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MINERAL INDUSTRIES OF

LATIN AMERICA AND CANADA

U.S.
DEPARTMENT
OF THE
INTERIOR

BUREAU
OF
MINES

1991

UNITED STATES DEPARTMENT OF THE INTERIOR • Bruce Babbitt, Secretary

BUREAU OF MINES

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 1991 and provides background information to assist in interpreting that performance. Content of the individual Yearbook volumes follows:

Volume I, Metals and Minerals, contains chapters 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, Commonwealth of The Northern Marianas, Territory of Guam, Island Possessions, and Trust Territory of the Pacific Islands. 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 160 foreign countries and discusses the importance of minerals to the economies of these nations. The 1991 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 Central Eurasia, Mineral Industries of the Middle East, and Minerals in the World Economy. This year's reports incorporate location maps, industry structure tables, and an outlook section previously incorporated in our Mineral Perspectives Series quinquennial regional books, which have been discontinued. The U.S. 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.

Acknowledgments

The U.S. Bureau of Mines, in preparing these Minerals Yearbook International Review 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 as well as from the annual reports of the mining companies. 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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Orlando Martino is Chief, Branch of Latin America and Canada, and has covered the mineral industry of Latin America with the U.S. Bureau of Mines since 1976. He studied applied physics and engineering sciences at Harvard University and international economics at the Johns Hopkins School of Advanced International Studies. He initiated his engineering career with Westinghouse International Co. in New York, and he evaluated mineral development projects with the U.S. Agency for International Development and the Inter-American Development Bank. He has visited mineral operations throughout Latin America, with 40 years of experience in the region, and has a working knowledge of French, Portuguese, and Spanish.

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LATIN AMERICA

AREA 19.5 million km² **POPULATION 462 million**

MAJOR MINERALS IN LATIN AMERICA

THE MINERAL INDUSTRIES OF

LATIN AMERICA AND CANADA

By Orlando Martino and Staff, Branch of Latin America and Canada

INTRODUCTION[1]

This regional report covers the mineral industries of Canada and 40 countries and areas in Latin America and the Caribbean Basin. Also included is a brief description of the mineral potential of Antarctica. The Latin American region encompasses an area twice that of the United States.

Latin America and Canada have a rich and diversified endowment of mineral fuels, metals, and industrial minerals. Tables 1 and 2 provide a summary view of Latin America and Canada's output of its major mineral commodities in world mineral supply in 1990 and 1991. Table 3 shows the relative importance of a selected group of minerals produced in Latin America in the world mineral economy.

Position in the World Mineral Economy

In terms of value, Latin America and Canada are both important in the world mineral economy as producers of crude oil, petroleum products, natural gas, and coal. With respect to a number of nonfuel minerals, the area contains several world-class producers. In 1991, Canada was the world's leading producer of uranium and zinc. In Latin America, Mexico was the world's leading producer of silver, sodium sulfate, and strontium; Brazil led in columbium and tin; and Chile was the world leader in copper, slightly ahead of the United States. In the next ranks, Canada was the world's second greatest producer of potash and was third in output of aluminum, copper, sulfur, and marketed natural gas. Second rank in the world included Brazil relative to iron ore output and Chile relative to iodine production. After Brazil, the other significant iron ore producers in the hemisphere were Canada, Venezuela, Chile, and Mexico, in order of importance. Brazil was the world's leading exporter of iron ore, accounting for about 29% of total world exports in 1990. The significant manganese producers were Brazil and Mexico. The area's leading steel producer was Brazil, which ranked seventh in the world, followed by Canada and Mexico. Besides Canada, the other significant nickel producers included Cuba and the Dominican Republic.

Production Trends

Nonfuel Minerals.—Considering all the countries in Latin America, the most outstanding production from the region in terms of share of world output includes silver, copper, bauxite, tin, iron ore, zinc, crude oil, lead, aluminum, and gold, in order of world percentage as shown in figure 1. Over the past decade, as a result of new discoveries and expanded productive facilities, Latin America has improved its relative world position as a supplier of aluminum, tin, copper, gold, iron ore, crude oil, tin, and zinc, as shown in table 3. It is a tribute to the resource base of the region that, after 450 years of mining operations, Latin America is still a key producer of silver and gold.

Energy.—According to the Latin America Energy Organization's (OLADE) data available for 1990, Latin America's proven oil reserves, including condensates and natural gas liquids, amounted to about 122 billion barrels or 12.2% of the world total. As a region, Latin America ranks second to the Middle East in oil reserves. About 90% of these oil reserves is located in Venezuela and Mexico, with the remaining 10% distributed mostly among Argentina, Bolivia, Brazil, Colombia, Ecuador, Peru, and Trinidad and Tobago. In the past 25 years, about 150 billion barrels of new reserves has been discovered in the region. This volume represents an increase of 600%, the highest rate of the world in the cited period, evidencing the great effort put forth in exploration and production. The region's total oil production averaged 7.4 million barrels daily in 1990 or 11.4% of the world rate, with Mexico and Venezuela being responsible for more than two-thirds of this output. Projections indicate that Latin America's production may reach the 10-million-barrel-per-day level before the end of this decade. At the present production rate, Latin America oil reserves will last 50 years, exceeding the world average of 45 years. The refining capacity installed in the region is about 7.7 million barrels daily, 80% of which is operated directly by state oil companies, an ownership pattern that may change over time. As a region, Latin America is self-sufficient in refining. Regarding natural gas, Latin America holds a relatively modest position in the world. The proven reserves are 7.3 trillion cubic meters, representing about 6% of the world total. As a region, Latin America was a net exporter of energy.

In addition to oil, gas, and coal, the region is significant as a source of geothermal power. Mexico ranks third after the United States and the Philippines in installed geothermal generating capacity, followed at much lower levels by El Salvador, Nicaragua, and Costa Rica, in order of capacity.

Regional Mineral Trade

Relative to growing domestic requirements, Latin America and Canada produce an important surplus of mineral commodities for international trade. In terms of value, the most important mineral exports for the global economy include: crude oil, natural gas, silver, copper, gold, bauxite, zinc, and aluminum, in order of value. Latin America is not a significant coal producer, but has a significant role as an exporter of steam coal by Colombia. Coal exports from Colombia increased from less than 1 million tons in 1983 to 20.2 million tons in 1991 and were expected to increase to 35 million tons by the year 2000.

For most of the countries in the region, the United States is the major market for their mineral exports. As border countries, Canada and Mexico export the major part of their surplus mineral output to the United States. In turn, the United States depends upon Canada and Mexico as the primary suppliers of a large variety of mineral commodities. Canada is the leading foreign supplier to the U.S. economy of natural gas, asbestos, nickel, potash, cadmium, selenium, peat, zinc, gypsum, iron ore, nitrogen, sodium sulfate, salt, mica, copper, and lead, in order of U.S. net percentage dependency. On the other hand, Mexico is the leading supplier to the United States of cement, fluorspar, graphite, strontium, and sulfur.

In 1991, the United States imported crude oil from eight countries in Latin America as detailed in table 4: Mexico, Venezuela, Colombia, Trinidad and Tobago, Ecuador, Argentina, Guatemala, and Peru, in order of magnitude. The bulk of oil imports came from the first three countries mentioned. If exports of petroleum products are taken into account, Venezuela becomes the most important supplier of oil to the U.S. market from Latin America. U.S. oil imports from Latin America in 1991 represented about 30% of total U.S. oil imports. Combined oil imports from both Latin America and Canada accounted for about 44% of total U.S. oil imports or an estimated 16% of total U.S. consumption, again with the inclusion of certain petroleum products. In the Western Hemisphere, Venezuela surpassed Canada as the leading oil supplier to the United States in 1990 and in 1991. In sum, the United States relies heavily on the Western Hemisphere as a source of energy minerals. This dependency is more pronounced if U.S. imports of natural gas are included. In 1991, natural gas imports from Canada accounted for 9% of U.S. consumption or 97% of total U.S. gas imports. The good road, rail, and pipeline infrastructure between the United States and Canada and Mexico facilitates the importation of oil and natural gas.

The extensive mineral trade between the United States and Canada has been enhanced and facilitated by the bilateral free trade agreement (FTA) that became effective on January 1, 1989. The FTA includes a schedule for the elimination of mineral and metal tariffs during varying periods not to exceed 10 years. The year 1991 marked the third year of operation of the FTA. Despite the economic recession in both Canada and the United States, Canada's resource-based exports to the U.S. market actually increased by 7.5% during the period 1989-91 while Canada's exports of resource-based exports to the rest of the world decreased by 6.5%.

Trade Liberalization Developments

In June 1990, the Presidents from Mexico and the United States endorsed the concept of a comprehensive free trade agreement between the United States of America and the United Mexican States. In February 1991, after preliminary trilateral discussions, Canada, Mexico, and the United States decided to proceed with trilateral negotiations for a North American Free Trade Agreement (NAFTA). These negotiations continued during all of 1991 with the goal of achieving a signed agreement by late 1992. The NAFTA negotiations included trade and investment issues relating to energy and other mineral commodities. Canada is the most important trading partner of the United States and Mexico is third in importance after Japan. A NAFTA would create a formidable trading bloc with a population of 372 million and an economic output of $6.5 trillion, exceeding that of the European Community. Next in the region as a U.S. trading partner is Brazil, in 13th rank, followed by Venezuela in 17th rank. NAFTA will be open to accession by other countries in Latin America. Technical details for joining NAFTA will be worked out after the trilateral trade commission contemplated in the NAFTA is established.

Mineral trade in the Western Hemisphere is also expected to be enhanced by the U.S. policy enunciated in June 1990, the "Enterprise for the Americas Initiative." This policy initiative is promoting the alleviation of foreign debt and the liberalization of trade and investment in Latin America, changes that would impact favorably on the region's mineral sector.

In line with this initiative, the United States has signed framework agreements on trade and investment with most Latin American countries with the exception of Cuba, Haiti, and Suriname. The framework agreements with Bolivia and Mexico actually predated the June 1990 initiative. A group of four countries, Argentina, Brazil, Paraguay, and Uruguay, agreed to form a Southern Cone Common Market (MERCOSUR) by the end of 1995. The Andean group formed by Bolivia, Colombia, Ecuador, Peru, and Venezuela agreed to create an Andean Free Trade Zone by 1992 and a common market by 1996. The framework agreement with the Caribbean Community and Common Market (CARICOM), composed of 13 English-speaking Caribbean nations, was signed in late 1991.

The framework agreements create Trade and Investment Councils with Government and private-sector participation that will consult on trade and investment relations and work toward liberalizing trade and investment opportunities. In connection with these agreements, countries such as Bolivia, Chile, and Mexico have liberalized their

foreign investment laws and mining codes to provide incentives for foreign investment capital. Increased foreign investment in the mining sector is seen as a way of diversifying and expanding exports, thereby gaining foreign exchange to confront the large foreign debts in most of the countries in Latin America.

Movement toward increased regional economic integration was marked by other trade agreements. In January 1991, Mexico and five Central American countries (Guatemala, Honduras, El Salvador, Nicaragua, and Costa Rica) signed the Tuxtla Gutiérrez Framework Agreement, which outlined general guidelines for future bilateral trade agreements. Mexico held bilateral consultations with each country with the aim of signing a framework agreement to create a free-trade zone of 110 million people by 1996. Mexico also signed a Cooperation Agreement with the European Community in April 1991. Mexico signed a free trade agreement with Chile in September 1991 that will eliminate tariffs on most traded goods over a 4-year period commencing in January 1992. Tariffs on more sensitive products will be phased out over 6 years. Although trade has quadrupled since the agreement was signed, it is still relatively small.

Economic and Investment Trends

As a result of political stability, the return to democratic government, and liberalization policies, there has been a surge of interest in investing in Latin America. It has been estimated that Latin America attracted a $40 billion inflow of private capital in 1991 that included a significant reversal of capital flight. Total U.S. direct foreign investment in Latin America has increased from a low of $24 billion in 1983 to $77.3 billion in 1991, of which $4.3 billion was directed toward the petroleum sector. U.S. investment in the primary and fabricated metals sector was $1.9 billion.

On November 14, 1991, the United States signed an important Bilateral Investment Treaty with Argentina. This treaty was the first of its kind in recent years in Latin America guaranteeing national treatment for U.S. investors, including the mining and oil sectors.

Private foreign investment in Latin America was also encouraged by the trend to reduce the role of Government in the economy. A number of countries, including Argentina, Bolivia, Brazil, Chile, and Mexico, have adopted policies to privatize Government-owned enterprises. Particularly notable were the actions by Mexico to auction the Government interest in a number of large-scale mining operations such as La Caridad copper operations in 1988, followed by Cananea copper operations in 1990. In November 1991, Mexico privatized its large iron and steel companies. Mexico's Autlán manganese operation was officially for sale, but by yearend 1991 no sale was announced. Brazil privatized its USIMINAS steel operations in 1991.

Mineral development in Latin America continued to be hampered by the large foreign debt—official and private—contracted by the individual countries. By yearend 1990, this debt for the region totaled $422 billion. Of the 15 highly indebted countries around the world, 10 are in Latin America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay, and Venezuela. However, long-term debt of the Latin American region as a percentage of its gross product has decreased from 55% of GNP in 1987 to 30% of GNP in 1991.

Data available for 1989 give the GDP for the Latin American region at $810 billion, considerably greater than the output of Canada ($450 billion), Eastern Europe, or the Southeast Asia region. (For purposes of comparison, the U.S. GDP in 1989 was $5,240 billion.) Latin America's overall economic growth increased by almost 3% in 1991, reversing the negative growth rate of 1990. However, the 1991 growth rate did not match the 4-year period of high growth, 1984-88, when the growth rate exceeded 3%. The projected growth rate for 1992 is expected to exceed 3%, but remain under 4%.

[1]Orlando Martino, Chief, Branch of Latin America and Canada, Division of International Minerals.

SELECTED GENERAL SOURCES OF REGIONAL INFORMATION

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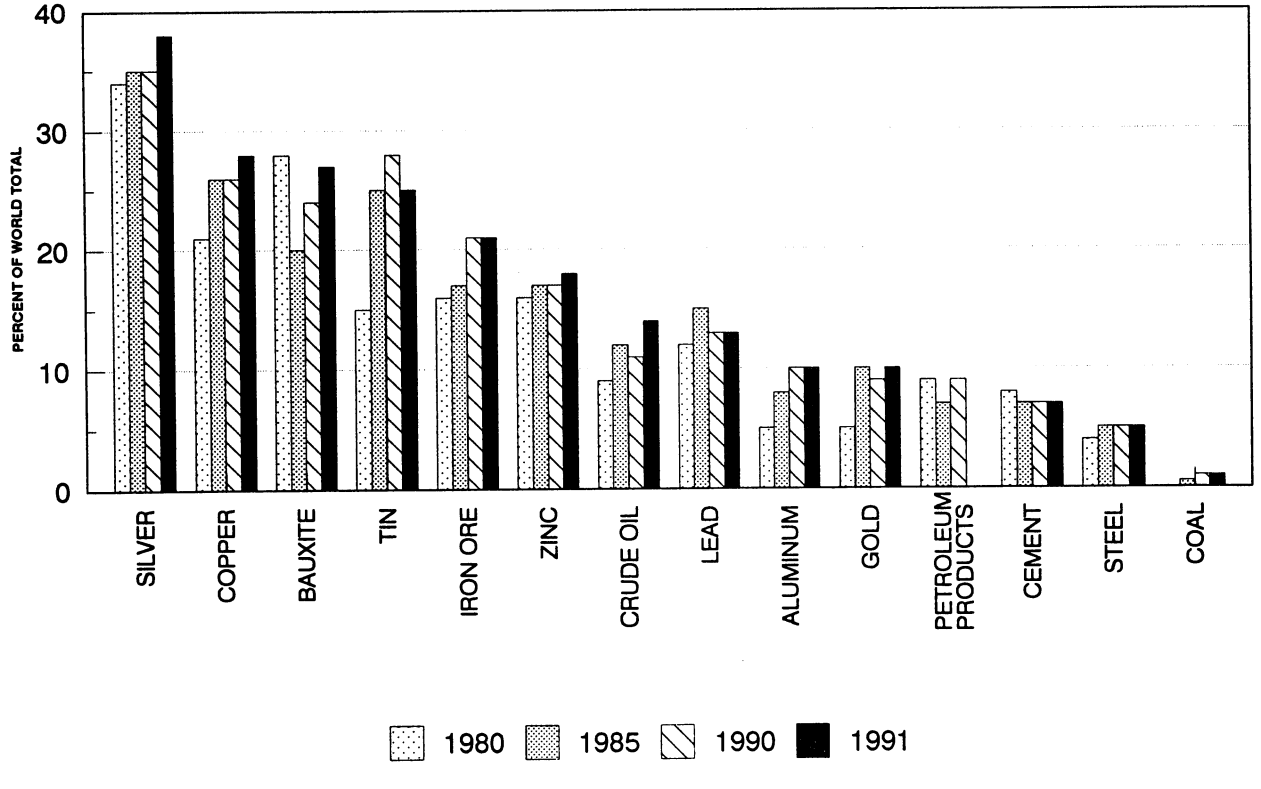
FIGURE 1
LATIN AMERICA: RELATIVE WORLD POSITION OF SELECTED MINERAL OUTPUT



SOURCE: U.S. Bureau of Mines.

TABLE 1

PRODUCTION OF SELECTED MINERALS IN LATIN AMERICA AND CANADA, 1990

(Thousand metric tons unless otherwise specified)

	Metals										
	Aluminum, metal	Bauxite	Copper, mine output	Gold (tons)	Iron ore, gross weight	Lead, mine output	Nickel, mine output	Silver (tons)	Steel, crude	Tin, mine output	Zinc, mine output
Argentina	165	—	(1)	1	992	r23	—	83	r3,634	(1)	r39
Bolivia	—	—	(1)	5	125	20	—	311	—	17	104
Brazil	931	r9,678	r36	r101	r152,300	r9	19	r171	20,567	r38	r158
Chile	—	—	r1,588	28	8,248	1	—	r655	772	—	25
Colombia	—	2	(1)	29	628	(1)	22	7	701	—	(1)
Cuba	—	—	3	—	—	—	40	—	270	—	—
Ecuador	—	—	(1)	11	—	(1)	—	(1)	20	—	(1)
Guyana	—	1,424	—	r10	—	—	—	—	—	—	—
Honduras	—	—	1	r(1)	—	6	—	r18	8	—	r30
Jamaica	—	10,921	—	—	—	—	—	—	r24	—	—
Mexico	68	—	299	8	8,073	r180	—	2,346	r8,726	r(1)	322
Peru	—	—	318	e10	r3,307	r188	—	r1,762	284	5	r584
Suriname	r32	r3,283	—	(1)	—	—	—	—	—	—	—
Venezuela	590	771	—	8	20,365	—	—	—	r3,176	—	—
Others[2]	—	85	—	6	11	—	29	23	e539	—	—
Total Latin America	1,786	26,162	2,245	217	194,049	427	110	5,376	38,721	60	1,262
Share of world percent	10	24	25	11	21	13	11	36	5	27	17
Canada	1,567	—	794	169	36,443	241	196	1,501	12,281	3	1,203
United States	4,048	W	1,587	290	56,400	495	(1)	2,170	89,720	(1)	543
Total Western Hemisphere[3]	7,401	26,162	4,626	676	286,892	1,163	306	9,047	140,722	63	3,008
Share of world percent	42	24	52	33	31	35	30	60	18	29	41

See footnotes at end of table.

TABLE 1—Continued

PRODUCTION OF SELECTED MINERALS IN LATIN AMERICA AND CANADA, 1990

(Thousand metric tons unless otherwise specified)

	Industrial minerals						Fuels			
	Barite, crude	Cement, hydraulic	Gypsum, crude	Phosphate rock	Salt, all forms	Sulfur, all forms	Coal, all grades	Natural gas, gross (million cubic meters)	Petroleum (thousand 42-gallon barrels)	
									Crude	Products
Argentina	e50	3,629	e400	—	e1,201	—	r270	e21,800	175,836	169,104
Bolivia	(1)	560	(1)	—	(1)	2	—	5,276	7,635	e8,500
Brazil	r65	r25,848	r828	2,968	r5,203	e316	e7,200	6,284	r640,557	r1,155,600
Chile	3	2,115	254	14	1,835	r e429	r2,729	4,198	7,157	e43,970
Colombia	5	6,320	e500	37	687	e40	20,400	e5,600	e159,500	e83,715
Cuba	—	r e3,500	r e130	—	e200	e5	—	e34	5,738	e53,000
Dominican Republic	—	1,060	78	—	e11	—	e1	—	—	7,916
Ecuador	—	e2,250	r e30	—	—	e14	e3	r185	106,006	39,231
Guatemala	(1)	r e889	66	—	109	—	—	e10	r1,439	e4,000
Mexico	305	23,824	5,434	r 4623	7,135	e2,413	10,014	37,741	930,023	572,226
Peru	e150	e2,185	e150	r47	e200	e66	e175	e1,100	47,050	54,080
Trinidad and Tobago	—	438	—	—	—	e5	—	e7,000	56,000	28,130
Venezuela	—	5,230	201	165	r439	106	2,190	40,516	770,133	r388,145
Others[5]	(1)	r e4,675	275	e15	r e464	e62	—	33	1,890	r e121, 339
Total Latin America	578	82,523	8,346	3,869	17,484	3,458	42,982	129,777	2,908,964	2,728,956
Share of world percent		10	8	9	2	10	6	1	6	12
Canada	r44	r11,745	r7,978	—	r11,191	r e6,716	68,331	138,358	e381,362	637,376
United States	r445	r78,606	r14,883	46,343	r36,916	r11,560	r933,562	r609,467	r3,282,810	5,300,530
Total Western Hemisphere[3]	1,067	172,874	31,207	50,212	65,591	21,734	1,044,875	877,602	6,573,136	8,666,862
Share of world percent	19	16	32	32	36	38	22	42	28	35

eEstimated. rRevised. W Withheld to avoid disclosing company proprietary data.

[1]Less than 1/2 unit.

[2]Includes Costa Rica, Dominican Republic, El Salvador, French Guiana, Guatemala, Nicaragua, Paraguay, Trinidad and Tobago, and Uruguay.

[3]Excludes Greenland.

[4]Includes only output used to manufacture fertilizers.

[5]Includes Aruba, Barbados, Costa Rica, El Salvador, Guadaloupe, Haiti, Honduras, Jamaica, Martinique, Nicaragua, Panama, Paraguay, Suriname, and Uruguay.

[6]Includes synthetic crude (from oil shale and/or tar sands).

TABLE 2

PRODUCTION OF SELECTED MINERALS IN LATIN AMERICA AND CANADA, 1991

(Thousand metric tons, unless otherwise specified)

	Metals										
	Aluminum, metal	Bauxite	Copper, mine output	Gold (tons)	Iron ore, gross weight	Lead, mine output	Nickel, mine output	Silver (tons)	Steel, crude	Tin, mine output	Zinc, mine output
Argentina	165	—	(1)	1	980	24	—	56	2,966	(1)	39
Bolivia	—	—	(1)	4	102	21	—	376	—	17	130
Brazil	1,000	10,310	37	89	150,000	9	21	170	22,616	29	161
Chile	—	—	1,814	29	8,414	1	—	674	805	—	31
Colombia	—	2	4	35	685	(1)	21	8	664	—	(1)
Cuba	—	—	3	—	—	—	35	—	270	—	—
Ecuador	—	—	—	12	—	—	—	—	20	—	—
Guyana	—	2,204	—	11	—	—	—	—	—	—	—
Honduras	—	—	1	(1)	—	8	—	39	8	—	38
Jamaica	—	11,550	—	—	—	—	—	—	e25	—	—
Mexico	51	—	284	9	7,539	165	—	2,224	7,883	(1)	301
Peru	—	—	382	9	3,593	200	—	1,769	418	7	628
Suriname	29	3,198	—	(1)	—	—	—	—	—	—	—
Venezuela	601	1,992	—	4	21,241	—	—	—	3,119	—	—
Others[2]	—	7	—	e18	10	—	29	24	637	—	—
Total Latin America	1,846	29,263	2,525	221	192,564	428	106	5,340	39,431	53	1,328
Share of world percent	10	27	28	11	21	13	11	38	5	25	18
Canada	1,822	—	798	179	35,961	278	197	1,338	12,987	4	1,148
United States	4,100	W	1,630	300	54,000	480	8	1,800	78,018	(1)	550
Total Western Hemisphere[3]	7,768	29,263	4,953	700	282,525	1,186	311	8,478	130,436	57	3,026
Share of world percent	42	27	55	33	31	35	33	60	17	27	41

See footnotes at end of table.

TABLE 2—Continued

PRODUCTION OF SELECTED MINERALS IN LATIN AMERICA AND CANADA, 1991

(Thousand metric tons, unless otherwise specified)

	Industrial minerals						Fuels			
	Barite, crude	Cement, hydraulic	Gypsum, crude	Phosphate rock	Salt, all forms	Sulfur, all forms	Coal, all grades	Natural gas, gross (million cubic meters)	Petroleum (thousand 42-gallon barrels)	
									Crude	Products
Argentina	e50	e3,000	e450	—	e1,201	—	292	e22,000	178,379	175,428
Bolivia	1	592	(1)	—	e(1)	3	—	5,432	8,094	9,770
Brazil	65	e25,000	880	3,309	e5,000	e316	e7,200	6,280	235,790	1,200,000
Chile	3	2,251	336	13	1,676	420	2,742	4,067	6,504	e44,000
Colombia	5	6,277	639	32	701	56	20,200	5,202	155,329	88,863
Costa Rica	—	700	—	—	50	—	—	—	—	2,507
Cuba	—	4,000	e130	—	e200	e5	—	—	e5,000	e53,000
Dominican Republic	—	1,231	118	—	e11	—	e(1)	—	—	10,301
Ecuador	—	2,300	24	—	—	e14	e3	e180	109,400	e39,300
Guatemala	—	e900	52	—	e100	—	—	e12	1,352	4,639
Mexico	204	26,700	4,774	4596	7,533	e2,094	9,401	37,555	978,126	582,045
Peru	150	e2,200	e160	18	e200	e66	151	1,012	41,898	55,567
Trinidad and Tobago	—	485	—	—	—	e5	—	7,000	55,000	30,200
Venezuela	—	6,337	244	162	430	e83	2,700	42,326	871,762	389,638
Others[5]	(1)	4,093	334	15	429	62	-	35	1,970	161,105
Total Latin America	478	86,066	8,141	4,145	17,531	3,124	42,689	131,101	2,648,604	2,793,363
Share of world percent	8	7	9	3	9	5	1	6	13	e12
Canada	51	9,396	7,305	—	11,585	6,856	78,086	144,987	e563,985	617,532
United States	430	64,410	13,880	47,000	36,290	10,600	903,542	615,612	2,707,039	5,933,298
Total Western Hemisphere[3]	959	159,872	30,052	51,145	65,406	20,580	1,024,317	891,700	5,919,628	9,344,193
Share of world percent	17	14	31	35	35	36	22	42	28	e37

eEstimated. W Withheld to avoid disclosing company proprietary data.

[1]Less than 1/2 unit.

[2]Includes Costa Rica, Dominican Republic, Ecuador, El Salvador, French Guiana, Guatemala, Nicaragua, Paraguay, Trinidad and Tobago, and Uruguay.

[3]Excludes Greenland.

[4]Includes only output used to manufacture fertilizers.

[5]Includes Aruba, Barbados, El Salvador, Guadeloupe, Haiti, Honduras, Jamaica, Martinique, the Netherlands Antilles, Nicaragua, Panama, Paraguay, Suriname, and Uruguay.

[6]Including synthetic crude (from oil shale and/or tar sands).

TABLE 3
LATIN AMERICA IN THE WORLD MINERAL ECONOMY

(Percent of total world output)[1]

Commodity	1980	1985	1988	1989	1990	1991
Silver	34	35	35	36	35	38
Copper	21	26	25	26	26	28
Bauxite	28	20	21	21	24	27
Tin	15	25	30	33	28	25
Iron ore	16	17	21	21	21	21
Zinc	16	17	15	17	17	18
Crude oil	9	12	11	10	11	14
Lead	12	15	12	13	13	13
Aluminum	5	8	9	9	10	10
Gold	5	10	11	10	9	10
Petroleum products	9	7	9	9	9	NA
Cement	8	7	8	7	7	7
Steel	4	5	6	6	5	5
Coal	—	.5	.8	.8	1	1

NA Not available.
[1]By volume.

TABLE 4
U.S. DEPENDENCY ON IMPORTS OF PETROLEUM FROM LATIN AMERICA, 1991

(Thousand 42-gallon barrels)

Country	Crude oil	Percent share	Petroleum products[1]	Percent share	Total petroleum	Percent share
Venezuela	243,986	39.7	133,752	57.2	377,738	44.5
Mexico	276,864	45.0	17,633	7.5	294,497	34.7
Colombia	44,924	7.3	[2]14,658	6.3	59,582	7.0
Trinidad and Tobago	26,433	4.3	5,561	2.4	31,994	3.8
Netherlands Antilles	—	—	29,693	12.7	29,693	3.5
Ecuador	19,199	3.1	[2]3,725	1.6	22,924	2.7
Bahamas	—	—	[2]12,878	5.5	12,878	1.5
Brazil	—	—	8,168	3.5	8,168	1.0
Peru	564	.1	[2]3,549	1.5	4,113	.5
Argentina	1,543	.3	4,252	1.8	5,795	.7
Guatemala	1,429	.2	—	—	1,429	.2
Total	614,942	100	233,869	100	848,811	[3]100.1
Total U.S. imports	2,110,532	100.0	673,231	100.0	2,783,763	100.0
From Latin America	614,942	29.1	233,869	34.7	848,811	30.5
From Canada	271,375	12.9	105,553	15.7	376,928	13.5
From Western Hemisphere	886,317	42.0	339,442	50.4	1,225,739	44.0

[1]Composed of LPG, motor gasoline, jet fuel, residual fuel oil, kerosene, naphthas, asphalt, and other products.
[2]Mostly residual fuel oil.
[3]Due to rounding.

Source: U.S. Department of Energy, Energy Information Administration, Petroleum Supply Annual 1991, July 1992.

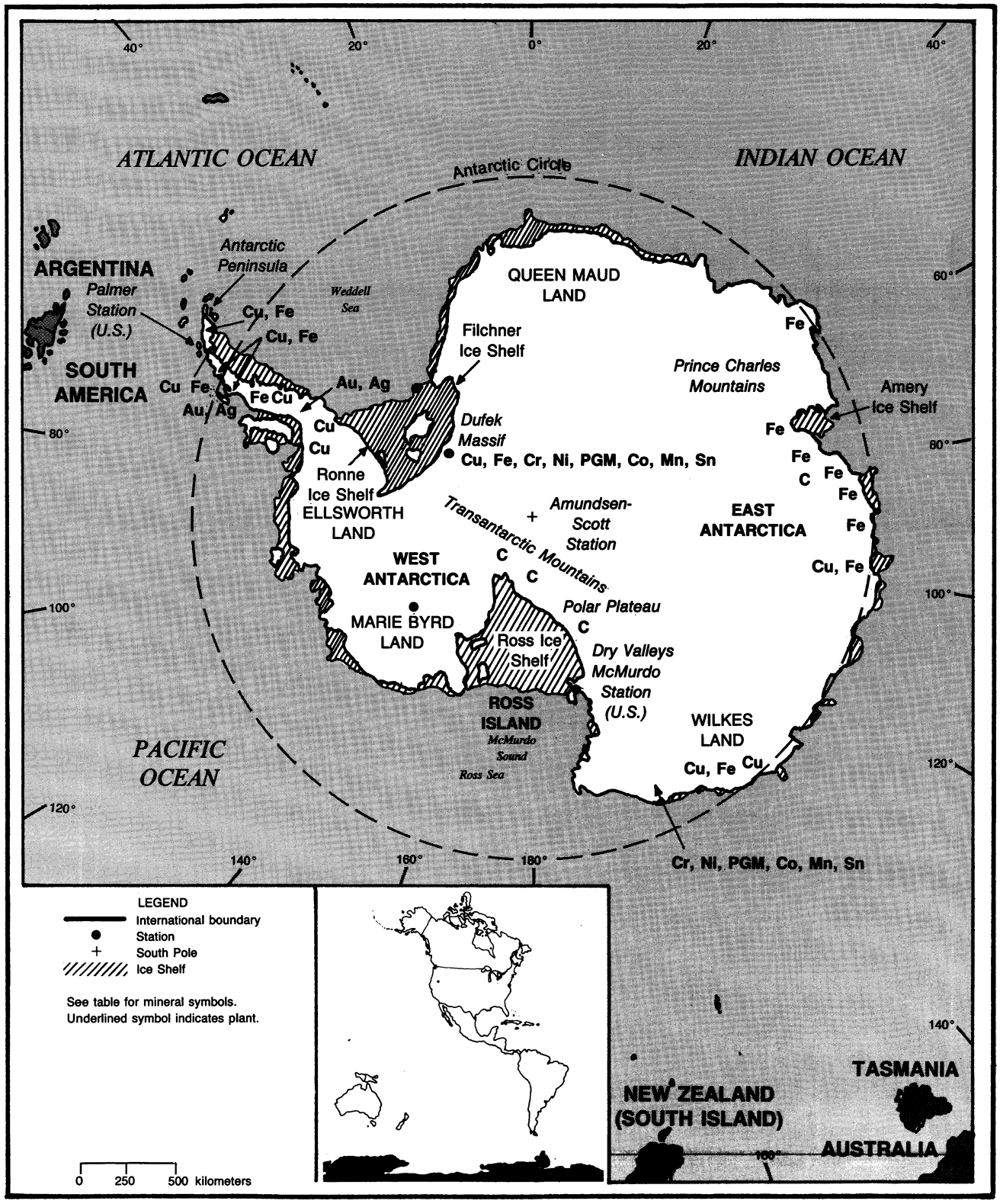
TABLE 5

LATIN AMERICA AND THE CARIBBEAN: INTERNATIONAL ORGANIZATIONS

ACP	African, Caribbean, and Pacific Countries (associated with the EC).
ANCOM	Andean Common Market.
—	Andean Pact.
ARPEL	Latin American State Oil Companies Association.
CABEI	Central American Bank for Economic Integration.
CACM	Central American Common Market.
CARICOM	Caribbean Community and Common Market.
CARIFTA	Caribbean Free Trade Area.
CBERA	Caribbean Basin Economic Recovery Act.
CDB	Caribbean Development Bank.
CELAM	Conference of Latin American Bishops.
ECLAC	Economic Commission for Latin America and the Caribbean (UN).
IADB	Inter-American Defense Board.
IAIC	Inter-American Investment Corporation.
IDB	Inter-American Development Bank.
ILAFA	Latin American Iron and Steel Institute.
ILAI	Institute for Latin American Integration.
ILPES	Latin American Institute for Economic and Social Planning.
LAIA	Latin American Integration Association.
MERCOSUR	Southern Cone Common Market (Argentina, Brazil, Paraguay, and Uruguay).
NAFTA	North American Free Trade Agreement.
OAS	Organization of American States.
ODECA	Organization of Central American States.
OECS	Organization of Eastern Caribbean States.
OLADE	Latin American Energy Organization.
OLAMI	Latin American Mining Organization.
PAHO	Pan American Health Organization.
—	Rio Group.
SELA	Latin American Economic System.
TCA	Amazon Cooperation Treaty.

ANTARCTICA

AREA 14.3 million km² **POPULATION varies**



THE MINERAL POTENTIAL OF

ANTARCTICA

By David B. Doan

A large continent of about 14 Mkm^2 in area, Antarctica lies almost entirely within the appropriately named Antarctic Circle. It is virtually surrounded by deep ocean basins and supports an ice sheet varying from 1,500 to about 3,900 m thick. Through a period of years, geophysical studies have revealed a fairly complete physiographic picture beneath the ice cover. West Antarctica is connected to the main part of the continent by a mountain chain rising well above sea level, though largely masked by ice and snow. The mountains of Marie Byrd Land are a large island mass whose surrounding ice extends well below sea level. The bedrock of most of East Antarctica apparently rises above sea level, with the high ranges of the Transantarctic Mountains and Queen Maud Land extending far above sea level.

The Antarctic continent, with its accompanying continental ice sheet and widely distributed mountain glaciers, is more or less unique at the planetary surface, being at once the coldest area on Earth, the least inhabited continent, the southern pole, and the locus of the greatest impoundment of fresh water on Earth. Moreover, it has a distinct fauna and flora, relating evidently both to temperature and the uniqueness of the landmass as a major continent. Exploration began piecemeal and by accident in the early 1800's, primarily by whale and seal hunters, and increased gradually toward the so-called Heroic Era, from 1894 to the late 1920's. During this 35-year period, explorers from a number of countries established bases, planted their flags at the pole, and in some cases made claims of land on behalf of their countries. Starting in the 1940's, geopolitical interest and contention rose sharply. By the early 1960's, scientifically sophisticated bases were established, and overland expeditions mounted, by many countries. Intentions were diverse but most countries maintained a public posture of scientific objectivity. Accommodation among countries, however, became desirable.

POLICIES AND PROGRAMS

The Antarctica Treaty, signed on December 1, 1959, and entered into force on June 23, 1961, established for at least 30 years a legal framework for peaceful use, scientific research, and suspension of territorial claims. Administration has been carried out through consultative member meetings; the 14th and latest meeting was held in Río de Janeiro, Brazil, in October 1987.

Consultative (voting) members include claimant nations, who claim somewhat overlapping portions of Antarctica as national territory, and nonclaimant nations, who have made no claims to Antarctic territory, although among the latter the United States and the former U.S.S.R. have reserved the right to do so and also do not recognize the claims of others.

Argentina and Chile are signatories of the 1961 Antarctica Treaty and are among the seven countries making claims on Antarctic territories. In October 1985, Uruguay achieved Consultative Party status within the treaty. Cuba and Peru are acceding (nonvoting) members. Argentina and Chile maintain research stations on Antarctica. Of all the claimant nations, Argentina has had the longest presence in Antarctica, dating to 1904. Argentina and Chile have signed the agreement called the Convention on the Regulation of Antarctic Mineral Resources Activities (CRAMRA) negotiated by the Antarctica Treaty nations during the period 1982-88.

In 1990, two concurrent resolutions were passed by the U.S. Congress: House of Representatives Concurrent Resolution 109 and Senate Concurrent Resolution 26, which declared that it is U.S. policy to pursue an indefinite or permanent ban on commercial mineral development activities in Antarctica. Both resolutions received widespread bipartisan support as well as the backing of major environmental groups.

The Madrid Antarctica Treaty Conference, held in Spain in June of 1991, saw near unanimity on the part of the consultative and nonclaimant nations as to a 50-year protected future for Antarctica, but the United States was unable to reach agreement before the end of the meetings concerning the possible future of mining in that continent. Chile alone supported the U.S. position, but in July the United States acceded to a compromise stating, in effect, that any of the parties wishing to mine after 50 years may do so only if agreed to by three-quarters of the 26 consultative nations.

MINERAL POTENTIAL

What is known of the geology of Antarctica, together with additional evidence from a great many mineral prospects in the small proportion of rocks actually exposed, suggests that a significant potential for mineral deposits occurs in various parts of the continent. Geologic work pointing to this conclusion has been published by geologists from Argentina, Australia, Canada, China, the Federal Republic of Germany, New Zealand, Norway, the Republic of South Africa, the United Kingdom, the former U.S.S.R, and the United States. Known

metalliferous fold belts in Africa, Australia, and South America appear to have continuations in Antarctica, based on general concepts of plate tectonics. Although much evidence is circumstantial, a reasonable scientific basis exists for projecting high-probability areas of ore-grade mineralization in Antarctica.

Some copper-bearing plutons on the Antarctic peninsula have distinct similarities to the Andean porphyry copper bodies. The Dufek Massif, a major intrusion near the African end of the Transantarctic Mountains, bears a distinct resemblance to, and is potentially larger than, the Bushveld Complex in the Republic of South Africa. Although the geology of the two complexes is comparable, they are quite different in geologic age.

Based on geologic structure and geophysical evidence, there is a clear possibility that petroleum resources are likely to be present, particularly offshore in the thick sedimentary basins of the Amery Ice Shelf, Filchner Ice Shelf, Ronne Ice Shelf, Ross Sea and Ice Shelf, and the Weddell Sea. Shows of petroleum and natural gas were encountered during Deep Sea Drilling Project Leg 28 in 1973 while drilling on the continental shelf in the Ross Sea area. The discovery of hydrocarbons along the Atlantic coasts of Africa and South America, the east coast of India, and the south coast of Australia underscores the possibility of similar accumulations along the coasts of Antarctica that were once in proximity to these petroliferous margins of other continents.

INFRASTRUCTURE

The infrastructure of Antarctica consists of temporary and permanent scientific stations that have been established by Argentina, Australia, Chile, France, the Federal Republic of Germany, Great Britain, India, Japan, New Zealand, the Republic of South Africa, the former U.S.S.R, and the United States. These stations have been or are supplied by ships and airplanes using temporary airstrips totaling about 39. There are no ports, only offshore anchorage. Antarctica has no indigenous human inhabitants. The total number of foreign inhabitants varies up to about 4,000, depending on the time of year.

OUTLOOK

The CRAMRA Treaty was adopted in Wellington, New Zealand, on June 2, 1988. It sought, among other things, to regulate a controlled, rational approach to future mineral exploration activities in the Antarctic. Three years later, however, the Madrid conference ultimately agreed to a 50-year moratorium on mineral exploration and mining of any kind, thus defining the outlook for the foreseeable future. Antarctica's remoteness, its harsh climate, the ice coverage of 98% of its surface, the lack of suitable mining-related technology, the abundance of minerals elsewhere, and the opposition of environmentalists and conservationists would provide additional reasons for hesitation in attempting exploration with the intent of mineral extraction.

OTHER SOURCES OF INFORMATION

Agencies

National Science Foundation
1800 G Street, NW
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Telephone: 202-357-5000

U.S. Geological Survey
12201 Sunrise Valley Drive
Reston, VA 22092
Telephone: 703-648-6600

Publications

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MEXICO: MURAL BY NORBERTO MARTINEZ IN THE FORMER CONSEJO DE RECURSOS MINERALES BUILDING IN MEXICO CITY, D.F. (PHOTO COURTESY OF THE CONSEJO DE RECURSOS MINERALES.)

ARGENTINA

AREA 2.8 million km² **POPULATION 32.6 million**

THE MINERAL INDUSTRY OF

ARGENTINA

By Pablo Velasco

Argentina, the second largest country in South America after Brazil, continued to be a modest producer of minerals. Its mining activities, excluding hydrocarbons, accounted for an estimated 0.3% or less of the country's 1991 GDP of about $134.7 billion.[1] The real GDP grew by about 6.4%, thus making 1991 the first year of economic recovery.

Argentina has become a model for Latin America economic reform. In the last 6 months, the initial success of the April 1991 Convertibility Law had been consolidated along with other important advances in deregulation, opening the economy, and stabilizing Argentina's financial situation. The Government, through the Ministry of Economy, continued with its policies of extensive public-sector reform, rapid privatization of state enterprises, and reliance on market forces. Economic stability resulted from the Government balancing its budget and maintaining confidence in the domestic currency. With its "Deregulation Decree" enacted on October 31, 1991, Argentina started unraveling innumerable regulations that favored select interest groups, distorted relative prices, and allowed corruption.

In 1991, Argentina continued its self-sufficiency in energy resources (coal, gas, petroleum, and uranium) and was a large producer of electricity. Argentina was the fourth largest producer of crude oil and natural gas in Latin America and ranked third in world production of boron minerals. Argentina had the most advanced nuclear energy program in Latin America, with two nuclear plants in operation and a third one under construction. Nuclear plants provided 7,750 MW of electric power to Argentina in 1991, or 14% of the total of 53,600 MW.

Argentina's mineral production and trade remained almost negligible in terms of their contributions to the GDP and total exports. Total mineral sector exports, excluding hydrocarbons, declined to an estimated $67 million, 14% lower than those in 1990. Metallic mineral exports represented 60.5% and industrial minerals 39.5% of the total mineral sector's exports figure. The state-owned entities included the petroleum company Yacimientos Petrolíferos Fiscales (YPF), Gas del Estado, Hierro Patagónico de Sierra Grande S.A. Minera (HIPASAM), Sociedad Mixta Siderúrgica Argentina (SOMISA), Yacimientos Carboníferos Fiscales (YCF), Dirección General de Fabricaciones Militares (DGFM), and the Altos Hornos Zapla smelter. The largest privately owned companies were Cía. Minera Aguilar S.A. (CMASA), producer of lead, silver, and zinc; the only aluminum smelter in Argentina, Aluminios Argentinos S.A.I.C. (ALUAR), which produced an estimated 171,000 tons of primary aluminum in 1991; ACINDAR Industria Argentina de Aceros S.A. (ACINDAR), a steel producer and manufacturer; and Sulfacid S.A., a producer of zinc metal.

GOVERNMENT POLICIES AND PROGRAMS

The Federal Government implemented several pragmatic economic measures in 1991 that were aimed at promoting foreign investment and stabilizing the economy through fiscal austerity, privatization, and a greater reliance on market forces. The privatization of several state-owned companies, which had begun in 1989, was continued in 1991. Some drastic austerity plans imposed on Argentina by the International Monetary Fund (IMF), such as the closure and/or merger of several state-owned banks, consolidation of Government agencies, and reduction in the number of public employees, also were put into effect. The economic solutions that Argentina envisioned started with stabilization of the exchange rate and a sudden reduction of the inflation rate. High interest rates, which can exceed 5% or 10% per month in dollar terms, attract an inflow of capital. This in turn maintains an appearance of stability in the nominal value of the austral. The exchange rate was close to $10,000 australes to the U.S. dollar. By yearend, the Government planned to replace the austral by the peso at a conversion rate of 10,000 australes to 1 peso.

The enactment of the Economic Emergency Act (EEA), law No. 23697, and the new State of Reform Act (SRA), law No. 23696 of August 1989, declared Argentina to be in a state of emergency and attempted to deregulate and liberalize the economy by setting guidelines for the privatization process and the development of the capital market. As a result, Argentina's international capital market has experienced soaring trading volumes since August 1991. The Ministry of Economy announced, on November 26, the creation of the Secretary of Hydrocarbons and Mines. This new position would combine functions formerly separated. The designation of this Secretariat position was included in the new organizational structure of the Ministry of Economy and was published on December 20 in the National Registry bulletin. Current Undersecretaries have been upgraded to Secretary, and the National Directorate of Geology and Mines to Subsecretary of Mining. This agency has continued to promote several mining areas and projects in the country for foreign investment and has

consolidated geological information, ore reserves, and project information into a useful manual for initial research. For decades, Government bureaucracy had imposed on Argentine businesses costly and cumbersome charges and restrictions, including everything from export license authorizations, special taxes, and negotiable port charges to a ceiling on work hours per day allowed certain labor categories.

A special Mining and General Legislation Commission was set up by the Honorable Chamber of Deputies of Argentina to prepare mining reform guidelines for proposed mining legislation to be submitted to the Congress. The Mining and General Legislation Commission was composed of miners and legislators. Before yearend, the Mining and General Legislation Commission submitted a draft of the proposed New Mining Legislation to the Honorable Chamber of Deputies after consultations with representatives of Argentina's mining sector, as well as to potential investors from Australia, Canada, the Republic of South Africa, and the United States.

The law adhered to the same private investment philosophy that opened industrial development to participation from small, medium, and large mining enterprises. Under the New Reformed Mining Code, private output of minerals, including metallic, industrial minerals, and fuel minerals, would not be taxed if exported. Article 2,342 of the Argentine Civil Code declares that gold, silver, copper, and fossil substances are the state or provinces' private properties despite the persons or corporation possessing the land. Likewise, the Mining Code stated that mineral resources belong either to the state or the provinces, depending on location. Although the state does not have property rights, the state and the provinces grant concessions and control the fulfillment of obligations and duties outlined by the law. Equipment could be imported tax free, and Federal taxes on multinational companies would be maintained at existing levels. The Argentine Government wanted the private sector, not the state, to have the leading role in promoting mining development. With Argentina's economy in crisis, the only source of risk capital required to activate mineral and metals production was from foreign companies. Argentina is a member of the Latin American Integration Association (ALADI) and the Southern Region Common Market Treaty (MERCOSUR). In 1991, Argentina had a $380 million trade deficit in metals and minerals while exporting $67 million. The mining sector has been a drain on the national treasury for decades.

Several Provincial governments were very active in promoting exploration joint ventures. The governments of Mendoza, San Juan, and Catamarca Provinces arranged their mining structure into much more flexible organizations that were at liberty to form joint ventures. Broken Hill Pty. Co. Ltd. (BHP), Anglo-American Corp., Río Tinto Zinc Corp. Ltd. (RTZ), International Musto Exploration Ltd. (Musto), and other foreign companies were carrying out exploration programs throughout the country. There is more detail on Musto under the copper commodity section.

PRODUCTION

Argentina continued to be the world's third largest producer and exporter of boron minerals and byproducts after the United States and Turkey. It also produced modest quantities of base metals such as cadmium, copper, lead, silver, and zinc; industrial minerals such as asphaltite, barite, bentonite, clays, celestite, feldspar, fluorite, granite, gypsum, kaolin, marble, sodium carbonate, and vermiculite; and mineral fuels such as coal, coke, and crude oil.

Production of precious metals was limited; gold output in 1991 reached 1,478 kg, which was an increase of 23% over that of the previous year. Smelter and refinery production of most metals, including ferroalloys, generally remained at about the same level as that of 1990. Argentina's major nonferrous metals industries—aluminum, zinc, and copper producers—have, like the steel industry, been hard hit by import-export red tape. Argentina's only primary aluminum producer, ALUAR, would not financially benefit from the deregulation measures. ALUAR produces about 170,000 mt/a of aluminum ingot, billet, and slab and exports 60% to 65% of these products, mostly to Japan. Crude steel production in Argentina decreased in 1991 to about 3.0 million tons from 3.6 million tons the preceding year, while domestic consumption increased to 2.1 million tons from 1.6 million tons in 1990. The biggest producers of steel in Argentina were SOMISA and ACINDAR. Production of crude oil increased 1.4% to 178,379 bbl in 1991 compared with that of the previous year, and refinery products increased 3.7% to 175,428 bbl in the same period. *(See table 1.)*

TRADE

The National Customs Administration and the National Institute of Statistics and Census reported the value of exported nonfuel minerals, mineral related products, and metals to be approximately $77 million, a decrease of 14.3% compared with that of 1990. The export value of crude oil and refinery products increased 38.3% to $848 million. The following principal nonfuel mineral exports were classified in five groups based on their export value: (1) borates, 18.2%, of which boron minerals were 2.2%; boric acid, 7.14%; and sodium borate, 8.9%; (2) metals, 31.6%, of which refined zinc was 27.4% and refined lead, 4.2%; (3) metallic minerals, 28.9%, of which lead minerals and concentrate were 23.4% and zinc minerals and concentrates, 5.5%; (4) granites, 10.8%, of which manufacture was 9.6% and granite in blocks, 1.2%; (5) others 10.5%, of which marble manufacture was 0.3%; salt was 1.3%; bentonite, 0.9%; perlite, 1.3%; gypsum, 0.6%; and iron oxide, 0.5%. In 1991, the nonfuel mineral and mineral-related products exported went to almost 50 countries as follows: Brazil, 29.6%; the United States, 9.4%; Belgium, 17.1%, the Netherlands, 2.9%; Australia, 5.4%; Japan 3.3%; Chile, 5.1%; Guatemala 2.9%; Costa Rica 2.5%; and Italy, 2.2%.

Brazil remained the single largest importer of Argentine minerals, accounting for approximately 30% of the total. According to Government import figures, the value of imports of minerals and basic manufactured products derived from mineral substances amounted to about $665 million. Imports of natural gas from Bolivia increased 1.4% to 2.7 Mm^3 having an estimated value of $230 million. Imports of metallurgical coal from the United States and other countries decreased 3.6% to an estimated 0.6 Mmt. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

Government participation in the mineral industry through the Subsecretaría de Minería accounted for approximately 60% of the major operating mining companies in the country. Included were such companies as DGFM and HIPASAM, which mined iron ore for its SOMISA pellet and steel plant and the Altos Hornos Zapla smelter. The state-owned Yacimientos Mineros de Agua de Dionisio (YMAD) controlled the exploration, exploitation, and development of the gold-silver-manganese-producing Farallón Negro Mine, the Bajo la Alumbrera copper-gold-silver-molybdenum deposit, the Alto de la Blenda lead-silver and zinc deposit, the Bajo el Durazno copper, gold, and molybdenum deposit, the Agua Tapada, the La Josefa copper and gold deposit, and the Bajo San Lucas copper deposits.

The Comisión Nacional de Energía Atómica (CNEA) controlled Empresa Nuclear Mendoza's uranium production from the Sierra Pintada Mine and provided the uranium needed for the Atucha I and the Embalse nuclear powerplants in Buenos Aires and Córdoba, respectively. Atucha II, still under construction, will also utilize the same source of uranium (U_3O_8) fuel for its power reactor when completed.

In the hydrocarbon sector, the Government, through the Secretaría de Hidrocarburos y Minería, controlled YPF, Gas del Estado, and YCF enterprises, which conducted the exploration, exploitation, contracting, marketing, and transportation of all petroleum, natural gas, and bituminous coal produced domestically. In addition, YPF managed some oil ventures in foreign countries, signed contracts with private national and foreign companies, and called for bids on the exploration, development, and exploitation of new areas in the country. However, over the next 2 years, the current administration wants to continue privatizing and selling another $30 billion worth of state-owned assets. This means that the state would withdraw from transportation, energy, roads, river transport, shipping ports, petrochemicals, hydrocarbons, steel, mail, gas supply, and water supply. Besides selling off companies, the Government will consider bids from private companies to operate concessions that were previously state monopolies such as: hydroelectric dams and distribution systems, Gas del Estado, and oil and gas fields currently operated by YPF. Besides these civilian operated companies, the Government also wanted to dispose of 26 military-run companies. These include the steelworks of SOMISA, the country's two biggest petrochemical plants (Bahía Blanca and General Mosconi); Fabricaciones Militares (DGFM); Hierro Patagónico de Sierra Grande (HIPASAM); Altos Hornos Zapla in Jujuy; and others. The only problem in selling the military-owned companies was the legal procedures involved that would allow them to become subject to privatization. Congress has to pass a law authorizing the privatization. The mineral industry in the private sector was composed of several mining and manufacturing companies such as Aluminios Argentinos SAIC (ALUAR), Cementos Loma Negra CIASA, Boroquímica SAMICAF, Cía. Minera Aguilar S.A., Cía. Minera Tea SAMICAF, Sulfacid SACIyF, and hundreds of small metallic and industrial mineral companies engaged in mining activities throughout Argentina.

At yearend, there were 10.9 million people employed, of which 12% was in agriculture, 31% in industry, and 57% in services. Of the total labor force, approximately 3.0 million, or 28%, were organized in labor unions. Approximately 7.0% of the labor force was unemployed in 1991. Of the total labor force employed in industry, 7,000 were in the cement industry, 36,000 in the metallurgical plants, 24,000 in the mining sector, and 21,000 in the oil and gas industry. *(See table 4.)*

COMMODITY REVIEW

Metals

Aluminum.—Primary aluminum in Argentina was produced by ALUAR. ALUAR's refinery in Puerto Madryn, Chubut Province, has an installed production capacity of 172,000 mt/a of primary aluminum. ALUAR's continuing addition of modern technology to the plant has enabled the company to operate in recent years at approximately 98% of its maximum capacity. However, in 1991, ALUAR cut output by 9% from mid-October owing to low aluminum prices and the new deregulation measures introduced by the Government that increased taxes by 2%. According to ALUAR's officials, the deregulation measures will not affect the volumes of aluminum products they export, and the elimination of the 3% export tax would reduce their costs. ALUAR would not financially benefit from the deregulation measures as other nonferrous metals producers would; however, they would not be penalized by them either. ALUAR produces about 170,000 mt/a of aluminum ingot, billet, and slab and exports 60% to 65% of these products, mostly to Japan, so the elimination of the 3% export tax would cut shipping costs. ALUAR imports virtually all the alumina it uses, mostly from Australia. With a 2% increase in the import tax, the overall import duty on alumina would be 5%. In tax terms, ALUAR would not have either an operational loss or gain. However, the other nontax-related deregulation will cut operational costs.

The new higher ceiling on work hours per day for dock workers would mean big savings for ALUAR. Before the

deregulation, dock workers could only work fixed hours, in some cases as little as 8 hours per day depending on the port, which caused ships to sit at docks longer than necessary. With the new flexible work hours, some dock workers were allowed to work around the clock, which meant there were lower freight charges as ships were able to load and unload more rapidly. Apparent consumption of aluminum in 1991 decreased from 54,100 mt/a to 42,300 mt/a.

Copper.—YMAD continued exploration, development, and production of all minerals within its mining concession of about 344 km^2, northwest of Catamarca Province. The YMAD mining concession included several deposits, including the Farallón Negro Mine, that have been under development since 1978. Alto de la Blenda was under exploration and development through a cooperative agreement with the Japanese Government.

Bajo de la Alumbrera, a porphyritic copper deposit on YMAD's mining concession and approximately 9 km from the Farallón Negro Mine, had minable reserves of approximately 350 Mmt/a of ore assaying 0.75 gm of gold per ton and 0.55% copper. A series of studies and metallurgical tests were performed on this deposit by Argentina and foreign companies such as Outokumpu Oy of Finland, Humboldt Wedad-KHD of the Federal Republic of Germany, and Bureau de Rercherches Geologiques a Mineres (BRGM) of France. All the studies confirmed the technical feasibility of processing the minerals of Bajo de la Alumbrera using conventional methods.

In November 1991, YMAD hoped to attract $500 million in foreign investment to develop major copper reserves in the northwest portion of Catamarca Province. After consultation with E.L. Bateman, a South African consultant company, YMAD decided to call for international bids on the Bajo de la Alumbrera porphyry copper deposit. Mining companies were informed of the public bidding to perform a more definitive feasibility study for the development of this deposit. The contract was awarded to International Musto Corp. Explorations Ltd. (Musto). As operator, Musto would finance and complete an 18-month feasibility study and had the option of bringing the ore deposit into production. The feasibility study would be completed by mid-1993 at an estimated cost of $4 million and in January 1992, Musto would sign the contract with YMAD for the exploration and exploitation of the Alumbrera deposit. The decision to enter phase 2 was at Musto's option. Previous studies indicated that the Bajo de la Alumbrera deposit could produce about 60,000 mt/a of copper, along with 500 mt/a of molybdenum, 10 mt/a of silver, and 8 mt/a of gold. The bids were to be opened on February 15, 1992.

Gold and Silver.—The Government reported that gold production increased 23.2% to 1,478 kg and silver production decreased 31.8% to 56,359 kg, respectively, in 1991, as compared with those 1990. Gold and silver were produced mainly from the Farallón Negro Mine in Catamarca Province and the Angela Mine in Chubut Province. The Farallón Negro, the Alto de la Blenda Mines, and other properties in the mining district are owned by YMAD. The district, in addition to these two mines, included the large Bajo de la Alumbrera copper-gold-silver-molybdenum deposit. YMAD also continued mining gold on a pilot basis using the heap-leaching process from ores produced at Bajo de la Alumbrera deposit, which recently was awarded to Musto of Canada for further exploration and exploitation. Farallón Negro has been producing gold and silver since 1978. Manganese was also mined as a byproduct, but not recovered during the process owing to low-grade content, and was deposited on special tail disposal areas for further processing. The Farallón Negro Mine currently has about 300,000 tons of proven and probable ore reserves mostly in the lower levels.

The Alto de la Blenda deposit has similar characteristics to Farallón Negro, and YMAD has centralized its attention on this deposit because it represented the future continuity of production for several years to come. The exploration efforts in this deposit were accomplished with the assistance of the Japanese International Cooperation Agency (JICA) through a $1.5 million grant to YMAD initially for 3 years and extended in July 1990 for 2 more additional years owing to the successful results found mainly in the lower level of the Alto de la Blenda Mine. The results obtained up to 1989 were an increase in reserves from 80,000 tons in 1960 to 875,000 tons in 1989, incremented further to 1,050,000 tons during the first semester of 1990, with the great possibility that it will reach to 1,200,000 tons by the end of 1991.

YMAD was planning to expand its plant capacity from 300 mt/d to 600 mt/d and the heap-leaching pad capacity from 150 mt/d to 300 mt/d, which would allow YMAD to produce about 1,100 kg of gold and 8,000 kg of silver per year. The investment planned to implement this project was about $6 million, of which two-thirds would be financed with YMAD's production. Improvements to the beneficiation plant and refinery, in the city of Catamarca, would cost about $2 million.

Cía. Minera Valle del Cura, S.A., after 4 years of intensive exploration work that included more than 10,000 m of surface and underground drilling, 3 km of drifting and raising, 10 km of trenching, and 20,000 analyzed samples and bulk sampling for pilot testing, has concluded the feasibility study for a gold project. Although results of the project study were unavailable, the investment was estimated to be in the order of $20 to $25 million to exploit the mine by the heap-leaching process to treat 300 to 400 mt/d.

Silver production decreased to about 9,000 kg at the Farallón Negro Mine in Catamarca Province. This mine is now apparently becoming depleted of its ore reserves. Plans are under way to commission two other mines in the same area and use the existing milling facilities. Another option being examined at yearend was the formation of a joint-venture company, and a tender was being prepared to that effect.

Iron and Steel.—Production of iron ore in Argentina declined 1.2% to 980 tons in 1991 compared with that of the previous year. The iron ore output comes from two sources, Altos Hornos Zapla in Jujuy Province and Hierro Patagónico de Sierra Grande (HIPASAM) in Rio Negro Province.

Crude steel production in Argentina decreased to 3 Mmt from 3.6 Mmt the previous year, while domestic consumption fell to 1.7 Mmt from 2.2 Mmt in 1990. The total amount imported reached 125,000 tons. In 1991, the steel industry had to import about 3.4 Mmt of iron ore and concentrate for a total value of $122 million, mainly from Brazil. In 1991, the Government's decision to close the state mining company of Sierra Grande (HIPASAM) was confronted with much opposition. The Government intended to privatize HIPASAM in 1989, but it was opposed by workers and the Sierra Grande community. The low quality and quantity of the iron ore produced, low profitability, and SOMISA's decision not to continue purchasing the HIPASAM's iron ore output led to the decision to shut it down.

SOMISA was HIPASAM's only significant client, so its difficulties were directly reflected on HIPASAM's activities, aggravating its financial situation because it was unable to reach the production levels needed for a balanced operation. SOMISA, now the largest steelmaker in Argentina, was founded in 1947. Because self-sufficiency in steel was considered essential to the national defense, SOMISA was placed under the authority of the DGFM. In addition to SOMISA, the Government created a second integrated producer, Altos Hornos Zapla, and an iron ore producer, HIPASAM, both of which were also placed under military control. DGFM, one of Argentina's most powerful institutions, has continued to play a key role in the development of the Argentine steel industry.

The Government planned to cut 3,000 jobs at SOMISA, Argentina's largest steel company, out of a total work force of almost 8,500. It also planned to scale back operations by halting one of two blast furnaces at the company's main mill in San Nicolás. SOMISA is said to be operating at a loss in excess of $1 million per day.

The Buenos Aires' 18th Labour Court has ordered SOMISA not to dismiss or fire employees and to continue operating a blast furnace scheduled for closure on October 18, 1991. The judge's decision came a day after thousands of steel workers marched in Buenos Aires in protest against the Government plans to downsize operations and privatize SOMISA. About 4,000 members of the Metal Workers' Union (UOM) were joined in the protest by other state employees and leftist militants.

The plant was slated for privatization in 1992, but the UOM was strongly opposed to the move and said it will defend both jobs and output, a pledge that has led to the deployment of 300 troops at the San Nicolás plant by the Government.

Altos Hornos Zapla was in the process of being privatized, and several European and Bolivian companies were preparing offers. The biggest steel producers in Argentina were SOMISA and ACINDAR.

Uranium.—Preliminary figures released by the Secretaría de Hidrocarburos y Minería indicate that the production of yellow cake (U_3O_8) in 1991 was maintained at the same level as that of the previous 2 years. The Embalse nuclear powerplant in Córdoba Province returned to service on October 14, 1990, after being shut down for 5 weeks for maintenance and inspection. The National Commission for Atomic Energy (CNEA) signed a contract on October 9 with Empresa Nuclear Mendoza S.E. for exploitation of the Sierra Pintada uranium mine, including services at the uranium processing plant. The contract would resume the uranium concentrate production, which was vital for the Atucha and Embalse plants. The San Rafael Mine, the richest uranium deposit in the country, was to be reactivated shortly. The CNEA officials praise Atucha I for having achieved a record performance during 1991 of 280 days of uninterrupted functioning, compared with 215 days the year before.

On November 30, 1990, Atucha I and Embalse had generated 7,750,000 MW•h of electricity during 1991, compared with the previous record of 7,200,000 MW•h. On December 13, the Presidents of Argentina and Brazil signed a nuclear safeguards agreement in Vienna, Austria. In this document, the two countries agreed to permit mutual inspection of their nuclear installation and to use nuclear material and installations under their control for peaceful purposes only. The International Atomic Energy Agency (IAEC) will have the right and obligation to ensure itself that safeguards are applied to all nuclear material under the control of the two signatories. The agreement includes the control of "sensitive substances," e.g., the enrichment of uranium and the processing of nuclear material, which were not previously subjected to inspection by other countries or organizations. CNEA officials indicated that if Argentina did not make provision for the generation of more electricity to supply the growing demand in the country, it could hamper economic growth. According to the CNEA, the demand for electricity increased 8% between January and September 1991. This demand could only be met by Atucha II being fully functional. CNEA officials said that nuclear energy had saved the country $ 1.7 billion during the 17 years of its existence, which was the equivalent of the initial capital investment in Atucha I and Embalse. By the beginning of January 1990, Atucha I and Embalse were contributing 7.6% of the country's electricity. During the period January to September 1991, however, they provided 17.1% of the country's electricity and, during certain peak periods, as much as 20%. This had happened because of the insufficient functioning of other energy sectors. On September 20, the Government started the process of pressure testing the protective dome built over Atucha II. On that occasion the Government said that the plant would be finished and beginning operation in 1995. Construction of Atucha II started in 1980 and was

supposed to have been completed in 1987. Lack of funds has caused the delay in the project to date. The completion of Atucha II would require about $1.6 billion. Currently, the estimated cost was $12.5 billion, but only if the construction went ahead according to schedule. CNEA sources announced on December 29, 1991, that Argentina will commission a plant at yearend 1992 to produce the heavy water that is used in its nuclear plants. Argentina will thus stop importing heavy water from other countries, particularly from Canada, its main supplier. Ninety-eight percent of the work on this plant, the first of its kind in Latin America, has been completed; it is in Arroyito, Neuquén Province, 1,000 km south of Buenos Aires. The production of heavy water would be sufficient to supply the Atucha I plant, the Embalse plant, and Atucha II, currently under construction, which will be finished in 1995. It was expected that production would be sufficient to supply a fourth nuclear plant that Argentina plans to build at the end of the century and that heavy water would also be exported to other countries in the medium term.

Industrial Minerals

Boron.—According to estimates, Argentina was ranked fourth in the world as a boron producer after the United States, Turkey, and Russia. Production of boron minerals was maintained at the same level as that of 1990. In terms of foreign exchange generated, this sector ranked first among all the industrial minerals produced in the country. From the total of minerals and derivatives exported in 1991, borates accounted for 21.3% (boron minerals, 1.5%; boric acid, 7.8%; and sodium borate, 12.0%). The largest boron mineral producer in the country was Cía. Boroquímica S.A.M.I.C.A.F., owned by RTZ Corp. and Industrias Químicas Boradero S.A., both in the Province of Salta.

Cement.—The Argentine production of cement continued its downward trend, which began in 1987 and reached 3.0 mt/a in 1991. This was a 52.4% decline compared with 1987 output and 17.3% compared with that of 1990. For the year, the cement industry operated at 30% of its installed capacity. According to the Portland Cement Manufacturer's Association, the average consumption of cement per inhabitant declined from 198 tons in 1987 to about 105 tons in 1991. The decrease in production during the past 4 years was due primarily to the stagnant demand in the construction industry and to the modernization, expansion, and installation of new plants in the country. Seven cement manufacturers signed an agreement with the Government under which they would reduce prices to the level of the second quarter of 1991, to come into effect on August 26th. This represents a 28.1% reduction in today's prices. The reciprocal deal involved a reduction in taxation and in the natural gas and electricity rates charged to the companies. The seven companies that were in accord with the Government were: Loma Negra, Cementos San Martín, Juan Minetti, Cementos Avellaneda, Corcemar, Petroquímica Comodoro Rivadavia, and Cementos El Gigante. Cementmakers in Argentina have claimed that power and light charges, coupled with high taxation, had made them uncompetitive in both home and export markets while cement exporters in Brazil and Chile had benefitted from their inability to compete. According to a Government official, a representative 50-kg sack of cement would come down in price from $5.63 to $4.05 before the end of this month. In 1991, there were 19 cement plants belonging to 7 companies operating in Argentina. Of these, Cementos Loma Negra C.I.A.S.A., with six plants, had a total installed capacity share of 43.3% (5.2 Mmt); Juan Minetti S.A., with five plants and a 19.8% share (2.4 Mmt); Corporación Cementera Argentina S.A. (Corcemar), with three plants and a 17.9% share (2.2 Mmt); Cía. Argentina de Cemento Portlant S.A., with two plants and a 7.5% share (0.9 Mmt); Calera Avellaneda S.A., with one plant and a 7.9% share (1.0 Mmt); and Petroquímica Comodero Rivadavia S.A. and Sandrin Hermanos S.A.C.I.C.F.I.A., with one plant each and a 2.5% and a 1.1% share, respectively (0.3 and 0.1 million, respectively).

Lithium.—Reportedly, at yearend, the Provincial government of Catamarca and FMC-LITHCO of the United States reached a final agreement to explore and develop the Salar del Hombre Muerto in northwestern Argentina. They were talking in terms of spending $5.0 million in exploration and up to $60.0 million if the project were developed. FMC has also been involved in discussions in Bolivia and Chile where similar salt flats exist; however, only one of these projects was considered likely to emerge. On March 5, the Governor of Salta advised the U.S. Ambassador that the Province of Salta had a longstanding boundary claim against the Province of Catamarca that would include the lithium deposits recently won as a concession by FMC. The Governor of Salta fully supported FMC's development of these lithium deposits but wanted to advise the Ambassador that the boundary dispute would become public and controversial. The situation was that those territories stood divided without any legally established limits. The Province of Salta possessed a large portion of the Hombre Muerto Salt Flats, where it maintained police detachments, Provincial road commission outposts, a Provincial civil registry office, a school, and a sanitary post. Furthermore, the only access by road to the area was through the Province of Salta.

Potassium.—The Río Colorado Potash project involved the development of a significant unexploited mineral deposit that would have a pioneering development impact on Argentina's incipient mining sector. It would introduce new mining technology to Argentina and result in a new product for export. Potassium, commonly referred to as "potash," is considered to be 1 of 36 metals and minerals fundamental to industrial development and is 1 of the 3 primary

agriculture nutrients along with nitrogen and phosphorus. Exploratory drilling and metallurgical tests suggested that the Río Colorado deposit could be one of the best potash deposits in the world, with sufficient reserves for significant future expansions. Minera TEA, the primary project sponsor, was a small, private mining company with 30 years of experience in nonmetallic mineral mining and processing. It would be assisted by international solution-mining experts whose services have been obtained. The project has been designed in two stages, a pilot phase followed by full-scale development of a 250,000-ton potash operation. The project cost, estimated at $58.4 million, anticipates financing from a joint-venture partner for the second phase of the project. Inter-American Investment Corp. (IIC) has been designated by Minera TEA to act as its advisor in securing the project financing on completion of the first phase. Solution mining is currently being used successfully in Canadian and U.S. potash mines. However, its use is limited because few ore bodies contain the appropriate geological formation and climatic conditions.

Solution mining consists of drilling wells down to the ore bed and injecting hot water. The potash and salt contained in the ore body is dissolved, forming a brine that is forced up the center tube of the well by the pressure of the injected water. The brine is piped to evaporation ponds. Through evaporation, a solid layer of potash (KCl) and sodium chloride (NaCl) settles in the bottom of the pond. This mixture is harvested and sent to the flotation plant, which separates the NaCl from the potassium chloride.

The Grupo TEA was a group of interrelated Argentine companies, most significantly Minera TEA S.A., Excavaciones de Roca S.A. (ERSA), Boratos S.A., Pucara S.A., and Los Tilianis S.A. While each company was an independent operating entity, they operated in 10 of the 22 Provinces. The companies' mining operations have been exploiting ballast, barite, dolomite, fluorite, granite, limestone, and industrial limes. Sales totaling $16.9 million in the fiscal year ended January 31, 1990, were primarily to the domestic market, although exports of boric acid, calcium carbonate, and granite were of increasing importance.

Mineral Fuels

In 1989, Argentina's estimated production of commercial energy totaled about 65.0 Mmt of standard coal equivalent, almost 1.2% above the 1988 level. Of the total, solid fuels accounted for only 0.7%, liquid fuels, 54.2%; gas fuel, 41.2%; and primary electricity, 3.9%.

Energy consumption data were not available for the years subsequent to 1989, when the total consumption was 61.9 Mmt of standard coal equivalent. Solid fuels provided 2.6%, liquid fuels contributed 45.2%, gas fuels supplied 48.0%, and primary electricity accounted for 4.2%.

Of the total installed electrical generating capacity of 16,600 MW in 1989, 54.1% was conventional thermal, 39.7% was hydroelectric, and 6.1% was nuclear. In that year, the latest for which complete data were available, a total of 50,910 kW•h was produced, 59.3% by conventional thermal plants, 29.8% by hydroelectric plants, and 10.9% by nuclear plants. In 1989, total electric power output declined 4.1%, but its distribution by source was not available, and 1990 power output was not yet reported.

Coal.—Production of bituminous coal increased 7.8% to 291,546 tons compared with that of 1990. YPF, the state-owned coal company, produced coal from the Río Turbio Mine in Santa Cruz Province. Under a 5-year project, planned in 1988, YCF was to increase its annual production to 650,000 tons by 1990; however, production declined owing to lack of sufficient financial resources and a small contribution from the National Energy Fund, setting back production and investment in the industry. In addition to these problems, the Río Turbio coal mines developed some operating problems that reduced production. One of the biggest problems was the high level of methane gas encountered in the mines as a result of a poor ventilation system. Other problems were the slow process in clearing the contaminated areas and delays in the provision of needed operating supplies and transportation equipment. The new economic stabilization program did not help as it reduced the existing tariff figures no less than four times. Devaluation continued through the second half of the year.

Natural Gas.—Natural gas production in 1991 was maintained at the same level as that in 1990. Recently, it became evident that Argentina's known natural gas proved reserves were about 579.05 billion m^3. However, it was quite possible that large, undiscovered natural gas reserves exist that could be exploited at relatively low economic cost. As a result of this reassessment of natural gas reserves, future shortages of natural gas were likely to develop in certain regions of the country, depending on the availability of transport and distribution systems. Most natural gas produced in Argentina was controlled by the state oil company, YPF. About 81% of the gas was produced by YPF and the rest either imported from Bolivia or produced under service contracts with private production companies. Gas imports from Bolivia were paid directly by Gas del Estado. Argentine Government officials had been saying that Argentina would not renew the contract to purchase natural gas from Bolivia that expired on April 30, 1992. Instead, the Government expected to be well advanced in the deregulation and privatization of the natural gas sector and planned to leave deals like Bolivian gas purchases to private operators. However, by yearend, it appeared that Argentina would agree to a new accord because restructuring of the gas sector in Argentina, including the privatization of Gas del Estado, was not completed. The new agreement extended the current natural gas agreement until December 31, 1993, although Argentina would be paying a price-per-cubic-foot about one-third of what it had been paying. To help compensate Bolivia for the lost revenue,

Argentina agreed to what is called "gift," payments totaling $110 million over the 20-month contract term. The Government of Bolivia must use these funds to buy Argentine products or to complete infrastructure projects in Bolivia near the Argentine border. The Government's current position was that there will be no need to extend the agreement with Bolivia when it expires in 1993. By that time, privatization of the Argentine natural gas sector was expected to be completed.

Petroleum.—Crude oil production increased 14.1% to about 178.0 Mbbl compared with that of 1987, reversing the recent downward trend. Argentina, although endowed with substantial and diversified energy resources, depended heavily on crude oil and natural gas to meet its energy requirements. However, the country has rarely been in a position of having adequate hydrocarbon reserves, and in recent years, production rates have consistently exceeded the rate at which depleted reserves have been replaced by new discoveries, reducing its most essential energy resources to a critical level from which it would be difficult and costly to recover. New large investments were required to discover additional hydrocarbon reserves. As a result of recent reassessments, proven crude oil reserves as of January 1, 1992, were estimated to be only 1.57 billion bbl, versus the previous estimate of 2.3 billion bbl, which at the current production rate of 441,300 bbl/d needed for present consumption requirements put the proved reserve/production ratio for crude oil equal to 8.9 years of supply.

In August 1985, the first legislation (Decree 1443) dealing with petroleum exploration and production contracts was enacted by the former President of Argentina. This decree invited private capital, foreign or domestic, to participate in the exploration and development of the country's oil hydrocarbons resources, eventually in as many as 165 blocks, including areas reserved to YPF. Since then, five bidding rounds have taken place in which a large number of international oil companies have been awarded exploration contracts. The Houston Plan was devised to attract private-sector participation. The first 3 rounds of bidding resulted in the award of 36 contracts from the 116 blocks offered. A fourth round was completed, but two-thirds of the blocks did not have any bidders. A fifth round of 70 areas was offered in late 1989. The response to the Houston Plan was a success: from 165 blocks offered, 80 have been awarded, an estimated $230 million in investments were made, and from 21 wells drilled, oil or natural gas was found in 9 of them, with an estimated reserve of 10.1 to 25.2 Mbbl.

More than 1 year has passed since the current Government had launched its revolutionary hydrocarbons deregulation plan. The result of the plan was beginning to show. Oil prices began to be determined by a free market, areas underemployed by YPF were producing free disposable crude for private companies, central areas were being exploited by YPF and a private partner, secondary areas were producing oil for its concessionaires, downstream and transport sectors were being deregulated, and the natural gas industry was in its privatization process. The Secretary of Fuels and Mining recently announced the new exploration plan, "Plan Argentina," at the World Petroleum Congress held in October in Argentina. The legal framework was to be Hydrocarbons Law 17,319, which devises a licensing scheme not very different in nature from that allowed in other jurisdictions. The licensee has ownership over hydrocarbons produced, and the "government share" is levied by means of royalties (12%) and taxes. Exploration permits are granted through a competitive bidding system, where investment commitments are offered, and if not carried out give rise to an obligation of payment. The terms for exploration fluctuate between a minimum of 9 years up to a maximum of 14 years (on shore) and 17 years (offshore). These permits are automatically converted into exploitation concessions, if a commercial discovery is declared by the licensee, for a period of 25 to 35 years to which the unused portion of the exploratory period may be added. The 140 areas included in this plan, 41 of which were offshore, were to be offered each 2 months, and companies will have the opportunity to propose area delimitations. Newly enacted Decree No. 2778/90 established that YPF was no longer a state-owned company ruled by public law, but a corporation ruled by private law (Companies Law 19,550). This meant that there was no difference between YPF and any other private company in its operating structure. YPF became authorized to sell all or part of its shares in the Stock Exchange, by any mechanism, to private companies without any further limitation. In the same way, YPF became free to contract loans with national or foreign banks. The purpose of this reform is to enable YPF to avoid selling its assets and oil reserves in a short term. The Argentine Government has enacted Decree No. 1930/91, ordering an International Call for Bids in order to select companies that will enter into contracts in association with YPF in the exploration and exploitation of the "CUENCA AUSTRAL." For the purpose of the call for bids, the CUENCA AUSTRAL was divided into the three following blocks: Santa Cruz I, Santa Cruz II, and Tierra del Fuego. The decree has established (1) the stages of the International Call for Bids, and (2) the general guidelines to be followed by the Bidding Conditions.

INFRASTRUCTURE

The Argentine road network consisted of about 208,350 km, of which 47,550 was paved, 39,500 was gravel, 101,000 was improved earth, and 20,300 was unimproved earth. Roads were one of the principal transport methods used to move mine production to processing plants in Buenos Aires and other shipping centers. Argentina had 11,000 km of navigable inland waterways and an excellent navigable river system. River transport operates largely on the Río de la Plata estuary and its tributaries: the Paraná, Uruguay, Paraguay, and Alto Paraná Rivers.

Argentina had about 4,090 km of pipeline for transport of crude oil and 2,900 km for refined products and 9,918 km of gas pipelines from production centers to consumer centers. The system connected oilfields and refineries to the north, center, west, and southeast with main industrial centers. Natural gas was also imported from Bolivia by gas pipeline through Yacuiba-Pocitos at the border to the northern Provinces and Buenos Aires. The existing Argentine railroad network covered approximately 34,172 km. It transported about 19 Mmt at of freight and 300 million passengers per year. Of the total network, 164 km was electrified. The network was owned and operated by the state enterprise Ferrocarriles Argentinos.

OUTLOOK

Argentina's energy resources are abundant and diverse. They include crude oil, natural gas, and hydropower, fair amounts of coal and uranium, as well as its vast nonfuel mineral resources that remain almost untapped. There is optimism about the development of these mineral projects and the discovery of new onshore and offshore oilfields and gasfields as future sources of energy and mineral production. New investments in Argentina are being directed toward several promising areas such as crude oil and natural gas, telecommunications, petrochemicals, gas pipelines, hotels, and tourism-related projects and agro-industry. In the future, once a new mining code is enacted in Argentina, the country may also see new investments in the mining sector. The Oil and Mining Secretariat announced on October 1 the results of the Government's first tender process for the "central areas" that contain the richest petroleum reserves. The Government achieved much less than it hoped in its December 16 auction of three areas in one of Argentina's richest Basins Areas of petroleum reserves. The Government had hoped that bidders would offer as much as $600 million for rights to 70% of the production in three areas (all onshore) in the Austral Basin in southern Argentina. However, only one bid, of $55 million, exceeded the base price set by YPF, and that was for the Santa Cruz I area, which had by far the lowest base price. For the two other areas, the bids, which varied widely, were not even close to the YPF minimum. The Government canceled the offer for those areas until the first quarter of 1992 together with other similar-size areas in the northeast Basin. In the past year, the investment climate in Argentina has improved with the implementation of an economic plan directed at privatizing state-owned companies, lowering import tariffs, free and floating currency exchange rates, removing import bans on most products, a new foreign investment law granting national treatment to foreign investors, and allowing the private sector the opportunity to enter previously closed areas. The launching of the Argentine Plan is expected to generate investments in exploration of between $15 to 20 billion in the next 10 to 15 years. Exploitation activities will improve and require additional investment following adjudication of the central and secondary oilfields. As a result of these changes, there have been a large number of U.S. companies interested in investing in Argentina.

