a total storage capacity of 40,000 tons. Throughput capacity would be 500,000 mt/a, with the potential to double this if and when the market demands.

Clays.—The United Kingdom is the leading world producer and exporter of ball clay. Also, it is the world's largest exporter and second largest producer after the United States of kaolin (china clay). English China Clays PLC (ECC) is the largest producer of china clay. ECC announced that because of declining market conditions, high interest rates, increased overseas competition, and decreased significantly pretax profits in 1990, the company was withdrawing from the housebuilding sector and selling its International Drilling Fluids (IDF) business. ECC was intending to concentrate on its operations in the ball clay, china clay and aggregates industry.

Fluorspar.—Minworth Group PLC, formerly a major supplier of fluorspar from its operation in Durham, was placed in receivership, and mining operations were restricted. The company's barite operation at Strontium in Scotland was closed. Laporte Minerals' Glebe Mines and its independent ore suppliers continued operations at Derbyshire, producing about 75,000 tons of ore containing 40% to 50% CaF_2.

Potash.—Cleveland Potash Ltd. (CPL), the only United Kingdom potash producer, initiated construction on a hot-leach filtration plant, a new compactor, and additional screening facilities. CPL hopes these projects, estimated to cost $7 million, will increase granular production by 30% and improve product quality. This was the first stage of a $10 million capital investment program to improve recovery at the Boulby Mine.

Salt.—Imperial Chemical Industries PLC (ICI) is the largest salt producer in the United Kingdom. ICI operates the Winsford Mine in Cheshire, which is one of the largest underground mines in the United Kingdom. Rock salt is mined at the Winsford Mine, which has a capacity of 2 Mmt/a. ICI also produces vacuum salt at its Weston Point facility, which is the world's largest single-stream vacuum evaporation operation with a capacity of 1.1 Mmt/a. Brine salt is produced at the Holford, Preesal, and Saltholme facilities for the internal manufacture of chorine, caustic soda, and synthetic soda ash.

Irish Salt Mining & Exploration Co. Ltd. produces rock salt from an underground mine at Kilroot, near Carrickfergus, which has a capacity of 300,000 mt/a. The company celebrated its 25th anniversary in May 1990 and is an important producer of deicing salt. The company initiated a contract to enlarge the shaft diameter at the mine from 2.0 m to 4.3 m to increase production efficiency. The project, estimated to cost $475,000, was scheduled to be completed in early 1991.

Sand and Gravel.—TMC Pioneer Aggregates Ltd., a joint-venture operation between Pioneer Aggregates (United Kingdom) Ltd. and TMC, is to develop what was expected to be the largest sand and gravel operation in the United Kingdom. Production was expected to be between 1 and 2 Mmt/a. The quarry is at Boreham, Essex, and covers 1,200 acres with estimated reserves of 34 Mmt. The company planned to have a pilot plant operational in 1991. Pioneer Aggregates (United Kingdom) Ltd. owns 26 quarries in the United Kingdom and, in 1990, commissioned a new aggregate plant at Durnford Quarry near Bristol.

Talc.—Shetlands Talc Ltd., a joint venture between Anglo European Minerals Ltd. and Dalraida Mineral Ventures Ltd., was granted planning permission to exploit a talc-magnesite deposit at Cunningsburgh, Shetland Islands. The main product would be 19,000 tons of high-brightness, 95%-talc-content material, and a secondary product would be a 95%-pure magnesite.

Mineral Fuels

Coal.—At the end of 1990, there were 68 underground mines operated by BC. This represented a reduction of 13 from these of the previous year. Privately owned, licensed underground mines numbered 156. Also, there were 59 open pit mines operated by 20 different contractors. Twelve open pit mines ceased production, and 13 production contracts for new mines were negotiated.

Since the coal strike of 1984-85, BC has made remarkable progress in improving its competitiveness. Operating costs have been reduced by one-third, and daily output per face has risen from 608 tons to 1,477 tons. The total work force has been reduced by more than 20,000 to about 85,000. Although productivity has shown an impressive rise, total production has declined by about 16% since 1983.

BC was negotiating a 3-year contract to supply coal to the newly formed private electric utilities National Power and PowerGen. For the first 2 years BC would commit to supply 70 Mmt/a and for the third year would supply 65 million metric tons. The price structure is based on Net Calorific Value, and in real terms, was not anticipated to contain any price increases for the next 3 years. The electricity industry accounts for about 80% of BC's total sales. Coal contributes about 32% toward primary energy consumption.

BC continued emphasis on clean coal technology research. The company received funding by the International Energy Agency to build a 3-MW pressurized fluidized bed combustion plant at Grimethorpe, South Yorkshire. Other clean coal research involved a $4.8 million joint-venture project between DOE and industry regarding nitrous oxide emissions and filters. In other research areas, BC started construction of a $75 million pilot plant at Point of Ayr, North Wales, to produce liquid transport fuels from coal.

The fifth mine of the Selby Complex, North Selby, started production in 1990. Riccall, Stillingfleet, Whitemoor, and Wistow were the other four mines of the Selby Complex. Each of the five separate mines, with total production targeted at more than 11 Mmt, sends its output through two spine tunnels to a drift outside the extraction area. This was the largest such project in Europe. The Wistow Colliery was the first colliery in Europe to mine more than 100,000 tons of coal in a week. The record output of 101,203 tons was achieved in 5 working days. The Australian company Meekatharra Minerals Ltd.'s joint-venture agreement with BHP-Utah, another Australian-owned company, to develop the lignite deposit near Ballymoney, Northern Ireland, had not been ratified at yearend. Meekatharra's drilling program has increased estimated lignite reserves to 770 Mmt. The lignite would be used to supply the electricity generating industry of Northern Ireland and reduce dependency on imported coal.

Natural Gas.—British Petroleum Ltd. (BP) entered into a joint-venture agreement with Statoil of Norway to build natural gas pipelines from North Sea fields to the United Kingdom and the Continent. BP is the largest producer of natural gas in the United Kingdom, with a production of 6,470 Mm^3/a.

Arco Ltd. signed a contract to supply PowerGen with 6 Mm^3/d of natural gas from the Pickerill Field for use in PowerGen's 900 MW power station at Killingholme. Also, PowerGen and Conoco Ltd. formed a joint venture, Kinetca, to supply natural gas to power stations. Construction of a natural gas pipeline from Conoco's terminal at Theddlethorpe, Lincolnshire, to PowerGen's proposed gas-fired station at Killingholme was to be the first project. Conoco is the third oil company, after Shell and BP, to enter into the natural gas distribution business in the United Kingdom. Four new gasfields—BP's Amethyst, Hamilton's Ravenspurn North, Shell's Sole Pit, and Arco's Welland—came on-stream in 1990.

Petroleum.—The 12th Licensing Round was held in April for 159 offshore petroleum blocks. Eighty companies made 115 applications with awards expected in early 1991. There was also a special "Frontier" licensing round, which for the first time covered 117 high-risk blocks of unknown geology northwest of Scotland, west of the Orkney Islands and in areas north of the 62d parallel. Thirty-seven companies made 113 applications covering 66 of the 117 blocks.

Six new oil fields came on-stream: Amoco's Arbroath, Sun's Blair, BP's Cyrus, Amerada Hess's Hamish, Shell's Kittiwake, and Phillip's Moira.

The United Kingdom has an onshore producing oilfield. The Wytch Farm Field in Dorset contains estimated reserves of 400 Mbbl. Exploration and drilling by BP confirmed that the field extends offshore under Poole Bay. The extent and amount of additional reserves had not been reported at yearend. In midyear, BP cut production of the field by 50% because of difficulties with a gas flaring system.

INFRASTRUCTURE

Rail and trucking transportation is well developed and excellent. The state-owned British Railways (BR) operates a 16,629-km 1.435-m standard-gauge system with 4,205 km of electrified and 12,591 km of double or multiple track. There are additional standard and narrow-gauge lines that are privately owned and operated. Northern Ireland Railways (NIR) operates a 332-km 1.600-m-gauge system with 190 km of double track.

All three major steel-producing areas are on or near tidewater. Petroleum refineries are likewise on the coast. The major cargo ports are Bristol, Liverpool, London, and Southhampton in England; Glasgow in Scotland; Cardiff and Milford Haven in Wales; and Belfast in Northern Ireland.

Transportation, not only in the United Kingdom but also in the whole of Europe, will change significantly with the completion of the Channel Tunnel. The tunnel, being constructed underneath the English Channel, will connect Folkestone, England, and Coquelles, near Calais, France. From these terminals, people will drive their cars and trucks onto trains that will transport them 49 km to each respective side in about one-half hour. Everything going through the tunnel will move by high-speed rail.

The system consists of three tunnels: one running north, one running south, and a service tunnel with connections between the two main tunnels. The tunnel system, which has 38 km under water, is the longest undersea tunnel ever built. It is also the largest privately financed construction project in history, with an estimated cost of $14 billion. Completion of the two railway tunnels was estimated for June 1993, at which time service between Folkestone and Calais will begin. The Channel Tunnel linking the two countries will be a vital component of the single market 1992 when the EC becomes one marketplace of 320 million people.

OUTLOOK

The United Kingdom is a significant player in the world mining and mineral processing industries. This is more the result of an extensive range of organizations in the country, with various interests in the mineral industry internationally, rather than production from the domestic industry. This is expected to continue.

Exploration is also expected to continue at a high level both onshore and offshore. Onshore exploration activities will be mainly directed toward precious metals. Offshore exploration interest will continue to be focused on North Sea areas, particularly east of the Shetland Islands and in the southern North Sea, which have been the most prolific areas in the past. Redevelopment of the Piper Alpha and Cormorant A areas was expected to be completed by 1992.

More gas-fired power stations are expected to be built owing to the privatization of the electricity industry and the removal of the restriction on the use of natural gas in power generation.

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[1]Where necessary, values have been converted from pounds sterling (£) to U.S. dollars at the rate of (£)1.00=US$1.92, the average rate during 1990.

[2]British Geologic Survey. United Kingdom Minerals Yearbook 1990, p. 4-1.

[3]Work cited in footnote 2.

[4]Page 2-2 of work cited in footnote 2.

OTHER SOURCES OF INFORMATION

Agencies

British Geologic Survey
Keyworth, Nottingham NG125GG
Central Statistics Office
Great George Street
London, SW1P 3AQ
United Kingdom
Department of Economic Development
(Northern Ireland)
Belfast BT1 3AJ
Northern Ireland
Department of Energy
1 Palace Street
London SW1E 5HE
United Kingdom
Department of Environment
2 Marsham Street
London SW1P 3EB
United Kingdom
Department of Trade and Industry
123 Victoria Street
London SW1E 6RB
United Kingdom

Publications

British Geologic Survey, Keyworth:
United Kingdom Mineral Yearbook, Annual.
Central Statistics Office, London:
Annual Abstracts of Statistics, Annual.
Monthly Digest of Statistics, monthly.
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Overseas Trade Statistics of the United Kingdom, Annual.
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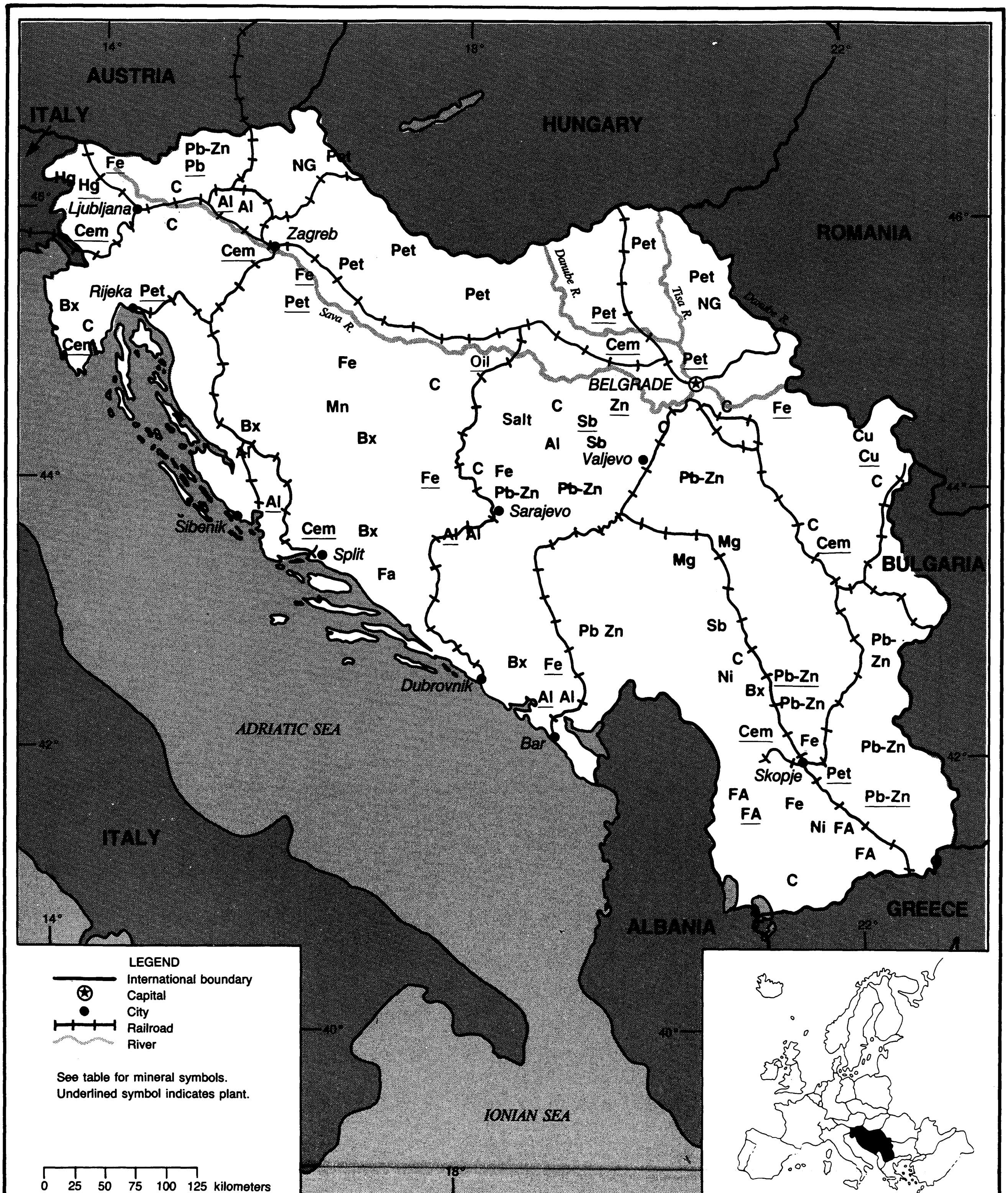
World Metal Statistics, Monthly.

YUGOSLAVIA

AREA 256,000 km² **POPULATION 23.9 million**



THE MINERAL INDUSTRY OF YUGOSLAVIA

By Walter G. Steblez

In 1990, Yugoslavia remained a producer of a broad range of mineral commodities. Although, by world standards, the country was not a dominant producer of any one mineral, in European terms, Yugoslavia was a significant producer of antimony, bauxite, copper, lead, and zinc. The country also produced a wide range of industrial minerals. Moreover, Yugoslavia's fuel and energy sector supplied the country with lignite and relatively small quantities of petroleum and natural gas.