[1]Where necessary, values have been converted from Argentine australes to U.S. dollars at the rate of australes 9,552=US$1.00, the average exchange rate in 1991.

OTHER SOURCES OF INFORMATION

Agencies

Subsecretaría de Minería (under Secretaría de Hidrocarburos y Minería)
Ave. Santa Fé 1548
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Dirección Evaluación de Yacimientos
Ave. Santa Fé 1548
1060 Buenos Aires, Argentina

Servicio Geológico Nacional
Ave. Santa Fé 1548
1060 Buenos Aires, Argentina

Dirección Nacional de Economía Minera
Ave. Santa Fé 1548
1060 Buenos Aires, Argentina

Dirección Nacional de Promoción Minera
Ave. Santa Fé 1548
1060 Buenos Aires, Argentina

Secretaría de Hidrocarburos y Minería
Ave. Julio A. Roca 651
1322 Buenos Aires, Argentina

Banco Nacional de Desarrollo
Gerencia de Minería
25 de Mayo 145, 4to Piso
Buenos Aires, Argentina

Yacimientos Carboníferos Fiscales
Ave. Pte. R. Sáez Peña 1190
Buenos Aires, Argentina

Yacimientos Petrolíferos Fiscales
Ave. Pte. R. Sáez Peña 777
Buenos Aires, Argentina

Sociedad Mixta Siderúrgica Argentina
Ave. Belgrano 737
Buenos Aires, Argentina

Comisión Nacional de Energía Atómica
Ave. Libertador General San Martín 8250
Buenos Aires, Argentina

Gas del Estado
Alsina 1169
1088 Buenos Aires, Argentina

Banco Central de la República Argentina
Reconquista 266
1003 Buenos Aires, Argentina

Publications

Estadística Minera de la República Argentina
Subsecretaría de Minería, Buenos Aires:
Annual report.

Panorama Minero, Capital Federal, Argentina:
Monthly magazine.

Tendencias Económicas (Business Trends), Buenos Aires:
Annual report.

TABLE 1 ·

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[e]
METALS						
Aluminum:						
Primary		152,529	154,203	e162,000	165,608	165,000
Secondary		7,500	7,100	e5,300	e6,000	6,000
Beryllium: Beryl concentrate:						
Gross weight		46	39	89	e85	80
BeO content		5	4	10	e9	8
Cadmium: Smelter		r53	r54	r60	r55	49
Columbium: Columbite concentrate:						
Gross weight	kilograms	—	e88	116	e100	90
Cb_2O_5 content	do.	—	51	87	e75	67
Copper:						
Mine output, Cu content		379	492	653	r344	3408
Refined		13,000	12,500	11,000	r15,000	315,000
Gold: Mine output, Au content		990	962	1,150	1,200	31,478
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	r850	r1,037	r1,017	r992	980
Fe content	do.	r451	r550	r539	r526	520
Metal:						
Pig iron	do.	1,752	1,596	2,062	r1,883	31,366
Sponge iron (direct reduction)	do.	1,034	1,067	1,166	r1,034	3954
Total	do.	2,786	2,663	3,228	r2,917	32,320
Ferroalloys, electric-furnace:						
Ferromanganese		21,407	19,737	25,545	23,787	23,800
Ferrosilicomanganese		11,746	11,610	16,857	21,536	21,500
Ferrosilicon		23,998	30,539	28,381	17,509	17,500
Silicon metal[e]		10,000	10,000	10,000	10,000	10,000
Other		6,362	5,744	5,603	7,124	7,200
Total		r73,513	r77,630	r86,386	r79,956	80,000
Steel, crude	thousand tons	3,633	3,652	3,909	r3,634	32,966
Semimanufactures[4]	do.	3,512	3,624	3,844	3,613	32,697
Lead:						
Mine output, Pb content		26,069	28,549	26,650	r23,365	323,697
Metal:						
Smelter, primary		r16,173	r14,810	r11,500	r5,500	11,000
Refined:						
Primary		r16,173	r14,810	r11,500	r5,500	11,000
Secondary		16,000	r14,030	13,000	r14,600	14,000
Total		r32,173	r28,840	r24,500	r20,100	25,000
Manganese ore and concentrate:						
Gross weight		6,393	9,339	5,532	r e3,500	3,600
Mn content		1,324	1,817	r1,080	r727	750

See footnotes at end of table.

TABLE 1—Continued

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[e]
METALS—Continued						
Silver, mine output, Ag content	kilograms	59,667	79,415	83,436	r82,657	356,359
Tin:						
Mine output, Sn content		186	446	405	r e230	230
Metal, smelter		r281	r323	r311	r e180	180
Tungsten, mine output, W content		14	13	20	r6	10
Uranium, mine output, U_3O_8 content		112,499	167,516	60,850	e61,000	60,000
Zinc:						
Mine output, Zn content		35,648	36,849	43,155	r38,664	339,253
Metal: Smelter:						
Primary		r31,700	r32,748	r31,567	r31,517	35,766
Secondary		2,600	r2,700	r2,700	r2,700	2,800
Total		r34,300	r35,448	r34,267	r34,217	338,566
INDUSTRIAL MINERALS						
Asbestos		332	2,328	225	e300	250
Barite		33,462	48,972	57,558	e50,000	50,000
Boron materials, crude		184,786	269,574	261,308	e260,000	250,000
Cement, hydraulic	thousand tons	6,302	6,048	4,470	3,629	3,000
Clays:						
Ball clay (plastic clay), n.e.s.	do.	644	844	307	e400	400
Bentonite		108,595	173,930	e150,000	e150,000	100,000
Foundry earth[e]		3107,000	100,000	100,000	100,000	100,000
Fuller's earth (decolorizing clay)[e]		2,000	2,000	2,000	2,000	2,000
Kaolin		r100,128	r93,871	r45,598	r e50,000	50,000
Laterite (aluminous)		44,548	65,651	67,200	e65,000	60,000
Refractory		47,834	49,287	32,111	e30,000	30,000
Other[5]		2,275,826	2,819,031	2,889,468	e2,900,000	2,800,000
Diatomite		5,098	7,122	6,301	e7,000	6,500
Feldspar		29,282	39,469	23,688	e24,000	23,000
Fluorspar		54,975	18,052	23,317	e20,000	20,000
Graphite		216	24	100	e100	100
Gypsum, crude		618,817	520,153	402,399	e400,000	450,000
Lithium: Spodumene, amblygonite, gross weight		178	119	104	e120	110
Mica:						
Sheet		340	330	r327	e400	350
Waste and scrap		451	630	e500	e500	450
Nitrogen: N content of ammonia		80,600	78,100	74,000	70,000	75,000
Phosphates: Thomas slag[6]		8	55	e50	e55	50
Pigments, mineral, natural: Ocher		1,022	815	578	e600	600

See footnotes at end of table.

TABLE 1—Continued

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[e]
INDUSTRIAL MINERALS—Continued						
Pumice and related volcanic materials		99,093	164,300	127,853	e125,000	125,000
Salt:						
Rock	thousand tons	1	1	1	e1	1
Solar	do.	950	1,246	1,185	e1,200	1,200
Total	do.	951	1,247	1,186	e1,201	1,201
Sand and gravel:						
Sand:						
Construction	do.	9,048	9,657	8,740	e9,000	9,000
Silica sand (glass sand)	do.	283	294	344	e300	300
Gravel	do.	3,574	4,657	3,700	e3,700	3,500
Soda ash		—	150	350	e300	300
Stone:						
Basalt	do.	2,542	2,627	1,900	e2,000	2,100
Calcareous:						
Calcite, nonoptical		2,800	41,130	e40,000	e35,000	30,000
Calcium carbonate (chalk)		28,500	51,300	58,500	e50,000	50,000
Dolomite		372,173	488,204	e250,000	e250,000	200,00
Limestone	thousand tons	13,911	11,896	9,190	e9,000	8,700
Marble:						
Aragonite, broken		2,160	5,504	1,882	e2,000	2,500
Onyx, in blocks and broken		9,020	8,256	4,809	e5,000	5,500
Travertine, in blocks and broken		14,462	21,107	3,467	e4,000	5,000
Unspecified, in blocks and broken		r48,977	72,959	35,122	e35,000	40,000
Flagstone		64,945	42,809	77,913	e75,000	75,500
Granite:						
In blocks		31,331	50,398	39,347	e40,000	45,000
Crushed	thousand tons	3,693	5,425	4,168	e4,000	4,500
Quartz, crushed		134,018	153,816	140,538	e140,000	135,000
Quartzite, crushed	thousand tons	2,128	1,287	691	e700	750
Rhodochrosite	do.	19	19	40	e35	35
Gemstone (agate, amethyst, tourmaline, etc.)		40,200	2,000	5,000	e4,000	3,000
Sandstone		608	120	e300	e300	250
Serpentine, crushed		28,689	29,750	11,333	e11,000	12,000
Shell, marl		830,325	383,363	285,630	e300,000	300,000
Tuff and tasca	thousand tons	12,146	8,966	2,006	e2,000	2,000
Strontium minerals: Celestite		1,349	2,241	1,193	e1,200	1,200

See footnotes at end of table.

TABLE 1—Continued

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[e]
INDUSTRIAL MINERALS—Continued						
Sulfates, natural:						
Aluminum (alum)		60,291	71,985	66,844	e65,000	65,000
Magnesium (epsomite)		2,500	12,140	e7,000	e7,000	6,500
Sodium (mirabilite)		27,483	15,341	10,281	e11,000	10,500
Talc and related materials:						
Pyrophyllite		1,260	671	1,310	e1,300	1,200
Steatite[e]		300	250	250	250	250
Talc		27,103	26,108	26,658	e26,000	25,000
Total		28,663	27,029	28,218	e27,550	26,450
Vermiculite		18,612	19,300	r590	r e10,000	10,000
Water, mineral-containing		177,544	172,152	142,229	e140,000	145,000
Zeolite[e]		110	100	100	100	90
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bitumen, natural (asphaltite)		3,350	2,158	824	e1,000	1,000
Coal, bituminous	thousand tons	381	505	441	270	3292
Coke, all types, including breeze	do.	925	820	e800	e800	830
Gas, natural:						
Gross	million cubic meters	19,128	22,695	r21,992	e21,800	22,000
Marketed[7]	do.	14,769	17,831	18,993	18,094	317,913
Natural gas liquids:						
Butane	thousand 42-gallon barrels	3,306	3,887	4,384	e4,196	4,200
Propane	do.	4,967	5,283	e5,300	e5,000	5,000
Total	do.	8,273	9,170	e9,684	e9,196	9,200
Peat, agricultural (turba)		3,338	2,621	2,481	e2,500	2,500
Petroleum:						
Crude	thousand 42-gallon barrels	156,348	164,418	167,949	175,836	3178,379
Refinery products:						
Gasoline	do.	31,246	28,041	40,311	34,615	335,909
Kerosene	do.	3,778	3,503	3,364	3,634	33,770
Jet fuel	do.	5,384	5,176	5,566	6,123	36,352
Distillate fuel oil	do.	54,172	53,997	56,108	58,776	360,974
Residual fuel oil	do.	25,734	27,790	30,232	25,636	326,595
Lubricants	do.	1,868	1,781	1,669	1,354	31,405
Other	do.	16,445	16,499	13,762	13,185	313,678
Refinery fuel and losses	do.	14,205	21,400	13,745	25,781	326,745
Total	do.	152,832	158,187	164,757	169,104	3175,428

[e]Estimated. [r]Revised.

[1]Table includes data available through June 1992.

[2]In addition to the commodities listed, bismuth, carbon black, columbite, lime, natural gasoline, perlite, and potassium sulfate (kalinite) were believed to be produced, but output was not reported quantitatively, and available information was inadequate to make reliable estimates of output levels.

[3]Reported figure.

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

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

[6]Thomas slag production was estimated from the Thomas crude steel reported in La Siderurgia Argentina annual published by the Instituto Argentino de Siderurgia.

[7]Includes natural gas imported from Bolivia.

TABLE 2

ARGENTINA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS					
Aluminum:					
Oxides and hydroxides		2	3	—	Uruguay 2; Paraguay 1.
Metal including alloys:					
Unwrought		81,802	136,184	5,863	Japan 74,171; Netherlands 35,794.
Semimanufactures		17,894	16,554	1,203	Netherlands 10,866; Brazil 1,252.
Chromium: Oxides and hydroxides		307	220	20	Chile 113; East Germany 58.
Copper: Metal including alloys:					
Scrap	value, thousands	—	$14	$14	
Unwrought		1	3	—	Mainly to Uruguay.
Semimanufactures		4,533	3,286	2,564	Brazil 239; Italy 103.
Iron and steel: Metal:					
Scrap		33	21	—	All to France.
Pig iron, cast iron, related materials		653	298	—	Brazil 112; Chile 111; Uruguay 69.
Ferroalloys:					
Ferromanganese		5	155	—	Paraguay 125; Chile 30.
Ferrosilicon		17,429	12,784	10,195	Netherlands 2,217; Chile 208.
Unspecified		5,902	19,104	16,185	Netherlands 906; Belgium-Luxembourg 574.
Steel, primary forms		410,836	228,895	58	Iran 58,420; Australia 27,040; Philippines 19,366.
Semimanufactures:					
Bars, rods, angles, shapes, sections		436,490	375,559	24,540	Belgium-Luxembourg 112,841; Chile 31,325; Japan 25,712.
Universals, plates, sheets		881,188	869,282	95,300	Thailand 231,233; Japan 74,040.
Hoop and strip		7,758	9,083	1,852	Chile 6,581; Brazil 170.
Rails and accessories		2,343	27,646	—	India 13,225; Iran 12,019; Chile 2,082.
Wire		18,854	26,181	11,713	Japan 4,504; Chile 3,695.
Tubes, pipes, fittings		496,750	483,933	98,563	U.S.S.R. 64,341; China 56,025.
Castings and forgings, rough		74	603	—	Colombia 328; Chile 205; Bolivia 51.
Lead:					
Ore and concentrate		19,635	23,899	—	Brazil 12,439; Belgium-Luxembourg 11,460.
Oxides		548	8,885	—	Brazil 8,376; Venezuela 412; Uruguay 93.
Metal including alloys:					
Unwrought		4,650	4,759	—	Japan 902; Brazil 782; Uruguay 637.
Semimanufactures		4	—		
Magnesium: Metal including alloys, semimanufactures		3	67	—	West Germany 53; Bolivia 11; Brazil 1.
Manganese: Oxides		—			
Mercury		—	22	—	Mainly to Uruguay.
Nickel: Metal including alloys, semimanufactures	value, thousands	$11	$8	—	Italy $5; Spain $2; Uruguay $1.
Silver: Metal including alloys, unwrought and partly wrought	do.	—	$293	—	Brazil $236; West Germany $56; Uruguay $1.
Tin:					
Ore and concentrate		135	—		
Metal including alloys:					
Unwrought	value, thousands	—	$1	—	All to Bolivia.
Semimanufactures		5	16	—	Mainly to Uruguay.

See footnotes at end of table.

TABLE 2—Continued

ARGENTINA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS—Continued					
Titanium: Oxides	value, thousands	$2	$1	—	All to Uruguay.
Tungsten: Metal including alloys, semimanufactures	do.	—	$32	—	Do.
Zinc:					
Ore and concentrate		6,877	11,855	—	Belgium-Luxembourg 9,153; Brazil 2,702.
Oxides		570	433	—	Brazil 386; Uruguay 44; Chile 3.
Metal including alloys:					
Unwrought		11,263	14,005	3,415	Netherlands 3,426; Dominican Republic 1,271.
Semimanufactures including powders, dust and flakes		2	10	—	All to Uruguay.
Other:					
Ores and concentrates		—	195	—	All to Chile.
Oxides and hydroxides		35	327	—	Chile 278; Brazil 41; Netherlands 8.
Ashes and residues		1	—		
Base metals including alloys, all forms		253	85	(2)	Mainly to Brazil.
Precious metals, waste and scrap	kilograms	(3)	2	—	Italy 1; Spain 1.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		3,738	3,354	—	Brazil 1,295; Chile 725; Uruguay 719.
Artificial: Silicon carbide		3,511	2,062	77	Belgium-Luxembourg 672; Brazil 598; Republic of South Africa 448.
Dust and powder of precious and semiprecious stones	value, thousands	$3	$4	—	All to Belgium-Luxembourg.
Grinding and polishing wheels and stones		18	34	—	Brazil 11; Paraguay 11; Chile 5.
Asbestos, crude		—	14	—	All to Uruguay.
Barite and witherite		37	36	—	Chile 27; Uruguay 9.
Boron materials:					
Crude natural borates		20,431	6,910	—	Brazil 6,371; Uruguay 367; Chile 151.
Oxides and acids		12,519	11,854	—	Brazil 3,898; Italy 2,473; Netherlands 2,134.
Cement		77,848	67,097	—	Chile 28,665; Brazil 27,196; Bolivia 10,950.
Clays, crude		11,613	13,281	18	Brazil 8,217; Chile 2,994; Uruguay 1,985.
Diatomite and other infusorial earth		20	10	—	All to Uruguay.
Feldspar, fluorspar, related materials		398	1,031	—	Chile 749; Brazil 132; Uruguay 128.
Fertilizer materials: Manufactured:					
Ammonia		445	301	—	Uruguay 225; Paraguay 70; Chile 6.
Nitrogenous		121	2,663	—	Bolivia 1,489; Uruguay 1,123; Paraguay 51.
Phosphatic		—	44	—	All to Bolivia.
Potassic		55	258	—	Bolivia 213; Brazil 25; Paraguay 21.
Unspecified and mixed		1	3,683	—	Bolivia 2,616; Paraguay 1,062; United Arab Emirates 5.
Graphite, natural		14	—		
Gypsum and plaster		14,396	16,029	—	Paraguay 15,179; Uruguay 752; Chile 93.
Lime		2,816	3,662	—	Chile 2,607; Bolivia 1,055.
Magnesium compounds: Magnesite, crude		25	—		

See footnotes at end of table.

TABLE 2—Continued

ARGENTINA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Mica:					
Crude including splittings and waste		50	260	—	France 201; Chile 56; Uruguay 3.
Worked including agglomerated splittings	value, thousands	—	$1	—	All to Uruguay.
Pigments, mineral: Iron oxides and hydroxides, processed		446	555	—	Brazil 83; Uruguay 79; Singapore 68.
Precious and semiprecious stones other than diamond, natural	value, thousands	$60	$200	$23	Italy $61; West Germany $56; Hong Kong $29.
Salt and brine		172,646	191,290	3	Brazil 185,551; Uruguay 4,559; Paraguay 1,077.
Sodium compounds, n.e.s:					
Soda ash, natural and manufactured		—	50	—	Paraguay 48; Brazil 2.
Sulfate, natural and manufactured		3,522	2,265	—	Brazil 2,264; Chile 1.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		12,594	8,368	—	Japan 4,872; Italy 2,399; Uruguay 713.
Worked		8,531	16,088	2,593	Italy 4,110; Netherlands 2,319.
Dolomite, chiefly refractory-grade		5,210	4,787	—	All to Chile.
Gravel and crushed rock		143	12	—	Do.
Quartz and quartzite		601	1,096	—	Chile 846; Uruguay 209; Bolivia 41.
Sand other than metal-bearing		2,171	39	—	Mainly to Bolivia.
Sulfur:					
Elemental: Crude including native and byproduct		63	35	—	Uruguay 25; Chile 9.
Sulfuric acid		7,293	14,623	3,301	Brazil 11,265; Uruguay 30.
Talc, steatite, soapstone, pyrophyllite		58	59	—	Chile 45; Paraguay 14.
Other:					
Crude		9,268	8,731	—	Brazil 8,507; France 177; Chile 27.
Slag and dross, not metal-bearing		99	20	—	All to Belgium-Luxembourg.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		785	308	—	Brazil 272; Uruguay 20; Republic of South Africa 16.
Carbon black		154,347	125,999	—	Brazil 69,932; Venezuela 45,006; Chile 3,776.
Coal: All grades including briquets		149	476	—	All to Uruguay.
Coke and semicoke		99,842	51,669	—	Belgium-Luxembourg 27,487; Spain 23,836; Uruguay 346.
Gas, natural	cubic meters	(3)	—		
Peat including briquets and litter		19	38	—	All to Uruguay.
Petroleum:					
Crude	thousand 42-gallon barrels	2,273	7,471	4,987	Chile 2,967; Uruguay 414.
Refinery products:					
Liquefied petroleum gas	do.	r1,510	991	—	Chile 460; Paraguay 330; Uruguay 124.
Gasoline	do.	7,798	16,888	12,354	Netherlands 2,898; Netherlands Antilles 1,042.
Mineral jelly and wax	do.	62	60	(2)	Chile 29; Peru 23; Uruguay 4.
Kerosene and jet fuel	do.	353	1,145	1,145	
Distillate fuel oil	do.	2,226	10,659	6,410	Paraguay 1,239; Uruguay 853.

See footnotes at end of table.

TABLE 2—Continued

ARGENTINA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued:					
Refinery productions—Continued:					
Lubricants	thousand 42-gallon barrels	153	114	(2)	Uruguay 45; Venezuela 43; Chile 13.
Residual fuel oil	do.	4,099	7,741	6,891	Italy 326; Uruguay 312.
Bitumen and other residues	do.	78	82	—	Paraguay 61; Chile 18; Uruguay 2.
Bituminous mixtures	do.	2	1	—	Mainly to Paraguay.
Petroleum coke	do.	1,390	2,159	181	Netherlands 790; Belgium-Luxembourg 550; Canada 334.

[r]Revised.
[1]Table prepared by H.D. Willis.
[2]Less than 1/2 unit.
[3]Quantity not available valued at $2,000.
[4]Revised to zero. Reclassified as liquefied petroleum gas.

TABLE 3

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS					
Alkali and rare-earth metals		30	11	—	Canada 7; Brazil 3; France 1.
Aluminum:					
Ore and concentrate		25,696	19,911	40	China 11,828; Brazil 7,890; Netherlands Antilles 154.
Oxides and hydroxides		300,411	216,364	459	Australia 205,616; Brazil 9,557; West Germany 631.
Metal including alloys:					
Scrap		—	24	—	Bolivia 23; France 1.
Unwrought		7	3	(2)	Mainly from Belgium-Luxembourg.
Semimanufactures		6,112	2,305	92	Brazil 1,693; Uruguay 181.
Beryllium: Metal including alloys, all forms	value, thousands	$2	$14	$8	U.S.S.R. $4; Switzerland $2.
Chromium:					
Ore and concentrate		20,393	17,160	—	All from Republic of South Africa.
Oxides and hydroxides	value, thousands	$4	$14	$6	West Germany $6; Italy $2.
Cobalt: Oxides and hydroxides		84	37	12	Belgium-Luxembourg 22; Finland 2.
Columbium and tantalum:					
Tantalum metal including alloys, all forms	value, thousands	$20	$13	$13	
Copper: Metal including alloys:					
Scrap		6	267	(2)	Uruguay 240; Bolivia 25; West Germany 1.
Unwrought		15,439	10,130	(2)	Chile 9,781; Peru 288; Greenland 58.
Semimanufactures		1,083	1,123	109	Brazil 224; Mexico 146; Japan 141.
Iron and steel:					
Iron ore and concentrate excluding roasted pyrite	thousand tons	4,001	3,140	—	Brazil 2,957; Peru 80; Venezuela 69.
Metal:					
Scrap		10,950	19,286	63	Brazil 6,351; Belgium-Luxembourg 3,685; Japan 2,352.
Pig iron, cast iron, related materials		3,805	5,823	399	Belgium-Luxembourg 2,362; Austria 1,150; Brazil 737.
Ferroalloys:					
Ferromanganese		2,392	2,109	—	Brazil 1,514; Norway 341; Spain 186.
Ferrosilicon		50	62	—	West Germany 60; Mexico 2.
Unspecified		2,765	2,466	140	Zimbabwe 1,212; Republic of South Africa 344; Brazil 215.
Steel, primary forms		294,859	86,649	13,943	Brazil 67,120; Republic of South Africa 5,580.
Semimanufactures:					
Bars, rods, angles, shapes, sections		14,084	5,214	329	Brazil 2,293; West Germany 504; Belgium-Luxembourg 444.
Universals, plates, sheets		92,816	72,297	3,861	Brazil 31,817; Spain 11,715; Japan 6,221.
Hoop and strip		3,578	4,017	457	Brazil 781; Japan 664; West Germany 545.
Rails and accessories		128	100	7	Netherlands 36; Italy 23; West Germany 15.
Wire		2,970	2,467	266	Uruguay 707; Brazil 675; Japan 493.
Tubes, pipes, fittings		13,260	10,612	887	Italy 4,532; Sweden 1,463; Japan 1,030.
Castings and forgings, rough		171	200	1	Chile 191; Brazil 4; West Germany 3.
Lead:					
Oxides		—	62	16	China 46.

See footnotes at end of table.

TABLE 3—Continued

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS—Continued					
Lead—Continued:					
Metal including alloys:					
Scrap		—	1,520	—	All from Uruguay.
Unwrought	value, thousands	$4	—		
Semimanufactures		11	12	(2)	Italy 10; Uruguay 1.
Magnesium: Metal including alloys:					
Unwrought		588	445	371	Norway 72; Canada 2.
Semimanufactures		27	37	34	West Germany 3.
Manganese:					
Ore and concentrate		66,325	97,301	74	Brazil 94,447; Bolivia 2,652.
Oxides		267	235	19	Brazil 171; Republic of South Africa 21.
Mercury		98	58	6	U.S.S.R. 15; Cyprus 11; Mexico 9.
Molybdenum: Metal including alloys:					
Unwrought including waste and scrap	value, thousands	—	$6	$6	
Semimanufactures		4	6	3	Austria 2; France 1.
Nickel:					
Matte and speiss		35	16	—	Cuba 13; Netherlands 3.
Metal including alloys:					
Unwrought		262	317	11	Brazil 143; Norway 93; Canada 31.
Semimanufactures		268	95	29	West Germany 26; Switzerland 15.
Platinum-group metals: Platinum metal including alloys, unwrought and partly wrought	value, thousands	$197	$141	$6	West germany $77; U.S.S.R. $26; Canada $25.
Silver: Metal including alloys, unwrought and partly wrought	do.	$295	$792	$14	Belgium-Luxembourg $596; Peru $134; West Germany $37.
Tin:					
Ore and concentrate		—	30	—	All from Bolivia.
Metal including alloys:					
Unwrought		696	544	10	Bolivia 285; Brazil 249.
Semimanufactures		20	26	6	Brazil 12; Bolivia 5.
Titanium: Oxides		272	319	43	Belgium-Luxembourg 185; West Germany 52.
Tungsten:					
Ore and concentrate		58	45	—	Peru 40; Bolivia 5.
Metal including alloys:					
Unwrought including waste and scrap	value, thousands	$22	$20	$12	Belgium-Luxembourg $7; Canada $1.
Semimanufactures		11	7	1	Belgium-Luxembourg 3; Brazil 1.
Uranium and thorium: Oxides and other compounds	value, thousands	$1	$1	$1	
Zinc:					
Oxides		62	79	9	West Germany 22; China 19; Peru 19.
Metal including alloys:					
Scrap		269	301	—	Peru 179; Canada 72; Spain 50.
Unwrought		1,000	1,742	—	Brazil 880; Spain 598; Peru 150.
Semimanufactures including powders, dust and flakes		(3)	2	(2)	Mainly from West Germany.

See footnotes at end of table.

TABLE 3—Continued

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS—Continued					
Other:					
Ores and concentrates		1,884	1,505	2	Republic of South Africa 1,298; Bolivia 194; Brazil 10.
Oxides and hydroxides		1,610	1,508	414	Chile 917; Cuba 43.
Ashes and residues		—	52	—	All from Chile.
Waste and sweepings of precious metals, n.e.s.	kilograms	—	32	—	All from Spain.
Base metals including alloys, all forms		401	205	120	Spain 22; Brazil 11.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		130	147	147	
Artificial: Corundum		8,186	4,969	88	Brazil 4,751; France 70; Austria 44.
Dust and powder of precious and semiprecious stones	value, thousands	$227	$195	$41	Republic of South Africa $134; Ireland $15.
Grinding and polishing wheels and stones		270	223	7	Italy 167; Brazil 11; Yugoslavia 10.
Asbestos, crude		7,093	6,588	199	Brazil 2,914; Canada 2,348; Zimbabwe 805.
Barite and witherite		52	32	12	Brazil 19; West Germany 1.
Boron materials:					
Crude natural borates		—	50	1	Chile 49.
Oxides and acids		5	5	—	Mainly from Italy.
Bromine[4]		35	53	2	Israel 27; Chile 22.
Cement		1,503	1,289	428	France 440; West Germany 202.
Chalk		1	16	15	West Germany 1.
Clays, crude		562,929	15,679	5,684	Brazil 9,638; Spain 180.
Cryolite and chiolite		23	18	—	Denmark 15; Belgium-Luxembourg 3.
Diamond, natural:					
Gem, not set or strung	value, thousands	$46	$36	—	Brazil $29; Belgium-Luxembourg $7.
Industrial stones	do.	$257	$245	$73	Republic of South Africa $155, Belgium-Luxembourg $17.
Diatomite and other infusorial earth		1,739	1,788	373	Mexico 833; Chile 579.
Feldspar, fluorspar, related materials		18	5,082	—	Mexico 5,055; Brazil 27.
Fertilizer materials: Manufactured:					
Ammonia	value, thousands	$1	—		
Nitrogenous		136,773	46,605	4,683	Mexico 21,547; West Germany 7,240; Bulgaria 4,686.
Phosphatic		9,391	9,689	7,136	Uruguay 1,710; Brazil 842.
Potassic		12,584	18,812	11,769	Israel 3,520; Belgium-Luxembourg 3,500.
Unspecified and mixed		71,506	85,219	76,381	Brazil 5,906; Belgium-Luxembourg 1,300.
Graphite, natural		1,317	1,202	76	Brazil 814; China 207.
Gypsum and plaster		23	2	—	All from United Kingdom.
Lime		—	4	—	All from Brazil.
Magnesium compounds: Magnesite, crude		20,766	15,855	43	Brazil 10,678; Mexico 2,711; China 1,040.
Mica:					
Crude including splittings and waste		6	9	1	Switzerland 8.
Worked including agglomerated splittings		10	4	1	Belgium-Luxembourg 2; Brazil 1.
Nitrates, crude		2,735	1,315	—	All from Chile.

See footnotes at end of table.

TABLE 3—Continued

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Phosphates, crude		8	5	5	
Pigments, mineral: Iron oxides and hydroxides, processed		66	76	42	West Germany 33.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$33	$58	—	Brazil $38; India $1; unspecified $19.
Synthetic	do.	$24	$11	$11	
Pyrite, unroasted		26	9	—	All from Italy.
Salt and brine		46	39	13	West Germany 17; Switzerland 5.
Sodium compounds, n.e.s.:					
Soda ash, natural and manufactured		169,203	162,068	70,060	Spain 41,306; Romania 21,838.
Sulfate, natural and manufactured		15	987	(2)	Chile 968; West Germany 18.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		1,568	3,654	—	Uruguay 1,528; Brazil 947; Italy 661.
Worked		1,167	1,733	(2)	Italy 810; Uruguay 454; Spain 375.
Dolomite, chiefly refractory-grade		393	250	8	Brazil 242.
Gravel and crushed rock		107,138	6,100	—	All from Paraguay.
Quartz and quartzite		26	62	—	Belgium-Luxembourg 39; Sweden 13; Brazil 10.
Sand other than metal-bearing		109,536	87,133	2,195	Uruguay 84,400; Brazil 537.
Sulfur:					
Elemental:					
Crude including native and byproduct		50,663	82,034	5,159	Canada 76,725; Chile 108.
Colloidal, precipitated, sublimed		19	9	8	West Germany 1.
Sulfuric acid		3,495	3,032	—	Uruguay 3,031; Italy 1.
Talc, steatite, soapstone, pyrophyllite		386	432	5	China 286; Brazil 108; Uruguay 30.
Other:					
Crude		5,752	2,783	232	Brazil 1,294; Republic of South Africa 802; West Germany 306.
Slag and dross, not metal-bearing		432	847	4	Australia 643; Uruguay 146; Brazil 54.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		67	41	41	
Carbon black		512	620	499	Brazil 65; West Germany 26.
Coal:					
Anthracite		1,146	1,017	8	Brazil 701; West Germany 308.
Bituminous	thousand tons	1,032	861	474	Australia 157; Poland 150.
Lignite including briquets		—	11	11	
Coke and semicoke		30,773	—		
Gas, natural	million cubic meters	2,210	2,381	—	All from Bolivia.
Peat including briquets and litter		58	56	56	
Petroleum:					
Crude	42-gallon barrels	7	373,123	—	All from Saudi Arabia.
Refinery products:					
Liquefied petroleum gas	do.	11,624	4,895	232	Brazil 4,663.
Gasoline	do.	1,615	222,598	34	Brazil 221,969; West Germany 391; Netherlands 212.

See footnotes at end of table.

TABLE 3—Continued

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued:					
Refinery products—Continued:					
Mineral jelly and wax	42-gallon barrels	4,872	18,801	10,656	Brazil 3,785; West Germany 2,534.
Kerosene and jet fuel	do.	132	70	62	West Germany 8.
Distillate fuel oil	do.	1,406,150	—		
Lubricants	do.	189,406	233,954	80,878	Italy 102,214; Venezuela 25,305.
Residual fuel oil	do.	1,736,202	—		
Bituminous mixtures	do.	48	158	127	Brazil 30.

[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.
[3]Quantity not available valued at $5,000.
[4]Includes fluorine and iodine.

TABLE 4

ARGENTINA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Aluminios Argentinos S.A.I.C. (ALUAR) (52.1% state, 47.9% private)	Puerto Madryn, Chubut Province	170.
Boron		Cía. Boroquímica S.A.M.I.C.A.F., (owned by Río Tinto Zinc Corp. Ltd.)	El Porvenir Mine, Jujuy Province; Tincalayu and Campo Quijano, Salta Province	300.
Cement		Loma Negra C.I.A.S.A.; Juan Minetti, S.A.; Corporación Cementera Argentina, S.A. (100% private)	Buenos Aires, Córdoba, Corrientes, Salta San Juan, Mendoza, and Jujuy Provinces	12,000.
Coal		Yacimientos Carboníferos Fiscales (Government 100%)	Río Turbio, Santa Cruz Province	1,600.
Gold and silver	kilograms	Yacimientos Mineros de Agua de Dionisio (YMAD) (Government 100%), Angela Mine (100% private)	Farallón Negro, Hualfín & Belén Departments Gastre Department, Chubut Province	1,200 Au, 9,000 Ag.
Iron ore		Hierro Patagónico de Sierra Grande, S.A. Minera (HIPASAM) (Government 100%)	Sierra Grande, Río Negro Province	2,000.
Lead, silver, zinc	kilograms	Cía. Minera Aguilar, S.A. [owned 100% by a Bolivian Consortium Cía. Minera del Sur, (COMSUR)]	Estación Tres Cruces, El Aguilar, Jujuy Province	49,800 Ag, 24,000 Pb, 30,000 Zn.
Natural gas	million cubic meters	Yacimientos Petrolíferos Fiscales (YPF) (Government 100%)	Neuquén Santa Cruz, Tierra del Fuego, Salta, and Río Negro Provinces	24,000.
Petroleum	million barrels	do.	Chubut, Santa Cruz, Neuquén, Río Negro, Mendoza, Salta, Tierra del Fuego, Jujuy, La Pampa, and Formosa Provinces	168.

See footnotes at end of table.

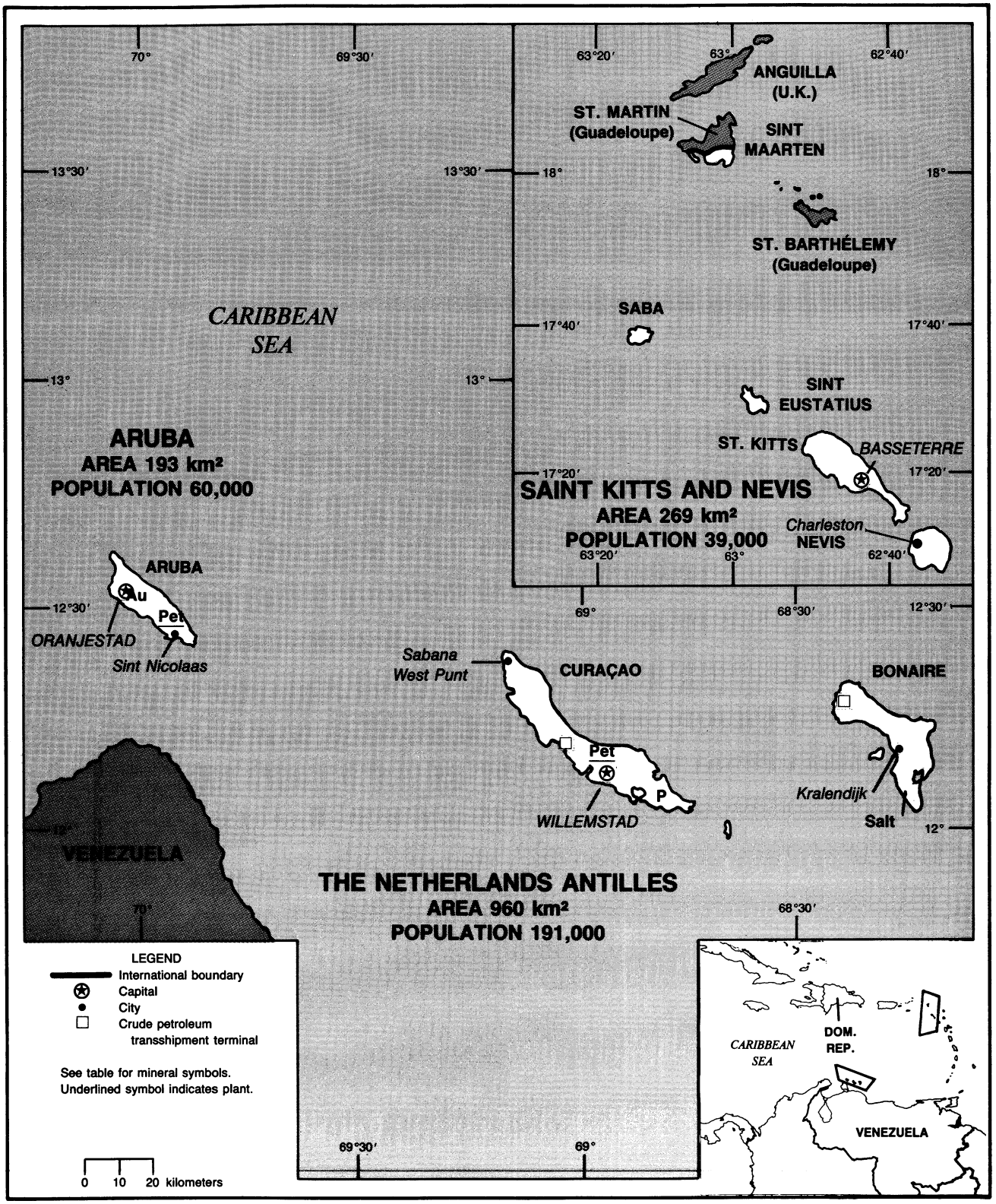
TABLE 4—Continued

ARGENTINA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Steel	Sociedad Mixta Siderúrgica Argentina (SOMISA) (3% private, 97% Government)	7 km from San Nicolás de los Arroyos, Buenos Aires Province	2,850.
Do.	ACINDAR-Industria Argentina de ACEROS, S.A. (100% private)	Plant Nos. 1. and 3 Buenos Aires Province; Plant No. 2. near Río Paraná, Santa Fé Province	1,500.
Uranium (ore)	Empresa Nuclear Mendoza, subsidiary of Comisión Nacional de Energía Atómica (Government 100%)	Sierra Pintada, San Rafael, Mendoza Province	205.
Zinc, refinery	Cía. Sulfacid S.A.C.I. y F (50% C.M.A.S.A., 50% private)	Near Rosario on the Paraná River, Santa Fé Province	35.

ARUBA, THE NETHERLANDS ANTILLES, AND SAINT KITTS AND NEVIS



THE MINERAL INDUSTRIES OF

ARUBA, THE NETHERLANDS ANTILLES, AND SAINT KITTS AND NEVIS

By Philip M. Mobbs

In 1991, the export of oil refinery products was the leading mineral-related activity of the Netherlands Antilles, an autonomous dependency of the Kingdom of the Netherlands. The GDP was estimated to be $1 billion[1] in 1988, the last year for which there were data. Tourism and offshore financing were the other major sectors of the Netherlands Antillean economy.

The economy of Aruba was led by tourism. Tourist arrivals on Aruba increased by almost 20% during 1991. The GDP was estimated to be $730 million[2] in 1989, the last year for which there were data. Aruba was separated from the Netherlands Antilles during January 1986. However, the island's slated 1996 independence from the Netherlands had been canceled by mutual consent.

The Federation of St. Kitts and Nevis consisted of the volcanic islands of Nevis and St. Christopher. The GDP was $97.5 million[3] in 1988, the last year for which there were data. Sugar cane culture and processing historically dominated the islands' economy. The islands became independent from the United Kingdom on September 19, 1983. Talk of Nevis' separation from the Federation resurfaced during late 1990.

PRODUCTION AND TRADE

The mineral industry of the Netherlands Antilles included a solar salt operation and a petroleum transshipment terminal on Bonaire; limestone and phosphate rock quarrying and petroleum refining on Curacao; a stone-crushing operation on Saba; a petroleum transshipment terminal on Sint Eustatius; and aggregate production on Sint Maarten.

The mineral industry of Aruba consisted primarily of a petroleum refinery and a proposed gold heap-leach operation.

While St. Kitts and Nevis' mineral industry produced some construction materials and salt, most of the nation's basic mineral requirements were imported. Local quarry material would be expected to be used to augment the materials required for the proposed construction of an additional 2,000 hotel rooms during the early 1990's. The $10 million Government contract for repairing hurricane damage, awarded late in 1991, would also be expected to increase usage of locally available construction materials. Beach sand mining was proscribed under the 1987 National Conservation and Environmental Protection Act.

The Netherlands Antilles' and Aruba's main trading partners were the European Community (EC) and the United States. Goods from the Netherlands Antilles and Aruba, both of which were associate members of the Economic Commission for Latin America and the Caribbean (ECLAC) and participants in the Caribbean Basin Initiative (CBI), had preferential access to the EC and the United States. St. Kitts and Nevis also participated in ECLAC and the CBI.

Salt was exported from the Netherlands Antilles to the Caribbean, New Zealand, and the United States. *(See table 1.)*

COMMODITY REVIEW

Metals

Monte Carlo Gold Mines Ltd., Richmond Hill, Ontario, Canada, held the exclusive gold mining concession on Aruba. Goldstack Resources of Val d'Or, Quebec, Canada, agreed to assist with the financing and entered as a 50% partner in the planned 200-ton-per-day heap-leach plant. Operations are expected to begin in 1992.

Industrial Minerals

Salt had been produced on Bonaire since the 16th century. AKZO Salt Antilles N.V. operated its solar salt facility on 2,226 hectares on the southern end of Bonaire.

During 1990, Devcon International Corp. of Deerfield Beach, Florida, purchased Bouwwbedrijf Boven Winden N.V., which quarried aggregate on Sint

Maarten. Production was consumed by the local construction industry.

Mineral Fuels

Coastal Aruba Refining Co. N.V., a subsidiary of Coastal Corp. of Houston, Texas, reactivated the Lago refinery on Aruba during November 1990. Exxon had closed the refinery in 1985 after more than a half century of operations. Coastal increased throughput from 100,000 barrels per day to 150,000 barrels per day during 1991. Asphalt, diesel fuel, feedstocks for Coastal's other refineries, kerosene, and residual fuel oil were produced.

Recent drilling activity off Aruba included Hamilton Brothers' 1989 Divi Divi 1 and Maraven's Mero 1X, which was begun in late 1989.

Petróleos de Venezuela S.A. (PDVSA) leased the Isla oil refinery at Willemstad, Curacao, from the Government of the Netherlands Antilles. Refineria Isla (Curacao) S.A., a PDVSA subsidiary, operated the refinery. The ocean terminal and facilities on Bonaire, purchased by PDVSA in 1989, were used for storage and transshipment.

Portions of mineral fuels transiting through St. Kitts and Nevis ended up on their beaches in 1991 after a diesel barge sank 29 km offshore. Both the U.S. Coast Guard and the French Navy assisted with the cleanup.

INFRASTRUCTURE

The Netherlands Antilles and Aruba had a combined total of 950 km of roads. St. Kitts and Nevis had 300 km of roadway.

Mineral products were moved through the ports of Oranjestad and Sint Nicolaas on Aruba and Willemstad on Curacao. Salt was transported from the AKZO Salt Antilles' stockpiles directly aboard ship via conveyor belt. The deepwater port of Basseterre served St. Christopher, and Charlestown was the port of entry for goods destined for Nevis.

Aruba's electrical generating capacity was 310 MW. There were plans to construct a new 60-kV substation on Aruba during 1992 to enhance the island's energy distribution. The Netherlands Antilles had an electrical generating capacity of 125 MW. St. Kitts and Nevis had an electrical generating capacity of 15.8 MW. *(See table 2.)*

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[1]Where necessary, values have been converted from Netherlands Antillean guilders (NAf) to U.S. dollars at the rate of NAf1.79=US$1.00.

[2]Where necessary, values have been converted from Aruba florins (Af) to U.S. dollars at the rate of Af1.79=US$1.00.

[3]Where necessary, values have been converted from East Caribbean dollars (EC$) to U.S. dollars at the rate of EC$2.70=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Centraal Bureau Voor de Statistiek
Windstraat 21
Oranjestad, Aruba

Centraal Bureau Voor de Statistiek
Willemstad, Curacao

Ministry of Public Works
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(809) 465-2521

Publications

U.S. Central Intelligence Agency: The World Factbook, 1990.

U.S. Department of Commerce, International Trade Administration:

Foreign Economic Trends and Their Implications for the United States, Aruba, annual.

Foreign Economic Trends and Their Implications for the United States, Netherlands Antilles, irregular.

TABLE 1

ARUBA, THE NETHERLANDS ANTILLES, AND ST. KITTS AND NEVIS: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991e
Petroleum refinery products	thousand 42-gallon barrels	63,510	69,350	65,335	e70,000	115,000
Phosphate rock e		16	16	15	15	15
Salt e		350	350	350	350	350
Sulfur, byproduct of petroleum e		60	60	60	60	60

eEstimated.
[1]Table includes data available through Apr. 7, 1992.
[2]In addition to commodities listed, crude construction materials (lime, sand, stone, etc.) may also be produced, but data on such production are not available, and information is inadequate to make reliable estimates of output levels.

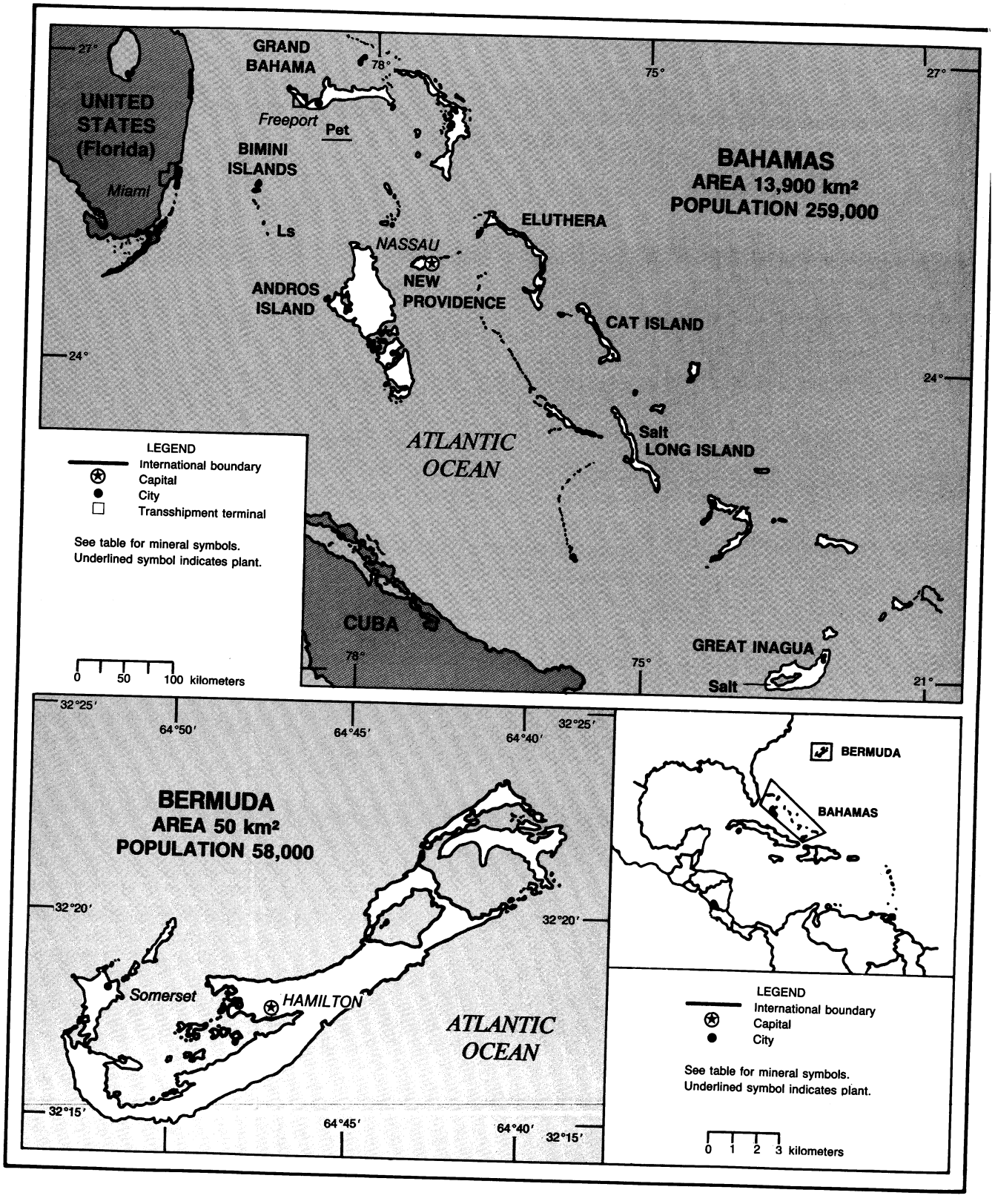
TABLE 2

ARUBA, THE NETHERLANDS ANTILLES, AND ST. KITTS AND NEVIS: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand 42-gallon barrels unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Netherlands Antilles:				
Petroleum products		Refinería Isla (Curacao) S.A. (Petróleos de Venezuela S.A., 100%)	Willemstad, Curacao	113,150
Salt	thousand metric tons	AKZO Salt Antilles N.V. (AKZO Salt Inc., 100%)	Southern end of Bonaire	360
Aruba:				
Petroleum products		Coastal Aruba Refining N.V. (Coastal Corp., 100%)	St. Nicolaas	175,200

THE BAHAMAS AND BERMUDA



THE MINERAL INDUSTRIES OF

THE BAHAMAS AND BERMUDA

By Philip M. Mobbs

THE BAHAMAS

Mineral production in The Bahamas in 1991 primarily consisted of calcium carbonate sand and rock and salt. The dominant sector of the Bahamian economy was tourism, followed by banking services. As the tourism industry slumped during the year, the economy slowed down. There was a correlational contraction of the construction industry that accounted for approximately 10% of the GDP.

Production

The value of mineral production in 1991 was $16.7 million, a 27% increase from that of 1990.[1] Salt and aragonite (a form of calcium carbonate) accounted for the major part of the total. *(See table 1.)*

Trade

The United States continued to be The Bahamas' most significant trading partner. In 1991, the value of exported goods and services from the United States to The Bahamas exceeded $750 million. Exports from The Bahamas to the United States totaled approximately $465.3 million. Cement, petroleum products, salt, and dimension stone dominated the short list of Bahamian mineral exports and reexports to the United States. In 1990, the U.S. imported 13.4 million barrels of petroleum products from The Bahamas, mostly residual fuel oil.

Structure of the Mineral Industry

Private industry dominated the limited mineral industry. Marcona Ocean Industries mined aragonite from the submerged dunes of the Great Bahama Bank, south of the Biminis. Dravo Bahama Rock Ltd., based in Freeport, Grand Bahama Island, dredged carbonate sand and stone. Island Construction Co. Ltd. and Freeport Aggregate Ltd. of Freeport provided limestone aggregate and sand for the local construction industry. On New Providence Island, the Government was the primary seller of sand, dredged by its Department of Works.

Morton Salt (Bahamas) Ltd. exported salt from its facilities on Great Inagua. Petróleos de Venezuela S.A. operated the Bahamas Oil Refining Co. oil transshipment facilities in Freeport. *(See table 2.)*

Commodity Review

Industrial Minerals.—A slowdown in Government sand barge landings at Malcom Park resulted in a temporary sand shortage on New Providence Island, which in turn affected the island's construction industry.

Mineral Fuels.—A petroleum exploration permit for the southern Bahamas was the subject of negotiations between British Petroleum Exploration Operating Co. Ltd. and the Government of The Bahamas.

Infrastructure

The Bahamas has two major commercial ports, Freeport on Grand Bahama Island and Nassau on New Providence Island. Nine small ports are used mainly for interisland transport. The islands had a 2,400-km road system.

To diminish the islands' dependence on imported mineral fuels, the Bahamas Electricity Corp. was pursuing several alternative energy projects funded by the Inter-American Development Bank. These included feasibility studies for waste wood-fired powerplants on Andros Island and Abaco Island and for a national solar energy program for heating water.

A 28-MW upgrade at the Clifton Power Plant on the west end of New Providence Island was begun during the year. Two new gas turbines were slated to be installed at the Blue Hill power station. In 1990, the nation's installed electrical generating capacity totaled 386 MW.

BERMUDA

Bermuda is an independent territory of the United Kingdom whose main industry is tourism. The mineral production of Bermuda constitutes a negligible part of the GDP, and the country's limited mineral requirements have to be imported. Although small quantities of coral limestone have been quarried for use as construction material, statistics on production are not available. Rain and seawater desalinization provide the freshwater supply for the archipelago of small islands about 1,050 km east of North Carolina. Electrical generating capacity in 1990 was 154 MW. Imports of petroleum products supply the energy requirements.

[1]Where necessary, values have been converted from Bahamian dollars (B$) to U.S. dollars at the rate of B$1.00=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Ministry of Agriculture, Trade and Industry
Levy Building, East Bay
P.O. Box N 3028
Nassau, The Bahamas
(809) 325-7502

Ministry of Works and Lands
JF Kennedy Dr.
P.O. Box N 8156
Nassau, The Bahamas
(809) 322-4830

Publication

Central Intelligence Agency:
The World Factbook, 1990.

TABLE 1
THE BAHAMAS: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]	1987	1988	1989	1990	1991
Salt	736	616	858	751	1,096
Sand: Aragonite	1,524	897	1,086	732	1,211

[1]Table includes data available through June 24, 1992.
[2]In addition to commodities listed, crude construction materials (sand and gravel, stone, etc.) may also be produced, but data on such production are not available, and information is inadequate to make reliable estimates of output levels.

TABLE 2
THE BAHAMAS: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

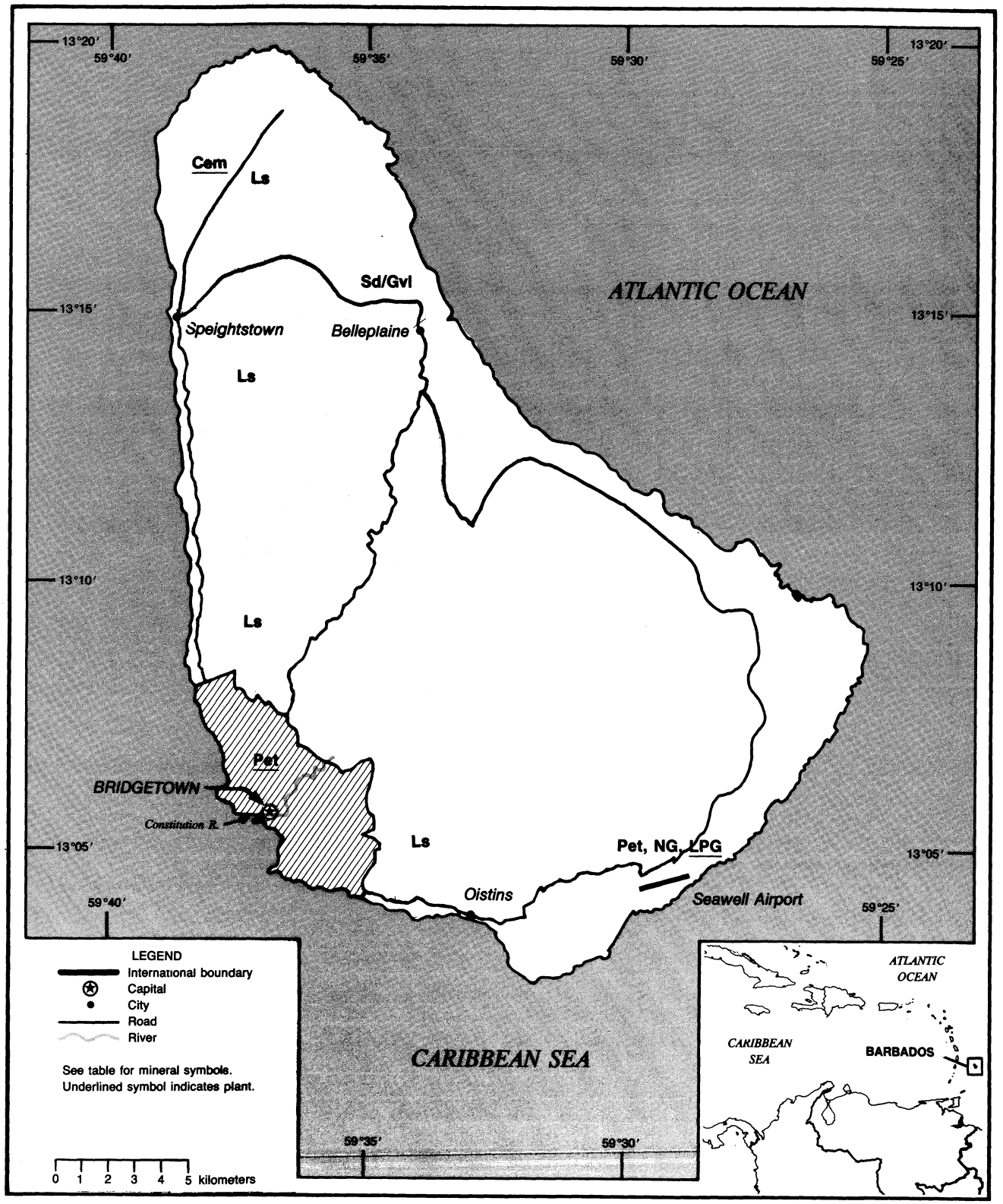
Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Bahamas Cement Co. (Intenational Development Corp. S.A. and Tag Group S.A.)	Freeport, Grand Bahama Island	690
Aragonite	Marcona Ocean Ind. Inc. (Marcona Corp., 100%)	Ocean Cay	2,500
Petroleum products thousand 42-gallon barrels	Bahamas Oil Refining Co. (Petróleos de Venezuela S.A., 100%)	Freeport, Grand Bahama Island[1]	128,000
Salt	Morton Salt (Bahamas) Ltd. (Morton Salt Co., 100%)	Great Inagua Island	1,500

[1]Refinery closed in 1985. Transshipment and storage facilities operational.

BRAZIL: CARAJAS IRON ORE BENEFICATION PLANT SOUTHWEST OF MARABA IN STATE OF PARÁ. (COURTESY OF CVRD)

BARBADOS

AREA 430 km² **POPULATION 258,000**



THE MINERAL INDUSTRY OF

BARBADOS

By Philip M. Mobbs[1]

The dominant mineral commodities produced in Barbados were petroleum and natural gas. Cement was the principal commodity in the industrial minerals sector.

The Barbadian economy revolved around tourism, sugar, and light manufacturing and assembly. The mineral sector formed a minor part of the country's economy. The construction sector's deterioration in 1991 reflected the 4% decline in the economy reported for the first half of the year. Nominal GDP was estimated to be $2.9 billion[2] for 1991.

GOVERNMENT POLICIES AND PROGRAMS

Barbados, like other Caribbean countries, encouraged foreign investment by granting investors certain tax advantages and other concessions. However, with the introduction of an International Monetary Fund-endorsed structural adjustment program at midyear, many of the Government's incentives were terminated.

The Quarry Act covered limited aspects of nonfuel mineral sector operations.

PRODUCTION

Production of crude petroleum and natural gas by Barbados National Oil Co., Ltd. (BNOC) was from the Woodbourne Field, St. Philip and Christ Church Parishes. The field had a rated capacity of 1,900 bbl/d.

Barbados had a small industrial minerals industry that produced cement, clays, limestone, sand and gravel, and crushed stone for the construction industry. *(See table 1.)*

TRADE

The island was a member of the Caribbean Community and Common Market (Caricom). During 1991, Barbados agreed with the group's initiative to adopt both a common external tariff (CET) and a common currency. However, by yearend, because of the potential disrupting effect on their economies, the CET had not been accepted by 5 of the 13-member community.

Barbados received preferential trade benefits under the Caribbean Basin Initiative of the United States. Through a Tax Information Exchange Agreement with the United States, Barbados was eligible to use Puerto Rican investment (Section 936) funds. The Lomé Convention and CARICAN permitted Barbados to qualify for trade benefits with Europe and Canada, respectively.

Barbados' leading trading partner was the United States. In 1991, trade between the countries totaled $197 million, $31 million in exports to the United States and $144 million in imports from the United States. Other major trading partners included Canada, Caricom countries, Japan, Germany, the United Kingdom, and Venezuela.

Mineral commodities and related products shipped from the island included cement, metal scrap and semimanufactures, petroleum products, sand and gravel, and stone. Mineral exports to the United States consisted primarily of industrial minerals shipped to Puerto Rico and the Virgin Islands. Barbados imported most of its mineral requirements. In 1991, Venezuela shipped approximately 700,000 barrels of reconstituted crude oil to Barbados under the San Jose Accords. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

The petroleum and natural gas and cement sectors continued as the largest employers in the nation's mineral industry. Employment in the mineral sector was estimated to be approximately 2,500, roughly 2% of the Barbadian labor force. The large mineral producers were operated by the Barbados Government or as joint ventures with other national governments. Small quarry operations were privately owned. *(See table 4.)*

COMMODITY REVIEW

Industrial Minerals

Cement was produced by Arawak Cement Co. at Checker Hall in St. Lucy Parish. Principal components for manufacturing clinker, limestone and clay, were mined locally. Gypsum, for cement, was imported. In past years, clinker had also been imported and ground at the plant.

Mineral Fuels

Barbados' petroleum and natural gas production was from the Woodbourne Field near the southeastern coast. Petroleum processing facilities were on the southwestern coast, north of Bridgetown. At the beginning of 1991, 107 wells were producing. During February, Petro-Canada International Assistance Corporation agreed to grant BNOC up to $2.5 million to partially fund 26 new wells.

Reserves

Crude oil reserves at the beginning of 1991 were estimated at 3,100 kbbl. Natural gas reserves as of January 1991 were estimated at 209.3 Mm^3. More than 80% of the island's surface rock was limestone. Limestone reserves were estimated to be in excess of 1 billion tons.

INFRASTRUCTURE

Cement and other Barbadian industrial mineral output was transported over the nation's 1,570-km road system. Bridgetown, the capital, was the island's only port. Petroleum was imported at terminals on the southeast and the southwest coasts. A pipeline system transports natural gas to commercial and residential customers.

Barbados Light and Power Company Ltd. reached an installed electric-generating capacity of 152 MW with the addition of a 13,500-kW fuel oil unit. Oil accounted for more than 70% of the nation's total energy usage. Domestic crude oil production supplied 31% of Barbados' total demand. Twenty percent was contributed by bagasse burning. Less than 1% of the energy demand was met by solar water heating. Natural gas satisfied the remaining energy demand.

OUTLOOK

Oil and gas produced on Barbados have decreased the need to import fuels. Increased drilling would be expected to enhance the production volume and reserve base. However, reserves appear to be limited.

Barbados' identified mineral deposits of clays, sand and gravel, and stone are generally limited in their attractiveness to major local or foreign interests. In the near term, production may increase, if the Inter-American Development Bank-funded National Transportation Plan recommends additional road building, airport improvements, or port development.

[1]With the collaboration of Doss H. White, State Mineral Officer, Tuscaloosa, Alabama.

[2]Where necessary, values have been converted from Barbadian dollars (BD$) to U.S. dollars at the rate of BD$2.0=US$1.00.

OTHER SOURCES OF INFORMATION

Agency

Ministry of Trade, Industry, and Commerce
Reef Road, Fontabelle
Bridgetown, Barbados, W.I.

Publication

Ministry of Finance and Economic Affairs, Bridgetown:
Barbados Economic Report, annual.

TABLE 1
BARBADOS: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		1987	1988	1989	1990	1991e
Cement, hydraulic	thousand metric tons	205	184	215	e250	200
Gas, liquefied petroleum	42-gallon barrels	—	16,632	16,824	e18,000	18,500
Gas, natural:						
Gross	million cubic meters	30	35	32	33	35
Marketed[e]	do.	10	17	15	15	17
Petroleum:						
Crude	thousand 42-gallon barrels	497	427	389	454	470
Refinery products	do.	1,669	1,723	1,915	2,125	2,200

[e]Estimated.
[1]Table includes data available through July 20, 1992.
[2]In addition to commodities listed, crude construction materials (clays, sand and gravel, stone, etc.) were also produced, but data on such production are not available, and information is inadequate to make reliable estimates of output levels.

TABLE 2
BARBADOS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
METALS					
Aluminum: Metal including alloys:					
Scrap		(2)	10	10	
Semimanufactures		32	10,478	10,478	
Copper: Metal including alloys:					
Scrap		12	31	11	United Kingdom 20.
Semimanufactures	value, thousands	$9	$15	—	Canada $10; St. Lucia $4; Grenada $1.
Iron and steel: Metal:					
Scrap		110	90	—	All to United Kingdom.
Ferroalloys		30	—		
Semimanufactures:					
Bars, rods, angles, shapes, sections		2,987	16,888	—	St. Lucia 13,795; Dominica 2,486; Antigua and Barbuda 251.
Universals, plates, sheets		8,014	249	—	St. Kitts and Nevis 198; St. Lucia 24; Dominica 15.
Hoop and strip	value, thousands	$4	$2	—	Guyana $1; St. Vincent and the Grenadines $1.
Wire		1	6	—	St. Lucia 3; St. Vincent and the Grenadines 3.
Tubes, pipes, fittings		32	37	—	Dominica 7; St. Vincent and the Grenadines 3; Guyana 2.
Lead: Metal including alloys:					
Scrap		—	112	—	Trinidad and Tobago 58; Panama 54.
Semimanufactures		144	—		
Other:					
Oxides and hydroxides	value, thousands	$2	—		
Ashes and residues		14	10	10	

See footnotes at end of table.

TABLE 2—Continued

BARBADOS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Destinations, 1989	
				United States	Other (principal)
INDUSTRIAL MINERALS					
Cement		124,017	116,700	—	St. Kitts and Nevis 18,117; Grenada 17,452; Netherlands Antilles 16,572.
Clays, crude		1	4	—	All to Trinidad and Tobago.
Diatomite and other infusorial earth	value, thousands	$1	—		
Fertilizer materials: Manufactured:					
Ammonia		1	8	—	Mainly to St. Vincent and the Grenadines.
Nitrogenous		4	106	—	All to Guyana.
Phosphatic		—	2	—	All to Dominica.
Potassic	value, thousands	—	$1	—	All to St. Lucia.
Unspecified and mixed		87	814	—	St. Lucia 813; Dominica 1.
Gypsum and plaster		72	1,915	—	St. Vincent and the Grenadines 1,042; Grenada 818; Jamaica 5.
Pigments, mineral: Iron oxides and hydroxides, processed	value, thousands	—	$1	—	All to Trinidad and Tobago.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		21	8	—	Do.
Worked	value, thousands	r$14	$6	—	Grenada $2; St. Lucia $2; Antigua and Barbuda $1.
Gravel and crushed rock		261	541	—	St. Lucia 254; St. Vincent and the Grenadines 61; unspecified 226.
Limestone other than dimension		3,995	255	—	St. Vincent and the Grenadines 165; Grenada 90.
Sulfur:					
Elemental: Colloidal, precipitated, sublimed	value, thousands	$2	$1	—	All to Dominica.
Sulfuric acid		—	2	—	All to St. Vincent and the Grenadines.
MINERAL FUELS AND RELATED MATERIALS					
Carbon: Carbon black	value, thousands	$1	$1	NA	NA.
Peat including briquets and litter		—	6	—	Dominica 3; Grenada 3.
Petroleum refinery products:					
Gasoline	42-gallon barrels	6,069	6,690	NA	NA.
Mineral jelly and wax	do.	79	228	—	St. Vincent and the Grenadines 24; St. Lucia 8; unspecified 196.
Kerosene and jet fuel	do.	989,946	971,083	NA	NA.
Distillate fuel oil	do.	46,722	109,953	NA	NA.
Lubricants	do.	5,607	117,656	58,247	Bahamas 21,847; Norway 10,192.
Residual fuel oil	do.	36,124	399,081	NA	NA.
Bituminous mixtures	do.	4,993	57,285	—	Jamaica 42,596; St. Kitts and Nevis 6,363; Belize 4,672.

rRevised. NA Not available.

[1]Table prepared by H. D. Willis.

[2]Quantity not available, valued at $13,000.

TABLE 3

BARBADOS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
METALS					
Aluminum:					
Oxides and hydroxides		20	23	20	United Kingdom 2; Canada 1.
Metal including alloys:					
Scrap	value, thousands	$1	—		
Semimanufactures		47,812	1,493,251	1,493,106	United Kingdom 76; Hong Kong 37.
Columbium and tantalum: Tantalum metal including alloys, all forms	value, thousands	$523	$362	$362	
Copper: Metal including alloys:					
Unwrought	do.	—	$1	$1	
Semimanufactures		18,614	20,788	15,962	West Germany 3,412; United Kingdom 1,405.
Iron and steel:					
Iron ore and concentrate		2,446	2,412	—	All from Venezuela.
Metal:					
Pig iron, cast iron, related materials		9	5	2	West Germany 3.
Steel, primary forms		(2)	18	—	All from United Kingdom.
Semimanufactures:					
Bars, rods, angles, shapes, sections		59,123	408,692	5,621	Venezuela 389,603; Trinidad and Tobago 9,445.
Universals, plates, sheets		9,511	271,028	2,032	Japan 145,997; Belgium-Luxembourg 100,572; West Germany 20,035.
Hoop and strip		80	39	18	United Kingdom 14; Netherlands 4.
Rails and accessories		3	5	5	
Wire		22,867	1,508	453	West Germany 281; Brazil 220.
Tubes, pipes, fittings		90,203	64,419	8,096	United Kingdom 25,302; Republic of Korea 11,627.
Castings and forgings, rough		3	4	4	
Lead:					
Oxides		141	100	36	West Germany 60; United Kingdom 3.
Metal including alloys:					
Scrap	value, thousands	$1	—		
Semimanufactures		58,739	3,184	3,105	United Kingdom 79.
Manganese: Ore and concentrate, metallurgical-grade	value, thousands	—	$1	$1	
Nickel: Metal including alloys, semimanufactures		2	1	1	
Silver: Metal including alloys, unwrought and partly wrought	value, thousands	$12	$6	$1	United Kingdom $5.
Tin: Metal including alloys, semimanufactures		1,313	2,454	1,123	Netherlands 801; France 272.
Titanium: Oxides		394	598	321	Italy 130; Netherlands 54.
Tungsten: Metal including alloys, semimanufactures	value, thousands	—	$1	—	All from United Kingdom.
Zinc:					
Oxides		15	35	7	France 26; Netherlands 1.
Metal including alloys, semimanufactures		66	35	—	United Kingdom 25; West Germany 10.

See footnotes at end of table.

TABLE 3—Continued

BARBADOS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Sources, 1989	
				United States	Other (principal)
METALS—Continued					
Other:					
Ores and concentrates		808	4	4	
Ashes and residues		—	51	51	
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.	value, thousands	$40	$1	NA	NA.
Grinding and polishing wheels and stones		7	9	2	Switzerland 4; United Kingdom 2.
Asbestos, crude		4	2	—	All from Canada.
Barite and witherite		2,042	4,044	4,044	
Cement		27,941	1,743	1,250	Belgium-Luxembourg 310; Denmark 143.
Chalk		10	10	—	All from United Kingdom.
Clays, crude		437	947	940	United Kingdom 7.
Diatomite and other infusorial earth		5	29	29	
Fertilizer materials:					
Crude, n.e.s.	value, thousands	$3	$1	—	All from New Zealand.
Manufactured:					
Ammonia		17	19	12	United Kingdom 6.
Nitrogenous		2,850	3,743	2,117	Dominican Republic 1,095; Guyana 400.
Phosphatic		4,165	467	436	Dominican Republic 25; United Kingdom 3.
Potassic		1,693	1,755	86	Sweden 1,499; Dominican Republic 149.
Unspecified and mixed		5,777	3,718	1,202	Dominican Republic 2,470; United Kingdom 17.
Graphite, natural		—	10	—	All from United Kingdom.
Gypsum and plaster		28,856	32,241	1,393	United Kingdom 20,199; Dominican Republic 4,801; Jamaica 4,302.
Lime		19	3,014	—	United Kingdom 15; unspecified 2,999.
Magnesium compounds: Magnesite, crude		—	3	3	
Mica:					
Crude including splittings and waste		4,877	109	16	Norway 83.
Worked including agglomerated splittings		2	5	3	United Kingdom 2.
Phosphates, crude		60,312	201	3	Netherlands 180; Venezuela 18.
Pigments, mineral: Iron oxides and hydroxides, processed		36	18	9	West Germany 3; Denmark 2.
Salt and brine		8,758	43,135	7,180	Canada 22,512; Jamaica 13,332.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		914	78	35	Italy 43.
Worked		214	1,095	1,093	Italy 2.
Gravel and crushed rock		1,978	135	74	Jamaica 54; Trinidad and Tobago 6.

See footnotes at end of table.

TABLE 3—Continued

BARBADOS: 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:					
Limestone other than dimension		—	21	21	
Sand other than metal-bearing		187	21,024	20,993	Trinidad and Tobago 31.
Sulfur:					
Elemental: Colloidal, precipitated, sublimed		—	3	—	All from Netherlands.
Sulfuric acid		64	128	13	Netherlands 69; Jamaica 29.
Talc, steatite, soapstone, pyrophyllite		4,844	71	18	Norway 48; Italy 1.
Other:					
Crude		86	1	1	
Slag and dross, not metal-bearing		5,839	—		
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		7	3	2	Canada 1.
Carbon: Carbon black		24	25	10	United Kingdom 13; Canada 2.
Coal:					
Lignite excluding briquets		15,852	10	—	United Kingdom 1; unspecified 9.
All grades including briquets		36	136,119	136,119	
Coke and semicoke		1	5	—	All from Belgium-Luxembourg.
Peat including briquets and litter		5,782	1,786	1,104	Ireland 98; Canada 10.
Petroleum refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	105	86	5	Venezuela 40; Trinidad and Tobago 32; Netherlands Antilles 7.
Gasoline	do.	12	53	—	Netherlands Antilles 51; Trinidad and Tobago 2.
Mineral jelly and wax	do.	(3)	166	3	United Kingdom 153; Netherlands 10.
Kerosene and jet fuel	do.	1,018	877	29	Trinidad and Tobago 470; Netherlands Antilles 331; Venezuela 30.
Distillate fuel oil	do.	29	159	—	Netherlands Antilles 121; Trinidad and Tobago 31; Venezuela 7.
Lubricants	do.	778	2,473	1,191	Jamaica 709; United Kingdom 302.
Residual fuel oil	do.	1,300	1,738	—	Venezuela 1,097; Trinidad and Tobago 301; Netherlands Antilles 224.
Bitumen and other residues	value, thousands	$3	$2	$1	United Kingdom $1.
Bituminous mixtures	thousand 42-gallon barrels	9	7	6	Trinidad and Tobago 1.

NA Not available.
[1]Table prepared by H. D. Willis.
[2]Quantity not available, valued at $6,000.
[3]Less than 1/2 unit.

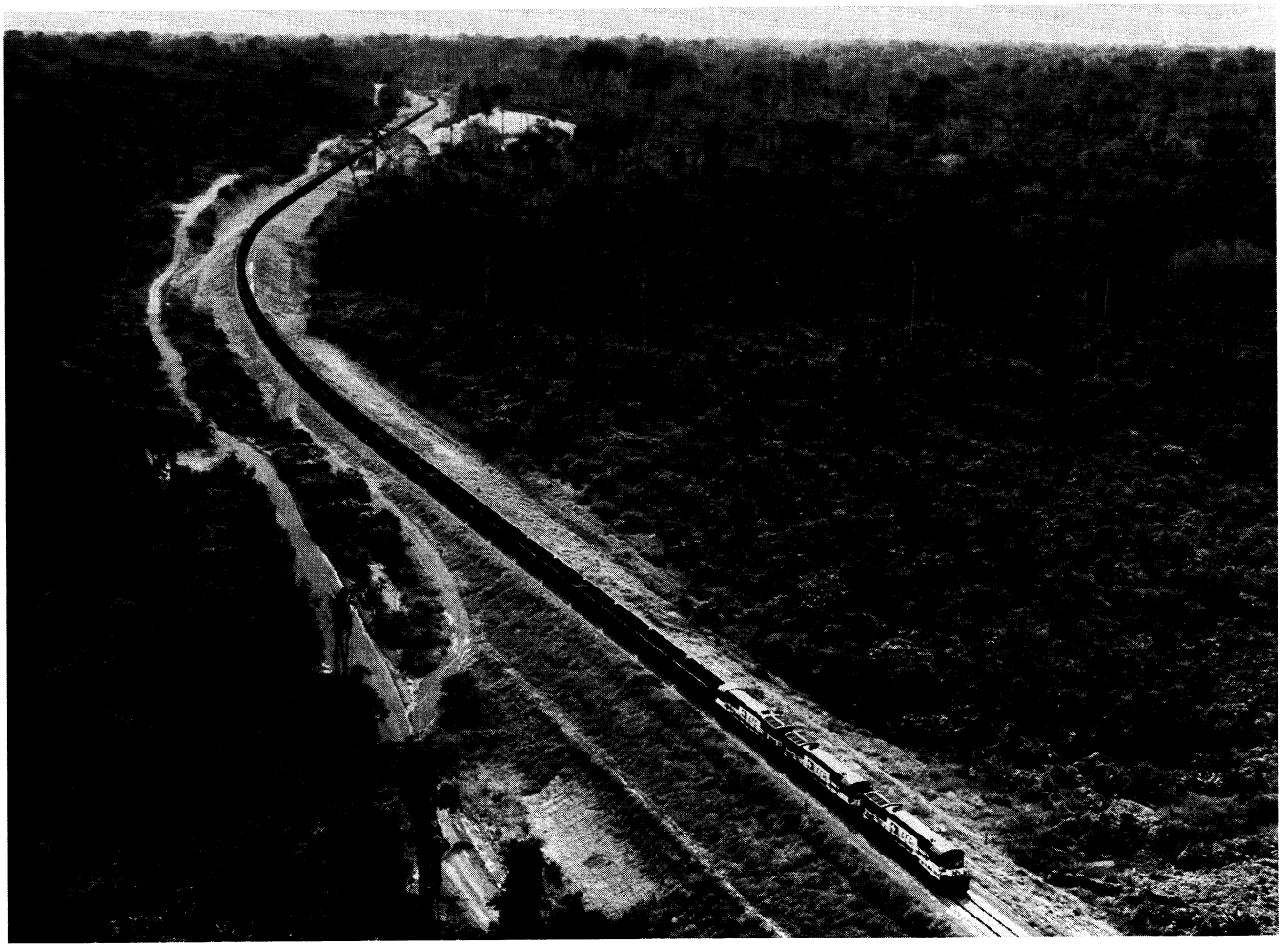
TABLE 4

STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand 42-gallon barrels unless otherwise specified)

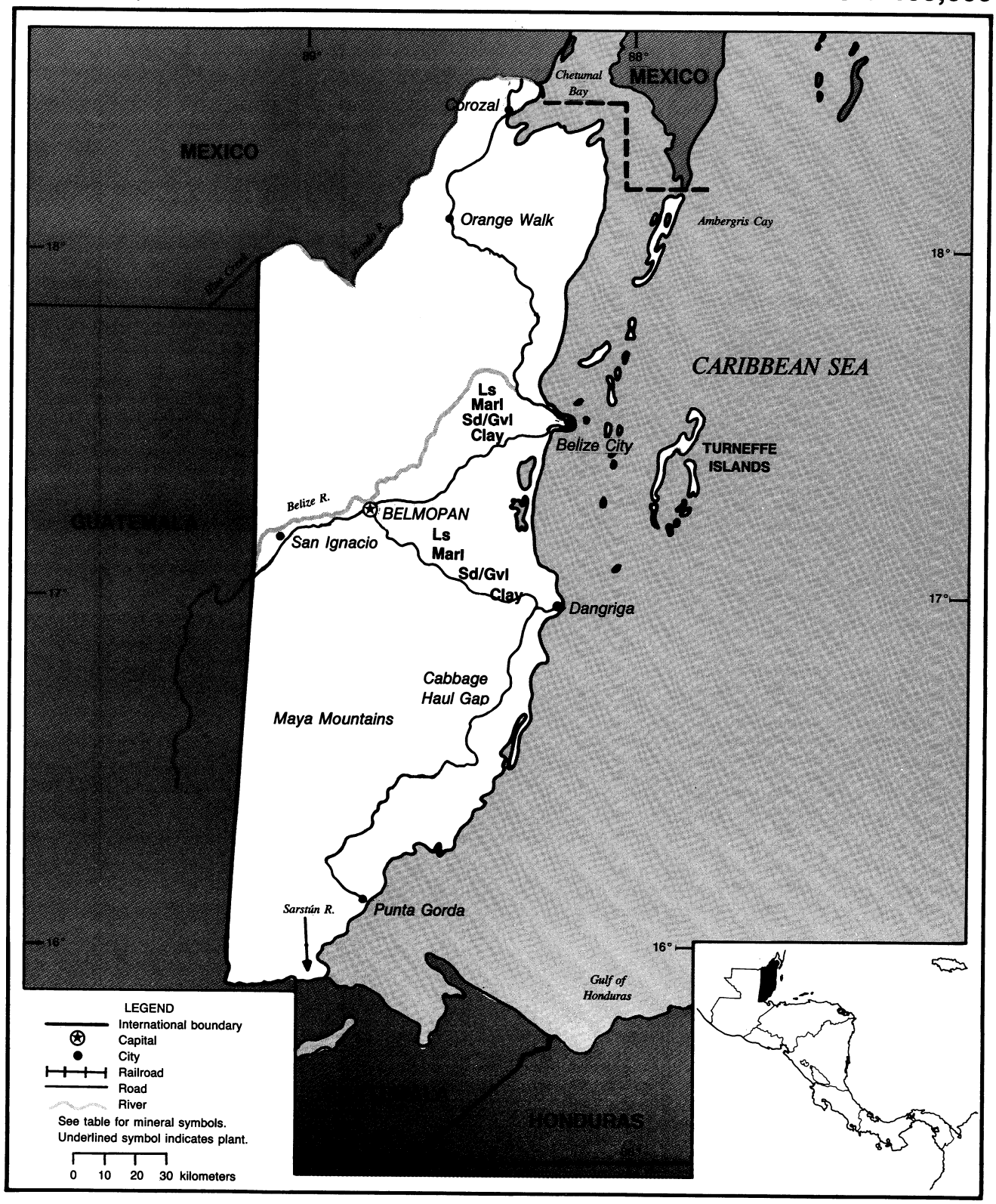
Commodity	Major operating ompanies and major equity owners	Location of main facilities	Annual capacity
Cement thousand metric tons	Arawak Cement Co. (Governments of Barbados, 51% and Trinidad and Tobago, 49%)	Checker Hall, St. Lucy Parish	300
Gas, liquefied petroleum	Barbados National Oil Co. Ltd. (BNOC) (Government, 100%)	Woodbourne Field, St. Philip Parish	25
Petroleum:			
Crude	BNOC	Woodbourne Field, St. Philip and Christ Church Parishes	694
Refinery products	Mobil Oil Barbados Ltd. (Mobil Oil Corp., United States, 100%)	Bridgetown, St. Michael Parish	1,100

BRAZIL: SPECIAL RAILROAD FOR TRANSPORTING HIGH GRADE IRON ORE FROM CARAJAS MINE TO PONTA DA MADEIRA TERMINAL MARANHAO STATE. (COURTESY OF CVRD)



BELIZE

AREA 23,000 km² **POPULATION 193,000**



THE MINERAL INDUSTRY OF

BELIZE

By Philip M. Mobbs

Belize's mining output was used primarily to satisfy the nation's demand for construction materials. Agriculture dominated the country's economy, accounting for 30% of GDP and 75% of export earnings. The country's mining activities accounted for less than 1% of the country's GDP in 1991, estimated at $370 million[1] at current prices.