In 1990, Yugoslavia's national income declined by 7.6% and industrial production declined 10% relative to that of 1989. The rate of inflation, which exceeded 2,000% in 1989, declined to 120% by yearend.[1] On balance, the performance of the country's mineral industry stagnated or declined in terms of physical output during the year. The work force in the mineral industry in 1990 showed declines in most sectors compared with that of 1989. Downturns from 2% to 6% were reported for coal mining, petroleum and natural gas extraction, iron ore mining, and steel production. Employment similarly declined in the mining and processing sectors for nonferrous metals and industrial minerals. A 14% decline in employment was also reported in the coal processing branch. The petroleum refining industry was the only branch of the country's minerals industry that reported an increase in employment in 1990, where it rose by 8%.[2]

The chief events in Yugoslavia's minerals industry in 1990 included discoveries of new gold, lead, and zinc deposits. New capacities were also put into operation in the steel industry.

GOVERNMENT POLICIES AND PROGRAMS

In 1990, the Government of Yugoslavia continued reforms to promote currency convertibility, the gradual decentralization of the economy, and the legal status for privatized and non-centrally-planned forms of business activity. To reduce the rate of inflation, the Government of Yugoslavia successfully instituted tight credit policies early in the year. However, open elections and the dissolution of the country's ruling League of Communists during the year resulted in pressure by several constituent Yugoslav Republics to put their needs before those of the Federal Government. Various hostile activities between several of the Republics occurred during this period, including the use of trade blockades. The resulting economic uncertainty led to the withdrawal of support to the country by the International Monetary Fund. By yearend, the efforts of the Federal Government to maintain economic reform policies were severely shaken by secessionist sentiments in the Republics of Croatia and Slovenia.

PRODUCTION

In 1990, Yugoslavia again reported mixed results concerning the production of crude and semiprocessed mineral commodities in most of the branches of the mineral industry. Aluminum, copper, and zinc showed slight production increases during the year, while the output of steel, lead, and most other metals declined substantially. The output of industrial minerals during this period almost without exception declined from the levels achieved in 1989. Total coal output increased by almost 17%, and although crude petroleum production declined by more than 7% in 1990 compared with that of 1989, the output of refined petroleum products rose by 3.2%.

In 1990, labor productivity in the minerals industry, on balance, continued to show a downward trend. Productivity only increased in the coal mining and nonferrous metals smelting branches; increasing by 3% and 5%, respectively, compared with those of 1989. However, coal beneficiation, petroleum and natural gas production and petroleum refining sectors showed declines of labor productivity by 18%, 5%, and 6%, respectively. Additionally, labor productivity in the iron ore mining and steel industries declined by 14% and 12%, respectively, and that in the nonferrous metals mining and refining by 1% and 6%, respectively. Similarly, productivity in the industrial minerals mining and processing sectors fell by 19% and 14%, respectively, during this period.[3]

In 1990, declines in both production and labor productivity in Yugoslavia's mineral industry were attributed to the transition of the country's economy to a market-based system as well as to political instability that began to manifest itself during the second half of the year.

Table 1 provides data that are consistent with those provided in previous Minerals Yearbook Volume III reports for Yugoslavia. Table 2 separates many of these data by Republic and as a percentage of the total output of the country.

TRADE

Yugoslavia's mineral trade in this report was compiled into nine tables from the country's latest available trade returns. Tables 3 and 4 provide preliminary trade returns for 1990 for major mineral commodities for both exports and imports, respectively. Tables 5 and 8 are compatible with historical trade data that had been provided for previous Minerals Yearbook Volume III reports for Yugoslavia. For 1990, additional data have been presented that give Yugoslavia's exports of mineral commodities after processing (table 6); that is, minerals acquired from abroad (table 10), or toll refined in Yugoslavia and reshipped to the country of origin. Similarly, Yugoslavia's exports for processing (table 7) are those mineral commodities shipped abroad for further processing or refining, that would be returned to Yugoslavia for final disposition (table 9).

In 1990, Yugoslavia's balance of payments status deteriorated. Faced with a significant current account deficit, on a convertible currency basis, the National Bank of Yugoslavia suspended sales of foreign exchange to local banks at midyear and restricted the withdrawal from foreign exchange accounts of private individuals. Sales of foreign exchange were severely

TABLE 1

YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989	1990[p]
METALS						
Aluminum:						
Bauxite	thousand tons	3,459	3,394	3,034	3,252	2,952
Alumina	do.	1,117	1,113	[r]1,060	1,170	1,086
Metal ingot:						
Primary		282,000	244,000	260,120	[r]330,535	349,087
Remelted[3]		37,670	37,084	53,229	[r]643	342
Total		319,670	281,084	313,349	[r]331,178	349,429
Antimony:						
Mine and concentrator output:						
Ore, gross weight		61,376	48,449	37,903	[r]42,530	19,715
Sb content of ore		859	834	725	[r]798	409
Concentrate, gross weight		2,746	1,227	1,105	[r]1,259	530
Metal (regulus)		1,842	1,002	1,145	1,081	248
Bismuth, smelter output		21	73	23	40	85
Cadmium, smelter output		259	305	405	[r]471	362
Chromite: Mine and concentrator output:						
Ore, gross weight		8,780	13,172	11,538	[r]12,721	10,843
Concentrate (produced largely from imported ores)		57,593	59,482	46,063	[r]36,263	33,668
Copper:						
Mine and concentrator output:						
Ore, gross weight	thousand tons	27,864	27,745	30,056	30,078	30,169
Cu content of ores		138,544	130,470	103,523	[r]138,931	140,145
Concentrate, gross weight		537,504	513,971	560,192	578,000	578,434
Metal:						
Blister and anodes:						
Primary		196,358	103,399	106,457	[r]101,606	105,908
Remelted[3]		31,525	62,384	65,519	[r]71,394	68,349
Total		227,883	165,783	171,976	173,000	174,257
Refined:						
Primary		99,152	98,805	105,595	[r]101,877	102,221
Remelted[3]		849	40,062	39,781	[r]49,158	49,174
Total		100,001	138,867	145,376	151,035	151,395
Gold, refined	kilograms	4,398	5,348	4,620	[r]3,741	8,190
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	6,618	5,983	5,545	[r]5,081	4,132
Fe content	do.	1,983	1,764	1,844	[r]1,305	1,578
Iron concentrate, gross weight	do.	2,995	3,247	3,332	3,170	2,750
Metal:						
Pig iron	do.	3,063	2,867	2,916	[r]2,896	2,313
Ferroalloys:						
Ferrochromium		68,604	56,276	93,349	[r]90,428	82,687
Ferromanganese		40,051	38,041	45,078	[r]33,868	31,822
Ferronickel		8,647	9,556	15,047	[r]17,102	11,850
Ferrosilicon		99,574	98,843	120,522	[r]122,179	103,188
Silicon metal		31,312	31,915	25,830	[r]15,897	12,661
Ferrosilicomanganese		41,330	42,528	46,804	[r]52,588	60,601

See footnotes at end of table.

TABLE 1—Continued

YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989	1990[p]
METALS—Continued						
Iron and steel—Continued						
Metal—Continued						
Ferroalloys—Continued						
Ferrosilicocalcium		—	487	772	[r]144	835
Ferrosilicochromium		7,513	6,240	3,668	[r]3,815	4,199
Other		6,715	7,584	10,678	[r]11,199	10,462
Total		303,746	291,470	361,748	[r]347,220	318,305
Crude steel:						
From oxygen converters	thousand tons	1,769	1,715	1,913	1,934	1,715
From Siemens-Martin furnaces	do.	1,509	1,301	1,158	1,100	793
From electric furnaces	do.	1,241	1,351	1,416	1,466	1,101
Total	do.	4,519	4,367	4,487	4,500	3,609
Semimanufactures	do.	5,411	6,260	6,066	6,164	4,893
Lead:						
Mine and concentrator output:						
Ore, gross weight (lead-zinc ore)	do.	4,558	3,908	3,847	[r]4,005	3,675
Pb content of ores		114,633	106,670	103,286	[r]107,611	99,148
Concentrate, gross weight		101,033	109,119	104,596	[r]105,271	96,890
Metal:						
Smelter:						
Primary		39,650	118,185	121,607	[r]110,670	90,183
Secondary[4]		28,748	28,423	30,430	[r]30,641	35,888
Total		68,398	146,608	152,037	[r]141,311	126,071
Refined:						
Primary, for domestic use and export		74,963	76,417	70,888	[r]99,616	[e]82,000
Secondary[e]		38,000	36,000	39,000	[r]18,000	17,000
Total		112,963	112,417	109,888	[r]117,616	[e]99,000
Magnesium metal		4,897	5,932	6,176	[r]6,105	5,788
Manganese ore:						
Gross weight		41,283	41,297	40,100	[r]38,920	50,863
Mn content		14,448	14,452	14,036	[r]13,622	17,802
Mercury	kilograms	75,013	67,016	69,980	51,000	37,000
Nickel:[e]						
Mine output:						
Ore, gross weight	thousand tons	270	280	280	[r]290	270
Ni content of ore		3,800	3,900	3,900	[r]4,000	3,800
Concentrate		200,000	200,000	200,000	200,000	200,000
Metal: Ferronickel, Ni content		2,500	2,500	4,000	[r]5,100	3,600
Platinum-group metals:						
Palladium	kilograms	85	132	142	([5])	—
Platinum	do.	33	24	23	[r]23	21
Selenium metal, refined	do.	54,400	66,362	60,812	[r]55,241	59,181
Silver metal, refined including secondary	thousand kilograms	175	165	139	[r]127	105
Uranium:						
Mine output		[e]110,000	110,011	107,365	[r]125,995	80,457
Concentrate		80	83	93	[r]101	58
U_3O_8 content[e]		56	58	65	[6]71	40

See footnotes at end of table.

TABLE 1—Continued

YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1986	1987	1988	1989	1990[p]
METALS—Continued					
Zinc:					
Zn content of lead and zinc ore	99,080	87,352	91,175	r94,739	83,788
Concentrator output, gross weight	98,587	118,904	117,565	r115,520	108,833
Smelter, primary	49,924	51,320	56,316	r55,900	56,734
Refined, primary and secondary:					
Smelter	14,978	9,684	11,234	r12,089	18,252
Electrolytic	67,063	108,383	116,290	r88,450	95,453
Total	82,041	118,067	127,524	r100,539	113,705
INDUSTRIAL MINERALS					
Asbestos, all kinds	7,557	10,964	17,030	9,111	6,578
Barite concentrate	18,250	19,270	23,350	r30,509	23,601
Cement, hydraulic thousand tons	9,127	8,963	8,840	r8,657	7,954
Clays:					
Bentonite	148,447	154,288	125,069	r128,593	102,681
Ceramic clay, crude	307,378	287,887	283,689	r292,784	213,302
Fire clay:					
Crude	148,573	174,124	155,718	r164,076	114,797
Calcined	42,803	42,092	28,188	r30,760	20,291
Kaolin	204,311	218,851	218,673	r260,141	198,513
Feldspar, crude	47,909	44,912	35,614	r42,246	43,490
Gypsum:					
Crude	594,704	553,372	555,231	r545,542	534,644
Calcined	87,803	75,396	81,245	r67,130	56,591
Lime:					
Quicklime thousand tons	1,888	1,790	1,268	r1,625	1,453
Hydrated do.	748	708	725	r782	670
Total do.	2,636	2,498	1,993	r2,407	2,123
Magnesite:					
Crude	428,791	402,976	382,606	r292,302	194,119
Sintered	161,295	149,000	136,746	r144,218	125,440
Caustic calcined	14,420	10,217	11,113	11,682	9,257
Mica, all grades	674	250	807	r794	802
Nitrogen: N content of ammonia thousand tons	814	937	858	680	549
Pumice and related volcanic materials: Volcanic tuff	385,844	423,917	407,988	r431,444	418,123
Quartz, quartzite, glass sand:					
Quartz and quartzite thousand tons	239	260	226	r183	172
Glass sand do.	2,427	2,258	1,798	r3,143	2,448
Total do.	2,666	2,518	2,024	r3,326	2,620
Salt:					
Marine	69,482	64,672	58,286	r59,512	71,345
From brines	282,493	282,650	200,276	r184,461	204,213
Rock	147,652	153,064	126,650	r133,597	99,747
Total	499,627	500,386	385,212	r377,570	375,305
Sand and gravel excluding glass sand thousand cubic meters	21,841	19,778	19,710	r21,066	17,150
Sodium compounds:					
Soda ash	207,968	201,539	213,891	204,050	173,158

See footnotes at end of table.

TABLE 1—Continued

YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1986	1987	1988	1989	1990[p]
INDUSTRIAL MINERALS—Continued					
Sodium compounds—Continued					
Sodium bicarbonate	20,940	19,844	18,016	[r]19,633	15,748
Sodium sulfate	42,581	37,556	41,479	[r]50,533	37,953
Stone excluding quartz and quartzite:					
Dimension:					
Crude:					
Ornamental cubic meters	100,659	97,619	[e]100,000	[r]198,684	93,978
Other do.	1,978	1,585	[e]1,500	[r]4,204	2,613
Partly worked facing thousand square meters	2,847	3,059	3,253	[r]3,264	3,229
Cobblestones, curbstones, other thousand cubic meters	4,259	4,846	[e]5,000	[r]163	11
Dolomite thousand tons	2,306	645	709	[r]960	804
Limestone do.	7,888	7,771	[e]8,000	[e]8,500	[e]8,500
Crushed and broken, n.e.s. thousand cubic meters	2,981	2,861	2,833	[r]3,426	2,912
Milled marble and other do.	5,129	4,486	[e]5,000	[r]7,333	6,729
Sulfur, pyrite and pyrrhotite:					
Pyrite, gross weight thousand tons	758	609	[e]610	[r]697	522
Pyrrhotite, gross weight do.	4	[e]5	[e]6	6	6
Sulfur:					
Sulfur content of pyrite[7] do.	319	256	[e]250	[r]293	219
Sulfur content of pyrrhotite[7] do.	1	2	[e]2	[r]3	[e]3
Byproduct:					
Of metallurgy[e] do.	175	175	170	[r]175	175
Of petroleum[e] do.	3	3	[e]3	[r]4	3
Total do.	498	436	[e]425	[r][e]475	[e]400
Talc:					
Crude	28,000	30,993	29,204	[r]26,614	20,069
Washed	27,815	28,440	27,566	[r]24,590	17,984
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	31,972	35,078	34,797	[r]37,505	30,624
Coal:					
Bituminous thousand tons	407	379	362	293	292
Brown do.	13,099	12,135	11,877	[r]10,314	12,029
Lignite do.	56,626	59,359	60,352	[r]59,896	64,054
Total do.	70,132	71,873	[r]72,591	[r]70,503	76,375
Coke:					
Metallurgical do.	3,092	2,570	2,827	[r]2,955	1,965
Breeze do.	253	220	280	[r]188	183
Foundry do.	149	170	151	[r]143	128
Total do.	3,494	2,960	[r]3,258	[r]3,286	2,276
Gas:					
Manufactured (excluding petroleum refinery gas):					
From coke plants cubic meters	1,459,097	1,527,961	[e]1,480,000	[r]1,127,802	796,946
From lignite gasification plants do.	94,926	29,028	[e]70,000	[r]18,300	18,300
Natural, gross production do.	3,046,670	3,601,181	3,760,097	[r]2,884,172	2,658,922

See footnotes at end of table.

TABLE 1—Continued

YUGOSLAVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1986	1987	1988	1989	1990[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Natural gas plant liquids: Propane and butane	thousand 42-gallon barrels	937	1,173	940	[r]1,045	1,126
Petroleum:						
Crude:						
As reported	thousand tons	4,140	3,867	3,681	[r]3,396	3,145
Converted	thousand 42-gallon barrels	30,665	28,685	27,305	[r]25,191	23,330
Refinery products:						
Liquefied petroleum gas	do.	3,424	4,424	[e]4,000	[r]4,219	4,431
Gasoline	do.	34,603	34,075	35,436	[r]56,400	62,612
White spirit	do.	50	119	[e]100	[r]144	133
Jet fuel	do.	1,870	2,824	2,602	[r]2,263	2,439
Kerosene	do.	835	204	[e]200	[r]213	272
Diesel	do.	27,766	28,062	30,288	[r]25,009	25,039
Paraffin	do.	718	227	[e]200	[r]223	234
Middle distillate fuel oil	do.	558	1,218	[e]1,200	[r]44,837	45,670
Lubricants	do.	4,494	4,830	4,802	[r]5,102	4,799
Residual fuel oil	do.	37,409	39,423	40,772	[e]40,000	[e]40,000
Asphalt and bitumen	do.	3,412	3,776	3,580	[r]3,834	3,386
Petroleum coke	do.	503	318	[e]300	[r]369	388
Other	do.	1,699	2,153	[e]2,000	[r]3,940	3,666
Total	do.	117,341	121,653	125,480	[r]186,553	193,069

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

[1]Table includes data available through Dec. 1991.

[2]In addition to the commodities listed, 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]Includes undetermined quantity of secondary raw material.

[4]Calculated as the difference between reported total and reported primary figure.

[5]Revised to zero.

[6]Reported figure.

[7]Calculated from pyrite and pyrrhotite concentrate using 42% as average sulfur content.

limited to commercial banks with provisions to finance only transactions for raw materials, petroleum, and coking coal imports, as well as the country's obligations on rescheduled debt.[4]

In contrast to exports, the value of imports in 1990 (U.S. dollars as a percentage of total exports and imports) showed a marked downward trend (table 11) compared to those in 1988 and 1989. This trend was consonant with declining trade with former CMEA areas and with Middle East countries during the year.

STRUCTURE OF THE MINERAL INDUSTRY

Table 12 lists the administrative bodies as well as subordinate production units of the main branches of the country's mineral industry in 1990.

TABLE 2

YUGOSLAVIA: SHARE OF SELECTED MINERAL PRODUCTION, BY FEDERAL REPUBLIC, FOR 1990

(Percentage)

Commodity	Republic					
	Bosnia and Hercegovina	Croatia	Macedonia	Montenegro	Serbia	Slovenia
METALS						
Aluminum:						
Bauxite	57.7	10.5	—	30.2	1.6	—
Alumina	68.2	—	—	24.9	—	6.9
Metal, primary	25.6	22.2	1.6	23.1	—	28.5
Antimony	—	—	—	—	100.0	—
Copper:						
Ore and concentrate	—	—	12.3	—	87.7	—
Metal, refined	—	—	—	—	100.0	—
Gold	—	—	—	—	99.8	(1)
Iron ore	98.9	—	1.1	—	—	—

See footnotes at end of table.

TABLE 2—Continued

YUGOSLAVIA: SHARE OF SELECTED MINERAL PRODUCTION, BY FEDERAL REPUBLIC, FOR 1990

(Percentage)

Commodity	Republic					
	Bosnia and Hercegovina	Croatia	Macedonia	Montenegro	Serbia	Slovenia
METALS—Continued						
Lead and zinc ore	16.5	—	36.9	2.6	40.2	3.7
Lead:						
Smelter	(1)	—	25.6	—	55.4	18.8
Refined	—	—	26.7	—	58.5	14.8
Mercury	—	—	—	—	—	100.0
Silver	—	2.4	14.7	—	81.6	1.4
Steel, crude:						
Oxygen converter	52.9	—	—	3.8	43.3	—
Open hearth	61.8	31.9	—	—	6.3	—
Electric furnace	2.8	15.5	16.5	19.4	0.6	45.8
Zinc:						
Smelter, secondary	—	—	100.0	—	—	—
Refined	—	—	45.3	—	53.4	0.7
INDUSTRIAL MINERALS						
Asbestos	80.5	—	—	—	19.5	—
Barite	92.1	7.9	—	—	—	—
Bentonite	—	29.4	65.3	(1)	4.9	—
Cement	10.0	33.0	8.1	—	34.4	14.4
Dolomite	30.9	—	58.1	—	10.9	—
Gypsum	62.7	18.6	10.2	—	8.5	—
Kaolin	21.4	—	—	—	71.8	6.8
Magnesite	4.4	—	—	—	95.6	—
Pumice	—	—	48.7	—	35.8	15.6
Salt, rock and brines	100.0	—	—	—	—	—
MINERAL FUELS						
Coal:						
Bituminous	—	53.0	—	—	47.0	—
Brown	82.8	(1)	—	(1)	5.4	11.4
Lignite	13.3	—	10.4	2.6	67.1	6.6
Natural gas	—	74.8	—	—	24.3	0.9
Petroleum	—	66.1	—	—	33.8	(1)

[1]Less than 0.5.
Source: Industrijska Proizvodnja, 1990.

COMMODITY REVIEW

Metals

Aluminum and Bauxite.—Yugoslavia's bauxite mining, alumina refining, and aluminum smelting facilities were distributed throughout virtually the entire country. Energoinvest operated bauxite mines in the Republics of Bosnia and Hecegovina and Croatia. Rudnici Boksita Niksic operated bauxite mines exclusively in Montenegro. Jadranski Aluminium's (Jadral) operations were entirely in Croatia, and RB Kosovo Klina, entirely in Serbia. The entire output of the latter operation has been exported because of the unsuitability of the bauxite for domestic refineries. Apart from the deposits exploited by RB Kosovo Klina, which contained a refractory-grade diaspore material, the balance of the country's monohydrate (boehmitic) bauxite deposits were suitable for metallurgical end use. These deposits were formed into lenticular or irregular-shaped bodies occurring in Triassic and Eocene carbonate rocks.

Yugoslavia's production of bauxite was not large by world standards, comprising less than 3% of total world output. However, the country's production for 1990 represented 34% of total European output (exclusive of that of the U.S.S.R.). Similarly, Yugoslavia's production of alumina and aluminum in 1990 was 14% and 8%, respectively, of total European production.[5]

Planned aluminum production quotas were met by all domestic producers in 1990, but the industry faced problems during the year owing to increased costs of electricity, which, reportedly, accounted for more than 70% of the primary aluminum production cost.

A new bauxite drying facility was commissioned during the year at Energoinvest's Mostar Aluminum Works in Bosnia and Hercegovina. The new facility, which cost $1.5 million, reportedly, was to add 28,000 tons of recoverable metal to Mostar's existing capacity.

In 1990, Yugoslavia's foreign trade organizations initiated offerings of aluminum ingot on a 5-year contract basis. This was in contrast to past practices when prefinancing or payment up front was stipulated for annual aluminum contracts. This change in policy was based on the redirection of the country's trade from CMEA toward market economy countries. Reportedly, long-term contracts could benefit Yugoslavia's sellers by effectively locking in a premium, following the implementation of the EC's planned reduction of the 6% duty on 99.7% aluminum ingot to 4.2%.[6]

Copper.—The Macedonian and Serbian Republics were Yugoslavia's only copper-producing areas. The largest producer, Rudarsko Toplonicki Bazen's (RTB) Bor mining, beneficiation, and smelting complex in Serbia, accounted for almost 95% of the country's mine output of copper from its Bor, Majdanpek, and Veliki Krivelj open pit mines.

A small amount of copper was mined and beneficiated at Bucim in Macedonia by Rabotna Organizacija za Rudarstvo i Metallurgija za Baker (RZB Bucim). Copper concentrates from RZB Bucim were smelted and refined at the Bor smelting and refining facilities.

In 1990, capital investment at the Bor complex reportedly amounted to about $126 million. These outlays covered facility expansion at the company's mines, beneficiation plant, and smelter. In view of the near exhaustion of the Bor open pit mine, RTB announced at yearend that further development and operation of the Cerovo deposit would commence soon. Reportedly, $37 million had been invested at this site. It was expected that with resources of about 18 Mmt of ore, the Cerovo operation could be exploited for 10 years. Additionally, exploration during the year revealed a relatively large copper ore body near Bor, containing resources of about 600 Mmt of ore grading 0.6% copper. Other deposits were discovered near Mali Krivelj in eastern Serbia and in central Serbia, near Tulari.

Ferroalloys.—In the beginning of October, Dalmacija, ferroalloys and carbide producer at Dugi Rat in Croatia, announced the temporary closure of a 25,000-mt/a ferromanganese furnace and a 38,000-mt/a ferrochromium furnace because of weak market conditions and an unfavorable foreign exchange rate.

Both facilities were placed on a care-and-maintenance basis in the expectation that the ferromanganese unit would reopen in early 1991 and the ferrochromium facility later in the year under more favorable market conditions.

Gold.—Yugoslavia has been a modest producer of gold, in large measure as a byproduct of processing domestic and some imported nonferrous metal ores. Domestic gold mining operations were relatively small in scale. In May, preparation was announced for trial mining operations at the Grabova Reka gold deposit, near Majdanpek in Serbia. The Grabova Reka deposit was found to contain 15,000 tons of ore grading 23.45 g/mt. During the year, two additional gold deposits were announced in Serbia. Resources at the Volujski Kluc deposit were estimated at about 1,440,000 tons of ore, grading 0.28% g/mt. The second deposit at Sveta Barbara was found to contain an estimated resource of 20,000 tons of ore grading 10 g/mt. Reportedly, some placer deposits of gold also remained in the Pek River.

Iron and Steel.—In early 1990, it became apparent that Yugoslavia's steel industry faced a critical financial situation, and its viability was questioned within the context of the country's transition to a market economy.

The Steel Producer's Association of Yugoslavia (Opste Udruzenje Crne Metalurgije Jugoslavije) held two meetings in January with the Government's Federal

TABLE 3

YUGOSLAVIA: EXPORTS OF SELECTED MINERAL COMMODITIES FOR 1990

(Metric tons)

Commodity	Quantity	Principal destination
METALS		
Aluminum:		
Bauxite	506,966	Czechoslovakia (262,237).
Alumina	538,782	U.S.S.R. (462,189).
Metal, unalloyed	195,185	Italy (146,114).
Copper:		
Ore and concentrates	17,479	China (11,175).
Matte	8,576	Belgium (8,576).
Metal, refined	35,830	Italy (18,947).
Iron ore	172,000	Hungary (166,000).
Lead concentrate	13,330	Belgium (7,620).
Manganese, ore and concentrate	5,046	Italy (5,046).
Zinc, concentrate	13,330	Belgium (7,620).
INDUSTRIAL MINERALS		
Fire clay	38,452	Italy (38,452).
Gravel	235,526	Italy (192,093).
Gypsum and anyhydride	46,428	Hungary (46,393).
Magnesite, dead-burned	12,646	Italy (11,124).
Marble:		
Unworked	20,469	Italy (19,615).
Blocks	20,777	Italy (7,615).
Quartz sand	17,241	Italy (11,150).
Pyrite, concentrate	32,724	Federal Republic of Germany, Eastern states (32,573).
Sand, natural	24,916	Austria (24,884).
MINERAL FUELS		
Coal:		
Brown and lignite	67,544	Romania (34,585)
Coke, matallurgical	91,357	Algeria (35,867).

Source: Statistics of Foreign Trade of the SFR Yugoslavia, Year 1990, Belgrade, 1991.

TABLE 4

YUGOSLAVIA: IMPORTS OF SELECTED MINERAL COMMODITIES FOR 1990

(Metric tons)

Commodity	Quantity	Principal source
METALS		
Aluminum:		
Bauxite	439,520	Guinea (213,834).
Alumina	245,341	Italy (115,940).
Metal, primary	13,685	U.S.S.R. (8,479).
Chromite:		
Less than 28% Cr_2O_3	17,754	Albania (17,771).
More than 28% Cr_2O_3	265,847	Turkey (120,070).
Copper, refined	7,539	Chile (4,179).

See footnotes at end of table.

TABLE 4—Continued

YUGOSLAVIA: IMPORTS OF SELECTED MINERAL COMMODITIES FOR 1990

(Metric tons)

Commodity	Quantity	Principal source
METALS—Continued		
Ferroalloys:		
Ferromanganese	6,856	Czechoslovakia (1,588).
Ferrosilicomanganese	245	Hungary (194).
Ferrochromium	2,970	East Germany (1,467).
Ferrosilicochromium	3,963	U.S.S.R. (3,178).
Ferronickel	151	Austria (80).
Ferrosilicon	5,013	U.S.S.R. (2,178).
Other ferroalloys	2,131	Austria (596).
Lead, concentrate	6,173	Greece (6,168).
Magnesium	859	U.S.S.R. (320).
Manganese, ore and concentrate	96,127	Botswana (30,313).[1]
Nickel, metal	900	Canada (307).
Pig iron	91,123	U.S.S.R. (19,092).
Tin	116	Federal Republic of Germany, Eastern states (78).
Titanium	23,701	Australia (23,701).
Zinc:		
Concentrate	55,430	West Germany (15,533).
Metal	8,838	Bulgaria (3,628).
INDUSTRIAL MINERALS		
Asbestos	28,323	U.S.S.R. (17,068).
Cement	187,371	Hungary (102,070).
Graphite	1,802	Czechoslovakia (995).
Magnesite:		
Crude	17,760	Turkey (17,739).
Deadburned	8,034	Italy (2,880).
Pyrite, ore and concentrate	3,632	Hungary (3,583).
Salt	218,526	Romania (199,937).
Silica sand	114,702	Hungary (51,904).
Sulfur, crude	140,056	Poland (97,479).
MINERAL FUELS		
Coal:		
Anthracite	174,121	U.S.S.R. (173,810).
Bituminous coal	3,085,298	U.S.S.R. (1,959,337).
Brown coal and lignite	30,852	Czechoslovakia (8,018).
Coke	34,889	Italy (20,703).
Natural gas	2,650,845	U.S.S.R. (2,573,691).
Petroleum	11,995,845	U.S.S.R. (6,082,291).

[1]Presumably originating in the Republic of South Africa, via the Common Customs Union.
Source: Statistics of Foreign Trade of the SFR Yugoslavia, Year 1990, Belgrade, 1991.

Executive Council (FEC) to discuss problems facing the steel industry. According to the steel industry's experts, the major issues negatively impacting Yugoslavia's steel industry included the lack of control of financial assets (the industry controlled only about 20% of its own working capital); the elimination of credits to finance raw material imports, as well as special credits designated for the payment of wages; and increasing reluctance by commercial banks to transact business with steel companies. Industry leaders also told FEC representatives that calculations adopted in November 1989 to the establish steel industry prices for 1990 were based on an incorrect exchange rate with the West German Deutsche Mark (DM), which was significantly at variance with a similar exchange rate set to establish infrastructural prices. According to industry spokespersons, this disparity was very disadvantageous to the country's steel industry. FEC representatives indicated general agreement with these views, but also stated that a recalculation of prices would not solve the industry's liquidity problems and that closures and/or production stoppages to eliminate inefficiencies were a part of the restructuring process.[7]

Later in the year, British Steel Consulting Ltd., contracted by the Steel Producers Association of Yugoslavia, concluded a study on restructuring Yugoslavia's steel industry.

The study pointed out that Yugoslavia's steel industry was significantly more efficient that those of other eastern European countries because of a much higher proportion of installed modern technology and a larger base of trading partners in hard currency areas. The study recommended that the Government of Yugoslavia establish a holding company to implement a restructuring program. The restructuring program would include closure of plants using outmoded technology (e.g., openhearth furnaces); the privatization of small, profitable operations; and the creation of two or three large, integrated steel mills. The steel industry's work force would be reduced from about 83,000 employees to 35,000. To make Yugoslavia's steel industry competitive with those in the EC, the study also recommended an investment of about $450 million through 1995 mainly for new technology and management knowhow. At yearend, the Government of Yugoslavia indicated that British Steel's report would be given considerable study.