During September, the Government of Guatemala formally recognized Belize as an independent nation. The Governments continued negotiations over Guatemala's territorial demands.

GOVERNMENT POLICIES AND PROGRAMS

The Government of Belize actively encouraged foreign investment. Foreign investors were able to benefit from guaranteed capital and unrestricted earnings repatriation, negotiated tax holidays, and lowered capital equipment import duties.

The Belize Investment Code assigned priorities to suggested economic development. Investments in the less-developed sections of the country were encouraged, especially ventures that hired and trained local population and used local natural resources. Undertakings that involved technology transfer and the generation of foreign exchange were also sought.

The Mineral Industry was subject to the Mines and Minerals Act, 1988, which became effective January 1, 1989. The act covered both the type of mineral to be extracted and the proposed size of production operations. Petroleum was specifically excluded from the provisions of the act.

PRODUCTION

Mineral production consisted primarily of clays, limestone, marl, and sand and gravel for the construction industry. Belize depended on imports for its other minerals and mineral fuel requirements. *(See table 1.)*

TRADE

Belize was highly dependent on foreign trade. The country had preferential access to the Caribbean, European, and U.S. markets through the Caribbean Common Market, the Lome Convention, and the Caribbean Basin Initiative, respectively.

Despite an abundance of arable land, Belize used only 10% to 15% of it for the production of basic commodities. Approximately 75% of the country's export earnings was derived from shipments of fruit juices, molasses, shellfish, and sugar.

STRUCTURE OF THE MINERAL INDUSTRY

Before 1988, much of the nation's industrial minerals output was produced under contract to the Government's Department of Public Works. Since 1988, the Geology and Petroleum Office has been charged with the administration of the mineral industry in Belize.

Many of the companies involved in nonfuel mineral operations were Belizean-owned. Three foreign companies held exclusive prospecting licenses for base metals, clay, and limestone ventures at the beginning of 1991. A number of U.S. firms held petroleum concessions. *(See table 2.)*

COMMODITY REVIEW

Metals

The Mines and Minerals Act, 1988, had evolved as a response to Ashland Gold Mines, Ltd.'s application for a precious mineral mining license in the Ciebo Creek area of the Maya Mountains. A small volume of gold was produced from the area in 1990 and 1991.

Additional areas of metallic mineralization have been reported in the Maya Mountains. During 1990, an exclusive prospecting license for a zinc deposit was issued for a site in the vicinity of Cabbage Haul Gap.

Industrial Minerals

The Belize, Sibun, and Monkey Rivers, as well as North and South Stann Creeks, were the focus of the country's clay, gravel, and sand operations.

Mineral Fuels

The prospect for a commercial petroleum discovery continued to attract independent operators to the country. Changes in petroleum royalty and tax laws made in the late 1980's encouraged exploration activity.

At the beginning of the year, Vaalco Energy Co. of Houston, Texas, obtained interest in a block held by Pentagon Petroleum Inc. of Baton Rouge, Louisiana. Vaalco scheduled 200 km of seismic surveys on its blocks during 1991. A two-well drilling program was proposed at midyear.

In February, Phillips Petroleum and the South Korean conglomerate Lucky Goldstar signed an agreement with the Government of Belize to drill a series of

exploratory wells. During March, Phillips spudded a well in the District of Corozal. The companies were reviewing data and planning a 3-D seismic survey with Seahawk Oil International Inc. of Irvine, California.

At midyear, Santa Barbara Oil Corp. and DIM Inc. of Salt Lake City, Utah, were awarded licenses to explore a 1,439-km^2 concession. Nortex Corp. of Houston also acquired an exploration license in northern Belize.

INFRASTRUCTURE

Quarried construction minerals were trucked to consumers over a 2,575-km road system, most of which was paved or gravel-surfaced. Dredged marl was barged to Belize City.

Road access to much of the country was limited. Large tracts of land were inaccessible. Sections of the highway system had been subject to closure during the rainy season. The infrastructure improvement program's demand for construction material continued at a reduced rate in 1991. Roadbeds had been extensively rehabilitated. River crossings were upgraded with steel and concrete bridges to ensure that the major highways would remain open all year. The United Kingdom proposed to donate $38 million toward upgrading the roads from Guatemala to Belize's ports. The deepwater ports in Belize City, Daigriga, and Big Creek handled the nation's shipping.

To generate electricity, Belize depended on imported oil, much of which was supplied by Mexico under the San José Accord. Despite the Belize Electricity Board's 10 diesel-generating plants with a total generating capacity of 25 MW, electricity was unavailable in most rural areas. Bagasse and diesel fuel were used to generate an additional 9 MW by private industries and individuals.

A 22-MW hydroelectric power station on the Macal River was proposed by International Energy Equities Inc. (IEEI) of Denver, Colorado, and Dominion Energy Inc. (DEI) of Richmond, Virginia. The $50 million station was scheduled to be completed by 1994 and operated by IEEI and DEI until 2034, after which the plant would be transferred to the Government.

To encourage the development of alternative energy sources, the Government eliminated the duty on solar and wind energy generators.

OUTLOOK

Industrial mineral development offers the greatest opportunity for expanding the mineral industry of Belize. The country has extensive limestone deposits that, when crushed, would be suitable for internal use and for export as aggregate. Additionally, there are developable dolomite deposits. Five granite outcrops have been identified as prospective sources of crushed stone and possibly dimension stone, and gypsum deposits have also been recorded, though not evaluated.

[1]Where necessary, values were converted from Belizean dollars (Bz$) to U.S. dollars at the fixed rate of Bz$2.00=U.S.$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Geology and Petroleum Office
Ministry of Natural Resources
84-36 Unity Blvd.
Belmopan, Belize

Ministry of Economic Development
P.O. Box 41
Belmopan, Belize

Publications

García, E. Mineral Resources of Belize, C.A. Transcript of Presentation at the Belizean Studies Conference, Belize City, Oct. 26, 1990.

International Trade Administration, U.S. Department of Commerce: Foreign Economic Trends and Their Implications for the United States. Washington, DC, 1990, annual.

Bateson, J. H., and I. H. S. Hall: The Geology of the Maya Mountains, Belize. Overseas Memoir 3, Institute of Geological Sciences, Her Majesty's Stationery Office, London, 1977, 44 pp.

TABLE 1
BELIZE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	1989	1990	1991e
Clays	—	—	r97, 611	r2,082,864	2,000,000
Dolomite	—	—	—	86, 045	100,000
Gold kilograms	—	—	—	1	5
Limestone	e350,000	e350,000	r165,594	r237,248	300,000
Marl	e900,000	e900,000	r1,043,891	r1,000	1,000
Sand and gravel	e500,000	e500,000	r278,034	r157,600	200,000

eEstimated. rRevised.
[1]Includes data available through July 15, 1992.

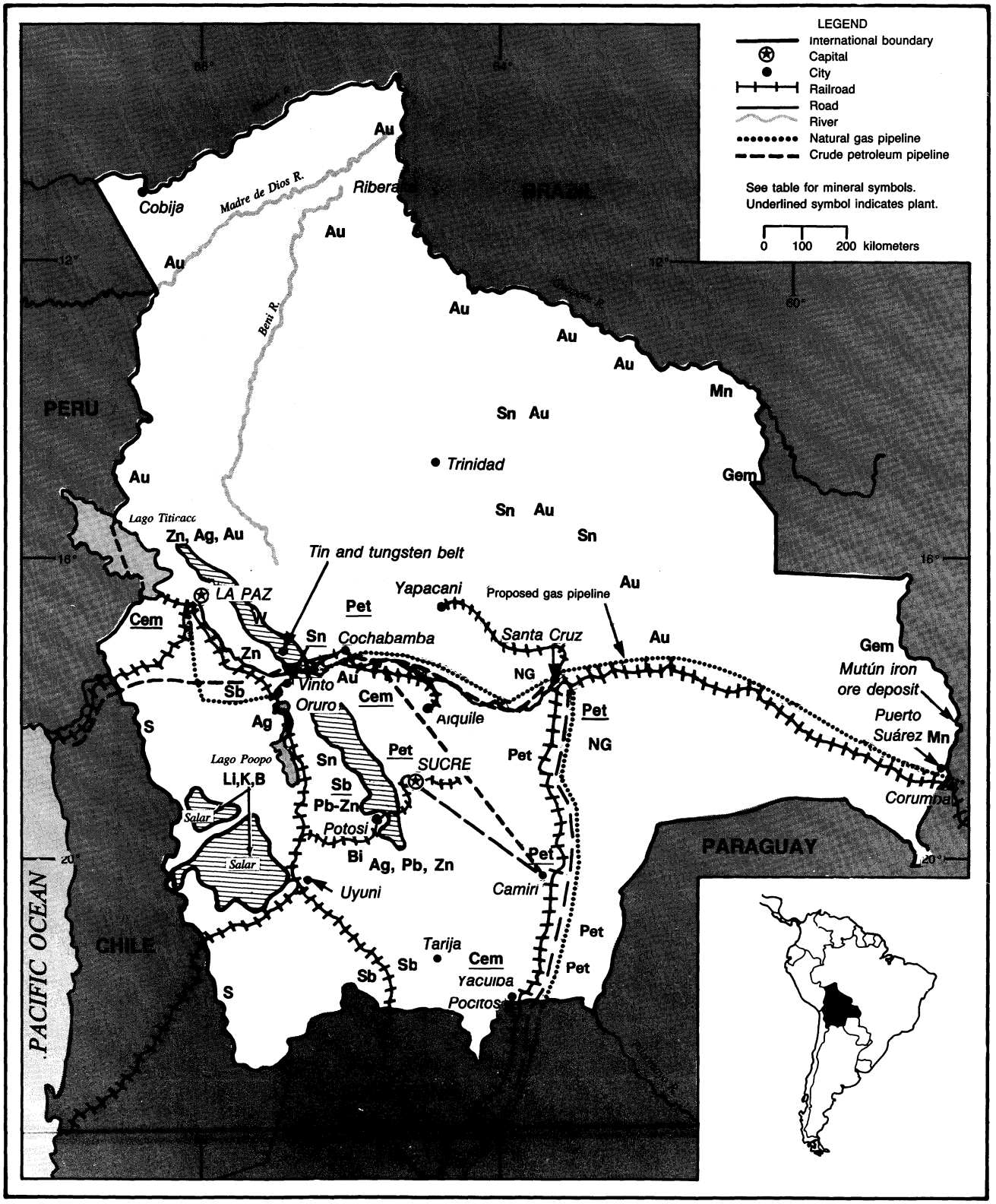
TABLE 2
BELIZE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Limestone	Belize Aggregate Ltd. (private)	Near Belmopan	150
Marl	Cisco Construction (private)	Offshore	500
Sand and gravel	Broadstar Construction Supplies (private)	Near Belize City	100
Do.	National Sand and Gravel (private)	Near Belmopan	100

BOLIVIA

AREA 1.1 million km² **POPULATION 7.5 million**



THE MINERAL INDUSTRY OF

BOLIVIA

By Pablo Velasco

In 1991, Bolivia's mining industry continued recovering from the deep economic recession that overwhelmed it in the mid-1980's; the retreat from mining in the national economy has been reversed. Depressed mineral prices, particularly of tin, and the austerity programs of the previous Government resulted in more than one-half of the mines being closed in 1986; some of them had reopened in 1991. The economic stability of Bolivia has become evident, and the mining industry now is much more responsive to market forces and is less dependent upon a single commodity than in the past. Although it had access to more credit than at any time during the past 12 years, investment capital continued to be scarce. The value of nonfuel mineral exports decreased 12.5% to an estimated amount of $356.3 million, relative to that of 1990, surpassing hydrocarbons for the fourth consecutive year as Bolivia's leading foreign exchange earner. Exports of hydrocarbons continued to be the second largest foreign exchange earner. Contribution to the National Treasury during 1991 was estimated by the National Treasury at $376.5 million (48.6% of its income). Exports of natural gas to Argentina were valued at $230.1 million compared with $225.4 million in 1990. This increase in value was due to higher prices paid by Argentina.

Tin and zinc production led the expansion in the nonfuel mineral sector, with strong performances by silver and gold. The value of gold exports decreased 39.3% as contraband trade increased, especially of alluvial gold mined in the Araras area in the Department of Beni and around Consata-Guanay gold fields in the Department of La Paz. Tin output—traditionally the most important commodity in the sector—recovered modestly from the crisis of late 1985. As a result Bolivia continued its relative position as the sixth largest tin producer in the world.

The state mining corporation, Corporación Minera de Bolivia (COMIBOL), formerly the largest mineral producer in the country, has now focused its efforts on attracting private firms to operate its mines under joint-venture or operating contracts and had reopened some of its mines to improve their mineral output in 1991. The private mining sector, composed of medium- and small-scale mining entities and cooperatives, maintained its position as the largest producers of antimony, gold, lead, tin, tungsten, and zinc in the country. However, some of its tungsten, tin, and antimony mines—closed in previous years—stayed shut as market prices remained low. The private mining sector continued increasing its national economic importance relative to the reduced output of COMIBOL.

Bolivia's economic growth and stability continued in 1991; after 4 years of GDP growth in the range of 2.6% to 3.0%—preceded by 6 years of negative GDP growth—the 4.1% growth rate in 1991 looked excellent. The GDP in real terms grew to about $6.1 billion.[1] The mining sector contributed about $540 million or 9.0% of the GDP. For the first time in more than a decade, real per capita income made significant gains. Inflation and the public debt continued under control. Inflation fell by almost three points to 14.5% in 1991, one of the lowest rates in South America. Preliminary data showed a negative trade balance of $93.1 million as imports increased by 34.0%, while exports decreased by about 8.4%, due to lower world prices for minerals.

GOVERNMENT POLICIES AND PROGRAMS

During an extraordinary session on April 3, 1991, the Bolivian National Congress approved law 1243, enacting a new mining code. The new code was widely discussed beforehand, notably with the International Monetary Fund. A review of the Government's policy toward the country's mineral sector was made by Congress to revise key aspects of the mining legislation with emphasis on the concerns of potential foreign investors. To attract foreign investment in the mineral sector, the mining code and hydrocarbons and investment laws were liberalized, approved, and enacted. A new investment code enacted in September 1990 guarantees equal treatment to foreigners, unlimited remittances, and free convertibility of currency and provides for international arbitration. The new mining code enacted on April 3, 1991, is basically the old mining code with the addition or revision of 38 articles. Two major changes in the mining law that concern foreign investment are: (1) foreign firms can now operate within the 50-km border limit in joint ventures or service contracts with Bolivian miners, with the exception of firms from the adjacent border country; and (2) all new investment in the mining sector will have to comply with a new taxation system replacing royalties with a 30% tax on profits. On November 27, 1991, a second law, law 1297, was enacted, changing articles 118, 119, and

120 of the new mining code to make them more explicit on the taxation system. The change permits foreign firms paying taxes in Bolivia to obtain tax credits in their home countries.

The new hydrocarbons law replaced the "General Law of Hydrocarbons" promulgated in 1972. The new law No. 1194 of November 1, 1990, encourages joint ventures in the energy sector and states that all private firms, foreign as well as national, contracted by Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), the national oil company, would have the same rights and responsibilities. Private oil companies cannot operate independently in Bolivia so they must enter into joint ventures or operational contracts with YPFB.

PRODUCTION

Official figures for 1991 indicated that the value of Bolivia's mineral production decreased by 12.5%, compared with that of 1990. The tin industry showed a modest decline as primary tin output decreased by 2.4% to 16,830 tons in 1991.

COMIBOL's overall mineral output improved modestly in 1991 for the fourth consecutive year. Mine output of the private mining sector surpassed past levels in 1991.

During the past 3 years, the Bolivian mining industry has tried to diversify its mineral production away from tin by increasing production of lead, zinc and associated silver, and ulexite. Zinc production reached a record figure of almost 130,000 tons.

Lead output maintained almost the same level of production of the previous year of about 20,000 tons of lead concentrate. Silver production increased 21% over that of the previous year. There was a decrease of officially recorded gold production from 5,198 kg in 1990 to about 3,500 kg in 1991. The decline in gold production, according to official information from the Ministry of Mining and Metallurgy, was largely due to the closure of the state-owned mining bank, Banco Minero de Bolivia (BAMIN), and an increase in gold contraband. BAMIN was the official trader that purchased most of the gold produced by the mining cooperatives and small miners. It was reported by nonofficial sources that large unknown quantities of gold continued to be smuggled by gold miners and illegal traders to neighboring countries because private exports of gold were legalized in August 1985. The most accurate official figures were for gold produced as precipitates by Empresa Inti-Raymi and exported as such.

COMIBOL's efforts were concentrated on attracting private firms to operate its mines under joint ventures or operating contracts. The company's reopening or expansion of those mines that could be exploited without economic losses was deferred to consider joint ventures. In 1991, COMIBOL's losses totaled $2.6 million. COMIBOL continued to operate as a holding company with five subsidiary mining companies and two subsidiary smelting companies. The mining sector work force, including the mining cooperatives, has remained fairly constant for the past 4 years at about 4% of Bolivia's total work force. *(See table 1.)*

TRADE

Nonfuel minerals and mineral fuels (oil and gas) continued to be Bolivia's leading exports; in combination they contributed 69% of Government revenues. All minerals accounted for 42% of total exports. Exports of nonfuel minerals decreased 12.5% in value to $356.3 million in 1991 compared with that of 1990. This was due mainly to a decrease in international market prices. In 1991, Bolivia's mining exports stopped increasing for the first time in 7 years. Zinc and tin continued to lead mineral exports by value, with strong performance by silver. Tin export earnings, historically Bolivia's most important mineral export, decreased about 4.0% in value to $99.4 million in 1991. In 1991, lead prices decreased 31.3% compared with that of 1990. Gold exports decreased as contraband increased, especially with alluvial gold mined in the Araras area. The nonfuel minerals sector surpassed the hydrocarbon sector as the leading foreign exchange earner for the fourth consecutive year.

Empresa Metalúrgica de Vinto (formerly ENAF, the past foreign exchange leader in the mining sector) increased its volume of metallic tin exports although its dollar value decreased slightly to $79.8 million. The medium-size mining group, for the fourth consecutive year, was the largest exporter of mineral products within the mining sector. However, its exports decreased 16% compared with those of the previous year and represented about 37% of Bolivia's total nonfuel mineral exports.

The small-size mining group, including the mining cooperatives, accounted for about 24% of the country's total nonfuel minerals exports. In 1991, hydrocarbons were the second largest export earner, contributing 27% or $230.1 million of the country's total export value. Natural gas exports to Argentina were valued at $228 million compared with $224 million in 1990. This increase was due to higher prices. Argentina continued to be the sole importer of Bolivia's natural gas.

In terms of value, Europe continued to be Bolivia's leading importer of ore concentrates and metallurgical products, accounting for 65% of total nonfuel export value. It was followed by the United States with 28%; the Latin American Integration Association and the Andean Group with 4.6%; and Asia, Africa, and others accounting for the remaining 2.5%. *(See table 2.)*

STRUCTURE OF THE MINERAL INDUSTRY

The Ministry of Mining and Metallurgy and the Ministry of Energy and Hydrocarbons were, respectively, the principal policymaking regulatory agencies within the mining and petroleum sectors of the economy. The Bolivian Government controlled and participated in the mineral industry with the Servicio Geológico de Bolivia (GEOBOL), the Instituto de Investigaciones Minero-

Metalúrgico de Oruro and COMIBOL as autonomous entities.

COMIBOL was decentralized on August 29, 1990, and reorganized as a holding company with five subsidiaries. The subsidiaries were: (1) Empresa Minera Quechisla, which operated the Chorolque tin mine, the San Vicente zinc-silver mine, the Tatasi lead-zinc-silver mine, the Tasna bismuth-gold mine, and the Animas-Inocente mine under exploration; (2) Empresa Minera de Potosí, which controlled the mines of Unificada del Cerro Rico de Potosí; (3) Empresa Minera de Oruro, which controlled the mines of Huanuni, the richest underground tin mine in Bolivia, Bolívar, San José, María Luisa, Santa Fé, and Poopó; (4) Empresa Minera de La Paz, which controlled the mines of Viloco, Colquirí, and Caracoles; and (5) Empresa Minera del Oriente, which controlled the El Mutún iron and manganese ore deposit. Some of the mines listed above were originally tin mines but shifted to producing associated metals.

GEOBOL's basic functions were to prospect for and explore the mineral resources of Bolivia. In 1991 the U.S. Geological Survey and GEOBOL concluded a 2-year program of the mineral assessment of the Altiplano. The total cost of the program was $1.85 million, of which $1.35 million was financed by the U.S. Trade Development Program and $0.5 million was provided by USAID.

BAMIN, which was closed down in 1991, provided credits to small-scale miners and purchased the output of small mines and sold minerals to mineral market traders.

Despite the scaling down of its operations, COMIBOL was still the major single producer of various minerals in the country and may become more important and productive because its reorganization was being implemented. COMIBOL operated about 10 mining units and has the responsibility for running the Vinto tin and antimony smelter and for maintenance of the Karachipampa smelter. Furthermore, COMIBOL held some very interesting mineral properties, which have been explored in varying degrees.

In the private sector, there were 23 affiliated mining companies in 1991 under the National Association of Medium-Size Miners. Compañía Minera Salinas, S.A. (COMISAL) and the Grupo Minero Chojnacota were the new members. This group was Bolivia's and the world's largest producer of antimony and tungsten among free market countries. It also produced gold, lead, silver, tin, and zinc and became the most productive entity in the mineral sector.

Grouped under the Cámara Nacional de Minería were 800 small mines operating in the country in 1991, a decrease of 400 compared with that of 1990. Mining cooperatives are organized under the Federación Nacional de Cooperativas Mineras (FENCOMIN) and included most of the gold mining cooperatives of Tipuani, Guanay, Mapirí, and Conzata. The gold mining cooperatives are grouped under the wing of FERRECO. According to The National Institute of Cooperatives (INALCO), there were more than 320 mining cooperatives in the country, of which about 40% were mining gold in 1991, mainly in the Province of Larecaja, La Paz Department (Tipuani area). In addition to gold, cooperatives also produced antimony, copper, iron ore, manganese, salt, sulfur, tin, and tungsten.

The Government continued the control of the smelting and refining of metals through Empresa Metalúrgica de Vinto (antimony and tin) and Empresa Metalúrgica de Karachipampa (lead, silver, and zinc), which remained shut down since mid-1984 for a shortage of ore feed and the lack of operating capital; both are subsidiary companies of COMIBOL as well as the Telamayu bismuth smelter. *(See table 3.)*

COMMODITY REVIEW

Metals

Antimony.—Bolivia's antimony output fell about 14% below that of 1990, the lowest production since 1980. However, Bolivia remained the second largest producer in the world after China. The decline in output was due to depressed world demand and lower prices as China continued flooding the world market. Antimony production was entirely by the private sector, with the medium-size mining sector contributing about 75% of total production, followed by the small-size mining sector and cooperatives with 17%, and the remainder by COMIBOL and others. The largest producer of antimony continued to be Empresa Minera Unificada, S.A. with its Chilcobija and Caracota Mines. Production per month from these two mines was about 500 tons of antimony concentrate grading 63% Sb with a total of 345 employees. Next in importance were Empresa Minera San Juan, Ltda. and Empresa Minera Hermanos Bernal, S.A. (no longer producer of primary ore, only antimony trioxide). A newcomer to the medium miners association, COMISAL, produced 662 tons of primary antimony ore from its mining group putuma in Potosí.

In 1991, Bolivia exported 7,369 tons of antimony, a 12% decrease in weight and an 18% decline in value compared with that of 1990. Of the total amount of antimony exported, 52% was in concentrates and 42% was as antimony trioxide, with the remainder as regulus (impure metal produced during smelting of ores or concentrates) and alloys.

Of the total antimony exported, 33% went to Europe and 34% went to United States. Bolivian primary antimony producers, through their local committee, strongly opposed the potential antimony sales program from the U.S. strategic stockpile. They suggested that the mere possibility of such sales had a negative impact on international market prices. They were also against the dumping of Chinese antimony. The Vinto antimony smelter of COMIBOL has remained closed for the past 4 years; however, in August 1990, the antimony smelter was fired up to start antimony metallic production as well as antimony trioxide using a new smelting method provided by Laurel Industries of Ohio, in the United States.

The private Palala antimony smelter of Hermanos Bernal in Tupiza, Department of Potosí, produced 618 tons of antimony trioxide in 1991, similar to the amount in 1990.

Gold.—Official gold production in Bolivia decreased by about 33% to 3,500 kg. This decrease was largely due to the closure of the state-owned mining bank, BAMIN, and the increase in gold contraband in 1991. BAMIN was the official agency that purchased most of the gold produced by the mining cooperatives and small miners.

Gold in Bolivia is produced mainly from alluvial deposits and one open pit, heap-leaching operation from an epithermal subvolcanic gold-silver deposit. This operation belongs to Inti Raymi mining company. The richest and most productive alluvial gold deposits are located on the Tipuani, Mapirí, Kaka, and Challana Rivers, all in the northern area of the Department of La Paz. The second most important alluvial area is the Araras area located in the northeast of the country, on the border with Brazil. Here, gold has been exploited from the Madera and Madre de Dios Rivers. The U.S. Embassy estimated that gold production in 1991 was more than 10,000 kg. The principal source of gold production in Bolivia continued to be the 128 gold mining cooperatives operating in the gold fields of Guanay, Huayti, Mapirí, Teoponte, Conzata, and Tipuani (120 km north of La Paz), which accounted for approximately 55% of total production. The medium-size mining sector contributed 45% of total output. Most of the gold cooperatives are small-size operations, poorly organized and seriously undercapitalized. However, these gold cooperatives were anxious and willing to establish joint ventures with nationals or foreign investors.

According to Bolivian mining officials and industry observers, these gold producers continued selling a large part of their gold production to private buyers instead of BAMIN, which was closed down in 1991, resulting in unregistered exports of gold. The U.S. Embassy estimated that in Bolivia at least 6,000 to 7,000 kg of gold was sold to local and foreign traders without being registered. It was estimated that the cooperatives included more than 34,000 miners and more than 10,000 barranquilleros or small-scale miners, all grouped under FENCOMIN. According to INALCO, about 166 cooperatives are still awaiting legal approval to begin mining operations on about 52,000 ha of gold-bearing material.

In the medium-size mining sector, Empresa Minera Inti-Raymi S.A. has become the largest private gold producer in Bolivia. Inti-Raymi was mining gold at its Kori Khollo open pit mine, next to the old La Joya Mine near Oruro, at the rate of 1,504 kg/a of gold and 9,042 kg/a of silver. In 1991, Inti-Raymi nearly doubled its proven gold reserves at the Kori Khollo Mine and continued its intensive drilling program to determine reserves of sulfide gold mineralization below the oxide cap currently under exploitation. The company has estimated Kori Khollo sulfide mineralization at 55.1 Mmt of minable sulfide ore and 5.7 Mmt of minable oxide ore with an average grade of 2.08 g/mt of gold and 13.7 g/mt of silver. The recovery rate for the sulfide ore is expected to average 63% for gold and 25% for silver. About 3 Mmt of the oxide ore will be processed through the current cyanide leaching operation before the startup of a new mill in 1992 that will be capable of extracting gold and silver from the sulfide ore. Inti-Raymi has begun constructing a 14,500-mt/d carbon-in-pulp facility at an anticipated cost of $163 million. The oxide zone was being mined at the rate of 1,400 kg/a of gold.

Gold exploitation began 7 years ago on the Brazilian border in the Araras region on the Madera River, 80 km north of the city of Guajara-Merín in Beni Department. Most of the gold produced in the Araras region is sold to Brazilian merchants on the border. Annual production in this area has been estimated to be about 500 kg.

Among other U.S. mining companies involved in Bolivia exploring the Altiplano and alluvial gold deposits in the Tipuani-Guanay-Mapirí region are ASARCO Incorporated, United Mining Corp., and PanAmerican Mining Ltd. In addition, there were several small gold operations involving small U.S. investors in the Guanay, Yuyo, Mapirí, and Teoponte areas that had operating contracts with local gold mining cooperatives.

Iron Ore.—Production and exports of iron ore decreased almost 19% and 35%, respectively, in 1991 below the 1990 level. Empresa Minera del Oriente (EMEDO), a subsidiary of COMIBOL, continued mining and exporting iron ore from the rich Mutún iron ore mine near the Brazilian border, east of Santa Cruz. Its iron ore exports went to neighboring Paraguay's state steel plant, Aceros del Paraguay S.A. (ACEPAR), after the completion of a successful pilot operation and the signing of the contract in October 1989. EMEDO exported almost 25,000 tons of iron ore grading 62% iron to Paraguay in 1991 compared with 38,200 tons in 1990. The iron ore exported was worth about $500,000. As was the case in 1990, ACEPAR did not buy enough iron ore in 1991 to fulfill its contractual obligations.

Bolivia's first steel rolling mill called Laminor was due to start producing reinforcing bars by the end of March using as raw material 14,000 tons of billets from ACEPAR. The Bolivian firm Grupo Mendoza bought billets at $220 per ton plus freight to supply its new Laminor steel rolling mill, located 5 km from the mining city of Oruro. Laminor stated that the rolling mill will operate at a rate of 14,000 mt/a initially, rising to 75,000 mt/a if financing and demand growth allow. Laminor hopes to compete with the 55,000 to 85,000 mt/a of rebar that Bolivia imports, mostly from Brazil. An Italian bank and a local bank provided most of the $6 million for Laminor's startup costs.

Over the next year, sales of iron ore to Paraguay were expected to generate about $1.6 million for Bolivia. Paraguay will also benefit from this transaction, because it will pay $12.50 per ton f.o.b. Puerto Ladario on the Paraguayan River, $3 to $6 less per ton of iron ore than it was

paying to Brazilian private suppliers. However, EMEDO'S officials were complaining that Brazilian suppliers, who have started legal proceedings against ACEPAR for breaking the contract, were trying to block Bolivia's exports by placing a series of obstacles at Brazilian ports.

Lead, Silver, and Zinc.—Production of all three commodities increased substantially in 1991 compared with that of 1990. Lead ore and concentrate increased 4.5%, silver was up 20.1%, and zinc was up 25%. Output of metallic lead, including alloys, recovered by 8.2% from the depressed level of the previous year. Output of metallic silver decreased 1% below that of 1990.

The medium-size mining sector was the dominant lead and zinc producer with 52% of total lead and 57% of total zinc. In this sector, the major producers were Cía. Quioma S.A., Compañía Minera del Sur, S.A. (COMSUR), Caballo Blanco S.A., and Tiahuanacu Ltda. COMIBOL mines continued to be the largest silver producers in the country with 44% of total output. The medium-size mines produced 37% and the small mines 19% of total silver. Cía. Minera de Oruro, one of the five subsidiary companies of COMIBOL, was in charge of five of COMIBOL's mines and one service company with a current labor force of 2,398 employees. In 1991, this company was hit by most of the strikes and stoppages called by COMIBOL's mine workers. San José and Huanuni were the mines with the highest number of days under strikes or stoppages. San José Mine is located next to the city of Oruro and was reopened in July 1987 with its labor force reduced to 543 employees. In 1991, the San José lead-silver mine was programmed to produce 1,391 tons of lead, 33 tons of silver, 16.3 kg of gold, and 835 tons of antimony. San José was also programmed to generate a $760,000 operating profit. The mill was enlarged to treat 600 mt/d of run of mine ore with 370 g/mt of silver. San José produced during 1991 a total of 923 tons of lead, 37.4 tons of silver, 12 kg of gold, and 587 tons of antimony. The Bolívar silver-tin-zinc mine, reopened in August 1988, had 321 miners engaged in developing new ore reserves. There was an increase in proven and probable reserves from 384 tons of silver in December 1990 to 439 tons in December 1991. Zinc reserves went up from 175,000 to 194,000 tons. Tin and lead reserves also increased substantially. Bolívar was scheduled to start operations in 1990 with a 750-mt/d concentrating plant, but due to several delays in the international invitation for a joint-venture operation, the mine is still producing under capacity. On May 27, 1991, five companies, Metal Mining Co. of Canada, Goldfield of South Africa, Cornish American Resources of the United Kingdom, and the Bolivian companies COMSUR and Compañía Minera Tiawanacu, S.A., presented bids for the exploration and the exploitation of the Bolívar mine. On June 27, 1991, recommendations to begin negotiations were submitted to the ministry of mines and to COMIBOL.

COMSUR, Bolivia's largest private-sector mining firm, continued to be the largest private silver producer in Bolivia. It mined the Porco zinc-lead-silver deposit with a new 1,100-mt/d flotation mill. It also acquired the Cascabel lead-silver mine (400 mt/d) from Alameda Ltda., where production continued in 1991. The Quioma Ltda. mining company, a subsidiary company of COMSUR, mined the zinc-lead-silver deposit of Asientos in Cochabamba. COMSUR partially owns the mining company Caballo Blanco, which mines the zinc-lead-silver mine of Huari Huari. COMSUR, through its subsidiary company Compañía Minera Conception (COMCO), opened in mid-1988 a 700-mt/d, heap-leaching plant later expanded to 1,000 mt/d. The plant treats old tailings of the Cerro Rico de Potosí mine area (averaging 180 g/mt of silver content) purchased by COMCO from the mining cooperatives.

Tiawanacu Ltda., a 50-50 joint venture with the U.S.-Canadian company JORDEX, is another of the large private zinc-silver producers in Bolivia. Tiawanacu operated its own Monserrat Mine and COMIBOL's San Francisco Mine, under a 10-year lease, and two mills. One of its mills is in Poopó and was recently enlarged to treat 500 mt/d, and the other is located in Potosí (250 mt/d). Most of the ore treated in Tiawanacu's mills was purchased from the small miners sector and cooperatives. In addition, the Poopó mill purchased about 300 mt/d of zinc ore from COMIBOL's Bolívar Mine. Tiawanacu was interested in leasing COMIBOL's Poopó zinc-tin-silver mine. REMINSA S.A. was owned by the Canadian company Golden Star and operated the Carguaicollo Mine with a 250-mt/d mill to treat tin-zinc-silver complex ores. Golden Star sold its properties and left the country in early 1991. This decision was taken because exploration in Carguaicollo showed limited reserves.

Other smaller medium zinc producers were Maragua Ltda., San José de Berque, and Bernal Hermanos, all operating zinc mines located in Potosí Department. COMIBOL's zinc production was 24% of the country's total zinc production, the medium miners sector contributed 57%, and the remaining 19% was by the small miners sector. Zinc concentrate exports increased almost 29% in 1991 to an alltime record of 127,519 tons (metallic content). No exports of metallic zinc were made in 1991.

Tin.—Bolivia's relative position as a world tin producer remained in fourth place after Brazil, Malaysia, and Indonesia. Tin continued to be Bolivia's most important nonfuel mineral commodity. Its output decreased by 2.4% from that of 1990 to 16,830 tons. The largest production increase in the private sector was by the small-size mines and cooperatives, which for the fifth consecutive year replaced COMIBOL as the leading tin-producing sector, and in 1991 accounted for about 48% of Bolivia's tin production. The COMIBOL mines produced about 44% of the total, and the remaining 8% was produced by the medium-size mining sector.

COMIBOL management continued to operate under the restructuring program established by Supreme Decree 22623 of

October 1990. Tin mines rich in complex silver ores like the San José and Unificada del Cerro Rico de Potosí Mines were able to remain open, although tin was no longer mined. Tin mines associated with wolframite mineralization, such as the Chambilaya and Enramada Mines, have remained closed since 1987. The reopening of COMIBOL's Huanuni Mine helped to increase its output of tin. The Huanuni Mine has become the largest and the richest tin mine in the country since its reopening in September 1988. Huanuni's tin ore production in 1991 increased 21% to 3,429 tons of tin content. The Colquirí tin mine, with its new 1,000-mt/d mill for ores, with 1.2% tin and 6.6% zinc is COMIBOL's second largest tin producer.

COMIBOL has signed five leasing contracts with domestic and foreign companies that have made investment commitments of about $150 million. The main foreign companies involved in the exploitation of tin mines are the Canadian-Australian company MINPROC and the Brazilian company Paranapanema through its subsidiary Mineração Taboca. The Minproc Project is for the exploitation of the old zinc-tin-silver tailings of the Colquirí Mine. The contract was scheduled to be signed in December 1992 for a 10-year period for an estimated investment of $70 to $90 million. The project involves the recovery of zinc, silver, and tin. The planned production was in the order of 2,025 tons of tin in concentrates, 27,000 tons of zinc, and 20,000 kg of silver per year. The Mineração Taboca project was for the processing of the huge slime deposit of the Catavi tailings. This surface deposit has a reserve of about 56 Mmt with an average content of 0.28% tin and requires an investment of about $12 million to treat 10,000 mt/d of tin tailing for approximately 30 years.

The Caracoles tin mine output increased 41.2% to 607 mt/d of tin content. Production at Catavi-Siglo XX, previously the largest underground tin mine in the world, completely stopped when the mine closed in 1986. Catavi's large mine and mill dumps were being mined by cooperatives formed by former COMIBOL miners who produced 242 tons of tin.

COMSUR and Empresa Minera Quioma, both subsidiary mining companies of Minera Bolivia S.A. based in Panama, were in 1991 the country's largest private tin producers. COMSUR's and Quioma's total tin production decreased from 553 tons in 1990 to 284 tons in 1991. This production came mainly from its Cerro Grande and Berenguela mines (E.M.Quioma) located in Cochabamba.

The state-owned Vinto tin smelter (formerly operated by ENAF) increased its metallic tin exports to 14,276 tons in 1991, although its dollar value decreased to $79.7 million from $80 million in 1990. The dollar value export figure is still well below the almost $191 million exported in 1984. About 86% of Bolivia's metallic tin exports went to the United States and the rest to six Latin American countries, the United Kingdom, and Germany. The smelter, which reopened in 1987 without state subsidies, improved consistently on the basis of Bolivia's growing production. In 1990, 13,231 tons valued at $83.0 million was produced, enabling the smelter to record a $1.5 million profit. In 1991, the Vinto smelter purchased 13,815 tons of high-grade tin concentrates (more than 45% tin) compared with 13,349 tons purchased in 1990. The Vinto smelter no longer produced thermic grades A3 and A4 or tin alloys but only produced grades A1 and A2.

Auction sales from the U.S. Government tin strategic stockpile continued to be a source of great concern to the Bolivian tin producers and the Bolivian Government authorities. Available surplus material for future disposal has added to concern about possible market disruption. Bolivia was authorized by the Association of Tin Producing Countries to export 12,000 tons of tin in 1992.

Tungsten.—Bolivia's production of tungsten concentrate (WO_3), heavily dependent on international prices, increased to 1,343 tons from 1,278 tons in 1990. The mines that were closed in previous years owing to severe ore depletion and high operating costs did not resume operations. Increased production came from the small miners and cooperatives that have small deposits with high ore grades and low labor costs. COMIBOL ceased production completely in 1986 due to severe ore depletion and high mining costs. Output of the medium-size mining sector decreased by 29% compared with that of 1990, and production by the small-size mining sector increased about 45% to 893 tons (WO_3 content). International Mining Company (IMCO) stopped being the single largest tungsten producer in the country. As in previous years, all of IMCO's production came from its Chojlla tin-tungsten mine, which since 1986 reduced its output to half its installed capacity. IMCO's Chambilaya and Enramada Mines closed in 1986 and remained closed. Empresa Minera San José de Berque has become the largest producer of tungsten with its Esmoraca, Pueblo Viejo, Española, and La Argentina mining group located in Sud Chichas, Potosí Department. The Chicote Grande Mine of Churquini Enterprises Inc., a subsidiary of Anschutz Mining Corp. of the United States, continued limited exploitation of the "Llamperas" with its production registered as part of the small-size mining sector. Churquini was purchased by COMSUR in late December 1991 and probably will increase its tungsten production in 1992-93.

Industrial Minerals

Cement.—Cement in Bolivia was produced by four cement plants in different regions of the country having a total production capacity of about 750,000 mt/a. Three plants, Compañía Boliviana de Cementos, S.A. (COBOCE), Fábrica Nacional de Cementos, S.A. (FANCESA), and Fábrica de Cementos El Puente (EL PUENTE) are state owned. The first two were originally owned by the Corporación Boliviana de Fomento, which was dissolved in August 1985 by S.D. 21060. The three plants were transferred to the local regional

development corporations of Cochabamba (Cordeco), and the FANCESA plant is now part of the Regional Development Corporation of Chuquisaca. The third plant, EL PUENTE, belongs to the Development Corporation of Tarija. Under the Government's privatization policy, the three plants will be offered under international bids. Sociedad Boliviana de Cementos, S.A. (SOBOCE) in La Paz (Viacha) was the only privately owned cement plant in the country. The largest plant was FANCESA, at Cal Orko (Mesa Verde) in Sucre Department, with a production capacity of 330,000 mt/a. In 1990, FANCESA produced 39% of the total. The second largest was SOBOCE, at Viacha, La Paz Department, with a production capacity of 210,000 mt/a in 1990 (35%). The third was COBOCE, at Irpa-Irpa, Cochabamba Department, with a capacity of 100,000 mt/a in 1990 (24%), and the fourth was EL PUENTE, at Méndez, Tarija Department, with a production capacity of 60,000 mt/a in 1990 (2%).

During 1991, production of cement increased by about 12% from that of 1990. Production of clinker in 1991 was about 450,000 tons, but the U.S. Embassy estimated the output of limestone from quarries near the cement plants at more than 900,000 tons. The Yacuses limestone deposit, with 60 Mmt of reserves in eastern Bolivia, in Santa Cruz Department, is jointly owned by the Regional Development Corporación of Santa Cruz and private entrepreneurs (Roda Group). They plan to install a 345,000-mt/a cement and clinker plant. The new company will be named Compañía de Cemento Camba, S.A. to be located at Sevaruyo, 125 km south of the city of Oruro. Due to financial problems, this project has been postponed indefinitely.

Lithium.—On May 22, Bolivia's procurement consultant, Crown Agents, presented to the Ministry of Mines and Metallurgy its recommendations on the bids received to exploit the brine of the Salar de Uyuni. Three companies presented tenders for the exploitation of lithium, boron, magnesium, and other salts dissolved in the brine of the Salar de Uyuni. FMC-LITHCO's bid offer was judged the best and the ministry of mines invited the company to start negotiations with Complejo Industrial de Recursos Evaporíticos del Salar de Uyuni (CIRESO) for the signing of a joint-venture contract. CIRESU is by law the Government of Bolivia's agency in charge of the exploration and exploitation of the Salar de Uyuni. The new contract will cover the joint venture between CIRESU and FMC-LITHCO. The basic terms of the contract were agreed upon and a final draft was being written by CIRESU's lawyers for FMC-LITHCO's approval. Once the draft contract is approved by both sides, it will be sent to the National Economic and Planning Council for approval and then to congress. According to Government officials, the agreed terms of the joint-venture contract covers the following: (1) Total area of exploitation: FMC-LITHCO requested 1,030 km^2 of the southwest edge of the Salar de Uyuni (the delta of the Río Grande de Lipez), but it was agreed during the negotiations to limit the concession to only 830 km^2; (2) Period of the contract: A 40-year period for the contract was agreed upon. The first 5 years will be dedicated to exploration (3 years) and to the preparation of the feasibility study (2 years); (3) Exploitation stage: During the 40-year contract FMC-LITHCO will produce 400,000 tons of metallic equivalent of lithium salts. FMC-LITHCO plans to construct a chemical plant to produce 18,000 mt/a of lithium carbonate. FMC-LITHCO has pledged that the projected lithium production from Uyuni will replace half of its current production and sales. It was estimated that lithium demand will grow 3% per year until the end of the century. FMC-LITHCO also agreed to study the possibility of constructing a second plant to produce 500,000 tons of potassium chloride; (4) Investment: FMC-LITHCO will invest in the first 20 years a total of $92 million in the exploration stage, the feasibility study, the construction of the lithium carbonate plant, the solar ponds, and the needed infrastructure. For the next 20 years, FMC-LITHCO plans to increase its investment up to $200 million; (5) Tax payment: FMC-LITHCO and some deputies working with CIRESU have agreed to present to the Bolivian Congress a draft law on brine. This law will establish separate taxes on brine operations, as opposed to taxes on normal mining operations, including a tax on net profit and a tax on net sales. In addition to this, the joint venture will also pay two conventional royalties, one on property (mining concession) and the other on operational profits, and the value added tax on capital repatriation, payments abroad of salaries, and commissions. All together, the taxes should come to an estimated 50% of the net profits of the joint venture. This should be less than the tax rate applied to normal mining operations. Crown Agents also recommended that COPLA, a Bolivian company, exploit the ulexite reserves in the Salar. Sociedad Química y Minera de Chile from Chile was disqualified because of legal constraints regarding mining operations within the 50 km of the border by a company from a country that borders on the concession.

Mineral Fuels

Bolivia's hydrocarbon sector participation in the worldwide energy picture remained negligible, and it appeared that this position would continue for the foreseeable future. However, Bolivia continued to be self-sufficient in crude oil, natural gas, and refined petroleum products. In 1991, crude oil production increased by 6% to 8.1 Mbbl, compared with that of 1990.

Bolivia's oil and gas industry continued to be the second largest foreign exchange earner, contributing 26.7% of the total value of exports and 46.5% of revenues. The sector accounted for 6.3% of the GDP and it employed about 7,500 persons out of a total work force estimated at 2 million. The industry continued to be controlled by the Ministerio de Energía e Hidrocarburos through its agency YPFB.

YPFB conducted exploration, production, refining, transportation, and

marketing in 1991. YPFB has signed 34 operational contracts since 1973, when the former hydrocarbon law was implemented. Of this total, four were exploration contracts to explore new areas in the Altiplano and Chaco basins and in the northern Sub-Andean Zone. On March 5, 1991, Esso Exploration Bolivia, Ltda., a subsidiary of Exxon Co. International, signed two operational contracts with YPFB to explore the Poopó Norte and Poopó Sur Blocks in the Altiplano Central. On March 20, the U.S.-based companies Texaco Exploration Azero, Inc. and Sun Oil Bolivia, Ltda. signed a contract to explore 997,500 ha in the Azero Block located in the central basin of the Sub-Andean Zone. On June 5, the consortium formed by Texaco Exploration Bolivia Subandino, Inc. (as the operator—35%), Mobil Boliviana de Petróleos (35%), and Shell Exploradora y Productora de Bolivia, BV, together with Bolivia Andina Petroleum Co. (a subsidiary of Anschutz Corp. (30%), signed an operational contract with YPFB to continue exploration in the Madidi Block (1,485,600 ha). During 1991, YPFB continued to negotiate exploration contracts with: (1) Phillips Petroleum Co. to explore the Curaguara de Carangas Block in the Altiplano Central; (2) Pluspetrol, S.A. of Argentina to explore the Los Lirios-Surutu Block in the Department of Santa Cruz; (3) the British-Irish company Pan Andean to explore the Chapare Block, just northwest of the Maxus track, in the Departments of Cochabamba, Santa Cruz, and Beni; (4) Eurocan Ventures (Bolivia), Ltda. of the Bermudas for an exploration track in the Izozog Block in Santa Cruz; (5) Phillips Petroleum Co. for the areas of Robore and Tucavaca in the Suárez Arana Block. Phillips is asking for a special law, as the tract is located on the Bolivian-Paraguayan border; (6) the Bolivian company Sociedad Petrolera del Oriente for an improved recovery and operational contract in the 78,500 ha of the Palmar del Oratoria Block in Santa Cruz; and (7) Petrobras of Brazil for exploration in the Madre de Dios basin. In addition there are several other companies that have signed preliminary study agreements but have not made any final decision to continue negotiations, such as Hunt Oil Corpora for the Colchani Block in the Altiplano.

Occidental Boliviana Inc. (a subsidiary of Occidental Petroleum Corp.) and Tesoro Bolivia Petroleum Co. (owned by Tesoro Petroleum Corp. and Mobil Oil Corp.) continue to be the only two U.S. oil companies operating in the country with exploitation contracts. Both companies started, in late 1990, deep-pool exploration drilling in their respective fields.

Petroleum reserves were estimated by YPFB as of December 31, 1991, at 112.14 Mbbl of liquids (90.08 Mbbl for YPFB and for contractors 22.06 Mbbl as proven reserves) and 153 billion^3 of which 116 billion^3 are proven reserves. YPFB's proven reserves of natural gas are 87 billion^3 or 75.2% of the total proven reserves and the contractors' reserves were at 29 billion^3. Bolivia's natural gas reserves could last another 30 years at the current rate of production. Considering the addition of the proposed export of 8 Mm^3/d to Brazil, current reserves would last more than 15 years.

Natural Gas.—Production of natural gas increased 3% from that of 1990 to 5,432 Mm^3. YPFB's Río Grande Gasfield continued to be Bolivia's largest natural gas producer, although its production was slowly dropping due to natural field exhaustion. Vuelta Grande's output, YPFB's second largest natural gas producer, increased 3.4%. Production from the new fields of Sirari and Víbora increased 73% and 118%, respectively, followed by Occidental Boliviana's Porvenir Gasfield and Tesoro Bolivia's La Vertiente Gasfield. Of the total production of natural gas, 64% was produced from YPFB gasfields, 27% by Occidental and Tesoro, and the remainding 9% by other producers.

Bolivia's domestic consumption of natural gas continued to be minimal at 466 Mm^3, 7.8% over that of 1990. The major consumers of natural gas in 1991 were the Empresa Nacional de Electricidad (ENDE), which consumed more than 50% of national production to generate electricity at Santa Cruz, Sucre, and Potosí. In 1991, Bolivia's LPG consumption decreased from 2.25 Mbbl to 2.12 Mbbl, and 125,000 barrels of LPG was exported to Chile valued at $2.2 million. Argentina continued to be Bolivia's sole foreign customer for natural gas. Accordingly, interest by Argentine firms in exploration and enhanced recovery contracts with YPFB has increased in the past 4 years. Bolivia's natural gas export agreement with Argentina ends in April 1992. In 1991, gas exports to Argentina decreased slightly from that of 1990 to 2,178 Mm^3 but increased 1.4% in value to $230.1 million. This increase in value was due to sales of gas with higher content of condensates bringing higher prices paid by Argentina. Payments for gas sales were more regular than during the previous 4 years. Argentine payments continued to be made 82% in cash and 18% deposited in an escrow account to be used for purchase and contract of Argentine goods and services in Bolivia.

Of the natural gas produced in Bolivia, 40.1% was exported to Argentina; 8.6% was consumed domestically; 35.8% was reinjected into the gasfields; 9.2% was vented, flared, or lost; 4.3% was consumed as fuel by YPFB; and the remainder was consumed in miscellaneous applications. As a result of YPFB's program of substituting gas products for liquids, domestic consumption of LPG continued increasing from about 2.3 Mbbl in 1990 to 2.4 Mbbl in 1991. In 1990 and 1991, several natural gas pipelines were installed and a larger volume of natural gas was consumed domestically. Most of the natural gas continues to be consumed in the city of Santa Cruz. YPFB operated four LPG plants at Río Grande, Gas Norte, Camiri, and Vuelta Grande in the Department of Santa Cruz, which produced LPG and natural gasoline.

In December 1989, the Governments of Bolivia and Argentina signed and ratified a series of agreements aimed at integrating the economies of the two countries. These agreements included a 17-point economic integration accord and

seven other agreements, among them an Energy Integration Agreement. The agreement ensures Argentine payments for Bolivian natural gas through April 30, 1992, and reworks the formula for payments of natural gas deliveries. The renegotiated contract through 1992 features a lower sale price for the natural gas and Argentine payments in 82% cash and 18% goods and services for use in Bolivia along the border with Argentina. Argentina also agreed to pay in a timely manner, which was maintained during 1991.

On November 26, 1991, a letter of intent was signed by Petróleo Brasileiro S.A. (Petrobras) and YPFB. The five-point letter of intent manifested Petrobras' decision to buy Bolivian natural gas and YPFB's decision to reach an agreement to sell it to the Brazilian market. The letter also stated the interest in having Petrobras' subsidiaries explore for hydrocarbons and market refined products in Bolivia. The new deal contemplates the construction of a 573-km-long gas pipeline from Santa Cruz to Puerto Suárez at the Bolivian-Brazilian border at a cost of about $320 million. On the Brazilian side, Petrobras will build a 1,900-km gas pipeline connecting the Bolivian town of Puerto Suárez to the States of Sao Paulo and Minas Gerais. The construction of this pipeline is estimated to cost in the range of $1.8 to $2.0 billion.

Petroleum, Crude.—The total average daily production of crude oil increased 5.6% to 22,174 bbl in 1991 from 20,928 bbl in 1990. Of the total crude oil produced, the YPFB share was almost 80%, and the remainder was produced by Occidental Boliviana, Tesoro Bolivia, and others.

During 1991, YPFB and the two U.S. contractors were active in exploration drilling. YPFB drilled 43,315 m, 77.4% higher than that in the previous year. YPFB made five new oil discoveries, the Carrasco X-1, Cobra X-1, Junín X-1, Junín X-2,and San Roque X-17 Fields, all of them in the central area of Santa Cruz Department.

Domestic consumption of refined petroleum products increased about 2% over that of 1990, to 25,234 bbl/d. The domestic prices for refinery products were increased 24.2% by the Government in 1991, with the price at yearend set at $0.63 per liter for premium gasoline. In November 1991, Occidental Boliviana Inc., formerly a subsidiary of Occidental Petroleum Corp. of Bakersfield, California, since 1973 together with Canadian Occidental Boliviana, Ltd., was bought by Diamond de Bolivia (Diamond-Sol-OBI) and Sol Petróleo, S.A. of Argentina. Diamond de Bolivia is a subsidiary company of Diamond Shamrock Corp. of Dallas, Texas. According to YPFB officials, the purchase was for about $47 million. Besides the two U.S, companies with exploitation and exploration contracts, there were nine other U.S. oil companies in Bolivia as operators or as farm-in partners exploring for oil in the country. Four of these companies signed operational contracts in 1991. In addition there were three Argentine oil companies with exploration and enhanced recovery contracts.

Reserves

In keeping with the 1990 5-year plan, mineral reserve estimates for lead, silver, tin, tungsten, and zinc were recalculated and revised for greater accuracy, not only at the main large mines but also for the medium- and small-size mining sectors. In view of the widespread occurrence of both lode and placer gold in Bolivia, gold reserves have not yet been projected.

INFRASTRUCTURE

The difficult development of communication and transportation systems in Bolivia has been determined by its rugged topography. The Andean Range constitutes a very difficult barrier for communication and transportation between the western and eastern regions of the country. The alignments of railroad lines and highways are sinuous, and during the rainy season mud avalanches occur, blocking them temporarily. In the eastern plains, the flooding of rivers constitutes a serious problem, preventing deliveries of supplies and food to the consumers. Nevertheless, Bolivia has a reasonably well-developed infrastructure. The transportation network is composed of a total of 38,836 km of highways: 1,300 km paved, 6,700 km gravel, and 30,836 km unimproved earth. The Pan-American highway linking Argentina and Peru crosses Bolivia from south to northwest. As a landlocked country, Bolivia has no ocean ports but does have access to ports in Chile (Arica and Autofagasta) and Peru (Matarani).

The railroad system consisted of 3,675 km of 1.000-m gauge and 32 km of 0.760-m gauge, all Government owned and controlled by Empresa Nacional de Ferrocarriles. Minerals produced in La Paz Department are transported by rail and truck to Arica, Chile, and to Matarani, Peru, for export. Minerals from Oruro, Potosí, Cochabamba, and Santa Cruz Departments are transported by railway to Antofagasta, Chile, for export and to Argentina and Brazilian consumers. Bolivia has 14,000 km of commercially navigable waterways, which connect the eastern region of the country with the Amazon basin.

Crude oil and condensates, refined oil products, and natural gas are transported from oilfields, gasfields, and refineries to domestic consumption centers and neighboring countries by a network of 1,800 km of pipeline for crude oil, 580 km for refined products, and 1,495 km for natural gas.

The Ministry of Energy and Hydrocarbons formulates national policies for the electrical power sector and regulates power systems operations. The generation, transmission, and distribution of electrical power in Bolivia is carried out by both state and private companies. ENDE, the state-owned electricity company, is in charge of planning the expansion of the electrical power sector. It is also responsible for contracting and operating new generation and transmission facilities everywhere except in the cities of La Paz and Oruro. As for the electricity supply for the country, an

estimated 1,763 Mkw•h was produced in 1990, an increase of 2% over that of 1989. The average consumption was 260 kw•h per capita. Bolivia had an installed electrical generating capacity of 605 MW, of which 301 MW or 50% was generated by hydroelectric plants and 304 MW or 50% by thermoelectric plants. ENDE has an installed generating capacity of 318.1 MW (53% of Bolivia's total). The privately owned Bolivian Electric Power Co. (COBEE-BPC), originally Canadian, has 140.3 MW of installed capacity (24% of the country's total). COBEE supplies electricity to the cities of La Paz and Oruro.

On March 9, 1984, the Bolivian Government signed a joint project agreement with the Italian Government and the United Nations Development Program (UNDP) to prepare a feasibility study of the geothermal potential in the Western Cordillera region of the country. YPFB and ENDE were assigned as the national counterpart agencies. The geological fieldwork and preliminary drilling was done by the Bolivian GEOBOL with technical assistance from the Italian Government. Four wells have been drilled by YPFB and ENDE at the geothermal field of Laguna Colorada. The geothermal field is about 220 km southwest of the town of Uyuni, Department of Potosí, and about 11 km east of the Bolivian-Chilean border. ENDE's plan to install a pilot geothermal plant with Italian funding has not made any progress owing to lack of total financing.

OUTLOOK

Prospects for Bolivia's mineral industry continued improving in 1991. Foreign investment in exploration for mineral deposits has accelerated in the past 3 years, after foreign investors became confident that the economic reforms introduced by the Government in 1985 would last. The new mining code approved in early 1991 has also helped to assure potential foreign investors that the Bolivian Government's free market policies will persist. The mining sector has received numerous proposals and inquiries from potential foreign investors from South Africa, Canada, the United Kingdom, Australia, and the United States. Available information shows that the foreign companies now in Bolivia are exploring for gold, silver, and base metal deposits in the Altiplano and the Pre-Cambrian shield. Despite the drastic reduction in COMIBOL operations, the streamlined COMIBOL may offer the private sector good opportunities for joint ventures or lease contracts. Most of Bolivia's gold was produced from alluvial deposits, and several firms were investigating further investment in gold extraction from epithermal volcanic and subvolcanic intrusions of their gold- and silver-bearing sulfide and oxide ores. Sulfur production in the Western Cordillera was also expanding. Nevertheless, Bolivia continues to be one of the poorest countries in Latin America, and it remains vulnerable to price fluctuations for its limited exports, mainly nonfuel minerals and natural gas.

Minerals and hydrocarbons continued to lead Bolivia's exports, together accounting for 70% of the total exports. Minerals accounted for 43% and hydrocarbons for 27% of total exports. Future generation of electrical power from geothermal fields at Laguna Colorada could be sold to existing mining interests in the Uyuni salt flat area or might attract new mining exploitation interest to the area of South Lipez, where sulfur and low-grade epithermal gold-silver deposits exist near Laguna Colorada.

Natural gas has the greatest potential for sustained long-term growth. The base metal sector appears to be recovering as a result of COMIBOL's rehabilitation program. Future resource development is likely to focus on continued expansion of the hydrocarbon sector as well as the development in a rational manner of Bolivia's gold industry and the iron ore-steel prospects at the Mutún deposit near Brazil. Planned medium-term mining projects include continuation of COMIBOL's rehabilitation program, the lithium and potassium projects, and the expansion of sulfur production and gold from alluvial deposits. The Bolivia and Brazil energy integration agreement includes the sale-purchase of electricity generated by a gas-fired thermoelectrical plant and the sale-purchase of urea and high-density polyethylene from a plant in Puerto Suárez, Department of Santa Cruz, and the construction of the 557-km gas pipeline between the Santa Cruz Gasfields and Puerto Suárez, near the Brazilian border. There also is the possibility of expansion of the current agreement concerning the export of natural gas to Argentina.

All future Bolivian projects are expected to be carried out under the general program of stabilization and restructuring of the nation's economy. Also included in the new climate are a revision of key aspects of the mining legislation (to be approved in 1992), reforms of the petroleum laws, and foreign and domestic investment laws, all with emphasis on attracting potential foreign and domestic investors.

[1]Where necessary, values have been converted from bolivianos ($b) to U.S. dollars at the rate of $b3.6=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

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TABLE 1

BOLIVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[p]
METALS[3]						
Antimony:						
Mine output, Sb content		10,635	9,943	9,189	8,454	7,287
Metal including Sb content of trioxide		1,723	1,015	1,236	1,046	3,548
Arsenic, mine output, arsenic trioxide, arsenic sulfide		132	191	338	300	463
Beryllium: Beryl concentrate:						
Gross weight		42	—	—	—	—
BeO content		3	—	—	—	—
Bismuth:						
Mine output, Bi content		1	13	41	68	—
Metal, smelter		—	—	—	137	—
Cadmium, mine output, Cd content[4]		15	39	79	102	115
Copper, mine output, Cu content		9	153	298	r157	30
Gold, mine output, Au content[5]	kilograms	2,755	4,889	3,595	5,198	3,500
Iron ore:[6]						
Gross weight		7,490	33,840	14,254	125,264	101,642
Fe content		4,718	21,319	8,980	78,916	72,148
Lead:						
Mine output, Pb content		9,043	12,544	15,728	19,913	20,810
Metal, smelter		201	24	12	117	213
Manganese, mine output, Mn content		—	—	100	r3,778	215
Silver, mine output, Ag content	kilograms	141,987	231,766	267,084	310,543	r375,702
Tantalum, tantalite	do.	—	—	—	r583	3,735
Tin:						
Mine output, Sn content		8,128	10,504	15,849	17,249	16,830
Metal, smelter		2,667	5,373	9,448	12,567	14,663
Alloys		—	—	—	r832	261
Tungsten, mine output, W content		638	900	1,118	1,014	1,065
Zinc: Mine output, Zn content		39,292	56,957	74,789	103,849	129,778
INDUSTRIAL MINERALS						
Barite		1,337	—	—	300	1,277
Bentonite		—	—	—	—	825
Calcite		600	e600	e500	300	250
Cement, hydraulic		396,018	452,285	505,426	560,446	591,630
Gemstone, amethyst:						
Polished	kilograms	—	—	—	50	254
Rough	do.	—	—	—	—	31,893
Gypsum, crude[e]		100	100	100	100	100
Marble		—	187	70	81	37
Onyx	kilograms	—	—	—	—	10,800
Pumice		—	—	200	100	100
Salt		e100	e100	60	155	e100
Slate		—	—	84	104	14,820
Sodalite	kilograms	—	—	—	—	4,170

See footnotes at end of table.

TABLE 1—Continued

BOLIVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[p]
INDUSTRIAL MINERALS—Continued						
Sulfur, native		8,746	6,733	8,167	2,101	2,782
Ulexite		—	586	9,609	3,076	14,227
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	4,565	4,811	5,291	5,276	5,432
Marketed	do.	2,394	2,520	2,565	2,203	2,178
Natural gas liquids:						
Natural gasoline	thousand 42-gallon barrels	514	544	627	732	814
Other (consumption)	do.	2,097	e2,600	2,628	2,040	1,847
Petroleum:						
Crude including condensate	do.	6,890	7,019	7,274	7,635	8,094
Refinery products:						
Liquefied petroleum gas	do.	886	878	1,106	e1,200	570
Gasoline	do.	3,239	3,266	3,504	e3,400	3,297
Jet fuel	do.	54	5,780	631	e600	683
Kerosene	do.	360	3,250	317	e300	269
Distillate fuel oil	do.	2,108	2,067	2,252	e2,560	2,828
Residual fuel oil	do.	225	208	106	e90	816
Lubricants	do.	107	107	75	e100	90
Unspecified	do.	73	311	164	e200	1,217
Refinery fuel and losses	do.	—	33	—	e50	—
Total	do.	7,545	7,773	8,155	e8,500	9,770

eEstimated. pPreliminary. rRevised.

[1]Table includes data available through Nov. 1992.

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

[3]Unless otherwise specified, data represent actual production by COMIBOL and small- and medium-size mines.

[4]Cadmium contained in zinc concentrates produced by COMIBOL. (Cadmium is not recovered in elemental form in Bolivia.)

[5]Small- and medium-size mines output sales to BAMIN, and COMIBOL exports (small- and medium-size mines cannot legally export gold).

[6]Data represent exports and are regarded as being equal to production.

[7]Includes production of 38,692 kg of metallic silver.

TABLE 2

BOLIVIA: EXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	1991	Principal destinations, 1991
METALS			
Antimony:			
Ore and concentrate, Sb content	7,268	3,820	NA.
Trioxides	r662	3,075	NA.
Metal including alloys:			
Regulus	6	13	NA.
All forms	443	461	NA.
Total	r1,111	3,549	United States 1,537; United Kingdom 1,346; Chile 654.
Arsenic: Trioxides and other compounds	r663	463	NA.
Bismuth: Metal including alloys, all forms	137	—	
Cadmium: Cd content of zinc ore	30	26	NA.
Columbium and tantalum: Tantalum ore and concentrate kilograms	583	3,735	NA.
Copper: Ore and concentrate, Cu content	456	25	NA.
Gold:			
Ore and concentrate, Au content kilograms	1,500	1,458	NA.
Metal including alloys, unwrought and partly wrought do.	3,757	1,899	NA.
Iron and steel: Iron ore and concentrate, Fe content	38,157	24,853	NA.
Lead:			
Ore and concentrate, Pb content	19,553	19,393	NA.
Metal including alloys	278	116	Brazil 100; Germany 16.
Manganese: Ore and concentrate	3,644	1,215	NA.
Silver:			
Ore and concentrate kilograms	281,400	299,431	NA.
Metal including alloys, unwrought and partly wrought do.	46,376	41,353	France 38,078; Chile 3,028; Germany 247.
Tin:			
Ore and concentrate, Sn content	3,730	3,522	NA.
Metal including alloys, all forms	13,685	14,512	United States 12,328; Chile 1,071; Colombia 306.
Tungsten: Ore and concentrate, W content	1,220	1,495	NA.
Zinc: Ore and concentrate, Zn content	98,882	127,519	NA.
INDUSTRIAL MINERALS			
Barite	300	1,277	NA.
Boron materials: Crude natural borates	3,104	12,225	NA.
Cement	15	NA	
Clays, crude: Bentonite	—	825	NA.
Precious and semiprecious stones other than diamond: Natural kilograms	[2]50	[3]43,254	NA.
Salt, natural	155	—	
Stone, sand and gravel: Dimension stone:			
Crude and partly worked	285	152	NA.
Sulfur, all forms	2,101	2,795	NA.

See footnotes at end of table.

TABLE 2—Continued

BOLIVIA: EXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	1991	Principal destinations, 1991
MINERAL FUELS AND RELATED MATERIALS				
Gas, natural	million cubic meters	2,203	2,178	All to Argentina.
Petroleum refinery products:				
Liquefied petroleum gas	thousand 42-gallon barrels	122	125	All to Chile.
Lubricants	do.	1	NA	

'Revised. NA Not available.

[1]Table prepared by H. D. Willis. Table includes partial provisional export data. Import data for 1990 and 1991 were not available at time of publication.

[2]Amethyst.

[3]Amethyst and onyx.

TABLE 3

BOLIVIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Antimony		Empresa Minera Unificada S.A. (EMUSA) (private, 100%)	Caracota, Chilcobija, and Espíritu Santo Mines, Potosí Department	2.7
Do.		Empresa Minera San Juan Ltda. (private, 100%)	Candelaria Mine, Potosí Department	2.1
Antimony trioxide		Empresa Minera Hermanos Bernal S.A. (private, 100%)	Palala smelter, Tupiza, Potosí Department	1.0
Gas, natural	million cubic meters	Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) (Government, 100%)	Río Grande and La Pena Gasfields, Santa Cruz Department	1,348
Do.	do.	do.	San Roque, Vuelta Grande Gasfields, Southern District	1,274
Do.	do.	do.	Sirari, Naranjillos Santa Cruz Gasfield, Central District	1,872
Do.	do.	Occidental Boliviana Inc., Tesoro Bolivia Petroleum Co. (U.S.) and Empresa Naviera Pérez-Compac-Sacfic (Argentina) contractors (private, 100%)	El Porvernir, La Vertiente, Gasfields, Santa Cruz Department	66,100
Gold	kilograms	Cooperatives (some with U.S. equity) (private, 100%)	Tipuani, Guanay, Mapirí, Huayta, Kaka and Teaponte Rivers, La Paz Department	2.2
Do.	do.	Empresa Inti-Raymi S.A. (private, 100%) (Battle Mountain Gold Mining Co., 85%; EMUSA, 15%)	Gold Leaching, open pit operation at La Joya, near Oruro, Oruro Department	1.5
Do.	do.	Bolivian Army's Development Corp.; 200 dredges operating in the Araras region (without legal concessions)	Araras, Cachuela Esperanza gold dredging, Pando and Beni Departments	6.0
Lead		Empresa Minera Quioma S.A. (COMSUR S.A.) (private, 100%) (Formerly owned by ASARCO Incorporated of the United States)	Asientos, lead-silver-zinc mine at Mizque, Cochabamba Department	6.5
Do.		Corporación Minera de Bolivia (COMIBOL)	Santa Fé, Tatasi, Animas-Inocente, and San José Mines, Potosí Department	3.2
Do.		Empresa Metalúrgica de Karachipampa (Government, 100%) (Autonomous subsidiary company of COMIBOL) Lead/silver smelter (to be fired up in 1991)	Karachipampa, Potosí Department	24.0

TABLE 3—Continued

BOLIVIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum	thousand barrels	Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) (Government, 100%)	La Peña, Vuelta Grande, Río Grande San Roque, and Monteagudo Oilfields Santa Cruz Department	6,037
Do.	do.	Occidental Boliviana Inc. and Tesoro Bolivia Petroleum Co., both U.S. companies and other contractors (private, 100%)	Porvenir, La Vertiente, and Tita Oilfields	1,238
Silver	kilograms	Corporación Minera de Bolivia (COMIBOL) Cía. Minera de Oruro, Cía. Minera Quechisla, and Cía. Minera de Potosí subsidiaries (Government, 100%)	San José, Bolívar, Poopó, Santa Fé, San Vicente, Tatasi, Animas-Inocente, and Unificada Mines at Oruro, and Potosí Departments	126,000
Do.	do.	Cía. Minera del Sur, S.A. (COMSUR) (private, 100%) (RTZ of the United Kingdom, shareholder)	Martha, Huari, Porco, and Milluni Mines, La Paz Department	38,600
Tin		COMIBOL: Cía. Minera de Oruro, Cía. Minera Quechisla, Cía. Minera de Potosí and Cía. Minera La Paz (Government, 100%)	Huanuni, Colquirí, Caracoles, Viloco, and Chorolque Mines, at Oruro, Potosí, and La Paz Departments	6.4
Do.		COMSUR, Barrosquira, International Mining Co., Yana Mallcu and Avicaya companies (private, 100%)	Martha, Cerro Grande, Milluni, and Berenguela tin mines	2.4
Do.		Small miners and cooperatives (private, 100%)	Catavi-Siglo XX, Caracoles, Bolívar Viloco, Colquirí, and Colquechaca Mines	6.4
Tin, refined		Empresa Metalúrgica de Vinto (COMIBOL's subsidiary) (Government, 100%)	Vinto, Oruro Department	9.0
Do.		Fundestano de Oruro S.A. (private, 100%)	City of Oruro, Oruro Department	5.0
Do.		Cía. Metalúrgica Industrial y Comercial-Hormet S.A. (private, 100%)	City of La Paz, La Paz Department	.2
Tungsten		COMIBOL-Cía. Minera La Paz (Government, 100%)	Kami, Tasna, and Bolsa Negra Mines, La Paz Department	Closed in 1987
Do.		International Mining Co. (IMCO) (private, 100%)	Chojlla Mine, La Paz Department	.5
Do.		Empresa Minera San Jose Berqué (private, 100%)	Esmoraca, Pueblo Viejo, Española, and La Argentina Mines, Sudchichas Province, Potosí Department	.2
Zinc		COMIBOL, Cía. Minera de Oruro, Cía. Minera Quechisla, Cía. Minera de Potosí (Government, 100%)	Santa Fé, Colquirí, San Vicente, Tatasi, Animas-Inocente, and Unificada Mines at Oruro, Potosí, and La Paz Departments	16.3
Do.		COMSUR S.A., Maragua Ltda., CaballoBlanco S.A. (private, 100%)	Porco, Asientos, Maragua, Huari-Huari Monserrat, and Monte Blanco Mines at Cochabamba, Oruro, and Potosí Departments	50.0

TABLE 4

BOLIVIA: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1990

(Metric tons unless otherwise specified)

Commodity	Reserves
Antimony, metal content	350,000
Lead, metal content	25,965
Lithium carbonate, thousand metric tons	5,500
Natural gas, billion cubic meters	142
Petroleum, thousand 42-gallon barrels	180,440
Silver, metal content	1,378
Tin, metal content	274,774
Tungsten, metal content	53,000
Zinc, metal content	935,497

BRAZIL

AREA 8.5 million km² **POPULATION 155 million**

THE MINERAL INDUSTRY OF

BRAZIL

By Alfredo C. Gurmendi

Brazil is a world leader in the production of bauxite, columbium, gemstones, gold, iron ore, kaolin, manganese, tantalum, and tin. Within the Latin American region, Brazil is a major producer of aluminum, cement, ferroalloys, gold, iron ore, manganese, steel (crude), and tin. The country is engaged in an ambitious exploration program to expand reserves and reduce its dependence on oil imports, which were approximately 40% of its crude oil requirements in 1991. The Brazilian economy did not recover from its deep recession of 1990. The GDP increased by 0.8% to $358 billion.[1] Industrial output decreased by almost 9% while the minerals sector showed an estimated decrease of almost 3% over that of 1990. The major contributors to the mineral output were bauxite, iron ore, and petroleum. The Government continued to utilize tight monetary policy and high interest rates with the objective of reducing inflation, which dropped from 1,585% in 1990 to 474% in 1991.

GOVERNMENT POLICIES AND PROGRAMS

The Government continued to utilize tight monetary policy with high interest rates with the objective of reducing inflation. Investment in mining and exploration has decreased considerably from the early and mid-1980's. There was an annual reduction in mining investment in 1990-91, from $1 billion to about $400 million, and investment in exploration in the same period decreased from $200 million per year to about $50 million. However, some of these decreases may be attributed to the general global recessionary economic climate. The reduction of foreign private investment in Brazil was largely triggered by the 1988 Constitution, which confined foreign investment to a minority position in any new mining project. The Executive Branch has sent to Congress an amendment of the Constitution, in the last quarter of 1991, with some modifications to these restrictions on foreign capital. It was expected that Congress would vote this bill in during 1992. In 1991, the President of Brazil reorganized the Executive Branch of Government. Under the reorganization, the Ministry of Mines and Energy was no longer part of the Ministry of Infrastructure. Included in the new ministry was the National Secretary of Mines and Metallurgy. The National Secretary of Mines and Metallurgy oversees the entire mineral industry while the National Department of Mineral Production (DNPM), an arm of the new secretariat, has the specific responsibility over mining.

At yearend, DNPM listed 5,880 mining concessions that were to be revoked because owners were found to have made insufficient efforts to exploit them as required by the Constitution. The 1988 Constitution stipulated that companies would have 1 year to prove they were working their concessions, rather than hoarding holdings for speculative reasons. The listed revocations involved one-fifth of all registered mining concessions in Brazil. The affected owners were permitted to appeal the decision before the concessions were offered for sale at auction.

PRODUCTION

The total value of minerals produced in 1991 was approximately $10 billion, or about 3% of GDP.

Brazil's mineral production, excluding crude oil and gas, is estimated at $5 billion, including $2 billion of Garinperos (informal producers) gold, diamond and precious stone, and construction material. The mineral commodities that were major contributors to the total mineral production in 1991 were bauxite, chromite, ferroalloys, gold, gypsum, iron ore, kaolin, lime, manganese, petroleum, steel, and zinc.

In 1991, Companhia Vale do Rio Doce S.A. (CVRD), the mixed equity mining conglomerate, invested $83.2 million to further increase gold production. *(See table 1.)*

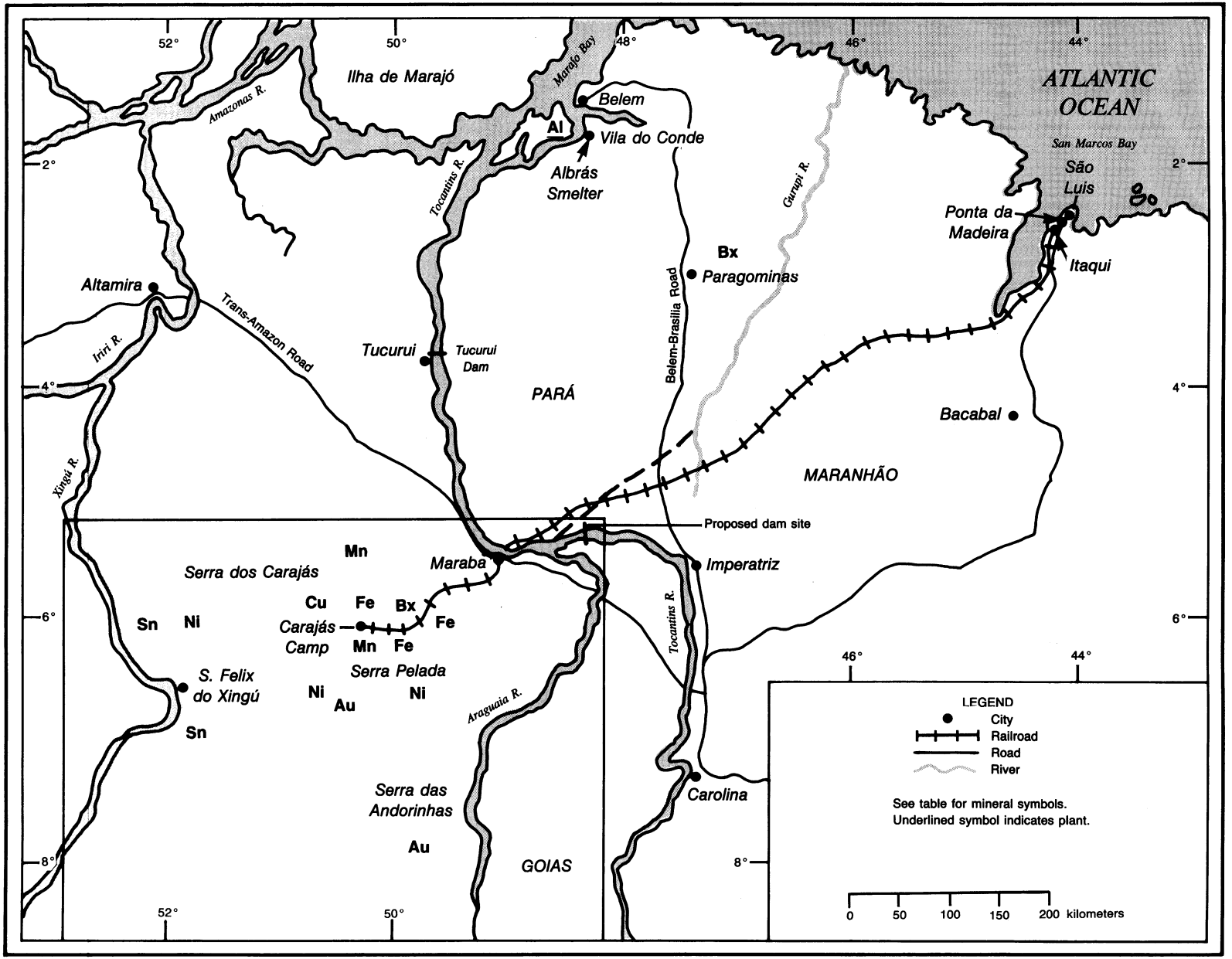
TRADE

The negative trade balance in the mineral sector for 1991 was heavily influenced by the value of petroleum imports. Total mineral imports were valued at $4.9 billion, while total exports were $3 billion. Exports of iron ore and bauxite combined for 86% of Brazilian mineral exports in 1991. Besides petroleum, other major mineral imports, in alphabetical order, were coal, copper, lead, natural gas, potash, sulfur, and zinc.