The issue of liquidity had a direct bearing on the cutback of electric power in March to the Zenica Mining, Beneficiation and Smelting Complex (Rudarsko Metalurski Kombinat Zenica). The electric power industry in Bosnia and Hercegovina reduced electric power deliveries to the Zenica operation after the latter failed to repay a substantial debt. This action idled about 10,000 workers and reduced steel output by 2,000 mt/d. Furthermore, in May, more than 5,000 miners went on strike at Zenica because of the company's failure to pay March wages.

The Smederevo steel mill in Serbia be-

TABLE 5

YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	—	161	—	All to Italy.
Aluminum:				
Ore and concentrate	639,528	600,084	—	Czechoslovakia 247,488; U.S.S.R. 261,053; Romania 132,371.
Oxides and hydroxides	224,832	679,975	—	U.S.S.R. 412,627; Italy 48,327; Austria 46,253.
Metal including alloys:				
Scrap	1,594	1,388	—	Italy 726; West Germany 508; Switzerland 152.
Unwrought	152,961	163,255	41	Italy 78,058; East Germany 33,812; France 22,890.
Semimanufactures	90,150	85,696	11,489	Czechoslovakia 13,861; West Germany 11,658; Italy 11,534.
Bismuth: Metal including alloys, all forms	22	1	—	All to Belgium-Luxembourg.
Cadmium: Metal including alloys, all forms	120	318	—	Switzerland 212; Netherlands 39; Czechoslovakia 32.
Chromium:				
Ore and concentrate	2,459	3,124	—	Mainly to Switzerland.
Oxides and hydroxides	17	—		
Cobalt: Metal including alloys, all forms	—	7	—	All to West Germany.
Columbium and tantalum: Tantalum metal including alloys, all forms	1	([2])	—	Do.
Copper:				
Ore and concentrate	11,722	6,191	2	Japan 3,596; Bulgaria 2,540.
Matte and speiss including cement copper	4,902	2,245	—	Belgium-Luxembourg 1,556; Bulgaria 609; Laos 78.
Sulfate	7,545	9,360	3,135	Equatorial Guinea 1,499; Turkey 1,009.
Metal including alloys:				
Scrap	4,326	1,672	—	Italy 1,399; West Germany 179.
Unwrought	26,520	35,079	5,599	Italy 14,385; West Germany 2,894.
Semimanufactures	42,693	37,159	2,744	West Germany 6,574; India 5,914; Italy5,464.
Gold: Metal including alloys, unwrought and partly unwrought	$17,050	$15,499	$1,881	Switzerland $7,566; West Germany $5,805.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	5	7	—	Malta 4; Austria 1.
Pyrite, roasted	62,528	46,518	—	Hungary 34,448; Austria 12,070.
Metal:				
Scrap	361,815	228,049	—	Italy 172,424; West Germany 44,474.
Pig iron, cast iron, related materials	17,101	34,827	—	Italy 28,087; West Germany 2,849.
Ferroalloys:				
Ferrochromium	63,365	70,656	34,762	Italy 12,372; Austria 6,277.
Ferromanganese	15,244	7,897	2,120	Italy 4,081; Albania 1,323.
Ferronickel	12,818	15,650	—	West Germany 9,858; Austria 1,697; Belgium-Luxembourg 1,147.
Ferrosilicomanganese	33,741	25,825	18,660	Italy 3,893; Austria 2,020.
Ferrosilicon	77,417	83,846	2,899	Italy 18,128; Turkey 13,561; Iran 10,931.
Silicon metal	18,463	9,654	—	West Germany 4,283; Italy 1,711; U.S.S.R. 1,499.
Unspecified	4,228	5,037	—	Iran 2,368; West Germany 1,664.
Steel, primary forms	119,740	97,367	—	Italy 63,816; Poland 11,656.

See footnotes at end of table.

TABLE 5—Continued

YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989: United States	Destinations, 1989: Other (principal)
METALS—Continued				
Iron and steel—Continued				
Metal—Continued				
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	452,627	216,049	—	Turkey 110,303; Italy 53,390; Austria 12,652.
Clad, plated, coated	32,592	21,725	—	China 14,128; Spain 1,947; U.S.S.R. 932.
Of alloy steel	18,055	20,179	330	Italy 8,631; Czechoslovakia 3,507; West Germany 2,459.
Bars, rods, angles, shapes, sections	851,443	494,246	—	Turkey 95,064; Italy 90,033; West Germany 79,259.
Rails and accessories	23,146	13,756	—	Turkey 7,559; Romania 3,042; Greece 1,836.
Wire	43,542	38,365	1	Italy 24,245; Greece 7,381; Czechoslovakia 4,097.
Tubes, pipes, fittings	248,386	173,856	3,795	Italy 45,892; West Germany 38,546; East Germany 16,913.
Lead:				
Ore and concentrate	1,140	12,059	—	Bulgaria 3,790; Italy 3,659; U.S.S.R. 3,050.
Oxides	7	8	—	U.S.S.R. 4; Iraq 3.
Metal including alloys:				
Scrap	—	101	—	All to Italy.
Unwrought	11,102	19,707	—	Czechoslovakia 6,882; Italy 4,232; Greece 2,852.
Semimanufactures	587	313	—	Italy 168; U.S.S.R. 67.
Magnesium: Metal including alloys:				
Scrap	15	51	—	West Germany 30; Italy 20.
Unwrought	3,970	3,695	—	West Germany 1,924; Belgium-Luxembourg 369.
Manganese:				
Ore and concentrate: Metallurgical-grade	—	946	—	All to Italy.
Metal including alloys, all forms	5	(2)	—	All to Iraq.
Mercury	27	5	—	All to Liechtenstein.
Nickel:				
Ore and concentrate	—	(2)	—	Mainly to Canada.
Metal including alloys:				
Scrap	12	—		
Semimanufactures	—	2	—	All to West Germany.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified	—	(2)	—	Mainly to Libya.
value, thousands	$12	$19	—	All to Austria.
Selenium, elemental	40	67	21	Netherlands 45.
Silver: Metal including alloys, unwrought and partly wrought kilograms	79,000	77,000	31,000	West Germany 24,000; Czechoslovakia 6,000.
Tin: Metal including alloys:				
Unwrought	13	11	—	Mainly to Italy.
Semimanufactures	1	$8k	—	U.S.S.R. $4: Iraq $2.
Titanium: Oxides	7,148	6,749	—	West Germany 4,447; Italy 1,851.
Tungsten:				
Unwrought including waste and scrap	11	—		
Semimaufactures	—	(2)	—	All to Algeria.
Zinc:				
Ore and concentrate	1,735	4,117	—	Belgium-Luxembourg 3,667; Austria 449.
Oxides	3,022	1,505	—	Hungary 1,359; Italy 145.

See footnotes at end of table.

TABLE 5—Continued

YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989	
			United States	Other (principal)
METALS—Continued				
Zinc—Continued				
Metal including alloys:				
Scrap	583	24	—	Mainly to Italy.
Unwrought	22,394	15,350	—	Czechoslovakia 9,283; East Germany 4,850.
Semimanufactures	2,402	6,423	—	Czechoslovakia 4,317; Netherlands 506.
Other:				
Ores and concentrates	—	(2)	—	All to U.S.S.R.
Oxides and hydroxides	812	657	—	Sweden 545; West Germany 100.
Ashes and residues	2,389	1,473	—	Italy 725; Austria 574; West Germany 133.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	72	259	—	U.S.S.R. 238; Iceland 20.
Artificial:				
Corundum	18,201	17,267	—	Italy 7,054; West Germany 4,928; Romania 1,462.
Silicon carbide	2,077	4,292	—	West Germany 3,180; Italy 423.
Dust and powder of precious and semi-precious stones including diamond, value, thousands	—	$2	—	All to Austria.
Grinding and polishing wheels and stones	4,250	4,042	179	West Germany 641; Egypt 612; France 596.
Asbestos, crude	203	1,119	—	Albania 1,029; Spain 41.
Barite and witherite	10,095	9,136	—	Hungary 7,067; Cuba 2,069.
Boron materials:				
Crude natural borates	—	(2)	—	Mainly to Algeria.
Oxides and acids	—	301	—	All to Hungary.
Cement	825,176	786,986	307	Italy 628,594; West Germany 35,013.
Chalk	160	313	—	Hungary 212; U.S.S.R. 100.
Clays, crude:				
Bentonite	2,792	11,633	—	Poland 9,152; Sudan 1,499.
Chamotte earth	—	(2)	—	Mainly to Libya.
Fire clay	460	NA		
Kaolin	777	193	—	Italy 190; Austria 2.
Unspecified	3	20,952	—	Italy 20,869; Bulgaria 55.
Cryolite and chiolite	10	16	—	Malta 14; Austria 2.
Diamond, natural: Industrial stones value, thousands	—	(2)	—	All to Cuba.
Diatomite and other infusorial earth	712	687	—	Austria 686.
Feldspar	3,576	4,635	—	Greece 3,917; Hungary 694.
Fertilizer materials:				
Crude, n.e.s.	37	134	—	Iraq 49; United Kingdom 39; West Germany 23.
Manufactured:				
Ammonia	17,054	6,518	—	Italy 6,514; Iraq 2; U.S.S.R. 1.
Nitrogenous	294,964	337,494	26,514	West Germany 109,848; China 58,568.
Phosphatic	98,746	58,276	—	Austria 29,902; Bulgaria 19,424; Czechoslovakia 5,740.
Unspecified and mixed	494,666	602,728	—	West Germany 198,431; Nigeria 121,901; Hungary 56,642.
Graphite, natural	3	(2)	—	All to U.S.S.R.
Gypsum and plaster	16,158	8,163	—	Hungary 7,969; U.S.S.R. 157.
Iodine	(2)	—		

See footnotes at end of table.

TABLE 5—Continued

YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989: United States	Destinations, 1989: Other (principal)
INDUSTRIAL MINERALS—Continued				
Lime	34,804	33,321	—	Hungary 20,136; Italy 10,013.
Magnesium compounds:				
Magnesite, crude	—	1	—	All to Italy.
Oxides and hydroxides	7,510	16,027	—	Italy 12,144; Albania 2,778.
Mica: Worked including agglomerated splittings	—	(2)	—	All to Iraq.
Phosphates, crude	—	2	—	All to U.S.S.R.
Pigments, mineral: Iron oxides and hydroxides, processed	34	759	—	West Germany 616; Italy 142.
Pyrite, unroasted	36,928	30,212	—	All to West Germany.
Salt and brine	83	34	—	Iraq 30; U.S.S.R. 2.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	30,722	37,802	—	West Germany 15,716; Italy 12,064; Hungary 3,850.
Sulfate, manufactured	2,036	1,758	—	Greece 679; Bulgaria 638; Italy 439.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	114,355	76,741	42	Italy 61,092; Czechoslovakia 8,090.
Worked	12,782	18,609	429	Austria 5,725; West Germany 5,029; Italy 2,348.
Dolomite, chiefly refractory-grade	833	1,176	—	Mainly to Austria.
Gravel and crushed rock	37,250	92,910	(3)	Italy 59,943; West Germany 15,820.
Limestone other than dimension	—	21	—	All to Austria.
Quartz and quartzite	1,234	1	—	Mainly to Iraq.
Sand other than metal-bearing	26,959	44,535	—	Austria 28,204; Italy 8,712; Greece 5,831.
Sulfur:				
Elemental:				
Crude including native and byproduct	30	246	—	All to Italy.
Dioxide	31	18	—	All to Hungary.
Sulfuric acid	21,600	17,778	—	Italy 10,782; Austria 3,422; Bulgaria 2,567.
Talc, steatite, soapstone, pyrophyllite	18	(2)	—	Mainly to U.S.S.R.
Other:				
Crude	6,760	6,578	—	Austria 5,643; Switzerland 323.
Slag and dross, not metal-bearing	11,037	6,924	—	Italy 5,178; Austria 1,466.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	40,241	28,827	—	Italy 19,212; Austria 9,437.
Carbon black	—	1,188	—	East Germany 1,144; West Germany 43.
Coal:				
Anthracite	2	(2)	—	Mainly to Iraq.
Briquets of anthracite and bituminous coal	—	(2)	—	Mainly to Iraq.
Lignite including briquets	45,625	349	—	All to Italy.
Coke and semicoke	446,575	175,202	1,666	Romania 94,291; Italy 25,113.
Peat including briquets and litter	498	64	—	All to Italy.
Petroleum:				
Refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	405	521	—	West Germany 266; Italy 148; Panama 61.
Gasoline do.	3,684	3,584	(2)	Italy 1,765; West Germany 917; Hungary 536.
Mineral jelly and wax do.	52	39	—	Italy 19; West Germany 16; Switzerland 2.
Kerosene and jet fuel do.	248	269	32	U.S.S.R. 47; United Kingdom 38.

See footnotes at end of table.

TABLE 5—Continued

YUGOSLAVIA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Distillate fuel oil	thousand 42-gallon barrels	283	897	2	West Germany 427; Austria 318; Italy 81.
Lubricants	do.	1,663	1,700	(2)	Austria 1,477; Italy 76.
Residual fuel oil	do.	935	1,683	40	West Germany 633; Italy 579; Panama 230.
Bitumen and other residues	do.	627	608	—	Austria 418; Italy 189.
Bituminous mixtures	do.	14	13	—	Austria 6; Djibouti 3; U.S.S.R. 2.
Petroleum coke	do.	3	69	—	Italy 66; Iran 3.

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include blue powder.

TABLE 6

YUGOSLAVIA: EXPORTS OF SELECTED MINERAL COMMODITIES AFTER PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
METALS					
Aluminum:					
Oxides and hydroxides		291,270	7,103	—	All to Netherlands.
Metal including alloys:					
Unwrought		—	2,144	—	Italy 1,839; Japan 305.
Semimanufactures		6,158	11,033	1,640	West Germany 2,177; Canada 1,627; Cuba 1,428.
Cadmium: Metal including alloys, all forms		5	—		
Chromium: Metal including alloys, all forms		—	2	—	All to Belgium-Luxembourg.
Cobalt: Metal including alloys, all forms	value, thousands	$10	—		
Copper: Metal including alloys:					
Scrap		50	96	—	All to Italy.
Unwrought		25,956	25,311	285	United Kingdom 11,630; Italy 7,316; Greece 3,072.
Semimanufactures		5,278	11,771	441	U.S.S.R. 5,857; Czechoslovakia 1,651; Cuba 1,449.
Gold: Metal including alloys, unwrought and partly wrought	value, thousands	$5,449	$1,623	—	Bulgaria $1,099; United Kingdom $344; Switzerland $178.
Iron and steel: Metal:					
Scrap		3,542	8,590	—	Italy 3,201; Switzerland 2,566; Austria 1,437.
Ferroalloys:					
Ferrochromium		6,441	3,238	334	Belgium-Luxembourg 1,228; Austria 1,057; West Germany 598.
Ferrosilicomanganese		—	17,285	13,085	Turkey 4,200.
Ferrosilicon		—	789	—	Austria 675; Belgium-Luxembourg 114.
Unspecified		123	29	—	West Germany 17; France 12.
Steel, primary forms		7,485	7,348	—	Bulgaria 3,884; Hungary 3,464.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		366,047	497,072	52	U.S.S.R. 322,034; Austria 52,475; Italy 43,097.

See footnotes at end of table.