In 1991, the total value of exports was approximately $31.6 billion versus the estimated total value of $21 billion for imports. The $10.6 billion trade surplus was 3.6% below that of 1990.

In 1989, Brazil and the United States reached an accord on a new Voluntary Restraint Agreement (VRA) that boosted

BRAZIL — MINERAL PROVINCE OF CARAJÁS



steel shipments to the United States by up to 55% during 1991 and 1992. The VRA allowed for steel exports of up to 1,556,000 tons in 1991, with an increase of 260,000 tons in 1992. *(See table 2.)*

STRUCTURE OF THE MINERAL INDUSTRY

The major portion of the mineral industry of Brazil was partially or wholly owned by private Brazilian investors, Brazilian companies, and foreign companies in 1991. The few exceptions were the natural gas and petroleum industry, which was 100% Government-owned through Petróleo Brasileiro S.A. (PETROBRAS), and the five large majority State-owned steel companies. In 1991, PETROBRAS was composed of five subsidiaries: (1) Petrobrás Distribuidora S.A. (BR), the petroleum products distribution company; (2) Petrobrás Química S.A. (PETROQUISA), the petrochemical company; (3) Petrobrás Internacional S.A. (BRASPETRO), the foreign operating company; (4) Petrobrás Fertilizantes S.A. (PETROFERTIL), the agricultural fertilizer company; and (5) Petrobrás Mineracao S.A. (PETROMIN), the mining company. PETROBRAS is the domestic operator. The Government-owned steel holding company, Siderúrgica Brasileira S.A. (SIDERBRAS), was eliminated in 1990. The Government is determined to proceed with the privatization of its steel industry. This would seem against the 1988 Constitution; however, Brazil had pledged since January 1991 to sell all its mills by 1994. Brazil kicked off the privatization effort on October 24, 1991, when it sold 75% of the common stock in Brazil's second largest steel mill, Usinas Siderurgicas de Minas Gerais S. A. (USIMINAS), to a variety of stockholders for $1.17 billion. The share auction for Cía. Siderúrgica do Nordeste (COSINOR) was set for November 24, 1991, and specialty steelmaker Acos Finos Piratini S. A. (PIRATINI) will go on the block on January 28, 1992. Additional mills will be privatized as follws: Cía. Siderúrgica de Tubarao (CST), a slab producer, in March 1992; Acos Minas Gerais S. A. (ACOMINAS), a structural and rail producer, in mid-1992; Cía. Siderúrgica Nacional (CSN), Brazil's largest mill, the second half of 1992; and Cía. Siderúrgica Paulista (COSIPA), a carbon steel sheet and plate producer, the first half of 1993. CVRD, the huge mining conglomerate, is 51% Government-owned. There are several smaller companies engaged in the mineral industry that are partially or wholly Government-owned.

The mineral industry of Brazil is large by world standards. In 1991, there were 162 cement and limestone mining companies operating 247 limestone mines in Brazil. In the same year, there were 34 separate iron ore mining companies operating 80 mines.

The five major integrated steelworks produced approximately 66% of the crude steel in 1991. CVRD produced approximately 60% of the iron ore. Mineracao Río do Norte S.A. (MRN), which is majority privately owned, produced approximately 65% of the total bauxite production. The five major aluminum smelters, all predominantly private Brazilian or foreign owned, produced approximately 77% of the primary aluminum in 1991.

Brazil's total labor force was approximately 57 million in 1991. Of the total, services comprised 42%, agriculture 31%, and industry 27%. The mineral sector comprised approximately 4% (700,000) of the industry total of 15.4 million. This did not include the 500,000 to 1 million garimperos active in Brazil. *(See table 3.)*

COMMODITY REVIEW

Metals

Alumina, Aluminum, and Bauxite.—In 1991, primary aluminum production increased by 22.6% over that of the previous year while bauxite production increased 6.5% for the same period. Alumina production remained at the 1990 level. Apparent consumption of primary aluminum for 1991 was 344,600 tons.

Industrias Votorantim, Brazil's largest private-sector company, expanded its Cía. Brasileira de Aluminio (CBA) primary aluminum plant from 70,000 mt/a to 255,000 mt/a in 1991. CVRD announced plans to construct a 1-Mmt/a alumina refinery near Paragominas, Pará State, to process the bauxite from the 850-Mmt deposit there. It will be known as the Jabuti Project.

CVRD announced that debt rescheduling talks with the International Monetary Fund and private creditor banks were crucial to the completion of the Alumina do Norte do Brasil S.A. (ALUNORTE) alumina refinery, which at yearend was one-half built. Albras-Aluminio Brasileiro S. A. (ALBRAS), a joint venture of CVRD (51%) and Japan's Nippon Amazon Aluminum Corp. (NAAC, 49%), reopened its plant in July 1991. Damage during the blackout of March 8, 1991, amounted to $55 million. Production was short by 40,000 tons of the 330,000-ton capacity. Other companies that are participants in ALUNORTE are Cía. Brasileira de Aluminio (7%), Alcan Aluminio do Brasil S.A. (9%), and Mineracao Río do Norte S.A. (22%). CVRD, which held 100% of ALUNORTE, will see its participation in the project decline to between 30% and 49%.

Mineracao Río do Norte S.A., the world's third largest bauxite producer and exporter, increased its production during 1991 by about 10.4% or 8.5 Mmt compared with that of 1990. Brazil's second largest aluminum smelter, ALBRAS, announced plans to increase its plant capacity from 160,000 to 345,000 mt/a by 1995 at a cost of approximately $650 million.

Reynolds Internacional do Brasil will triple its output of aluminum cans to 750,000 mt/a and begin to export them to Latin American markets. This was announced at yearend by Reynolds Metals of the United States, the holding company. Alto Brazil Mineracao-ABM is a joint venture of Alcoa Aluminio S.A. (60%) and Billiton Metais S.A. (40%) to mine their bauxite deposit in the Amazon

region. It proposed to mine the Oriximina deposit near the Trombetas River and the MRN mine in the State of Pará. Construction began in 1991 on the first phase, to have a capacity of 2.5 Mmt/a and, depending on the market, production could reach 4.5 Mmt/a. When in operation, it will supply the feed to the Alcoa Aluminio S.A. refinery at Sao Luis, Maranhao State.

Columbium and Tantalum.—In 1991, Cía. Brasileira de Metalurgia e Mineracao (CBMM) accounted for approximately 80% of Brazil's production capacity and supplied approximately 65% of the world demand for ferrocolumbium.

In midyear, CBMM began construction of a new ferrocolumbium unit at Araxa, Minas Gerais State. The plant will have a capacity of 22,800 mt/a and will cost $15 million.

Early in the year the Mining Resources and Research Co. of Amazonas announced the discovery of what may be the largest columbium-containing deposit in the world. It was found in the Sao Gabriel da Coxoeira district of the State of Amazonas and contains approximately 2.9 billion tons of columbium ore.

In 1991, tantalum production in Brazil was 84 tons compared with 90 tons in 1990. Brazil was third in tantalum concentrate production in 1991, following Australia and Malaysia.

Copper.—Brazilian copper production amounted to 37,000 tons in 1991, which was a 1.5% increase over that of 1990. CVRD has concluded feasibility studies for the Salobo deposit in Carajas, Para State, proving 1.3 billion tons of reserves with a grade of 0.86% of copper and associated with gold, molybdenum, and silver. CVRD announced plans to build a $345 million, 225,000-mt/a copper refinery plant near its Salobo Mine. The plant is expected to go on-line sometime in 1994.

Copper consuming companies in Brazil imported approximately 52,000 tons of copper in 1991, 4.4% over that of 1990.

CPRM, the State mineral resources prospection company, announced plans to invest $1.5 million in an extensive survey of the national copper reserve that covers an area of 546,000 km^2 straddling the States of Amapá and Pará. The reserve created in 1984 has never been properly surveyed.

Gold.—Official gold production in 1991 was approximately 88,100 kg, which was a decrease of about 12.5% from that of 1990. Mining companies produced 38% of the total output, with the balance produced by garimpos. The large increase in official production was the result of a more liberal Government policy regarding identification of the gold's origin.

CVRD announced plans to spend $136 million by 1992 and to become Brazil's largest gold producer. In 1991, Mineracao Morro Velho S.A., a mixed equity company, was the largest producer in Brazil.

The discovery, in September 1989, of a new gold deposit at the old Serra Pelada Mine in the Carajás area of the State of Pará caused garimpos to flood back into the region. This open pit mine previously had been considered depleted. The new discovery occurred in the main street of the original mine site boomtown. A large pit was quickly developed, which threatened the foundations of nearby homes and stores.

In February 1989, the President of Brazil signed a decree prohibiting the use of mercury and cyanide in the mining of gold unless approved by Brazilian State environmental agencies. The States most affected were those in the Pantanal and Amazon regions.

At yearend, the Minas Gerais Environment Policy Commission closed a garimpo alluvial gold mining operation on the Paracatu River. Health checks on the 2,000 garimpos that worked there revealed an excessive exposure to mercury. Many had absorbed mercury into the bloodstream at more than 200 times the permissible levels. Sao Bento Mineracao S.A. announced plans to invest $8.5 million to boost gold output at its mine in east-central Minas Gerais State from 2,300 kg to 4,500 kg by 1993. The gold will be extracted by a combination of bioleaching using General Mining Union Corp. Ltd. (Republic of South Africa) technology and pressure oxidation.

Iron and Steel.—Ferroalloys.—In 1991, ferroalloy production decreased by 10% from that of the previous year. For the year, exports increased from those of last year and reached 118.8 Mmt while imports decreased 39%. In 1991, Brazil's iron ore share in the world market continued to be about 30%, which maintained a first-rank position. Brazil was the fourth largest ferroalloy producer in the world and the third largest exporter. Apparent domestic consumption for 1991 was approximately 693,000 tons.

Indústria e Comercio de Minerios (ICOMI) announced in midyear that ferrochrome production had begun at its new plant at Porto de Santana, Amapa State. The plant, with a capacity of 20,000 mt/a, was operated by Cía. Ferroligas do Amapá S.A. (CFA), a wholly owned subsidiary of ICOMI.

Norway's Elkem A/S, one of the world's largest manganese alloy producers, agreed to invest $70 million in a joint venture with Brazil's Prometal Produtos Metalúrgicos S.A. to build a 160,000-mt/a ferromanganese plant. The plant, to be in Marabá, Pará State, is a $170 million project in which Elkem will hold a 40% share. The manganese will come from a nearby Prometal mine, and the iron ore will come from the Carajás area.

Prometal announced at yearend that two fixed export contracts had been signed totaling 90,000 mt/a of ferromanganese for delivery to one buyer in Germany and two in Japan. The term for each contract is 5 years. The ferroalloy will come from the plant at Maraba, Para State, which is to begin production in midyear 1992.

Iron Ore.—Brazil's 1991 production of iron ore, reported to be 150 Mmt, decreased by almost 2% from that of the previous year. CVRD produced 103.8 Mmt and exported 75.5 Mmt, representing 63.6% of the total iron ore

exports. The remaining major producers, in order of descending output, were Mineracoes Brasileiras Reunidas (MBR), Samarco Mineracao S.A., Ferteco Mineracao S.A., and S.A. Mineracao da Trindade (SAMITRI).

Total iron ore exports for 1991 were 118.8 Mmt, which exceeded the 1990 figure by 8%. The total export revenues of $2.7 billion also exceeded the record of $2.5 billion set in 1990. The major importers of Brazilian iron ore were Japan (25.5%) and the Federal Republic of Germany (19.3%). In 1991, the United States imported 4% of Brazil's total iron ore exports.

MBR, Brazil's second largest iron ore producer, announced plans to invest $1 billion over a 10-year period beginning in 1991. The investment program is aimed at increasing reserves and production. The target is to increase output to 35 Mmt/a from the present 23 Mmt/a by the end of the century.

In early 1990, Brazil finalized export contracts at substantially increased prices and at a level well above that set by the Association of Iron Ore Exporting Countries. The Brazilian iron ore producers' association attributed the increase in prices to a greater world demand, which in part was due to a continued expansion of the world's steel industry.

Pig Iron.—In 1991, Brazil exported approximately one-third of the pig iron traded in the world; however, by yearend the industry in Brazil was in serious trouble. The major source of the problem was the new environmental laws stipulating that by 1990 a minimum of 50% of the charcoal used had to come from reforested areas rather than the virgin forests. A maximum of 20% of the charcoal used was allowed to be purchased from third parties. It was also stipulated that the percentage of charcoal used by the producers from their own reforestation programs must grow by 10% per year until it reaches 100% by 1995. The Government found that of 110 pig iron producers, only 12 had conformed to the new laws, and as a consequence, at least 60 plants were shut down for environmental reasons by yearend.

Steel.—Brazil's export quota to the United States declined by 6.5% or 1.455 Mmt/a. Within the quota, a 739,000-mt/a limit was placed on semifinished products and a 716,000-mt/a limit placed on finished steel products.

Brazil's 1991 steel production decreased almost 3.1%, while steel exports fell approximately 3.6%.

Brazil's five large parastatal steel mills lost $2 billion in 1991, increasing their accumulated debt to $7 billion. The losses were primarily attributed to lower domestic demand, an unfavorable exchange rate, higher inflation rates, and lower world prices, which were down between 13% and 20% from those of 1990. During the year the work force in the mills was reduced from 172,000 to 140,000. There also was great concern that without further investment the steel mills would be obsolete by the mid-1990's.

In 1989, Cía. Siderúrgica Belgo-Mineíro, in a joint venture with Trefil Arbed of Luxembourg, commenced construction of a 20,000-mt/a steel cord works in Pine Bluff, Arkansas (United States). The plant is to come on-stream in 1992, with 50% of its wire rod requirement to come from Belgo-Mineíro's wire mill in Brazil.

The Gerdau Group, Brazil's largest private steelmaker, announced plans to modernize the direct-reduced iron 300,000-mt/a Usiba plant it purchased at a Government auction in October 1989. The upgrading options under consideration were the newer HYL-III process and the Midrex process. If the Midrex option is adopted, a completely new plant would have to be constructed.

The Brazilian Government is determined to proceed with the privatization of its steel industry despite the controversy and political turmoil. On October 24,1991, the Government started the privatization process by selling 75% of the common stock in Brazil's second largest steel mill, Usinas Siderurgicas de Minas Gerais S.A. (USIMINAS), to various shareholders for $1.17 billion. Brazil had pledged since January 1991 to sell all of its mills by 1994.

Manganese.—Manganese concentrate production continued a decline that began in 1987. The 1991 output figure was about 16.5% below that of 1990. The largest decline occurred in 1987 when production decreased almost 30% from that of 1986. The principal reason for the diminution of total manganese production was the depletion of the high-grade ore reserves of Industria e Comercio de Minerios' (ICOMI) Serra do Navio Mine near Macapá, Amapa State. Another negative factor was the grade of the ore being mined by CVRD at its new manganese mine, the Azul Mine, in the Carajás complex. The grade of the Azul Mine manganese ore is 45% Mn, and the average grade of the ore on the international market is 48% Mn. The high content of aluminum in the ore, about 8%, may be a mitigating factor affecting the marketability of the Azul ore.

In 1991, Brazil produced 1,966,800 tons of manganese ore; of this total, 43% was exported.

Tin.—Brazil continued to be a leading producer in 1991. However, tin production decreased by 24% in 1991 from that of 1990. The reduction in Brazilian output was because of the closing of some high-cost operations and also to the downturn in tin prices. Brazilian tin exports in 1991 declined to 19,500 tons, or about 40%, compared with those of the previous year. Domestic consumption was about 6,300 tons, a small increase from that of 1990.

Paranapanema S.A. Mineracao, Industría e Construcao, Brazil's largest tin-mining company, reported that tin sales amounted to $86.4 million for 1991. Mineracao Taboca S.A., a subsidiary of Paranapanema, was fined $1.2 million by the Brazilian Government for mining in a permanent reserve.

In early 1991, the Federal police announced that they had closed down three illegal tin mines that were active in Yanomami Indian territory in the

Territory of Roraima. Collectively, the three mines had produced 150 tons of tin per month.

Titanium.—In early 1991, CVRD began investing in the production of titanium sponge and an advanced titanium compound used in the space, shipbuilding, and chemical industries on an industrial scale. CVRD reached an agreement with the space technology institute of the air force, whereby the institute will receive 1% of all royalties when the compound is produced industrially in exchange for the transfer of equipment to CVRD.

The Brazilian subsidiary of E. I. du Pont de Nemours and Co. Inc. of the United States began construction of a titanium dioxide sizing and packaging facility at Uberaba, Minas Gerais State. The plant is to begin operation in early 1992.

Industrial Minerals

Gemstones.—For many years, Brazil has been an important producer of gemstones in the world. This ranking has applied in terms of volume as well as variety. The large proportion of gemstones produced was mined by garimperos. For this reason gemstone reserves are unknown, but Brazil appears to have potential for very large reserves.

The total value of gemstone (including diamond) exports increased by 18% in 1991. Exports of uncut gemstones have declined since 1990 despite the removal of some export barriers.

Quartz.—A consortium that consisted of CVRD, Nisso Iwai (Japan), and Telequartz began production of quartz powder in 1990. The powder is an important constituent in the production of optic fibers, crucibles, oscillators, solar cells, wafers and integrated circuit packing, and ceramic materials of exceptional purity.

In 1991, Brazil continued to be the largest producer of quartz in the world. Brazil is estimated to have 53 Mmt of reserves representing 95% of the known world supply.

Other Industrial Minerals.—Potash production in 1991 decreased by an estimated 60% from that of 1990. Because of the reduced production, Brazil imported 1.9 Mmt of potash in 1991.

Production of phosphate rock in 1991 amounted to 3.28 Mmt, an increase of 10.4% over the 2.97 Mmt of last year. The country imported 150,000 tons of phosphate rock in 1991 to supply part of the demand in the northeast of Brazil. The reported domestic consumption was 3.7 Mmt/a. Seventy-three percent of the phosphoric acid was used in the fertilizer industry, 25% in the chemical industry, and the rest in other uses.

Mineral Fuels

In 1991, the total amount of energy produced was 152,428,000 tons of oil equivalent. The primary sources, in order of importance, were hydraulic energy, firewood, petroleum, sugarcane bagasse, natural gas, steam coal, metallurgical coal, and uranium. Imported energy sources were 78,160,000 tons of oil equivalent. Total energy consumption was 162,457,000 tons of oil equivalent. Export, variations in inventory, nonutilized, and reinjected energy totaled 10,068,000 tons of oil equivalent. The transportation sector consumed 32,629,000 tons of oil equivalent and the industrial sector 69,229,000 tons of oil equivalent. Consumption, by categories, in the mineral industry, in order of importance, was pig iron and steel, 17,552,000 tons of oil equivalent; nonferrous and other metals, 8,231,000 tons of oil equivalent; cement, 2,799,000 tons of oil equivalent; mining and pelletization, 2,591,000 tons of oil equivalent; and ferroalloys, 2,569,000 tons of oil equivalent.

With more than 13 million alcohol-powered vehicles on the road and an alcohol shortage, the production breakdown of road vehicles has shifted to 70% gasoline-powered from almost entirely alcohol-powered production in 1989.

Coal.—The Brazilian coal industry, not a large component of its mineral industry, has been in decline in recent years. Coal production is concentrated in the southern states of Santa Catarina, 60%; Rio Grande do Sul, 36%; and Parana, 3%, with minor production from Minas Gerais. Brazil's total coal production in 1991 was estimated to be about 7 Mmt/a, of which about 20% was metallurgical coal and the remainder was for power generation.

Most Brazilian coal is of lower quality than Colombian coal. Total Brazilian coal reserves were estimated as 5.4 billion tons. Imports increased by more than 4% to approximately 11.4 Mmt/a, which was almost entirely composed of metallurgical coal. The United States exported an estimated 5 Mmt of metallurgical coal to Brazil in 1991.

Natural Gas and Petroleum.—The gas pipeline linking the Enchova platform in the offshore Campos Basin to Macaé, Río de Janeiro State, which was completed in midsummer 1989, has added 5 Mm^3/d gas flow to the Río de Janeiro and Sao Paulo markets.

BRASPETRO, the foreign operating subsidiary of PETROBRAS, began producing natural gas in the Gulf of Mexico at yearend 1989. The gas was recovered from the Frederick Field, 27 km off the Louisiana coast by Petrobrás América Inc., a subsidiary of BRASPETRO.

Petroleum production decreased 1.4% over that of 1990, while natural gas production increased about 4.8%. In 1991, Brazil's imports of petroleum were 26.5 Mmt/a at a cost of $3.5 billion.

The Enchova platform in the Campos Basin went back into production in early 1990, only 18 months after almost being completely destroyed by fire.

Nuclear.—At yearend 1989, a bill was submitted to the Brazilian Congress that proposed the termination of the Brazil-Germany nuclear energy accord signed in 1975. Construction continued on a pilot powerplant that has the capability to produce 1 ton of 99.6%-pure heavy water

per year. The plant is to be completed in 1994. The site of the top-secret plant and the production process were not announced. Brazil contains the fifth largest uranium reserves in the world. Reserves in 1991 amounted to about 163,000 tons of U_3O_8 and 92,000 tons of inferred reserves. Private interests are permitted to participate in uranium exploration and production in Brazil through State-owned joint ventures; however, there is a restriction that no more than 20% of the country's uranium reserves may be exported.

Reserves

In 1991, Brazil was among the world leaders in reserves of the following mineral commodities, by rank: columbium (1), barite (2), bauxite (3), vermiculite (3), tin (3), iron ore (5), manganese (5), and talc and pyrophyllite (5). *(See table 4.)*

INFRASTRUCTURE

In 1991, Brazil had a total of 32,002 km of railroads composed of 25,268 km of 1.000-m gauge, 4,339 km of 1.600-m gauge, 74 km of 1.600- to 1.000-m gauge, 13 km of 0.760-m gauge, and 2,308 km electrified. The country contained a total of 1,448,000 km of roads, composed of 48,000 km paved and 1,400,000 km of gravel and dirt. There was 50,000 km of navigable inland waterways. The major shipping ports were Belém, Manaus, Porto Alegre, Recife, Río de Janeiro, Río Grande, Salvador, and Santos. Among the 271 ships were 56 tankers, 15 chemical tankers, 10 liquefied natural gas, 14 combination ore and oil, 82 bulk, and 2 combination bulk vessels. There were 2,000 km of crude petroleum pipelines, 3,804 km of refined petroleum product pipelines, and 1,095 km of natural gas pipelines. In 1991, Brazil's installed electrical generating capacity was 52,865 MW. Total production of electric power for the year was 202,280 GW•h, which translated into 1,340 kW•h per capita.

In early 1990, power investment negotiations were underway between the Brazilian Government and five companies, of which four were foreign subsidiaries. The companies involved were Alcan Aluminio do Brasil S.A. (Canada), Alcoa Aluminio S.A. (United States), Billiton Metais S.A. (Netherlands), Dow Química S.A. (United States), and the Brazilian company, Camargo Corréa Industrial S.A. The proposal submitted by the five companies was to build a 1,200-MW dam on the Tocantins River on the border between Maranhao and Goias States. A Billiton spokesman stated that the dam construction would cost approximately $1 billion and that Billiton has pledged $350 million. The companies all have been receiving electricity from the Tucurui Dam on the Tocantins River, but the demand has been increasing at such a rapid rate that the demand could exceed the supply in a very few years. Another factor was the 10% subsidy on electricity prices that expires in the year 2004.

During the past several years, the lack of funding has led to a significant deterioration in the quality of Brazilian highways. A recent World Bank study found that 28% of the country's highways was in bad condition versus only 10% in 1979. Another study found that the lack of proper maintenance of Brazilian roads added 10% to 15% to total transportation costs in the country.

A study by the Brazilian Steel Institute (IBS) found that the loading of 1 ton of steel at the Port of Santos cost $32.50. In comparison, the average cost of loading 1 ton of steel in Asian, European, and U.S. ports was $4.50. At the Ports of Río de Janeiro and Vitoria, the costs were $10.00 plus per ton of steel.

The ports of Brazil were found to require heavy investments in modernization and expansion. The bottlenecks resulting from the lack of capacity were so great that Brazilian importers in 1988 paid almost $300 million in penalties charged by ships that had to wait in line to be unloaded.

In 1991, CVRD invested $118.8 million to improve its rail transportation system. Constran S.A. Construcao e Comercio of The Itamaraty Group, a private sector of Brazil, plans to construct 1,718 km of additional railroad linking to the existent railroad system. The initial 311 km of railroad, at a cost of $276 million, is expected to be completed by the end of 1994. The new system's projected cost is $2.5 billion. This addition will connect to the existent system, which runs from Vitoria, Espirito Santo; Belo Horizonte, Minas Gerais; Santos, Sao Paulo; and Chapadao do Sul, Mato Grosso do Sul. The new railroad system will run from Chapadao do Sul, Mato Grosso do Sul to Cuiaba, Mato Grosso and Santarem, Para and branching from Cuiaba, Mato Grosso to Porto Velho, Rondonia.

OUTLOOK

For economic growth, Brazil must keep inflation at a manageable level. In addition, the public deficit needs to be reduced along with improvements in its foreign debt. A factor that may have a negative effect over the longer term is the environment, especially the Amazon rain forest. Much depends on what approaches are used to protect the environment in the midst of sustainable development.

Improvement and additional infrastructure will have a major, direct bearing on Brazilian industries in the foreseeable future. The planned Ferronorte railroad new system and modernization of its existent ports will augment Brazil's ability to increase industrial production and competitiveness. The sectors most likely to be affected are those that depend most heavily on electricity, transport, and the shipping ports. The aluminum, auto, petrochemical, and pulp and paper industries, which depend heavily on energy and on exports, will benefit most from improved infrastructure.

[1]Where necessary, values have been converted from Brazilian cruzeiros (Cz$) to U.S. dollars at the rate of Cz$2,396.1=US$1.00, the average rate for 1991.

OTHER SOURCES OF INFORMATION

Agencies

Comissao Nacional de Energía Nuclear (CNEN)
Rua General Severianao
90 Botafogo-ZC-02
22290-Río de Janeiro-RJ-Brasil

Companhía de Pesquisa de Recurso Minerais (CPRM)
Avenida Pasteur 404-Anexo, 2° Andar, Pria Vermelha
22290-Río de Janeiro-RJ-Brasil

Conselho de Nao-Ferrosos e de Siderúrgia (CONSIDER)
Esplanados dos Ministerios-Bloco 6-5° Andar
70053-Brasilia-DF-Brasil

Conselho Nacional do Petróleo (CNP)
SGAN-Q.603 Modulos J, I e H
70830-Brasilia-DF-Brasil

Departamento de Mineracao Informacao Instituto
Brasileiro de Mineracao (IBRAM)
Avenida Afonso Pena, 3880 3°, 4° e 5° Andares
30000-Belo Horizonte-MG-Brasil

Departamento Nacional de Producao Mineral (DNPM)
Ministerio das Minas e Energia
SAN-Quadra 01-Bloco "B"
70040-Brasilia-DF-Brasil

Petróleo Brasileiro S.A. (PETROBRAS)
Avenida República do Chile, 65
20035-Río de Janeiro-RJ-Brasil

Río Doce Geologica e Mineracao S.A. (DOCEGEO)
Avenida President Wilson 11° Andar
22030-Río de Janeiro-RJ-Brasil

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TABLE 1

BRAZIL: PRODUCTION OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[e]
METALS						
Aluminum:						
Bauxite, dry basis, gross weight		6,566,500	7,727,600	8,442,000	r9,678,203	3 10,310,000
Alumina		1,326,000	1,487,850	1,632,000	1,624,400	1,700,000
Metal:						
Primary		843,500	873,500	889,500	930,600	1,000,000
Secondary		50,284	60,500	66,000	60,000	60,000
Beryllium: Beryl concentrate, gross weight		1,000	913	800	e850	850
Cadmium: Metal, primary		214	283	283	e200	200
Chromium:						
Crude ore		830,000	779,000	r829,000	e810,000	890,000
Concentrate		170,000	r147,122	r182,877	105,000	3 138,000
Marketable product[4]		191,033	229,912	e225,000	r256,453	3 306,900
Cobalt:						
Mine output, Co content by hydroxide[e]		150	150	200	200	200
Metal, electrolytic		—	—	e30	e60	60
Columbium-tantalum ores and concentrates, gross weight:						
Columbite and tantalite		r493	r444	r481	r342	320
Djalmaite concentrate[e]		10	10	10	10	10
Pyrochlore concentrate, Cb_2O_5 content		r18,867	r37,274	r29,023	r27,142	3 28,449
Copper:						
Mine output, Cu content		40,332	44,845	44,440	r36,441	3 37,000
Metal:						
Primary		146,969	147,880	r153,378	r157,120	160,000
Secondary		52,200	r38,051	r54,426	r27,000	35,000
Gold:[e 5]						
Mine output	kilograms	31,400	30,800	30,000	r 3 29,986	3 33,584
Garimpeiros (independent miners)	do.	52,300	69,400	70,000	r 3 71,742	3 55,525
Total	do.	83,700	100,200	100,000	r 3 101,728	3 89,109
Iron and steel:						
Ore and concentrate (marketable product):[4]						
Gross weight	thousand tons	134,493	r146,008	r157,900	r152,300	150,000
Fe content	do.	91,200	98,600	e102,300	e99,900	100,000
Metal:						
Pig iron[6]	do.	20,944	23,454	24,363	21,141	22,000
Ferroalloys, electric-furnace:						
Chromium metal		123	155	135	37	3 37
Ferrocalcium silicon		25,673	31,519	33,020	27,520	3 21,708
Ferrochromium		105,394	130,024	113,267	83,753	3 82,225
Ferrochromium silicon		8,079	9,177	8,938	4,973	3 4,524
Ferrocolumbium		10,880	19,106	16,378	16,643	3 18,959
Ferromanganese		155,252	180,588	180,668	170,504	3 169,103
Ferromolybdenum		422	427	332	69	3 47
Ferronickel		35,496	33,930	34,997	34,257	3 34,069

See footnotes at end of table.

TABLE 1—Continued

BRAZIL: PRODUCTION OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[e]
METALS—Continued						
Iron and steel—Continued:						
Metal—Continued:						
Ferroalloys, electric-furnanoe—Continued:						
Ferrophosphorus		1,784	1,469	1,928	1,278	[3]864
Ferrosilicon		231,159	267,538	286,994	229,408	[3]191,423
Ferrosilicon magnesium		17,575	17,000	15,864	10,340	[3]10,168
Ferrosilicon zirconium		398	793	1,392	503	[3]102
Ferrotitanium		80	549	430	125	[3]126
Ferrotungsten		123	133	22	6	[3]1
Ferrovanadium		88	261	302	44	[3]41
Inoculant		3,308	7,678	12,098	11,461	[3]24,431
Silicomanganese		188,022	193,490	208,262	216,779	[3]272,046
Silicon metal		39,982	79,287	116,779	131,614	[3]106,002
Total		823,838	973,124	1,031,806	939,314	[3]935,876
Steel, crude, excluding castings	thousand tons	22,228	[r]24,656	25,055	20,567	[3]22,616
Semimanufactures, flat and nonflat	do.	31,068	32,306	32,537	29,450	25,000
Lead:						
Mine output, Pb content		11,633	14,314	16,050	[r]9,291	[3]8,600
Metal:						
Primary		29,842	29,501	32,522	[r]30,118	28,000
Secondary		58,361	68,681	53,295	[r]45,300	42,100
Magnesium metal:						
Primary		5,488	5,865	6,200	[e]6,500	6,500
Secondary[e]		[3]1,376	1,500	1,500	1,600	1,600
Manganese ore and concentrate, marketable, gross weight[4]		2,067,385	[r]1,670,000	[r]1,904,000	[r]2,300,000	2,500,000
Nickel:						
Mine output, Ni content		21,897	[r]18,667	[r]18,826	[r]18,788	20,600
Ferronickel, Ni content		9,739	9,216	9,445	[r]8,847	9,000
Rare-earth metals: Monazite concentrate, gross weight		1,560	[r]2,633	[r]2,503	[r]1,656	1,600
Silver[7]	kilograms	110,400	124,100	[r]114,117	[r]171,052	170,000
Tin:						
Mine output, Sn content		27,364	44,102	50,232	[r]37,580	29,300
Metal:						
Primary		29,446	41,857	44,240	[r]37,580	28,100
Secondary[e]		200	250	250	250	250
Titanium concentrates, gross weight:						
Ilmenite		169,303	142,167	144,200	[r]114,117	110,000
Rutile		324	1,514	2,600	[r]1,814	1,700
Tungsten, mine output, W content		800	[r]738	679	[r]316	300
Zinc:						
Concentrate and salable ore		700,348	832,383	[r]840,707	[r]744,527	758,000
Mine output, Zn content		133,375	155,531	[r]178,439	[r]158,025	161,100
Metal, smelter:						
Primary		138,652	139,667	155,846	[e]150,000	155,000
Secondary		9,384	4,307	6,409	[e]5,500	6,000
Zirconium: Zircon concentrate, gross weight[8]		18,140	28,029	32,970	[r]16,907	22,000

See footnotes at end of table.

TABLE 1—Continued

BRAZIL: PRODUCTION OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[e]
INDUSTRIAL MINERALS						
Asbestos:						
Crude ore		3,176,231	3,554,916	3,500,000	e3,940,000	3,950,000
Fiber		212,807	227,653	206,195	232,332	e233,100
Barite:						
Crude		99,424	68,855	63,665	r64,923	65,000
Beneficiated		102,220	78,842	51,407	r55,576	55,000
Marketable product[4]		102,345	85,287	r57,741	r68,188	65,000
Calcite		60,284	51,138	e50,000	e50,000	50,000
Cement, hydraulic	thousand tons	25,470	r25,330	r25,926	r25,848	25,000
Clays:						
Bentonite		216,591	r147,149	146,550	r167,618	165,000
Kaolin:						
Crude		2,259,777	2,092,635	r2,167,234	r1,960,000	2,000,000
Beneficiated		661,149	759,892	r714,647	r710,000	720,000
Marketable product[4]		742,825	r1,121,892	r1,021,770	r981,826	980,000
Diamond:						
Gem	thousand carats	300	r350	350	600	600
Industrial	do.	200	180	150	900	900
Total[9]	do.	500	r530	500	1,500	1,500
Diatomite:						
Crude		26,375	33,500	e35,000	e35,000	35,000
Beneficiated		15,956	r15,145	15,618	r13,311	13,000
Marketable product[4]		16,011	r15,165	r15,759	r13,313	13,100
Feldspar and related materials:						
Feldspar, marketable product[4]		118,608	r146,951	r142,893	r110,559	115,000
Leucite, marketable product[4]		4,369	5,562	e5,000	e5,000	5,000
Sodalite, crude, marketable product[4]		535	517	e500	e500	500
Total		123,512	r153,030	r e148,393	r e116,059	120,500
Fluorspar:						
Crude		242,414	401,384	e400,000	e400,000	400,000
Concentrates, marketable product:						
Acid-grade		58,736	r54,920	56,973	r47,724	50,000
Metallurgical-grade		31,212	r35,078	38,558	r22,659	25,000
Total		89,948	r89,998	95,531	r70,383	75,000
Graphite:						
Crude		525,164	730,851	e650,000	e650,000	650,000
Marketable product:						
Direct-shipping crude ore		10,505	r12,570	r13,005	r8,400	10,000
Concentrate		31,414	34,520	r31,650	r30,000	30,000
Total		41,919	r47,090	r44,655	r38,400	40,000
Gypsum and anhydrite, crude		801,667	r788,673	r860,970	r827,953	880,300
Kyanite:						
Crude		922	689	e700	e750	750
Marketable product[4]		510	630	e600	e600	600

See footnotes at end of table.

TABLE 1—Continued

BRAZIL: PRODUCTION OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[e]
INDUSTRIAL MINERALS—Continued						
Lime, hydrated and quicklime	thousand tons	5,300	5,500	5,730	e5,700	5,700
Lithium mineral concentrates:						
Amblygonite		52	25	e25	e25	25
Petalite		2,946	1,115	e1,800	e1,200	1,200
Spodumene		505	301	e400	e350	350
Total		3,503	1,441	e2,225	e1,575	1,575
Magnesite:						
Crude		778,502	810,837	1,385,565	r1,432,741	1,300,000
Beneficiated		383,378	404,126	259,508	r257,159	260,000
Mica, all grades		2,415	2,520	r3,700	r e5,000	5,000
Nitrogen: N content of ammonia		957,630	935,400	935,400	937,500	940,000
Phosphate rock including apatite:						
Crude:						
Mine product	thousand tons	28,135	26,458	e27,000	e27,000	27,000
Of which, sold directly	do.	656	38	35	e35	35
Concentrate:						
Gross weight	do.	4,777	4,672	3,655	2,968	3,309
P_2O_5 content	do.	1,694	1,663	1,293	1,051	1,100
Pigments, mineral: Other, crude		5,803	5,223	e5,500	e5,500	5,500
Potash: Marketable product (K_2O)		37,111	54,121	96,945	r65,735	65,000
Precious and semiprecious stones except diamond, crude and worked:						
Agate		5,300	2,600	3,000	e3,000	3,000
Amethyst		1,400	1,500	1,000	e1,000	1,000
Aquamarine		34	197	20	e20	20
Citrine		400	160	100	e100	100
Emerald		60	100	90	e90	90
Opal		16	13	500	e500	500
Ruby[e]	value	$10,000	$10,000	$10,000	$10,000	$10,000
Sapphire[e]	do.	$15,000	$15,000	$15,000	$15,000	$15,000
Topaz		22	72	50	e50	50
Tourmaline		60	170	80	e80	80
Other		500	500	e500	e500	500
Quartz crystal, all grades		3,802	3,020	3,174	e3,100	3,100
Salt:						
Marine	thousand tons	3,600	3,020	2,355	r4,170	4,000
Rock	do.	950	1,336	r1,298	r1,033	1,000
Silica (silex)	do.	r3,654	r4,077	r4,100	r3,721	3,500
Sodium compounds:						
Caustic soda[e]		975,000	975,000	975,000	975,000	975,000
Soda ash, manufactured (barilla)		170,000	184,416	e200,000	e200,000	200,000

See footnotes at end of table.

TABLE 1—Continued

BRAZIL: PRODUCTION OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[e]
INDUSTRIAL MINERALS—Continued						
Stone, sand and gravel:						
Dimension stone:						
Marble, rough-cut	cubic meters	96,051	132,490	e150,000	e200,000	200,000
Slate		32,474	45,384	e50,000	e50,000	50,000
Crushed and broken stone:						
Basalt	cubic meters	664,794	993,855	e1,000,000	e1,000,000	1,000,000
Calcareous shells		450,006	440,589	e450,000	e450,000	450,000
Dolomite	thousand tons	2,848	3,395	e3,500	e3,500	3,500
Gneiss	cubic meters	480,340	1,042,467	1,039,829	e1,000,000	1,000,000
Granite	thousand cubic meters	50,843	58,646	e60,000	e60,000	60,000
Limestone	thousand tons	57,021	60,111	e60,000	e60,000	60,000
Quartz[10]		207,000	247,465	e250,000	e250,000	250,000
Quartzite:						
Crude		437,115	393,346	e400,000	e400,000	400,000
Processed		267,918	197,886	e200,000	e200,000	200,000
Sand: Industrial		2,566,220	2,613,027	e2,700,000	e2,700,000	2,700,000
Sulfur:						
Frasch		5,742	6,039	5,721	e6,000	6,000
Pyrites		76,704	102,856	71,740	e90,000	90,000
Byproduct:						
Metallurgy		153,038	152,013	163,724	e160,000	160,000
Petroleum		77,322	61,396	60,121	e60,000	60,000
Total		312,806	322,304	301,306	e316,000	316,000
Talc and related materials:						
Talc, marketable product[4]		425,513	339,077	e400,000	e430,000	430,000
Pyrophyllite, marketable product[4]		51,114	60,070	e60,000	e60,000	60,000
Other: Algalmatolite, marketable product[9]		3104,536	120,000	120,000	120,000	120,000
Vermiculite:						
Crude		123,261	124,419	e120,000	e120,000	120,000
Marketable product[4]		16,825	18,849	19,000	e19,000	19,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous, marketable[4]	thousand tons	6,742	7,428	7,186	e7,200	7,200
Coke, metallurgical, all types	do.	962	1,185	1,006	e1,000	1,000
Gas, natural:						
Gross	million cubic meters	5,781	6,076	6,105	6,284	36,280
Marketed	do.	3,886	3,839	4,014	4,035	4,030
Natural gas liquids	thousand 42-gallon barrels	9,529	e9,400	e9,500	r13,073	312,935
Petroleum:						
Crude	do.	215,419	210,605	217,941	r640,557	3633,728
Refinery products:						
Gasoline	do.	73,000	81,395	68,700	r184,896	192,000
Jet fuel	do.	20,075	19,345	19,458	r46,224	48,000
Kerosene	do.	3,285	3,285	2,292	r11,556	12,000
Distillate fuel oil	do.	150,015	155,125	145,752	r346,680	360,000
Lubricants	do.	6,205	5,110	4,206	r11,556	12,005
Residual fuel oil	do.	84,315	78,110	74,166	r219,564	228,000
Other	do.	101,470	89,060	124,068	r288,900	300,000

See footnotes at end of table.

TABLE 1—Continued

BRAZIL: PRODUCTION OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Refinery products—Continued:						
Refinery fuel and losses	thousand 42-gallon barrels	18,250	18,250	22,008	[r]46,224	48,000
Total	do.	456,615	449,680	460,650	[r]1,155,600	[11]1,200,000

[e]Estimated. [r]Revised.

[1]Table includes data available through Oct. 2, 1992.

[2]In addition to the commodities listed, bismuth, molybdenite, and uranium oxide are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Direct sales and beneficiated.

[5]Officially reported figures are as follows, in kilograms: Major mines: 1987—13,095; 1988—22,160; 1989—23,000; 1990—29,861 (revised); 1991—33,584. Independent miners (Garimpos): 1987—22,700; 1988—34,260; 1989—31,000; 1990—71,742 (revised); and 1991—55,525.

[6]Includes sponge iron as follows, in thousand metric tons: 1987—202; 1988—195; 1989—239; 1990—260; and 1991—270.

[7]Officially reported output; of total production, the following quantities are identified as placer silver (the balance being silver content of other ores and concentrates), in kilograms: 1987—20,200 (estimated); 1988—34,319 (revised); 1989—58,000 (revised); 1990—52,000 (revised); and 1991—50,000 (estimated).

[8]Includes baddeleyite-caldasite.

[9]Figures represent officially reported output plus official Brazilian estimates of output by nonreporting miners.

[10]Apparently includes crude quartz used to produce quartz crystal (listed separately in this table) as well as additional quantities of common quartz.

[11]Figure represents officially reported production (1991 Annual Report) by Petroleo Brasileiro S.A. (PETROBRAS).

TABLE 2

BRAZIL: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	Destinations, 1990	
		United States	Other (principal)
METALS			
Alkali and alkaline-earth metals:			
Alkali metals	4	—	Mexico 2; Peru 2.
Alkaline-earth metals	231	18	Netherlands 61; Japan 57; France 51.
Aluminum:			
Ore and concentrate thousand tons	5,474	1,335	Venezuela 1,670; Canada 1,666.
Oxides and hydroxides	171,867	122,611	Chile 32,747; Argentina 6,565.
Metal including alloys:			
Scrap			
Unwrought	591,935	31,967	Japan 303,614; Netherlands 163,627.
Semimanufactures	39,468	8,928	Netherlands 10,093; Costa Rica 6,042.
Antimony: Metal including alloys, all forms value, thousands	$5	—	All to Italy.
Cadmium: Metal including alloys, all forms do.	$7	—	All to Netherlands.
Chromium: Oxides and hydroxides	257	—	Ecuador 250; Chile 7.
Cobalt:			
Oxides and hydroxides	1	—	All to Panama and Suriname.
Metal including alloys, all forms	120	39	Netherlands 55; West Germany 35.
Copper:			
Ore and concentrate	1,300	—	All to Japan.
Metal including alloys:			
Scrap value, thousands	$4	—	All to New Zealand.
Unwrought	41,624	7,802	Netherlands 14,505; Italy 7,002.
Semimanufactures	20,593	8,770	Hong Kong 2,818; Canada 1,989.
Gold: Metal including alloys, unwrought and partly wrought kilograms	5	—	Mainly to West Germany.
Iron and steel:			
Iron ore and concentrate, excluding roasted pyrite thousand tons	113,469	4,943	Japan 29,273; West Germany 18,600; Republic of Korea 7,094.
Metal:			
Scrap	210	—	Spain 90; Argentina 60; West Germany 60.
Pig iron, cast iron, related materials thousand tons	3,493	267	Japan 1,152; China 465.
Ferroalloys:			
Ferrochromium	16,217	270	Netherlands 7,508; France 3,750; Japan 2,000.
Ferromanganese	65,569	20,519	Netherlands 19,622; Paraguay 4,764.
Ferronickel	15,861	691	Belgium-Luxembourg 7,635; West Germany 4,183; Finland 2,651.
Ferrosilicomanganese	91,936	21,779	Netherlands 24,158; Japan 18,525.
Ferrosilicon	199,903	46,957	Japan 78,278; Libya 36,669.
Silicon metal	114,197	41,472	Japan 26,179; Netherlands 18,468.
Unspecified	41,189	12,694	Japan 9,071; Netherlands 6,517.
Steel, primary forms thousand tons	3,520	783	Republic of Korea 387; Japan 319.

See footnotes at end of table.

TABLE 2—Continued

BRAZIL: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	Destinations, 1990	
		United States	Other (principal)
METALS—Continued			
Iron and steel—Continued:			
Metal—Continued:			
Semimanufactures:			
Flat-rolled products:			
Of iron or nonalloy steel:			
Not clad, plated, coated thousand tons	2,923	297	Thailand 396; Iran 376; Japan 337.
Clad, plated, coated	244,772	28,062	India 56,650; Italy 22,590.
Of alloy steel	53,347	14,322	India 5,069; Turkey 4,644.
Bars, rods, angles, shapes, sections thousand tons	1,846	198	Hong Kong 267; Republic of Korea 224.
Rails and accessories	735	—	Colombia 317; Netherlands 149; Belgium-Luxembourg 82.
Wire	36,123	7,522	Paraguay 4,958; Bolivia 3,091.
Tubes, pipes, fittings	337,467	118,622	Colombia 29,190; Malaysia 23,634.
Lead:			
Ore and concentrate	6	—	All to Republic of South Africa.
Oxides	1	—	Mainly to Angola.
Metal including alloys:			
Unwrought	4,375	141	Netherlands 2,021; Malaysia 1,563; Italy 501.
Semimanufactures	207	21	Netherlands 120; Bolivia 40.
Magnesium: Metal including alloys:			
Unwrought	1	—	Mainly to Netherlands.
Semimanufactures	6	1	Argentina 4.
Manganese:			
Ore and concentrate: Metallurgical grade	950,049	72,720	Italy 177,454; Czechoslovakia 154,217; Netherlands 81,419.
Oxides	4,609	1,517	West Germany 2,106; Ecuador 234.
Metal including alloys, all forms	241	120	India 61; Canada 30.
Mercury kilograms	3,000	—	All to Angola.
Nickel: Metal including alloys:			
Unwrought	1,713	1,083	Japan 250; Netherlands 200.
Semimanufactures	66	—	Italy 39; Colombia 5; Republic of South Africa 5.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$14,292	—	All to Uruguay.
Silver: Metal including alloys, unwrought and partly wrought do.	$51	$15	Japan $30; Angola $1.
Tin:			
Ore and concentrate	2,561	—	All to Angola.
Metal including alloys:			
Unwrought	27,641	3,969	Netherlands 22,488; Hungary 420.
Semimanufactures	398	40	Paraguay 140; Italy 120; Belgium-Luxembourg 87.
Titanium:			
Ore and concentrate	37,653	—	Argentina 34,995; Japan 1,717; Uruguay 490.
Metal including alloys:			
Unwrought[2]	38	38	

See footnotes at end of table.

TABLE 2—Continued

BRAZIL: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	Destinations, 1990	
		United States	Other (principal)
METALS—Continued			
Titanium—Continued:			
Metal including alloys—Continued:			
Semimanufactures	14	—	Spain 8; Argentina 3; Canada 2.
Tungsten: Metal including alloys, semimanufactures	2	—	Mainly to Italy.
Zinc: Metal including alloys:			
Unwrought	33,741	24,050	Netherlands 6,097; Singapore 1,500.
Semimanufactures	941	—	West Germany 902; Colombia 23; Uruguay 10.
Zirconium: Ore and concentrate	4,078	—	United Kingdom 1,850; Spain 1,370; Netherlands 576.
Other:			
Ores and concentrates	161	34	Japan 83; Netherlands 36.
Oxides and hydroxides	1,351	934	Netherlands 125; United Kingdom 93.
Ashes and residues	13,376	148	Australia 12,210; Canada 396; Japan 351.
Base metals including alloys, all forms	57	5	Japan 39; Netherlands 12.
Metalloids[3]	2,577	—	Mainly to Angola.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc. value, thousands	$2	—	Japan $1; Peru $1.
Artificial: Corundum	38,936	8,884	Netherlands 5,425; Republic of Korea 5,395.
Dust and powder of precious and semi-precious stones value, thousands	$19	—	All to Colombia.
Grinding and polishing wheels and stones	2,918	1,706	Chile 215; France 122.
Asbestos, crude	53,141	—	Thailand 10,454; Iran 7,852; Indonesia 7,770.
Barite and witherite	90	—	Suriname 30; Uruguay 28; Bolivia 19.
Boron materials:			
Crude natural borates	3	—	All to Chile.
Oxides and acids	180	—	All to Netherlands.
Bromine[4]	3	—	All to Angola.
Cement	55,114	—	Peru 27,719; Paraguay 19,583; Bolivia 7,503.
Clays, crude:			
Bentonite	382	11	Bolivia 350; Guyana 10.
Kaolin	292,236	—	Belgium-Luxembourg 120,167; Japan 85,330; Nigeria 37,254.
Unspecified	637	—	Chile 463; Argentina 88; Ireland 44.
Diamond: Natural:			
Gem, not set or strung value, thousands	$62,845	$19,203	Belgium-Luxembourg $24,115; Netherlands $5,938.
Industrial stones do.	$102	—	Belgium-Luxembourg $100; Ecuador $2.
Diatomite and other infusorial earth	12,408	—	All to Italy.
Feldspar	6,610	34	Canada 3,425; Netherlands 3,000; Suriname 100.
Fertilizer materials:			
Crude, n.e.s.	50	—	Mainly to Paraguay.
Manufactured:			
Ammonia	209	—	Uruguay 153; Angola 46; Paraguay 10.
Nitrogenous	242,854	32,554	China 125,038; France 52,637.
Phosphatic	1,146	—	Argentina 650; Paraguay 369; Ecuador 81.

See footnotes at end of table.

TABLE 2—Continued

BRAZIL: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	Destinations, 1990	
		United States	Other (principal)
INDUSTRIAL MINERALS—Continued			
Fertilizer materials—Continued:			
Manufactured—Continued:			
Potassic	1,659	—	West Germany 700; Paraguay 335; Uruguay 285.
Unspecified and mixed	67,117	—	Paraguay 43,249; Uruguay 14,448; Bolivia 5,006.
Fluorspar	2,274	—	Suriname 2,145; France 100; Netherlands 27.
Graphite, natural	8,441	1,235	Netherlands 2,592; Japan 2,325.
Gypsum and plaster	12	1	Bolivia 7; Angola 2.
Lime	3,326	—	Paraguay 3,222; Argentina 104.
Magnesium compounds:			
Magnesite, crude	160	—	All to Bolivia.
Oxides and hydroxides	92,404	245	Poland 37,029; Venezuela 18,800; Chile 14,220.
Mica:			
Crude including splittings and waste	417	—	West Germany 321; United Kingdom 60; Japan 20.
Worked including agglomerated splittings	834	155	France 420; Mexico 140.
Nitrates, crude	100	—	All to Suriname.
Phosphates, crude	35	—	All to France.
Pigments, mineral: Iron oxides and hydroxides, processed	1,947	972	Mexico 345; Japan 238.
Precious and semiprecious stones other than diamond: Natural value, thousands	$53,805	$13,842	Japan $10,933; West Germany $9,836.
Pyrite, unroasted	2	—	All to Portugal.
Quartz crystal, piezoelectric value, thousands	$481	—	All to Japan.
Salt and brine	12,200	—	Nigeria 7,106; Angola 5,000; Paraguay 24.
Sodium compounds, n.e.s.: Sulfate, manufactured	379	—	Suriname 200; West Germany 170; Peru 8.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	439,012	4,309	Italy 266,360; Belgium-Luxembourg 39,382; Spain 34,932.
Worked	22,403	7,989	West Germany 3,346; Belgium-Luxembourg 2,203.
Dolomite, chiefly refractory-grade	317	—	Argentina 250; Uruguay 50; Suriname 17.
Gravel and crushed rock	2,302	570	Saudi Arabia 979; Canada 747.
Limestone other than dimension	303	—	Suriname 302; Paraguay 1.
Quartz and quartzite	4,180	258	Italy 1,513; Japan 839; West Germany 489.
Sand other than metal-bearing	566	—	Belgium-Luxembourg 406; Argentina 159.
Sulfur:			
Elemental: Crude including native and byproduct	6	—	All to the Bahamas.
Dioxide	5	—	All to Paraguay.
Sulfuric acid	33,539	—	Chile 33,538; Suriname 1.
Talc, steatite, soapstone, pyrophyllite	2,696	333	Canada 1,193; Venezuela 301.
Vermiculite[5]	10,090	5,547	Australia 2,383; Belgium-Luxembourg 2,045.
Other:			
Crude	168	40	Mexico 51; Sweden 40.
Slag and dross, not metal-bearing	764	291	United Kingdom 341; Netherlands 112.

See footnotes at end of table.

TABLE 2—Continued

BRAZIL: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Destinations, 1990	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		10	—	All to Paraguay.
Carbon black		427	8	Uruguay 173; Pakistan 170; Chile 63.
Coal: Anthracite		860	—	Bolivia 775; Argentina 85.
Coke and semicoke		24	—	All to Bolivia.
Petroleum refinery products:				
Liquefied petroleum gas	42-gallon barrels	61,967	116	Paraguay 44,985; Australia 15,161; Nigeria 638.
Mineral jelly and wax	do.	13,403	8	Uruguay 8,208; Chile 2,463; Argentina 2,227.
Bitumen and other residues	do.	418	—	Uruguay 412; Paraguay 6.
Bituminous mixtures	do.	2,145	—	Paraguay 1,006; Bolivia 739; Seychelles 127.
Petroleum coke	do.	61	—	Mexico 55; Chile 6.

[1]Table prepared by H. D. Willis. Export and reexport data for 1989 and 1991 were not available at time of publication.
[2]Includes waste and scrap.
[3]Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."
[4]Includes fluorine and iodine.
[5]Includes chlorite and perlite.

TABLE 3

BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Albras-Aluminio Brasileiro S.A. (ALBRAS) [Government, 26%; private, 25%; Nippon Amazon Aluminum Co. (NAAC), 49%]	Belem, Para State (smelter)	160 (metal).
Do.	Alcan Aluminio do Brasil S.A. (Alcan Aluminium Ltd., 100%)	Saramenha, Minas Gerais State (refinery)	150 (alumina).
Do.	Alcan Aluminio Pocos de Caldas (ALUCALDAS) (Alcan Aluminio do Brasil S.A., 100%)	Pocos de Caldas, Minas Gerais State (mine)	1,000 (bauxite).
Do.	Alcoa Aluminio S.A. (ALUMAR)(Aluminum Co. of America, 60%; Billiton International Metals B.V., 40%)	Pocos de Caldas, Minas Gerais State (mine) (Sao Luis, Maranhao State (refinery) (smelter)	400 (bauxite). 500 (alumina) 174 (metal).
Do.	Aluminio do Brasil Nordeste S.A. (Alcan Aluminum Ltd., 100%)	Aratu, Bahia State (smelter)	58 (metal).
Do.	Billiton Metais S.A. (Billiton International Metals B.V., 100%)	Sao Luis, Maranhao State (refinery)	375 (refinery).
Do.	Compahnia Brasileira de Aluminio (CBA) (private, 100%)	Pocos de Caldas, Minas Gerais State (mine) Sorocaba, Sao Paulo State (refinery) (smelter)	Pocos de Caldas, 1,000 (bauxite). 170 (alumina). 170 (metal).
Do.	Compahnia Geral do Minas (private, 21%; Aluminum Co. of America, 79%)	Pocos de Caldas, Minas Garais State (refinery) (smelter)	275 (alumina). 90 (metal).
Do.	Mineracao Rio do Norte S.A.(MRN) (Government, 24%; private, 32%; Alcan Empreendimentos Ltda., 24%; Billiton International Metals B.V., 10%; Norsk Hydro Comercio e Industria, 5%; Reynolds Aluminio do Brasil, 5%)	Oriximina, Para State (mine)	8,000 (bauxite).
Do.	Vale do Sul Aluminio S.A. (Government, 27%; private, 25%; Shell do Brasil S.A., 44%; Reynolds Metals Co., 4%)	Santa Cruz, Rio de Janeiro State (smelter)	86 (metal).
Chromite	Coitezeirio Mineracao S.A. (COMISA) (private, 75.4%; Bayer do Brasil S.A., 24.6%)	Campo Formosa, Bahia State (mine)	50 (ore).
Do.	Companhia de Ferro Ligas da Bahia (FERBASA) (private, 100%)	Campo Formoso, Bahia State (mine) (beneficiation plant)	370 (ore). 292 (concentrate).
Copper	Companhia Brasileira do Cobre (CBC) (private, 100%)	Cacapava do Sul, Rio Grande do Sul State (mine) (beneficiation plant)	1,000 (ore). 1,800 (concentrate).
Do.	Mineracao Caraiba Ltda. (Government, 100%)	Jaquarari, Bahia State (mine) (beneficiation plant)	3,000 (ore). 5,700 (concentrate).
Columbium	Companhia Brasileira de Metalurgia e Mineracao (CBMM) (private, 55%; Molycorp, Inc., 45%)	Araxa, Minas Gerais State (mine) (beneficiation plant)	1,200 (ore). 44.
Do.	Mineracao Catalao de Goias Ltda. (private, 68.5%; Anglo American Corp. do Brasil, 31.5%)	Ouvidor, Goias State (mine)	500 (ore).
Ferroalloys	Companhia Brasileira Carbureto de Calcio (CBCC) (private, 100%)	Santos Dumont, Minas Gerais State (plant)	54.
Do.	Companhia Ferro-Ligas de Bahia S.A. (FERBASA) (private, 100%)	Pojuca, Bahia State (plant)	194.
Do.	Companhia Ferro-Ligas Minas Gerais (MINASLIGAS) (private, 100%)	Pirapora, Minas Gerais State (plant)	58.

See footnotes at end of table.

TABLE 3—Continued

BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Ferroalloys—Continued:	Companhia Paulista de Ferro-Ligas (private, 100%)	Barbacena, Caxambu, Jeceaba, Passa Quatro and Passa Vinte, Minas Gerais State; Corumba, Matto Grosso do Sul State; and Xanxere, Santa Catarina State (seven plants)	326.
Do.	Italmagnesio S.A. Industria e Comercio (private, 100%)	Braganca Paulista, Sao Paulo State; and Varzeada Palma, Minas Gerais State (two plants)	63.
Gold kilograms	Companhia de Mineracao e Participacoes (CMP) (private, 100%)	Lourenco, Amapa State (mine)	1,080 (ore).
		Currais Novos, Rio Grande do Norte (mine)	300.
Do.	Mineracao Morro Velho S.A. (private, 50%; Anglo American Corp. do Brasil, 50%)	Novo Lima, Raposos, and Sabara, Minas Gerais State; and Jacobina, Bahia State (four mines)	2,000.
Gold	Sao Bento Mineracao S.A. (Gencor Industria e Comercio Ltda., 49%; Amcor S.A., 29.4%; Amcor Metais Ltda, 21.6%)	Santa Barbara, Minas Gerais State (mine)	500.
Iron ore	Companhia Vale do Rio Doce (CVRD) (Government, 51%; private, 49%)	Serra dos Carajas, Para State; and Itabira, Ouro Preto, and Santa Barbara, Minas Gerais State (four mines)	91,000.
Do.	Ferteco Mineracao S.A. (Ferteco) (Exploration und Bergbau Gmbh, 100%)	Ouro Preto and Brumadinho, Minas Gerais State (two mines)	12,800.
Do.	Mineracoes Brasileiras Reunidas (MBR) (private, 85.3%; Mitsui e Co. Ltd. 14.7%)	Novo Lima and Itibirito, Minas Gerais State (two mines)	31,500.
Do.	Samarco Mineracao S.A. (Samarco) (private, 51%; Broken Hill Properties Ltd., 49%)	Mariana, Minas Gerais State (mine)	11,700.
Do.	S.A. Mineracao da Trindade (SAMITRI) (private, 100%)	Mariana, Rio Piracicaba, Itabira, Ouro Preto and Sabara; Minas Gerais State (five mines)	9,300.
Lead	Mineracao Boquira S.A. (private, 100%)	Boquira, Bahia State (mine)	300 (ore).
		(beneficiation plant)	310 (concentrate).
Manganese	Companhia Vale do Rio Doce (CVRD)	Corumba, Minas Gerais State (mine)	500 (ore).
		Serra dos Carajas, Para State (beneficiation plant)	1,000 (concentrate).
Do.	Industria e Comercio de Minerios S.A. (ICOMI) (private, 100%)	Macapa and Mazagao, Amapa State (two mines)	1,500 (ore).
		(beneficiation plant)	800 (concentrate).
Nickel	Companhia Niquel Tocantins (private, 100%)	Niquelandia, Goias State (mine)	150 (ore).
Steel	Aco Minas Gerais S.A. (ACOMINAS) (Government, 99.8%; others, 0.2%)	Rodovia, Minas Gerais State	2,000.
Do.	Companhia Acos Especiais Itabira (ACESITA) (Government, 90.9%; private, 9.1%)	Timoteo, Minas Gerais State (stainless steel plant)	600.
Do.	Companhia Siderurgica Belgo - Mineira (private, 100%)	Joao Monlevade, Minas Gerais State	1,000.
Do.	Companhia Siderurgica de Tubarao (CST) (Government, 74%; Kawasaki Steel Corp.,13% Societa Finanziaria Siderurgia-Finsider, 13%)	Serra, Espirito Santo State	3,000.

See footnotes at end of table.

TABLE 3—Continued

BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Steel—Continued:	Companhia Siderurgia Nacional (CSN) (Government, 99.7%; others, 0.3%)	Volta Redonda, Rio de Janeiro State	4,600.
Do.	Companhia Siderurgica Paulista (COSIPA) (Government, 99.6%; others, 0.4%)	Cubatao, Sao Paulo State	3,900.
Do.	Usinas Siderurgicas de Minas Gerais S.A. (USIMINAS) (Government, 95%; Nippon Usiminas, 5%)	Ipatinga, Minas Gerais State	4,400.
Tin	Mineracao Jacunda Ltda (private, 100%)	Santa Barbara, Novo Mundo, and Potosi; Rondonia State (six mines) (three beneficiation plants)	108 (ore). 450 (concentrate).
Do.	Paranapanema S.A. Mineracao, Industria e Construcao (private, 100%)	Aripuana, Mato Grosso State; Ariquemes, Rondonia State; Novo Aripuana and Presidente Figueiredo, Amazonas State; and Sao Felix do Xingu, Para State (five mines) (two beneficiation plants) Piraporada Bom Jesus, Sao Paulo State (refinery)	5,420 (ore). 1,400 (concentrate). 25 (metal).
Titanium	Rutilo e Ilmenita do Brasil S.A. (RIB) (private, 100%)	Mataraca, Paraiba State (mine) (two beneficiation plants)	4,200 (ore). 120 (concentrate).
Zinc	Companhia Minera de Metais (CMM) (private, 100%)	Vazante, Minas Gerais State (mine) (beneficiation plant)	800 (ore). 48 (concentrate).
Do.	do.	Tres Marias, Minas Gerais State (refinery)	72 (metal).
Do.	Mineracao Areiense S.A.-MASA(MASA) (private, 100%)	Vazante, Minas Gerais State (mine)	400 (ore).
Zirconium	Nuclemon Minero-Quimica Ltda. (Government, 100%)	Sao Joao da Barra, Rio de Janeiro State (mine)	660 (ore).
Do.	do.	Itapemirim, Espirito Santo State (mine)	90 (ore).
Do.	do.	Prado, Bahia State (mine) (three beneficiation plants) (three separation plants)	90 (ore). 123 (concentrate). 90 (concentrate).
Asbestos	SAMA-Sociedade Anonima Mineracao de Amianto (SAMA) (private, 100%)	Minacu, Goias State (mine) (beneficiation plant)	9,000 (ore). 230 (concentrate).
Cement	Cimento Santa Rita S.A. (private, 100%)	Itapevi, Sao Paulo State (plant) Salto de Pirapora, Sao Paulo State (plant)	1,000. 1,200.
Do.	Companhia Cimento Portland Itau (private, 100%)	Itau de Minas, Minas Gerais State (three plants)	2,400.
Do.	Companhia de Cimento Portland Paraiso (private, 100%)	States of Espirito Santo, Goias, Minas Gerais and Rio de Janeiro (five plants)	4,000.
Do.	Companhia de Cimento Portland Rio Branco (private, 100%)	Rio Branco do Sul, Parana State (two plants)	5,000.
Diamond	Mineracao Tejucana S.A. (private, 100%)	Diamantina, Minas Gerais State (mine)	100.
Fluorspar	Mineracao Nossa Senhora do Carmo Ltda. (private, 100%)	Morro da Fumaca and Pedras Grandes, Santa Catarina State (four mines) (two beneficiation plants)	180 (ore). 220 (concentrate).

See footnotes at end of table.

TABLE 3—Continued

BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Flourspar—Continued:	Mineracao Santa Catarina Ltda. (private, 100%)	Morro da Fumaca and Pedras Grandes, Santa Catarina State (four mines) (beneficiation plant)	100 (ore). 120 (concentrate).
Do.	Nacional de Grafite Ltda. (private, 100%)	Itapecerica and Pedra Azul, Minas Gerais State (three mines) (two beneficiation plants)	840 (ore). 720 (concentrate).
Gypsum	CBE-Companhia Brasileira de Equipamento (CBE) (private, 100%)	Codo, Maranhao State and Ipubi, Pernambuco State (two mines)	100.
Do.	Companhia de Cimento Portland Paraiso (private, 100%)	Ipubi, Pernambuco State (mine)	50.
Kaolin	Caulim da Amazonia S.A. (CADAM) (private, 100%)	Mazagao, Amapa State (mine) (beneficiation plant)	720 (ore). 360 (concentrate).
Do.	Empresa de Mineracao Horii Ltda. (Horii) (private, 100%)	Biritiba and Mogi das Cruzes, Sao Paulo State (two mines) (two beneficiation plants)	200 (ore). 180 (concentrate).
Limestone	Companhia de Cimento Portland Paraiso (private, 100%)	States of Goias, Minas Gerais, and Rio de Janeiro (five mines)	2,000.
Do.	Companhia de Cimento Portland Rio Branco (private, 100%)	Rio Branco do Sul, Parana State (three mines)	5,500.
Do.	S.A. Industrias Votorantim (private, 100%)	States of Rio de Janeiro, and Sao Paulo (four mines)	1,000.
Magnesite	Magnesita S.A. (private, 100%)	Brumado, Bahia State-(one major mine and numerous small mines) (two beneficiation plants)	770 (ore). 820 (concentrate).
Phosphate rock	Arafertil S.A. (Arafertil) (Government, 33.33%; private 66.67%).	Araxa, Minas Gerais State (mine)	5,000.
Do.	Copebras S.A.(Copebras) (private, 90.55%; Anglo American Corp. do Brasil, 9.45%)	Ouvidor, Goias State (mine)	4,400.
Do.	Fertilizantes Fosfatados S.A.-Fosfertil (FOSFERTIL) (Government, 100%)	Tapira, Minas Gerais State (two mines)	10,500.
Do.	Serrana S.A. de Mineracao (Serrana) (private, 100%)	Jacupiranga, Sao Paulo State (mine)	6,000.
Salt (rock)	Mineracao e Quimica do Nordeste S.A. (Dow Produtos Quimicos Ltda., 100%)	Vera Cruz, Bahia State (mine)	1,000.
Coal	Carbonifera Criciuma S.A. (private, 100%)	Circiuma and Sideropolis, Santa Catarina State (two mines)	4,000.
Do.	Companhia Carbonifera de Urussanga (CCU) (private, 100%)	Criciuma, Sideropolis, and Urussanga; Santa Catarina State (three mines)	7,200.
Do.	Companhia de Pesquisas e Lavras Minerais-Copelmi (COPELMI) (private, 100%)	Arroio dos Ratos, Butia, and Charqueadas; Rio Grande do Sul State (four mines)	5,700.
Petroleum thousand 42-gallon barrels	Petroleo Brasileiro S.A. (PETROBRAS) (Government, 81.4%, private, 11.8%; public, 6.8%)	99 fields in the States of Alagoas, Amazonas, Bahia, Ceara, Espirito Santo, Rio de Janeiro, Rio Grande do Norte, Para, Maranhao, and Sergipe	220,000.
Petroleum products	do.	11 refineries in the States of Amazonas, Bahia, Ceara, Minas Gerais, Parana, Rio de Janeiro, Rio Grande do Sul, and Sao Paulo	503,000.

See footnotes at end of table.

TABLE 3—Continued

BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum—Continued:	Refinaria de Petroleo Ipiranga S.A. (private, 100%)	Ipiranga, Rio Grande do Sul	3,400.
Do.	Refinaria de Petroleos de Manguinhos S.A. (private, 100%)	Manquinhos, Rio de Janeiro State	3,650.

TABLE 4

BRAZIL: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

(Thousand metric tons unless otherwise specified)

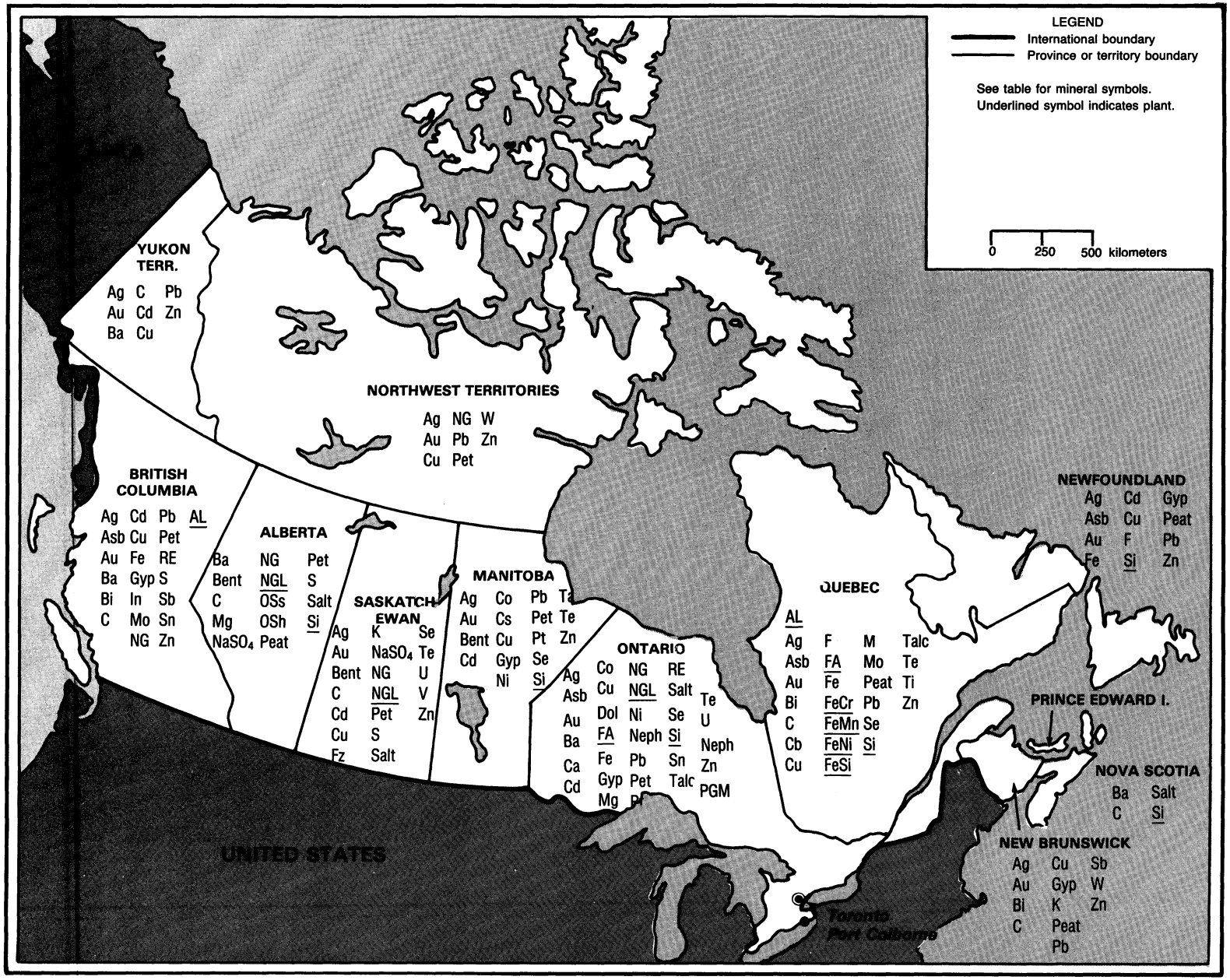
Commodity		Reserves
Asbestos, fiber		3,416
Bauxite, ore		2,660,000
Chromite, Cr_2O_3 content		4,780
Coal, all types		23,670,000
Columbium, pyrochlore, and columbite ore		3,604
Copper, metal content		12,000
Fluorspar, ore		36,000
Gold; metal	metric tons	1,000
Graphite, ore		38,000
Gypsum		674,151
Iron ore, 60% to 65% Fe content		19,200,000
Kaolin		1,100,000
Lead, metal content		359
Magnesite		176,000
Manganese, metal content		89,360
Natural gas[1]	million cubic meters	123,776
Nickel, metal content		6,134
Petroleum[1]	thousand 42-gallon barrels	9,429,210
Phosphate rock		300,000
Tin, metal content		752
Titanium, TiO_2 content		2,733
Zinc, metal content		4,400
Zirconium, ore		1,692

[1]Petroleo Brasileiro S.A. (PETROBRAS) 1991 Annual Report, p. 13.

CANADA

AREA 9.9 million km²

POPULATION 26.8 million



THE MINERAL INDUSTRY OF

CANADA[1]

By David B. Doan

The economic recession in Canada wore on through all of 1991, inflicting growing uncertainties on the mining industry and hardship on workers laid off. Mineral production declined to $30.4 billion[2] from $35.4 billion the previous year, representing 6% of the GDP of $588.7 billion. Inventory accumulation in various parts of the world for a number of mineral commodities caused a slackening of demand, particularly in the high-consumption, highly developed countries, and a progressive weakening in market prices. As commodity prices sagged, many mines either suspended production or closed permanently in cases where finances precluded even the preservation of operational readiness. In terms of recession and deflation, Canada was joined not only by the United States and the United Kingdom, but also by Germany and Japan, each country experiencing its own particular difficulties.

One of the most vexing problems faced by Canadians was the proposed formation of a "Distinct Society" by the people of Quebec, generally voiced in conjunction with the idea of separation from Canada to form a different nation. If such a move were to occur, it was suggested that Quebec would nonetheless use Canadian currency. Considering the probable amount of inherited debt at separation, and the necessity for a nation of Quebec to be free to issue its own debt instruments in support of the state, it seemed likely that Quebec would need its own currency to support its monetary and financial operations. Production from the gold mines of Quebec might then play a crucial role in backing the currency. Although thinking had not publicly progressed this far, at the end of the year the Government was suggesting that constitutional reforms might preclude the movement toward separation.

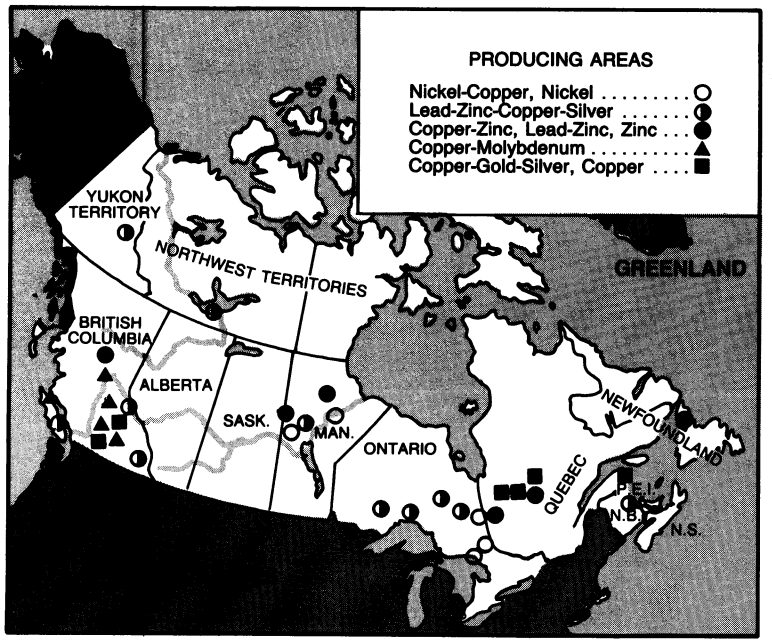
Environmental pressures, particularly by activists invoking their own ideas of adequacy and acceptability, roiled the mining industry and continued to persuade companies to look elsewhere for projects, particularly in Latin America. An example was the Windy Craggy situation in northern British Columbia, a world-class deposit of copper and cobalt ready to be mined but vehemently opposed by environmentalists in both Canada and the United States. Overall evaluation by the Province of British Columbia of all development in that part of the Province was under way, but the message to mining companies was unambiguous. In the final decade of the 20th century, capital monies slosh back and forth electronically between the major countries of the world 24 hr/d, faster than possible by goods or equipment or human travel. The capital goes where it is welcomed for profitable investment and where it sees an acceptable return on investment, whether in agriculture, mining, manufacturing, or other development. Latin America was increasingly a consumer of North American capital because mining, with reasonable controls, is welcome there; soon more of the same capital will be moving to the former U.S.S.R. for the same purpose. Canada increasingly sought means to define the permissible versus the impermissible in terms acceptable to both the mineral industries and the environmentalists.

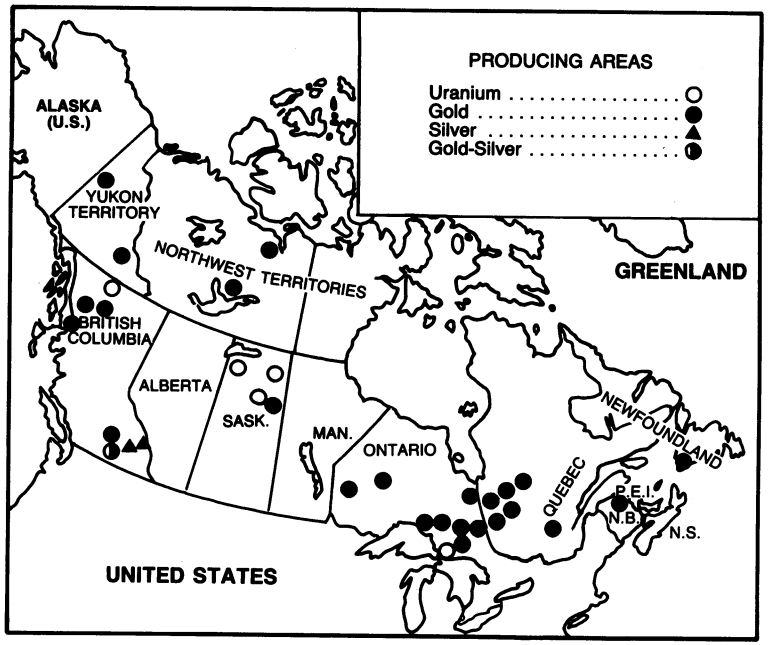
GOVERNMENT POLICIES AND PROGRAMS

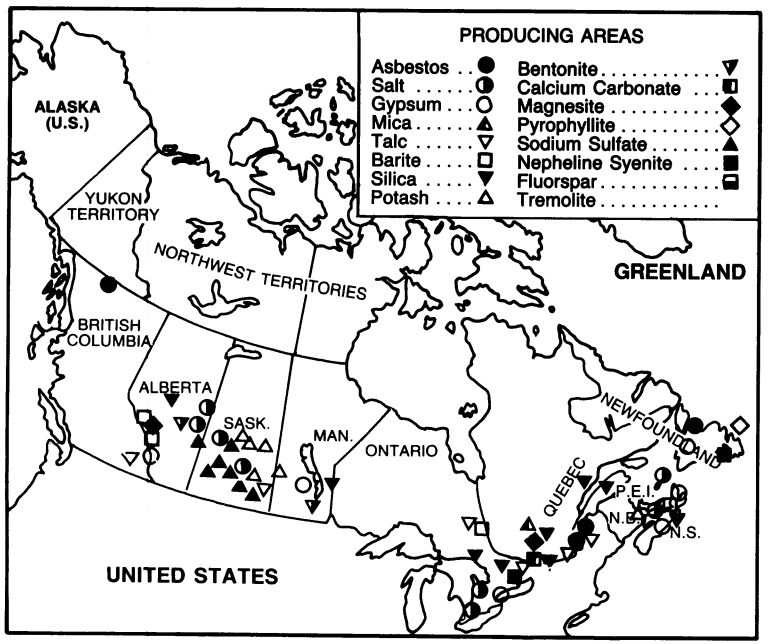
Starting in October 1991, the Government's Standing Committee on Energy, Mines, and Resources began a study on "Sustainable Energy and Mineral Development: A Realistic Response to the Environmental Challenge." In the next 2 months the committee received reports from a variety of industry organizations in petroleum, coal, mining, electrical, nuclear, and energy, all reflecting their views on the environmental challenge. Issues raised included the current regulatory regime, the role of governments, development of innovative technologies, and the impact of technological change. The hope of the committee was to complete its work in the spring of 1992. Its aim was the formulation of a negotiating position on the control of the so-called greenhouse gas emissions for the Canadian negotiating team to recommend to the United Nations Conference on Environment and Development.

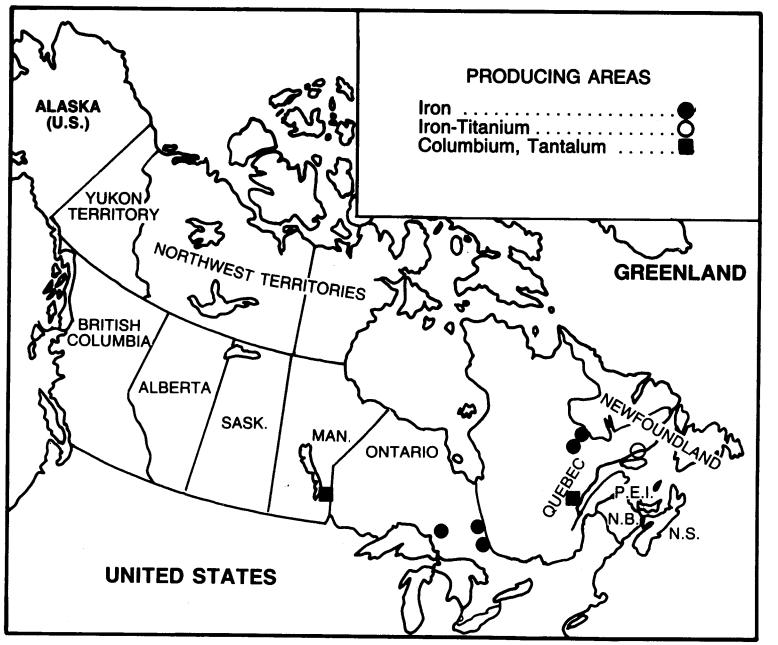
In conjunction with the committee's work, they received a lucid and comprehensive presentation from the Assistant Deputy Minister of the Mineral Policy Sector (MPS) outlining the contribution of minerals to the economy, the relationship of mineral extraction to the environment, and the policy response by Ministry of Energy, Mines and Resources (EMR) toward the resolution of issues arising in terms of assistance to industry, other departments of the Government, and to the Provincial governments. Too long to be detailed here, the policy response addresses various categories of activity, definitions and distinctions, measures to be taken, research, and legislation concerning acid

CANADA — PRINCIPAL PRODUCING MINES



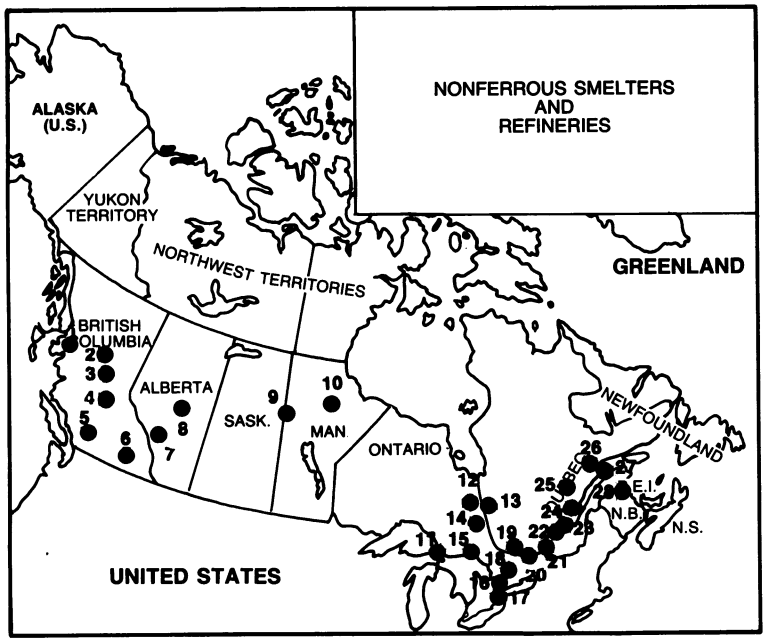


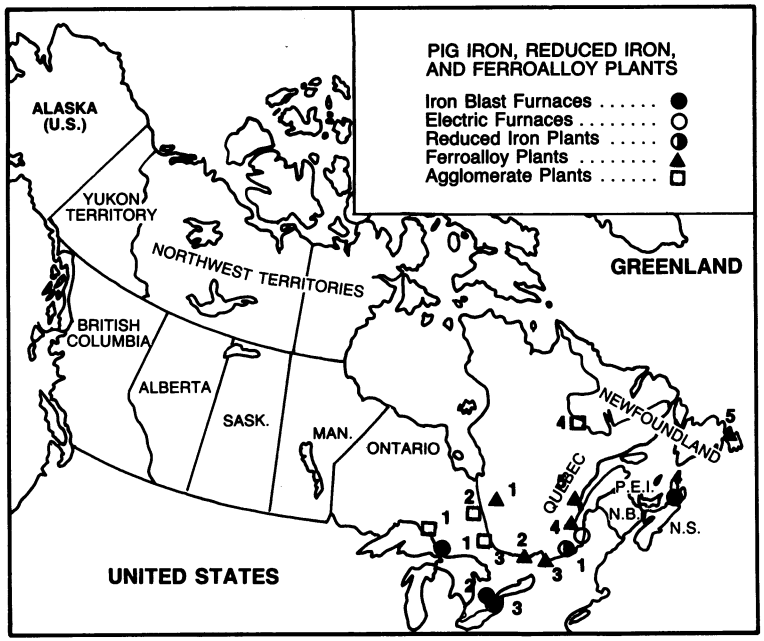




Source: Reproduced with permission from the Geological Survey of Canada (GSC 900A). Ottawa 1990.

CANADA — PRINCIPAL FERROUS AND NONFERROUS PROCESSING PLANTS





NONFERROUS SMELTERS OR REFINERIES

26. BAIE COMEAU: Aluminum ingots and alloys
21. BEAUHARNOIS: Aluminum ingots and alloys
24. BÉCANCOUR: Aluminum ingots and alloys, Magnesium ingots and alloys
28. BELLEDUNE: Lead, Silver, Copper matte, Bismuth, Sulfuric acid, Antimony, Diammonium phosphate
11. BLIND RIVER: Uranium trioxide
16. BRAMPTON-TORONTO: Gold, Silver
14. COBALT: Silver
3. ENDAKO: Molybdic trioxide
15. FALCONBRIDGE: Nickel-Copper matte
9. FLIN FLON: Copper anodes, Zinc, Cadmium
8. FORT SASKATCHEWAN: Nickel, Cobalt, Copper sulfide, Ammonium sulfate
25. GRANDE BAIE: Aluminum ingots and alloys
19. HALEY: Magnesium, Magnesium alloy ingots, Calcium, Calcium alloys, Strontium
7. HIGH RIVER: Magnesium ingots and alloys
2. HOUSTON: Ammonium dimolybdate, Molybdic trioxide
25. ISLE MALIGNE: Aluminum ingots and alloys
25. JONQUIÈRE: Aluminum ingots and alloys, Alumina, Aluminum chemicals, composites
1. KITIMAT: Aluminum ingots and alloys
4. McLEESE LAKE: Copper cathodes
22. MONTREAL-EAST: Copper (cathodes, billets), Gold, Silver Tellurium, Selenium, Selenium salts, Nickel sulfate, Copper sulfate
27. MURDOCHVILLE: Copper anodes, Sulfuric acid
13. NORANDA: Copper anodes
20. OTTAWA: Gold, Silver
17. PORT COLBORNE: Utility Nickel, Nickel oxide, Nickel-Chromium-Iron ingots. Platinum metals (in residues), Cobalt oxide, Electrolytic cobalt
5. PORT COQUITLAM: Tungsten, Titanium and Tantalum-Niobium (Columbium) metal powders and carbides
18. PORT HOPE: Uranium hexafluoride, Uranium dioxide, Uranium metals and alloys
23. SOREL: Titanium dioxide slag, Iron
15. SUDBURY: Nickel oxide (sinter), Nickel pellets and powder, Nickel sulfate, Copper (cathodes, wire/bars), Gold, Silver, Selenium, Tellurium, Platinum metals (in residues), Sulfuric acid, Liquid SO_2, Sulfur
10. THOMPSON: Nickel, Copper matte, Precious metal residue, Cobalt oxide
12. TIMMINS: Zinc, Copper cathodes, Cadmium, Indium, Sulfuric acid
6. TRAIL: Zinc, Lead, Silver, Gold, Cadmium, Bismuth, Tin, Indium, Germanium, Antimonial lead, Mercuric chloride, Copper matte, Sulfuric acid, Ammonium sulfate, Sulfur, Liquid SO_2, High purity metals
21. VALLEYFIELD: Zinc, Cadmium, Sulfuric acid

PIG IRON PLANTS

BLAST FURNACES

1. Sault Ste. Marie, The Algoma Steel Corp., Ltd.
2. Hamilton, Stelco Inc.
2. Hamilton, Dofasco Inc.
3. Nanticoke, Stelco Inc. (Lake Erie Works)
4. Sydney, Sydney Steel Corp.

ELECTRIC FURNACES

1. Sorel, QIT-Fer et Titane Inc.

REDUCED IRON PLANTS

1. Contrecoeur, Sidbec-Dosco Inc.

FERROALLOY PLANTS (Primary)

1. Duparquet, Eldorado Gold Mines Inc.
2. Ottawa, Masterloy Products Ltd.
3. Beauharnois, Elkem Metal Canada Inc.
3. Beauharnois, Chromasco Division of Timminco Ltd.
3. Varennes, ERCO Industries, Ltd.
4. Becancour, SKW Canada Inc.
6. Long Harbour, ERCO Industries Ltd.

IRON ORE AGGLOMERATE PLANTS

1. Wawa, The Algoma Steel Corp. Ltd., (Algoma Ore Div.)
2. Adams Mine, Dofasco Inc.
3. Sherman Mine, Dofasco Inc.
4. Labrador City, Iron Ore Co. of Canada
5. Pointe Noire, Wabush Mines
5. Port Cartier, Quebec Cartier Mining Co.

Source: Reproduced with permission from the Geological Survey of Canada (GSC Map 900A). Ottawa 1990.

mine drainage, land reclamation, contaminants in water, acid rain, health effects of minerals and metals, recycling, and land access and use.

This policy response by the MPS built upon, and made more explicit, various features of the Government's Green Plan announced the previous year, which sponsored more than 100 initiatives to be funded through a 6-year period at a cost of $2.6 billion. The Green Plan included policies, programs, and standards to clean up, protect, and enhance the country's air, land, and water. Among other things, the plan encompasses the use of renewable resources, reduction of waste generation, the improvement of energy efficiency, environmentally responsible decisionmaking, and the maintenance of global environmental security. Although most of the Green Plan does not take aim at mining and minerals production, the implications were clear in the beginning and have thus been addressed by EMR and its MPS. Some of the response required of the mining industry would include control of major emissions from metal mines and smelters; regulations dealing with transboundary movement of hazardous wastes and their disposal, consistent with the Basel Convention; capping of sulfur dioxide and "greenhouse" gas emissions by the year 2000; creation of an extended national-accounts reporting system, including environmental indicators; and completion of the national parks system by the year 2000. With the number of ramifications of the Green Plan for the mineral industry of Canada, there was continuing study and discussion of roles and consequences. In summary, the MPS policy response picked up where appropriate on the Green Plan in terms of the interests of the mining industry.

The Free Trade Agreement with the United States, which the Canadian mining industry actively supported, completed its third year of existence in 1991. The United States-Canada Free Trade Agreement (FTA) had been in effect since January 1989. With the 10-year phaseout of tariffs on mineral commodities, business on both sides of the border was studying the new trade and investment opportunities that the FTA had generated. Not only did the FTA create the largest such area in the Western Hemisphere, but both countries looked southward toward Mexico as a candidate for an even larger North American Free Trade Agreement, or NAFTA, to be negotiated in 1992 if all went well.

The Tariff Acceleration Agreement between the United States and Canada in 1989 testified to the FTA's success. The phaseout of tariffs was accelerated on more than 400 products, including minerals (as shown in table 4), worth $6 billion in two-way trade. United States-Canada subsidy issues, however, continued to be thorny. Chapter 19 of the FTA provided for continuing negotiations on subsidies and antidumping measures, and a bilateral working group was established to negotiate on subsidies. This would depend on the completion of the GATT subsidy negotiations in the Uruguay Round, whose end was not really in sight.

The Government continued the "Minerals and Metals Policy of the Government of Canada," which committed the Government to promote the development of the mining sector as a basis for regional economic development. Joint Federal-Provincial agreements, called Mineral Development Agreements (MDA's), were intended to strengthen and diversify the minerals sectors of the Provincial economies. The MDA's were thus a vehicle to be adjusted to the specific needs of each region or Province. MDA's that commenced in 1984 expired in fiscal year 1990-91, so that new negotiations were under way during 1990 and 1991 for updating, realigning, or initiating new MDA arrangements.

PRODUCTION

The value of mineral production in Canada in 1991 overall, including fuels, was $30.4 billion, down more than 14% from the equivalent total of the year before. Production of mineral fuels decreased by 13.6% from $20,150 million in 1990 to $17,331 million in 1991, unlike the greatly expanded output of natural gas and crude from 1989 to 1990. The drop in value of fuels produced was largely the consequence of lower prices during the year; the true volume of petroleum production dropped only 0.6%. Moreover, both the coal price and volume produced were up in 1991.

The aggregate value of all nonfuel mineral production in Canada during the year 1991 was $13,062 million, down just less than 16% from that of the preceding year. Of this total, the value of metals produced was $9,101 million, a decrease of 16.5% from the 1989 value. In the industrial minerals group, the value of nonmetals produced was $1,965 million, down 9.7% from that of 1990, and the value of the so-called structurals, or construction materials, dropped by 18.2% to $1,996 million in 1991.

Regionally, Alberta again led the Canadian Provinces in total mineral production, including fuels, with an output valued at $14.1 billion, or about 46% of the total for the year. Ontario was a distant second with a total of $4.4 billion, or about 14.5% of the total. Third place was occupied by British Columbia, which produced $3.3 billion worth of minerals, representing about 11% of the total. *(See tables 1 and 2.)*

Mineral fuels led the list in terms of value of output during the year 1991, with petroleum crude first and natural gas second. After these came gold, natural gas byproducts, and copper for the top five mineral commodities. The next highest five mineral commodities in value produced were coal, nickel, zinc, iron ore, and finally potash in 10th place.

On a regional basis, considering the Provinces from east to west, Newfoundland and Labrador registered a decrease in value from that of 1990 of about 8.4% for a total mineral output worth $692 million. Of this, iron ore comprised 93% of the total. St. Lawrence Fluorspar Ltd., which closed in 1990 for lack of profitability at the relatively low world market prices for fluorspar, was placed in receivership. Baie Verte Mines Inc.'s open pit asbestos mine was closed as expected, but the assets of Baie Verte Mines Reprocessing

Inc. were purchased by Teranov Mining Corp., which continued operation of the wet-process mill for recovery of asbestos from tailings.

New Brunswick's mineral production decreased almost 30% in value to about $539 million in 1991, with zinc playing the leading role. The Caribou lead-zinc mine suspended operations in 1990 expecting to reopen in 1991 after a new determination of reserves, but the mine continued to be staffed by a skeleton crew monitoring effluents and ready for immediate startup. The mine was offered for sale by Breakwater Resources Ltd. Labor problems impeded lead and zinc production at Brunswick Mining and Smelting Corp. Ltd. until May of the year, ending a 10-month strike.

Mineral production in Nova Scotia decreased in value by 3% to about $388 million in 1991. Curragh Resources Inc. opened the Westray coal mine at Stellarton, which was expected to reach an output of 700,000 tons in 1992. Rio Algom Ltd. announced that it would close the East Kemptville tin mine in early January 1992. Westminer Canada Ltd. suspended activity of its Gays River Mine and offered the property for sale. Closure of these latter two mines ended production of base and precious metals in the Province for the present time.

The value of Quebec's mineral production in 1991, at $2.56 billion, shrank more than 3% from that of the previous year. In spite of an 18% increase in gold production, weakness in both precious-metal and base metal prices combined with slack demand for construction materials to cause the decline. Exploration activity diminished as did investment in fixed assets and purchase of equipment, all leading to reductions in the level of employment. The Financial Assistance Program for Mineral Prospecting in eastern Quebec, involving about $110 million each year for prospecting and exploration in the Lower St. Lawrence and Gaspe regions, was renewed during the year.

At $4.35 billion, Ontario showed a decrease of 22% in the value of mineral production in 1991. Metals and construction materials were down in total value, but the third largest category, industrial minerals, showed a 9% gain. Uranium production dropped sharply. Soft metals prices resulted in suspensions or closings at Timmins (St. Andrew Goldfields Ltd. and Falconbridge Gold Corp.), Kirkland Lake (Eastmaque Gold Mines Ltd.), Renabie (International Corona Corp. and Barrick Resources Corp.), and Sturgeon Lake (Noranda Minerals Inc.) along with production cutbacks at the Sudbury operations of Inco Ltd. and Falconbridge Ltd.

The value of Manitoba's mineral production in 1991 fell 14% from that of 1990 to a total of $873 million. This cloud had a potential silver lining in the form of an increased interest by industry in exploration for base metals in Manitoba, plus the escalation of investment in new mine and refining capacity by Inco Ltd. at its nickel operation at Thompson. Beyond this was the award, late in the year, of loans to Hudson Bay Mining and Smelting Co. Ltd. by the Federal Government as well as the Provinces of Manitoba and Saskatchewan.

Saskatchewan saw the value of its mineral output drop 2% to $1.05 billion in 1990, largely the result of price weakness and a lack of demand for the two principal mineral products of the Province, uranium and potash, as well as low prices for gold and base metals. Seasonal layoffs, based on high inventory and low demand, were common in the potash mining industry.

The value of mineral output in Alberta decreased by 15% to $14.1 billion, including $13.7 million for the mineral fuels, of which coal accounted for $472 million. These values primarily resulted from lower prices and sales volumes for natural gas, crude, and coal. Although sulfur markets were relatively active, prices were lower.

At $3.23 billion, the value of mineral production in British Columbia was down 5% from that of the previous year. Mineral fuels represented about $1.57 billion of this, of which coal amounted to about $870 million. Lower commodity prices and fewer sales, in the face of reduced demand, all contributed to the decline in total value produced.

The value of mineral production in the Northwest Territories, including fuels, was $661 million, or 23% below that of 1990. Since closure of Pine Point Mines Ltd. in 1988, shipments of stockpiled lead and zinc concentrates had been continuing through the previous year and were finally completed in 1991. Exploration expenditures, however, were slightly higher than those of 1990, reportedly focusing on gold targets in the western region.

The Yukon Territory realized mineral production worth $302 million in 1990, down 36% from that of 1990. Although gold output was up very slightly, lead, silver, and zinc production was down sharply. Exploration expenditures were up but, unlike the neighboring Northwest Territories, the quest in the Yukon Territory was mainly for base metals. *(See table 3.)*

TRADE

Exports, traditionally a pillar of the Canadian economy, weakened in 1991 because of the economic recession in much of the Western World. For Canada's mineral commodity export trade, the combination of inventory accumulation in various producing countries plus the relatively high Canadian dollar combined to depress market returns.

Canada's mineral exports were down slightly from the $21.4 billion of 1989, amounting to $20.6 billion in 1991 and including crude minerals, smelted and refined products, semifabricated and fabricated forms, plus waste and scrap for recycling. The mining and metallurgical extractive industries registered about three-quarters of the total. Mineral exports represented about 17.1% of total Canadian exports for the year.

As well as being Canada's best overall customer, the United States continued to be Canada's best mineral-exports customer in 1990, absorbing 55.7% of the total, including coal but excluding crude oil and natural gas. Of the remaining mineral exports, 12.4% went

to the EC and 11.3% to Japan. Meanwhile, 1991 mineral imports were $11.2 billion, down from $11.7 billion in 1990. Of these imports in 1991, 68.7% came from the United States, 11.7% from the EC, and 3.4% from Japan. The mineral industry of Canada thus contributed a net trade surplus of $9.43 billion to the country's merchandise balance of trade, down only slightly from that of 1990. *(See tables 4 and 5.)*

Other than petroleum, Canada's main exports were as follows: crude materials—iron ore, potash, and sulfur to the United States; copper concentrates to Japan; iron ore and zinc concentrates to the EC; smelted and refined metals—aluminum, copper, gold, iron and steel, nickel, silver, and zinc to the United States; aluminum and gold to Japan; and copper and nickel to the EC. Coal exports went mostly to Japan.

The FTA will not be fully implemented until 1998, at which time 10 years of progressively diminishing tariffs will essentially phase out. Trade between the United States and Canada exceeds that of any other two countries in the world, amounting in 1989 to $200 billion, and expected to grow. So far, FTA implementation had been successful and smoother than might have been expected for such a complex accord, particularly when subsidy issues were yet to be resolved. The Economic Council of Canada, a research organization of the Federal Government, forecast that by 1998, free trade would bring a net gain of 251,000 jobs to Canada, increasing employment by almost 2% and Canada's GNP by 2.5%. The U.S. Department of Commerce estimated that the elimination of tariffs alone would result in a $25 billion increase in trade between the two countries during a 5-year period, with more than 14,000 new U.S. jobs created. *(See tables 6 and 7.)*

STRUCTURE OF THE MINERAL INDUSTRY

The most recent statistics available show that the Canadian mineral industry, toward the end of the 1980's, comprised approximately 2,078 domestic and 143 foreign companies. Companies were considered foreign whose corporate voting rights were at least 50% non-Canadian.

Broken down by operating category, there were 34 foreign and 428 Canadian firms in the primary metals sector; 83 foreign and 1,542 Canadian concerns in the nonmetallic minerals sector; and 26 foreign and 108 Canadian corporations in the petroleum and coal sectors. Downstream from these were 221 foreign and 6,427 Canadian companies in fabricated metals production. In general, foreign companies were subject to all of the same taxes as domestic companies, and repatriation of earnings was unimpeded. Some companies were partly government-owned, such as Potash Corp. of Saskatchewan Inc., of which 63% was owned by the Provincial government, and Saskatchewan Oil & Gas Corp., 81% owned by the same government. Moreover, the Province of Alberta owned 37% of Alberta Energy Co. Ltd. Although the proportion of government ownership was changeable, the trend was toward privatization. Petro-Canada was owned partly by Federal and partly by Provincial governments, but was expected to become completely privatized. A large proportion of the total number of mining and petroleum companies were partly public-owned, with their shares trading on various exchanges in Canada and, in many cases, the United States.

Overall, the mineral industry in Canada consisted of underground mines, open pits, leaching operations, concentrators, smelters, and refineries, as well as the drilling and production operations characteristic of the petroleum industry. Table 8 depicts the structure of the mineral industry by sectors of the major mineral commodities.

On the labor scene, total employment in mining and primary metals in 1991 was, at 138,343 jobs overall, down about 5% from that of the year before. This was the lowest level since 1961 and continued the decline that began after 1989. The work force in metal mines, down 6% overall, was augmented only in gold mining, which showed an increase of 3%. The labor force in industrial mineral extraction was likewise generally down, about 1% for nonmetals and 8% in structural materials. Jobs in the coal mining sector, showing an increase of 3%, were at the highest level since 1985.

Average earnings in mining in Canada have been among the highest of all industrial classifications. Average weekly earnings in 1990 for hourly waged employees were $842.18 for metal mines and $677.11 for nonmetals, with indications of at least a 5% increase for 1990. Although these rates were well above those for manufacturing and construction, problems loomed on the horizon. Changes in technology, skill levels, and work force demographics, combined with a weakening of enrollment in mining-related courses at colleges and universities, have raised questions about the future viability of the mining work force in Canada. Accordingly, attention is being focused by the industry, Provincial governments, and educational institutions to develop strategies for human resource development.

COMMODITY REVIEW

Metals

Aluminum.—Production of primary aluminum increased 16% to 1.822 Mmt in 1991, marking a new high, from 1.567 Mmt in 1990. For the industry as a whole, however, Western World production was up only slightly in the midst of increasing inventories, and prices on the London Metal Exchange (LME) fell to their lowest level since 1982. An increase in exports from the former U.S.S.R. helped bring about an increase in aluminum stocks in LME warehouses to almost 1 Mmt by December.

Alcan Aluminium Ltd. (Alcan) completed the final phase of construction of its Laterriere smelter, which cost almost $700 million with a rated capacity of 200,000 mt/a. Alcan began closing older Soderberg potlines at the Arvida smelter in Jonquiere in 1990, to be replaced by Laterriere production.

Pollution control at Laterriere is projected to capture more than 99% of the fluorides and dust particles in effluent gases. For that region of Quebec, startup of Laterriere and closure of the Soderberg potlines at Arvida is expected to reduce atmospheric emissions of polycyclic aromatic hydrocarbons by 60% and fluorides by 50%.

Alcan had planned to continue its Kemano hydroelectric project in British Columbia, scheduled to cost $1 billion altogether, that would upgrade its generating capacity from 896 MW to 1,436 MW. Construction was halted, however, pending an appeal filed by Alcan to a court ruling providing for an independent environmental review. The company had initiated the project only after previous environmental reviews and changes to meet Federal and Provincial requirements. Plans were to sell excess power to the British Columbia Hydro Power Authority until such time as Alcan decided to add additional smelting capacity. To the end of the year, Alcan's spending and financial commitments on the expansion exceeded $590 million.

Near yearend, because of price weakness, Alcan reduced primary aluminum production at three of its older and higher cost smelters in Quebec. Shawinigan was reduced by 21,000 mt/a, Isle Maligne by 24,500 mt/a, and Arvida by 22,000 mt/a.

In 1990, Canadian Reynolds Metals Co. Ltd. (Can. Reynolds) initiated startup of the Baie Comeau smelter's 120,000-mt/a fifth potline in Quebec, which increased total Baie Comeau capacity to 400,000 mt/a. The expansion was completed in April 1991 at a cost of $437 million, making it the largest aluminum smelter in North America.

A second expansion project in Quebec, costing $437 million, was completed in March by Aluminerie de Becancour Inc., whose smelter at Becancour was upgraded by the addition of a third potline that raised the total capacity to 360,000 mt/a. The company is a consortium, including Can. Reynolds, Alumax Inc., Pechiney Quebec Inc., and Albecour Inc.

Aluminerie Alouette Inc., owned by VAW-Vereignigte Aluminum-Werke AG of Germany (20%); Austria Metall Aktiengesellschapt of Austria (20%); Hoogovens Groep B.V. of the Netherlands (20%); Société Générale de Financement du Québec (SGF) (20%); Kobe Steel Ltd. (13.33%); and Marubeni Corp. of Japan (6.67%) set June 1992 for the startup of its $1.22 billion, 215,000-mt/a smelter at Sept-Iles, Quebec.

Cobalt.—Canadian cobalt production in 1991 decreased to 2,160 tons worth $54.1 million, compared with the output of 2,184 tons worth $43.7 million in 1990, the greater value in 1991 resulting from price gains during the fourth quarter of the year.

Cobalt production is entirely the byproduct of nickel-copper mining and processing by Inco Ltd. and Falconbridge Ltd., as well as from processing of purchased and toll refining materials, from various imported and domestic sources, by Sherritt Gordon Ltd. in Fort Saskatchewan, Alberta.

In the light of weakening demand for nickel, Inco decided to reduce its nickel production in the fourth quarter of the year by closure of several copper-nickel mines in the Sudbury district *(see copper following)*, but nonetheless its cobalt output climbed about 12% to 1,540 tons in 1991.

Falconbridge's refinery in Nikkelverk, Norway, extracts cobalt from nickel-copper matte that it produces at Sudbury, Ontario. The annual capacity of this plant is 60,000 tons of nickel, 2,000 tons of cobalt, and 36,000 tons of copper. Other than for the 60% of Falconbridge's nickel originating at Sudbury, 25% comes from Botswana and about 15% mainly from the U.S.S.R., but this proportion has varied.

Sherritt Gordon's output of cobalt climbed from 690 tons in 1990 to about 820 tons in 1991, the increase partly the result of richer feed materials from Cuba containing 5% cobalt. Sherritt planned to increase its cobalt refining facilities, relying partly on a proprietary process for adapting to the new high ratio cobalt feed. Cobalt capacity would be more than doubled, and the company planned to accelerate its programs for development and marketing of a wider range of value-added cobalt-base industrial materials.[3]

Copper.—Although copper prices moderated somewhat in 1991, easing to an average of about $2.31 per kilogram versus about $2.65 per kilogram in 1990, production was up 4% in 1991 to almost 798 kmt of contained copper in the ore mined. Although LME copper stocks increased by a factor of about 6 from mid-1990 to the end of 1991, prices were sustained by supply disruptions in various producing countries. Blister and anode copper production rose 4% to slightly more than 546 kmt, while refined copper likewise increased 4% to 538,339 tons.

Exploration for new copper deposits remained strong, probably stimulated by depleting reserves and expected mine closures. In northwestern British Columbia, 30 km from the U.S. border, Geddes Resources Ltd. hoped to continue with its Windy Craggy project that involved reserves of at least 165 Mmt in the north and south zones grading 1.9% copper and 0.8% cobalt along with significant gold and silver. Further study verified the existence of the new Ridge zone that should increase total reserves. Although the original mine plan was rejected by the Provincial Mine Development Steering Committee because it did not completely consider the problem of generation of acid waste waters, a revised plan was submitted at the end of 1990. However, great concern in both Canada and the United States has focused on potential environmental problems, visualized by certain activists as insurmountable. The chief concern seemed to be the fear that acid mine waters would drain into the Tatshenshiny River, which flows through the narrow Alaskan panhandle on its way to the sea, and decimate the salmon stocks and breeding grounds. The Provincial government took the entire matter under advisement and announced that before any specific consideration of the Windy Craggy site, the entire future of northern British Columbia would be studied with

special reference to long-range development. Only after that would particular sites be taken up for study. The future of Windy Craggy thus remained in limbo for the entire year.

Originally developed by Noranda, Inc., the Goldstream copper-zinc mine near Revelstoke, British Columbia, was operated briefly in 1984 and then closed, owing to low metals prices and problems with zinc recovery. In 1990, however, Nippon Mining Co. Ltd. and Sumitomo Corp. agreed to finance the reopening of the mine, now owned by Bethlehem Resources Corp. and Goldnev Resources Inc. The mine reopened in May 1991, and output is targeted at 16,000 mt/a of contained copper and 3,000 mt/a of contained zinc. Reserves are projected at 1.86 Mmt grading 4.81% copper and 3.06% zinc, plus some silver.

The Afton copper mine southwest of Kamloops, owned by Afton Operating Corp., a partnership of Metall Mining Corp. and Teck Corp., closed indefinitely in August 1991 because of high operating costs, thereby putting 200 people out of work. The mine produced about 11,000 tons of copper in concentrates the previous year.

By way of contrast, Highland Valley Copper, mining the so-called Valley and Lornex ore bodies at a rate of 275,000 mt/d, emerged as one of the largest copper operations in the world. Ranking second in daily tonnage milled, but fifth in terms of copper extracted because of the low grade of the deposits, the entire operation was compared with Chuquicamata in Chile and Palabora in South Africa. With a stripping ratio of 1:1, about 133,000 mt/d of throughput is ore, with the remainder as overburden and waste rock. Projected life of the mine is 20 years, but other known mineralization may extend the operation significantly. Energy costs were about $35 million per year or about 20% of total operating cost. Water requirements are met by a closed system that recirculates 132 m^3/minute to the Highland milling complex from the tailings ponds, with new water added when necessary from surface water runoff, deep wells, or the Thompson River. Aggressive reclamation of mined areas has been under way in cooperation with the Provincial Mines Department. Gross revenue was about $350 million/a.[4]

Finally, in British Columbia, PRM Resources Ltd. contemplated a $440 million smelter and refinery project at Kitimat. The company planned a complete feasibility study for a 200,000 mt/a operation to process both Canadian and offshore concentrates, rather than shipping British Columbia copper concentrates to Japan as has been customary. Although Japanese charges for treatment and refining had been agreeable in the past, their marked increase during 1991 encouraged the new approach and seemed to increase the likelihood of success for domestic processing.

Hudson Bay Mining & Smelting Co. Ltd. (HBM&S) continued exploration of its high-grade zinc-copper mineralization zone beneath the existing workings of the Trout Lake Mine, owned jointly with Granges Inc. and Manitoba Minerals Resources Ltd. Further discovery in 1991 centered on the new No. 10 lens, which would combine with previous discoveries to extend mine life for a number of years. In a new development, HBM&S was acquired by Minorco, based in Luxembourg, for about $87.3 million. Minorco then instituted a $163 million modernization program at HBM&S's Manitoba metallurgical complex, which faced closure by new Canadian antipollution laws to become effective in 1994.

Near the end of the third quarter, Inco announced the suspension of production at its Creighton No. 3 Mine as well as several other small deposits near the main Garson Mine and the Whistle open pit, all of which will cut Inco's annual Sudbury copper production by about 4%. At the same time, Inco announced discovery of two high-grade copper-nickel-precious metal ore bodies in the Sudbury district. On the northwest rim of Sudbury Basin, the Victor deposit shows reserves thus far of more than 4 Mmt grading 7.3% copper, 2.25% nickel, and 13 g/mt precious metals, with the richest zone below 2,440 m. Between the Levack and McCreedy East Mines, the second deposit shows reserves of 4.2 Mmt grading 11% copper, 0.8% nickel, and 12 g/mt precious metals.

Settlement was reached between Aur Resources Inc. and Louvem Mines Inc. in 1990 as to ownership of the Louvicourt property near Val d'Or, Quebec, containing an estimated 37 Mmt grading 3.6% copper, 1.59% zinc, 21.3 g/mt silver, and 0.09 g/mt of gold. Louvem's share of ownership was 45%, while Aur's share increased to 55%. Aur announced in late 1991 that development originally projected at somewhere between $125 and $175 million would instead be closer to $285 million, with production starting probably in 1994. Output was targeted at 55,000 mt/a of contained copper and 17,000 mt/a of zinc, plus significant amounts of gold and silver.

Falconbridge Ltd. pressed the exploration of its Raglan copper-nickel deposit in the Ungava region of Quebec, with reserves thus far projected as 16 Mmt grading 3.13% nickel and 0.88% copper.

Gold.—Canada produced almost 179 tons of gold in 1991, up smartly from the output of 169 tons the year before, but not changing Canada's position as fifth in world production behind the Republic of South Africa, the United States, the U.S.S.R., and Australia. Based on a quoted average price of $362 per ounce, or about $11.64 per gram, the value of production was $2.04 billion, up 2% from that of 1990. As in the previous year, about 80% of the gold produced came from 60 primary gold mines.

Gold prices during the year, generally in the mid-$300 range, were soft compared with those in previous years. Downward pressure was exerted on prices by a combination of factors, including the relief of apprehensions concerning the Gulf War, continuing sales by socialist countries, relatively high interest rates in some industrialized nations, and strong production from the mines of various Western countries. Gold mining companies in Canada, as elsewhere in the world, looked hard at their cash-flows and break-even points.

Costs were reexamined, along with tonnages, grades, and mining plans. A return to anything near the soft prices of 1982 did not seem likely, but was nonetheless a concern to most companies.

Placer Dome Inc. declined to proceed with development of the Eskay Creek property after a protracted negotiation with Corona Corp. that reduced the complexity of interlocking ownerships to a straight 50-50 agreement. Following an intensive review, Placer Dome concluded that an estimated capital cost of $183.3 million for production of a projected 7,776 kg/a of gold plus ancillary silver was not to its financial liking. The deposit has been characterized as 1.15 Mmt of ore grading 59.8 g/mt of gold and 2,405 g/mt of silver. Corona conceded a 22% joint-venture interest to Placer Dome, undertook an $8.7 million feasibility study, and aimed for production beginning in 1994 or 1995. Corona actually controls the property through two subsidiaries, Prime Resources Inc. and Stikine Resources Ltd.

Placer Dome was also reexamining its options on its Mount Milligan property, a large, low-grade copper and gold deposit likewise in British Columbia. Upon acquisition in 1990, the ore body was estimated at 313 Mmt grading 0.20% copper and 0.53 g/mt of gold. After 18,900 m of new drilling, however, the deposit was projected to be 329 Mmt grading 0.22% copper and 0.40 g/mt of gold. Study indicated that excluding acquisition costs, already written off, the positive net cash-flow would nonetheless involve a return insufficient to justify the $390 million to $480 million capital investment required for development.[5]

In the Northwest Territory, NorthWest Gold Corp., a subsidiary of Northgate Exploration Ltd., put its Colomac Mine on a care-and-maintenance basis in June of the year. The mining of low grades, and low recoveries, combined to increase operating costs in the face of lower gold prices. The company had not been able to arrange refinancing, although it had produced about 4,666 kg of gold in approximately 1 1/2 years of operation.

In Ontario, four mines closed in 1991. The Renabie Mine, owned by Corona Corp. (55%) and American Barrick Resources Corp. (45%), had been reactivated four times since 1941 and produced 35 tons of gold altogether. The mine was closed near the end of the third quarter as the result of weak prices, declining reserves, lower grades, and rising costs. In the Timmins area, Eastmaque Gold Mines closed its Eastmaque Mine. The Goldpost Mine, owned by Goldpost and St. Andrew Goldfields, was also closed. The Bell Creek Mine, owned by Canamax Resources Inc., was closed in October as the result of high operating costs in the face of lower prices. Shortly afterward, Falconbridge Gold Corp. said that it would purchase the Bell Creek Mine and mill for $4.37 million and would reopen the mill sometime in 1992 to process ore from Falconbridge's nearby Hoyle Pond Mine.

In spite of gold mine closures, Ontario's total production of 77 tons of gold in 1991 was down only 4% from that of 1990. More than 50% of Ontario's production was from the three mines in the Hemlo district. Near Virginiatown, the Cheminis gold operation came on-stream at midyear at a cost of $11.4 million. Owned by Northfield Minerals Inc. (78.5%) and Towerland Properties Inc. (21.5%), the Cheminis ore body is projected at 300 Mmt containing 5 g/mt of gold. The mine was expected to produce between 311 kg and 467 kg of gold per month at a reported cost of $262 per ounce.

Gold production in Quebec enjoyed a good year in 1991, having increased 28% overall to 51.9 tons in the midst of four new mine openings and two significant closures.

Cambior Inc. commissioned the Mouska Mine in Bousquet Township, its third new mine in as many years. In the Joutel area, Agnico-Eagle Mines Ltd. opened its Eagle West Mine, less than 1 km west of the company's Eagle shaft. Two other startups included the Simkar Mine owned jointly by Explorations Ronrico Inc. and Mines d'or Louvicourt Inc. as well as the Norlartic Mine owned by Aur Resources Inc. (70%) and Ressources Nova Cogesco Inc. (30%).

Although Aurizon Mines Ltd. closed the Sleeping Giant Mine, 65 km north of Amos, Quebec, in the midst of gold price weakness, Cambior Inc. began a 3-year $10.5 million exploration program to earn a 50% interest in the property. Near yearend, it was disclosed that new drifting on the 295-m level cut mineralized zones from which wall sampling yielded 2 m grading 24.3 g/mt gold, 3 m of 31.5 g/mt, and another 2 m yielding 21 g/mt gold.

Iron and Steel.—Production of iron ore dropped slightly in 1991, decreasing to 35.96 Mmt from 36.44 Mmt the previous year, a drop of 1.6% compared with the 10% drop from 1989 to 1990. Employment throughout the iron ore mining and processing industry dropped to 5,900 from 6,200 the previous year and 6,900 in 1989. After closure of two mines the previous year imports of iron ore from the United States were substantial at 5 Mmt, which represented 40% of total consumption of iron ore by Canadian steel plants in 1991. At best, 8 blast furnaces operated in 1991 compared with 10 in 1989.

About 37 Mmt of concentrates and products was shipped during the year, the largest category having been 15.2 Mmt of concentrates not further processed. Shipment of acid pellets was 14.2 Mmt; fluxed pellets, 5.9 Mmt; sinter, 1.2 Mmt; and chips, 0.1 Mmt. The 1991 drop of between 11% and 12% in U.S. crude steel production accounted for a 19% drop in iron ore pellet shipments to the United States.

Following the closure of the Iron Ore Co. of Canada (IOC) Schefferville Mine in Quebec, the Adams Mine at Kirkland Lake, Ontario, and the Sherman Mine at Temagami, Ontario, all in the past year or two, only four principal iron mines remained operating in Canada. Three of these were in Quebec or Labrador, including Quebec Cartier Mining Co. (QCM) at Mt. Wright; IOC at Carol Lake, Labrador; and Wabush Mines at Wabush, Labrador, and Pointe-Noire, Quebec. The fourth mine was Algoma

Ore Div. of the Algoma Steel Corp. Ltd. in Wawa, Ontario. Some additional concentrates have been produced on a much smaller scale, averaging about 75,000 mt/a, in British Columbia.

Production of pig iron increased 13% to about 8.3 Mmt, somewhat better than that in 1990 but significantly less than the 10.1 Mmt of 1989. Crude steel output increased approximately 6% to about 13 Mmt in 1991, but again, not very close to the 15.5 Mmt of 1989. Production of ferroalloys was estimated at 249 kmt for 1991, up about 4% from that of 1990. Labor problems at Algoma, QCM, and Wabush in 1990 were settled, generally with enhanced income and benefits for their respective workers, but in 1991 created an added increment of cash outgo for each company. The effects of economic recession in both Canada and the United States, and weaker demand in world markets, afforded less than a robust year for iron and steel production in Canada.

Lead and Zinc.—Production of lead from Canadian mines rose, for the first time in 4 years, from 241,277 tons in 1990 to 278,141 tons in 1991, an increase of 15%. The gain was primarily the result of the resolving of labor disputes and production problems, and not an indication that lead was leading the industry out of economic recession. Output of primary and secondary refined lead jumped from 183,645 tons in 1990 to 211,304 tons in 1991, also a gain of 15%, in spite of the weakening of LME average lead prices quoted at 37 cents per pound in 1990 and at 25 cents per pound in 1991. Mine production of zinc fell from 1,203,161 tons in 1990 to 1,148,189 tons in 1991, or about 4.6%, but output of refined primary zinc managed a solid gain from 591,788 tons in 1990 to 660,552 tons in 1991, an increase of almost 12%, while LME zinc prices quoted at 69 cents per pound in 1990 sagged to 51 cents per pound quoted in 1991. Production cutbacks, mine closings, and transportation problems all played a role in the decrease of mine production of zinc, but Canada remained the leader in production of zinc concentrates by furnishing better than 20% of the Western World's supply.

Brunswick Mining and Smelting Corp. Ltd.'s Bathurst operations, which encountered difficulties stemming from both labor disputes and technical problems, reached contract settlement in May with the 1,100 miners and 470 Belledune smelter workers involved. A full production rate of 10,500 mt/d was achieved by the end of July, but the work force had to be reduced by more than 10% to reduce operating costs. The company also switched to more economical blasthole open-stope mining from cut-and-fill methods in the lower levels where increased rock stress required bulk mining methods.

A rather unusual waste recovery operation at the Belledune smelter involved the processing of 15,000 tons of lead-contaminated soil from an industrial site near Halifax. Transported by rail to the smelter, the soil was composed of as much as 1% lead and about 50% silica as flux.

Cominco Ltd.'s Sullivan Mine reopened at Kimberly, British Columbia, which helped offset other declines in zinc production totals. Operations were suspended from January to November 1990, at which time a new labor contract was signed with the United Steelworkers of America.

Problems continued through the year at Cominco's new 160,000-mt/a QSL smelter at Trail, which remained closed. The company had discontinued modifications of the plant and postponed the forthcoming 1991 startup pending tests on similar equipment in Germany. Metallgesellschaft AG froze modification of its 100,000-mt/a QSL lead smelter pending further study of gas injectors and refractory stabilizing systems. Cominco did, however, continue modification of its zinc smelter at Trail for accommodation of concentrates from the Red Dog Mine in Alaska. Late in the year, however, it announced that low zinc prices would force it to operate its zinc refinery at 90% of capacity. By the end of the year Cominco had planned to lay off 266 workers, or 10% of its work force, as a cost-reduction measure.

The Stronsay lead-zinc project 240 km northwest of Fort St. John, owned by Curragh Resources Inc. (70%) and Asturiana de Zinc SA (30%), was slated for development construction in 1992 upon approval of environmental permits. With reserves of 52 Mmt grading 2% lead and 8% silver, plus 42 g/mt silver, the operation was projected to produce 28,000 mt/a of lead in concentrate for about 20 years. The government of British Columbia agreed to provide $32 million in support of transportation facilities for Stronsay, which was expected to cost $122 million overall.

After nearly exhausting reserves at Curragh's Faro Mine in the Yukon Territory, the new Vangorda open pit was put in production in 1991 and, with the nearby Grum deposits, was expected to be able to turn out 200,000 mt/a of zinc in concentrates. Faro produced 189,040 tons of lead concentrates and 359,444 tons of zinc concentrates in 1990. Elsewhere in the Yukon Territory, Curragh (80%) and Hillsborough Resources Ltd. (20%) opened their Sa Dena Hes Mine (nee Mt. Hundere) north of Watson Lake at a cost of about $61 million. Reserves of this underground mine were estimated to be 4.8 Mmt grading 4% lead, 12.7% zinc, and 59 g/mt silver, projected to support production of 30,000 mt/a of lead and 52,000 mt/a of zinc concentrates that would be trucked to Skagway, Alaska, for ocean shipment.

Noranda opened the Norita East Mine at Matagami. Its ore was to be processed at the nearby Mattagami mill, which had no more ore from the Normetal Mine near La Sarre (Exploration Miniere Normetal Inc., 50%, and Exploration Miniere La Sarre Inc., 50%) after the ore body there was exhausted. The Norita East Mine was expected to produce 25,000 mt/a of zinc in concentrates upon achieving full production in 1992. Noranda's Canadian Electrolytic Zinc Ltd. refinery at Valleyfield was hampered by startup problems at its cellhouse as well as a shortage of concentrates from the Brunswick Mine during its extended labor troubles. Putting a good face on it, late

in the year Noranda said that it would hold production below 200,000 mt/a at the refinery because of weak demand for zinc. In the same vein, Falconbridge Ltd. cut zinc production by 20,000 mt/a at its Kidd Creek Mine in Ontario until prices improve.

Mine closures included Noranda Minerals Inc.'s Mattabi Mines Inc.'s mine at Lyon Lake, Ontario, and HBM&S Rod Mine at Snow Lake, Manitoba. Suspensions until demand improves included Breakwater Resources Ltd.'s Estrades Mine near Joutel, Quebec, that had a capacity of 18,000 mt/a of zinc in concentrates and 1,000 mt/a of lead in concentrates. In Nova Scotia, ground water and ground stability problems caused Westminer Canada Ltd. to suspend operations and put its Gays River Mine and associated 800-mt/d mill up for sale, along with the advice that the mine would be viable with new drainage wells and an improved pumping system.

Finally, an era ended when Cominco's Pine Point Mine in the Northwest Territories shipped the last of its stockpiled high-grade lead concentrates to the Naoshima smelter in Japan, owned in toto by Mitsubishi Metal Corp. after the latter acquired Cominco's 45% interest.

Magnesium.—For the second year in a row refinery production of magnesium increased sharply, from 26,726 tons in 1990 to 35,512 tons in 1991, an increase of about 33%. Three Canadian producers had expected to achieve full capacity of 60,000 mt/a sometime in 1991, which would have made Canada second only to the United States in output of magnesium, but events had it otherwise. In September, the Magnesium Corp. of America (Magcorp) filed an antidumping and countervailing duties petition against imports of pure and alloyed magnesium from Canada and Norway manufactured by Norsk Hydro. The countervailing duties petition against Norway was later dropped by the International Trade Council on the basis of insufficient evidence.

Earlier in the year, in April, Magnesium Co. of Canada Ltd. (MAGCAN) closed its newly commissioned 12,500-mt/a plant at Aldersyde, Alberta, because lower prices for magnesium, high interest rates, and a higher Canadian dollar prevented the new smelter from approaching the break-even point. Raw material for this plant came from the Baymag high-grade magnesite deposit near Radium Hot Springs, British Columbia. Startup problems had previously plagued the project, which had only been in operation for 6 months, causing large cost overruns that raised questions as to overall feasibility of the MAGCAN project in light of the drop in quoted magnesium prices from $1.60 to $1.10 per pound.

Timminco Metals, a division of Timminco Ltd., made high-purity magnesium for specialized applications at its 6,000-mt/a plant at Haley Station, Ontario. With purity as high as 99.95%, this company's products were used for alloys with calcium and aluminum, electronic products, and reagents for the pharmaceutical industry. In June of the year, owing to decreased demand, Timminco reduced production capacity to 4,000 mt/a for an indefinite period and laid off 100 workers.

By the time of Magcorp's filing in September, deep discounts were being offered in light of lowered demand and large inventories overhanging the market. Trades occurred in Europe at prices as low as a reported $0.90 cents per pound. In November, Norsk Hydro left the International Magnesium Association (IMA), taking Norsk Hydro Canada, based in Quebec, along with it. During the same month the company also cut production at its plant in Becancour, Quebec, from a rate of 35,000 mt/a to 20,000 mt/a.

In December, the U.S. Department of Commerce issued a preliminary ruling that exports of magnesium from Canada were subsidized below fair market price. Representatives of Greenpeace iterated themselves into the situation, reporting that secret contracts between Norsk Hydro and Hydro-Quebec showed that the latter was selling electricity to the magnesium producer at less than 1.5 cents per kW·h, significantly below the utility's cost of 2.4 cents per kW·h. Little short of universal umbrage was expressed in the newspapers of Quebec, with comment reflecting irritation with the United States-Canada Free Trade Agreement itself and very pointed dissatisfaction with the apparent results, including not only magnesium but other commodities Canada had been accused of dumping. The Canadian trade minister said that the ruling would be challenged within GATT and that U.S. legal counsel had been retained. At yearend, the dispute had developed undertones concerning Quebec's economic future and the desirability of overturning the FTA.

Nickel.—Although mine production of nickel was up slightly, from 196,225 tons in 1990 to 196,868 tons in 1991, demand was soft throughout the year. Prices sagged as production plus exports from the U.S.S.R. increased somewhat. Reduction of output in the latter half of the year by both Falconbridge and Inco tended to brake the downward trend of prices, but LME spot prices nonetheless slipped from a quotation of $4.41 per pound in January of 1991 to a quoted $3.20 per pound at the end of the year.

All this was after quoted average prices per pound had dropped from $6.25 in 1988 and $6.04 in 1989 to $4.03 per pound in 1990. Quoted LME price highs were about $8.72 during the first quarter of 1989, so that in the 3 years from the beginning of 1989 to the end of 1991, world nickel prices dropped almost 65% while the industry sought ways to cope. Production was cut, but exploration continued.

In April, Falconbridge described plans for the second stage of exploration at its wholly owned subsidiary, New Quebec Raglan Mines Ltd. in the Ungava region of northern Quebec. With reserves estimated at 17 Mmt grading 3.13% nickel and 0.88% copper plus some platinum-group metal (PGM) values, the deposit was to be further explored by construction of a ramp and 2,000 m of further underground development along with 60,000 m of definition drilling. Other effort would be directed toward developing the local infrastructure for the mine.

In early May, Timmins Nickel Inc. agreed to provide $1.31 million to Dumont Nickel Corp. for a first-phase test program of the Dumont nickel property near Amos, Quebec, which would earn Timmins a 55% stake in the development. A further 20% could be earned by Timmins if Dumont declined participation in a more extensive study involving bulk sampling and a pilot plant. The property is near a highway, railway, powerline, and natural gas pipeline, all of which would reduce costs of new infrastructure. By yearend, the deposit was projected at more than 500 Mmt with a grade of 0.39% nickel.

At midyear, Inco announced a 5-year capital spending budget of almost $400 million to raise average grade, lower unit costs, and expand total output. New mining technologies would be introduced, and higher grade mines would be brought into production, including the Lower Coleman and McCreedy East projects. The McCreedy East operation was expected to be Inco's most productive mine at Sudbury.

In August, it was reported that Sherritt Gordon, badly needing nickel sulfides to satisfy unused capacity at its refinery in Fort Saskatchewan, Alberta, had entered into an agreement with the Government of Cuba to purchase nickel matte. Cuba had difficulty raising enough cash to obtain fuel for its nickel refineries owing to political and economic troubles in the U.S.S.R. and was also unable to carry out the planned expansion of its nickel refining capacity because its former partner, the German Democratic Republic, ceased to exist. The tradeoff in the Sherritt Gordon arrangement is the cost of transporting nickel sulfides from Cuba to Alberta and the inability to sell any of its product in the United States because of the U.S. trade embargo on Cuban materials. After operating at about 60% of capacity and finally closing down for 1 month in 1990, Sherritt was able to reach 90% of capacity in 1991.[6]

In August and September, both Falconbridge and Inco announced production cuts, the former reducing the rate of output between 10% and 15% at its Nikkelwerk refinery in Norway as well as shutting down one of its two furnaces at Falconbridge Dominicana, thereby cutting output by 50% in the Dominican Republic. Inco announced it would "cut its nickel production by 10 million pounds for the balance of 1991." It added that production was to be suspended at the Creighton Mine, at several small deposits adjacent to the Garson Mine, and at the Whistle open pit, which was being mined by an outside contractor. Development of Inco's new McCreedy East Mine at Sudbury, begun in 1989, was also suspended.[7]

On the positive side, Inco announced in late September that it had discovered two new nickel deposits in the Sudbury Basin. One of these, in the Levack area, is 915 m from the McCreedy East Mine, 1,100 m to 1,525 m below surface, and has an estimated 4.6 Mmt grading 11% copper, 0.8% nickel, and 10.6 g/mt of precious metals. The second discovery, called Victor, is 25 km from Sudbury on the northeast rim of the basin at a depth of 2,400 m below surface and contains an estimated minimum of 18 Mmt grading 7.3% copper, 2.25% nickel, and 11.57 g/mt of precious metals. Because of the depths of the two new deposits, it was thought that higher nickel prices might be required to justify development.

In late November, Inco's Port Colborne, Ontario, refinery sustained a breakdown of one of its two furnaces producing utility nickel, putting it out of action until sometime in 1992 at the earliest. The furnace had been scheduled for relining in March 1992, after 120 melts, but broke down on melt 59. Meanwhile, the second furnace was undergoing scheduled relining, so that production was completely interrupted. No injuries or damage to the refinery building occurred.[8]

Platinum-Group Metals.—Output of PGM dropped slightly from 11,709 kg in 1990 to 11,532 kg in 1991, a decrease of 1.5% that represented captive recovery from nickel rather than response to market conditions. Most Canadian production is by Inco or Falconbridge from their Sudbury mines, plus a minor amount in Manitoba from Inco's Thomson Mine, the HBMS Namew Lake Mine, and Outokumpu Mines at Flin Flon.

As a rough cut, based on corporate reports, Inco's ratio of PGM produced worked out to about 14:10:1 for the group members palladium:platinum: rhodium. Although rhodium amounted to only one-twentyfifth of the PGM, prices had tripled to $3,620 in 1990 and then reached $3,982 in 1991 before dropping to below $64,300 per kg at the end of the year.[9]

The new nickel discoveries by Inco in the Sudbury Basin boded well for the PGM outlook; the Victor discovery contains an estimated minimum of 18 Mmt grading 11.6 g/mt of PGM plus gold. The McCreedy discovery contains 5 Mmt grading 10.6 g/mt of PGM plus gold. In the meantime, production startup was expected in mid-1992 of the Madeleine Mines' Lac-des-Iles property in northwest Ontario, which was projected to be able to produce 4,665 kg/a of PGM.

Silver.—Although prices for silver have been weak since the runup at the beginning of the 1980's, they hit a 17-year low of $115.10 per kg in February of 1991 before recovering somewhat for the remainder of the year. In the midst of adequate inventories and virtually stagnant demand, silver production in Canada declined from 1,501 tons in 1990 to 1,338 tons in 1991, a difference of about 11%. Silver is commonly a byproduct of gold and base metal mining and subject to whatever mining incentive applies to the major product, whether this be gold, copper, or lead-zinc. Accordingly, silver output suffered as mines closed for reasons involving supply, demand, and prices for other major mineral commodities.

Canada's largest primary silver producer, the Equity Silver Mine in British Columbia, was expected to close on exhaustion of reserves in 1992. Postclosure reclamation costs had been negotiated with the government of British Columbia, and the company, Equity Silver Mines Ltd., placed a $28 million bond to cover effluent treatment costs

after closure, plus a $4.8 million security payment against waste-dump and plant-site restoration. Reclamation work proceded during the year while the mine operated at its capacity of 10,000 mt/d, slated to last until open pit reserves are depleted in mid-1992 and the mine closes in the fall of that year. A feasibility study was under way to determine whether the mine's life could be extended by further reserves underground.

Elsewhere in British Columbia, Treminco Resources Ltd. cut its production by 33% and its work force by 50% as the result of lack of demand and weak prices. The Samatosum Mine near Kamloops, owned jointly by Minnova Inc. (70%) and Rea Gold Corp. (30%), produced 133 tons of silver in 1990, its first full year of operation. Development drilling in 1991 showed 80,300 tons of reserves grading 1,022 g/mt silver, 1.7 g/mt gold, 1.2% copper, 2.9% zinc, and 1.7% lead, but the mine is scheduled for closure in October 1992 after open pit and underground reserves are consumed.

Tin.—The only tin mine in North America, Rio Algom Ltd.'s mine at East Kemptville, Nova Scotia, was scheduled for closure in early January 1992, according to the company's announcement in September 1991. Low tin prices and a high Canadian dollar combined to make the operation unprofitable. A plan for keeping the mine in operation was presented by company management to the government of Nova Scotia and to the labor union, but foundered because such issues as reclamation could not be resolved. The mine had been opened 2 weeks before the collapse of the world tin cartel in 1985, which devastated prices and marked the start of the doldrums for tin mining that enter their seventh year in 1992.

Uranium.—The downward trend in uranium output continued. Canada produced 9,124 tons of U_3O_8 during the year, about 12% less than the 10,342 tons produced in 1990. A combination of falling prices and continuing oversupply weakened the market and in turn the incentive to mine uranium. Prices fell to an alltime low of $15.95 per kg in October, and the U.S.S.R. appeared as a new supplier on the world scene.

After a 2-year shutdown, Cameco Corp. started milling again at Rabbit Lake, Saskatchewan, as marketers brought in new export contracts for 8,300 tons of uranium. Feed was in the form of stockpiled ore from the Collins Bay B deposit, mined out in the early part of the year. Quantity-flexibility clauses were incorporated into most of the contracts in keeping with marketing trends over the past few years.

Construction of an underground decline at the adjacent Eagle Point property continued, with the expectation of encountering the ore body well into 1992. Cameco stepped up mining of the Deilmann pit at Key Lake, aiming to mine out the pit so as to use it for tailings impoundment. When Key Lake ore is exhausted, the mill may switch to processing ore from MacArthur River. Cameco began privatization of the company by selling more than 10 million shares aggregating about $115 million. Together with a subsequent warrants offering, these sales to the public saw Cameco approaching approximately 38% public ownership.

Environmental concerns forced the government of Saskatchewan to refer six new uranium mining projects to independent panels for review. Five of these were to be reviewed by a joint Federal-Provincial panel, including (1) the extension of Cluff mining operations to develop the South and West Dominique-Janine deposits, (2) the South McMahon Lake Denison/Midwest joint-venture project, (3) Minatco's McLean Lake project, (4) the Cigar Lake project at Cigar Lake, and (5) Cameco's McArther River project. The sixth project, expansion of Cameco's Rabbit Lake operation to include Eagle Point/Collins Bay A and D deposits, was to be reviewed by a Federal panel only, in that tentative approval had already been granted by Saskatchewan officials.

In Ontario, Dennison Mines disclosed that Ontario Hydro had given Notice of Termination of its uranium supply contract to take effect on January 1, 1993, and announced that accelerated deliveries would allow production and work force levels to be sustained until closure in about the second quarter of 1992.

Ontario Hydro also agreed to continue the current contract with Rio Algom's Stanleigh Mine to 1996, but not to 2020 as had been originally stipulated. Stanleigh personnel were also working in asset disposal and environmental decommissioning activities stemming from the Quirke and Panel Mine closures the previous year. Ontario Hydro, joining previous efforts by the Province and the Federal Government, offered almost $80 million to help the Elliot Lake community change from dependence on uranium mining to a more diversified economy.

Other Metals.—Antimony production decreased from 658 tons in 1990 to 625 tons in 1991, primarily because Dominion Explorers Inc. closed its Durham Mine at Lake George, New Brunswick, the previous year. In spite of the fact that this was the only primary antimony mine in North America, oversupply from China caused price deterioration to the point at which profitability disappeared.

Canadian molybdenum production amounted to 11,333 tons in 1991, down about 5.5% from that of 1990. Although reserves had been turned around as both tonnage and grade were increased at Canada's only primary molybdenum producer, Placer Dome Inc.'s Endako Mine in British Columbia, lower demand and oversupply led to inventory accumulation and lower prices.

Industrial Minerals

Asbestos.—Despite rising prices for asbestos during the year, a 2.3% decrease in production, or 670,000 tons compared with 686,000 tons in 1990, resulted mostly from mine closure and production difficulties underground. Demand continued to weaken for short fibers.

At long last, in October, the U.S. Fifth Circuit Court of Appeals (New Orleans) handed down a judgment on the Environmental Protection Agency (EPA)

final asbestos ban rule issued in July 1989. The EPA had expected to ban 96% of current asbestos uses and phase them out by 1997, but the court remanded the rule on grounds that the EPA had failed to muster substantial supporting evidence in justification of the rule. The court criticized the EPA for failing to implement the dictates of the Toxic Substances Control Act as intended, and for failing to evaluate the toxicity of likely substitutes. The EPA was given until February 1992 to take its case to the U.S. Supreme Court.

Following restructuring, Princeton Mining Corp. had become the owner of Cassiar Mining Corp. and its McDame Mine in British Columbia. Stockpiled material from the open pit was used for mill feed while the operation switched to material from the underground McDame ore body. McDame produced mill feed at a rate of between 1,500 and 2,000 mt/d by the end of 1990, but problems at that time with tailings disposal caused suspension of the wet-process operation. The transition of the mine to underground extraction led to various difficulties, the first of which was block caving. This mining method brought down blocks that were too large to handle, so the company installed an underground crusher. Subsequent problems compelled Princeton to seek court protection, and it was granted 90 days from October 15, 1991, to reorganize. Cassiar was also forced to find new underground reserves or face total depletion sometime in 1992.

In early February, the Baie Verte Mines Inc. open pit operation at Baie Verte, Newfoundland, closed after 27 years of production and resulted in the loss of 390 jobs. Teranov Mining Corp., the owner of the wet milling process, was given access to one of the open pits for tailings disposal. The legal dispute continued between Princeton Mining Corp., which owns 55% of Baie Verte Mines Reprocessing Inc. (BVMRI), and Cliff Resources Corp., which owns 45% of BVMRI. The latter company owned the new wet-process plant and technology, but defaulted on a $3.5 million loan from Princeton, which appointed Coopers & Lybrand as receivers. Teranov Mining Corp. bid successfully for BVMRI and began producing in July of the year. Although forced to shut down temporarily at the end of the year because of frozen tailings, the wet process was expected to extend operations at Baie Verte for 15 to 20 years.

Cement.—Production of cement, at 9.4 Mmt, dropped from 11.7 Mmt in 1990 and 12.6 Mmt in 1989, probably reflecting the general economic recession and a decrease in housing starts. An interconnected North American cement market has been developing for a number of years. Marine transportation at low cost has attracted buyers to sellers to such a degree that 23% of U.S. cement consumption has been from Canada during the period 1988 to 1991. Particularly affected States were Michigan, Minnesota, New York, Vermont, and Washington. Both cement and clinker were competitive in the American market because of Canadian production efficiency and the relatively strong American dollar. Mexican cement penetrated markets in the U.S. South and Southwest, but in 1990 the U.S. International Trade Commission imposed antidumping duties of up to 58% on all Mexican cement.

A progressive restructuring of the cement industry in Canada in the past few years has resulted in decentralization and diversification, but also increased foreign control, estimated to approximate about 80% of capacity. Belgium's S.A. Cimenteries CBR owned Inland Cement Ltd. France's Societe des Ciments Francais (SCF) owned both Miron Inc. and Lake Ontario Cement Ltd. (LOC). SCF uses "ESSROC" to identify all of its companies in both Canada and the United States, so that LOC also uses ESSROC Canada Inc. as its name.

St. Lawrence Cement Inc. (SLC), in Quebec, the major producer of cement as well as concrete and aggregates in eastern Canada, allied itself with Philips Environmental Services, a waste management company that provided a variety of products, including supplemental fuels and less costly substitutes for some cement raw materials. SLC operated its Resource Recovery/Refuse Derived Fuel (RDF) project with plans to replace up to 20% of its coal requirement by RDF made from nonhazardous municipal waste.

Fluorite.—After the St. Lawrence Fluorspar Ltd. mine in Newfoundland closed in November 1990, it was kept on pumps until April 1992, when the pumps were finally turned off. Estimates were that the mine could be pumped out again in about 2 weeks, but hope had waned that the mine could be sold as a stand-alone operation after the owner, Minworth Group PLC of the United Kingdom, went into receivership. The ore occurs in veins 1 to 5 m wide and grades about 42% CaF_2. Proven reserves amount to 5 Mmt, with an additional 8 Mmt probable.

Graphite.—Societe d'Exploration Miniere Mazarin Inc. planned to bring its Lac Knife graphite deposit, in eastern Quebec, into production sometime in 1991. The deposit comprises 8.1 Mmt of ore grading 16.7% Cg (carbon in the graphite structure), with the relatively uniform graphite grain-size distribution running fairly constant. The open pit mining plan projects production of 23,000 mt/a for a period of 60 years. Capital of about $28.5 million is estimated to be required to bring the project to production.[10]

Gypsum and Anhydrite.—At approximately 7.3 Mmt produced in 1991, output of gypsum dropped about 8.5% from that of the previous year, reflecting ongoing weakness in the construction sector. Production is primarily by subsidiaries of U.S. companies acting according to demand for wallboard by both U.S. and Canadian consumers in all building categories. Nova Scotia and Newfoundland produced the bulk of Canadian gypsum, plus lesser amounts from British Columbia, Manitoba, and Ontario.

Although gypsum occurs widely in Canada (and the world), the relatively

high unit weight, low unit cost, and vulnerability to damage of wallboard combine to give gypsum products a relatively high place value, discouraging long-distance transportation. Instead, new gypsum industries tend to develop in new localities to serve developing construction requirements. Canadian gypsum extraction and processing operations are commonly subsidiaries of U.S. gypsum manufacturers such as USG Corp. and National Gypsum Company.

U.S.-based Louisiana-Pacific Corp. finished its $57 million fiber-gypsum board plant at Port Hawksbury, Nova Scotia, which began operation at less than capacity. It used local gypsum, imported perlite, and recycled paper to produce board for both the regional and export markets.

Domtar Inc. completed its $17 million mine project to support the company's board complex at the same site at Caledonia, Ontario. Continuous mining machines were to be used to extract material from gypsum reserves thought to be sufficient for 75 years. Domtar's Surrey, British Columbia, plant was the first in North America to use large quantities of reclaimed and recycled wallboard. Through an arrangement with a reclaimer, Vancouver's New West Gypsum, Domtar was using about 75% scrap from construction sites and 25% waste from wallboard plants.

At Hagersville, Ontario, CGC Inc., partly owned (75%) by USG Corp. of Chicago, continued its 6-year expansion program intended to develop sufficient reserves of raw material to ensure output of 650,000 mt/a of finished products.

Potash.—Production of potash dropped in 1991 to 7.012 Mmt from 7.345 Mmt the previous year, a difference of about 4.5% that reflected weakened demand, high inventories, and soft prices. This level of output was significantly less, by more than 1 Mmt, than the recent high of 8.328 Mmt in 1988. Total Canadian capacity was projected to be about 11.8 Mmt/a K_2O. A worldwide oversupply of potash, likely to continue for several years, has depressed the mining incentive of many producers, both in Canada and the remainder of the world.

The Province of Saskatchewan took what amounted to the final step in privatization of its Potash Corp. of Saskatchewan (PCS). A group of Canadian underwriters paid the Province about $120 million to acquire special warrants that will be exchangeable into 7,301,133 common shares at $16.37 per share. The PCS privatization began in 1989 when it first went public, amidst much political controversy, and has been done in stages since then as the first publicly traded potash supplier in Canada. Excluding some acquired concessions, PCS owned rights to a reported 575,000 acres in Saskatchewan, thought to contain reserves of 4.3 billion tons of 22.8% K_2O.

PCS and International Minerals & Chemicals Corp. (Canada) Ltd. (IMC Canada), which is wholly owned by IMC Fertilizer Group Inc., extended their 5-year mining and processing agreement at Esterhazy, Saskatchewan. PCS was to have the right to option a 25% share of equity in any new venture, such as a mine. IMC Canada would submit an environmental impact statement for a replacement mine near Esterhazy, to be evaluated by the Provincial government probably in the early part of 1992. Two shafts were to be sunk over a 5-year period as part of the $450 million plan. A new mine able to produce 4.2 Mmt/a KCl was to be located about 8 km northeast of the existing IMC Canada K2 mine. Existing milling would be used, fed by an 8-km undergound pipeline transporting ore in metal capsules moved by compressed air.

In New Brunswick, in early 1991, the Government initiated a new policy for the acquisition of mineral rights. For potash, the rule allows a prospector, holding a valid prospecting license, to apply for an exploration agreement to seek potash in an area of a minimum of 10,000 and a maximum of 20,000 contiguous ha. At the time of yearly renewal, the total area of search could be reduced, but not to less than 10,000 ha. Annual increases in work/assessment requirements were to start at $55,000 in year one. Other requirements were to escalate in similar fashion, but the exploration agreement could be extended yearly provided all terms and conditions were satisfied. It was intended that the new law would make potash more attractive as an exploration target.

Under Saskatchewan's new tax plan all companies were to be liable for a base payment of about $9.45 per ton of K_2O sold, plus a progressive profit tax ranging from 15% to 50%. Although the base payment and profit taxes would be adjusted for inflation each year, the Crown and freehold royalties were to be deductible against the base payment. Other credits could be given for research and development costs and market development costs. The base payment was to shift upward to about $9.75 per ton the first day of 1991.

Sulfur.—Production of elemental sulfur increased more than 5% to 6.23 Mmt for 1991, representing output from sour natural gas, petroleum refineries, and tar sands. In addition to these sources, smelter gases accounted for an additional 726,000 tons, for a total of 6.956 Mmt from all sources. Canada thus became the world's second largest producer of elemental sulfur, with a 16% market share, and continued as the largest exporter with a 38% share of global trade. About 52% of U.S. imports of sulfur during the period 1988-91 was supplied by Canada.

New drilling and natural gas production feeding processing facilities accounted for an increase in sulfur production, but this was partly compensated by the decline of gas production from established reservoirs. After potash, asbestos, and salt, the sulfur industry ranked fourth in value of production of industrial minerals, down from second position the previous year. Altogether the Canadian sulfur industry in 1990 accounted for 1,300 jobs directly, including sulfur forming, handling, transportation, marketing, and sales.

Perhaps the most significant event of 1991 in the sulfur industry of Canada was the formation of a new offshore sulfur export marketing organization christened

PRISM Sulfur Corp. and owned by 30 western Canadian sulfur producers. The nine that founded the venture were Amoco Canada Petroleum Co. Ltd., Canadian Occidental Petroleum Ltd., Chevron Canada Resources, Gulf Canada Resources Ltd., Husky Oil Operations Ltd., Mobil Oil Canada, Petro Canada, Shell Canada Ltd., and Suncor Inc. PRISM called itself a stand-alone corporation, providing offshore export marketing services to its producing companies, organized along the lines of other export associations in the fertilizer industry such as Canpotex for potash and PHOSCHEM for phosporous. The company declared itself bound to its suppliers by two fundamental agreements—a shareholders agreement and a sulfur supply agreement. The sulfur supply capability of PRISM's 30 shareholders comprised more than 4 Mmt/a and was expected to expand to 5 Mmt/a in 1993 with the startup of the Caroline Project. Shell Canada Ltd. had initiated this operation at the Caroline Gasfield, 100 km northwest of Calgary, where its production was running about 35% H_2S with reserves of 25 Mmt of sulfur.

PRISM operated at first out of offices in both Calgary, Alberta, and Vancouver, British Columbia, but after midyear consolidated its staff of 18 people in Calgary, where they would execute its business plan and provide administrative and logistical support to the overall venture.

Another project, for evaluation of the technical and economic feasibility of extracting commercial sulfur from super sour gas, had been planned by Shell Canada Ltd., Mobil Oil Canada Ltd., PanCanadian Petroleum Ltd., and Norcen Energy Resources Ltd. as they started up the $56 million Bearberry pilot plant near Sundre, Alberta. This 224-mt/d recovery plant was to process 90% H_2S sour gas for sulfur extraction from reserves projected at between 70 Mmt and 100 Mmt. In early 1991, Shell Canada Ltd. and two partners, Canadian Hunter Exploration Ltd. and Conwest Exploration Co. Ltd., reported a sour gas discovery close to the Caroline Gasfield that, at 46% H_2S, exceeded even Caroline's 35% H_2S. Shell announced capital investment of close to $1.05 billion, including about $355 million for furthering the Caroline natural gas development project, including a new sulfur pellet-forming plant at Shantz that of itself employed 1,540 workers on-site.

Near the beginning of the year Shell bought out Gulf Canada Resources Ltd.'s original working interest in the Caroline Gasfield for $87 million, thus increasing Shell's share from 60% to approximately 70%.

Other Industrial Minerals.—Production of lime, at 2.336 Mmt, was virtually unchanged from the previous year's 2.341 Mmt, and not much change was foreseen in 1992 as long as steel-industry demand remained weak. During 1991, the lime industry included 14 companies that operated 20 plants, 13 of them in eastern Canada. Employment settled back to about 900 jobs, still above the average of 810 since about 1961.

Production of *salt* reached 11.585 Mmt in 1990, an increase of more than 3% from that of the previous year, reflecting in part a return to normal production after a 1990 strike that crippled production at Canadian Salt Co. Ltd. for 6 months. Canada ranked about fifth in world salt production and was the leading foreign supplier to the United States. Production capacity overall was 70% rock salt, 23% captive brines, and 7% evaporated salt. The pulp and paper industry furthered its switch of bleaching processes away from chlorine technology. Some mills reduced chlorine usage by adopting other bleaching processes, including extended lignification, oxygen delignification, sodium chlorate bleaching, integrated chlorine dioxide with hydrochloric acid recycling, and ozone and hydrogen peroxide bleaching.

Output of *silica* eased to an estimated 2 Mmt in 1991, a drop of about 11% that was generally blamed on the economic recession rather than any significant change in the industry. Widely produced in Canada, silica is meeting competition from plastics in the glass container market, but new opportunites were on the horizon, including cultured quartz for electronic oscillators, chemical-grade silica for silicones, monocrystalline silicon for silicon chips, refined silicon carbide for advanced ceramics, and fused high-purity silica for other chemical and electronic uses. A cultured quartz plant was under construction at Trois-Rivieres, Quebec.

For reasons probably involving weakening of the construction industry during the year, production of all types of *stone* fell from 111.4 Mmt in 1990 to 85.8 Mmt in 1991, a decrease of slightly more than 23%. Categories of stone for construction included granite, sandstone, limestone, slate, and marble. Common uses were aggregate for concrete, crushed stone for paving, dimension stone and other masonry, roofing, finishing or facing stone (with which Canada is well endowed), and stone for pulverizing and chemical uses.

Mineral Fuels

Coal.—Production of Canadian coal and lignite, totaling 71.1 Mmt, was up 4.1% from that of the previous year, thus improving in 1991 to about the same degree that it had shrunk in 1990. Value of production was up from $1.57 billion to $1.66 billion. Domestic consumption of coal was essentially by Provincial electric utilities. Although Canada accounted for less than 2% of world coal production, it exported about one-half of its production, making it the fourth largest coal exporter after Australia, the United States, and the Republic of South Africa. These exports consisted mainly of Albertan metallurgical coal shipped to Japan and Korea, where it competed with like volumes of U.S. coal. In eastern Canada, however, domestic coal has to be augmented by imports of U.S. coal, mostly thermal coal, so that Canada is in the unusual position of being both a major exporter and importer of coal. The seeming paradox reflects transportation costs between mines and consumers and is one more example of the natural integration of U.S. and Canadian interest in various mineral commodities, another being cement. After a decade of

declining coal prices gradually edged parts of the coal sector into financial instability, especially exporters in British Columbia, other parts of the country were seeing expanded demand for coal in the near- to mid-term future.

In Nova Scotia, the new Westray coal mine near Stellarton in Pictou County, owned 90% by Curragh Resources Inc., was expected to produce more than 1 Mmt/a and to employ 250 miners upon achieving capacity. Extending offshore under the ocean, this mine was expected to enable Nova Scotian power units to combine advance combustion technology with lower sulfur coal to reduce nitrogen oxides and sulfur dioxide emissions to the atmosphere.

In British Columbia, coal matters were more complicated. One of the largest industrial projects ever undertaken in that Province, the North East Coal Project (NECP), was planned originally in the 1970's as a means of boosting the regional economy. It was developed by the Federal and Provincial governments, two mining companies, the Canadian National Railway, Charbonnages de France International, and a consortium of 55 financial institutions after the signing of a protocol agreement with a Japanese Steel Industry (JSI) group of 10 companies in 1981. NECP included two coal mines, Quintette and Bullmoose, intended to produce 7.5 Mmt/a, an entirely new town, a high-voltage transmission line from the hydropower grid, a rail line, and port facilities at Ridley Island on the coast. By 1983, JSI had cut the prices and volumes of its coal imports at a time when Quintette, the larger coal mine, was going through severe startup problems. In 1985, Denison Mines wrote off its entire investment in Quintette of more than $200 million. By 1987, JSI began negotiating to reduce the premium prices it had contracted to pay for Quintette coal. Quintette agreed to drop the price from about $87.50 per ton to about $80.00 per ton, at which point JSI pressed for further reduction to about $50.50 per ton. In the absence of any likelihood of agreement, the case went to arbitration by a British Columbia panel in May 1990, where the JSI lost its case and the price of NECP coal did not fall to world market levels. The panel established phased retroactive reductions in price to the $72 per ton level, and Quintette responded by seeking court restraint on all of its creditors while it reorganized. In 1991, Teck Corp., the main shareholder in the smaller Bullmoose Mine, took over the Quintette Mine and negotiated a modest price increase of between $4 per ton and $5 per ton. Also in 1991, the Federal Government wrote off most of its $200 million investment in the Ridley coal terminal in an effort to cut its losses. By the end of 1991, Quintette's creditors were able to agree on a restructuring plan and awaited reaction from the Government departments and agencies involved.

Although NECP was characterized by some as "a bad idea whose time had come" when it was originally calculated to "kick-start the British Columbia economy," it incurred losses from all sides, including a subsidy from Japanese industry of about $695 million. A private watchdog group, Energy Probe, asserted that the JSI deliberately led, or misled, their suppliers, not only Canada but also Australia and Indonesia, to overinvest in metallurgical coal. Other industry observers noted that NECP proved to be part of a carefully orchestrated plan by JSI to create a glut of coal on world markets and to depress prices. Clearly, the saga of NECP was not over, but depended heavily on the outcome of efforts by both Quintette and the Government to make the project viable.

Natural Gas.—Canada ranked third in the world, after the U.S.S.R. and the United States, in output of natural gas. Production rose in 1991 to a gross output of 145 billion m^3, an increase of more than 5%. Thus once again the production of natural gas played a major role in the mineral economy of Canada. Production of marketable gas in Canada increased from an average of 264 Mm^3/d in 1989 to 288 Mm^3/d in 1990, an increase of more than 9%, compared with an increase of 6% in 1991. Marketable gas is gross (total) production minus reinjected gas and producer consumption.

Aside from disputes between gas producers and tax authorities of western Provinces such as Alberta, which are not being resolved very readily, publicity was given to the possibility of major natural gas production in Quebec. For at least 2 years a Canadian-American consortium as well as an Australian multinational company has been acquiring exploration rights on thousands, and perhaps hundreds of thousands, of hectares of land in the St. Lawrence Valley between Montreal-Lake Champlain and Quebec City. Any production of gas here would be far from the James Bay hunting and fishing grounds, for one thing, and would require much shorter transmission lines to major populated areas. Although minor gas production has been known in the St. Lawrence Valley for more than 100 years, new seismic studies suggest deeper and bigger reservoirs. Initial drilling was projected to start late in the year.

What had seemed to be a beneficial arrangement between Alberta gas producers and San Francisco-based Pacific Gas & Electric Company (PG&E) began to go sour in mid-1990, when contract negotiations stalled over price. Approximately 190 local producers in Canada, who sell their gas to Alberta and Southern Gas Co. Ltd., a wholly owned subsidiary of PG&E, to be transported over the Pacific Gas Transmission (PGT) pipeline to California, had reportedly refused to accept offers of less than the preexisting rate of $1.80 per thousand cubic feet. The Canadian view was that PG&E was trying to force prices down by having its subsidiary, PGT, accommodate other cheaper surplus gas from certain producers in Canada and thus undercut the market. The contrary view, by the California Public Utilities Commission (CPUC), was that gas prices were too high for its retail consumers in the PG&E area. This might normally be a case in which the dynamics of the market would be expected to allocate volumes and prices of gas most efficiently, but there were complications. The Alberta Petroleum Marketing Commission (APMC) threatened heavy

fines, up to $1 million per day, against producers who took gas out of the Province without removal permits issued by APMC. Alberta had already withheld removal permits for gas sales to Ontario in its dispute with the latter over core markets in that Province.

It seemed plain to some observers that the disagreement was out of the hands of PG&E and the Alberta producers and had become something of a contest between CPUC and APMC, in which either could be construed, especially by the other, as using regulatory powers to thwart market pricing mechanisms. The problem had not been solved by the end of 1990 and, at that point, threatened to grow in complexity.

Any hope that the situation would straighten itself out in 1991 was dashed as Canadian producers and Government officials expressed dismay at what seemed to them the increased politicization of the U.S. process for regulating natural gas production and pricing. Beyond this was the growing impatience on both sides at hard-ball legalistic practices of third-party interests frustrating the regulatory process in both countries. The issues went to the heart of the relationship, in each country, between free-market competition, production, and pricing of gas versus the regulatory structure. The tendency was toward shared values in the United States and Canada as to exploration and production, a common price mechanism, but with two separate regulatory structures that, like two very different species, not only could not communicate but were barely aware of each other. What was needed in developing a single great North American energy market was some form of beneficial interfacing between the regulatory entities of each country.

Petroleum, Crude.—Production of crude rebounded sharply to 564 Mbbl in 1990, a gain of 48% overall, which did not quite equal the 584 Mbbl produced in 1989, but acted to slow the perceived deterioration of the industry in Canada caused by high taxes, high interest rates, high Provincial royalties, and low prices for crude. Industry spokesmen further pointed to between 3,000 and 4,000 layoffs during 1991 and predicted the loss of 10,000 more jobs by 1995.