TABLE 6—Continued

YUGOSLAVIA: EXPORTS OF SELECTED MINERAL COMMODITIES AFTER PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989: United States	Destinations, 1989: Other (principal)
METALS—Continued				
Iron and steel: Metal—Continued				
Semimanufactures—Continued				
Flat-rolled products—Continued				
Of iron or nonalloy steel—Continued				
Clad, plated, coated	84,519	86,221	—	U.S.S.R. 61,193; West Germany 10,944; East Germany 8,243.
Of alloy steel	—	83	—	Italy 46; Austria 37.
Bars, rods, angles, shapes, sections	77,416	150,177	—	U.S.S.R. 112,713; Turkey 13,037; Austria 11,972.
Rails and accessories	260	105	—	All to Bulgaria.
Wire	2,944	10,078	—	Italy 7,250; Czechoslovakia 909; West Germany 792.
Tubes, pipes, fittings	41,267	34,318	—	Hungary 13,507; Czechoslovakia 6,801; Poland 6,541
Lead: Metal including alloys, unwrought	10,140	7,436	—	Switzerland 4,462; United Kingdom 1,633; Czechoslovakia 595.
Manganese: Metal including alloys, all forms value, thousands	$15	—		
Silver: Metal including alloys, unwrought and partly wrought	28	19	—	United Kingdom 9; Switzerland 7; Bulgaria 2.
Zinc:				
Blue powder	640	198	—	All to United Kingdom.
Metal including alloys:				
Unwrought	36,426	27,288	1,096	United Kingdom 18,141; Switzerland 5,849; Spain 1,371.
Semimanufactures	3,032	3,289	—	West Germany 2,883; Austria 377.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Artificial, corundum	903	495	—	All to West Germany.
Cement	—	21,328	—	Do.
Fertilizer materials: Manufactured:				
Nitrogenous	—	25,935	—	Bulgaria 6,667; Austria 5,367; Jordan 4,000.
Unspecified and mixed	21,608	38,320	—	Hungary 20,550; West Germany 9,384; France 8,386.
Stone, sand and gravel: Dimension stone, worked	9	2	—	All to Austria.
Sulfur: Sulfuric acid	3,315	11,999	—	All to Bulgaria.
MINERAL FUELS AND RELATED MATERIALS				
Coke and semicoke	233,824	433,167	73,555	Hungary 142,114; U.S.S.R. 90,909.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	94	39	—	Panama 35; Switzerland 4.
Gasoline do.	744	265	—	United Kingdom 209; Switzerland 55.
Kerosene and jet fuel do.	49	22	—	All to United Kingdom.
Distillate fuel oil do.	1,512	733	—	United Kingdom 449; Panama 284.
Lubricants do.	1	1	—	All to East Germany.
Residual fuel oil do.	1,089	—		

[1]Table prepared by staff, International Data Section.

TABLE 7

YUGOSLAVIA: EXPORTS OF SELECTED MINERAL COMMODITIES FOR PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989: United States	Destinations, 1989: Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides value, thousands	$15	—		
Metal including alloys:				
Scrap	—	39	—	All to West Germany.
Unwrought	782	1,688	—	West Germany 1,683; Italy 5.
Semimanufactures	24	57	—	West Germany 55; Austria 2.
Copper:				
Matte and speiss including cement copper	—	5,859	—	Belgium-Luxembourg 5,000; Bulgaria 859.
Metal including alloys:				
Scrap	365	383	—	Italy 294; France 55; West Germany 33.
Unwrought	1,080	203	—	Austria 108; Hungary 87; France 8.
Semimanufactures	934	1,126	—	Italy 563; Bulgaria 442; Italy 122.
Gold:				
Waste and sweepings value, thousands	—	$46	—	All to West Germany.
Metal including alloys, unwrought and partly wrought do.	$307	$136	—	Do.
Iron and steel: Metal:				
Scrap	124,068	539	—	West Germany 503; Italy 36.
Steel, primary forms	14,089	—		
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	13,616	9,598	—	West Germany 9,361; Italy 237.
Clad, plated, coated	1	5	—	All to Hungary.
Of alloy steel	8	—		
Bars, rods, angles, shapes, sections	19	3	—	All to West Germany.
Wire	1	1	—	Mainly to Switzerland.
Tubes, pipes, fittings	15	14	—	All to West Germany.
Lead:				
Ore and concentrate	5,860	4,979	—	All to Bulgaria.
Metal including alloys, unwrought	515	754	—	Belgium-Luxembourg 728; Austria 26.
Nickel: Scrap	2	—		
Platinum-group metals:				
Waste and sweepings value, thousands	$5,898	$506	—	West Germany $325; Italy $140; United Kingdom $41.
Metals including alloys, unwrought and partly wrought:				
Platinum do.	$756	$609	—	United Kingdom $370; West Germany $238.
Unspecified do.	$355	$79	—	All to West Germany.
Silver:				
Waste and sweepings[2] do.	$149	$197	—	Do.
Metal including alloys, unwrought and partly wrought	10	18	—	Poland 16; West Germany 1.
Tin: Metal including alloys, scrap	2	—		
Tungsten: Metal including alloys, unwrought including waste and scrap	26	—		
Uranium and thorium: Uranium metal including alloys, all forms	111	147	147	

See footnotes at end of table.

TABLE 7—Continued

YUGOSLAVIA: EXPORTS OF SELECTED MINERAL COMMODITIES FOR PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Destinations, 1989: United States	Destinations, 1989: Other (principal)
METALS—Continued				
Zinc: Blue powder	152	—		
Other:				
Oxides and hydroxides	12	—		
Ashes and residues	179	233	—	Austria 232; West Germany 1.
INDUSTRIAL MINERALS				
Abrasives: Artificial: Silicon carbide	(3)	130	—	All to West Germany.
Chalk	—	3	—	France 2.
Clays, crude: Kaolin	1	4	—	All to France.
Gypsum and plaster	—	20	—	All to East Germany.
Magnesium compounds: Oxides and hydroxides value, thousands	r$3	—		
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	26	—		
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	—	1	—	All to United Kingdom.
Petroleum refinery products:				
Gasoline, aviation 42-gallon barrels	91,443	58,557	—	All to Hungary.
Lubricants do.	59,381	42,595	—	Hungary 40,418; Austria 2,177.

rRevised.
[1]Table prepared by staff, International Data Section.
[2]May include other precious metals.
[3]Less than unit.

TABLE 8

YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	6	2	(2)	Austria 1.
Alkaline-earth metals	223	124	—	U.S.S.R. 85; France 39.
Aluminum:				
Ore and concentrate	364,761	691,925	210	Guinea 540,490; Australia 82,904.
Oxides and hydroxides	128,230	196,112	3	Italy 69,667; India 24,079; Australia 22,205.
Metal including alloys:				
Scrap	—	448	—	Mainly from U.S.S.R.
Unwrought	19,657	13,842	1	U.S.S.R. 8,898; Romania 3,947.
Semimanufactures	8,077	9,456	28	U.S.S.R. 5,330; West Germany 1,509.
Antimony: Metal including alloys, all forms	66	66	—	West Germany 51; Austria 7; China 7.
Arsenic:				
Oxides and acids	167	179	—	West Germany 133; Belgium-Luxembourg 21; France 12.
Metal including alloys, all forms	39	67	—	China 20; U.S.S.R. 15; United Kingdom 15.
Beryllium: Metal including alloys, all forms value, thousands	$30	$7	(2)	Mainly from West Germany.
Bismuth: Metal including alloys, all forms	30	22	10	Belgium-Luxembourg 6; Switzerland 3.

See footnotes at end of table.

TABLE 8—Continued

YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989	
			United States	Other (principal)
METALS				
Chromium:				
Ore and concentrate	288,006	330,979	—	Turkey 200,356; Albania 70,603; U.S.S.R. 49,895.
Oxides and hydroxides	632	656	—	U.S.S.R. 287; China 150; Poland 119.
Metal including alloys, all forms	11	18	—	West Germany 10; China 8.
Cobalt:				
Ore and concentrate	—	$1	—	All from France.
Oxides and hydroxides	50	47	—	Netherlands 17; United Kingdom 17; Finland 6.
Metal including alloys, all forms	19	73	3	Zaire 25; West Germany 13; Switzerland 13.
Columbium and tantalum:				
Ore and concentrate	—	3	—	Austria 2.
Metal including alloys, all forms, tantalum	1	2	(2)	Mainly from West Germany.
Copper:				
Sulfate	2,892	2,907	—	U.S.S.R. 2,906; West Germany 1.
Metal including alloys:				
Scrap	11	508	(2)	U.S.S.R. 487; Albania 17; Poland 4.
Unwrought	20,256	20,594	—	Chile 11,104; Zambia 3,499; Zaire 3,040.
Semimanufactures	12,582	15,404	33	Poland 8,096; Zambia 2,468; West Germany 1,394.
Germanium: Metal including alloys, value, thousands	(2)	$6	—	Mainly from France.
Gold: Metal including alloys, unwrought and partly wrought	$1,766	$1,838	$1,016	West Germany $485; Switzerland $250.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	1,485,638	2,305,488	—	Brazil 820,505; U.S.S.R. 506,456; Peru 465,445.
Metal:				
Scrap	746,283	646,385	21,013	U.S.S.R. 484,702; Poland 42,998; Bulgaria 24,327.
Pig iron, cast iron, related materials	41,042	113,468	966	U.S.S.R. 71,057; Italy 12,156.
Ferroalloys:				
Ferrochromium	204	287	—	West Germany 239; Sweden 38.
Ferromanganese	1,561	2,997	—	West Germany 1,439; Italy 720; Switzerland 338.
Ferronickel value, thousands	$3	—		
Ferrosilicochromium	677	3,053	—	U.S.S.R. 1,844; Belgium-Luxembourg 1,092.
Ferrosilicomanganese	58	52	—	Mainly from Bulgaria.
Ferrosilicon	959	3,066	49	West Germany 977; Belgium-Luxembourg 727; U.S.S.R. 636.
Silicon metal	436	936	1	West Germany 677; Brazil 215.
Unspecified	2,753	2,918	(2)	West Germany 1,028; Austria 867.
Steel, primary forms	393,589	512,194	—	U.S.S.R. 377,816; Czechoslovakia 51,469.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	454,039	535,273	10	Czechoslovakia 169,895; West Germany 91,659; Austria 55,620.
Clad, plated, coated	11,065	69,750	773	West Germany 31,277; Italy 10,535; Austria 7,072.
Of alloy steel	29,783	33,730	200	West Germany 15,630; Italy 8,283; France 2,444.
Bars, rods, angles, shapes, sections	127,528	106,801	7	Poland 31,881; Czechoslovakia 23,834; Italy 10,829.
Rails and accessories	4,472	4,642	—	Poland 2,374; West Germany 1,033; Austria 541.
Wire	23,955	27,612	(2)	Poland 5,699; U.S.S.R. 4,915; West Germany 4,419.
Tubes, pipes, fittings	47,438	65,635	2,250	West Germany 23,654; East Germany 16,578; Italy 7,440.

See footnotes at end of table.

TABLE 8—Continued

YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989 United States	Sources, 1989 Other (principal)
METALS—Continued				
Lead:				
Ore and concentrate	20,008	6,044	—	All from Greece.
Oxides	5,954	6,729	—	Austria 4,060; East Germany 1,327; Bulgaria 645.
Metal including alloys:				
Scrap	509	3,056	—	Switzerland 2,596; Austria 271.
Unwrought	8,578	5,343	—	Spain 3,000; Italy 1,004; West Germany 700.
Semimanufactures	29	16	1	West Germany 10; Italy 4.
Magnesium: Metal including alloys:				
Scrap	(2)	(2)	—	All from Switzerland.
Unwrought	(2)	94	—	Netherlands 41; West Germany 33; Belgium-Luxembourg 20.
Semimanufactures	42	27	—	West Germany 22; France 4.
Manganese:				
Ore and concentrate, metallurgical-grade	130,587	93,015	—	Gabon 36,985; Botswana 31,163; U.S.S.R. 24,365.
Oxides	406	503	(2)	Greece 202; Belgium-Luxembourg 182; West Germany 57.
Metal including alloys, all forms	478	294	34	France 68; West Germany 52; Netherlands 51.
Mercury	48	29	—	West Germany 20; Italy 4; Austria 3.
Molybdenum:				
Ore and concentrate	—	28	—	All from Canada.
Metal including alloys:				
Unwrought	(2)	2	1	United Kingdom 1.
Semimanufactures	20	24	(2)	Austria 13; Hungary 4; Japan 2.
Nickel: Metal including alloys:				
Scrap	—	$6	—	Mainly from Austria.
Unwrought	1,681	884	(2)	Canada 323; U.S.S.R. 268; West Germany 83.
Semimanufactures	503	639	1	United Kingdom 185; West Germany 175; U.S.S.R. 175.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:				
Palladium value, thousands	$1,817	$2,279	(2)	Austria $699; West Germany $529; United Kingdom $474.
Rare earth metals including alloys, all forms	66	61	—	U.S.S.R. 60; Austria 1.
Selenium: Elemental	(2)	1	—	Mainly from West Germany.
Silver:				
Metal including alloys, unwrought and partly wrought kilograms	14,000	11,000	(3)	Austria 7,000; West Germany 3,000.
Tellurium, elemental and boron value, thousands	$14	$43	—	West Germany $29; Austria $14.
Tin: Metal including alloys:				
Scrap	—	(2)	—	Mainly from Denmark.
Unwrought	1,456	1,134	—	Malaysia 850; West Germany 121.
Semimanufactures	25	23	—	West Germany 21; Italy 1.
Titanium:				
Ore and concentrate	46,058	52,518	—	Australia 47,132; Malaysia 4,986.
Oxides	1,979	1,623	18	Poland 712; China 305; West Germany 258.
Metal including alloys:				
Unwrought including waste and scrap	(2)	(2)	—	All from West Germany.
Semimanufactures	6	28	(2)	Italy 21; West Germany 3; Austria 2.
Tungsten: Metal including alloys:				
Unwrought	27	4	(2)	Austria 3; West Germany 1.
Semimanufactures	9	9	(2)	Hungary 3; Japan 2; Austria 1.

See footnotes at end of table.

TABLE 8—Continued

YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989: United States	Sources, 1989: Other (principal)
METALS—Continued				
Uranium and thorium: Oxides and other compounds value, thousands	$1	$2	—	Canada $1; West Germany $1.
Vanadium: Metal including alloys, all forms	—	$1	—	All from West Germany.
Zinc:				
Ore and concentrate	45,402	54,079	—	Peru 13,324; Greece 12,153; Mexico 9,477.
Oxides	1,453	1,234	—	Czechoslovakia 550; Austria 384; West Germany 214.
Metal including alloys:				
Scrap	—	32	3	U.S.S.R. 21; West Germany 8.
Unwrought	7,756	13,799	62	Bulgaria 6,841; Algeria 2,661; West Germany 1,668.
Semimanufactures[4]	366	233	—	West Germany 168; Austria 26; France 25.
Zirconium:				
Ore and concentrate	735	296	86	Austria 114; West Germany 44.
Metal including alloys:				
Unwrought including waste and scrap	5	10	—	Mainly from Switzerland.
Semimanufactures	38	1	([2])	Mainly from West Germany.
Other:				
Ores and concentrates	2,044	1,117	—	Turkey 589; U.S.S.R. 525; Austria 4.
Oxides and hydroxides	601	570	([2])	U.S.S.R. 213; West Germany 104; Netherlands 67.
Ashes and residues	227	2,295	—	Austria 1,358; Switzerland 937.
Base metals including alloys, all forms	13	8	1	West Germany 5; Austria 2.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	1,419	1,165	—	Italy 575; Turkey 560.
Artificial:				
Corundum	2,445	2,012	3	Austria 821; Poland 247; Italy 300.
Silicon carbide	1,693	1,632	—	West Germany 850; Poland 489; U.S.S.R. 210.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$1,663	$1,668	$28	Switzerland $547; Belgium-Luxembourg $426; Romania $244.
Grinding and polishing wheels and stones	641	847	4	Austria 387; Italy 196; West Germany 112.
Asbestos, crude	38,456	36,613	2	U.S.S.R. 19,245; Zimbabwe 10,068; Canada 3,867.
Barite and witherite	2,979	7,069	—	Turkey 4,901; China 2,063.
Boron materials:				
Crude natural borates	41,922	39,315	9,381	Turkey 29,251.
Oxides and acids	4,991	5,867	20	Italy 1,966; Turkey 1,420; France 954.
Bromine	12	12	—	Mainly from Israel.
Cement	106,671	156,798	([2])	Hungary 134,236; Bulgaria 12,832; Albania 8,555.
Chalk	7,543	10,499	—	Austria 6,050; Switzerland 4,307.
Clays, crude:				
Bentonite	635	44	7	West Germany 25; Italy 11.
Chamotte earth	1,244	511	—	Czechoslovakia 244; France 244; West Germany 21.
Fire clay including unspecified	49,258	52,311	734	Czechoslovakia 43,653; Poland 3,315; Spain 2,800.
Kaolin	83,307	80,977	632	Czechoslovakia 32,604; East Germany 13,949; Austria 9,072.
Cryolite and chiolite	970	1,210	—	Denmark 1,200; Austria 10.
Diamond, natural:				
Gem, not set or strung value, thousands	$223	$754	—	Belgium-Luxembourg $421; Switzerland $191; West Germany $113.