After the announcement in 1990 that the immense Hibernia petroleum prospect offshore Newfoundland would be developed with a commitment of Federal monies, enabling legislation was passed in late 1991. The Hibernia Development Act released Ottawa's contribution of $2.36 billion to the $4.55 billion project. Newfoundland Offshore Development Constructors was awarded the contract to build the gravity-based structure (GBS) that would serve as the platform for drilling and production operations. The GBS would be completed in 1994 and towed to a site on the Grand Banks in mid-1995. Rumors that the Hibernia developers would be compelled to sell their oil to the United States because of the United States-Canada FTA were ended by officials who made it clear that the oil would be sold to the highest bidder on the world market. A discordant note was sounded when Gulf Canada Resources Ltd., a member of the Hibernia consortium, announced that it sought a buyer for one-half of its 25% stake in the project on grounds that the company could not afford to pay its share of the capital costs.

In Alberta, the petroleum industry pressed for reduction in the royalty fees that the Province charges for the removal of hydrocarbons from Crown lands, meaning most of Alberta's productive areas. Although demands for reduction have been heard for several years, a special industry study showed that profit levels in Alberta were even lower in the petroleum industry than in regulated utilities. The Province responded that it, too, was in fiscal straits, but near the end of the year acted to relieve some of the royalty pressure on petroleum companies' operations, particularly the smaller independent producers. The relief applied to production of oil but not natural gas. Alberta also reduced royalties on petroleum produced from horizontal wells in an effort to stimulate drilling and production using the new technology of horizontal completions.

Research continued on methods of recovery of hydrocarbons from the Athabasca oilsands north of Fort McMurray, Alberta. A horizontal well in situ steam injection process designed as a precommercial pilot operation was to have started sometime in 1992 after a smaller proof-of-concept pilot project produced 130,000 bbl of bitumen over a period of several years. What could amount to a multi-billion-bbl payout has moved slowly but successfully in the face of continuing price uncertainties. Athabasca, Peace River, and other bitumen and heavy oil deposits in Alberta amount to 2.5 trillion bbl of oil in place, about 40% of the world's known bitumen.[11]

Reserves

Table 9 shows the levels of Canadian reserves of major mineral commodities as of the early part of 1991, in terms of metal contained in ore. These reserves represent "proven" and "probable" categories. Tonnage reported as "possible" was not included. Reserves were defined as well delineated and economically minable ore from producing mines and deposits committed to production.

Canadian reserves of gold decreased almost 7%, or 110 tons, from those of the previous year. This was the second year in a row of reversal of the marked growth in gold reserves during the 1980's, reflecting in turn the impetus of high gold prices at the beginning of that decade. On-site exploration and development at existing mines partly replaced the amount of gold removed during the year. Copper reserves decreased more than 8% to mark the effect of only minor additions by discovery. Other copper producers lowered the reserves total through routine depletion of the ore mined during the year. Reserves of molybdenum decreased throughout 1990 to about 193,000 tons in January of 1991, a drop of 18%. Only one of the several mines producing molybdenum, all in British Columbia, added significantly to reserves. Lead reserves were down less than 6% from

those of the year before. Largest negative factors were depletion of reserves at the Curragh Resources Inc. Faro Mine in the Yukon, closure of the Caribou Mine, and more conservative methods of reporting reserves at the Brunswick No. 12 Mine, all in addition to normal mining depletion. Zinc reserves decreased more than 4% to 20.091 Mmt in spite of the major additions of reserves at the Sa Dena Hes Mine in the Yukon as well as at the Steele-Stratmat operation in New Brunswick, which was committed to production in 1989. At 23,000 tons, silver reserves were down 12% at the beginning of 1991. Mining and changes in reporting subtracted more silver from the reserve lists than was replaced or added by development decisions. Reserves of nickel declined about 6% to 5.792 Mmt. In addition to normal depletion, changes in reporting removed an amount equal to about one-half of what was mined during 1991. Nonetheless, the ratio of reserves to average yearly production of nickel was significantly higher than for any of the other metals.

INFRASTRUCTURE

With a total land area of about 9,221,000 km^2, which is slightly larger than the United States, Canada has networks of highly developed infrastructure as well as other vast areas of trackless wilderness. The country has 884,272 km of roads, comprising 250,023 km of paved highway, 462,913 km of gravel or other loose surface, and 171,336 km of earth-surface roads, the latter not graded or drained in many places. Bulldozed temporary roads have been established for mining exploration in many out-of-the-way places, but these deteriorate quickly where not maintained.

A total of 93,544 km of railroads included two main systems, the Canadian National and the Canadian Pacific. The country also has about 3,000 km of inland waterways, including the St. Lawrence Seaway, one of the greatest in the world. Principal ports were Halifax, Montreal, Québec, St. John (New Brunswick), St. John's (Newfoundland), Toronto, and Vancouver. Canada's merchant marine was made up of approximately 75 ships of 1,000 or more gross registered tons.

The country has about 1,400 airports, 1,155 of them usable. Of these, 443 have permanent-surface runways, 4 with runways longer than 3,659 m; 30 with runways 2,440 m to 3,659 m long; and 328 with runways 1,220 m to 2,439 m in length. Civil aviation includes about 636 major transport aircraft, with Air Canada as the major carrier.

Canada generates electrical power from coal and natural gas fuels as well as massive hydroelectric facilities. Total capacity is approximately 105,000 MW. About 500 million MW·h, or 18,840 kW·h per person, was produced in 1990. Pipelines included 23,564 km for crude oil and refined products as well as 74,980 km for transmission of natural gas, but the total length grows yearly in that more is added than subtracted. Alberta's network represents the greatest length for any Province.

OUTLOOK

In a specific sense, the continuing pattern of new mineral discoveries confirmed the desirability of further exploration and increased the reserves in some mineral categories. Canada's mineral industry thus provided assurances that it is alive if not well, and, by supporting a number of regional economies, will continue to be a significant part of the national economy. Some observers, however, saw a lack of balance in exploration results in that precious metals seemed to be absorbing effort that might alternatively be spent on base metals. Reserves of the latter have declined generally in recent years, but there were signs that the situation could be turning around.

The larger picture starts with the Canadian economy in recession, along with that of the United States, its major trading partner. Uncertainties of demand, price weaknesses, and labor instabilities are predictable characteristics of economic downturns, and there were no clear indications as to when these would improve.

Over the longer term there were questions of Quebec's potential secession and the economic consequences to both Quebec and the remainder of Canada. Previous strong, or even uncompromising, comments on both sides of the question have moderated somewhat as financial and political realities have become apparent. The political leadership in Quebec, however, is under continuing pressure to do something in the way of redefining the Province's role vis-a-vis Canada, so the issue remains.

Another long-term consideration is embodied in the concept of "sustainable development," or the degree to which mining companies can balance the need for development and economic growth by good stewardship in the protection of the natural environment and human well-being. The Canadian mineral industry is committed to environmental responsibility in the development of resources, but the ultimate costs are not yet discernible. Some mining companies, responding to both environmental restrictions and taxation, will probably continue to look elsewhere for viable projects, particularly in Latin America.

On the positive side, the FTA between Canada and the United States should become an economic plus factor in both countries. Although preliminary concern has been heard both north and south of the border, the long-term benefits of this agreement should include gradual labor shifts into more productive industries in both countries. Beyond this, the completion of NAFTA, with Mexico as the third partner, was expected to bring significant economic benefits to all three countries.

[1]For more detailed information on the mineral industry, see the Canadian Mineral Surveys for 1990 and 1991, prepared by the Mineral Policy Sector and the Energy Sector, Ministry of Energy, Mines and Resources, Ottawa, Canada, both of which were used extensively as source material for this report. The U.S. Department of the Interior, U.S. Bureau of Mines, has arranged to have these Canadian publications placed in selected depository libraries of the 50 States and Puerto Rico.

[2]Where necessary, values have been converted from Canadian dollars (CAN $) to U.S. dollars at the rate of CAN$1.1455=US$1.00.

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[6]The Northern Miner. V. 78, No. 23, Aug. 12, 1991, p. 18.

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[8]Metal Bulletin. No. 7636, Nov. 28, 1991, p. 7.

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TABLE 1

CANADA: VALUE OF PROVINCIAL MINERAL PRODUCTION

(Billion dollars)

Province or Territory	1990	1991[p]
Alberta	16.5	14.1
Ontario	5.4	4.4
British Columbia	3.5	3.3
Saskatchewan	2.8	2.6
Quebec	2.5	2.5
Manitoba	1.0	1.0
Northwest Territories	1.0	.7
New Brunswick	.8	.7
Newfoundland	.7	.5
Yukon	.5	.4
Nova Scotia	.4	.3
Prince Edward Island	(1)	(1)
Total[2]	35.4	30.4

[p]Preliminary

[1]Less than 1/2 unit.

[2]Data may not add to total shown because of independent rounding.

Source: Energy, Mines and Resources Canada, Ottawa, 1991.

TABLE 2

CANADA: VALUES OF PRINCIPAL MINERAL PRODUCTION

(Million dollars)[1]

Commodity	1990	1991[p]
Metals:		
Gold	2,038	2,056
Copper	2,138	1,834
Nickel	1,735	1,596
Zinc	2,123	1,179
Iron ore	1,125	982
Uranium	744	412
Lead	230	178
Silver	219	162
Platinum-group	176	124
Molybdenum	85	61
Total[2]	10,613	8,584
Industrial minerals:		
Potash	778	802
Cement	741	713
Sand and gravel	681	551
Stone	558	448
Asbestos	220	240
Salt	206	226
Sulfur, elemental	312	213
Lime	155	163
Clay products	123	122
Peat	70	80
Sulfur in smelter gas	80	67
Total[2]	3,924	3,625
Mineral fuels:		
Petroleum crude	4,527	9,269
Natural gas	4,798	4,527
Natural gas byproducts	1,893	1,853
Coal	1,604	1,662
Total[2]	20,150	17,311

[p]Preliminary.

[1]Values shown here were converted to U.S. dollars using the 1990 and 1991 average conversion rates for each entire year, thus these values may differ slightly from those noted in text.

[2]Data may not add to totals shown because of independent rounding.

Source: Energy, Mines and Resources Canada, Ottawa, 1991.

TABLE 3

CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
METALS						
Aluminum:						
Alumina, gross weight	thousand tons	r953	r993	r1,048	1,087	1,131
Metal:						
Primary		1,540,439	1,534,499	r1,554,753	1,567,395	1,821,642
Secondary		67,838	r113,000	r77,000	r67,659	67,660
Antimony[2]		3,706	3,171	r2,821	r658	625
Bismuth[3]		165	181	r157	r74	139
Cadmium[4]		1,481	r1,664	r1,711	r1,334	1,565
Calcium	kilograms	W	W	W	W	W
Cobalt:						
Mine output, Co content[5]		2,490	r2,398	r2,344	2,184	2,158
Metal[6]		r2,527	r2,356	r2,110	2,063	2,248
Columbium and tantalum:						
Pyrochlore concentrate:						
Gross weight		4,304	5,230	5,443	5,272	5,230
Cb content		1,937	2,354	2,458	2,382	2,354
Tantalite concentrate:						
Gross weight		—	91	295	r331	399
Ta content		—	27	73	82	95
Copper:						
Mine output, recoverable Cu content[7]		794,149	758,478	r723,052	r793,735	797,603
Metal, primary and secondary:						
Blister and anode		499,400	537,000	510,000	525,204	546,495
Refined		491,178	528,723	r515,216	515,835	538,339
Gold	kilograms	r117,227	r135,889	r159,527	169,412	178,712
Iron and steel:						
Iron ore:[8]						
Gross weight	thousand tons	37,702	38,742	40,900	36,443	35,961
Fe content	do.	23,658	24,540	26,180	22,959	22,655
Metal:						
Pig iron	do.	r9,719	9,500	r10,139	7,346	8,268
Ferroalloys	do.	260	r207	250	e240	e249
Steel, crude	do.	r14,737	r14,866	r15,458	12,281	12,987
Lead:						
Mine output, Pb content		r423,207	r366,564	r276,065	r241,277	278,141
Metal, refined:						
Primary		139,475	179,461	157,330	r87,180	106,420
Secondary		91,186	89,863	r85,515	r96,465	104,884
Lithium: Spodumene[9]		11,500	14,000	14,000	12,000	
Magnesium metal, primary[e]		7,000	7,000	7,000	[10]26,726	[10]35,512
Molybdenum		r12,509	r12,494	r14,073	r11,994	11,333
Nickel:						
Mine output, Ni content[11]		189,086	198,744	r200,900	r196,225	196,868
Metal, plant production[12]		132,528	159,605	r195,554	191,145	192,821
Platinum-group metals	kilograms	10,930	12,541	10,389	r11,709	11,532
Selenium, refined[13]	do.	300,000	321,000	r270,000	r369,000	395,000

See footnotes at end of table.

TABLE 3—Continued

CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
METALS—Continued						
Silver	kilograms	r1,452,483	r1,483,816	r1,370,737	r1,501,451	1,337,830
Tellurium, refined[13]	do.	13,000	10,000	r8,000	13,000	13
Tin, mine output, Sn content	do.	r2,779	r3,591	r2,790	2,828	4,455
Titanium:						
Ilmenite, gross weight	thousand tons	(14)	(14)	(14)	—	—
Sorel slag[15]		925,000	1,025,000	1,040,000	r1,046,000	701,000
Tungsten, mine output, W content		—	—	—	—	—
Uranium oxide (U_3O_8)		r14,666	r14,695	r13,475	r10,342	9,124
Zinc:						
Mine output, Zn content		1,481,544	r1,370,000	r1,216,139	1,203,161	1,148,189
Metal, refined, primary		609,909	703,206	669,677	591,788	660,552
INDUSTRIAL MINERALS						
Asbestos	thousand tons	665	r710	r714	r686	670
Arsenic trioxide[16]		e2,000	r2,825	r1,825	485	e236
Barite		42,000	51,000	r39,000	r44,000	51,000
Cement, hydraulic[17]	thousand tons	12,590	12,036	r12,591	r11,745	9,396
Clays and clay products[18]	value, thousands	$159,000	r$196,724	r$200,138	$143,072	$121,706
Diatomite[e]		4,200.00	4,200	4,200	4,100	4,000
Gypsum and anhydrite	thousand tons	9,094	r9,512	r8,180	r7,978	7,305
Lime	do.	2,330	r2,518	r2,552	r2,341	2,336
Magnesite, dolomite, brucite		150,000	150,000	150,000	150,000	e180,000
Mica, scrap and flake		13,500	12,000	12,000	e16,000	e17,000
Nepheline syenite		500,000	r540,000	r551,000	r533,000	493,000
Nitrogen: N content of ammonia		3,511,719	4,010,161	4,100,000	2,967,653	3,207,785
Potash, K_2O equivalent	thousand tons	r7,267	r8,328	r7,014	r7,345	7,012
Pyrite and pyrrhotite, gross weight[e]		5,000.00	5,000	5,000	5,000	5,000
Salt	thousand tons	10,129	r10,687	r11,158	r11,191	11,585
Sand and gravel	do.	278,550	r287,653	r274,848	r244,316	200,497
Silica (quartz)	thousand tons	2,560	2,807	r2,332	2,081	e2,000
Sodium compounds, n.e.s.:						
Sodium carbonate (soda ash)[e]		325,000.00	325,000	325,000	315,000	310,000
Sodium sulfate, natural[19]		342,000	r331,000	r327,000	347,000	285,000
Stone[20]	thousand tons	128,969	r120,126	r119,335	r111,352	85,785
Sulfur: Elemental byproduct:						
Of smelter gases	do.	723	r856	r809	r790	726
Of sour natural gas	do.	5,809	5,981	5,183	5,210	5,460
Of refineries[e]	do.	190.00	200	200.00	207	230
Of tar sands	do.	426.00	485.00	500.00	503.00	540
Talc, soapstone, pyrophyllite		r136,418	r146,443	r144,828	r131,000	115,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		160,000	180,697	180,000	178,212	157,115
Coal:						
Bituminous and subbituminous	thousand tons	51,200	57,500	60,085	58,924	62,149
Lignite	do.	10,000	12,000	10,915	9,407	8,981
Coke, high-temperature	do.	4,637	4,663	r4,414	3,708	3,622

See footnotes at end of table.

TABLE 3—Continued

CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Gas, natural:						
Gross	million cubic meters	98,700	109,088	114,661	138,358	144,987
Marketed	do.	79,652	88,035	92,530	98,773	105,201
Natural gas liquids: Gross						
Ethane	thousand 42-gallon barrels	37,120	38,165	42,352	44,694	47,414
Propane	do.	33,428	39,327	41,302	42,448	42,393
Butane	do.	20,130	19,044	22,194	21,621	23,557
Pentanes plus	do.	38,110	40,620	43,414	41,567	43,392
Condensate	do.	1,210	1,521	1,871	976	1,217
Total	do.	129,998	138,677	[r]151,133	151,306	157,973
Peat		662,000	736,000	[r]812,000	[r]715,776	762,116
Petroleum:						
Crude[21]	thousand 42-gallon barrels	560,000	584,000	583,827	381,362	563,985
Refinery products:						
Liquefied petroleum gas, propane, and butane	do.	39,055	19,710	20,700	17,224	16,538
Gasoline:						
Aviation	do.	2,619	2,477	1,059	813	759
Other	do.	208,415	218,635	228,298	231,545	229,665
Petrochemical feedstocks	do.	43,327	42,330	29,080	31,345	31,942
Jet fuel	do.	32,485	32,485	26,980	33,288	28,592
Kerosene	do.	13,140	11,680	15,546	2,792	3,493
Distillate fuel oil, diesel and light	do.	150,015	160,600	166,731	174,588	169,184
Residual fuel oil, heavy	do.	44,530	50,735	53,903	56,673	54,081
Lubricants	do.	5,840	7,300	7,372	6,549	6,176
Asphalt	do.	22,045	21,577	17,018	16,894	15,922
Petroleum coke	do.	(22)	(22)	(22)	5,398	5,692
Unspecified	do.	41,144	40,196	40,072	33,730	30,791
Refinery fuel and losses[23]	do.	38,024	37,595	32,726	26,537	24,697
Total	do.	640,639	645,320	639,485	637,376	617,532

[e]Estimated. [p]Preliminary. [r]Revised. W Withheld to avoid disclosing company proprietary data.

[1]Table includes data available through Aug. 1992.

[2]Sb content of antimonial lead alloys, flue dust, and doré slag estimated on the basis of reported gross production.

[3]Refined metal and bullion from domestic ores plus recoverable Bi content of exported concentrates.

[4]Refined metal from domestic ores plus recoverable Cd content of exported ores and concentrates.

[5]Actual output not reported. Data represent the Co content of all products derived from ores of Canadian origin, including nickel oxide sinter shipped to the United Kingdom and nickel-copper-cobalt matte shipped to Norway for further processing.

[6]Actual output not reported. Data represent the output within Canada of metallic cobalt from ores of both Canadian and non-Canadian origin.

[7]Blister copper from domestic ores plus recoverable Cu content of exported matte and concentrates.

[8]Series represent gross weight and metal content of usable iron ore as mine shipments.

[9]Based on all of Canada's spodumene concentrates (Tantalum Mining Corp. of Canada Ltd.'s Tanco property).

[10]Reported figure.

[11]Refined nickel from domestic ores plus recoverable Ni content of exported matte.

[12]Includes metallic nickel, nickel oxide, Incomet, nickel powder and pellets, utility nickel, nickel carbonate, and nickel residue.

[13]From all sources, including imports and secondary sources.

[14]Revised to zero. New information indicates that titanium had been recovered from titaniferous iron ore.

[15]Refined sorel slag contained 80% TiO_2 in 1986-90.

[16]Refined Arsenic (AS_2O_3) from Nerco's Con Mine in Yellow Knife, Northwest Territories.

[17]Cement shipped and/or used by producers.

[18]Includes bentonite products from common clay, fire clay, stoneware clay, and other clays.

[19]Excludes byproduct production from chemical plants.

[20]Crushed, building, ornamental, paving, and similar stone.

[21]Including synthetic crude (from oil shale and/or tar sands).

[22]Combined with "unspecified" category.

[23]Refinery fuel represents total reported production of still gas, including a small amount sold.

TABLE 4

CANADA: UNITED STATES-CANADA FREE TRADE AGREEMENT SCHEDULE OF SELECTED TARIFFS[1]

Commodity	Existing tariffs 1988 (percent)		Phaseout schedule
	Canada[2]	United States[2]	
METALS			
Chromium	10.2	3.7	5-year elimination starting Jan. 1, 1989; 20% reduction per year.
Cobalt	10.2	5.5	Do.
Columbium (niobium)	4.0	4.9	Do.
Copper:			
Refined	10.3	1.0	Do.
Alloys	10.2	1.0	10-year elimination starting Jan. 1, 1989; 10% reduction per year.
Ferroalloys:			
Ferromolybdenum	10.2	4.5	5-year elimination starting Jan. 1, 1989; 20% reduction per year.
Ferrosilicon chromium	10.2	10.0	Immediate lifting of tariffs on Jan. 1, 1989.
Ferrotitanium	10.2	3.7	5-year elimination starting Jan. 1, 1989; 20% reduction per year.
Ferrotungsten and ferrosilicon tungsten	10.2	5.6	Do.
Ferrovanadium	10.2	4.2	Do.
Manganese	10.2	5.5	10-year elimination starting Jan. 1, 1989; 10% reduction per year.
Minor metals:			
Beryllium, waste and scrap	10.2	8.5	5-year elimination starting Jan. 1, 1989; 20% reduction per year.
Germanium, unwrought	10.2	2.7	Do.
Magnesium containing at least 99.8% by weight of Mg	4.0	7.2	10-year elimination starting Jan. 1, 1989; 10% reduction per year.
Lead:			
Refined (metal content)	8.1	2.7	10% reduction per year.
Oxide	8.1	10.1	5-year elimination starting Jan. 1, 1989; 20% reduction per year.
Rare-earth metals	12.5	3.7	5-year elimination starting Jan. 1, 1989; 20% reduction per year.
Tantalum	10.2	5.5	Do.
Vanadium	10.2	3.0	Do.
Zinc:			
Refined	—	1.5	10-year elimination starting Jan. 1, 1989; 10% reduction per year.
Zirconium	10.2	4.2	5-year elimination starting Jan. 1, 1989; 20% reduction per year.
INDUSTRIAL MINERALS			
Granite, cut	5.5	4.2	5-year elimination starting Jan. 1, 1989; 20% reduction per year.
Graphite, powder	9.2	—	Do.
Gypsum, wallboard	9.4	2.4	10-year elimination starting Jan. 1, 1989; 10% reduction per year.

[1]Based on the United States-Canada Free Trade Agreement and Minerals and Metals: An Assessment, Energy, Mines and Resources Canada, Ottawa, 1988.
[2]Previous tariff rates under the General Agreement on Tariffs and Trade (GATT).

TABLE 5

CANADA: PROPORTIONATE CONTRIBUTION OF LEADING MINERALS TO TOTAL VALUE OF MINERAL PRODUCTION

(Percent)

Commodity	Share of 1990	Share of 1991[p]
Petroleum, crude	32.9	31.2
Natural gas	14.3	15.3
Gold	6.0	6.9
Natural gas byproducts	5.9	6.2
Copper	6.1	6.2
Coal	4.6	5.6
Nickel	5.1	5.4
Zinc	5.7	4.0
Iron ore	3.1	3.8
Potash	2.4	2.7
Cement	2.5	2.4
Sand and gravel	2.0	1.9
Stone	1.7	1.5
Uranium	2.2	1.4
Others	5.5	5.5
Total	100.0	100.0

[p]Preliminary.

Source: Energy, Mines and Resources Canada, Ottawa, 1991.

TABLE 6

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS[2]					
Alkali and alkaline-earth metals:					
Alkali metals		122	175	20	West Germany 155.
Alkaline-earth metals		382	408	194	Netherlands 128; Australia 56.
Aluminum:					
Ore and concentrate		3,933	687	687	
Oxides and hydroxides		128,257	134,334	128,357	West Germany 2,532; Brazil 1,123.
Ash and residue containing aluminum		5,263	49,566	49,566	
Metal including alloys:					
Scrap		164,492	188,363	156,528	Japan 21,412; Taiwan 2,284.
Unwrought		1,159,682	1,282,196	827,613	Japan 165,390; Netherlands 82,424.
Semimanufactures		159,313	188,364	180,744	United Kingdom 3,830; Morocco 1,042.
Antimony:					
Ore and concentrate		2,371	463	47	United Kingdom 415.
Oxides		20	—		
Metal including alloys, all forms		102	202	2	Austria 200.
Arsenic: Metal including alloys, all forms		209	51	44	Netherlands 6.
Beryllium: Metal including alloys, all forms	kilograms	58	4,358	4,358	
Bismuth: Metal including alloys, all forms		28	131	131	
Cadmium: Metal including alloys, all forms		1,433	1,283	739	Japan 254; United Kingdom 129.
Chromium:					
Ore and concentrate		49	1,283	1,283	
Oxides and hydroxides		239	157	137	United Kingdom 20.
Metal including alloys, all forms		82	4	4	
Cobalt:					
Ore and concentrate		22	—		
Oxides and hydroxides		372	393	2	United Kingdom 381; Australia 5; Hong Kong 5.
Metal including alloys, all forms		3,245	3,056	1,295	Norway 1,206; United Kingdom 292.
Columbium and tantalum:					
Ores and concentrates[3]		4,653	4,269	2,380	United Kingdom 898; Japan 823.
Tantalum metal including alloys, all forms		67	5	5	
Copper:					
Ore and concentrate, Cu content		333,343	360,193	613	Japan 268,012; Republic of Korea 32,858; Spain 23,927.
Matte and speiss including cement copper		18,796	14,682	(4)	Norway 13,734; United Kingdom 948.
Oxides and hydroxides		—	18	18	
Sulfate		1,910	3,245	3,245	
Ash and residue containing copper		50,422	5,847	73	Republic of South Africa 3,338; Namibia 2,361.
Metal including alloys:					
Scrap		67,327	104,469	85,890	West Germany 4,495; India 3,739.
Unwrought		326,279	336,697	184,470	United Kingdom 57,832; Netherlands 33,427.
Semimanufactures		32,544	22,343	19,431	Israel 1,122; United Kingdom 385.
Germanium: Metal including alloys, all forms	kilograms	302,527	5,801	5,796	Hong Kong 5.
Gold:					
Ore and concentrate, Au content	kilograms	9,917	10,817	NA	NA.

See footnotes at end of table.

TABLE 6—Continued

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS[2]—Continued					
Gold—Continued:					
Waste and sweepings	kilograms	30,933	30,021	3,442	West Germany 26,192; Belgium-Luxembourg 312.
Metal including alloys, unwrought and partly wrought	do.	161,985	144,929	33,593	Switzerland 46,393; Hong Kong 19,252.
Iron and steel:					
Iron ore and concentrate excluding roasted pyrite, gross weight	thousand tons	30,222	27,100	9,225	West Germany 4,049; United Kingdom 3,254.
Metal:					
Scrap	do.	900	1,372	1,065	Turkey 93; India 52.
Pig iron, cast iron, related materials		471,320	262,764	169,919	Netherlands 70,944; Italy 15,732.
Ferroalloys:					
Ferrochromium		38	573	573	
Ferromanganese		21,893	15,041	15,038	Brazil 3.
Ferromolybdenum		15	35	—	Belgium-Luxembourg 18; Netherlands 17.
Ferronickel		—	172	135	Republic of Korea 36.
Ferrosilicomanganese		1,589	7,734	7,734	
Ferrosilicon		32,505	53,532	38,356	Japan 6,459; Republic of Korea 3,633.
Silicon metal		16,564	14,811	7,749	Japan 3,468; West Germany 2,238.
Unspecified		954	380	346	Philippines 17; Belgium-Luxembourg 14.
Steel, primary forms		293,291	327,263	194,650	Thailand 20,007; Japan 17,249.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		1,458,179	1,476,210	729,605	Iran 215,631; Italy 194,656.
Clad, plated, coated		399,358	380,085	250,371	Mexico 58,457; Italy 28,598.
Of alloy steel		68,625	82,926	66,594	Republic of Korea 7,895; United Kingdom 2,235.
Bars, rods, angles, shapes, sections		1,026,232	906,835	855,099	Republic of Korea 10,526; Mexico 10,422.
Rails and accessories		95,688	245,929	156,815	Egypt 43,371; Mexico 16,751.
Wire		182,856	158,804	148,546	Belgium-Luxembourg 3,412; Switzerland 1,028.
Tubes, pipes, fittings[5]		468,338	401,873	371,051	China 10,470; Indonesia 7,463.
Lead:					
Ore and concentrate		155,175	211,245	9,013	Japan 68,682; West Germany 49,223; Italy 25,434.
Oxides		1	307	303	Republic of South Africa 4.
Ash and residue containing lead		1,111	1,097	415	India 347; United Kingdom 241.
Metal including alloys:					
Scrap		15,686	17,950	8,730	Philippines 2,958; Brazil 1,885.
Unwrought		123,356	116,134	71,280	United Kingdom 8,971; Japan 8,949.
Semimanufactures		11,060	857	582	India 250; United Kingdom 20.
Magnesium: Metal including alloys:					
Scrap		483	3,358	3,346	United Kingdom 12.
Unwrought		1,421	19,466	16,972	Netherlands 707; Japan 377.
Semimanufactures		684	844	563	Ireland 207; Republic of Korea 70.
Manganese:					
Oxides		225	29	29	
Metal including alloys, all forms		1,382	264	241	Republic of Korea 23.

See footnotes at end of table.

TABLE 6—Continued

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS[2]—Continued					
Mercury	kilograms	14	33,165	32,624	United Kingdom 527; Japan 12.
Molybdenum:					
Ore and concentrate		16,140	11,062	—	Japan 4,454; Belgium-Luxembourg 2,680; Chile 1,297.
Oxides and hydroxides		—	25	7	Brazil 18.
Metal including alloys:					
Unwrought including waste and scrap		(4)	7	7	
Semimanufactures		4	1	1	
Nickel:					
Ore and concentrate, Ni content		21	—		
Matte and speiss		65,496	68,671	589	Norway 35,240; United Kingdom 32,842.
Oxides and hydroxides		741	395	395	
Metal including alloys:					
Scrap		7,936	5,594	4,375	Netherlands 576; Sweden 308.
Unwrought		62,675	65,860	64,850	Belgium-Luxembourg 731; Sweden 142.
Semimanufactures		10,567	10,891	7,339	Japan 2,324; Netherlands 389.
Platinum-group metals:					
Ore and concentrate	kilograms	[6]10,148	NA		
Waste and sweepings	do.	706,466	931	928	Spain 3.
Metals including alloys, unwrought and partly wrought:					
Palladium	do.	4,645	5,167	1,035	United Kingdom 3,670; France 311.
Platinum	do.	5,125	1,850	199	Australia 566; Japan 525; Hong Kong 403.
Rhodium	do.	—	25	25	
Iridium, osmium, ruthenium	do.	—	18	18	
Rare-earth metals including alloys, all forms		64	—		
Selenium, elemental		386	393	108	United Kingdom 132; Netherlands 71.
Silicon, high-purity	kilograms	105	—		
Silver:					
Ore and concentrate	do.	74,484	1,866	210	West Germany 1,647; United Kingdom 8.
Waste and sweepings[7]	do.	461,763	196,377	70,615	United Kingdom 64,716; West Germany 23,232.
Metal including alloys, unwrought and partly wrought		1,025	1,270	1,060	Singapore 166; Republic of Korea 18.
Tin:					
Ore and concentrate		2,790	2,828	—	Malaysia 2,278; Mexico 469; Singapore 72.
Metal including alloys:					
Scrap		3,205	529	427	Taiwan 78; Belgium-Luxembourg 19.
Unwrought		131	467	467	
Semimanufactures		845	275	184	Singapore 88; Republic of Korea 2.
Titanium:					
Ore and concentrate		120,295	29,197	29,197	
Oxides		31,349	5,686	5,267	Saudi Arabia 139; United Kingdom 102.
Metal including alloys, all forms		480	1,038	955	United Kingdom 46; Indonesia 27.
Tungsten:					
Ore and concentrate	kilograms	365	5,386	—	All to West Germany.

See footnotes at end of table.

TABLE 6—Continued

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS[2]—Continued					
Tungsten—Continued					
Metal including alloys:					
Unwrought including waste and scrap		2	63	54	West Germany 5; France 2.
Semimanufactures		14	13	12	Australia 1.
Uranium and thorium:					
Ore and concentrate	kilograms	396,295	—		
Oxides and other compounds		76	118	54	Netherlands 63.
Uranium metal including alloys, all forms		9,595	12,498	10,833	France 928; Netherlands 318.
Vanadium:					
Oxides and hydroxides	kilograms	—	825	825	
Ash and residue containing vanadium		501	1,085	1,085	
Metal including alloys, all forms		137	67	—	All to Hong Kong.
Zinc:					
Ore and concentrate		657,841	737,809	20,674	Belgium-Luxembourg 196,432; West Germany 116,913; Japan 73,315.
Oxides		40,046	27,319	26,893	U.S.S.R. 306; Hong Kong 91.
Blue powder		5,207	5,365	5,101	Taiwan 87; United Arab Emirates 72.
Ash and residue containing zinc[8]		10,816	8,752	4,843	India 1,814; United Kingdom 903.
Metal including alloys:					
Scrap		11,583	38,295	29,878	Taiwan 6,201; China 1,450.
Unwrought		508,996	456,322	373,791	Japan 21,934; Taiwan 18,455.
Semimanufactures		500	1,099	1,075	United Kingdom 18; Cuba 4.
Zirconium:					
Ore and concentrate		127	20	20	
Metal including alloys, all forms		164	108	72	Republic of Korea 32; France 4.
Other:					
Base metals:					
Ores and concentrates		12,827	6,513	6,234	West Germany 214; Japan 65.
Oxides and hydroxides		19	1,385	1,382	Belgium-Luxembourg 3.
Ashes and residues		59,469	85,908	85,625	United Kingdom 74; Japan 68.
Base metals including alloys, all forms		1,592	211	10	Taiwan 188; Australia 9.
Precious metals, n.e.s.: Ore and concentrates	kilograms	37,409	115,392	20,421	West Germany 60,886; Japan 23,747.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		2,001	5,914	5,835	India 33; United Kingdom 21.
Artificial:					
Corundum		107,855	105,897	82,892	United Kingdom 15,840; West Germany 5,488.
Silicon carbide		63,374	59,229	59,080	Republic of Korea 123; Jamaica 16.
Dust and powder of precious and semi-precious stones excluding diamond	kilograms	12,210	164,870	164,870	
Grinding and polishing wheels and stones	value, thousands	$10,881	$15,171	$9,906	Finland $860; West Germany $735.
Asbestos, crude		707,816	649,485	40,420	Japan 95,708; Thailand 68,714; Italy 43,875.
Barite and witherite		6,214	9,945	9,945	

See footnotes at end of table.

TABLE 6—Continued

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Boron materials:					
Crude natural borates		—	2	2	
Elemental including tellurium		52	24	13	West Germany 10; United Kingdom 1.
Oxides and acids		132	45	43	Barbados 1.
Cement	thousand tons	2,543	2,904	2,901	France 1; Greenland 1.
Chalk		66	—		
Clays, crude:					
Bentonite		2,398	1,170	1,165	France 3; Iran 2.
Fire clay		40	168	168	
Fuller's earth		161	45	45	
Kaolin		668	38	38	
Unspecified		517	1,263	1,170	Finland 90; Taiwan 2.
Cryolite and chiolite		13	25	25	
Diamond, natural:					
Gem, not set or strung	carats	175,676	66,736	31,881	Hong Kong 11,487; Belgium-Luxembourg 9,844.
Industrial stones	do.	195,252	43,105	37,860	Ireland 4,200; Republic of South Africa 795.
Dust and powder	thousand carats	2,802	3,721	3,709	Belgium-Luxembourg 11.
Unsorted	value, thousands	$3,052	$986	$986	
Diatomite and other infusorial earth		—	24	21	Australia 3.
Feldspar, fluorspar, related materials:					
Feldspar		331	348	—	France 204; Taiwan 144.
Fluorspar		40,123	22,620	22,620	
Unspecified		407,099	382,408	275,777	Netherlands 55,858; Italy 24,767.
Fertilizer materials:					
Crude, n.e.s.		3,058	18,713	18,592	Australia 71; Japan 31.
Manufactured:					
Ammonia	thousand tons	4,776	1,124	1,112	Taiwan 12.
Nitrogenous	do.	1,627	2,159	1,874	Australia 135; China 32.
Phosphatic		2,998	2,746	2,746	
Potassic	thousand tons	10,976	11,769	6,404	China 1,323; Japan 584.
Unspecified and mixed	do.	171	180	151	Turkey 21; Jamaica 5.
Graphite, natural		999	10,530	9,412	Japan 344; Australia 336.
Gypsum and plaster		5,214,258	5,805,720	5,804,768	Netherlands 227; Guyana 202.
Iodine	kilograms	71	—		
Kyanite and related materials		5	295	295	
Lime		83,607	138,410	138,378	Bermuda 17; France 13.
Magnesium compounds:					
Magnesite, crude		526	75	75	
Oxides and hydroxides		56,449	61,338	53,281	West Germany 4,288; Austria 1,723.
Sulfate		265	31	31	
Mica:					
Crude including splittings and waste		12,859	12,182	8,573	Japan 2,926; Netherlands 351.
Worked including agglomerated splittings		139	3	1	Brazil 2.
Nitrates, crude		948	101	9	New Zealand 90; France 2.

See footnotes at end of table.

TABLE 6—Continued

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Phosphates, crude		4,909	5,716	5,706	Belize 10.
Phosphorus, elemental		22,155	11,276	9,331	Colombia 1,491; Brazil 210.
Pigments, mineral:					
Natural, crude		—	1	1	
Iron oxides and hydroxides, processed		12,323	16,923	16,873	Australia 35; Guatemala 11.
Potassium salts, crude		171	1,285	1,285	
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$12,097	$8,851	$3,921	France $2,023; Hong Kong $596.
Synthetic	do.	$188	$240	$90	Taiwan $125; West Germany $9.
Pyrite, unroasted		10,540	119,722	119,722	
Salt and brine	thousand tons	2,138	1,912	1,908	St. Pierre and Miquelon 2.
Sodium compounds, n.e.s.:					
Soda ash, natural and manufactured		130,113	144,741	144,741	
Sulfate, natural and manufactured		175,668	167,638	160,743	Thailand 3,992; Australia 2,903.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		118,679	985,950	857,898	Japan 80,465; Italy 32,956.
Worked	value, thousands	$23,432	$28,564	$27,136	Japan $1,100; United Kingdom $141.
Dolomite, chiefly refractory-grade		485,710	896,725	896,550	United Kingdom 175.
Gravel and crushed rock		1,073,876	1,351,384	1,274,594	Bahamas 54,867; Bermuda 11,009.
Limestone other than dimension		928,723	1,367,620	1,364,506	United Kingdom 3,114.
Quartz and quartzite		41,179	637	637	
Sand other than metal-bearing		20,637	235,226	183,911	Bahamas 50,696; Thailand 271.
Sulfur:					
Elemental:					
Crude including native and byproduct	thousand tons	5,516	6,058	1,423	Morocco 821; Brazil 316.
Colloidal, precipitated, sublimed		281	291	291	
Dioxide		77,871	61,867	61,867	
Sulfuric acid		628,082	1,280,508	1,280,451	Bermuda 10; West Germany 9.
Talc, steatite, soapstone, pyrophyllite		43,740	40,119	39,808	United Kingdom 160; West Germany 111.
Vermiculite[9]		3,143	17	—	All to Italy.
Other:					
Crude		42,392	40,980	36,084	France 1,594; Taiwan 1,080.
Slag and dross, not metal-bearing		909,820	589,323	576,255	Norway 13,068.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		8,363	155,252	155,209	Yugoslavia 43.
Carbon including carbon black		61,024	82,339	70,204	West Germany 3,270; France 1,664.
Coal:					
Anthracite		—	668	154	Australia 464; Singapore 18.
Bituminous	thousand tons	31,706	31,986	815	Japan 19,551; Republic of Korea 5,213; Brazil 1,228.
Lignite including briquets		20,900	63,487	63,487	
Unspecified including briquets		95,112	8,127	8,123	United Kingdom 4.
Coke and semicoke		172,563	160,293	140,493	Venezuela 19,800.

See footnotes at end of table.

TABLE 6—Continued

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Gas, natural: Gaseous	million cubic meters	r37,870	47,373	47,373	
Peat including briquets and litter		720,628	616,588	542,858	Japan 65,765; Republic of South Africa 2,300.
Petroleum:					
Crude	thousand 42-gallon barrels	235,603	220,488	217,427	Republic of Korea 2,318; Japan 493.
Refinery products:					
Liquefied petroleum gas	do.	r40,816	41,133	41,131	St. Pierre and Miquelon 2.
Gasoline[10]	do.	20,723	25,220	24,760	Mexico 136; Netherlands 60.
Naphtha[10]	do.	3,332	3,850	3,850	
Mineral jelly and wax	do.	274	264	264	
Kerosene and jet fuel[10]	do.	6,913	11,020	NA	NA.
Distillate fuel oil[10]	do.	29,191	29,154	28,691	France 45; unspecified 418.
Lubricants	do.	r—	—		
Residual fuel oil[10]	do.	12,581	15,251	15,065	NA.
Bitumen and other residues	do.	1,242	72	71	Ireland 1.
Bituminous mixtures	do.	96	1,237	1,236	Unspecified 1.
Petroleum coke	do.	255	684	476	Japan 107; United Kingdom 57.

rRevised. NA Not available.

[1]Table prepared by H. D. Willis.

[2]Data for ores and concentrates equal total weight of all metals contained unless otherwise indicated.

[3]May include vanadium ore and concentrate.

[4]Less than 1/2 unit.

[5]Quantities for fittings were not provided, valued at $45,937,000 in 1989 and $32,526,000 in 1990.

[6]Metal content.

[7]Includes other precious metals.

[8]Includes hard zinc spelter.

[9]Includes chlorites and perlite.

[10]Source: International Energy Agency, Organization for Economic Co-operation and Development.

TABLE 7

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS[2]					
Alkali, alkaline-earth metals:					
Alkali metals		3,702	4,162	4,088	West Germany 70; United Kingdom 4.
Alkaline-earth metals		r74	121	25	China 93; unspecified 3.
Aluminum:					
Ore and concentrate, gross weight	thousand tons	2,541	2,310	31	Brazil 1,526; Australia 273; Guinea 257.
Oxides and hydroxides	do.	2,041	1,983	711	Australia 684; Jamaica 503.
Ash and residue containing aluminum		2,179	1,750	565	Australia 1,185.
Metal including alloys:					
Scrap		58,203	52,603	50,626	United Kingdom 877; Venezuela 710.
Unwrought		64,979	84,658	77,878	France 4,073; Switzerland 1,020.
Semimanufactures		344,159	328,196	289,558	France 7,345; Belgium-Luxembourg 5,446.
Antimony:					
Ore and concentrate		56	44	NA	NA.
Oxides		1,322	1,277	726	United Kingdom 505; unspecified 46.
Metal including alloys, all forms		243	182	68	China 107; United Kingdom 5.
Arsenic:					
Elemental		67	203	138	China 59; Japan 5.
Oxides and acids		540	996	912	France 83.
Beryllium: Metal including alloys, all forms		16	31	31	
Bismuth: Metal including alloys, all forms		27	40	39	China 1.
Cadmium: Metal including alloys, all forms		62	48	48	
Chromium:					
Ore and concentrate		r33,843	21,309	4,975	Philippines 11,192; Republic of South Africa 5,142.
Oxides and hydroxides		2,634	2,563	1,716	West Germany 398; United Kingdom 339.
Metal including alloys, all forms		150	214	92	Japan 80; United Kingdom 31.
Cobalt:					
Ore and concentrate		1	20	20	
Oxides and hydroxides		33	72	6	Belgium-Luxembourg 54; Finland 12.
Metal including alloys, all forms		716	812	265	Zaire 452; Netherlands 34.
Columbium and tantalum:					
Ores and concentrates		38	NA		
Metal including alloys, all forms:					
Columbium (niobium)		6	NA		
Tantalum		23	25	25	
Copper:					
Ore and concentrate, Cu content[3]		47,935	40,643	13,029	Indonesia 9,666; Portugal 9,110.
Matte and speiss including cement copper		4,234	3,032	3,032	
Oxides and hydroxides		735	532	284	Australia 244.
Sulfate		5,202	5,078	546	China 1,386; U.S.S.R. 1,180; Netherlands 1,171.
Ash and residue containing copper		24,762	37,248	23,034	Brazil 12,210; India 1,600.
Metal including alloys:					
Scrap		97,174	65,540	60,977	Chile 3,577; France 299.
Unwrought		18,984	12,732	7,971	Chile 1,687; Finland 1,513.
Semimanufactures		77,247	68,546	53,422	West Germany 2,173; Brazil 2,105.

See footnotes at end of table.

TABLE 7—Continued

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS[2]—Continued					
Germanium: Metal including alloys, all forms		4	11	10	Belgium-Luxembourg 1.
Gold:					
Ore and concentrate, Au content	kilograms	998	626	NA	NA.
Waste and sweepings		2,064	1,892	1,833	Australia 43; United Kingdom 16.
Metal including alloys, unwrought and partly wrought	kilograms	52,628	47,906	41,492	Uruguay 1,835; Guyana 1,303.
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite, gross weight	thousand tons	5,368	4,113	3,708	Brazil 405.
Pyrite, roasted		2,413	1,656	1,656	
Metal:					
Scrap		1,460,467	1,002,519	1,001,258	Sweden 354; France 294.
Pig iron, cast iron, related materials		40,148	24,302	22,510	Brazil 1,023; West Germany 247.
Ferroalloys:					
Ferrochromium		48,550	43,202	4,049	Republic of South Africa 34,511; Finland 3,134.
Ferromanganese		44,840	29,358	5,147	Republic of South Africa 13,079; West Germany 4,746.
Ferromolybdenum		1,150	581	85	Belgium-Luxembourg 189; Chile 186; Austria 92.
Ferronickel		2,993	2,524	—	Dominican Republic 2,151; New Caledonia 372.
Ferroniobium		1,067	1,108	472	Brazil 635.
Ferrosilicochromium		2,441	1,192	871	Zimbabwe 300; Republic of South Africa 21.
Ferrosilicomanganese		13,096	17,153	1,031	Brazil 10,111; Republic of South Africa 6,000.
Ferrosilicon		20,925	20,504	18,517	Brazil 1,251; Belgium-Luxembourg 336.
Ferrotitanium and ferrosilicotitanium		r438	533	347	United Kingdom 179.
Ferrovanadium		371	300	173	West Germany 110; Belgium-Luxembourg 17.
Silicon metal		1,318	2,407	656	Brazil 1,706; Japan 28.
Unspecified		r7,059	4,623	2,542	France 989; Brazil 580.
Steel, primary forms		653,858	277,327	64,717	Italy 88,866; France 34,188.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		448,412	775,587	481,798	France 54,686; West Germany 53,860.
Clad, plated, coated		294,046	403,955	260,770	Japan 38,025; Republic of Korea 26,588.
Of alloy steel		146,233	147,660	64,622	Sweden 18,295; West Germany 16,520.
Bars, rods, angles, shapes, sections		711,510	753,556	465,372	Brazil 54,312; Japan 39,358.
Rails and accessories		72,703	76,365	16,291	Japan 42,369; United Kingdom 8,188.
Wire		62,658	61,567	32,938	United Kingdom 6,415; France 5,567.
Tubes, pipes, fittings[4]		312,085	373,091	230,230	Japan 43,972; Brazil 15,866.
Lead:					
Ore and concentrate		34,375	43,974	22,451	Peru 13,468; Australia 8,055.
Oxides		7,577	6,238	6,068	Republic of South Africa 165; United Kingdom 5.
Ash and residue containing lead		546	2	2	
Metal including alloys:					
Scrap		26,660	34,831	34,787	Indonesia 42.

See footnotes at end of table.

TABLE 7—Continued

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS[2]—Continued					
Lead—Continued:					
Metal including alloys—Continued:					
Unwrought		11,131	11,682	7,661	Mexico 3,944; Brazil 61.
Semimanufactures		820	951	826	Belgium-Luxembourg 72; Denmark 31.
Lithium: Oxides and hydroxides		102	82	65	NA.
Magnesium: Metal including alloys:					
Scrap		80	41	41	
Unwrought		10,826	11,758	8,581	Norway 2,687; France 425.
Semimanufactures		2,030	1,126	1,124	Japan 1; United Kingdom 1.
Manganese:					
Ore and concentrate, metallurgical-grade		79,047	62,831	6,919	Republic of South Africa 22,885; Australia 15,829; Mexico 9,080.
Oxides		7,740	7,568	5,913	Japan 1,368; Brazil 161.
Metal including alloys, all forms		5,225	4,268	1,763	Republic of South Africa 2,138; China 150.
Mercury		32	54	49	Ireland 4.
Molybdenum:					
Ore and concentrate		521	258	258	
Oxides and hydroxides		124	176	176	
Metal including alloys:					
Unwrought including waste and scrap		28	42	40	West Germany 2.
Semimanufactures		31	35	31	Austria 2; Belgium-Luxembourg 2.
Nickel:					
Ore and concentrate, Ni content		1,097	33	1	Norway 24; Finland 8.
Matte and speiss		2,521	13,086	5,345	Australia 2,941; U.S.S.R. 2,250.
Oxides and hydroxides		77	37	NA	NA.
Metal including alloys:					
Scrap		13,480	9,314	8,008	Norway 445; United Kingdom 410.
Unwrought		3,787	4,083	186	United Kingdom 1,612; Norway 1,370; U.S.S.R. 774.
Semimanufactures		2,253	2,684	1,813	West Germany 348; United Kingdom 129.
Platinum-group metals:					
Waste and sweepings	value, thousands	$10,189	$11,584	$7113	Mexico $2,217; Australia $1,829.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	1,430	1,682	846	United Kingdom 468; West Germany 212.
Platinum	do.	4,440	4,217	1,200	U.S.S.R. 1,284; Republic of South Africa 782.
Rhodium	do.	229	361	107	U.S.S.R. 140; Republic of South Africa 69.
Iridium, osmium, ruthenium	do.	11	15	NA	NA.
Rare-earth metals including alloys, all forms		2	20	NA	NA.
Selenium, elemental		6	9	2	Japan 7.
Silicon, high-purity		447	469	120	Japan 347; Austria 1.
Silver:					
Ore and concentrate[5]	value, thousands	$5,968	$9,516	$4,539	Peru $4,697; Guyana $198.
Waste and sweepings[5]	do.	$59,545	$61,397	$53,470	United Kingdom $4,490; France $1,825.

See footnotes at end of table.

TABLE 7—Continued

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS[2]—Continued					
Silver—Continued:					
Metal including alloys, unwrought and partly wrought	kilograms	231,801	110,734	108,866	NA.
Tin:					
Ore and concentrate	do.	49,025	291	291	
Metal including alloys:					
Scrap		270	94	94	
Unwrought		3,959	3,760	140	Bolivia 829; China 516; Brazil 480.
Semimanufactures		447	332	275	Bolivia 20; Malaysia 18.
Titanium:					
Ore and concentrate		58,246	27,523	1,347	Australia 25,166; Sierra Leone 1,010.
Oxides		6,466	3,954	2,239	West Germany 586; France 578.
Metal including alloys:					
Unwrought including waste and scrap		861	908	875	United Kingdom 32; Japan 1.
Semimanufactures		1,760	1,633	1,333	Japan 166; United Kingdom 84.
Tungsten:					
Ore and concentrate	kilograms	194	—		
Metal including alloys:					
Unwrought including waste and scrap		141	62	61	West Germany 1.
Semimanufactures		67	66	55	Japan 5; United Kingdom 3.
Uranium and thorium:					
Ore and concentrate		78	20	19	France 1.
Oxides and other compounds	kilograms	r34,833	248,490	258	France 204,364; unspecified 43,867.
Uranium metal including alloys, all forms		1,285	1,870	231	Australia 1,144; Namibia 261.
Vanadium:					
Oxides and hydroxides		1,263	838	287	Republic of South Africa 455; China 96.
Metal including alloys, all forms		2	5	5	
Zinc:					
Ore and concentrate		40,564	182,733	129,383	Peru 42,619; Bolivia 9,103.
Oxides		1,917	2,438	2,080	Mexico 144; Netherlands 126.
Blue powder		658	555	438	Australia 80; Mexico 37.
Ash and residue containing zinc		293	567	567	
Metal including alloys:					
Scrap		1,379	1,615	1,615	
Unwrought		4,707	9,482	4,645	Australia 2,222; Yugoslavia 990.
Semimanufactures		2,272	4,366	2,957	Peru 444; Netherlands 252.
Zirconium:					
Ore and concentrate		10,426	9,841	2,323	Australia 6,100; Republic of South Africa 1,248.
Metal including alloys:					
Unwrought including waste and scrap		15	9	2	France 7.
Semimanufactures		281	280	166	France 114.
Other:					
Ores and concentrates, metal content		2,176	1,001	993	NA.
Oxides and hydroxides		1,749	983	560	France 72; unspecified 351.
Ashes and residues		30,264	17,372	7,670	United Kingdom 4,597; Italy 4,190.

See footnotes at end of table.

TABLE 7—Continued

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS—Continued					
Other—Continued:					
Base metals including alloys, all forms		11	9	9	
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		16,106	25,339	17,730	Greece 4,660; Turkey 2,298.
Artificial:					
Corundum		6,176	5,637	4,865	Austria 617; West Germany 34.
Silicon carbide		7,280	6,036	5,816	West Germany 99; Norway 98.
Dust and powder of precious and semi-precious stones including diamond	value, thousands	$5,259	$4,730	$568	Ireland $2,281; U.S.S.R. $1,713.
Grinding and polishing wheels and stones	do.	$39,050	$42,258	$25,028	Italy $5,920; West Germany $3,057.
Asbestos, crude		1,174	879	879	
Barite and witherite		5,577	7,995	6,812	Netherlands 956; West Germany 158.
Boron materials:					
Crude natural borates		596	573	573	
Elemental[6]		3	6	2	Japan 4.
Oxides and acids		5,257	5,672	5,581	Italy 53; United Kingdom 38.
Bromine and fluorine		1,373	1,512	1,509	Israel 2; United Kingdom 1.
Cement	thousand tons	660	656	418	Turkey 152; Venezuela 27.
Chalk		16,430	15,889	15,704	United Kingdom 141; West Germany 26.
Clays, crude:					
Bentonite		294,267	229,959	203,794	Greece 26,015; United Kingdom 147.
Chamotte and dinas earths		10,271	9,622	9,622	
Fire clay		12,366	10,443	10,185	NA.
Fuller's earth		7,377	6,643	6,643	
Kaolin		431,516	506,432	505,996	Italy 294; United Kingdom 111.
Unspecified		182,480	196,388	194,906	United Kingdom 1,422; unspecified 60.
Cryolite and chiolite		9,359	7,926	5,582	Norway 1,846; Denmark 395.
Diamond, natural:					
Gem, not set or strung	value, thousands	$64,022	$119,393	$22,592	Belgium-Luxembourg $37,421; U.S.S.R. $26,920; Israel $23,022.
Industrial stones	do.	$4,338	$6,213	$2,973	Ireland $2,550; Zaire $435.
Unsorted	do.	$129,732	$51,055	$15,316	Belgium-Luxembourg $18,229; Israel $10,744.
Dust and powder	thousand carats	6,364	6,168	408	U.S.S.R. 5,002; Ireland 694.
Diatomite and other infusorial earth		21,041	20,951	20,722	West Germany 228.
Feldspar, fluorspar, related materials:					
Feldspar		3,961	2,589	2,581	West Germany 8.
Fluorspar		162,664	151,255	8,395	Mexico 88,627; Morocco 31,595; China 22,636.
Leucite, nepheline and nepheline syenite		2	93	NA	NA.
Fertilizer materials:					
Crude, n.e.s.		4,540	4,900	4,875	United Kingdom 18; France 7.
Manufactured:					
Ammonia		12,084	12,754	12,678	West Germany 2; unspecified 73.

See footnotes at end of table.

TABLE 7—Continued

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Fertilizer materials—Continued:					
Manufactured—Continued:					
Nitrogenous		r263,322	320,107	156,736	Netherlands 112,013; Nigeria 37,129.
Phosphatic		51,874	52,017	38,009	Saudi Arabia 14,000; Netherlands 8.
Potassic		r46,139	96,171	95,069	West Germany 732; Italy 29.
Unspecified and mixed		431,663	483,593	468,652	Finland 11,394; Belgium-Luxembourg 1,773.
Graphite, natural		6,047	6,278	6,097	Sri Lanka 45; China 34.
Gypsum and plaster		323,934	336,796	159,806	Mexico 90,414; Spain 85,997.
Iodine		45	104	95	Chile 8.
Kyanite and related materials:					
Andalusite, kyanite and sillimanite		6,183	4,950	4,950	
Mullite		480	1,295	1,295	
Lime		38,929	43,696	42,065	United Kingdom 1,628; India 3.
Magnesium compounds:					
Magnesite, crude		125,657	96,714	374	China 96,340.
Oxides and hydroxides		86,166	99,827	82,702	China 7,521; Norway 5,000.
Mica:					
Crude including splittings and waste		2,512	2,340	2,216	India 82; Japan 42.
Worked including agglomerated splittings	value, thousands	$4,123	$5,977	$3,334	France $2,476; India $117.
Nitrates, crude		10,000	7,880	3,467	Chile 4,332; West Germany 61.
Phosphates, crude	thousand tons	1,847	1,258	429	Togo 782; Senegal 47.
Phosphorus, elemental		62	75	68	Japan 7.
Pigments, mineral:					
Natural, crude		1,531	1,002	850	NA.
Iron oxides and hydroxides, processed		6,579	7,069	5,958	West Germany 897; Spain 186.
Potassium salts, crude		r9	8	8	
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$22,135	$14,554	$6,204	Thailand $2,457; Brazil $875.
Synthetic	do.	$1,639	$1,563	$742	Republic of Korea $155; India $116.
Pyrite, unroasted		4,588	2,860	2,860	
Quartz crystal, piezoelectric	value, thousands	$1,698	$588	$509	Japan $71; Singapore $7.
Salt and brine	thousand tons	2,361	2,095	1,552	Mexico 342; Chile 117.
Sodium compounds, n.e.s.:					
Soda ash, natural and manufactured		140,691	158,719	158,711	United Kingdom 5; West Germany 3.
Sulfate, natural and manufactured		8,550	8,375	4,565	United Kingdom 3,529; Japan 129.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		85,101	77,261	39,283	Republic of South Africa 23,068; Zimbabwe 3,743.
Worked	value, thousands	$77,945	$83,017	$16,852	Italy $42,993; Spain $4,230.
Dolomite, chiefly refractory-grade		16,946	4,721	4,709	United Kingdom 12.
Gravel and crushed rock		905,826	1,177,005	1,169,955	France 1,536; Belgium-Luxembourg 777.
Limestone other than dimension	thousand tons	3,274	3,750	3,750	

See footnotes at end of table.

TABLE 7—Continued

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel:					
Quartz and quartzite		10,227	7,796	7,629	Brazil 156.
Sand other than metal bearing		1,455,222	1,215,081	1,214,533	United Kingdom 167; Japan 113.
Sulfur:					
Elemental:					
Crude including native and byproduct		18,311	13,247	13,218	France 29.
Colloidal, precipitated, sublimed		1,845	1,620	1,581	West Germany 39.
Dioxide		470	840	840	
Sulfuric acid		28,433	71,319	71,289	West Germany 16; United Kingdom 13.
Talc, steatite, soapstone, pyrophyllite		48,438	43,974	43,249	United Kingdom 460; Brazil 203.
Vermiculite[7]		53,020	48,568	37,180	Greece 8,388; Republic of South Africa 3,000.
Other:					
Crude		21,361	28,113	26,735	Mexico 1,277; U.S.S.R. 65.
Slag and dross, not metal-bearing		155,915	348,542	336,592	Norway 5,341; East Germany 4,544.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		4,332	6,340	4,577	Netherlands Antilles 1,430; West Germany 18.
Carbon including carbon black		20,305	17,074	16,630	West Germany 333; United Kingdom 59.
Coal:					
Anthracite		422,178	440,670	440,670	
Bituminous	thousand tons	14,903	14,347	14,314	Venezuela 33.
Lignite including briquets		214	178	178	
Unspecified including briquets		122,472	19,237	16,200	West Germany 1,546; unspecified 1,490.
Coke and semicoke		970,468	873,543	873,425	France 100; West Germany 18.
Gas, natural: Gaseous[8]	million cubic meters	771	293	293	
Peat including briquets and litter		274	316	316	
Petroleum:					
Crude	thousand 42-gallon barrels	178,003	200,310	6,784	United Kingdom 73,172; Norway 51,348; Saudi Arabia 22,460.
Refinery products:					
Liquefied petroleum gas	do.	r6,260	6,483	5,783	Canada 6,260; United Arab Emirates 632.
Gasoline[8]	do.	10,158	5,814	2,150	Netherlands 1,164; Norway 714.
Naphtha[8]	do.	349	264	264	
Mineral jelly and wax	do.	148	163	151	West Germany 4; France 2.
Kerosene and jet fuel[8]	do.	12,144	11,238	NA	NA.
Distillate fuel oil[8]	do.	7,893	4,715	4,006	United Kingdom 433; Netherlands 269.
Lubricants	do.	r83	61	58	West Germany 1.
Residual fuel oil[8]	do.	27,313	25,361	19,114	Venezuela 4,629; Nigeria 646.
Bitumen and other residues	do.	2,739	2,348	1,296	Netherlands Antilles 488; Spain 425.
Bituminous mixtures	do.	1,012	1,010	948	Spain 60; France 1.
Petroleum coke	do.	5,900	5,429	5,425	France 4.

rRevised. NA Not available.

[1]Table prepared by H. D. Willis.

[2]Data for ores and concentrates equal total weight of all metals contained unless otherwise indicated.

[3]Includes copper content of other ores and concentrates.

[4]Quantities for fittings were not provided; valued at $187,135,000 in 1989 and $190,919,000 in 1990.

[5]Includes other precious metals.

[6]May include tellurium.

[7]Includes chlorites and perlite.

[8]Source: International Energy Agency, Organization for Economic Co-operation and Development.

TABLE 8

CANADA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Alcan Aluminum Ltd.	Montreal, Quebec	
Do.	do.	Smelter, Laterriere, Quebec	200.
Do.	do.	Smelter, Isle Maligne, Quebec	73.
Do.	do.	Smelter, Beauharnois, Quebec	47.
Do.	do.	Smelter, Shawinigan, Quebec	84.
Do.	do.	Smelter, Grand Baie, Quebec	171.
Do.	do.	Smelter, Jonquiere, Quebec	232.
Do.	do.	Smelter, Kitmat, British Columbia	268.
Do.	Aluminiere de Becancour Inc. (Pechiney Corp., 25%; Government Quebec, 24.95%)	Smelter, Beaconcour, Quebec	360.
Do.	Canadian Reynolds Metals Co. Ltd. (Reynolds Metals Co., 100%)	Smelter, Baie Comeau, Quebec	400.
Asbestos	LAB Chrysotile Inc. [Lac d/Amiante du Quebec, Ltee (LAQ), 55%; Societe Nationall de l'Amiante (SNA), 45%]	Black Lake, Quebec	160 (fiber).
Do.	JM Asbestos Inc.	Jeffrey Mines, Asbestos, Quebec	300 (fiber).
Do.	Cassiar Mining Corp. (Princeton Mining Corp., 100%)	Cassiar, British Columbia	100 (fiber).
Cement	Lafarge Canada Inc.	Bath, Montreal, Quebec	1,000 (dry process cement).
Do.	do.	Exshaw, Alberta	1,184 (dry process cement).
Do.	Ciment St. Laurent Inc. (St. Lawrence Cement, 100%)	Joliette, Quebec	1,075 (dry process cement).
Do.	St. Lawrence Cement Inc.	Mississauga, Ontario	1,900 (wet and dry).
Do.	Lake Ontario Cement Ltd.	Picton, Ontario	927 (dry process cement).
Coal	Brinco Coal Corp. (Consolidated Brinco Ltd., 100%)	Quinsam Coal Mine, Campbell River, British Columbia	14,400 (open pit underground).
Do.	Cape Breton Development Corp. (Government of Canada, 100%)	Sydney, Nova Scotia	22,000 (longwall).
Do.	Luscar, Ltd.	Obed Mountain Mine, Hinton, Alberta	3,500.
Do.	Manalta Coal Ltd.	Gregg River Mine, Hinton, Alberta	3,960 (open pit).
Do.	do.	Highvale Mine, Seba Beach, Alberta	11,610 (open pit).
Do.	do.	Utility Mine, Estevan, Saskatchewan	3,600 (open pit).
Do.	Smoky River Coal Ltd. (Smoky River Holdings Ltd., 100%)	Grande Cache, Alberta	3,600 (underground and open pit).
Copper	Brenda Mines Ltd. (Noranda Inc., 69%)	Peachland, British Columbia	10,800.
Do.	Broken Hill Proprietary Co. Ltd. (BHP Holdings Inc., 100%)	Island Copper Mine, Port Hardy, British Columbia	16,200.
Do.	Cassiar Mining Corp. (Princeton Mining Corp., 100%)	Similco Mine, Princeton, British Columbia	9,000.

See footnote at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Copper	Falconbridge Ltd. (Noranda Inc., 50%; Trelleborg AB, 50%)	Sudbury Operations, Sudbury, Ontario	4,250.
Do.	do.	Strathcona and Timmins operations, Timmins, Ontario	4,860.
Do.	do.	Smelter, Timmins, Ontario	440.
Do.	Gibraltar Mines Ltd. (Placer Dome Inc., 68.14%)	McLease Lake, British Columbia	13,070.
Do.	Highland Valley Copper (Cominco, 50%; Rio Algom Ltd., 33.5%; Teck Corp., 11.5%; and Highmont Mining Co., 5%)	Logan Lake, British Columbia	4,500.
Do.	INCO Ltd.	Sudbury and Shebandowan, Ontario Thompson District, Manitoba	20,250 (mine).
Do.	do.	Smelter, Sudbury, Ontario	500.
Do.	do.	Refinery, Subdury, Ontario	170.
Do.	Noranda Inc.	Bell Copper Mine, Babine Lake, British Columbia	5,550 (mine).
Do.	do.	Smelter Horne, Noranda, Quebec	770.
Gold	Agnico-Eagle Mines Ltd.	Joutel, Quebec	590 (ore).
Do.	American Barrick Resources Corp. (The Horsham Group, 21.1%)	Camflo Div., Val-d'Or, Quebec	436 (ore).
Do.	Cassiar Mining Corp. (Acquired by Princeton)	Similco Mine, Princeton, British Columbia	450 (kg metal).
Do.	Eastmaque Gold Mines Ltd.	Kirkland Lake, Ontario	949 (ore).
Do.	Echo Bay Mines Ltd.	Lupin Mine, Contwoyto Lake, Northwest Territories	612 (ore).
Do.	Royal Oak Mines Inc.	Giant Mine, Yellowknife, Northwest Territories	407 (ore).
Do.	do.	Giant Mill-tailings, Yellowknife, Northwest Territories	3,265 (ore).
Do.	do.	Pamour, Ontario	945 (ore).
Do.	do.	Schumacher, Ontario	931 (ore).
Do.	Hemlo Gold Mines Inc. (Noranda, Inc., 50.8%)	Golden Giant Mine, Marathon, Ontario	1,080 (ore).
Do.	Hope Brook Gold Inc. (BP Canadian Holdings Ltd., 75.7%)	Hope Brook Mine, Conteau Bay, Newfoundland	1,090 (ore).
Do.	LAC Minerals Ltd.	Page Williams Mie, Hemio, Ontario	2,100 (ore).
Do.	Hudson Bay Mining and Smelting Co. (Inspiration Resources Corp., 100%)	Flin Flon and Snow Lake, Manitoba	2,600 (kg metal).
Do.	do.	Rutan Mine, Leaf Rapids, Manitoba	2.412 (ore).
Do.	Placer Dome Inc.	Campbell Mine, Red Lake, Ontario	400 (ore).
Do.	do.	Detour Lake Mine, Northeast Ontario	900 (ore).
Do.	do.	Dome Mine, South Porcupine, Ontario	1,300 (ore).
Do.	do.	Sigma Mine, Val-d'Or, Quebec	500 (ore).
Do.	do.	Kiena Mine, Val-d'Or, Quebec	500 (ore).
Do.	do.	Equity Silver Mine, Houston, British Columbia	3,500 (ore).
Do.	Teck-Corona Corp. (Teck Corp., 100%)	David Bell Mine, Hemlo, Ontario	456 (ore).
Gypsum	Domtar Inc.	Flat Bay, Newfoundland	1,300.

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Gypsum	Georgia-Pacific Corp.	River Denys, Sugar Camp, Nova Scotia	1,460.
Do.	Little Narrows Gypsum Co. Ltd. (USG Corp., 100%)	Little Narrows, Nova Scotia	1,640.
Do.	National Gypsum (Canada) Ltd. (Aancor Holdings Corp., 100%)	Milford, Nova Scotia	3,300.
Do.	Westroc Industries Ltd.	Windermere, British Columbia	1,170.
Iron and steel	Iron Ore Co. of Canada	Carol Lake, Labrador	8,800 (concentrate).
Do.	do.	do.	10,300 (acid pellets).
Do.	Quebec Cartier Mining Co. (Dofasco Inc., 50%)	Mount Wright, Quebec	16,950 (concentrate).
Do.	do.	do.	7,500 (acid pellets).
Do.	The Algoma Steel Corp. Ltd. (Dofasco Inc., 100%)	Sault Ste. Marie, Ontario	2,478 (pig iron), 3,135 (crude steel), 657 (sinter).
Do.	Dofasco Inc.	Hamilton, Ontario	3,642 (pig iron), 4,500 (crude steel).
Do.	Stelco, Inc.	do.	2,733 (pig iron), 7,990 (crude steel), 560 (sinter).
Do.	Wabush Mines Ltd. (Inland Steel Industries, 18%; LTV Corp., 26.9%; IRI Italy, 11.38%)	Wabush, Labrador and Pointe Noire, Quebec	6,200 (concentrate).
Lead	Brunswick Mining and Smelting Corp. Ltd. (Noranda Inc., 64.8%)	No. 12 Mine, Bathurst, New Brunswick	72 (Pb contained).
Do.	Falconbridge Ltd. (Noranda Inc., 50%; Trelleborg AB, 50%)	Strathcona, Timmins, Ontario	212 (Pb-Zn contained).
Do.	Hudson Bay Mining and Smelting Co., Ltd. (Inspiration Resources Corp., 100%)	Flin Flon and Snow Lake, Manitoba	60 (Pb-Zn contained).
Do.	Cominco Ltd.	Trail, British Columbia	135 (refined lead).
Do.	Curragh Resources Inc. (Banco Espanol de Credito S.A., 100%)	Faro Mine, Yukon Territory	184 (Pb-Zn contained).
Limestone	Lafarge Canada Inc.	Steep Rock, Manitoba	906 (quarry limestone).
Do.	Scotia Limestone Ltd.	Iris Cove, Sydney, Nova Scotia	720 (limestone).
Do.	Inland Cement Ltd. (CBR Materials Corp. of Canada, 100%)	Mafeking, Manitoba	720 (limestone).
Do.	do.	Cadomin, Alberta	2,160 (quarry limestone).
Do.	Havelock Ltd. (Kickenson Mines, Ltd. 100%)	Havelock, New Brunswick	864 (limestone).
Do.	Continental Lime Ltd.	Faulkner, Manitoba	1,440 (320/R-1 crushed stone).
Nickel	Falconbridge Ltd. (Noranda Inc., 50%; Trelleborg AB, 50%)	East, Fraser, Lockerby, Onaping, Strathcona, and Craig in Sudbury, Ontario	30 (metal contained).
Do.	do.	Smelter, Falconbridge	45 (rated capacity).

See footnote at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Nickel		INCO Ltd.	Sudbury district mines: Frood Stobie, Little Stobie, Creighton, Copper Cliff North and South, Garson, Levace McCreedy East and West, Shebandowan, Clarabelle, Lower Coleman, Crean Hill, Murray, and Totten in Sudbury area, Ontario	106 (metal contained).
Do.		do.	Smelter, Sudbury, Ontario	110 (metal contained).
Do.		do.	Refinery, Sudbury, Ontario	56.8 (metal contained).
Do.		do.	Refinery, Port Colborne, Ontario	30 (metal contained).
Do.		do.	Thompson, Pipe, Birchtree mines in Manitoba	62 (metal contained).
Do.		do.	Smelter, Thompson, Manitoba	82 (metal contained).
Do.		Sherritt Gordon Ltd.	Refinery, Fort Saskachewan, Alberta	24 (metal contained).
Petroleum:[1]				
Gas	billion cubic meters	Bow Valley Industries Ltd.	Edgerton, etc.	1.8.
Crude	million 42-gallon barrels	do. (British Gas Canada Ltd., 100%)	do.	12.4.
Gas	million cubic meters	BP Canada Inc. (The British Petroleum Co. PLC London, 100%)	Noel Area, North Alberta; Chauvin, Sibbald, N Pembina, Alberta	47.
Crude	million 42-gallon barrels	do.	do.	1.2.
Do.		Gulf Canada Corp. (Olympia and York Developments, 80%; Gulf, 20%)	Fenn-Big. Valley, Swan Hills, Goose River, Peerless, and Sene, Alberta	18.
Do.		Home Oil Co. Ltd. (Interhome Energy Inc. 100%)	Red Earth, Garrington, Cherhill, Medicine River, and Swan Hills, Alberta	11.5.
Gas	billion cubic meters	Home Oil Co. Ltd. (Interhome Energy Inc. 100%)	Red Earth, Garnington, Cherhill, Medicine River, and Swan Hills, Alberta	1.8.
Crude	thousand 42-gallon barrels	Imperial Oil Ltd. (Exxon Corp., USA, 70%; others, 30%)	Judy Creek, Cold Lake, Alberta, and Mackenzie Delta, Beaufort Sea, Yukon and Northwest Territories	670.
Gas	million cubic meters	do.	do.	36.4.
Crude	million 42-gallon barrels	Mobil Oil Canada Ltd. (Mobil Corp., United States, 100%)	Hibernia, Grand Banks, SE of Newfoundland and Sable Island, Nova Scotia, and others in Alberta, Saskatchewan, and British Columbia	26.1.
Gas	billion cubic meters	do.	do.	3.0.
Crude	million 42-gallon barrels	Norcen Energy Resources Ltd. (Hollinger Inc., 59%; Hees International, 41%)	Pembina, Bodo, Majorville, Alberta	12.1.
Do.	do.	Oakwood Petroleums Ltd. (Sceptre Resources Ltd., 100%)	Grantham, Hays, Ronalane, Peace River, Normandville, Randell, Alberta, and Grizzly Valley, British Columbia	24.6.
Do.	do.	PanCanadian Petroleum Ltd. (Canadian Pacific Enterprises, 87%; others, 13%)	Rycroft, Wembley, Elk Point, Rio Bravo, Alberta	19.7.
Gas	billion cubic meters	do.	do.	3.53

See footnote at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum:			
Crude million 42-gallon barrels	Shell Canada Ltd. (Shell Investments, 79%; others, 21%)	Dimsdale, Little Smoky Lake, Sousa, Alberta, Midale, Benson, Saskatchewan	22.2.
Gas billion cubic meters	do.	do.	6.53.
Crude million 42-gallon barrels	Suncor Inc. (Sun Co. Inc., United States, 75%; Ontario Energy Resources, 25%)	Kidney, Zama Lake, Cosway, Albersun Prevo, and Medicine River, Alberta and Leitchville, Unwin, Saskatchewan	4.1.
Crude thousand 42-gallon barrels	Texaco Canada Petroleum Inc. (Texaco Inc., United States, 78%; others, 22%)	Eaglesham, Virgo, Alberta, and Desan, British Columbia	158.
Gas million cubic meters	do.	do.	67.3.
Crude million 42-gallon barrels	UNOCAL Canada Ltd. (UNOCAL Corp. USA, 100%)	Calgary, Alberta	14.7.
Potash (K_2O equivalent)	Potash Corp. of Saskatchewan Inc. (private, 37%; Provincial Government, 63%)	Lanigan, near Lanigan Saskatchewan	3,400 (KCl).
Do.	do.	Rocanville, Southeast Saskatchewan	1,750 (KCl).
Do.	International Minerals and Chemical Corp. (Canada) Ltd.(IMC Fertilizer Corp., 100%)	Esterhazy, Southeast Saskatchewan	1,814 (KCl).
Do.	Kalium Chemicals (Kalium Canada Ltd., 100%)	Potash Mine, 40 km west of Regina, Moose Jaw, Saskatchewan	2,040 (KCl).
Salt and brine operations	The Canadian Salt Co.	Pugwash, Nova Scotia	1,400 (rock salt and brine salt).
Do.	do.	Iles-de-la-Madeleine, Quebec	1,625 (rock salt).
Do.	do.	Ojibway, Ontario	2,600 (rock salt).
Silver	Cambior, Inc.	Quebec	396 (mill feed).
Do.	International Corona Corp. (Dundee Bancorp, 30%)	Nickel Plate Mine, Hedley, British Columbia	1,320 (mill feed).
Do.	Equity Silver Mines Ltd. (Placer Dome Inc., 58.8%)	Houston, British Columbia	2,970 (Ag-Au-Cu conc).
Do.	LAC Minerals Ltd.	Macassa Mine, Ontario	165 (mill feed).
Do.	do.	Bousquet Mine, Quebec	580 (mill feed).
Do.	Similco Mines Ltd.	Princeton, British Columbia	8,250 (Ag-Au-Cu conc).
Do.	United Keno Hill Mines Ltd.	Elsa, Yukon Territory	132 (mill feed).
Sodium chlorate production using salt	Dow Chemical Canada Inc. (The Dow Chemical Co. Michigan, United States, 100%)	Fort Saskatchewan, Alberta	524 (caustic soda).
Do.	do.	do.	476 (chlorine).
Do.	do.	Sarnia, Ontario	350 (caustic soda).
Do.	General Chemical Canada Ltd.	Amherstburg, Ontario	363 (sodium carbonate).
Sulfur:			
Petroleum refinery capacities	Consumer's Cooperative Refineries Ltd. (Federated Cooperatives Ltd., 100%)	Regina, Saskatchewan	54.
Do.	Esso Petroleum Canada	Sarnia, Ontario	50.
Do.	Sulconam Inc. (Petro Canada, 7.6%)	Montreal, Quebec	108.
Main sulfur extraction plants (sour gas and oil sands)	Amoco Canada Petroleum Co., Ltd. (Amoco Corp. USA, 100%)	East Crossfield-Elkton, Alberta	650.
Do.	Canadian Occidental Petroleum, Ltd.	East Calgany-Cross field, Alberta	610.

See footnote at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Sulfur: Main sulfur extraction plants (sources and oil sands)	Chevron Canada Resources Ltd. (Chevron Corp. USA, 100%)	Kaybob South III, Alberta	1,281.
Do.	Husky Oil Ltd.	Ram River, Ricinus, Alberta	1,646.
Do.	Shell Canada Ltd.	Waterton, Alberta	1,120.
Principal SO_2 and H_2SO_4 production capacities	Canadian Electro Zinc Ltd. (CEZ) (Noranda Inc., 90.17%)	Valleyfield, Quebec	430 (H_2SO_4).
Do.	INCO Ltd.	Copper Cliff, Ontario	950 (H_2SO_4).
Do.	Falconbridge Ltd.(Naranda Inc., 50%; Trelleborg AB, 50%)	Kidd Creek, Ontario	690 (H_2SO_4).
Do.	ESSO Chemical Canada (Imperial Oil, Ltd., 100%)	Redwater, Alberta	910 (H_2SO_4).
Uranium	Denison Mines Ltd.	Elliot Lake, Ontario	1,319 (metal).
Do.	Cameco Corp. (Province of Saskatchewan, 61.5%; Government of Canada, 38.5)	Key Lake, Saskatchewan	4,976 (metal).
Zinc	Brunswick Mining and Smelting Corp. Ltd. (Noranda Inc., 64.3%)	Bathurst, New Brunswick	232 (Zn contained).
Do.	Falconbridge Ltd. (Noranda Inc., 50%; Trelleborg AB, 50%)	Timmins Operations, Ontario	212 (Pb-Zn contained).
Do.	do.	Smelter	133 (slab zinc).
Do.	Hudson Bay Mining and Smelting Co., Ltd.	Snow Lake concentrator, Manitoba	1,125 Pb-Zn ore).
Do.	do. (Inspiration Resources Corp., 100%)	Flin Flon mine and smelter	85 (slab zinc).
Do.	Cominco Ltd. (Cominco, 55%; Pine Point Mines Ltd., 45%)	Sullivan Mine, Kimberley, British Columbia	70 (Pb-Zn contained).
Do.	do.	Smelter, Trail, British Columbia	300 (slab zinc).
Do.	Curragh Resources Inc. (Banco Espanol de Credito S.A., 100%)	Faro Mine, Yukon Territory	184 (Pb-Zn contained).

[1]Projections of annual capacity involve matching decline curves against new discoveries, and are extrapolations only, based on data in Canadian Oil & Gas Handbook 1991, Northern Miner Press, Inc.

TABLE 9

CANADA: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

(Thousand metric tons unless otherwise specified)[1]

Asbestos, fiber		e39,000
Coal, all types		e6,371,000
Copper, metal content		11,203
Gold, metal	metric tons	[2]1,500
Gypsum		[3] e500,000
Iron ore, iron content		e1,314,000
Lead, metal content		6,317
Molybdenum, metal content		193
Natural gas	million cubic meters	[4]2,059,884
Nickel, metal content		5,792
Petroleum crude	thousand barrels	[4]6,765,900
Potash, K_2O equivalent		e14,000,000
Salt		[3]314,000
Silver, metal	metric tons	23,000
Sodium sulfate		[3]92,000
Sulfur		e140,000
Uranium		[5]271
Zinc, metal content		20,091

eEstimated.

[1]1991 Canadian Minerals Yearbook, Energy, Mines and Resources Canada, unless noted.

[2]Excludes metal in placer deposits.