See footnotes at end of table.

TABLE 8—Continued

YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989 United States	Sources, 1989 Other (principal)
INDUSTRIAL MINERALS—Continued				
Industrial stones value, thousands	$871	$513	—	Belgium-Luxembourg $319; Ireland $115; Zaire $41.
Diatomite and other infusorial earth	1,352	1,051	460	Italy 193; Hungary 172.
Feldspar, fluorspar, related materials:				
Feldspar	2,373	1,139	—	France 600; Czechoslovakia 460.
Fluorspar	10,349	4,838	—	France 1,124; West Germany 977; China 967.
Unspecified	3	11	—	Netherlands 9; Norway 1.
Fertilizer materials:				
Crude, n.e.s.	120	20	—	Mainly from Austria.
Manufactured:				
Ammonia	102,447	157,504	—	Hungary 73,112; Bulgaria 36,837; Czechoslovakia 32,970.
Nitrogenous	315,231	342,265	—	Czechoslovakia 82,008; Hungary 78,195; Poland 55,145.
Phosphatic	33,650	30,719	—	Romania 23,769; Tunisia 6,951.
Potassic	638,017	442,218	—	U.S.S.R. 256,048; East Germany 164,360.
Unspecified and mixed	102,738	93,396	36,345	U.S.S.R. 34,258; Romania 18,079.
Graphite, natural	2,560	2,458	(2)	Czechoslovakia 1,064; West Germany 991.
Gypsum and plaster	78	231	1	West Germany 122; East Germany 50; Italy 48.
Iodine	12	14	(2)	Chile 12; Japan 1.
Kyanite and related materials:				
Andalusite,kyanite, sillimanite	(2)	259	—	All from West Germany.
Mullite	7,248	4,141	—	Poland 4,107; Austria 19; West Germany 15.
Lime	25	25	(2)	West Germany 23; U.S.S.R. 2.
Magnesium compounds:				
Magnesite, crude	5	19,893	—	All from Turkey.
Oxides and hydroxides	10,358	10,679	1	Greece 8,000; Italy 989.
Mica:				
Crude including splittings and waste	101	72	1	West Germany 33; India 21; Norway 8.
Worked including agglomerated splittings	89	85	(2)	Czechoslovakia 39; Austria 26.
Nitrates, crude	396	480	—	East Germany 315; Austria 105; Bulgaria 50.
Phosphates, crude	1,741,304	1,234,726	—	Morocco 528,192; Jordan 420,166; Syria 208,014.
Phosphorous, elemental	133	68	—	U.S.S.R. 50; Italy 16; West Germany 1.
Pigments, mineral: Iron oxides and hydroxides, processed	1,443	1,721	(2)	U.S.S.R. 397; Belgium-Luxembourg 375; Spain 358.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$16	$57	$1	Switzerland $30; West Germany $12; Belgium-Luxembourg $6.
Synthetic do.	$295	$230	$19	West Germany $82; Austria $53; Belgium-Luxembourg $33.
Pyrite, unroasted	11,197	10,774	—	Bulgaria 10,734; West Germany 40.
Quartz crystal, piezoelectric value, thousands	$84	$166	—	Japan $86; United Kingdom $77; West Germany $3.
Salt and brine	255,485	268,769	—	Romania 215,562; Tunisia 29,590.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	86,672	91,166	(2)	Romania 41,109; Bulgaria 38,278; East Germany 7,469.
Sulfate, manufactured	31,834	45,873	—	East Germany 21,529; Austria 14,666; U.S.S.R. 6,121.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	5,966	13,475	82	Bulgaria 6,850; Italy 2,917; Spain 2,634.
Worked	396	1,825	—	Italy 1,764; West Germany 36.
Dolomite, chiefly refractory-grade	30	70	—	Norway 50; West Germany 20.

See footnotes at end of table.

TABLE 8—Continued

YUGOSLAVIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued					
Gravel and crushed rock		15,563	30,344	—	Austria 29,831; France 175.
Quartz and quartzite		741	1,009	237	West Germany 576; Austria 120.
Sand other than metal-bearing		68,680	109,310	189	Hungary 53,632; Czechoslovakia 32,218; West Gemmany 16,916.
Sulfur:					
Elemental:					
Crude including native and byproduct		210,343	144,141	—	Poland 85,383; Canada 20,373; West Germany 13,900.
Colloidal, precipitated, sublimed		175	73	—	Italy 36; West Germany 20; France 15.
Dioxide		70	76	—	Italy 50; West Germany 26.
Sulfuric acid		15,276	5,338	—	Hungary 5,258; West Germany 66.
Talc, steatite, soapstone, pyrophyllite		5,099	4,449	24	West Germany 1,468; Austria 1,381; Italy 1,005.
Vermiculite		16,689	17,123	—	Hungary 10,023; U.S.S.R. 4,100; Greece 1,204.
Other:					
Crude		4,722	3,768	50	West Germany 751; Italy 612; Netherlands 302.
Slag and dross, not metal-bearing		53,232	97,054	—	Italy 44,366; Austria 29,460; Canada 14,007.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		3,244	4,760	372	Czechoslovakia 3,550; Albania 659.
Carbon:					
Carbon black		16,034	16,735	33	Italy 8,881; Mexico 4,045; West Germany 3,386.
Other		18	—		
Coal:					
Anthracite		225,661	186,579	28	U.S.S.R. 186,527; Italy 24.
Bituminous	thousand tons	3,631	3,283	789	U.S.S.R. 1,837; Australia 263.
Briquets of anthracite and bituminous coal		74	—		
Lignite including briquets		25,079	26,402	—	Czechoslovakia 16,766; East Germany 9,306.
Coke and semicoke		59,676	93,216	24,471	West Germany 41,805; Italy 23,357.
Gas, natural: Gaseous	million cubic meters	3,619	4,283	—	Mainly from U.S.S.R.
Peat including briquets and litter		3,045	4,704	—	U.S.S.R. 4,681; Italy 13; Belgium-Luxembourg 9.
Petroleum:					
Crude	thousand 42-gallon barrels	89,666	86,156	34	U.S.S.R. 41,927; Iraq 21,599; Libya 10,657.
Refinery products:					
Liquefied petroleum gas including non-refinery production	do.	747	491	([2])	U.S.S.R. 240; Bulgaria 121; Hungary 115.
Gasoline	do.	2,503	1,707	([2])	Italy 579; Romania 498; Greece 164.
Mineral jelly and wax	do.	20	32	([2])	West Germany 17; Hungary 4; Italy 3.
Kerosene and jet fuel	do.	550	778	([2])	Italy 420; Libya 143; Hungary 103.
Distillate fuel oil	do.	611	835	([2])	U.S.S.R. 395; Bulgaria 178; Panama 151.
Lubricants	do.	742	543	1	Hungary 229; Poland 76; Czechoslovakia 70.
Residual fuel oil	do.	3,305	2,556	—	U.S.S.R. 1,335; Italy 645; Egypt 184.
Bitumen and other residues	do.	2	2	—	Mainly from Austria.
Bituminous mixtures	do.	1	2	([2])	Do.
Petroleum coke	do.	691	694	449	West Germany 199.

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]Unspecified quantity valued at $17,000.
[4]May include blue powder.

TABLE 9

YUGOSLAVIA: IMPORTS OF SELECTED MINERAL COMMODITIES AFTER PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Principal sources, 1989
Abrasives: Artificial: Silicon carbide		—	120	All from West Germany.
Aluminum:				
Oxides and hydroxides	value, thousands	$15	—	
Metal including alloys:				
Unwrought		—	23	All from West Germany.
Semimanufactures		741	940	West Germany 935; Italy 5.
Bismuth: Metal including alloys, all forms		17	—	
Coal: Lignite, agglomerated briquets		—	1,040	All from Hungary.
Cobalt:Metal including alloys, all forms		2	—	
Copper: Metal including alloys:				
Unwrought		1,323	743	Italy 582; Bulgaria 161.
Semimanufactures		920	580	Bulgaria 563; West Germany 12; Austria 2.
Gold: Metal including alloys, unwrought and partly wrought	value, thousands	$251	$156	Bulgaria $119; West Germany $37.
Gypsum and plaster		—	2	All from East Germany.
Iron and steel: Metal:				
Steel, primary forms		107,449	42,527	All from U.S.S.R.
Semimanufactures: Flat-rolled products:				
Of iron or non-alloy steel: Not clad, plated, coated		15,779	258	All from West Germany.
Lead:				
Oxides		34	13	All from Austria.
Metal including alloys, unwrought		193	2,760	All from Bulgaria.
Petroleum refinery products: Lubricants	42-gallon barrels	15,267	4,438	Hungary 3,416; Austria 1,029.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:				
Platinum	value, thousands	$58	$245	France $198; West Germany $56.
Unspecified	do.	$788	$1,014	United Kingdom $531; West Germany $483.
Silver: Metal including alloys, unwrought and partly wrought		2	1	Mainly from West Germany.
Tin: Metal including alloys, unwrought		2	—	
Zinc: Metal including alloys:				
Unwrought		147	2	All from Bulgaria.
Semimanufactures		14	—	

[1]Table prepared by staff, International Data Section. No imports after processing were reported from the United States in 1989.

TABLE 10

YUGOSLAVIA: IMPORTS OF SELECTED MINERAL COMMODITIES FOR PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	—	68,731	—	Guinea 58,771; U.S.S.R. 10,000.
Metal including alloys:				
Scrap	—	20	—	All from Italy.

See footnotes at end of table.

TABLE 10—Continued

YUGOSLAVIA: IMPORTS OF SELECTED MINERAL COMMODITIES FOR PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity	1988	1989	Sources, 1989	
			United States	Other (principal)
METALS—Continued				
Aluminum—Continued				
Metal including alloys—Continued				
Unwrought	1,183	2,456	—	Italy 1,406; U.S.S.R. 537; West Germany 514.
Semimanufactures	7,109	7,873	522	U.S.S.R. 2,006; West Germany 1,761; Cuba 1,505.
Chromium:				
Ore and concentrate	2,206	3,500	—	All from Turkey.
Metal including alloys, all forms	2	—		
Copper:				
Ore and concentrate	9,626	—		
Metal including alloys:				
Scrap	10	17	—	All from Japan.
Unwrought	1,289	1,256	—	West Germany 501; Bulgaria 328; Austria 175.
Semimanufactures	2,915	5,119	199	U.S.S.R. 2,230; Austria 1,118; Bulgaria 1,006.
Gold: Metal including alloys, unwrought and partly wrought value, thousands	$1,203	$2,874	$1,821	Switzerland $632; West Germany $421.
Iron and steel:				
Iron ore and concentrate	19,258	1,518	—	All from West Germany.
Metal:				
Scrap	3,173	18,634	—	Austria 14,858; Hungary 1,456; St. Vincent and Grenadines 1,403.
Ferroalloys:				
Ferrochromium	5,863	3,194	—	Turkey 2,815; Austria 260.
Ferrosilicon	—	1,220	—	Austria 922; Belgium-Luxembourg 298.
Unspecified	40	12	—	All from Belgium-Luxembourg.
Steel, primary forms	198,649	163,650	—	U.S.S.R. 137,057; Hungary 19,071; East Germany 3,484.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	129,817	125,968	2	U.S.S.R. 97,367; Czechoslovakia 20,564; West Germany 5,339.
Clad, plated, coated	106,977	83,567	—	U.S.S.R. 83,073; West Germany 249; Austria 245.
Of alloy steel	247	143	([2])	West Germany 54; Italy 48; Austria 31.
Bars, rods, angles, shapes, sections	44,415	37,077	10	U.S.S.R. 23,341; Hungary 5,202; West Germany 4,029.
Rails and accessories	513	26	—	All from Bulgaria.
Wire	180	4,428	52	U.S.S.R. 1,477; Czechoslovakia 770; Italy 726.
Tubes, pipes, fittings	33,739	44,382	19	Hungary 12,522; Bulgaria 8,299; Poland 7,811.
Lead:				
Ore and concentrate	13,690	—		
Metal including alloys:				
Scrap	763	71	—	All from Czechoslovakia.
Unwrought	9,311	24,018	—	Greece 7,888; Turkey 4,500; United Kingdom 3,858.
Semimanufactures	([2])	—		
Magnesium: Metal including alloys, unwrought	16	—		
Manganese:				
Ore and concentrate, metallurgical-grade	8,000	35,862	—	Botswana 25,311; Gabon 10,551.
Oxides	—	20	—	All from China.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	—	$14	—	All from Japan.
Ore and concentrate	15,742	—		

See footnotes at end of table.

TABLE 10—Continued

YUGOSLAVIA: IMPORTS OF SELECTED MINERAL COMMODITIES FOR PROCESSING[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
METALS—Continued					
Platinum-group metals: Metals including alloys, unwrought and partly wrought—Continued					
Blue powder		2,137	—		
Metal including alloys:					
Unwrought		36,387	70,354	—	Peru 28,913; United Kingdom 22,895; Morocco 5,320.
Semimanufactures		3,119	3,334	—	West Germany 2,941; Austria 370.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.: Artificial:					
Corundum		—	400	—	All from Hungary.
Cement		60	—		
Clays, crude: Kaolin		—	([2])	—	All from Austria.
Diamond:					
Gem, not set or strung	value, thousands	—	$3	—	Do.
Industrial stones	do.	$30	—		
Diatomite and other infusorial earth		20	—		
Fertilizer materials: Manufactured:					
Ammonia		—	7,606	—	Bulgaria 6,878; Austria 491; Hungary 237.
Nitrogenous		—	5,637	—	Bulgaria 4,529; U.S.S.R. 431; Hungary 386.
Unspecified and mixed		9,610	60,178	17,055	Togo 27,728; Jordan 26,714.
Graphite, natural	value, thousands	$23	$8	$8	
Salt and brine		245	193	—	All from West Germany.
Stone, sand and gravel:					
Dimension stone, worked		22	2	—	All from Austria.
Quartz and quartzite		8	—		
Other: Slag and dross, not metal-bearing		60	—		
MINERAL FUELS AND RELATED MATERIALS					
Coal: Bituminous, coking		264,526	701,904	115,655	U.S.S.R. 480,320; Belize 55,438.
Coke and semicoke		70,166	65,284	50,005	U.S.S.R. 15,279.
Petroleum refinery products:					
Gasoline	42-gallon barrels	159,341	86,009	9	United Kingdom 86,000.
Kerosene and jet fuel	do.	2,162	1,527	—	All from West Germany.
Distillate fuel oil	do.	—	171,602	—	All from U.S.S.R.
Lubricants	do.	973	1,323	98	West Germany 1,225.