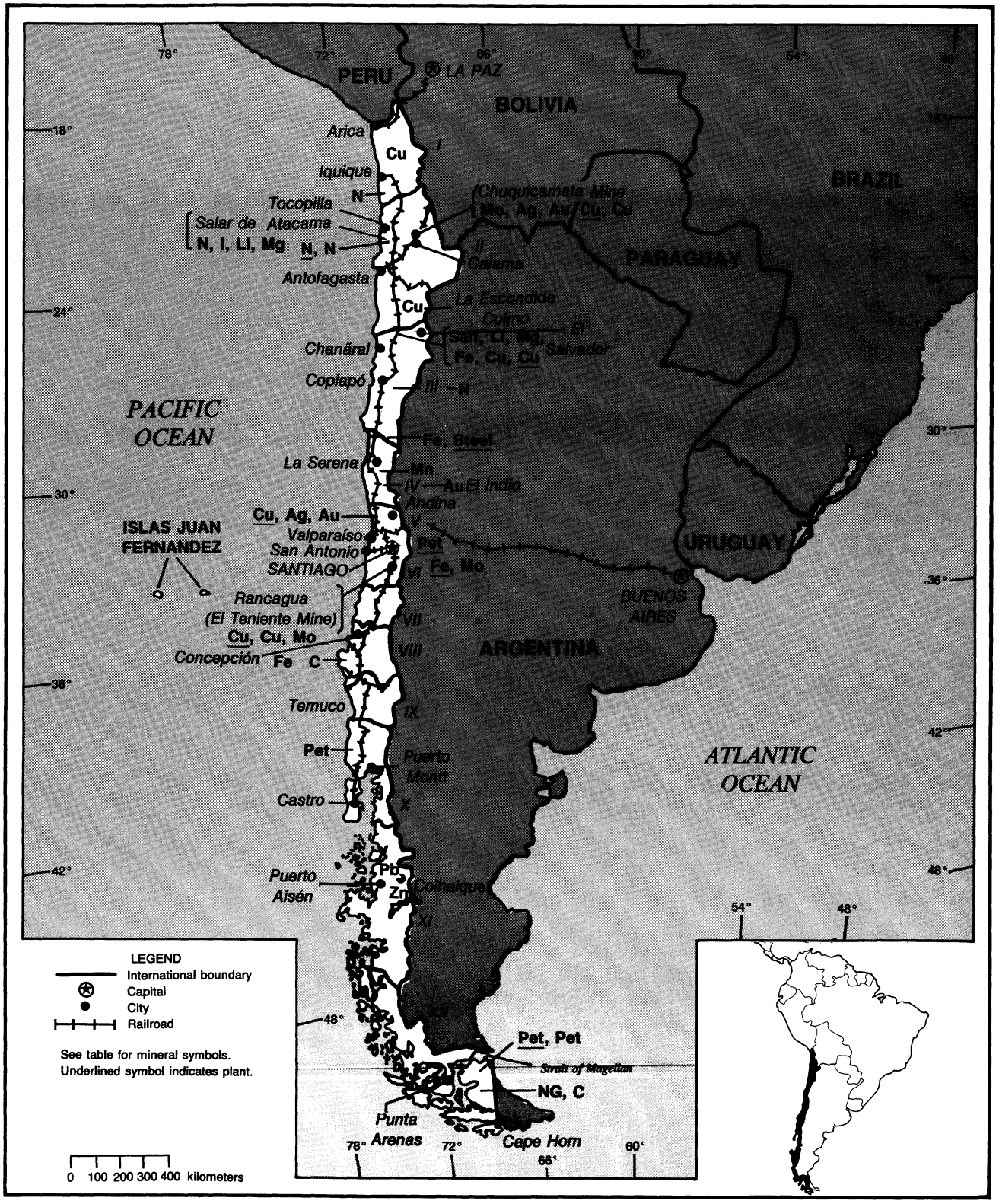
[3]Data in thousand short tons, unless noted.

[4]Extrapolated from 1991 Canadian Oil and Gas Handbook, The Northern Miner Press Ltd.

[5]Recoverable at prices of $100 per kilogram of U, or less.

CHILE

AREA 756,900 km² **POPULATION 13.4 million**



THE MINERAL INDUSTRY OF

CHILE

By Pablo Velasco

Chile continued to be the largest producer and exporter of copper in the world, although the United States was a close second. Chile's copper production accounted for 20% of the total output of the market economy copper-producing countries and was expected to maintain this lead in the foreseeable future because of the startup of the large Escondida Mine in late 1990. This giant copper mine produced more than 316,000 tons of copper in concentrates in the first full year of operation, which was just below its design capacity of 320,000 mt/a. The shortfall was due to bad weather during the year. The Chilean Copper Commission (Cochilco) reported a 14.2% increase in copper production to more than 1.8 Mmt in 1991. Chile was also one of the world's significant producers and exporters of potassium nitrate and sodium nitrate, ranking second in the world production of iodine, lithium, molybdenum, and rhenium after the United States. Chile produced a record 28.7 tons of gold and 673.7 tons of silver in 1991, and possessed approximately 22% of the world's copper reserves, as well as important reserves of lithium, 58%; rhenium, 40%; iodine, 23%; selenium, 21%; and molybdenum, 20%.

The mining sector's contribution to export value was $4.4 billion or 48.5% of the total. Corporación Nacional del Cobre de Chile (CODELCO-Chile), with its four mining divisions, contributed about 62% of the total copper produced in the country. Despite the various problems confronted by CODELCO-Chile during the past 4 years, 1991 was a lower, but still profitable, year for the state-owned company with earnings before taxation totaling $887.5 million, mainly as a result of lower-than-expected copper prices whose average price at the London Metal exchange was $1.06 per pound. CODELCO-Chile contributed $869.9 million to the Chilean treasury in 1991, significantly less than the $1.5 billion that was contributed in 1990. CODELCO's copper production declined to 1.13 Mmt in 1991, down 5.8% from a peak of 1.19 Mmt in 1990, and was expected to drop further in 1991 as a result of declining ore grades and continued production problems at the El Teniente Mine. Preliminary data indicated that the Chilean economy registered a real GDP growth of 6% to $30.4 billion[1] in 1991, the fourth highest annual rate in the past 32 years, while per capita income increased 13.5% to $2,241. The economy rebounded into a more dynamic mode after adjusting policies that had caused a sluggish 2.1% growth in 1990. The most important pieces of new mining legislation were: Chile's first mineral depletion allowance; the authorization of CODELCO-Chile to negotiate the sale of its many unexploited mineral properties; the transfer of mineral patent income from the Ministry of Finance to the regional Governments; an amendment to Chile's mining code to minimize future legal disputes; the first nationwide gaseous emission standards for mineral smelters, roasters, and thermal powerplants; a petroleum price stabilization fund; and permission for a U.S. oil company to explore for oil and gas in Chile's national parks.

GOVERNMENT POLICIES AND PROGRAMS

The Central Bank of Chile modified the rules for debt for equity swap transactions under chapter XIX of its Compendium of Foreign Exchange Rules. In November, the Central Bank authorized foreign investors to sell portions of investment acquired through chapter XIX operations, but maintained the 3-year requirement on the repatriation of the capital associated with these investments. The Government also announced that it is concluding deliberations on a package of modifications to foreign investment rules that would liberalize regulations on the repatriation of capital and earnings. The change would enable investors to speed up capital and profit repatriation under such conditions as agreeing to prepayment of compensation to bring the investment in line to those made under Decree Law 600 (DL 600), Chile's direct investment statute.

The Foreign Investment Committee stated that inflows of foreign investment through DL 600 in 1991 totaled an unprecedented $1.3 billion. The committee approved eight major projects for industry ($130 million), mining ($1.1 billion), and services ($27.5 million) totaling $1.27 billion. Another 38 smaller approved projects accounted for $30.7 million. The Committee reported that in 1991 about $3.4 billion in investments was authorized, an increase of 135% over that of the previous year. In 1991, the country with the largest foreign investment commitments in Chile was the United States with $1.49 billion, or 43.8% of the total authorized foreign investment.

Chile's mining code, which had been in place for at least 11 years, applied equally to domestic and foreign firms. No mining licenses were required under the mining code. The code allowed ownership of mining concessions, granted an owner the right to extract ore from the concession, and required that the owner

obtain the necessary permits before extracting the ore.

Responding to a serious loophole in the new mining code, the Ministry of Mines was preparing a law that would make it more difficult for individuals to place mining claims on mineral properties already claimed under the old mining code. Under the new code, some individuals had been able to take advantage of a loophole allowing them to place claims on properties that had been incorrectly surveyed. The incorrect location of mineral properties was not uncommon before the introduction of modern surveying practices. This loophole created a legal nightmare for several foreign mining companies, and although the amendment will not contribute to the resolution of existing disputes, it should minimize the problems in the future. It was not clear when this proposal would be presented to Congress.

In addition, the Chilean Government planned to submit a comprehensive environmental law to Congress in 1992 or 1993. The major new mines being built by foreign firms to international standards should be comfortable with tighter regulation, but the aging mines and smelters operated by Chilean state enterprises face a costly, multiyear process of retrofitting to meet new standards. Substantial portions of the State mining corporation investment budgets over the next 2 to 3 years will be devoted to environmental rehabilitation. The coordinating mechanism, the National Environmental Commission (CONAMA), is focusing on the creation of a schematic document that lays out general environmental objectives and outlines a policy response. As part of this task, CONAMA was attempting to identify and synthesize more than 2,000 Chilean laws that bear on the environment. Although these laws were often unknown and usually ignored, Chilean environmental officials hoped to employ them as a basis for a rationalized environmental regulatory framework. The Commission's work so far revealed that Chile lacked regulations in several problem areas, including the management of toxic wastes and integrated river basins, and had no environmental impact statement requirements. In addition to CONAMA, the Government established a special municipal commission under the control of the Minister Secretary General of the Presidency to address the numerous pollution problems of the Santiago Metropolitan Area. The Commission's highest priority was the reduction of the capital city's severe air pollution. Thus far, the current administration had issued one environmental decree, a limit on sulfur dioxide emissions. CODELCO and Empresa Nacional de Minería (ENAMI) needed to invest $920 million over the next 8 years to modernize their copper smelters to comply with Chile's environmental law regulating sulfur dioxide emissions in the mining sector (Decree 185.)

PRODUCTION

The Chilean mining industry experienced another year of continued growth in 1991 as a result of its attractiveness to domestic and foreign investors and the startup of the giant Escondida Mine in late 1990, which added 320,000 mt/a of copper production. According to the Chilean Copper Commission, most of the foreign investment in the mining sector was concentrated in the following projects: Zaldívar, Candelaria, Andacollo, Refugio, Quebrada Blanca, Cerro Colorado, and Expansion of the Los Bronces and Chagres Smelter. Some of these projects were already under way or in advanced construction stages. Similarly, a number of projects in different stages of study of their feasibility were expected to be completed in 1992. Mining projects that were expected to begin operations in 1992 included: La Candelaria ($500 million), Cerro Colorado ($290 million), Quebrada Blanca ($360 million), Zaldívar ($400 million), and the Refugio ($130 million). Other projects such as Los Pelambres, Collahuasi, Iván and Zar, Las Luces, Yolanda, and Lince were in advanced stages of development. Review of the production statistics for 1991 shows the effective contribution of the medium-scale mining sector in comparison with the large-scale mining sector, which was handled entirely by CODELCO-Chile. CODELCO-Chile's copper production maintained leadership with another record-high output amounting to 62% of the total copper produced in the nation. The small- and medium-size mining sectors produced the remaining 38% of the copper.

The leading minerals produced in Chile were coal, copper, crude oil, gold, iodine, iron ore, lead, lithium carbonate, manganese, molybdenum, natural gas, petroleum products, silver, sodium and potassium nitrates, sodium sulfate, and zinc.

Output of copper, coal, gold, iodine, iron ore, manganese, molybdenum, rhenium, silver, selenium, zinc, and potassium nitrate increased, while production of lead lithium carbonate, ulexite, sodium sulfate, and crude oil, decreased compared with those of 1990. The production of fine copper increased 14.2% to 1.8 Mmt, still another record high. Molybdenum, metal doré, and sulfuric acid were produced as by-products of copper. CODELCO-Chile accounted for all of the output of molybdenum in the form of molybdenum trioxide and concentrate. In addition, CODELCO-Chile produced sulfuric acid. *(See table 1.)*

TRADE

In 1991, Chile's total exports amounted to $8.93 billion and total imports, $8.09 billion, to yield a $835 million trade surplus, down 34.4% from a $1.27 billion surplus in 1990. In 1991, total exports increased 7.4% and imports increased 15.0% compared with those of 1990. Mineral exports accounted for 48.5% of the total exports of the nation. In 1991, Chile's main export was copper, worth $3.62 billion (39.9% of the total mineral exports). Metallic minerals exported were valued at $635.7 million (14.4%). Industrial minerals sold abroad (and other) totaled $143.4 million (3.3%). Mineral exports from Chile totaled $4.4 billion or 48.5% of the total

of all exports for 1991. Besides copper, Chile's main minerals exports were gold, iodine, iron ore, lithium carbonate, molybdenum, silver, and zinc. CODELCO-Chile shipped about 990,100 tons of fine copper in 1991 and the medium and small producers 715,300 tons, with the remainder sold by others. Sales of fine copper plus byproducts by CODELCO-Chile amounted to about $2.8 billion, representing a decrease of $565 million, or 16.9%, compared with that of 1990. Based on a pretax profit of $887.5 million, the net profit for 1991 amounted to $292.9 million, a decrease of $328.5 million from the total earnings achieved in 1990. The unfavorable effects of decreased production and sales were reinforced by a decrease in the price of copper. The United States was Chile's principal trading partner, accounting for about 18% of Chile's imports and 20% of Chile's exports. According to U.S. Department of Commerce data in 1991, U.S. exports to Chile amounted to $1.58 billion and U.S. imports from Chile totaled $1.60 billion.

In September 1990, Chile was one of the first Latin American countries to sign a bilateral framework agreement on trade and investment with the United States. The U.S. Trade Representative formally recommended that the United States reinstate Chile as a beneficiary country under the U.S. Generalized System of Preferences (GSP). Chile had been suspended from the program in February 1988 because of a determination that it did not meet the worker rights eligibility standard. A review of changes in labor practices initiated last April found that Chile had "substantially overcome" the problem that had caused its suspension, and Chile again became a beneficiary of the GSP program. The GSP qualified Chile for trade valued at $300 million for duty-free status, of which about $100 million covered copper products. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

The Chilean Government through the Ministry of Mines exercised dominant control over the mineral industry through three large mining enterprises and four regulatory agencies: CODELCO-Chile; ENAMI; and Corporación de Fomento de la Producción (CORFO), which includes Cía. de Acero del Pacífico S.A. de Inversiones (CAP), Empresa Nacional del Petróleo S.A. (ENAP), Empresa Nacional del Carbón S.A. (ENACAR), Cía. Chilena de Electricidad S.A. (CHILECTRA), Sociedad Química y Minera de Chile S.A. (SOQUIMICH); and four regulatory agencies: Servicio Nacional de Geología y Minería (SERNAGEOMIN), Comisión Chilena del Cobre (COCHILCO), the Foreign Investment Committee, and CONAMA.

CODELCO-Chile, the largest copper producer and exporter in the world, was composed of four divisions, Chuquicamata, El Teniente, Andina, and El Salvador, which had a total production of 1.1 Mmt of fine copper in 1991. CODELCO-Chile was also a producer of gold, metal doré, molybdenum (trioxide, concentrate), and silver, as well as sulfuric acid and ammonium perrhenate (rhenium). ENAMI, the second largest state-owned company, was created in the early 1960's to promote mining activities, process and market copper and other minerals, and to provide services to the mining industry. To strengthen this position, ENAMI has established as part of its mission the promotion, development, and processing of Chile's small- and medium-size nonferrous metals mines output. ENAMI also purchased concentrates of copper, gold, and silver; precipitates and minerals for direct smelting; and anodes and blister for its smelters and refineries. The company served as a market regulating force by determining rates for minerals and mining products bought from producers in potentially attractive mining zones, provided credit to miners who lacked access to standard sources of financing, facilitated miners' access to banking sources, and provided training and support programs to small-size miners. Furthermore, ENAMI produced, sold, and distributed sulfuric acid; participated with private investors in the development of mining projects; guarded against potential environmental harm from mining production; and bought ores for flotation and leaching at its own plants. CORFO was created in 1939 to develop economic programs for the promotion of manufacturing activities by exploiting natural resources. These objectives led to the birth of other major enterprises such as ENAP, CAP, ENDESA, and ENACAR. The total labor force, including staff and office personnel, working directly in the minerals sector numbered 76,843, representing about 1.7% of the total labor force (4,540,400) in the country. Approximately 6.5% of the total labor force was unemployed during the year. The metals sector's labor force was 59,746, about 78% of the mineral sector labor force total, of which 47,180 were copper workers. The industrial minerals sector labor force was 3,594, and the mineral fuels sector was 13,503, 85% of which was coal miners. CODELCO-Chile employed about 26,841 copper workers in 1991, or about 45% of the total metals sector employees. *(See table 4.)*

COMMODITY REVIEW

Metals

Copper.—Chile's copper production in 1991 reinforced its position as the world's largest producer and exporter of copper. According to official statistical figures released by the Ministry of Mines through its agencies Comisión Chilena del Cobre and Servicio Nacional de Geología y Minería, Chile produced another historical record of 1.8 Mmt of copper in 1991. The increase in copper production of 14.2% over that of the previous year was due to the additional output from the new private-sector La Escondida Mine that produced about 300,000 tons. Total output would have been even greater but for technical and production problems in the two largest CODELCO mines, El

Teniente and Chuquicamata. CODELCO's copper production decreased by 5.8% in 1991 compared with that of 1990, owing mainly to lower copper grades, from an average of 1.42% in 1990 to 1.29% in 1991. In addition, production fell as a result of the legal strike involving Chuquicamata Unions, between July 1 and July 14. On the other hand, the production of copper by the medium and small mining sectors increased by 80.7%. CODELCO-Chile invested $343 million in 1991 to maintain extraction levels and mineral-treatment capacity, as well as limiting cost increases resulting from lower copper grades. A significant part of this investment, unlike those made in previous years, has been channeled into an intensified development of environmental cleaning-up plans. Also included were geological exploration and feasibility studies to support the exploitation of new deposits and expansion of others that are currently operational and have significant potential. The 1991 investment was about $13 million more than that in 1990. CODELCO-Chile's contribution to the Chilean Treasury decreased in 1991 to $870 million, a decline of $635 million with respect to that of 1990. Chuquicamata Div. reached another record of 641,429 tons of fine copper in 1991; however, 5.8% less than that of the previous year and 58% of the total copper produced by CODELCO-Chile. CODELCO's other three mines' output was as follows: El Teniente, 278,765 tons; El Salvador, 91,082 tons; and Andina, 114,202 tons.

The fifth division of CODELCO, the Tocopilla powerplant, produced all the power required for Chuquicamata's operation plus a surplus for the national grid of 2,821,593 MW•h, an increase of 17.4% over that of 1990. At present, four copper smelters in Chile produce sulfuric acid from gases having a production capacity of 385,000 tons per year. The second Chuquicamata plant and the first of ENAMI's Ventanas are under construction. The third plant of Chuquicamata has already been contracted for, and the second plant of El Teniente is in a projected stage. For 1992 the sulfuric acid production in Chile will be more than 2 Mmt/a, a figure that differs considerably from the present consumption rate of 675,000 Mmt/a. Sulfuric acid production in 1991 was 593,863 tons (about 1,627 mt/d), compared with 516,624 tons in the prior year.

CODELCO-Chile's increase in sulfuric acid consumption expected for the next few years is due mainly to the introduction of a leaching process in its mines. These projects are based on the existence of large reserves of oxidized copper ore, the huge availability of sulfuric acid, and low copper production costs by means of hydrometallurgical processes. Additional copper production will be contributed by the private sector. For the next 5 years, this production will be mainly from the Australian firm Broken Hill Proprietary Co. Ltd.'s (BHP) large La Escondida Mine, which was inaugurated in November 1990 with an investment of less than $1 billion. La Escondida is rushing through a surprise new venture to produce copper cathodes. This arrangement, on which the company says it is moving "aggressively," will add another thick layer of output and profitability to what 1991 returns are already confirming is a hugely successful mine. The company is looking at an extra output of 80,000 tons of cathodes per year, the equivalent in itself of a big new mine. The first slice of the project, a 40,000-mt/a unit, should be coming on-stream sometime in the second half of 1994. Future capacity of La Escondida Mine operations will depend on market demand, as the ore is of such a high grade (reserves are 1.8 billion of ore grading 2.14% Cu) that output can be adjusted with small changes in tonnage and cutoff grade.

Exxon expects to finish its $400 million expansion of the Los Bronces copper mine 6 months ahead of schedule. The lack of rain and snowfall in 1990 and 1991 allowed Techint Cía. International de Ingeniería y Construcciones, the main pipeline contractor, to get ahead on a 56-km pipeline, a key feature of the project. The project's timetable is critical. Disputada said that by the end of 1992 there would not be any space left in the San Francisco dam for its tailings, the waste produced in the concentrators. The pipeline was completed in September, and Disputada is now focusing its efforts in the construction of the crushers and mills near the mine. Disputada also started to remove the overburden of the El Infiernillo pit this year, already the production area of the mine. Los Bronces' ore body is located on one of the world's largest porphyry copper deposits. CODELCO's Andina Mine, on the other side of a ridge, exploits the same deposit. Los Bronces itself has reserves of 1.3 billion tons of ore with an average grade of 0.81% copper and 0.016% of molybdenum, enough to maintain operations for more than one century with the mine's new treatment capacity.

Empresa Minera de Mantos Blancos is owned jointly by Anglo-American Corp. of the Republic of South Africa (68.5%), Inversiones Sud-Americana S.A. (5.7%), and Inversiones La Protectora S.A. (11.2%). The International Finance Corp., a World Bank affiliated company, has sold its 15.8% stake to institutional investors. Sales of copper during 1990 reached 71,056 tons with a revenue of $173.7 million; 43,516 kg of silver was also sold for a value of $6.9 million. During the first half of 1991, Mantos Blancos sold $80.4 million compared with $91.5 million in the same period year before, resulting in a partial profit of $24.7 million compared with $30.5 million ending June 1990. In January 1989, the company bought the option to explore and exploit the Manto Verde Mine in Region III. The Manto Verde project includes the claims of the Manto Verde Group called Manto Ruso and adjoining Manto Monstruo. The company keeps a purchase option on these claims, whose total price may reach, if exercised, $700,000. Empresa Minera Mantos Blancos was planning to develop this $150 million open pit copper mine, called Manto Verde in northern Chile, with its own solvent extraction and electrowinning (SX-EW) plant, which will have a capacity of 35,000 to 40,000 mt/a of copper cathodes. Prefeasibility

studies have indicated total reserves of 85 Mmt of ore averaging 0.86% copper. The full feasibility study, which is expected to cost about $8.8 million, was to be completed by mid-1993.

Compañía Minera Ojos del Salado S.A., a subsidiary of Phelps Dodge of the United States, was negotiating to use CODELCO's port installations at El Chanaral to ship copper concentrates from the Ojos del Salado deposit and by the main Candelaria ore body. Ojos del Salado inaugurated a major expansion of its plants in Tierra Amarilla in November, doubling capacity to 3,500 mt/d at a cost of $20 million. This will raise output to 23,000 mt/a of copper, fine content, up from 11,500 mt/a. The copper will be shipped out in the form of concentrates. The La Candelaria copper deposit in 1992 will continue its financial search for the $500 million. La Candelaria was seeking money from Far Eastern and European sources. Sumitomo Corp. of Tokyo, the world's biggest copper trader, agreed to take a 20% ownership state in La Candelaria earlier this year for $40 million and will support its share of debt financing. The Overseas Private Investment Corp. (OPIC), the U.S. Government insurance agency, has awarded a $50 million loan to La Candelaria. In addition, La Candelaria will obtain political risk insurance coverage for $100 million from OPIC. La Candelaria is located near Copiapo on the southern edge of the Atacama desert. The mine was expected to come on-stream in 1995, representing the biggest new copper investment since BHP-Utah's La Escondida Mine was inaugurated in early 1991. La Candelaria is slated to produce about 350,000 mt/a of concentrates with a 30% copper content with a plant capacity of 28,000 mt/d of proven reserves stand at 350 million tons. The average ore grade is 1.14% copper. To date, Phelps Dodge has disbursed $23 million on La Candelaria to finance feasibility work and exploration.

Other copper projects that looked viable in 1991 include Quebrada Blanca, in northern Chile in Region I, which originally belonged to the state mining company (ENAMI). It was tendered to Cominco Resources International Ltd. from Canada and had been granted the right, jointly with ENAMI, to develop the copper deposit. Cominco will have 85% interest in the project while ENAMI, the original promotor, will hold a 10% stake in the project with the remaining 5% belonging to Sociedad Minera Pudahuel, a private Chilean mining concern that will contribute with a new mining technology in the project. Quebrada Blanca is expected to produce approximately 70,000 mt/a of fine copper for a 15-year period, once it starts up in 1994. According to Cominco management, Quebrada Blanca will require an investment of $350 to $360 million, of which $110 million will be financed directly by Cominco and the rest raised in international capital markets. A zone of secondary enrichment was reported to contain at least 85 Mmt of oxide and sulfide reserves grading 1.4% copper, and the underlying primary zone was estimated to contain 400 Mmt of ore grading 0.8% copper.

Compañía Minera Cerro Colorado S.A., the Chilean subsidiary of Río Algom Ltd., of Vancouver, hoped to complete before the end of the year the financial package for its $150 million copper project east of Iquique, high on the northern plateau. The Nippon Mining Co. first explored the Cerro Colorado copper deposit in Region I between 1975 and 1980. Río Algom Ltd, (TSE) of Canada, a subsidiary of Río Tinto Zinc of the United Kingdom, signed an option on the property in 1981 and completed a feasibility study the following year. Río Algom negotiated a financing and long-term copper concentrate sales agreement with Outokumpu Oy of Finland in 1985. However, Outokumpu abandoned the project in 1986 because of doubts concerning the economic feasibility of the deposit. Río Algom has now revived the project. Although the original project was based on the flotation of sulfide ores, the new project is based on bacteria heap leaching with sulfuric acid. The Cerro Colorado, a porphyry copper deposit, had more than 100 Mmt of estimated reserves with an average grade of 1.3% copper. The project was designed to produce 40,000 tons of copper cathodes per year. The mine will be open pit with bacteria heap leaching and an electrowinning process. The company was negotiating project financing with a large U.S. bank. Production could begin in 1993. Total planned investment was estimated at $290 million.

The Compañía Minera Doña Inés de Collahuasi S.A. was preparing the groundwork to launch a key feasibility study in 1993 that would set the stage to develop the large Collahuasi. The company, owned by a consortium of Falconbridge Ltd., Toronto; the Shell Group, The Hague and London; and Chevron Corp., San Francisco, was completing a massive 40,000-m exploration drilling program aimed at mapping out one of the most promising ore bodies in the Andes. Collahuasi is 4,600 m above sea level on the Tarapaca plateau, 280 km from Iquique, in the vicinity of Quebrada Blanca and Cerro Colorado. In September, Collahuasi decided to focus its exploration in and around Rosario, its main deposit, estimated to contain at least 200 Mmt of minable ore with an average grade of 1.2% copper, although geologists say the figure could grow to 1.0 billion tons with an average grade of 1.0% copper. At any rate, in September, Collahuasi cast aside the idea of a starter pit to establish a minable resource of 30 to 40 Mmt of oxide and enriched sulfides to produced 80,000 tons of copper. That alone would have meant an investment of $250 to $300 million, similar to nearby Quebrada Blanca. The company estimated that the feasibility study would cost up to $10 million and that Collahuasi could come on-stream in 1995 or 1996.

Compañía Minera Los Pelambres, slated to produce 60,000 tons of copper concentrates per year, was negotiating a long-term contract to have four-fifths of its production purchased by Lucky Goldstar International, Seoul, which owns 40% of the venture. Commercial production was scheduled for January 1992 and the first shipment 1 month later. The remainder of its production was being negotiated with smelters in

Chile, Europe, and Japan. The concentrates will have a 37% copper content, which means that total fine content output will be about 22,000 mt/a. Los Pelambres concentrates are free of arsenic, mercury, and other impurities sometimes common in the Chilean Andes. The mine lies 380 km north of Santiago, near the border with Argentina. The Luksic Group, Santiago and London, owns 20% of the mine. Midland Bank plc, London, which financed its contribution to the venture in a chapter XIX debt-swap deal, owns the remaining 40%. The company is mining a high-grade section of Los Pelambres, one of the world's largest low-grade deposits. Located on the east end of the billion ton porphyry deposit, the ore body has 12.5 Mmt at an average grade of 1.63%. Later, operations will be expanded to a new ore body on the westend of Los Pelambres, where 24.5 Mmt of ore has an average grade of 1.47%. Los Pelambres built a 5,000-mt/d plant. In addition, the company is exploring the northern sector of the porphyry deposit to uncover other high-grade mineral formations. Construction will cost about $60 million. RAYROCK Yellowknife Resources Inc., Toronto, expected to wrap up a $20 million finance package for Iván-Zar, a copper project 35 km northeast of Antofagasta, in early 1992. Iván-Zar is an electrowinning project from which production in a first stage would be 8,000 mt/a of copper cathodes. This is one of a number of small-sized copper deposits to come on-stream in the mid-1990's. The list includes Shell's Las Luces in Antofagasta and Cardoen's Amolanas copper project near Copiapo. Commercial production at Iván-Zar should commence in the first half of 1993. Compañía Minera Lince Ltda. expected to begin commercial production of copper cathode by December 25, 1992, after successfully starting up its crushing circuit in November. The project, which uses avant-garde seawater heap-leaching technology, is coming on-stream on schedule and, the company says, "very close to budget." Investment was estimated at $62 million. Output is to be 20,000 mt/a of copper cathodes. Lince is negotiating an agency agreement with Outokumpu Oy, Espoo, Finland, to market the cathodes. Outokumpu owns a 15% stake in the venture, purchased for $9.4 million. The Luksic Group, of London and Santiago, owns another 25% through Carolina de Michilla SA, one of its mining operations. The remaining 60% is owned by Offshore Equities, a wholly owned subsidiary of the Chemical Bank Corp., New York, part of the equity financing brought in via chapter XIX.

Gold and Silver.—The low gold and silver prices resulted in the owners trying to market a number of the gold-silver prospects, and/or major project delays and reduced production. Nevertheless, the giant projects are expected to increase Chile's future gold and silver production. Servicio Nacional de Geología y Minería (SERNAGEOMIN), an agency under the Ministry of Mines, reported that gold production increased 4.8% to 28,879 kg and silver production increased 2.9% to 676,339 kg in 1991. The medium-size mines produced almost 71% of the gold and 6% of the silver in the country, followed by the large-size mines of CODELCO, with almost 7% of the gold and 42% of the silver primarily as byproducts of the copper industry, and with the remainder being produced by the small-size mines. Among the small and medium gold-producing companies, the biggest gold producer was still the El Indio Mine, now owned by LAC Minerals of Canada. The production of gold from the medium- and small-sized mines, including Choquelimpie (Vilacollo), El Hueso (Homestake), San Cristóbal (Niugini), El Bronce de Petorca, and La Coipa, increased by 28% compared with that of 1990. According to company officials, La Coipa on its own should produce 5 to 6 tons of gold in 1992 and nearly 500 tons of silver, while Niugini heap-leach operations should contribute 1,500 kg of gold in doré bars. Production at Marte Mine was suspended in September by Anglo American, owing to multiple technical problems, including solution freezing at high altitude. CODELCO increased its gold output to more than 400 kg in 1991 as a byproduct of its electrolytic copper refining.

The largest silver producer in the country continued to be CODELCO, with 275,317 kg in 1991, nearly one-half the country's total output, followed by La Coipa. Other important producers were Mantos Blancos, El Indio, Vilacello, and El Hueso. CDE Chilean Mining Corp., a subsidiary of Coeur d'Alene Corp., Coeur d'Alene, Idaho, was finishing its feasibility study for the Fachinal gold deposit and expected to open a far south frontier for the 1990's gold development in the Andes. Fachinal is east of Chile Chico in Aysen, Patagonia, 1,300 km south of Santiago. This was the most advanced gold project in a promising new mining area.

At the north end of the country, 3,400 km away, SCM Vilacollo Ltda., the company formed by Shell, Citibank, and Northgate to operate the Choquelimpie Mine near the Bolivian frontier, was seeking new reserves near the mine. Marte, Anglo American Corp., Johannesburg, was involved with certain geological and metallurgical problems dogging Marte. Production at Marte Mine was suspended in September. The mine, in the bleak high-altitude Maricunga region, was launched officially in January 1990. It lost $24 million in its first year of operation and produced at a rate of 28% of its installed capacity. The mine operator was Cía. Minera Tres Cruces SCM, a company formed by Anglo American, 54%; Cominco, 26%; and Chemical Bank, New York, 20%.

La Coipa, operated by Cía. Minera Mantos de Oro Ltda., a company owned by Placer Dome and TVX Gold, was operating at its full capacity of 15,000 mt/d of ore since September. Output was expected to be 5,910 kg of gold per year and 498,000 kg of silver. That means a 20% increase over 1990's gold output. But most dramatic was the increase in La Coipa's silver output. The 498,000 kg/a to be produced at La Coipa would rank Chile as a world class producer. Coipa's output explained Chile's significant increase in silver production in 1990 and 1991. Mantos de Oro was carrying out a $600,000 exploration program at Coipa

Norte, where the company estimates 9.2 Mmt of reserves with an average content of 171 g/mt of silver but only 0.2 g/mt of gold. Niugini Mining Ltd. Kainantu and Sydney, was investing $1 million in exploration to confirm new reserves. As part of the program, Inversiones Mineras del Inca, the Niugini subsidiary operating the Coipa Norte Mine, plans to carry out 20,000 m of air reverse drilling. When Niugini started the feasibility study for the project in 1990, reserves were estimated at 10 Mmt averaging 1.34 g/mt of gold. By March 1991, reserves amounted to 15.2 Mmt with an average grade of 1 g/mt of gold per ton, increasing the production life of the project from 5 to 7 1/2 years. The company hopes to increase reserves to 27.7 Mmt with an average grade of 1 g/mt through the current exploration program.

The Central Bank of Chile was preparing to approve its first ever gold-base loan, for Bema Gold Corp., Vacouver, owner of the El Refugio venture on the Atacama plateau. Bema Gold Chile Ltda., operator of the mine, said it already had approval from the Central Bank on the $75 million loan; it expected formal approval soon. According to the feasibility study, completed by Mineral Resources Development Inc., El Refugio has a minable reserve of 112 Mmt of ore grading 1 g/mt gold containing 93.3 Mmt of gold with an open pit strip ratio of 1:1. The study recommends a plant with a processing rate of 33,000 mt/d. At that rate, Bema would produce 7.2 mt/a of gold, or 20 kg/d, for 9.4 years.

Iron Ore, Manganese, and Steel.—Compañía Minera del Pacífico S.A. (CMP) was the only Chilean producer of iron ore. Although there were many other deposits, current iron production came from El Romeral Mines in Region IV, El Algarrobo in Region III, and the reactivated El Laco Mine in Region II. Proven reserves amounted to approximately 1 billion tons of iron ore, 45% of which was attributed to the aforementioned mines. El Romeral Mine, which had proven reserves of 56.5 Mmt grading 55.8% iron, produced about 3.6 Mmt of ore per year for direct exports mainly to Japan, with the remainder for the Huachipato smelter. Chilean iron production, including iron ore pellets, was 8.4 Mmt in 1991, an increase of 2% compared with that of 1990. Production of pellets was about 4.2 Mmt in 1991.

Manganesos Atacama, S.A. (MASA), a subsidiary of CAP, a Swiss-Chilean Industrial Group, owned iron mines and Chile's largest steel plant, and produced manganese, ferromanganese, and ferrosilicon alloys as well as steel cones for mills. The company produced manganese ore at the El Corral Quemado and Los Loros Mines in Region IV; MASA also bought ore from other producers in the same region.

In 1991, production of manganese ore reached 43,767 tons, 10.3% more than that in 1990. Most of the manganese produced by MASA was bought by the Huachipato smelter. Manganese sales in 1991 amounted to $7.5 million, exceeding the previous year by 25%.

Cía. Siderúrgica Huachipato, S.A., an affiliated company of CAP, had a net profit in 1991 of $22.3 million, an increase of 4.4% compared with that of 1990. Sales revenues from steel products in the domestic market fell 3.9% as compared with those of 1990 owing to a decrease in shipments and lower prices. The production of steel ingots at Huachipato amounted to 805,000 tons in 1991 compared with 772,000 tons in 1990.

A project for the recovery of vanadium from El Romeral Mine deposit was being evaluated by the company. Technical and economical feasibility studies of this project have been carried out with the Center of Mining and Metallurgical Research, which has determined the need for the proposed project. With an investment of approximately $30 million, the company may process about 1,500 mt/d of magnetic concentrates with high vanadium content, thus obtaining about 4,000 mt/a of vanadium pentoxide and supplying up to 10% of the Western market. Romeral has reserves representing 6% of world vanadium, with grades between 0.5% and 0.7%.

Lead and Zinc.—Chile's lead production declined for the third consecutive year by 6.3% in 1991 compared with that of 1990. Most of the lead production was derived from operations at Cía. Minera Catemo Ltda. in Region V instead of Region XI where Sociedad Contractual Minera El Toqui, Ltda. (SCMT) operates. The average price for lead in 1991 was $0.25 per pound, which was 31% lower than that of the previous year.

Production of zinc increased 23.3% in 1991 to 30,998 tons, of which 91% was from SCMT owned by Minera LAC Chile, S.A., a subsidiary of LAC Minerals of Canada established in 1987. The average price of zinc in 1991 was $0.51 per pound, which was at $0.69 per pound in 1990. Chile is home to one medium-size zinc mine, El Toqui, in southern Chile (Aysen), owned by Minera LAC Chile S.A. The mine's estimated reserves are 5.6 Mmt. LAC completed an expansion program, which is largely responsible for the increases in Chilean zinc production over the past 3 years; recovery rates have also increased from 7% to 8.3%, allowing total output to increase 17%. Although studies have been made concerning the possibility of further expansion, the prospects are clouded by low world prices and the introduction of new capacity elsewhere. El Toqui also produced relatively small and declining quantities of lead.

Empresa Minera de Aysén, Ltda. (EMA), owned by CORFO, operated the Rosillo Mine and a concentration plant in Puerto Cristal, in Region XI. Minera Outokumpu Chile, Ltda. has signed an agreement with EMA to explore zinc mineralization in southern Chile. The target zinc deposits are 80 km south of General Carrera Lake in Region XI. Outokumpu Chile will invest $500,000 in this exploration. If a decision is made to develop a mine, EMA and Outokumpu Chile would form a joint company. EMA already operates a small zinc mine and concentrator in the region.

Cía. Minera Catemu, which belonged to Chilean interests, exploited the Veta Grande Mine and operated a concentration plant in Santa Rosa in

Region V. The company produced about 9,000 tons of zinc and 1,000 tons of lead annually. Compañía Chilena del Zinc was planning to built a zinc refinery pilot plant in Puerto Sánchez in Region XI. Investment will be somewhat less than $1 million, and production will amount to 360 mt/a of metallic zinc. The company would be supplied with zinc ore by Empresa Minera de Aysen, whose reserves are very limited according to explorations already completed.

Industrial Minerals

Lithium and Potassium.—Chile was the second largest producer of lithium in the world after the United States. Production of lithium carbonate in 1991 reached 8,575 tons, 5.6% less than that of the previous year. The only producer of lithium in Chile was Sociedad Chilena del Litio, Ltda. (SCL). SCL, the Chilean-based, wholly owned subsidiary of Cyprus Minerals, was set to produce 715,381 tons of lithium carbonate in 1992, a significant increase on 1991's 587,856 tons of registered production. Production last year was affected by the setup of the boron extraction plant, which led to delays for 25 days. A further 24 days was lost when serious damage to the chemical plant at La Negra occurred. But a new plant under construction will allow lithium carbonate to be produced without boron, meaning that a very pure product can be produced. The resulting lithium was also said to contain very low sulfate levels. SCL was looking to invest about $4.5 million during 1992 to improve the quality of the lithium and also to step-up production of potassium sulfate from the current level of 58,000 mt/a worth $3.2 million in local sales.

By yearend, total investment to produce lithium carbonate from mineralized brines near Antofagasta had only reached $85 million, but further investment in saline deposits was stepped up at the end of 1990. Sociedad Minera Salar de Atacama, Ltda. (MINSAL), a consortium of AMAX Exploration, Inc., 63.75%; CORFO, 25%; and Molíbdenos y Metales, S.A. (Molymet), 11.25%, was established in 1986 to develop the mixed salts project in the Atacama salt flat in Region II. The project was designed to produce lithium carbonate, potassium chloride, potassium sulfate, and boric acid. Future production was expected to be 16,500 tons of lithium carbonate, 451,400 tons of potassium chloride, 227,000 tons of potassium sulfate, and 25,700 tons of boric acid per year.

When the project of MINSAL is completed, lithium production could rise to about 25,000 mt/a. AMAX, which had until February 1991 to decide on the startup of the project, has offered its shares for sale. The International Finance Corp. (IFC), which has its own technical analysis on the MINSAL project, was interested in buying. Other buyers that have been mentioned are U.S. Borax, BHP of Australia, and Cyprus Foote. If the buyer were the latter, it would control world production of lithium. In March 1991, CORFO stated that the project was under way, indicating that five parties were interested in its implementation and that they were analyzing the possibility of buying part or all of AMAX's share. Among the interested parties was the Chilean company Soquimich, in a joint venture with Lithium Corp. of America (LITHCO); Tenneco from the United States has also been mentioned. In both cases the projects would be redefined for an investment of $150 million and production of 1,026 tons of lithium plus an amount of potassium chloride. The advantage of the joint venture is that they are already in the market with the products that will be obtained from the project. The Chilean project has been reportedly compared with the El Hombre Muerto project in Argentina and the Uyuni salt project in Bolivia, as salt content is higher in Chile and its infrastructure is considered better.

Nitrates and Iodine.—SQM was expanding both its potassium nitrate and iodine production facilities. This follows the formation of two independent operating divisions. At the company's María Elena plant, production capacity is to be raised from 230,000 mt/a to 430,000 mt/a and should be on-line by June 1991. Investment in the project has been about $2 million to date and has involved the expansion of solar evaporation ponds in the Atacama Desert, northern Chile, and process modifications. In total, the company now has a production capacity of 900,000 mt/a of nitrates, with sodium and potassium being the primary ones. The new system at María Elena will also give the company the flexibility to produce variable volumes of potassium and sodium nitrates according to market demand. Nitrate reserves are substantial, and the company reports that they are sufficient to allow sustained production of 1 Mmt/a of nitrates for several decades. Iodine capacity has also been expanded and now stands at 6,000 mt/a, although current production is in the order of 4,000 mt/a. SQM also recently completed a research and development center to provide technical support for the company. During 1991, SQM is anticipating total sales of more than $250 million. Kap Resources, Ltd. entered into a 50-50 joint venture with Atacama Resources, Ltd., known as the Taltal Joint Venture, in which North Lily Mining Co. was retained as the operator and will receive a 10% share in the profits. North Lily Mining Co. released the results of assays on the sodium sulfate content of samples taken from its Yolanda property in northern Chile that indicate an average sodium sulfate content of 9.3%.

Geostatistical estimates of the sodium sulfate reserves conducted by Davy McKee Corp. by solution mining process indicated that the sodium sulfate could be recovered as a byproduct of the heap leaching of the nitrate-iodine ore or "caliche." The Yolanda property was sampled extensively during 1989, and the reserves of iodine and nitrate were announced earlier this year. Using a cutoff grade of 8% sodium nitrate, Davy MaKee calculated that the deposit holds in excess of 20 Mmt of "caliche" grading 11.8% sodium nitrate and 237 parts per million of iodine. At current prices, the iodine and nitrate content of the deposit is worth about $900 million.

Sulfur.—Chile has been an importer and producer of sulfur for many years. In 1991, Chile imported about 41,000 tons of sulfur, 33.5% less than that in the previous year, mostly from Canada and Bolivia. Chile's native sulfur production derived from caliche decreased 41% below that of 1990 to 16,884 tons. Chile's total production of sulfur, including sulfur derived from smelters and oil refineries, was maintained at about 400,000 tons. Its main use was as raw material to produce sulfuric acid. Chile has large reserves of volcanic sulfur, at more than 4,000 m above sea level. Its costly extraction historically has not been able to compete with less expensive imported sulfur. Therefore, exploitation is carried out sporadically when the price increases.

Among the sulfur deposits currently under exploration or development are the Sillajuaya Volcano where the R.M.S. Group of Canada announced an investment of $85 million in a plant to process 5,000 mt/d of caliche. The greatest expense in this project was found to be the construction of facilities in addition to metallurgical problems in the flotation circuit. The project has been delayed indefinitely. The Tacora Volcano, on the Peruvian border, had an estimated reserve of 7 Mmt. Azufrera Chile, Ltda. was formed by DEVCO of the United States and SAUSALCO of Saudi Arabia to analyze an investment of $10 million in a project to produce 120,000 mt/d of sulfur pellets from this deposit.

Condesa Mining Corp. of the United States has received authorization from the Foreign Investment Committee to carry out a $25 million development in two sulfur mines near San Pedro de Atacama with a capacity to treat 1,000 mt/a. The project would include construction of a concentrating plant, a refining plant, and a pipeline up to the port of Coloso, south of Antofagasta. No initiation date had been reported.

Empresa Minera y de Transportes Hemani extracted caliche from the Purico Volcano, in Region I, for the production of sulfuric acid. Output of refined sulfur from this deposit reached 1,100 mt/a. Placer Developments of Canada also completed a geological analysis in the Purico Volcano.

Consumption of sulfuric acid in Chile amounted to 675,000 mt/a with a deficit of about 30,000 tons purchased abroad. To produce sulfuric acid, Chile must import about 40,000 tons of sulfur annually. Startup of new sulfuric acid plants using gases from the smelters will increase CODELCO-Chile's production to more than 1.5 Mmt annually. As a result, Chile will significantly lower sulfur imports. In the medium term, the country could become a net exporter of this product. In Chile, sulfuric acid was produced from gases from four copper smelters: Chuquicamata, Las Ventanas, Paipote (Hernán Videla Lira), and Chagres. These plants have a production capacity of 1.7 Mmt/a: 1,280,000 tons from Chuquicamata (three plants), 290,000 tons from Las Ventanas, 60,000 from Paipote, and 70,000 from Chagres. There are also about 20 smaller sulfuric acid plants between Arica and Rancagua that use sulfur as raw material. The capacity of these plants adds up to approximately 500,000 mt/a.

Mineral Fuels

Coal.—Coal output decreased 6.1% to 2.56 Mmt in 1991. The Chilean Government has encouraged greater domestic coal production as a means of reducing Chile's dependence on petroleum. Chile, with a population of 13,528,945, is a small coal market in which the most important consumers are electric utilities. Demand for electricity was concentrated in the central part of the country, where 93% of the population lives and in the northern area associated with mining and minerals refineries. Because of its geography, Chile has good conditions for hydroelectricity in the central and southern areas and depends on thermal powerplants in the northern grid. Industrial consumption of coal is spread along the country in a large number of small consumers. In the case of metallurgical coal, demand is concentrated in one consumer, which is the only integrated steel mill of the country. On the other hand, bituminous steam coal deposits are in the central area, in which a number of underground mines are presenting increased difficulties because of worsening mining conditions, increasing costs, and noneconomical reserves. Subbituminous coal deposits in the south, despite its lower grade and the larger shipping distance, because of low production costs and important reserves, represent the future for this industry in Chile. Chile has no reserves of metallurgical coal and imports all of its requirements. Chile's coal is produced in three areas: bituminous coal in the Province of Arauco in the central area of the country, subbituminous coal in the Province of Valdivia in the central/south area, and in the Province of Magallanes in the south. The Arauco area has a production capacity of 1,500,000 mt/a of bituminous coal with 3 medium-size producers (ENACAR, 750,000 mt/a); (Schwager, 400,000 mt/a) and (Carvile, 100,000 mt/a) and a large number of smaller mines, with 250,000 mt/a. The Valdivia area, composed of small mines with low production costs, distant loading ports, high transportation costs, as well as limited reserves, does not encourage the development of an infrastructure to solve these problems. The Magallanes area is the only source of steam coal that has a promising future. Actual production is of 900,000 mt/a based on a calorific value of 4,400 kcal/kg, and all is shipped to the north of the country under long-term contracts with utility companies that are part of the northern grid. Demonstrated reserves are 671 Mmt and estimated resources are 5 billion tons. Metallurgical coal has been imported in Chile for more than 39 years, originally only from the United States and today from Australia, West Canada, and very small amount from the United States. In the past coking capacity has not been enough, so the country also imported metallurgical coke. Beginning in 1992, Chile expects to import about 700,000 mt/a permanently. Now the steel plant has a new coke battery of 500,000-ton capacity and it is expected to maintain pig iron production at about 900,000 mt/a. In 1991, imports of coal reached

approximately 1.8 Mmt, mainly for use in thermal powerplants to produce electricity. Of the total amount imported, 1.2 Mmt corresponded to Chilgener, which bought coal from Australia, Canada, Colombia, South Africa, and the United States. The remainder, which was metallurgical coal, was imported by Siderúrgica of Huachipato. Empresa Nacional del Carbón (ENACAR) is the most important traditional producer of coal in the country, supplying about 120 relevant companies. At present, Compañía de Carbones de Chile, S.A. (COCAR) supplies only one large company: CODELCO-Chile's Tocopilla Div., whose contract was a condition for investing and startup of the Pecket coal mine in Region XII and COCAR's signing of a 10-year contract to supply coal to CODELCO's Tocopilla electric power division in Region II. Coal provides almost 70% of the electricity for Chile's Northern Electric Powergrid that supplies Regions I and II. Despite the Chilean economy's remarkable growth in recent years, not all sectors have benefitted equally. The area near Conception in southern Chile, though gaining from the new developments in forestry and fisheries, remains linked to the money-losing underground coal industry, which has repeatedly required Government assistance. Most recently, a subsidy has been put into place to make up the difference between the cost of producing at these mines and the cheaper price at which imported Colombian and Venezuelan coal sells in Chile. In recent months, the industry has lurched to a crisis. The Schwager Coal Co., a private firm, laid off 600 workers in December 1991. Greater-than-expected losses at ENACAR, the state-owned underground coal mining enterprise that employs 5,000 workers, have forced authorities to suspend trading of the company's securities while an additional bail-out was arranged. The Government has stated that ENACAR cannot expect to remain a burden on the state indefinitely, and company management is looking at ways to shed workers and inject new technology to reduce costs. However, it is openly debated in Chile whether ENACAR's aged mines can ever be self-supporting. ENACAR, during the first quarter of 1991, reported a positive balance of $1.25 million. The success was due to an operating reorganization initiated in April 1990. In May 1990, ENACAR signed a cooperation agreement with Charbonnages of France Ingenierie (CDF), initiating a modernization process that will allow it to increase its current production of 1 Mmt/a by 50% in 5 years. Carbonífera Schwager reported lower profits compared to those of the same period in 1990.

With the exception of COCAR, which operated the highly mechanized Pecket open pit mine near Punta Arenas in Region XII, Chile's coal industry was obsolete and inefficient. This was particularly true in the case of ENACAR and CARVILE, which survive on Government subsidies. ENACAR alone has lost $20 million during the past 3 years.

Carbonífera Schwager, a former division of ENACAR, was reportedly losing money. Carbonífera San Pedro de Catamuntun was reportedly making a profit, but its operations were very high cost with little opportunity for improvement in the near future. Only COCAR made a healthy profit, reportedly because of its 10-year sales contract with CODELCO-Chile. COCAR plans to call a private tender in March for proposals to expand the pit of its Pecket Mine on the shores of the Straits of Magellan. The company was carrying out a $500,000 feasibility study of the project. The project will increase the output capacity from 1.3 Mmt/a of coal to 2.1 Mmt/a with an investment of $30 million. The expansion of Pecket is directly related with a couple of new thermoelectric plants currently on the drawing board. The first was the Guacolda, the 125-MW, $160 million plant that a group of companies, led by Chilgener and CAPSA, plans to build at the port of Huasco, midway between Copiapo and Coquimbo. COCAR is part of the group, with a 25% stake. The second is also a 125-MW thermoelectric plant to be placed in the north somewhere between Antofagasta and Arica. The planned plant was aimed at meeting the growing demand for electricity in the mine-rich Atacama as new, power-hungry projects like Zaldívar, Cerro Colorado, Collahuasi, and Quebrada Blanca come on-stream in the mid-1990's. Cocar estimates that consumption of coal could rise by 800,000 mt/a if both projects go ahead.

Recent developments have been complicated by 3 years of drought. A related decline in hydroelectric power production required large volumes of imported steam coal to increase the production of thermal power. As foreign producers have begun to compete for this new market, estimated to have a total value of $150 million per year, the price of imported coal has increasingly undercut the price of domestic coal. Unable to compete with growing coal imports, the Chilean producers' council has argued that unrestricted coal imports will eventually lead to the collapse of domestic industry and a serious deterioration in the standard of living in Regions VIII and X, Chile's principal coal-producing areas. According to Chilean coal producer officials, imports of coal threaten 17,000 jobs in the domestic coal industry, another 100,000 jobs in supporting industries, and more than $200,000 worth of capital investment in the sector. The Council of Chilean coal producers has complained that the Colombian coal is subsidized and has asked for Government protection. The Minister and President of the National Energy Commission subsequently announced on August 16 that the Colombian coal was not subsidized. Nevertheless, because of the potential damage to the domestic coal industry, the Government will withdraw the preferential Latin American Free-Trade Association (LAFTA) tariff of 13.5% for Colombian coal, which will then be subject to the standard import tariff of 15%. The council also proposed the establishment of a National Development Fund for the coal industry with an annual budget of $8 million per year to subsidize domestic production. This fund would support the greater mechanization of the industry, promote the increased

consumption of coal, develop clean coal technologies, and stimulate greater research and development. The fund would be financed by a surcharge on electric power consumption with an exception for the poorest consumers.

In March 1992, coal production should start at the open pit on Isla Riesco in the Otway inlet north of Punta Arenas. Since 1986 the Chilean Government has been carrying out full prospections in this area. The project considers an investment of $65 million to prepare an open pit. Reserves would be 600 Mmt of bituminous coal type, similar to that of Pecket (5,400 kcal/kg). Production cost was estimated at $12 million or less.

Natural Gas.—Natural gas production amounted to 4,067 Mm^3, a decrease of 3.1% compared with that of 1990, continuing the declining trend since 1982. Of the total production, about 56% was reinjected, 3% was flared, and 22% was marketed internally. During 1991, 2 drilling teams worked on land and 3 worked offshore, totaling 51 wells drilled. With the startup of the $300 million Cape Horn methanol plant, northeast of Punta Arenas, gas sales rose sharply from 493 Mm^3 in 1988 to 1,112 Mm^3 in 1990; however, in 1991 sales declined to 896 Mm^3. Owing to depletion of the Springhill district, ENAP was mainly dedicated to exploring new oil- and gas-producing areas, both in the country and abroad. Natural gas plays a relatively small role in terms of energy produced or consumed in Chile, representing approximately 6% of final consumption. Natural gas is found in relatively low amounts, in far southern Chile, where ENAP drills for it in conjunction with its petroleum operations. Through a series of pipelines it is supplied to the cities of Punta Arenas, Puerto Natales, and Porvenir, all in the far south. Natural gas from southern Chile is also compressed into liquid form (propane or butane) and moved into central Chile by ship. In addition to the liquid propane and butane shipped from the south, gas manufactured as a byproduct of petroleum refining enjoys some use in the main cities of central Chile, Santiago and Valparaíso, and in the central city of Concepción as does gas processed from coal. Some manufactured gas is also imported. Although the role of natural gas in Chile's energy balance is relatively small now, this may change in the future. Argentina's Neuquén Province, which borders Chile, is a major natural gas producer for domestic Argentine consumption. However, there is significant capacity to spare, and producers are looking at the Chilean market. Although such a project has appeared attractive from an economic standpoint, for many years bad political relations between Argentina and Chile had made it impossible, with the Government of Chile being concerned about energy security and the Government of Argentina unwilling to assist the economy of a potentially unfriendly country. With the return to democracy in both countries and a warming of relations, both the Argentine and the Chilean Governments are now behind the idea of a gas pipeline. They have made it clear that private enterprise will have to fund and construct it. Several different consortia have been formed to bid on the project (one of which includes a U.S. operator, TRASCO, of Houston, Texas). The current incarnation would include the construction of a large gas-fired thermoelectric plant in Chile to use the Neuquén gas. If it goes through, it would mark a major diversification of Chilean electric power generation away from hydro and coal. No positive results have been obtained from explorations in the north. Drilling performed in the Atacama salt flat Region II by Chile Hunt Oil Co., a subsidiary of Hunt Oil Co. of Texas (United States), was not successful.

Petroleum.—Chilean production of crude oil suffered a further decrease in 1991, to 6.5 Mbbl. That continued a decline that started in 1983, owing to the exhaustion of Chile's existing reserves and growing consumption. Offshore production represented 50% of the annual total. Production wells on Tierra del Fuego Island accounted for almost 42%, while mainland production accounted for only 34% of the total.

Chile's demand for petroleum has increased in recent years while domestic production has steadily declined, thus creating an increased dependence on imports. In 1991, Chile produced almost 6.5 Mbbl of crude oil and imported about 40.2 Mbbl from several countries: Nigeria, 18.8%; Gabon, 14.7%; Venezuela, 13.4%; Ecuador, 9.8%; Argentina, 8.8%; Colombia, 6.9%; and the remainder, 13.6%, from other countries. Despite significant efforts to increase the role of private enterprise in the petroleum sector, the state retains a key, even dominant, presence through ENAP; the president of ENAP's board of directors is the Minister of Mines and the vice president is the head of CORFO, the state holding company. ENAP provides all of Chile's current domestic production from wells in southern Chile—some on the mainland of South America, some on the island of Tierra del Fuego, and the bulk (61%) from offshore oil platforms. In an effort to make up for dropping production from existing wells, ENAP has embarked on an aggressive exploration campaign, drilling 57 wells in 1990 and 51 new wells in 1991. ENAP, which holds all drilling rights throughout Chile, has let out exploration contracts on blocks of land in far northern and southern Chile to a variety of foreign petroleum firms. Texaco is the only one of the majors present. U.S. independents include Hunt, Maxus, and Anderman/Smith; several small Canadian and European independents are also drilling. Thus far no new oil has been found. ENAP is also the only owner of Chile's two refineries, the Petrox S.A. and the Concon S.A. plants, which together produce 86.2% of Chile's gasoline and diesel fuel. Other smaller ENAP facilities refine an additional 10%, leaving only 3.8% that is imported. ENAP centrally buys the imported crude for its refineries and is purchased through long-term contracts and 30% on the spot market. The sources of crude for Chilean refineries was aforementioned. Although dominant in domestic production, importation, and refining, the

Chilean Government is out of the business of retail distribution of gasoline and other products. The Chilean petroleum company (COPEC), once a state enterprise, has been privatized; it belongs to the Angeline Family, owners of one of Chile's largest industrial groups. It reportedly has 40% of the market. The rest is divided between Exxon and Shell, with a few smaller firms also present.

INFRASTRUCTURE

Chile extends approximately 4,200 km along the Pacific Coast of South America and has an average width of approximately 180 km between the coastline and the Andes. Chile was divided into 12 numbered regions, beginning with Region I at the northern border with Peru and continuing in sequence to Region XII at the southern end, with each having a regional capital. Chile has three main geographical areas that vary dramatically in climate, resources, and population. The northern area from Region I to Region IV includes the Atacama Desert, one of the world's driest areas. Farming is limited to a few irrigable areas. However, abundant and varied mineral and energy resources are in this area. Its vast reserves of copper, iron ore, nitrates, and lithium carbonate constitute a major asset to the Chilean economy. Continuing south from Region V to Region X is the central area, where 90% of the population resides. The Andes compose one-third to one-half of the middle Chile area. Near the northern end of the valley lies Santiago, Chile's capital and home to about one-third of the country. Industrial resources include large copper deposits, as well as coalfields and hydropower.

The southern Chile area from Region XI to Region XII is one of the wettest and stormiest parts of the world. Less than 2% of the population resides here. Southern Chile's resources are concentrated in the area lying east of the mountains. These natural resources include coal, natural gas, and petroleum.

The railway system of Chile served all the important industrial, mining, and agricultural areas from Region I (Iquique) to Region X (Puerto Montt) for a total of 8,613 km. The pattern of Chile's highways was similar to that of its railways. The road system totals 79,025 km, of which 9,913 km was paved, with most of the remainder of secondary quality.

International trade of mineral commodities, chiefly copper and its byproducts, are handled through the ports of Arica, Antofagasta, and Valparaíso. Five of the biggest ports in the country are Valparaíso, Tocopilla, Cruz Grande, Talcahuano, and San Antonio, which handle almost 60% of the total tonnage.

Crude oil, refined products, and natural gas are transported to consumption centers by three major pipelines that are 785 km, 755 km, and 320 km, respectively.

OUTLOOK

Implementation of the Foreign Investment Law of 1974 (Decree Law 600) and the 1977 and 1987 amendments, which provided the legal framework guaranteeing the rights of foreign investors, established maximum tax rates, offshore accounts, and a minimum period after which profits and capital could be repatriated. The new labor code, law 18,620 of 1980, as amended in 1987, and the new Mining Code of 1984, allowed ownership of mining concessions, granted owners the right to extract ore from the concession, and the first mineral depletion allowance amendment.

An important recent factor in attracting foreign investment in Chile has been the debt-equity swaps under the Central Bank's chapter XIX regulations. Under these regulations, foreign investors can purchase discounted debt notes for conversion into equity; these debt notes are redeemable at near-face value, approximately 80% on the dollar, in Chilean pesos at the official exchange rate. Debt-equity swaps have had a significant impact in Chile's mining sector since the first investment was approved in March 1987. The swaps have resulted in a number of foreign mining companies and banks investing in a wide number of mining projects. The Special Operation Contract for the Exploration and Exploitation of Hydrocarbon's Law of 1975, as subsequently amended, established the rules for Petroleum Operation Contracts (POC's).

The Chilean mining activities were concentrated in five areas: coal, copper and its byproducts, industrial minerals, iron and steel, and precious metals. Chile's annual copper production is expected to grow from the current 1.8 Mmt in 1991 to more than 2 Mmt in 1992, while gold is projected to increase from 28,700 kg to 40,000 kg and silver is projected to increase from 650,000 kg to about 700,000 kg during the same period.

The production of bentonite, boric acid, nitrates, diatomite, iodine, lithium carbonate, potassium chloride, potassium sulfate, and sulfuric acid are also expected to increase by significant amounts. Finally, in the energy sector, coal is expected to increase from 2.74 Mmt in 1991 to about 3 Mmt in 1992. The Chilean Government has encouraged greater domestic coal production as a means of reducing Chile's dependence on imported petroleum. The Pecket coal mining project is expected to save Chile about $40 million in energy costs and an additional $100 million in oil imports. Chile's domestic petroleum production has declined from 54% of national consumption in 1982 to 20% in 1991. This percentage is expected to continue to drop in the coming years because of the exhaustion of Chile's existing reserves, Chile's rapid economic growth, and the growing consumption of petroleum.

The largest and most visible foreign investment that came on-stream ahead of schedule in 1990 was the $1.2 billion La Escondida copper project. The list of U.S. companies currently active in Chile include: Utah International, Exxon Minerals, Phelps Dodge, Cyprus Minerals, AMAX, Homestake, Chevron Resources, Freeport, Newmont, Hunt Oil, Pecten, and Maxus Energy. Citibank and Bankers Trust have also taken an equity interest in two important mining projects, a practice that is expected to be followed by a number of

other U.S. banks. Five other large foreign investments are also expected to come to a decision in the near future. These include Exxon's (United States) $380 to $400 million Los Bronces copper expansion project; AMAX's (United States) $200 to $250 million MINSAL lithium, potassium chloride, potassium sulfate, and boric acid project; Phelps Dodge's (United States) $150 to $250 million Geolar and La Candelaria project; and Magellan International Nitrogen Co. (MINCO) and Combustion Engineering's (United States) $380 to $400 million ammonia-urea plant in Cabo Negro in Region XII. In addition, there were Placer Dome's (United States) $140 to $160 million Ladera-Farellon gold project, Placer Dome and TVX Mining's (United States) $230 million Minera Mantos de Oro-La Coipa project, COMINCO (Canada) and ENAMI's (Chile) $135 million Minera Quebrada Blanca S.A. (Chile) project, Outokumpu's (Finland) $100 million Zaldívar project, and Midland Bank (United Kingdom) and Minera Anaconda's (Chile) $66 million Minera Los Pelambres Ltda. copper project.

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[1]Where necessary, values have been converted from Chilean pesos (Ch$) to U.S. dollars at the rate of Ch$349=US$1.00, the average exchange rate for 1991.

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Agencies

Corporación Nacional del Cobre de Chile
Comisión Chilena del Cobre (COCHILCO)
Agustinas 1161
Santiago, Chile

Servicio Nacional de Geología y
Minería (SERNAGEOMIN)
Santa María 0104
Santiago, Chile

Empresa Nacional de Minería (ENAMI)
McIver 459
Santiago, Chile

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TABLE 1

CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[p]
METALS						
Arsenic trioxide		3,616	3,207	r e5,000	r e6,000	e7,000
Copper:						
Mine output, Cu content[3]		r1,418,100	r1,451,000	r1,609,300	r1,588,400	1,814,300
Metal:						
Smelter, primary[4]		1,106,900	1,189,400	e1,266,600	1,328,500	1,296,100
Refined:[5]						
Fire, primary refined[e]		180,300	r200,100	r163,600	r113,900	141,000
Electrolytic		790,000	r812,600	r907,400	r1,077,700	1,087,300
Total		970,300	1,012,700	1,071,000	1,191,600	1,228,300
Gold, mine output, Au content	kilograms	17,035	20,614	22,559	27,503	28,879
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	6,637	7,710	8,761	8,248	8,414
Fe content	do.	4,380	5,089	5,478	5,035	5,136
Metal:						
Pig iron	do.	617	776	679	675	703
Ferroalloys:						
Ferromanganese		6,613	6,935	7,492	6,956	6,277
Ferrosilicomanganese		1,231	683	180	e200	e700
Ferrosilicon		4,655	5,686	6,370	e5,800	e5,600
Ferromolybdenum		1,325	1,191	2,990	e3,00	e3,100
Other		475	2,212	2,840	e2,500	e2,000
Total		14,299	16,707	19,872	18,456	e17,677
Steel, crude[6]	thousand tons	726	909	800	772	805
Semimanufactures (hot-rolled)	do.	502	664	643	516	587
Lead, mine output, Pb content		829	1,359	1,241	1,120	1,050
Manganese ore and concentrate:						
Gross weight		31,803	43,655	43,806	39,697	43,767
Mn content		10,821	14,511	13,865	r12,450	12,500
Molybdenum, mine output, Mo content		16,941	15,515	16,550	13,830	14,434
Rhenium, mine output, Re content	kilograms	6,564	6,940	e6,800	e6,800	e6,500
Selenium	do.	45,909	47,051	r48,200	r49,400	50,600
Silver	do.	499,761	506,501	545,412	r654,603	676,339
Zinc, mine output, Zn content		19,618	19,182	18,370	25,146	30,998
INDUSTRIAL MINERALS						
Barite		2,109	43,135	59,873	3,038	2,901
Bentonite		—	529	2,005	r2,207	1,054
Borates, crude, natural (ulexite)		13,438	32,122	130,512	131,763	97,135
Cement, hydraulic	thousand tons	r1,500	r1,885	r2,010	r2,115	2,251
Calcite (chalk)	do.	3,017	3,647	r3,746	r3,776	3,998

See footnotes at end of table.

TABLE 1—Continued

CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[p]
INDUSTRIAL MINERALS—Continued						
Clays:						
Cimita		82	1,488	1,405	2,969	2,401
Kaolin		44,533	54,464	58,512	32,416	62,991
Other (unspecified)		15,893	18,769	20,100	18,563	16,026
Diatomite		3,218	2,919	3,315	3,877	5,557
Feldspar		705	4,569	8,081	2,980	4,006
Gypsum:						
Crude		235,173	315,904	277,276	253,744	335,678
Calcined		92,441	92,135	104,300	105,786	e100,000
Iodine, elemental		3,181	r3,939	r4,640	r5,000	5,700
Lapis lazuli	kilograms	e8,000	e8,000	e8,000	192	450
Lime, hydraulic[e]	thousand tons	1,000	1,200	1,300	1,300	1,200
Lithium carbonate		6,139	7,332	7,508	9,082	8,575
Nitrogen: Natural crude nitrates:						
Sodium		576,960	546,560	528,020	e550,000	e600,000
Potassium (KNO_3)		149,200	276,230	266,850	e250,000	e250,000
Total		726,160	822,790	794,870	e800,000	e850,000
Phosphates:						
Guano		5,685	4,052	3,127	1,452	1,308
Rock (apatite)		10,389	9,161	14,354	13,986	13,338
Total		16,074	13,213	17,481	15,438	14,646
Pigments, mineral, natural: Iron oxide		8,145	8,542	23,653	15,557	6,761
Potash, K_2O equivalent		23,110	25,343	e25,000	e25,000	e20,000
Potasium chloride (KCl)		—	—	—	45,135	e45,000
Pumice (includes pozzolan)		242,453	277,179	299,834	305,147	320,928
Quartz, common		350,488	495,484	477,497	541,714	492,038
Salt, all types	thousand tons	865	1,043	904	1,835	1,676
Sodium compounds, n.e.s.: Sulfate[7]		60,406	62,879	66,490	e73,000	e70,000
Sand and gravel (silica sand)[e]	thousand tons	300	300	300	300	300
Stone:						
Limestone (calcium carbonate)	do.	3,017	3,647	3,746	3,776	3,984
Marble		—	2,022	1,115	1,347	1,170
Sulfur:						
Native, other than Frasch:						
Refined		14,917	16,924	15,463	28,235	e20,000
Caliche		22,131	20,725	r e500	347	400
Byproduct, (from smelters and oil refining)		335,116	416,266	e400,000	e400,000	e400,000
Total		372,164	453,915	r e415,963	e428,582	e420,400
Talc		980	1,070	835	898	536
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous and lignite	thousand tons	1,736	2,470	2,404	r2,729	2,563
Coke: Coke oven	do.	297	287	e300	e300	e300

See footnotes at end of table.

TABLE 1—Continued

CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Gas, natural:						
Gross	million cubic meters	4,353	4,279	4,236	4,198	4,067
Marketed	do.	1,145	1,990	1,962	2,121	e2,000
Natural gas liquids:						
Natural gasoline	thousand 42-gallon barrels	626	706	698	695	e680
Liquefied petroleum gas	do.	2,761	2,657	2,520	2,154	e2,200
Total	do.	3,387	3,363	3,218	2,849	e2,880
Petroleum:						
Crude	do.	10,922	8,934	8,063	7,157	6,499
Refinery products:						
Liquefied petroleum gas	do.	2,560	2,422	2,849	2,774	e2,800
Gasoline:						
Aviation	do.	69	69	126	126	e100
Motor	do.	8,586	9,642	12,416	12,309	e12,300
Jet fuel	do.	1,453	1,157	1,705	1,767	e1,800
Kerosene	do.	1,069	1,434	1,648	1,365	e1,400
Distillate fuel oil	do.	9,554	11,454	13,259	14,410	e14,400
Residual fuel oil	do.	6,114	6,925	8,586	9,246	e9,200
Unspecified	do.	1,679	2,743	1,836	1,973	e2,000
Total	do.	31,084	35,846	42,425	43,970	e44,000

eEstimated. pPreliminary. rRevised.

[1]Table includes data available through Nov. 1992.

[2]In addition to the commodities listed, pyrite is also produced, but available information is inadequate to make reliable estimates of output levels.

[3]Figures are the nonduplicate copper content of ore, concentrates, cemented copper, slags and minerals, copper as a byproduct of gold and silver precipitate, and other copper-bearing products measured at the last stage of processing as reported by Comision Chilena del Cobre (COCHILCO). Mine production reported by Servicio Nacional de Geologia y Mineria (SERNAGEOMIN) was as follows, in metric tons: 1987—1,412,936; 1988—1,472,041; 1989—1,628,269; 1990—1,616,261; and 1991—1,840,000 (estimated).

[4]Figures are total blister, fire-refined, electrolytic, and equivalent copper output, including that blister subsequently refined in Chile and copper produced by electrowinning. Detailed statistics on electrowinning are not available; although based on current plant capacities, electrowon copper production is estimated to be approximately 55 metric tons per year.

[5]Figures are total refined copper distributed into two classes according to method of refining, fire-refined and electrolytic, which includes electrowon copper refined in Chile.

[6]Excludes castings.

[7]Includes natural sodium sulfate and anhydrous sodium sulfate, coproducts of the nitrate industry.

TABLE 2

CHILE: EXPORTS OF COPPER AND MOLYBDENUM ORE, BY DESTINATION[1]

Destination	Copper (thousand metric tons)			Molybdenum (metric tons)
	Ore and concentrate, Cu content[2]	Blister	Refined	Ore and concentrate, Mo content
1990:				
Argentina	—	—	11.3	—
Austria	—	2.5	.3	—
Belgium-Luxembourg	—	1.5	13.2	—
Brazil	61.1	7.4	10.1	(3)
Canada	1.5	7.0	—	—
China	3.9	—	.1	—
France	—	18.5	117.5	—
Germany:				
Eastern states	—	1.5	4.2	—
Western states	19.0	25.7	189.7	—
Total	19.0	27.2	193.9	—
Greece	—	—	11.9	—
Hungary	—	1.8	—	—
India	.1	—	20.1	—
Indonesia	—	—	32.9	—
Italy	(3)	—	132.9	—
Japan	81.7	(3)	209.9	—
Korea, Republic of	25.8	.1	61.8	—
Malaysia	—	—	12.9	—
Netherlands	.1	1.0	22.8	—
Philippines	13.6	—	—	—
Portugal	—	—	8.6	—
Singapore	—	—	5.4	—
Spain	32.8	—	6.6	—
Sweden	4.8	—	12.9	—
Taiwan	—	—	105.4	—
Thailand	—	—	6.5	—
Turkey	—	.8	.8	—
United Kingdom	—	17.9	65.9	—
United States	(3)	61.2	66.7	—
Venezuela	—	—	.8	—
Yugoslavia	—	4.2	4.0	—
Other	17.0	—	5.9	—
Total	261.4	151.1	1,141.1	(3)
1991:				
Argentina	(3)	—	25.3	—
Austria	—	—	.3	—
Belgium-Luxembourg	—	8.6	30.6	238.0
Brazil	68.0	—	61.5	—
Canada	1.3	—	—	—
China	23.5	—	.8	—
Finland	13.5	—	—	—
France	—	—	140.8	—

See footnotes at end of table.

TABLE 2—Continued

CHILE: EXPORTS OF COPPER AND MOLYBDENUM ORE, BY DESTINATION[1]

Destination	Copper (thousand metric tons)			Molybdenum (metric tons)
	Ore and concentrate, Cu content[2]	Blister	Refined	Ore and concentrate, Mo content
1991—Continued:				
Germany: Western states	47.9	14.6	110.2	—
Greece	—	—	10.4	—
Hong Kong	—	—	5.6	—
Hungary	—	.2	.2	—
Indonesia	—	—	26.9	—
Italy	—	—	111.9	—
Japan	177.8	4.6	212.4	—
Korea, Republic of	53.3	17.3	46.8	—
Malaysia	—	—	14.8	—
Mexico	—	1.5	.5	—
Netherlands	—	1.0	14.3	622.0
Philippines	22.4	—	—	—
Poland	15.8	—	—	—
Portugal	—	—	12.0	—
Singapore	—	—	6.5	—
Spain	61.1	—	13.8	—
Sweden	7.1	—	14.0	—
Taiwan	.1	—	158.6	—
Thailand	—	—	3.8	—
Turkey	—	1.0	.5	—
United Kingdom	—	.4	50.5	—
United States	(3)	42.0	51.8	—
Venezuela	—	—	1.6	—
Yugoslavia	—	.3	3.0	—
Other	14.9	—	.1	—
Total	506.7	91.5	1,129.5	860.0

[1]Table prepared by H. D. Willis.
[2]Includes cement copper and secondary copper.
[3]Less than 50 tons.

Source: Comision Chilena del Cobre.

TABLE 3

CHILE: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989[2]	1990	Destinations, 1990	
				United States	Other (principal)
METALS					
Aluminum: Metal including alloys:					
Scrap		NA	260	33	Japan 143; Netherlands 45.
Unwrought		NA	20	—	All to Peru.
Semimanufactures		NA	115	8	Bolivia 68; Ecuador 15; Brazil 8.
Chromium: Ore and concentrate		NA	21	—	All to Argentina.
Copper:					
Ore and concentrate		NA	[3]544,155	10,606	Japan 155,686; Spain 112,247; Brazil 109,532.
Matte and speiss including cement copper		NA	1,037	1,037	
Metal including alloys:					
Scrap		NA	2,740	33	Brazil 1,950; China 215; Republic of Korea 171.
Unwrought	thousand tons	NA	1,321	165	West Germany 218; Japan 213.
Semimanufactures		NA	20,207	4,666	Colombia 4,486; Ecuador 1,371.
Germanium: Metal including alloys, all forms value, thousands		NA	$5	—	All to West Germany.
Gold: Metal including alloys, unwrought and partly wrought	kilograms	NA	96,327	7,898	West Germany 50,958; United Kingdom 33,448.
Iron and steel:					
Iron ore and concentrate	thousand tons	7,741	6,528	138	Japan 3,957; West Germany 1,187; Republic of Korea 520.
Metal:					
Scrap		NA	28,864	—	Spain 27,709; Peru 1,108; Brazil 28.
Pig iron, cast iron, related materials		NA	16	16	
Ferroalloys:					
Ferrochromium		NA	54	—	Argentina 49; Colombia 5.
Ferrosilicon		NA	679	—	Colombia 431; Peru 248.
Unspecified		NA	5,731	406	Belgium-Luxembourg 1,997; Netherlands 1,178; Japan 1,039.
Steel, primary forms		NA	68,282	—	Costa Rica 31,966; Ecuador 27,371; Guatemala 3,998.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		NA	61,412	—	Costa Rica 22,326; Ecuador 17,975; Guatemala 16,824.
Clad, plated, coated		NA	2,475	—	Argentina 955; Ecuador 779; Bolivia 577.
Of alloy steel		NA	16	—	Iraq 11; Bolivia 4.
Bars, rods, angles, shapes, sections		NA	4,605	—	Peru 4,355; Bolivia 138; Ecuador 101.
Rails and accessories		NA	5	—	All to Bolivia.
Wire		NA	887	800	Bolivia 60; Uruguay 12.
Tubes, pipes, fittings		NA	1,811	1,609	Bolivia 64; Peru 54.

See footnotes at end of table.

TABLE 3—Continued

CHILE: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989[2]	1990	Destinations, 1990	
				United States	Other (principal)
METALS—Continued					
Lead:					
Ore and concentrate		NA	1	—	All to West Germany.
Metal including alloys:					
Scrap		NA	1,027	83	West Germany 170; Belgium-Luxembourg 159.
Unwrought		NA	1,113	181	Japan 794; United Kingdom 100; Belgium-Luxembourg 38.
Manganese:					
Ore and concentrate, metallurgical-grade		NA	13	—	All to Bolivia.
Metal including alloys, all forms		NA	10	—	All to Japan.
Molybdenum: Ore and concentrate, roasted		NA	26,268	709	Japan 8,007; United Kingdom 6,690; Belgium-Luxembourg 3,867.
Platinum-group metals: Metals including alloys, unwrought and partly wrought	value, thousands	NA	$47	$47	
Silver: Metal including alloys, unwrought and partly wrought	do.	NA	$91,713	$7,223	Brazil $26,893; West Germany $26,191; United Kingdom $14,141.
Tin: Metal including alloys, semimanufactures	do.	NA	$3	—	All to Ecuador.
Zinc:					
Ore and concentrate		NA	53,133	—	Japan 18,049; Spain 14,110; Belgium-Luxembourg 7,145.
Metal including alloys, scrap		NA	16	—	All to Republic of Korea.
Other:					
Base metals:					
Oxides and hydroxides		NA	1,222	220	Netherlands 893; Austria 74.
Ashes and residues		NA	42	21	Tanzania 21.
Base metals including alloys, all forms		NA	5	5	
Metalloids[4]		NA	41	—	Brazil 13; Argentina 12; Singapore 4.
Precious metals, n.e.s.:					
Ores and concentrates	thousand kilograms	NA	74,483	—	Japan 54,323; Brazil 16,741; West Germany 3,419.
Waste and scrap	kilograms	NA	40,923	—	All to Japan.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		NA	25	—	All to Venezuela.
Grinding and polishing wheels and stones		NA	2	—	Mainly to West Germany.
Barite and witherite		26,929	—		
Boron materials:					
Crude natural borates		8,986	5,600	20	Colombia 2,186; Brazil 1,253; Republic of Korea 501.
Oxides and acids		11,785	23,545	2,459	Belgium-Luxembourg 5,349; Netherlands 3,680.
Bromine, fluorine, iodine		4,640	4,196	1,282	Belgium-Luxembourg 2,166; Netherlands 477.

See footnotes at end of table.

TABLE 3—Continued

CHILE: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989[2]	1990	Destinations, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Cement		48,717	42,928	—	French Polynesia 42,895; United Kingdom 32.
Chalk		NA	50	—	All to Bolivia.
Clays, crude:					
Bentonite		NA	2	—	All to Uruguay.
Kaolin		25	11	—	All to Argentina.
Unspecified	value, thousands	NA	$2	—	All to Ecuador.
Diatomite and other infusorial earth		857	1,481	—	Argentina 568; Peru 368; Colombia 246.
Fertilizer materials:					
Crude, n.e.s.		60	144	—	Japan 104; West Germany 40.
Manufactured:					
Ammonia		NA	13	—	Bolivia 12; United Kingdom 1.
Nitrogenous		NA	1,643	—	Bolivia 593; Ecuador 512; Argentina 392.
Phosphatic		NA	5	—	All to Bolivia.
Potassic		NA	13	—	Do.
Unspecified and mixed		121,148	137,783	35,975	Brazil 93,191; Italy 3,150.
Gypsum and plaster		94	48	—	All to French Polynesia.
Magnesium compounds: Magnesite, crude		NA	21	—	All to Peru.
Nitrates, crude		355,322	351,230	145,567	Belgium-Luxembourg 104,539; Spain 27,127.
Phosphates, crude		219	98	—	Bolivia 95; Peru 3.
Pigments, mineral: Iron oxides and hydroxides, processed		NA	23	—	All to Colombia.
Precious and semiprecious stones other than diamond: Natural	value, thousands	NA	$757	$4	Uruguay $724; Italy $17.
Salt and brine	thousand tons	700	1,075	766	Canada 113; Japan 80.
Sodium compounds, n.e.s.:					
Soda ash, natural and manufactured		NA	61	—	All to Bolivia.
Sulfate, natural and manufactured		25,509	14,776	—	Brazil 9,285; Colombia 2,000; Argentina 968.
Stone, sand and gravel:					
Dimension stone: Worked		NA	9	4	Canada 2; France 1.
Quartz and quartzite		NA	400	—	All to Uruguay.
Sand other than metal-bearing		NA	15	—	Paraguay 8; Peru 6.
Unspecified	kilograms	274	—		
Sulfur:					
Elemental: Crude including native and byproduct		78	107	—	All to Argentina.
Dioxide		NA	17	—	All to Peru.
Sulfuric acid		NA	104	—	All to Bolivia.
Other:					
Crude		NA	47	—	All to Brazil.
Slag and dross, not metal-bearing		NA	28,223	28,223	

See footnotes at end of table.