[1]Table prepared by staff, International Data Section.
[2]Less than 1/2 unit.

TABLE 11

YUGOSLAVIA: MINERAL TRADE, BY SECTOR, AS A PERCENTAGE OF TOTAL EXPORTS AND IMPORTS FOR 1988, 1989, AND 1990[1]

Sector	1988		1989		1990	
	Export	Import	Export	Import	Export	Import
Coal, mining and processing	0.3	1.7	0.2	1.9	0.1	1.1
Petroleum and natural gas, extracting and processing	1.1	16.2	1.3	15.4	1.6	15.6
Iron ore mining and steelmaking	6.2	5.1	5.0	6.2	5.6	4.4
Nonferrous metals mining and processing	6.6	2.4	6.7	2.9	7.0	1.9
Industrial minerals, mining and processing	2.0	8.7	2.1	3.5	1.9	2.6
Total	16.2	29.1	15.3	29.9	16.2	25.6

[1]Based on values given in U.S. dollars.

Source: Statistike Spoljne Trgovine SFR Jugoslavije za 1990 Godinu (Statistics of Foreign Trade of the SFR Yugoslavia, Year 1990), Belgrade, 1991.

TABLE 12

YUGOSLAVIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Major commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Kombinat Aluminijuma Titograd	Plant at Titograd, Montenegro	200.
Do.	Energoinvest	Plants at Birac-Zvornik, BiH	600.
Do.	do.	Plant at Mostar, BiH	280.
Do.	Unial, Tvornica Glinice in Aluminija Boris Kidric	Plant at Kidricevo, Slovenia	120.
Aluminum	Boris Kidric; Tvornica Lakih Metala	Smelter at Sibenik, Croatia	75.
Do.	Kombinat Aluminijuma Titograd	Smelter at Titograd, Montenegro	100.
Do.	Energoinvest	Smelter at Mostar, BiH	92.
Do.	Unial, Tvornica Glinice in Aluminija Boris Kidric.	Smelter at Kidricevo, Slovenia	50.
Antimony, metal	Zajaca, Rudarsko Topionicarski Bazen	Smelter at Zajaca, Serbia	4.
Antimony ores and concentrates	do.	Mines and mills near Zajaca, Serbia	80. 300.
Do.	do.	Mines and mill at Rajiceva Gora, Serbia	
Bauxite	Energoinvest	Mines in BiH at Vlasenica, Jajce, Bosanska Krupa, Posusje, Listica, Citluk, and other locations; and mines in Croatia at Rovinj and other locations	[2]2,500.
Do.	Rudnici Boksita, Niksi·	Mines in Montenegro at Kutsko Brdo, Zagrad, Biocki Stan, Durakov Do., and other locations	650.
Do.	Jadral, Jadranski Aluminijum	Mines in Croatia at Obrovac, Drnis, and other locations	450.
Coal: Bituminous	Istarski Ugljenokopi Rasa	Mines at Labin and Potpican, Croatia	300.
Do.	do.	do.	200.
Do.	Ibarski Rudnici Kamenog Uglja	Mines at Jarando and Usce, near Baljevac na Ibru, Serbia	150.
Do.	do.	do.	100.
Brown	SOUR Titovi Rudnici Uglja, Tuzla, BiH	Mines in BiH	[2]12,000.

See footnotes at end of table.

TABLE 12—Continued

YUGOSLAVIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Major commodity	Major operating companies	Location of main facilities	Annual capacity
Coal—Continued Brown—Continued	SOZC, Rudarsko Energetski Kombinat E. Kardelj, Trbovlje, Slovenia	Mines: Sasavski Rudnici at Trbovlje, Hrastnik, Ojstro, Senovo, and Kanisarnica	[2]1,300.
Lignite	SOUR Titovi Rodnici Uglja, Tuzla, BiH	Mines in BiH	[2]7,000.
Do.	SOUR Kolubara, Rudarsko Energetsko Industrijski Kombinat, RO	Opencast mines: Polje B and Polje D	[2]10,000.
Do.	Kolubara Povrsinski Kopovi	Tamnavski Kopovi (also known as Kolubarski Rudnici Lignita), near Vreoci, Serbia	[2]14,000.
Do.	SOUR Elektroprivreda Kosova, RO Kosovo, Proizvodnja Separacija i Transport Uglja.	Opencast mines: Dobro Selo and Belacevac, near Obilic, Serbia	[2]2,000.
Do.	Rudarsko Energetski Kombinat Velenje, RO Rudnik Lignita-Velenje	Mine at Velenje, Slovenia	[2]5,000.
Cement	16 producing enterprises, of which the largest were—	20 plants in operation	[2]13,860.
	Dalmacija Cement	Partizan plant at Kastel Sucurac, Croatia	[2]1,525.
		Prvoborac plant at Solin, Croatia	884.
		"10 Kolovoz" plant at Solin Majdan, Croatia	440.
		Renko Sperac plant at Omis, Croatia	140.
	Beocinska Fabrika Cementa	Plant at Beocin, Serbia	[2]2,031.
	Fabrika Cementa Novi Popovac	Plant at Popovac, Serbia	[2]1,613.
Chromite, concentrate	Jugohrom, Hemijsko-Elektrometalurski-Kombinat	Concentrator at Radusa, Macedonia	150.
Copper	Rudarsko Topionicki Bazen Bor	Smelter at Bor, Serbia	180.
Do.	do.	Electrolytic refinery at Bor, Serbia	180.
Do.	do.	Mine and mill at Bor, Serbia	[2]5,000 ore.
Do.	do.	Mine and mill at Majdanpek, Serbia	[2]15,000 ore.
Do.	do.	Mine and mill at Veliki Krivelj, Serbia	[2]8,000 ore.
Do.	Bucim, Rabotna Organizacija za Rudarstvo i Metalurgija za Baker	Mine and mill at Bucim, near Radovis, Macedonia	7,000 ore.
Ferroalloys	Jugohrom, Hemijsko-Elektrometalurski-Kombinat.	Plant at Jegunovce, Macedonia	80.
Do.	Elektrobosna, Elektrohemijska i Eletrotermijska Industrija	Plant at Jajce	80.
Iron ore	Rudarsko Metalurski Kombinat Zenica	Mines at Vares, Ljubija, and Radovan, BiH	[2]5,000.
Do.	Skopje Rudnici i Zeljezarnica Skopje	Mines at Tajmiste, Demir Hisar, and Damjan, Macedonia	[2]1,000.
Lead-zinc ore	Rudarsko-Metalursko-Hemijski Kombinat za Olovo i Cink Trepca	Mines at Ajvalija, Kopaonik, Badovac; Trepca, Blagodat, Lece; Veliki Majdan, Tisovak; and Kisnica, Rudnik, Veliki, and Majdan, Suplja Stijena	[2]5,000.
Do.	do.	Mills at Kriva Feja, Lece, Rudnik, Badovac, Leposavic, Zvecan, and Maravce, Suplja Stijena	[2]3,160.
Do.	Energoinvest	Mine and mill at Srebrenica, BiH	300.
Do.	Rudarsko Metalursko Prepobotuvacki, Kombinat Zletovo-Sasa:		
Do.	Sase, Rudnici za Olovo i Cink	Mine and mill near Kamenica, Macedonia	300.

See footnotes at end of table.

TABLE 12—Continued

YUGOSLAVIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Major commodity	Major operating companies	Location of main facilities	Annual capacity
Lead-zinc ore—Continued	Rudarsko Metalursko Prepobotuvacki, Kombinat Zletovo-Sasa:		
Do.	Zletovo, Rudnici za Olovo i Cink	Mine and mill near Probistip, Macedonia	700.
Do.	Rudnik Svinca, Topilnica, Mezica	Mine and mill near Mezica, Slovenia	400.
Do.	Hemijska Industrija Zorka:		
Do.	Brskovo, Rudnici Olova i Cinka	Mine at Brskovo, Montenegro	500.
Do.	Veliki Majdan Rudnik Olova i Cinka	Mine at mill near Krupanj, Serbia	250.
Lead metal	Rudarsko Metalursko Hemijski Kombinat za Olovo i Cink Trepca	Smelter at Zvecan, Serbia	180.
Do.	do.	Refinery at Zvecan, Serbia	90.
Do.	Rudnik Svinca in Topilnica, Mezica	Smelter at Mezica, Slovenia	35.
Do.	do.	Refinery at Mezica, Slovenia	30.
Do.	Zletovo, Topilnica za Cink i Olovo	Imperial Smelter at Titov Veles, Macedonia	40.
Do.	do.	Refinery at Titov Veles, Macedonia	40.
Magnesite	Rudnici Magnezita "Sumadija"	Mine and plant at Sumadija, 20 kilometers northwest of Cacak, Serbia	120 conc.
Do.	Rudnik i Industrija Magnezita "Strezovce"	Opencast mine at Beli Kamen, Strezovce, near Titova Metrovica, Serbia	300.
Do.	do.	Sinter plant at Strezovce	40.
Do.	Magnohrom, Rudnik Magnezita "Magnezit"	Mine at Bela Stena, Baljevac na Ibru, Serbia	30.
Manganese, ore	Mangan-Energoinvest	Mine and concentrator at Buzim, BiH	100.
Mercury	Rudnik Zivega Srebra, Idrija	Mine and smelter in Idrija, Slovenia	[3][2]15,000.
Natural gas	Industrija Nafte (INA)	Natural gasfields in Croatia: Bog·ic Lug, Molve, and others	[4]70,000.
Do.	Naftaplin (Naftagas), RO za Istrazivanje, i Proizvodnju Nafte i Gasa	Natural gasfields in Serbia: Kikinda and others	[4]30,000.
Nickel, ore	Feni-Rudnici i Industrija za Nikel, Celik i Antimon	Mine and opencast mine near Kavadarci, Macedonia[5]	[2]2,300.
Do.	do.	Ferronickel Plant at Kavadarci, Macedonia[5]	[7][2]16,000.
Petroleum: Crude	Industrija Nafte (INA)	Oilfields in Croatia and Slovenia: Benicanci, Zutica, Struzec, Ivanic Grad, Lendava, and others	[8]70.
Do.	Naftagas, Naftna Industrija	Oilfields in Serbia: Kikinda and others	30.
Refined	Industrija Nafte (INA):		
Do.	Rafinerija Nafte Rijeka	Refineries at Urinj and Rijeka, Croatia	[8]160.
Do.	Rafinerija Nafte Sisak	Refinery at Sisak, Croatia	[8]150.
Do.	Rafinerija Nafte Lendava	Refinery at Lendava, Slovenia	[8]16.
	Naftagas, Naftna Industrija:		
Do.	Rafinerija Nafte Pancevo	Refinery at Pancevo, Serbia	[8]110.
Do.	Rafinerija Nafte Novi Sad	Refinery at Novi Sad, Serbia	[8]28.
Do.	Energoinvest: Rafinerija Nafte Bosanski Brod	Refinery at Bosanski Brod, BiH	[8]100.
Pig iron	Rudarsko Metalurski Kombinat Zenica (RMK Zenica)	4 blast furnaces at Zenica, BiH 2 blast furnaces at Vares, BiH	[8]2,250. 100.
Do.	do.	Electric reduction furnaces at Iljas, BiH	100.

See footnotes at end of table.

TABLE 12—Continued

YUGOSLAVIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1990

(Thousand metric tons per year unless otherwise specified)

Major commodity	Major operating companies	Location of main facilities	Annual capacity
Pig iron—Continued	Metalurski Kombinat, Smederevo	Blast furnace at Smederevo, Serbia	720.
	Metalurski Kimbinat "Zeljezara Sisak"	2 blast furnaces at Sisak, Croatia	235.
Do.	Zdruzeno Podjetje Slovenske Zelezarne	2 blast furnaces at Zelezara Jesenice, Slovenia	300.
Do.	Zelezara Store	Electric reduction furnaces at Store pri Celju, Slovenia	290.
Do.	Skopje, Rudnici i Zeljezarnica Skopje	5 Elkem electric furnaces at Skopje, Macedonia	430.
Salt	Hemijski Kombinat "Sodaso," Rudnik Soli i Solni Bunari	Rock salt: Mines at Tusanj, BiH	[2]120,000.
Do.	do.	Production from brine at Tuzla, BiH	[9]2,000,000.
Do.	Solana "Pag," Solana "Ante Festin"	Marine Salt: Pag Island, Croatia	13.
Steel, crude	Rudarsko Metalurski Kombinat Zenica	Plant at Zenica, BiH	[2]2,060.
Do.	Skopje, Rudnici i Zeljezarnica	Plant at Skopje, Macedonia	980.
Do.	Zdruzeno Podjetje Slovenske Zeljezare	Plant at Jesenica, Slovenia	960.
Do.	do.	Plant at Ravne, Slovenia	200.
Do.	do.	Plant at Store, Slovenia	200.
Do.	Metalurski Kombinat Smederevo	Plant at Smederevo, Serbia	600.
Zinc metal	Rudarsko Metalursko Hemijski Kombinat Olova i Cinka Trepca, Metalurgija Cinka	Electrolytic plant at Titova Metrovica, Serbia	40.
Do.	Zletovo, Topilnica za Cink i Olovo	Imperial Smelter plant and refinery at Titov Veles, Macedonia	65.
Do.	Hemijska Industrija Zorka	Electrolytic plant at Sabac, Serbia	40.

[1]BiH Bosnia i Hercegovina.
[2]Million metric tons per year.
[3]Flasks per year.
[4]Million cubic feet.
[5]Both closed in 1984.
[6]Shut down in 1984.
[7]Nickel in ferronickel.
[8]Thousand barrels per day.
[9]Cubic meters per year.

gan testing the first of two continuous casting lines. The continuous casting line reportedly would produce slabs ranging from 6 m to 12 m in length, 1.25 m to 2.05 m in width, and 0.20 m to 0.25 m in thickness. When fully operational, both lines would increase the plant's capacity from 840,000 to 1,650,000 tons of steel per year. Also, the addition of a hot strip mill was planned to raise rolled sheet production at Smederevo from 1 to 1.5 Mmt/a. Reportedly, the strip mill would be built by a consortium of German companies headed by Schloemann-Siemag and commissioned at the end of 1991.

Lead and Zinc.—In 1990, exploration revealed a new lead and zinc deposit in Serbia near the Juzna Morava River in the Medvedja municipal district. Although the deposit was not fully defined by yearend, the ore contained associated gold, silver, and other metals. The deposit, however, was believed to be sufficiently large to allow mining operations for about 50 years.

Industrial Minerals

Yugoslavia produced a large number of industrial minerals that included barite, bentonite, gypsum, kaolin, magnesite, and pumice for domestic needs as well as exports.

At yearend, Yugoslavia's geological services reported the discovery of borate deposits in the Boljevac valley totaling about 6 Mmt of commercial-grade material.

Subsequently, the nearby Ibar coal mining enterprise announced plans to start mine development and the construction of a 5,000-mt/a boric acid plant in 1991. Geologists, reportedly, indicated that potential resources in the area could reach 20 Mmt of borate.

Mineral Fuels

Coal.—In August, Yugoslavia suffered what was described as the worst mining disaster in its history. A methane gas explosion killed 178 miners at the Kreka lignite mine in Dobrnja in the central part of the country.

The electric power company, Elektrovojvodina of Novi Sad in Serbia, began testing a large dredger to mine lignite seams along the Danube River near Kovin. The dredger was built in Novi Sad and equipped with an underwater cutting wheel supplied by Orenstein and Koppel AG of the Federal Republic of Germany. Overburden stripping would have a throughput of 2,300 m^3/hr and, at full capacity, the mining operation would reportedly produce about 5.5 Mmt/a of lignite. The lignite would be transported by slurry pipeline to a thermal power station that was scheduled for completion in 1994.

Natural Gas and Petroleum.—The principal events in the country gas industry included the start of construction of the 36-km Pojate-Krusevac gas pipeline and 50 km of distribution mains to the town of Krusevac. The project was estimated to cost about $43 million. In addition, plans were announced to build a gas pipeline in the Serbian Province of Kosovo. The pipeline would be extended to Pristina and outlying areas such as Djeneral Jankovic, Kacanik, Glogovac, and Titova Mitrovica.

Developments in the petroleum sector included the start of operation in October of 10 new oil wells near the town of Pozarevac in Serbia. Jugopetrol of Belgrade and Naftagas of Novi Sad continued exploration work near Pozarevac during the year and reported discovering a new oilfield with 35 deposits of petroleum, ranging in depth from 1,700 m to 3,000 m. Industry experts indicated that the new field was expected to produce about 200,000 tons of petroleum per year. Additionally, Naftagas of Novi Sad reported that the Rusanda oilfield in the Banat area became operational at yearend. The new deposit was expected to produce 40,000 tons of crude petroleum annually. The company also reported that the Rusanda deposit was the first Mesozoic structure to be exploited in Yugoslavia.

The decline of barter-based imports of petroleum from the U.S.S.R. because of that country's drop in output has made new domestic production even more essential. Domestic output has historically accounted for about one quarter of Yugoslavia's annual consumption of petroleum.

Nuclear Power.—Reportedly, the Zirovski Vrh uranium mine at Todraz in Slovenia was permanently closed for environmental reasons. In May, the last 60-ton shipment of yellow cake was sent to the United States for processing. The processed fuel (fuel rods) has been used at the Krsko nuclear power station in Slovenia, the country's only nuclear fueled electric power facility.

Reserves

In view of Yugoslavia's effort to transform its economy to a market-base system, the country's mineral resources will have to be reevaluated from a market perspective. Reserves, as defined by market economies, are mineral deposits that can be mined at a profit under existing conditions with existing technology. In centrally planned and other non-market-economy countries, such as Yugoslavia, political rather than economic consideration was paramount in formulating policies for industrial development. Political directives to discover exploitable mineral resources may have resulted in possible overestimations and other distortions of collected field data. The system that was used to measure "reserves" was based on two cross-imposed classification schemes, one relating to the exploitability of the mineral in question and the other relating to the reliability of the information on its quantity and grade.

The first system determined whether or not the deposit was suitable for exploitation, given the current technological capability and need. The second classification related to the reliability of the data gathered on the quantity of the mineral in situ. The second classification designated deposits into "reserve" categories A, B, C1, and C2, based on the Soviet classification system, where sufficient geological data had been gathered relative to the size of the deposit and its mineral grade. Taking this system into account, Yugoslavia's mineral resources are given in table 13.

TABLE 13

YUGOSLAVIA: APPARENT RESOURCES OF MAJOR MINERAL COMMODITIES FOR 1990

Commodity	Capacity (thousand metric tons)
Antimony, ore	12,000
Bauxite	150,000
Coal (in standard coal equivalent)	10,000,000
Copper, in ore	4,000
Iron, in ore	500,000
Lead and zinc ore	90,000
Lead, in ore	2,500
Manganese ore	6,000
Mercury (cinnabar) ore	4,000
Nickel, in ore	25,000
Phosphate, in P_2O_5	30,800
Sulfur	10,000
Zinc, in ore	2,200

INFRASTRUCTURE

Yugoslavia's inland system of ways and communications consisted of 132,617 km of railroads, highways, and inland waterways. The railroad system consisted of 9,270 km of 1.435-gauge track, of which 930 km was double track and 3,771 km was electrified. The highway and road system consisted of 71,315 km of asphalt, concrete, and stone block-paved roads; 34,299 km of macadam, gravel, and crushed stone roads; and 15,133 km of earth roads. Yugoslavia had 2,600 km of navigable waterways. The country's merchant marine fleet consisted of 270 ships with a total weight of 5,809,219 dwt. The fleet included 131 cargo, 16 container, 14 roll-on/roll-off, 9 petroleum, 3 ore-oil, 73 bulker, and 8 combination bulker vessels.

The major seaports were Bar, Koper, Ploce, Split, and Rijeka. In addition, Yugoslavia had 1,373 km of pipeline for crude petroleum, 150 km of pipeline for refined products, and 2,900 km of pipeline for natural gas. Tables 14 and 15 show the distribution of mineral exports and imports for 1990, respectively, by type of carriage and receiving-exporting areas.

OUTLOOK

Yugoslavia is likely to remain an important European producer of minerals because of the country's long history of mining and prospects of discovering new mineral deposits in significantly large areas of the country that remain to be surveyed adequately. Rationalization of the country's existing economic structure would preclude concrete determinations concerning the future profile of most branches of its minerals industry. Yugoslavia, in common with other centrally planned economy countries, will require extensive modernization of its infrastructure, giving added value and importance to the industrial minerals sector.

In 1990, ethnic and political dissentions and environmental problems continued to be major issues confronting the country's restructuring. Ethnic and political issues proved to be particularly disruptive to the Government's efforts to institute rapid economic reforms during the year, and it is anticipated that these difficulties will continue for the near term.

TABLE 14

YUGOSLAVIA: DISTRIBUTION OF MINERAL EXPORTS IN 1990, BY TYPE OF CARRIAGE AND RECEIVING AREAS

(Thousand metric tons)

Type of carriage/commodity	Receiving area					
	Total	EC	EFTA	Turkey	CMEA	Non-European countries
Automobile-truck:						
Iron ore and scrap iron	41	20	3	1	2	15
Nonferrous metal ores and concentrates	31	26	3	—	1	1
Metals	221	181	23	2	8	7
Industrial minerals, crude	42	32	3	—	3	4
Lime, cement, and other construction materials	342	265	38	2	37	2
Fertilizers	7	6	1	—	—	—
Solid fuels	1	—	—	—	—	—
Crude petroleum	45	31	12	—	2	—
Refined petroleum products and gas	1	—	—	—	—	—
Tars and crude chemicals from coal and natural gas	16	13	2	—	—	—
Railway:						
Iron ore and scrap iron	448	235	12	—	201	—
Nonferrous metal ores and concentrates	273	13	—	—	260	—
Metals	1,111	721	104	1	285	—
Industrial minerals, crude	106	23	4	—	80	—
Lime, cement, and other construction materials	239	130	37	2	69	—
Fertilizers	85	33	13	—	38	—
Solid fuels	307	95	33	—	179	—
Crude petroleum	—	—	—	—	—	—
Refined petroleum products and gas	452	103	237	—	112	—
Tars and crude chemicals from coal and natural gas	92	15	54	—	23	—
Inland waterways:						
Iron ore and scrap iron	118	13	3	—	102	—
Nonferrous metal ores and concentrates	79	51	1	—	27	—
Metals	442	30	9	—	403	—
Industrial minerals, crude	40	2	1	—	37	—
Lime, cement, other construction materials	56	39	16	—	1	—
Fertilizers	146	99	26	—	21	—
Solid fuels	11	—	7	—	4	—
Crude petroleum	402	130	200	—	72	—
Refined petroleum products and gas	33	5	27	—	—	—
Tars and crude chemicals from coal and natural gas	1	—	—	—	1	—
Maritime:						
Iron ore and scrap iron	76	15	2	7	1	51
Nonferrous metal ores and concentrates	368	87	38	9	220	14
Metals	454	210	19	69	35	121
Industrial minerals, crude	223	221	—	1	—	1
Lime, cement, and other construction materials	758	703	6	26	1	22
Fertilizers	466	207	10	23	12	214
Solid fuels	71	27	—	1	3	40
Crude petroleum	78	78	—	—	—	—
Refined petroleum products and gas	831	729	22	—	5	75
Tars and crude chemicals from coal and natural gas	2	2	—	—	—	([1])

[1]Less than 500 tons.

Source: Data derived from International Goods Transport SFRY-EC 1990, Belgrade, 1991.

TABLE 15

YUGOSLAVIA: DISTRIBUTION OF MINERAL IMPORTS IN 1990, BY TYPE OF CARRIAGE AND EXPORTING AREAS

(Thousand metric tons)

Type of carriage/commodity	Export area					
	Total	EC	EFTA	Turkey	CMEA	Non-European countries
Automobile-Truck:						
Iron ore and Scrap iron	6	5	1	—	—	—
Nonferrous metal ores and concentrates	4	2	1	—	1	—
Metals	58	45	11	—	3	—
Industrial minerals, crude	29	12	10	1	6	—
Lime, cement, and other construction materials	131	81	17	2	30	1
Fertilizers	4	3	—	—	2	—
Solid fuels	13	12	—	—	—	—
Crude petroleum	45	10	8	—	27	—
Refined petroleum products and gas	1	—	—	—	—	—
Tars and crude chemicals from coal and natural gas	12	5	2	—	5	—
Railway:						
Iron ore and scrap iron	448	235	12	—	201	—
Nonferrous metalores and concentrates	273	13	—	—	260	—
Metals	1,111	721	104	1	285	—
Industrial minerals, crude	107	23	4	—	80	—
Lime, cement, other construction materials	186	85	35	—	66	—
Fertilizers	85	33	13	—	38	—
Solid fuels	307	95	33	—	179	—
Crude petroleum	—	—	—	—	—	—
Refined petroleum products and gas	452	103	237	—	112	—
Tars and crude chemicals from coal and natural gas	92	15	54	—	23	—
Inland Waterways:						
Iron ore and scrap iron	410	—	1	—	409	—
Nonferrous metal ores and concentrates	54	1	1	—	52	—
Metals	1,212	11	9	—	1,192	—
Lime, cement, other construction materials	1	1	—	—	—	—
Fertilizers	615	—	—	—	615	—
Solid fuels	221	—	—	—	221	—
Crude petroleum	18	—	—	—	18	—
Refined petroleum products and gas	218	3	3	—	212	—
Tars and crude chemicals from coal and natural gas	—	—	—	—	—	—
Maritime:						
Iron ore and scrap iron	1,624	129	38	90	139	1,228
Nonferrous metal ores and concentrates	950	140	69	51	53	636
Metals	290	103	9	7	66	104
Industrial minerals, crude	273	47	8	40	72	106
Lime, cement, and other construction materials	28	9	—	—	8	11
Fertilizers	446	1	—	—	—	445
Solid fuels	3,029	150	—	—	1,895	984
Crude petroleum	8,780	32	76	1,221	3,569	3,881
Refined petroleum products and gas	2,194	252	7	265	1,251	418
Tars and crude chemicals from coal and natural gas	6	—	—	—	—	6

Source: Data derived from International Goods Transport SFRY-EC 1990, Belgrade, 1991.

[1]U.S. Department of State. 1991 Foreign Economic Trends.

[2]Statisticki Godisnjak Jugoslavije, 1991 (Belgrade: 1991), p. 277.

[3]Work cited in footnote 2.

[4]Work cited in footnote 1.

[5]Metallstatistik1980-1990 Metallgesellschaft Aktiengesellschaft, Frankfort, 1991, pp. 8-11.

[6]Journal of Commerce, May 23, 1990, p. 9A.

[7]Ekonomska Politika, Mar. 5, 1990, pp. 24-26.

OTHER SOURCES OF INFORMATION

Agency

Privredna Komora Jugoslavije (Yugoslav Chamber of Economy)
11001 Belgrade, Terazije 15-23 P.O Box 1003

Savezni Geoloski Zavod (Federal Geological Institute),
Belgrade, Yugoslavia

Publications

Indeks (Index), published monthly.
Statisticki Godisnjak (Statistical Yearbook).
Nafta (Petroleum), published monthly.
Celik (Steel), published monthly.

MAP SYMBOLS

Commodity	Symbol
Alunite	Alu
Alumina	Al
Aluminum	AL
Andalusite	And
Antimony	Sb
Arsenic	As
Asbestos	Asb
Asphalt	Asp
Barite	Ba
Bauxite	Bx
Bentonite	Bent
Beryllium	Be
Bismuth	Bi
Bitumen (Natural)	Bit
Boron	B
Bromine	Br
Cadmium	Cd
Calcium	Ca
Carbon Black	CBl
Cement	Cem
Cesium	Cs
Chromite	Cr
Clays	Clay
Coal	C
Cobalt	Co
Columbium	Cb
Copper	Cu
Corundum	Cn
Cryolite	Cry
Diamond	Dm
Diatomite	Dia
Dolomite	Dol
Emerald	Em
Feldspar	Feld
Ferroalloys	FA
Ferrochrome	FeCr
Ferromanganese	FeMn
Ferronickel	FeNi
Ferrosilicon	FeSi
Fertilizer	Fert
Fluorspar	F
Gallium	Ga
Germanium	Ge
Gold	Au
Graphite	Gr
Gypsum	Gyp
Ilmenite	Il
Indium	In
Iron and Steel	Fe
Iron Ore	Fe
Kaolin	Kao
Kyanite	Ky
Lapis Lazuli	Laz
Lead	Pb
Lignite	Lig
Lime	Lime
Limestone	Ls
Liquefied Natural Gas	LNG
Liquefied Petroleum Gas	LPG
Lithium	Li
Magnesite	Mag
Magnesium	Mg
Manganese	Mn
Marble and Alabaster	Marb
Mercury	Hg
Mica	M
Molybdenum	Mo
Natural Gas	NG
Natural Gas Liquids	NGL
Nepheline Syenite	Neph
Nickel	Ni
Nitrates	Nit
Nitrogen (Ammonia Plants)	N
Oil Sands	OSs
Oil Shale	OSh
Olivine	Ol
Opal	Opal
Peat	Peat
Perlite	Per
Petroleum, Crude	Pet
Petroleum-Refinery Products	Pet
Phosphate	P
Pig Iron	Pig
Pigments, Iron	Pigm
Platinum Group Metals	PGM
Potash	K
Precious and Semiprecious Stones	Gem
Pumice	Pum
Pyrite	Py
Pyrophyllite	Pyrp
Quartz or Quartzite	Qtz
Rare Earths	REE
Rhenium	Re
Rutile	Ru
Salt	Salt
Sand and Gravel	Sd/Gvl
Sandstone	Ss
Selenium	Se
Sepiolite, Meerschaum	Sep
Serpentine	Serp
Shale	Sh
Silicon	Si
Sillimanite	Slm
Silver	Ag
Soapstone	Soap
Soda Ash, Trona	NaAsh
Sodium Sulfate	$NaSO_4$
Stone	Stone
Strontium	Sr
Sulfur	S
Talc	Talc
Tantalum	Ta
Tellurium	Te
Thorium	Th
Tin	Sn
Titanium	Ti
Titanium Dioxide	TiO_2
Tungsten	W
Uranium	U
Vanadium	V
Vermiculite	Verm
Wollastonite	Wo
Wonderstone	Ws
Yttrium	Y
Zinc	Zn
Zirconium	Zr

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MAP LEGEND

Symbol = Mine, including beneficiation plants, well

Circled Symbol = Group of producing mines or wells

Underlined Symbol = Processing plant or oil refinery, including smelters and metal refineries

(Symbol) = Undeveloped resource

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