TABLE 3—Continued

CHILE: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989[2]	1990	Destinations, 1990	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		NA	17	—	All to Bolivia.
Coal: Bituminous		NA	110	—	Do.
Coke and semicoke		NA	15	—	Do.
Petroleum refinery products:					
Liquefied petroleum gas	42-gallon barrels	NA	70	—	All to United Kingdom.
Bitumen and other residues	do.	NA	376	—	Paraguay 303; Bolivia 73.
Bituminous mixtures	do.	NA	830	—	Bolivia 812; United Kingdom 18.

NA Not available.

[1]Table prepared by H. D. Willis.

[2]Partial export data as reported by Comision Chilena del Cobre; no other data were available at time of publication.

[3]Copper content 261.4 thousand metric tons. Complete breakdown available in table 2.

[4]Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

TABLE 4

CHILE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989[2]	1990	Sources, 1990	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals:					
Alkali metals	value, thousands	NA	$8	$8	
Alkaline-earth metals	do.	NA	$19	$8	Canada $11.
Aluminum:					
Ore and concentrate		4,399	4,151	(3)	Guyana 3,500; China 651.
Oxides and hydroxides		2,497	438	256	West Germany 69; Italy 53.
Metal including alloys:					
Unwrought		NA	6,924	2,097	Argentina 4,590; Canada 150.
Semimanufactures		NA	5,313	438	West Germany 1,540; Brazil 1,060; Argentina 987.
Antimony: Metal including alloys, all forms		NA	16	—	All from Bolivia.
Cadmium: Metal including alloys, all forms		NA	2	—	Mainly from Spain.
Chromium:					
Ore and concentrate		22,111	9,388	265	Republic of South Africa 4,824; Philippines 4,289.
Oxides and hydroxides		NA	225	87	Argentina 116; West Germany 10.
Metal including alloys, all forms		NA	13	11	United Kingdom 1.
Cobalt:					
Oxides and hydroxides		NA	23	11	United Kingdom 7; Belgium-Luxembourg 5.
Metal including alloys, all forms	value, thousands	NA	$6	—	All from West Germany.
Columbium and tantalum: Tantalum metal including alloys, all forms	do.	NA	$6	$1	Canada $4; West Germany $1.
Copper:					
Ore and concentrate		NA	493	(3)	Mainly from Bolivia.
Metal including alloys:					
Unwrought		NA	50	1	United Kingdom 42; Spain 5.
Semimanufactures		NA	314	25	Brazil 128; Belgium-Luxembourg 36; West Germany 32.
Gold: Metal including alloys, unwrought and partly wrought	kilograms	NA	2	2	
Iron and steel:					
Iron ore and concentrate	value, thousands	NA	$4	$1	Japan $3.
Metal:					
Scrap		NA	42	—	Mainly from West Germany.
Pig iron, cast iron, related materials		NA	472	56	Brazil 233; Argentina 111.
Ferroalloys:					
Ferrochromium		NA	515	24	Zimbabwe 225; Republic of South Africa 94; U.S.S.R. 51.
Ferromanganese		NA	86	11	United Kingdom 49; Republic of South Africa 18.
Ferrosilicon		NA	345	99	Argentina 207; Brazil 38.
Ferrosilico manganese		NA	15	7	Argentina 8.
Unspecified	value, thousands	NA	$531	$6	Brazil $521; West Germany $3.
Steel, primary forms		NA	7,314	(3)	Brazil 3,383; Poland 1,985; Venezuela 1,944.

See footnotes at end of table.

TABLE 4—Continued

CHILE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989[2]	1990	Sources, 1990	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued:					
Metal—Continued:					
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		NA	153,154	115	Brazil 61,211; Argentina 49,659; Republic of South Africa 11,148.
Clad, plated, coated		NA	35,586	379	Japan 13,803; Republic of South Africa 5,326; United Kingdom 4,806.
Of alloy steel		NA	10,255	138	West Germany 1,940; Republic of South Africa 1,339; France 1,208.
Bars, rods, angles, shapes, sections		NA	85,402	805	Brazil 27,061; Argentina 24,295; Republic of South Africa 18,252.
Rails and accessories		NA	6,964	1,025	Canada 2,235; Argentina 2,066; United Kingdom 1,284.
Wire		NA	4,111	273	Argentina 2,163; West Germany 768.
Tubes, pipes, fittings		NA	48,262	3,490	Brazil 17,742; Argentina 12,681; Republic of South Africa 6,796.
Lead:					
Oxides		NA	216	5	Peru 206; Republic of South Africa 3.
Metal including alloys:					
Unwrought		NA	1,851	284	Peru 1,567.
Semimanufactures		NA	66	1	Belgium-Luxembourg 57; United Kingdom 8.
Magnesium: Metal including alloys:					
Unwrought		NA	2	1	Canada 1.
Semimanufactures		NA	79	14	West Germany 64; United Kingdom 1.
Manganese:					
Oxides		NA	98	66	Belgium-Luxembourg 26; Netherlands 6.
Metal including alloys, all forms		NA	60	2	Republic of South Africa 57; China 1.
Mercury		NA	18	—	Algeria 10; China 4; Japan 4.
Molybdenum: Metal including alloys:					
Unwrought including waste and scrap	value, thousands	NA	$3	—	All from Italy.
Semimanufactures	do.	NA	$48	$23	Belgium-Luxembourg $16; West Germany $7.
Nickel: Metal including alloys:					
Unwrought		NA	34	1	Norway 28; Canada 3; West Germany 2.
Semimanufactures		NA	78	13	Norway 18; Austria 15.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified	value, thousands	NA	$25	$15	West Germany $8; Switzerland $2.
Silicon, high-purity[4]		NA	35	(3)	Argentina 20; China 14.
Silver: Metal including alloys, unwrought and partly wrought	value, thousands	NA	$202	$6	West Germany $166; Brazil $19; Italy $11.
Tin: Metal including alloys:					
Unwrought		NA	300	—	Bolivia 265; Brazil 32; Malaysia 2.
Semimanufactures		NA	5	(3)	Bolivia 2; West Germany 1; United Kingdom 1.

See footnotesat end of table.

TABLE 4—Continued

CHILE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989[2]	1990	Sources, 1990	
				United States	Other (principal)
METALS—Continued					
Titanium:					
Ore and concentrate		NA	343	—	Republic of South Africa 226; Australia 85; United Kingdom 31.
Oxides		NA	105	30	Belgium-Luxembourg 26; Hong Kong 20.
Metal including alloys:					
Unwrought including waste and scrap	value, thousands	NA	$2	$2	
Semimanufactures		NA	50	(3)	United Kingdom 48; West Germany 1; Sweden 1.
Tungsten: Metal including alloys:					
Unwrought including waste and scrap	value, thousands	NA	$22	$7	Canada $7; Spain $3.
Semimanufactures	do.	NA	$88	$80	Japan $3; Switzerland $3.
Uranium and thorium: Oxides and other compounds	do.	NA	$2	—	All from West Germany.
Vanadium: Metal including alloys, unwrought including waste and scrap		NA	2	2	
Zinc:					
Ore and concentrate	value, thousands	NA	$1	—	All from West Germany.
Oxides		NA	260	25	Peru 146; China 37.
Metal including alloys:					
Unwrought		NA	4,792	1	Peru 3,925; Mexico 434; Netherlands 201.
Semimanufactures[5]		NA	441	2	United Kingdom 303; Republic of South Africa 60; Republic of Korea 42.
Zirconium:					
Ore and concentrate		NA	96	1	Australia 60; Republic of South Africa 24; Mexico 10.
Metal including alloys, unwrought					
Unwrought including waste and scrap		NA	18	—	Mainly from Republic of South Africa.
Semimanufactures	value, thousands	NA	$9	$8	Switzerland $1.
Other:					
Ores and concentrates	do.	NA	$1	$1	
Oxides and hydroxides		NA	350	50	Argentina 205; Norway 30.
Ashes and residues		NA	1	—	All from Finland.
Base metals including alloys, all forms	value, thousands	NA	$678	$38	Canada $600; Peru $19.
Metalloids[6]		NA	158	113	Netherlands 21; West Germany 14.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.	value, thousands	$82	$842	$19	Argentina $747; West Germany $68.
Artificial:					
Corundum		NA	443	51	Brazil 346; Canada 42.
Silicon Carbide		NA	44	4	Argentina 35; Brazil 3.
Grinding and polishing wheels and stones		NA	1,103	35	Switzerland 361; Brazil 336; West Germany 98.
Asbestos, crude		8,832	7,791	143	Canada 6,252; Brazil 952; Italy 218.
Barite and witherite		4	287	—	Bolivia 253; Argentina 34.

See footnotes at end of table.

TABLE 4—Continued

CHILE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989[2]	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Boron materials: Oxides and acids		13	12	3	West Germany 7; Argentina 1.
Bromine, fluorine, iodine		NA	2	(3)	Mainly from West Germany.
Cement		53,879	37,338	626	Argentina 28,241; Peru 7,147; France 1,132.
Chalk		28	165	—	All from Brazil.
Clays, crude:					
Bentonite		10,065	4,771	1,633	Argentina 2,746; United Kingdom 224.
Kaolin		[7]13,801	8,944	8,138	Argentina 311; West Germany 233.
Unspecified		—	733	632	Argentina 85; Japan 15.
Cryolite and chiolite		NA	1	1	
Diamond, natural:					
Gem, not set or strung	value, thousands	NA	$18	—	All from Belgium-Luxembourg.
Industrial stones	do.	NA	$674	$481	United Kingdom $75; West Germany $61.
Dust and powder	do.	NA	$29	$22	Belgium-Luxembourg $7.
Diatomite and other infusorial earth		893	89	30	Mexico 59.
Feldspar		64	323	—	All from Argentina.
Fertilizer materials:					
Crude, n.e.s.		NA	55	55	
Manufactured:					
Ammonia		NA	33,524	(3)	Venezuela 28,102; Colombia 5,415; Argentina 4.
Nitrogenous		NA	293,752	138,631	Netherlands 36,331; Trinidad and Tobago 30,356.
Phosphatic		130,520	146,062	145,861	Uruguay 200.
Potassic		162,135	153,142	34,107	Canada 83,642; Israel 35,362.
Unspecified and mixed		93,081	76,716	76,200	Belgium-Luxembourg 214; United Kingdom 94.
Fluorspar		9,929	536	12	Argentina 443; Republic of South Africa 60; United Kingdom 21.
Graphite, natural		1,165	117	41	West Germany 31; United Kingdom 22.
Gypsum and plaster		61	214	1	West Germany 108; Argentina 104.
Iodine	kilograms	560	NA		
Lime		2,127	2,729	—	All from Argentina.
Magnesium compounds:					
Magnesite, crude		NA	260	213	Austria 42; Brazil 5.
Oxides and hydroxides		NA	9,947	135	Brazil 9,107; West Germany 293; Austria 208.
Unspecified		25,220	—		
Mica:					
Crude including splittings and waste		95	100	22	India 58; Argentina 20.
Worked including agglomerated splittings		NA	9	3	West Germany 3; India 2.
Nitrates, crude	value, thousands	NA	$1	—	All from West Germany.
Phosphates, crude		26,508	16,897	10,589	Peru 6,307.

See footnotes at end of table.

TABLE 4—Continued

CHILE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989[2]	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Pigments, mineral: Iron oxides and hydroxides, processed	value, thousands	NA	$247	$58	West Germany $126; Brazil $43.
Precious and semiprecious stones other than diamond, natural	do.	NA	$30	$11	Zaire $11, Brazil $6.
Salt and brine		418	270	50	West Germany 143; Netherlands 51.
Sodium compounds, n.e.s.:					
Soda ash, natural and manufactured		79,121	66,711	52,283	Belgium-Luxembourg 12,835; Poland 1,406.
Sulfate, natural and manufactured		71	11	1	United Kingdom 6; West Germany 4.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		704	423	—	Argentina 171; Bolivia 134; Italy 117.
Worked		NA	3,680	51	Argentina 1,750; Italy 1,613; Spain 198.
Dolomite, chiefly refractory-grade		34,214	12,248	8,061	Argentina 4,187.
Gravel and crushed rock		NA	30	—	Colombia 21; Spain 5; Brazil 2.
Quartz and quartzite		NA	867	—	Argentina 845; West Germany 22.
Sand other than metal-bearing		122	155	79	Argentina 30; Italy 29.
Unspecified		1,862	—		
Sulfur:					
Elemental:					
Crude including native and byproduct		51,155	128,022	1,523	Canada 118,067; Bolivia 8,404.
Colloidal, precipitated, sublimed		5,221	260	217	Spain 23; Switzerland 18.
Dioxide	value, thousands	NA	$1	—	All from West Germany.
Sulfuric acid		NA	175,719	3	Mexico 52,367; Brazil 32,800; Japan 28,070.
Talc, steatite, soapstone, pyrophyllite		11,707	1,974	554	Peru 700; Italy 368.
Vermiculite, perlite, chlorite		NA	29	—	All from Argentina.
Other:					
Crude		130,776	9,631	9,029	Mexico 373; West Germany 57.
Slag and dross, not metal-bearing		NA	129	(3)	United Kingdom 65; West Germany 63.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		NA	433	35	Trinidad and Tobago 396; United Kingdom 1.
Carbon: Carbon black		NA	7,985	75	Venezuela 5,929; Colombia 1,330; Argentina 585.
Coal:					
Anthracite		NA	389	325	Belgium-Luxembourg 33; France 31.
Bituminous	thousand tons	NA	1,770	345	Republic of South Africa 399; Canada 379.
Lignite including briquets		NA	1	1	
Coke and semicoke		NA	80,795	20	Japan 49,018; China 19,800; Colombia 11,957.
Peat including briquets and litter		NA	36	—	All from Canada.
Petroleum:					
Crude	thousand 42-gallon barrels	NA	40,613	—	Nigeria 11,459; Gabon 8,186; Ecuador 6,262.

See footnotes at end of table.

TABLE 4—Continued

CHILE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989[2]	1990	Sources, 1990	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued:					
Refinery products:					
Liquefied petroleum gas	42-gallon barrels	NA	1,647,710	110,339	Venezuela 650,284; Argentina 422,170; Mexico 145,731.
Mineral jelly and wax	do.	NA	82,934	1,613	West Germany 36,092; Argentina 27,293; Spain 7,382.
Bitumen and other residues	do.	NA	19,756	145	Argentina 19,610.
Bituminous mixtures	do.	NA	376	36	Trinidad and Tobago 218; Brazil 91.
Petroleum coke	do.	NA	16,115	984	Argentina 14,976; West Germany 94.

NA Not available.

[1]Table prepared by H. D. Willis.

[2]Partial import data as reported by Comision Chilena del Cobre; no other data were available at time of publication.

[3]Less than 1/2 unit.

[4]May include silicon metal

[5]Includes zinc dust, powders, flakes.

[6]Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

[7]Includes other unspecified clays.

TABLE 5

CHILE: STRUCTURE OF THE MINERAL INDUSTRY

(Thousand metric tons unless otherwise specified)

Major commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Coal (bituminous)		Empresa Nacional del Carbón S.A. (ENACAR), CORFO's subsidiary (Government, 100%)	Arauco Province, Region VIII	750,000
Do.		Carbónifera Schwager Ltda. (61% Agencias Universales S.A., 39%; 1,500 shareholders)	Coronel Province	400,000
Do. (subbituminous coal)		Cía. de Carbones de Chile Ltda. (COCAR) [Cía. de Petróleos de Chile S.A., 81%; International Finance Corp. (I.F.C.) (U.S.), 10%; and Northern Strip Mining Ltd. (U.S.), 9%]	Pecket, Magallanes Province	1,300,000
Copper		Corporación Nacional del Cobre de Chile (CODELCO-Chile)	Santiago	1,125
Do.		Chuquicamata Div. of CODELCO	Antofagasta Province, Region II	650
Do.		El Teniente Div. of CODELCO	Rancagua Province, Region VI	290
Do.		Andina Div. of CODELCO	Santiago Province, Region V	115
Do.		El Salvador Div. of CODELCO (Government, 100%)	Copiapo Province, Region III	91
Do.		Empresa Minera Escondída, Ltda. (BHP, 57.5%; RTZ Corp. PLC, 30%; JECO, 10%; IFC, 25%)	Atacoma Desert, 150 km south of Antofagasta Province	320
Do.		Empresa Nacional de Minería (ENAMI) (Government, 100%)	Santiago	270
Do.		Cía. Minera Disputada de Las Condes, S.A. [Exxon (U.S.), 87%; ENAMI—Government, 13%]	do.	200
Do.		Cía. Minera Mantos Blancos S.A. (Anglo-American Corp., 88%; I.F.C., 12%)	do.	100
Gold	kilograms	Cía. Minera San Jóse Ltda. (El Indio Mine, owned by LAC Minerals of Canada, 83%)	do.	15,000
Do.	do.	ENAMI (Government, 100%)	do.	9,000
Do.	do.	CODELCO-Chile (byproduct from copper) (Government, 100%)	do.	2,000
Iodine	metric tons	Sociedad Química y Minera de Chile SOQUIMICH, subsidiary of CORFO (Government, 35%; private, 65%)	do.	5,500
Potassium nitrate	do.	do.	do.	250
Sodium nitrate	do.	do.	do.	600
Sodium sulfate	do.	do.	do.	70,000
Iron ore		Cía. Minera del Pacífico S.A., CAP's subsidiary (100% private)	La Serena Province	8,400
Iron ore pellets		do.	do.	4,000
Lead and zinc		Soc. Contractual Minera El Toqui Ltda., (LAC Minerals of Canada, 100%)	Santiago	1 31
Lithium carbonate		Soc. Chilena de Litio Ltda. (SCL), subsidiary of Cyprus Foot Minerals Co. of the U.S. (100% private)	do.	8.6
Manganese		Manganesos Atacama S.A., CAP's subsidiary (100% private)	do.	43.7
Molybdenum		CODELCO-Chile (byproduct from copper) (Government, 100%)	do.	14.4

TABLE 5—Continued

CHILE: STRUCTURE OF THE MINERAL INDUSTRY

(Thousand metric tons unless otherwise specified)

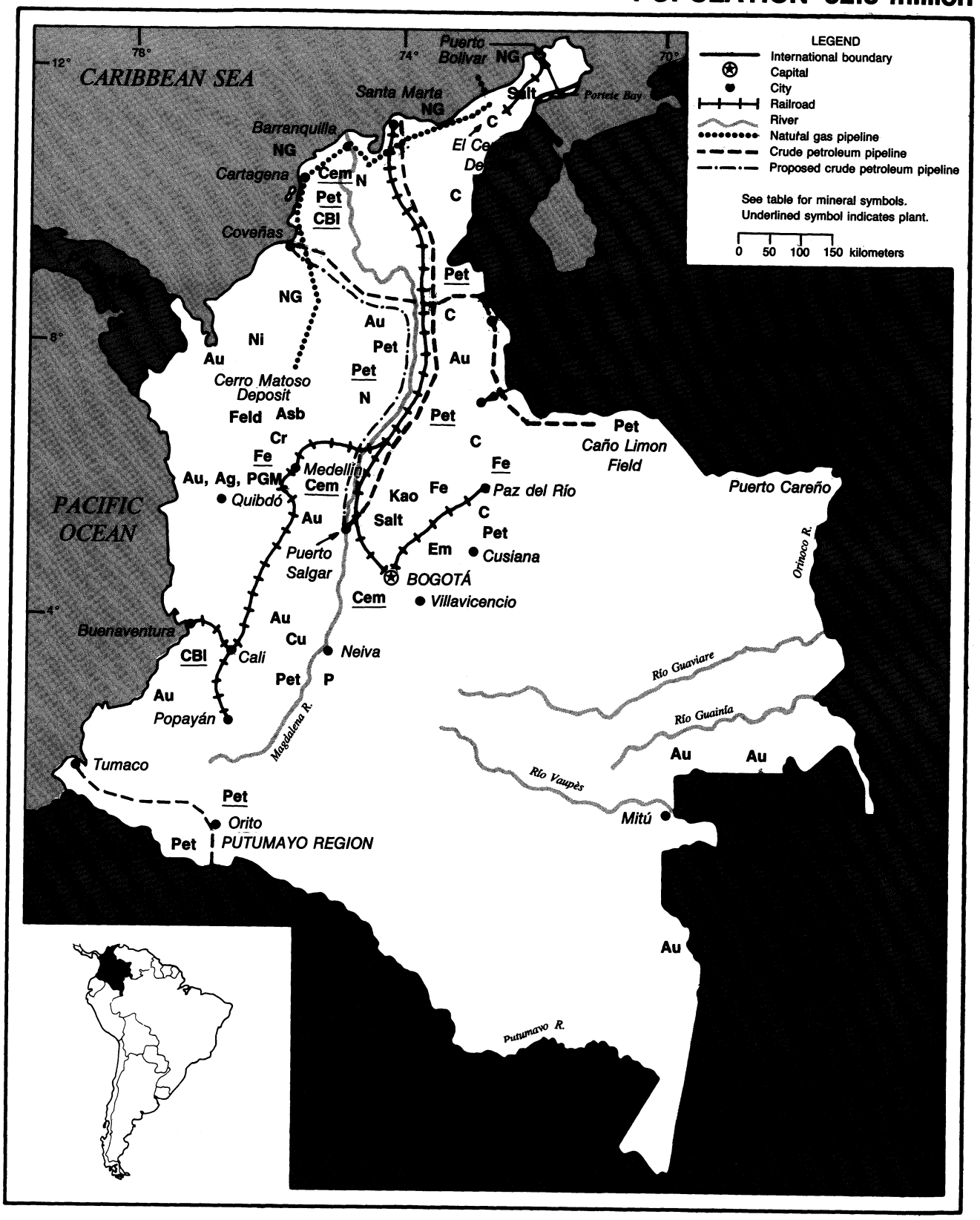
Major commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Natural gas	million cubic feet	ENAP subsidiary of CORFO (Government, 100%)	Santiago	4
Petroleum	million barrels	do.	do.	6.5
Silver (byproduct from copper)	kilograms	CODELCO-Chile	do.	275,000
Do.	do.	Cia. Minera San Jose Ltda. El Indio Mine, (LAC Minerals of Canada, 83%)	do.	57,000
Steel		Cia. Siderurgica de Huachipato S.A., CAP subsidiary (100% private)	do.	800

BRAZIL: LOADING CARAJAS IRON ORE AT NEW PONTA DA MADEIRA TERMINAL IN MARANHAO STATE. (COURTESY OF CVRD)

BRAZIL: CLOSE-UP VIEW OF IRON ORE SHIP-LOADING FACILITY AT PONTA DA MADEIRA TERMINAL IN MARANHAO STATE. (COURTESY OF CVRD)

COLOMBIA

AREA 1.14 million km² **POPULATION 32.8 million**



THE MINERAL INDUSTRY OF

COLOMBIA

By Philip M. Mobbs

Colombia was recognized worldwide as a source of quality emeralds. Within Latin America, Colombia was the leading producer of coal, kaolin, and platinum and a major producer of asbestos, cement, ferronickel, gold, salt, and crude petroleum and natural gas.

The growth of Colombia's mineral industry appeared to stagnate in 1991, primarily because of decreased hydrocarbon production. In general, however, the mining sector was moderately successful with increases in both production and exports. Overall sector growth was 2.1% for the year. Petroleum production was adversely impacted by guerrilla attacks on infrastructure and low product prices.

In recent years, the mining industry has gained a more important place in Colombia's economy. The petroleum sector was a significant force in this respect. A number of major projects were programmed for the ensuing 2 to 3 years. Included were the drilling of a large number of exploratory and exploitation wells, the construction of a new refinery in the middle Magdalena region, several oil and gas pipelines, and several petrochemical plants. The anticipated expansion of coal exports from the La Loma project, estimated to start up in 1994, was also a factor.

Colombia's GDP grew by an estimated 2.2% in 1991 to $46 billion[1] in current prices. The major mineral products were petroleum, natural gas, coal, gold, petroleum products, and nickel. The nation's inflation rate dropped from slightly more than 32% in 1990 to just less than 27% in 1991.

GOVERNMENT POLICIES AND PROGRAMS

Colombia relied on the capital and technological knowledge of large, specialized companies to promote continued development of its mineral resources. Companies included Carbones de Colombia (CARBOCOL), the state coal mining enterprise; Cerro Matoso S.A., the mixed-equity nickel mining company; Empresa Colombiana de Minas (Ecominas), the state company that implemented mining projects; Empresa Colombiana de Petróleos (Ecopetrol), the state petroleum enterprise; and associated foreign petroleum companies. During the first part of the year, Ecominas' name was changed to Minerales de Colombia, S.A. (Mineralco).

The new mining code (Código Minero) became law in late 1989. The mining act, which was crafted to facilitate and encourage mineral exploration and development, contained provisions to facilitate and expedite the processing of claim applications, to improve the security of mineral occupancy and tenure, and to establish a fund to provide financial assistance to small- and medium-scale miners.

The new Constitution written by the Constituent Assembly in 1990 to replace the 1886 Constitution became effective on July 5, 1991. Under article 332, the state retained the rights to all surface and subsurface nonrenewable natural resources. The new Constitution also created the position of Minister of Foreign Trade.

In January, law 9 was enacted. It authorized the same tax treatment for new foreign investments as domestic investments. The law also authorized dual foreign exchange rates, the official exchange rate and a free-market rate. Foreign trade transactions were processed at the official rate by the Banco de la República. By the end of November, the Government eliminated the official exchange rate, shifting all exchange transactions to the market rate.

With decree No. 416, coal, gas, oil, and nickel producers were charged with a temporary "war-tax" to fund the Government's anti-guerrilla brigades. The mobile brigades were to provide security to remote drilling and mining locations. The initial tax was subsequently declared unconstitutional, in part due to a requirement to retroactively tax income. A second version of the tax law, decree No. 1017, was issued in April. The "war-tax" would be tied to production volumes in 1992. Production was also subject to a royalty tax and an income tax. (In remote areas, the guerrilla factions demanded a "war-tax" of their own.) The remittance tax on repatriation of profits will be reduced from 19% in 1991 to 12% by 1996.

The Government's economic liberalization program, "apertura," lowered import tariffs and generated progressive foreign investment laws. However, the changes in the labor code, foreign exchange procedures, and fiscal and monetary policy coupled with the violence associated with guerrilla activity and the narcotics industry resulted in some risk-adverse investors delaying their investment plans.

Intermittent peace negotiations between the Government and the Coordinadora Nacional Guerrillera Simón Bolívar (CNGSB) were conducted in Caracas during 1991. The CNGSB was the umbrella group representing the Fuerzas Armadas Revolucionarias de

Colombia, the Ejército de Liberación Nacional (ELN), and a splinter group from the disbanded Ejército Popular de Liberación.

PRODUCTION

Colombia ranked as the third largest coal producer in the Western Hemisphere after the United States and Canada. In 1991 production of crude petroleum decreased while petroleum products increased relative to 1990. Ferronickel was up 3%. Gold production set a new volume record. Most other metals posted increased mine output for 1991. The major contributors to the increased production in the industrial minerals sector were gypsum, mica, salt, sand, and sulfur, alphabetically. *(See table 1.)*

TRADE

Colombia was a member of the Andean Pact and of GATT. It was also a beneficiary under the U.S. Generalized System of Preferences. In January, the country became eligible for the EC's 4-year Andean Program, which reduced tariffs on many Colombian exports. In December, it became eligible for broader access to the U.S. market as a beneficiary under the Andean Trade Preference Act. Late in the year, a bilateral trade agreement was signed with Venezuela. The treaty authorized a cutback in regulations covering transportation of goods between Colombia and Venezuela in 1992.

The total value of mineral fuel exports composed 26% of the total value of exports for 1991. The entire mineral output accounted for 38% of the total value of exports. In 1991, the total value of Colombian exports was approximately $7.7 billion. The United States received 44% of the exports. The value of imports from the United States was about $2.1 billion, with total imports reaching an estimated $4.6 billion.

In 1990, the value of petroleum exports exceeded the annual value of coffee exports. However, in 1991, the value of petroleum exports again trailed coffee. Approximately 62 Mbbl of crude petroleum was exported in 1991.

Coal exports, mainly steam coal, were approximately 16 Mmt in 1991. The principal export destinations, with associated percentages, were Western Europe (85%), the United States (8%), the Mediterranean area (4%), and the Far East (3%). Beginning in 1989, Colombia supplanted China as the fourth largest coal exporter in the world. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

Colombia had three major regions of economic activity—the central, north coast, and western regions. The primary center of activity in the central region was Bogotá, the country's capital city. The central area had a significant share of the nation's petroleum production and important coal deposits. The region also produced most of the country's refined petroleum products in 1991. In addition, the cement and steel plants in this region were the major domestic producers. The western region had vast hydroelectric resources with an installed capacity of 3,810 MW. The north coast or Caribbean region contained the second largest petroleum refinery and large chemical and petrochemical production facilities. The Cerro Matoso nickel mine as well as the extensive El Cerrejón coal mining complexes were in this region.

According to a recently completed mining census, 35 minerals were exploited on a national basis. It was determined that Colombia had about 7,300 mines, more than one-half of which were associated with the mining of gold. The following mineral commodities are listed in the order of number of operating mines: gold, coal, other industrial minerals, platinum, clay, limestone, marble, and emeralds. It was also found that 74% of the mines were surface operations with the remainder being underground. Approximately 19% of the mining was still being done in the traditional manner, with pickax and shovel or by washing placer deposits. The endeavor, Colombia's first detailed survey, was conducted by the Departamento Nacional de Estadística, CARBOCOL, Instituto Nacional de Investigaciones Geológicas y Mineras (INGEOMINAS), and Mineralco (formerly Ecominas).

Two Government agencies were created to administer mining exploration and development: INGEOMINAS, founded in 1919 for exploration activities, and Ecominas, created in 1968 to implement mining projects and execute the national mining development plan. Additional Government entities were created to operate the coal, nickel, and nuclear industries.

The major part of Colombia's mining industry was privately owned. This was especially true with the industrial minerals (excluding emerald), iron and steel, and the precious metals (gold, platinum, and silver). Although oil and natural gas exploration was funded primarily by private companies, production was effectively controlled by the Government entity Ecopetrol. Foreign investors could enter the mineral industry through fixed-term concessions or with an association contract with a state enterprise.

Ninety-two of the 320 association contracts signed with Ecopetrol remained in effect at the end of 1991. Exploration risk was primarily borne by foreign investors. Ecopetrol reimbursed 50% of producing wells' costs and assumed 50% of the contract's working interest only when the field had been determined to be commercially viable. In addition to the standard association contract, approximately 14 of the 89 associate contracts in effect at the beginning of the year contained a risk-sharing clause. Under the shared-risk contracts, Ecopetrol assumed 30% of the exploration costs. *(See table 4.)*

COMMODITY REVIEW

Coal, gold, and oil attracted the most new foreign interest. Proposed coal and petroleum projects were primarily export oriented. There were a number of proposed projects under consideration,

including the Guainía gold project, the Mocoa copper-molybdenum project in Putumayo Department, a phosphate project north of Bogotá, and the La Guajira gypsum prospect. Mineralco was also promoting manganese, uranium, and zinc projects as well as an aluminum plant in the Cauca Valley, an area of abundant electrical power.

Some departments were affected by the interaction between the guerrillas, Government troops, the drug terrorist squads, and local paramilitary self-defense forces. Harassment of mining and petroleum operations has increased over the past decade, especially in the Department of César. The ELN destroyed the coal camp at La Jagua del Ibirico twice during the 1990-91 period. Mining equipment, oil pipelines, and powerlines continued to attract significant guerrilla interest. Regions of the country were blacked out for days because of the attacks. In the east, the Caño Limón-Coveñas pipeline was ruptured 60 times in 1991. The western oil infrastructure was also damaged by rebel attacks. Shipments of petroleum to Central America were thrice suspended owing to damage caused by guerilla attacks.

Nationalization of the petroleum industry was the goal of the ELN. By eliminating foreign investment, the guerrilla group hoped to retain all oil profits for Colombia. One of the guerrillas' traditional fundraising methods, kidnapping local ranch owners, was extended to the mineral industry. Three Natco Co. engineers were held for a year before being released in 1991. Victims kidnapped during 1991 included three French engineers and two Japanese engineers.

Metals

Bauxite.—Bauxite was produced by small operations in the Upper Cauca Valley. Traditionally, washed production from the Jamundí area, ranging from 1,000 to 3,000 mt/a, was utilized by the nation's chemical industry to make aluminum sulfate.

Copper.—Late in 1990, El Roble Exploración Y Explotación S.A. began operations at a new copper mine northwest of Medellín. The first production was shipped at the beginning of 1991. The operation was projected to annually ship 14,000 tons of 24% copper concentrate to the Hibi Kyoda Smelting Co. in Tamano, Okayama Prefecture, Japan.

Gold.—In Colombia, gold mining can be traced to pre-Columbian times. Colombia ranked fourth in gold production in the Western Hemisphere after the United States, Canada, and Brazil, in that order.

The Department of Antioquía, Colombia's major source area for gold, produced more than 70% of the nation's total output. Much of this was produced by small operations using rudimentary methods. The Ministry of Mines and Energy estimated that elementary extraction methods were causing the loss of up to 60% of Colombia's total gold production. Mineralco was attempting to interest foreign investors in large-scale gold mining.

In 1989, the Government declared an additional 59,500 m^2 in the Amazon basin as part of the country's Indian reservations. Mineralco was examining the region's Precambian terrain in Amazonas, Guainía, and Vaupés Departments along the Brazilian and Venezuelan frontiers. The company was promoting a large-scale gold project in the Guainía region. Despite the Government's discouragement, there was extensive small-scale gold activity in the Amazon basin spilling across the border into Brazil.

Greenstone Resources of Canada began production at its Oronorte Mine near Zaragoza, Department of Antioquía, in November 1990. Concentrates were shipped to Nippon Mining. Average production reportedly exceeded 35 kg gold and 35 kg silver per month during the year. At yearend, the mine life was estimated to be more than 10 years.

Resources of the Americas of Washington, DC, started up a 45-mt/d pilot plant at Giraldo that received ore from the company's Buritica Mines. Exploration work continued through the year. Applications for exploitation permits for the Palo Seco and Yaragua Mines were submitted to the Ministry of Mines and Energy during 1991.

Other companies active in Colombia gold were Duval Resources Ltd. at El Carmen; Frontino Gold Mines Ltd., which worked the underground mine near Segovia; and Mineros de Antioquía S.A., which operated six bucketline dredges in the Río Nechí in El Bagre-Zaragoza area.

Iron and Steel.—Iron ore production increased 9% while steel production decreased slightly in 1991. The Paz del Río Mine, approximately 248 km northeast of Bogotá, was the major source of iron ore for Acerías Paz del Río, S.A., Colombia's only fully integrated steel mill. The mill had a crude steel annual capacity of 300,000 tons, including a 50,000-ton capacity to process scrap. Semi-integrated steel plants in other parts of the country *(see table 4)* utilized electric furnaces to produce steel from pig iron and scrap.

A steel industry cooperation agreement with Venezuela was approved late in 1991. The agreement will allow Colombian steel mills until December 1994 to modernize. Comparatively higher electricity costs, raw material costs, and transportation costs will also have to be addressed to enhance the competitive position of Colombia's steel industry.

Nickel.—The country's nickel production came from the Cerro Matoso Mine at Montelíbano, Department of Córdoba. The operator, Cerro Matoso S.A., was a joint venture between Billiton Overseas Ltd. (53%), a subsidiary of Royal Dutch Shell (Netherlands), and Empresa Colombiana de Níquel (47%), a Government entity. The mine has averaged about 800,000 tons of ore per year grading 2.7% nickel. At the present rate of extraction, the reserves were projected to last about 20 years. Although the plant has operated under capacity since 1982, anticipated demand

has led Cerro Matoso to consider the addition of a 10,000-mt/a furnace to the present 19,000-mt/a capacity.

Colombia produced approximately 2% of the world's nickel. Cerro Matoso ranks as one of the world's leading ferronickel producers and in 1991 was profitable for the first time since opening in 1982. Ownership of the concession reverts wholly to the Government in 2007.

Platinum.—Platinum production increased by almost 22% over that of the previous year. Production was primarily from placer deposits on the Rio San Juan and its tributaries in Chocó Department. Additional production was from placers along the upper Río Atrato in Chocó and the gold and platinum placers on the Rio Nechí in Antioquía Department.

Industrial Minerals

Asbestos has been mined in Colombia since 1982. About one-third of the country's production came from a single mine in the Department of Antioquía. Gypsum has been produced in various regions for many years. In 1990, gypsum production satisfied approximately 80% of the cement industry's requirements. Limestone is widely found in Colombia. Most of the cement plants were near limestone mines. The primary phosphate rock deposits are principally along the eastern range of the Andes Mountains, with the largest deposit situated about 250 km northeast of Bogotá.

Cement.—The construction industry's general lack of demand for products, which adversely affected the steel sector, was also felt by the cement industry. However, Cementos del Valle S.A., at Puerto Isaacs near Yumbo, was expanding its installed capacity to 1.2 Mmt/a, and Cementos Diamante's Ibaqué Project, a 1-Mmt/a coal-fired dry process plant, was scheduled to come on-line in 1993. Cía. Colombia de Clinker added a new gas-fired oven and cement mill in the expansion of its capacity to 1.03 Mmt/a. Other companies planned to expand during the next 4 to 5 years, including Acerías Paz del Río at Belencito and Cementos Ríoclaro S.A. at Puerto Triunfo.

Emeralds.—Colombia was the world's leading emerald producer in 1991. Most of Colombia's emeralds came from mines in the Department of Boyacá, most notably the Chivór, Coscuez, Muzo, and Quípama Mines north of Bogotá. In addition to mine personnel, an estimated 35,000 irregular miners scavenged the emerald mine dumps.

Most emeralds were exported as raw stones. Japan continued as the single largest market of legally exported stones. However, it was estimated that as much as 80% of the production was smuggled out of the country. Official exports increased in 1991. This was viewed as proof of the success of Mineralco's program to get miners to sell their stones to the state company. During 1991, an official emerald exchange was proposed, to be located in Bogotá, to facilitate standardization of stone prices and reduce smuggling. An associated stonecutting center was proposed to enhance the value of stone exports and provide the opportunity for technical training for the local work force. A number of local emerald merchants viewed the proposal unfavorably.

Salt.—Salt was produced from both seawater evaporation basins along the north coast and from underground mines north of Bogotá. By 1993, more than 150 Mmt of rock salt reserves will become accessible to Concesión de Salinas, the state salt mining company. The company was completing an underground salt cathedral at Zipaquirá to replace the existing 170-year-old cathedral in the mine, which stands on the 150 Mmt of salt reserves. The estimated productive life of the mine will thus be extended from 10 years to more than 300 years.

Sulfur.—Sulfur was produced from both mines and as a byproduct of petroleum processing. The most significant mine in Colombia was the Mina El Vinagre near Puracé in Cauca Department. Ecopetrol produced more than 9,000-mt/a at the Barrancabermeja refining complex. A 13,000-mt/a modified Claus unit was to be installed at the Cartegena refinery in 1992.

Mineral Fuels

Coal.—Based on yearend figures, Colombia contained the largest coal reserves in Latin America, principally of steam coal. Existing reserves are sufficient to last 1,000 years at the current rate of extraction. About one-half of the country's demonstrated reserves occurred along the north coast, concentrated in the La Guajira Peninsula.

In 1991, Colombia produced 20.2 Mmt, of coal and exported 15.8 Mmt, of which 13.4 Mmt originated from the Cerrejón Mines. The coal from this region was an excellent quality steam coal having a sulfur content of less than 1% and an ash content not exceeding 8%. Approximately 11.9 Mmt of steam coal was mined from the El Cerrejón Norte Mine in 1991. The major part of the El Cerrejón Norte coal was primarily exported to Western Europe. Cerrejón's port, Puerto Bolivar, had a nominal capacity of 15 Mmt/a.

Total Colombian coal exports were projected to reach 49 Mmt/a by 2001. Given the imminent startup of Mexico's coastal power stations in 1993, there exists the opportunity to increase Colombian exports to Mexico from the present 1 Mmt/a to a significant proportion of the 25 Mmt/a that Mexico may require by the turn of the century.

The second largest coal project in Colombia, Drummond Co.'s La Loma venture in César Department, continued under development through 1991. Drummond, of Jasper, Alabama, through its Colombian subsidiary, Drummond Ltd., had negotiated transportation rights on the rail line to Santa Marta. However, the use of the Santa Marta coal facility was denied by the Government, forcing Drummond to evaluate the feasibility of constructing an estimated $180 million terminal at Ciénaga. The

environmental study of the proposed Ciénaga facilities was completed in 1991. Additionally, the region surrounding the proposed 60 km^2 open pit mine at La Loma continued to have problems with guerrillas.

The interior coal basins provided most of the coal to the domestic market in 1991. It was the interior areas, mainly around Bogotá, where the preponderance of Colombia's coal inferred reserves occurred.

Prodeco, the principal private coal producer, operated a number of steam and metallurgical (coking) coal projects in central Colombia. Production in 1991 was reported to be 700,000 tons of steam coal and 250,000 tons of coking coal. The company restarted production from the Cerrejón Central Zone with an estimated production of 500,000 tons. Prodeco also was contracted by CARBOCOL to work the Calenturitas Project in the Department of César. Prodeco exported its production through its 3.5-Mmt/a facilities at Santa Marta.

Carbones del Caribe, the other significant private coal producer, operated the mines at Puerto Libertador. Coal was sold to local cement companies and exported. The company planned to bring a number of projects on-line in 1992-93, including the San Jorge Mine in the Department of Córdoba and the Oreganal Mine in El Cerrejón Central Zone. Carbones del Caribe also planned to join the approximately 20 companies working La Jagua de Ibirico Zone in the Department of César.

The semiprivate joint-venture Carbones de Boyacá purchased coal from the approximately 1,400 family-owned and operated coal mines in Boyacá Department. The coal was then sold to Acerías Paz del Río. Other private coal companies included Atlantic Coal de Colombia, Carbo Fuels and Minerals, and Carbones de los Andes.

CARBOCOL was continuing exploration and/or feasibility studies on the Amagá, El Descanso, San Luis, Tadu, and Tibú coalfields.

Natural Gas and Petroleum.—Natural gas production decreased an estimated 7% from 1990 production values. Of the estimated 5.2 billion m^3 produced, about 4.2 billion m^3 was marketed domestically. There was no export of natural gas in 1991. Much of the nation's natural gas reserves are located either offshore or on the La Guajira Peninsula and in the Department of Meta.

Colombia's petroleum reserves were dispersed among seven basins throughout Colombia. A significant part of the reserves lies in the eastern plains, principally in the Arauca subbasin that holds the huge Caño Limón Field. This structure contained estimated reserves of 300 Mbbl of heavy-grade petroleum.

Recoverable petroleum reserves have been conservatively estimated to be in excess of 1.74 billion bbl. At the 1991 rate of production, the reserves would last approximately 12 years. At the beginning of the year, it was estimated that, without the discovery of additional reserves, Colombia would return to being a net importer of petroleum by 1995. Reserve figures were expected to be adjusted significantly upward in 1992 to account for British Petroleum's (BP) Cusiana discovery. Published estimates of Cusiana's reserves have ranged from 700 Mbbl. to 10 bbl.

In 1988, the 1 Cusiana wildcat had discovered hydrocarbons on the 378-km^2 Santiago de las Atalayas contract area, 160 km northeast of Bogotá. The British Petroleum Company's BP Exploration Co. (Colombia) Ltd. was the operator, with a 40% interest. Other joint-venture partners were TOTAL-Compagnie Française des Pétroles through its subsidiary Total Exploratie en Produktie Mij. BV (40%) and the Triton Energy Corporation through its subsidiary Triton Colombia Inc. (20%). The partners' 4,600-m delineation well, 2A Cusiana, confirmed the discovery in 1991. The 1 Buenos Aires step-out, approximately 9 km south of 1 Cusiana, was being drilled at the end of 1991. Preliminary information concerning the 1 Buenos Aires appeared to be encouraging. Ecopetrol was expected to back in for 50% of the contract when the field was declared to be commercially viable. Unlike other fields, the Cusiana area had a history of subsurface rights belonging to private individuals. The courts had confirmed that these rights superseded a 1969 law and even the new Constitution that held that mineral rights belong to the nation.

BP also held 100% of the interest in three contracts north of the Cusiana field (Pauto, Sacama, and Tamara contracts). At the end of the year drilling operations were under way on the Tamara-1. During 1991, BP acquired the first offshore deepwater lease (greater than 150 m) offered by the Government in the Caribbean.

Garnet Resources Corp. of Houston, Texas, through its Argosy Energy International subsidiary, tested oil on its 1 Miraflor wildcat. Argosy was one of the companies operating under the association contract arrangement with a risk-sharing clause.

Lasmo Oil (Colombia) Ltd. (66.7%) and Sun International Exploration and Development Co. (33.3%) tested oil in their Purification-1ST well. Lasmo and Sun plan additional exploration of their Epsinal block in the Upper Magdalena Valley.

American International Petroleum Corp. was drilling a wildcat on the Puli contract area of the Middle Magdalena basin. Hocol, S.A. (55%), a subsidiary of Royal Dutch Shell, and Triton (45%) received Ecopetrol's approval for the development of the Saldana River Prospect.

Occidental Petroleum, which operated the Caño Limon fields, acquired a new association contract in the Cauca Valley. Repsol, the Spanish state oil company, held 11 association contracts.

Refineries operated by Ecopetrol included the industrial complex at Barrancabermeja, Santander Department, which had a capacity of 196,000 bbl/d; the operations at Cartagena in Bolivar Department, which had a capacity of 70,700 bbl/d; the Orito refinery in Putumayo Department, which was rated at 2,400 bbl/d; and the refinery at Tibú in Norte de Santander Department, which had a capacity of 5,000 bbl/d. A proposed 105,000-bbl/d refinery at Puerto Triunfo in the Middle Magdalena Valley

was temporarily postponed to evaluate the impact of the Cusiana discovery.

Reserves

In 1991, Colombia contained the largest known coal reserves in Latin America. It also was among the leaders in asbestos, emerald, gold, natural gas, petroleum, phosphate rock, and sulfur. Colombia's reserves of major minerals are included in table 6.

INFRASTRUCTURE

The Government was interested in privatization of some of the 30 regional companies that generate or transmit electricity. Hydropower furnished more than 78% of the total installed electrical generating capacity of 9,435 MW in 1991. This represented only 5% of the hydropower potential available in Colombia. Based on recent surveys and studies, it was determined that the country contained at least 308 additional potential hydroelectric plant sites that were economically feasible. Major hydroelectric plants under construction include the 1,000-MW Guavio River Project in the Department of Cundinamarca, which was to be completed in 1993, and the 322.5-MW plant at Ríogrande. There were plans for construction of an additional 1,362 MW of hydroelectrical generating capacity by the turn of the century.

Thermoelectric plants accounted for approximately 22% of the total installed electrical generating capacity. Because of the nation's hydroelectric focus, there had been less emphasis on maintenance of thermal plants, resulting in their being unable to operate at full capacity. With the increased availability of steam coal, the Government had identified eleven proposed coal-fired thermal plants as prospective investment projects.

Colombia had a total of 75,450 km of roads. Early in the year, the Government proposed a 15-project, $500 million program to improve the nation's transportation infrastructure. Colombia, Mexico, and Venezuela agreed to study the completion of the Inter-American Highway through Panama.

The country contained 3,563 km of single-track, 0.914-m gauge railroad. The Government had eliminated the national railroad organization in 1989, replacing it with Ferrovías, which was responsible for construction and maintenance of track, station, and related facilities, and the Colombian Railway Transport Co., which was responsible for rail service operations.

There was 14,300 km of inland waterways navigable by riverboats. Buenaventura, on the Pacific coast, was the country's largest port. Coal was exported through Puerto Bolívar and Santa Marta on the Caribbean coast. New coal export facilities were planned for Barranquilla and Ciénaga. The nation's primary petroleum port was Coveñas. Cartagena and Tumaco also handled petroleum exports. Buenaventura and Santa Marta handled imports of refined petroleum products. New cement-handling facilities were under construction at Buenaventura, Cartagena, and Tolú. Privatization of the Colombian port system was under consideration.

There was a total of 5,890 km of pipeline consisting of 3,585 km of crude petroleum, 1,350 km of refined products, 830 km of natural gas, and 123 km of natural gas liquids. Ecopetrol was to complete a 470-km crude oil pipeline from the Cusiana area to Coveñas in 1992. Promigas S.A. was examining the possibility of installing an additional 4,424 km of gas pipeline. Colombia, Mexico, and Venezuela agreed to investigate the feasibility of constructing a Colombia-Venezuela gas pipeline system and eventually extending it north into Central America.

OUTLOOK

Colombia has made impressive progress during the past generation in terms of social indicators such as extension of health services, literacy, and mortality rates. The economy has shown a remarkable resilience in dealing with chronic violence and sociopolitical conflicts and continues to expand and diversify. It has been calculated that a medium-term growth rate of at least 5% will be necessary to prevent the unemployment rate from rising, a development that would have political as well as economic implications.

The medium- and long-term outlook for the minerals sector looks promising. This is especially true concerning the mineral fuels coal, natural gas, and petroleum. The long-term outlook for gold looks good providing adequate exploration and development of the Guainía region takes places. Emerald and nickel production at current levels is expected to continue for the next 15 to 20 years. Foreign investment will continue to be needed to fund Colombia's hydrocarbon exploration and development.

[1]Where necessary, values have been converted from Colombian pesos (Col$) to U.S. dollars at the average rate for 1991 of Col$637.93 = US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

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TABLE 1

COLOMBIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
METALS						
Bauxite		e2,000	e1,500	1,500	1,640	1,716
Copper: Mine output, Cu content		—	—	—	304	3,643
Gold	kilograms	26,546	29,014	29,506	29,352	34,844
Iron and steel:						
Iron ore and concentrate	thousand tons	615	609	573	628	685
Pig iron	do.	326	309	297	323	305
Steel, crude	do.	689	754	706	r701	664
Semimanufactures, hot-rolled	do.	532	597	598	592	581
Lead:						
Mine output, Pb content		158	31	394	331	362
Refined (secondary)[e]		4,000	4,000	3,500	3,500	3,600
Manganese: Mine output, Mn content		—	3,580	3,600	r500	552
Nickel:						
Mine output, Ni content		e25,200	19,979	21,425	22,439	20,590
Ferronickel, Ni content		r8,400	r7,000	r7,113	r7,736	8,425
Platinum-group metals	kilograms	638	815	973	1,316	1,603
Silver	do.	4,977	6,563	6,847	6,591	8,036
Zinc: Mine output, Zn content		—	138	394	356	266
INDUSTRIAL MINERALS						
Asbestos:						
Mine output		132,723	152,896	158,149	r159,600	160,332
Fiber[e]		6,600	7,600	7,900	8,000	r7,825
Barite		3,792	e4,000	5,460	5,380	5,342
Cement, hydraulic	thousand tons	5,965	6,764	6,643	6,320	6,277
Clays:						
Bentonite		e2,900	e3,000	2,950	3,100	3,178
Common clay and kaolin	thousand tons	1,221	1,306	1,800	r1,920	1,984
Diatomite		—	—	3,600	r3,100	3,890
Feldspar		33,760	37,136	40,850	34,800	e39,178
Fluorite		e300	e300	300	780	894
Gemstones: Emerald[3]	carats	886,551	1,095,650	1,200,000	3,100,000	1,075,232
Gypsum	thousand tons	302	307	553	e500	639
Lime, hydrated and quicklime[e]	do	1,300	1,300	1,300	1,300	1,300
Magnesite		15,444	17,760	20,425	r19,300	18,768
Mica		e50	e55	60	75	92
Nitrogen: N content of ammonia		88,600	84,100	91,800	e90,000	e90,000
Phosphate rock		e34,000	35,000	31,200	37,000	31,516
Salt:						
Rock	thousand tons	205	209	190	209	219
Marine	do.	450	473	470	478	482
Total	do.	655	682	660	687	701
Sodium compounds, n.e.s.: Sodium carbonate		116,864	114,087	e115,000	e115,000	e115,000
Stone and sand:						
Calcite		5,334	8,736	12,060	r7,208	5,758
Dolomite	thousand tons	33	33	45	45	46
Limestone	do.	e12,000	11,980	e12,000	17,000	15,660

See footnotes at end of table.

TABLE 1—Continued

COLOMBIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
INDUSTRIAL MINERALS—Continued						
Stone and sand—Continued:						
Marble		17,500	e17,500	r30,000	r32,200	33,380
Sand excluding metal-bearing		602,400	654,800	700,000	r790,000	858,784
Sulfur:						
Native (from ore)		41,490	42,795	45,575	31,686	46,563
Byproduct, from petroleum		e10,200	8,200	8,000	e8,000	9,308
Total		51,690	50,995	53,575	39,686	55,871
Talc, soapstone, pyrophyllite		11,927	12,800	9,196	10,113	11,064
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]		18,000	18,000	18,000	20,400	20,000
Coal:						
Metallurgical	thousand tons	759	585	650	e700	940
Steam	do.	13,835	14,315	18,252	e19,700	19,260
Total	do.	14,594	14,900	18,902	20,400	20,200
Coke, all types[e]	do.	600	550	550	[2]339	400
Gas, natural:						
Gross	million cubic meters	e5,380	5,029	5,113	e5,600	5,202
Marketed	do.	(4)	4,062	e4,100	e4,500	4,248
Natural gas liquids	42-gallon barrels	1,717	1,384	e1,400	e1,500	2,239
Petroleum:						
Crude	do.	147,843	136,760	147,563	159,500	155,329
Refinery products:						
Liquefied petroleum gas (propane)	do.	4,380	4,745	e4,500	e4,500	4,855
Gasoline:						
Aviation	do.	276	255	e260	e265	301
Motor	do.	28,194	27,120	e28,500	e29,000	32,120
Jet fuel	do.	3,650	3,650	e3,800	e4,000	3,956
Kerosene	do.	2,190	2,190	e2,200	e2,300	1,692
Distillate fuel oil	do.	14,235	14,235	e14,300	e14,300	16,761
Lubricants[e]	do.	750	733	750	750	[2]651
Residual fuel oil	do.	24,820	23,360	e23,500	e24,000	26,900
Asphalt and bitumen	do.	1,079	1,127	e1,100	e1,100	1,205
Refinery fuel and losses, and unspecified products.	do.	2,555	3,285	e3,500	e3,500	e422
Total	do.	82,129	80,700	e82,410	e83,715	88,863

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

[1]Table includes data available through Nov. 20, 1992.

[2]Reported figure.

[3]Based on registered exports by the Banco de la Republica.

[4]Comparable historical data were not available at the time of publication.

TABLE 2
COLOMBIA: VALUE OF SELECTED MINERAL EXPORTS

(Millions of U.S. dollars)

Commodity	1982	1983	1984	1985	1986	1987	1988	1989	1990[r]	1991[e]
Crude oil and refined products	[1]$284	[1]378	[1]444	[1]407	619	1,341	953	1,438	1,950	1,500
Coal	17	29	59	151	190	360	425	650	545	660
Ferronickel	6	56	81	53	48	77	179	190	146	155
Emeralds	41	33	31	25	34	62	90	103	111	150
Cement	55	34	38	46	25	63	66	70	70	75
Total	403	530	653	682	916	1,903	1,713	2,451	2,822	2,540
Total exports	3,283	3,176	3,469	3,763	5,434	5,638	5,805	6,364	7,079	7,651
Selected minerals as percent of total exports	12	17	19	18	17	34	30	39	40	33

[e]Estimated. [r]Revised.
[1]Fuel oil only.

TABLE 3
COLOMBIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Destinations, 1990	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	78	152	2	Venezuela 53; Peru 44; Ecuador 33.
Metal including alloys:				
Scrap	913	773	598	Venezuela 110; United Kingdom 65.
Unwrought	118	—		
Semimanufactures	127	335	—	Chile 277; Ecuador 25; Peru 11.
Chromium: Oxides and hydroxides	—	2	—	Thailand 1; Venezuela 1.
Copper:				
Ore and concentrate	—	63	—	All to Japan.
Metal including alloys:				
Scrap	—	2,570	1,630	Spain 525; Venezuela 347.
Unwrought	—	21	—	All to Venezuela.
Semimanufactures	15	72	34	Panama 13; Cuba 12.
Iron and steel: Metal:				
Scrap	93	180	153	Netherlands 27.
Pig iron, cast iron, related materials	60	51	—	Ecuador 50; Guatemala 1.
Ferroalloys: Unspecified	34,691	50,806	8,233	Netherlands 27,923; France 7,963.
Steel, primary forms	7	3,262	3	Ecuador 2,053; Singapore 1,205.
Semimanufactures:				
Bars, rods, angles, shapes, sections	53	16,092	7,606	Mexico 7,352; Venezuela 753.
Universals, plates, sheets	6,108	4,336	—	Cuba 3,921; Trinidad and Tobago 337; Peru 78.
Hoop and strip	—	89	89	
Wire	380	299	—	Peru 136; Ecuador 66; Dominican Republic 59.
Tubes, pipes, fittings	1,242	622	477	Venezuela 70; Peru 38.
Castings and forgings, rough	250	813	365	Venezuela 258; Chile 189.
Lead:				
Oxides	—	35	—	France 26; Venezuela 9.
Metal including alloys:				
Scrap	—	62	62	

See footnotes at end of table.

TABLE 3—Continued

COLOMBIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS—Continued					
Lead—Continued:					
Metal including alloys—Continued:					
Unwrought		—	85	—	Ecuador 78; Costa Rica 7.
Semimanufactures		5	8	—	All to Venezuela.
Manganese: Oxides		140	—		
Mercury		60	—		
Platinum-group metals: Platinum metal including alloys, unwrought and partly wrought	value, thousands	$62	$4,995	$4,902	Spain $83; West Germany $10.
Silver: Metal including alloys, unwrought and partly wrought	do.	—	$7	$7	
Tin: Metal including alloys, semimanufactures		—	6	—	Costa Rica 4; Venezuela 2.
Titanium: Oxides	value, thousands	$1	—		
Tungsten: Metal including alloys, semimanufactures	do.	—	$1	—	All to Panama.
Zinc: Oxides		10	50	—	Venezuela 30; Guatemala 20.
Other:					
Ores and concentrates of precious metals, n.e.s.		1,291	371	—	Republic of Korea 350; Japan 21.
Oxides and hydroxides		34	43	12	Ecuador 14; Venezuela 12.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		(2)	1	—	All to Spain.
Grinding and polishing wheels and stones		3	11	(3)	Brazil 5; Ecuador 4; Guatemala 1.
Barite and witherite		—	18	18	
Bromine[4]		50	—		
Cement	thousand tons	1,024	1,408	1,088	Netherlands Antilles 55; Suriname 55.
Chalk		—	80	—	All to Ecuador.
Clays, crude		395	457	—	All to Venezuela.
Diamond: Natural: Gem, not set or strung	value, thousands	—	$215	—	Japan $214; Australia $1.
Fertilizer materials:					
Crude, n.e.s.		95	239	—	West Germany 208; Netherlands 31.
Manufactured:					
Ammonia		5,519	10,501	5,086	Chile 5,415.
Nitrogenous		5	34	—	All to Ecuador.
Phosphatic		690	186	—	Do.
Potassic		—	121	—	Do.
Unspecified and mixed		23,116	5,720	—	Honduras 4,622; Ecuador 751; Panama 251.
Gypsum and plaster		2,473	4,358	—	Venezuela 3,446; Ecuador 912.
Lime		65	12	—	All to Venezuela.
Mica: Crude including splittings and waste		6	—		
Pigments, mineral: Iron oxides and hydroxides, processed		6	153	12	Thailand 64; Costa Rica 26; Guatemala 18.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$108,762	$112,702	$15,483	Japan $89,057; West Germany $1,317.

See footnotes at end of table.

TABLE 3—Continued

COLOMBIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Precions semiprecious stones other than diamond—Continued:					
Synthetic	value, thousands	$1	—		
Pyrite, unroasted		30	—		
Salt and brine		72,684	21,592	—	All to Brazil.
Sodium compounds, n.e.s.: Sulfate, natural and manufactured		5	—		
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		125	260	—	Italy 95; Venezuela 70; Peru 51.
Worked		34	72	40	Venezuela 26; Panama 6.
Dolomite, chiefly refractory-grade		90	260	—	All to Ecuador.
Gravel and crushed rock		15,283	—		
Quartz and quartzite	value, thousands	$17	$2	$1	Italy $1.
Sand other than metal-bearing		101	5,026	—	Netherlands Antilles 5,000; Chile 21;
Sulfur:					
Elemental:					
Crude including native and byproduct		843	3,519	—	Ecuador 2,004; Peru 924; Honduras 357.
Colloidal, precipitated, sublimed		—	13	—	All to Venezuela.
Sulfuric acid		—	200	—	Do.
Talc, steatite, soapstone, pyrophyllite		—	26	—	Do.
Other: Crude		—	1	—	All to Italy.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		43	88	—	All to Ecuador.
Carbon black		5,241	4,681	—	Ecuador 2,814; Chile 1,291; Cuba 279.
Coal:					
Anthracite		1,857	201	—	All to Venezuela.
Bituminous	thousand tons	12,485	13,506	1,074	United Kingdom 2,390; Denmark 2,028; France 1,935.
Coke and semicoke		102,456	119,829	13,500	Venezuela 62,191; Ecuador 15,572.
Petroleum:					
Crude	thousand 42-gallon barrels	r65,589	76,568	65,112	Chile 4,528; Netherlands 563.
Refinery products:					
Mineral jelly and wax	do.	(3)	6	5	Costa Rica 1.
Kerosene and jet fuel	do.	r1,919	1,221	932	Chile 121; unspecified 168.
Distillate fuel oil	do.	r297	1,586	796	Venezuela 789; Brazil 1.
Lubricants	do.	5	4	—	Costa Rica 1; Panama 1; Peru 1.
Residual fuel oil	do.	21,479	22,905	19,161	The Bahamas 2,192; Netherlands Antilles 301.
Bitumen and other residues	do.	(3)	(3)	—	All to Costa Rica and Ecuador.
Bituminous mixtures	do.	1	3	—	Ecuador 1; Peru 1; Venezuela 1.

rRevised.
[1]Table prepared by H. D. Willis.
[2]Unreported quantity valued at $8,000.
[3]Less than 1/2 unit.
[4]Includes fluorine and iodine.

TABLE 4
COLOMBIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Sources, 1990	
			United States	Other (principal)
METALS				
Alkali and rare-earth metals	4	1	1	
Aluminum:				
Ore and concentrate including alumina	9,151	7,047	575	Hong Kong 6,147; West Germany 156.
Oxides and hydroxides	4,273	4,535	955	West Germany 1,860; United Kingdom 931.
Metal including alloys:				
Unwrought	13,791	21,373	190	Venezuela 19,892; Canada 698; Argentina 400.
Semimanufactures	6,271	7,863	2,104	Venezuela 4,611; Yugoslavia 306.
Chromium: Oxides and hydroxides	127	63	33	West Germany 30.
Cobalt: Oxides and hydroxides	1	1	1	
Copper: Metal including alloys:				
Scrap	—	54	—	All from Ecuador.
Unwrought	2,125	585	33	Peru 550; Switzerland 1.
Semimanufactures	17,876	19,585	880	Peru 6,874; Chile 4,491; Belgium-Luxembourg 2,186.
Gold: Waste and sweepings kilograms	—	16	16	
Iron and steel:				
Iron ore and concentrate	388	24	23	United Kingdom 1.
Metal:				
Scrap	204,887	73,167	32,115	Netherlands 20,585; Venezuela 10,003.
Pig iron, cast iron, related materials	16,093	18,714	79	Switzerland 17,804; Brazil 443; West Germany 213.
Ferroalloys:				
Ferromanganese	5,844	4,994	44	Mexico 3,697; Brazil 1,251.
Ferrosilicon	3,125	1,851	13	Brazil 750; Chile 576; Venezuela 465.
Unspecified	5,371	1,824	143	Brazil 852; Venezuela 263; Mexico 150.
Steel, primary forms	62,045	34,581	6	Venezuela 31,876; United Kingdom 1,261; Panama 745.
Semimanufactures:				
Bars, rods, angles, shapes, sections	58,772	47,028	4,357	United Kingdom 8,367; Spain 6,538; France 6,001.
Universals, plates, sheets	300,260	329,689	9,186	Venezuela 120,331; Japan 100,122; West Germany 24,486.
Hoop and strip	5,827	6,980	401	United Kingdom 4,628; Japan 864.
Rails and accessories	8,641	5,064	83	Spain 4,611; Japan 295.
Wire	994	1,491	758	Belgium-Luxembourg 266; Venezuela 182.
Tubes, pipes, fittings	110,681	139,377	16,687	Brazil 40,964; Venezuela 30,843; Belgium-Luxembourg 30,756.
Castings and forgings, rough	619	1,914	620	Spain 621; Chile 284.
Lead:				
Ore and concentrate	—	100	—	All from Mexico.
Oxides	1,522	1,049	5	Peru 1,024; Ecuador 10; Mexico 10.
Metal including alloys:				
Scrap	—	672	—	All from Venezuela.
Unwrought	2,615	2,234	—	Peru 2,026; Mexico 108; Venezuela 100.
Semimanufactures	13	15	8	West Germany 6; France 1.

See footnotes at end of table.

TABLE 4—Continued

COLOMBIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Sources, 1990	
			United States	Other (principal)
METALS—Continued				
Magnesium: Metal including alloys—Continued:				
Scrap	200	—		
Unwrought	28	40	25	Canada 8; Norway 5.
Semimanufactures	67	56	36	France 18; West Germany 1.
Manganese:				
Ore and concentrate: Metallurgical-grade	3,360	7,811	—	Brazil 4,466; Mexico 3,173; Venezuela 100.
Oxides	489	524	66	Brazil 268; Japan 148.
Mercury	59	49	3	West Germany 34; Spain 10.
Molybdenum: Metal including alloys, semimanufactures	4	3	3	
Nickel:				
Ore and concentrate	1	—		
Metal including alloys:				
Scrap	5	14	14	
Unwrought	284	170	72	Canada 95; United Kingdom 3.
Semimanufactures	116	228	120	West Germany 22; Brazil 6.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified value, thousands	$34	$6	$1	West Germany $5.
Silver: Metal including alloys, unwrought and partly wrought do.	$35	$82	$3	Peru $61; Venezuela $17.
Tin:				
Ore and concentrate	—	1	—	All from West Germany.
Metal including alloys:				
Unwrought	398	401	25	Bolivia 341; Peru 35.
Semimanufactures	47	62	5	Bolivia 51; West Germany 3.
Titanium: Oxides	414	378	57	United Kingdom 117; West Germany 106; Venezuela 67.
Tungsten: Metal including alloys, semimanufactures value, thousands	$9	$8	$8	
Zinc:				
Oxides	101	101	8	West Germany 52; Peru 41.
Blue powder[2]	451	1,182	65	Venezuela 1,062; France 50.
Metal including alloys:				
Scrap	1	—		
Unwrought	14,890	8,797	—	Peru 8,583; Venezuela 122; Canada 90.
Semimanufactures	r96	1,503	12	Peru 1,475; United Kingdom 6.
Other:				
Ores and concentrates	292	700	450	Australia 141; Netherlands 102.
Oxides and hydroxides	r148	154	67	Netherlands 33; West Germany 32.
Ashes and residues	—	52	—	All from Venezuela.
Base metals including alloys, all forms	83	158	62	Venezuela 39; West Germany 23.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	7,271	15,945	31	Ecuador 15,864; West Germany 34.

See footnotes at end of table.

TABLE 4—Continued

COLOMBIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Sources, 1990	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Abrasives, n.e.s.—Continued:				
Artificial:				
Corundum	1,420	1,040	12	Brazil 826; Venezuela 103; West Germany 46.
Silicon carbide	r365	478	2	Norway 185; Brazil 128; Switzerland 110.
Dust and powder of precious and semiprecious stones value, thousands	$8	—		
Grinding and polishing wheels and stones	28	45	26	West Germany 7; Italy 5.
Asbestos, crude	14,370	13,622	90	Switzerland 8,137; Canada 5,194; Brazil 141.
Barite and witherite	16,029	3,071	3,020	Peru 51.
Boron materials:				
Crude natural borates	4,120	6,416	—	Chile 4,110; Peru 2,206; Ecuador 100.
Oxides and acids	384	684	186	Peru 490; West Germany 8.
Bromine[3]	2	19	(4)	Chile 15; West Germany 3.
Cement	3,906	3,362	411	Brazil 1,083; Honduras 1,000; France 628.
Chalk	132	347	341	Switzerland 6.
Clays, crude	11,649	12,741	11,850	France 341; Mexico 260.
Diamond: Natural:				
Gem, not set or strung value, thousands	$22	$45	$41	Spain $4.
Industrial stones do.	$6	$6	$2	Argentina $3; Canada $1.
Diatomite and other infusorial earth	1,406	2,173	120	Mexico 1,889; Chile 164.
Feldspar, fluorspar, related materials	1,118	280	21	United Kingdom 52; Mexico 50; Netherlands 48.
Fertilizer materials:				
Crude, n.e.s.	2	2	2	
Manufactured:				
Ammonia	21,472	19,083	4,773	Venezuela 11,926; Panama 2,381.
Nitrogenous	429,719	494,635	223,386	Venezuela 72,383; United Kingdom 54,078.
Phosphatic	9,332	11,298	11,298	
Potassic	255,322	363,100	141,594	East Germany 115,707; Canada 51,124.
Unspecified and mixed	169,917	221,157	192,461	Norway 22,428; Spain 5,783.
Graphite, natural	130	47	37	West Germany 6; United Kingdom 3.
Gypsum and plaster	32,121	66,078	20,272	Mexico 18,977; Dominican Republic 15,976.
Magnesium compounds: Magnesite, crude	1,916	1,829	308	Austria 789; Venezuela 378.
Mica:				
Crude including splittings and waste	132	101	76	France 24; Belgium-Luxembourg 1.
Worked including agglomerated splittings	9	9	4	Belgium-Luxembourg 4; Spain 1.
Nitrates, crude	54	66	—	All from Chile.
Phosphates, crude	37,703	49,960	49,960	
Pigments, mineral: Iron oxides and hydroxides, processed	1,136	1,008	121	West Germany 563; Mexico 166.
Potassium salts, crude	—	11	—	All from Chile.
Precious and semiprecious stones other than diamond: Natural value, thousands	$13	$30	$19	West Germany $6; Spain $4.
Pyrite, unroasted	21	2	—	All from West Germany.
Salt and brine	141	401	86	Venezuela 267; West Germany 47.

See footnotes at end of table.

TABLE 4—Continued

COLOMBIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sodium compounds, n.e.s.:					
Soda ash, natural and manufactured		21,614	19,635	19,635	
Sulfate, natural and manufactured		6,194	2,014	7	Chile 2,000; West Germany 4.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		12,323	13,519	36	Peru 8,322; Italy 2,209; Cuba 1,245.
Worked		763	1,558	60	Peru 849; Ecuador 562; Honduras 81.
Dolomite, chiefly refractory-grade		6,802	3,915	1,100	Belgium-Luxembourg 2,815.
Gravel and crushed rock		22,850	22,834	109	Costa Rica 21,900; Venezuela 608.
Quartz and quartzite		7	5	—	All from West Germany.
Sand other than metal-bearing		4,392	7,193	2,945	Brazil 4,100; Sweden 67.
Sulfur:					
Elemental:					
Crude including native and byproduct		31,904	35,019	29,173	Venezuela 5,846.
Colloidal, precipitated, sublimed		63	70	70	
Sulfuric acid		14	10	5	West Germany 4.
Talc, steatite, soapstone, pyrophyllite		2,198	2,336	589	Italy 758; North Korea 583.
Other: Crude		11,572	12,943	1,477	East Germany 10,907; United Kingdom 278.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		104	51	51	
Carbon black		751	699	190	West Germany 288; Singapore 139.
Coal: Anthracite		2	444	5	Venezuela 439; United Kingdom 5.
Coke and semicoke		(3)	7	(4)	Mainly from West Germany.
Peat including briquets and litter		13	5	5	
Petroleum refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	1	145	4	Venezuela 141.
Gasoline	do.	9,505	9,957	130	Netherlands Antilles 3,150; Venezuela 2,493; Argentina 2,242.
Mineral jelly and wax	do.	121	80	3	Spain 40; Japan 29; Venezuela 4.
Kerosene and jet fuel	do.	11	11	(4)	Mainly from Brazil.
Distillate fuel oil	do.	1	531	—	Netherlands 280; Canada 247; Brazil 3.
Lubricants	do.	441	484	114	Venezuela 365; West Germany 4.
Residual fuel oil	do.	25	11	—	All from Brazil.
Bitumen and other residues	do.	(4)	(4)	(4)	
Bituminous mixtures	do.	(4)	1	1	
Petroleum coke	do.	2	3	3	

[r] Revised.
[1] Table prepared by H. D. Willis.
[2] Includes zinc dust, flakes and powders.
[3] Includes fluorine and iodine.
[4] Less than 1/2 unit.
[5] Unreported quantity valued at $1,000.

TABLE 5

COLOMBIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Asbestos		Minera Las Brisas S.A. (Eternit Colombiana S.A., 70%)	Campamentos, Antioquía Department (mine)	9
Carbon black		Cabot Colombiana S.A. (private, 100%)	Cartagena, Bolivar Department (plant)	NA
Do.		Productos Petroquimicos S.A. (private, 100%)	Cali, Valle del Cauca Department (two plants)	12
Cement		Cía. Colombia de Clinker S.A. (Colclinker) (private, 100%)	Cartagena, Bolivar Department (plant)	1,100
Do.		Cementos del Caribe S.A. (private, 100%)	Barranquilla, Atlantico Department (plant)	1,000
Do.		Cementos del Valle S.A. (private, 100%)	Yumbo, Valle del Cauca Department (plant)	1,200
Do.		Cementos Rioclaro S.A. (private, 100%)	Puerto Trifuno, Antioquía Department (plant)	1,000
Coal		Carbones de Colombia (CARBOCOL) (Government, 50%) and International Colombia Resources Corp. (INTERCOR) (Exxon, 50%)	El Cerrejón Norte Mine, La Guajira Department	15,000
Do.		Drummond Ltd. (Drummond Co., 100%)	La Loma Mine, Cesar Department	[1]10,000
Do.		Prodeco (private, 100%)	A number of mines in Central Colombia	1,000
Do.		Acerías Paz del Río S.A. (private, 100%)	Paz del Río, Boyaca Department (mine)	600
Copper		El Roble Exploración Y Explotación S.A. (Minas El Roble, 51%; Nittetsu Mining, 44.1%; and C Itoh, 4.9%)	El Roble Mine, El Carmen, Chocó Department	4
Emerald		Minerales de Colombia S.A. (Government, 100%)	Chivor, Coscuez, Muzo, and Quípama Mines, Boyaca Department	NA
Gold	kilograms	Frontino Gold Mines Ltd. (private, 100%)	El Silencio Mine, Segovia, Antioquía Department	1,500
Do.	do.	Greenstone Resources Ltd. (private, 100%)	Oronorte Mine, Segovia, Antioquía Department	500
Do.	do.	Mineros de Antioquía S.A. (private, 100%)	Rio Nechí, near El Bagre, Antioquía Department (mines)	2,000
Do.	do.	Small miners (Cooperatives and individual prospectors)	Rio Nechí, Antioquía Department (mines)	NA
Iron ore		Acerias Paz del Río S.A.	Paz del Río, Boyaca Department (mine)	650
Kaolin		Ceramicas del Valle Ltda. (private, 100%)	Yumbo, Valle del Cauca Department (mine)	NA
Natural gas	million cubic meters	Empresa Colombiana de Petroleos (Ecopetrol) (Government, 100%)	North coast, Guajira Department (national gasfields)	3,500
Do.	do.	International Petroleum Colombia Ltd. (International Petroleum Corporation, 100%)	Barrancabermeja locale, Antioquía and Santander Departments	1,200
Nickel		Cerro Matoso S.A. (Billiton Overseas Ltd., 53%; Government, 47%)	Cerro Matoso Mine, Montelíbano, Cordoba Department	23
Nitrogen		Abonos de Colombia (private, 100%)	Cartagena, Bolivar Department (plant)	100
Do.		Monomeros Colombo-Venezolanos S.A. (private, 100%)	Barranquilla, Atlantico Department (plant)	85
Petroleum	42-gallon barrels	Ecopetrol	16 fields in various departments	70,000
Do.	do.	Houston Oil Colombiana S.A. (HOCOL) (Royal Dutch Shell, 100%)	14 fields in various departments	36,500
Petroleum products	do.	Ecopetrol	Barrancabermeja Refinery, Santander Department	71,400
Do.	do.	do.	Cartegena Refinery, Bolivar Department	25,806
Do.	do.	do.	Tibú, Norte de Santander Department	1,825
Do.	do.	do.	Orito, Putumayo Department	875
Phosphate		Fosfatos de Colombia S.A. (private, 100%)	Neiva, Huila Department	30
Do.		Fosfatos Boyaca S.A. (Government, 100%)	Iza, Boyaca Department	20
Platinum		Small miners (Cooperatives and individual prospectors)	Río San Juan, Chocó Department	NA

See footnotes at end of table.

TABLE 5—Continued

COLOMBIA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Salt:			
Marine	Instituto de Fomento Industrial (IFI) (Government, 100%)	Manaure Salina, La Guajira Department	1,200
Rock	Concesion Salinas (Government, 100%)	Zipaquira, Cundinamarca Department	500
Silver kilograms	Frontino Gold Mines Ltd.	Segovia, Antioquía Department (mine)	2,500
Do. do.	Small miners (Individual prospectors and cooperatives)	Rio Nechí, Antioquía Department (mines)	2,000
Steel:			
Integrated plant	Acerias Paz del Río S.A.	Belencito, Boyaca Department	300
Semi-integrated plants	Fundiciones Technicas S.A. (private, 100%)	Medellin, Antioquía Department	NA
Do.	Siderúrgica del Boyacá S.A. (private, 100%)	Bogota, Federal District	NA
Do.	Siderúrgica de Medellin S.A. (private, 100%)	Medellin, Antioquía Department	NA
Do.	Siderúrgica de Muña S.A. (private, 100%)	Chusacá, Federal District	NA
Do.	Siderúrgica del Pacifico S.A. (private, 100%)	Cali, Valle del Cauca Department	NA
Sulfur	Industrias Purace S.A. (private, 100%)	El Vinagre Mine, Cauca Department	50
Do.	Ecopetrol	Barrancabermeja, Santander Department	29

NA Not available.
[1]Under development.

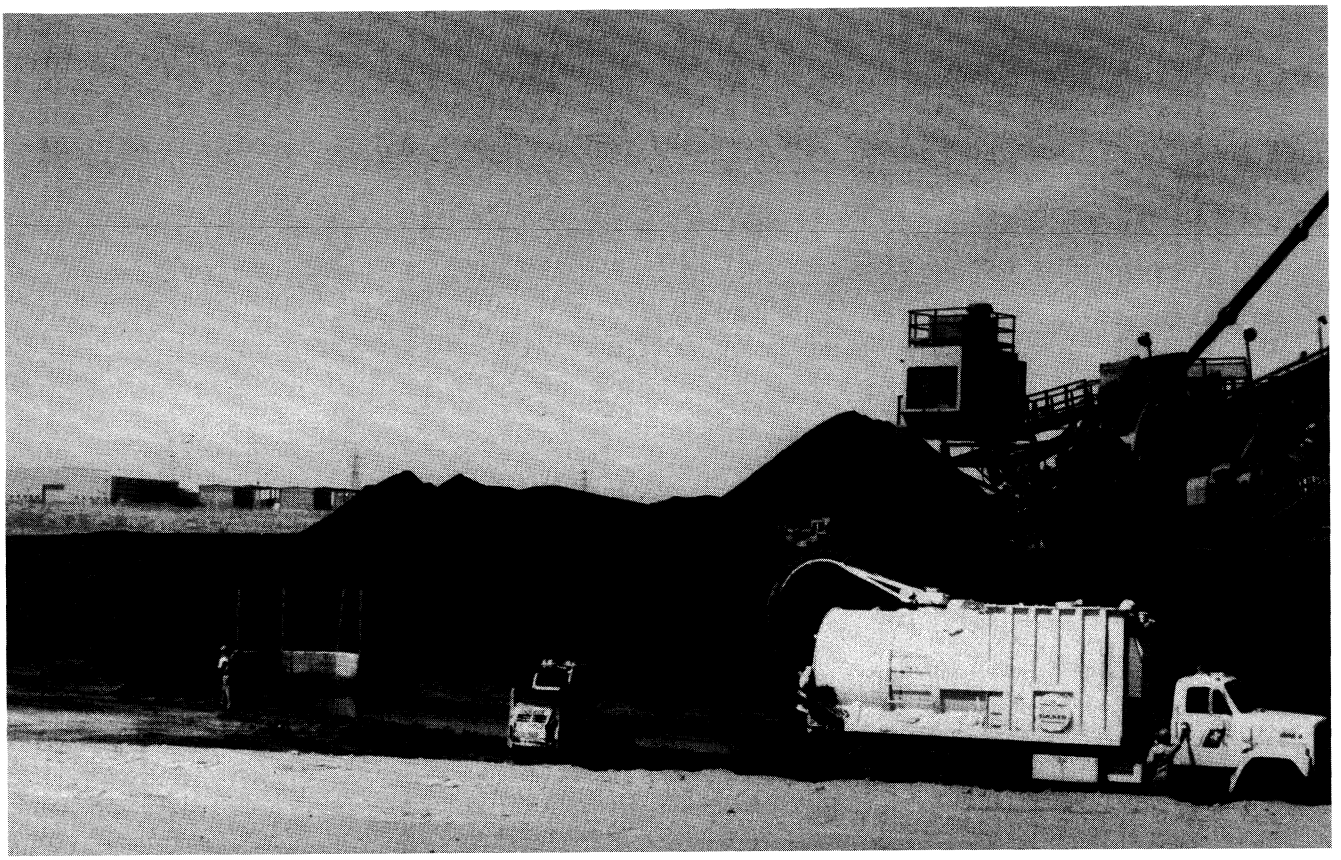
TABLE 6

COLOMBIA: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

(Thousand metric tons unless otherwise specified)

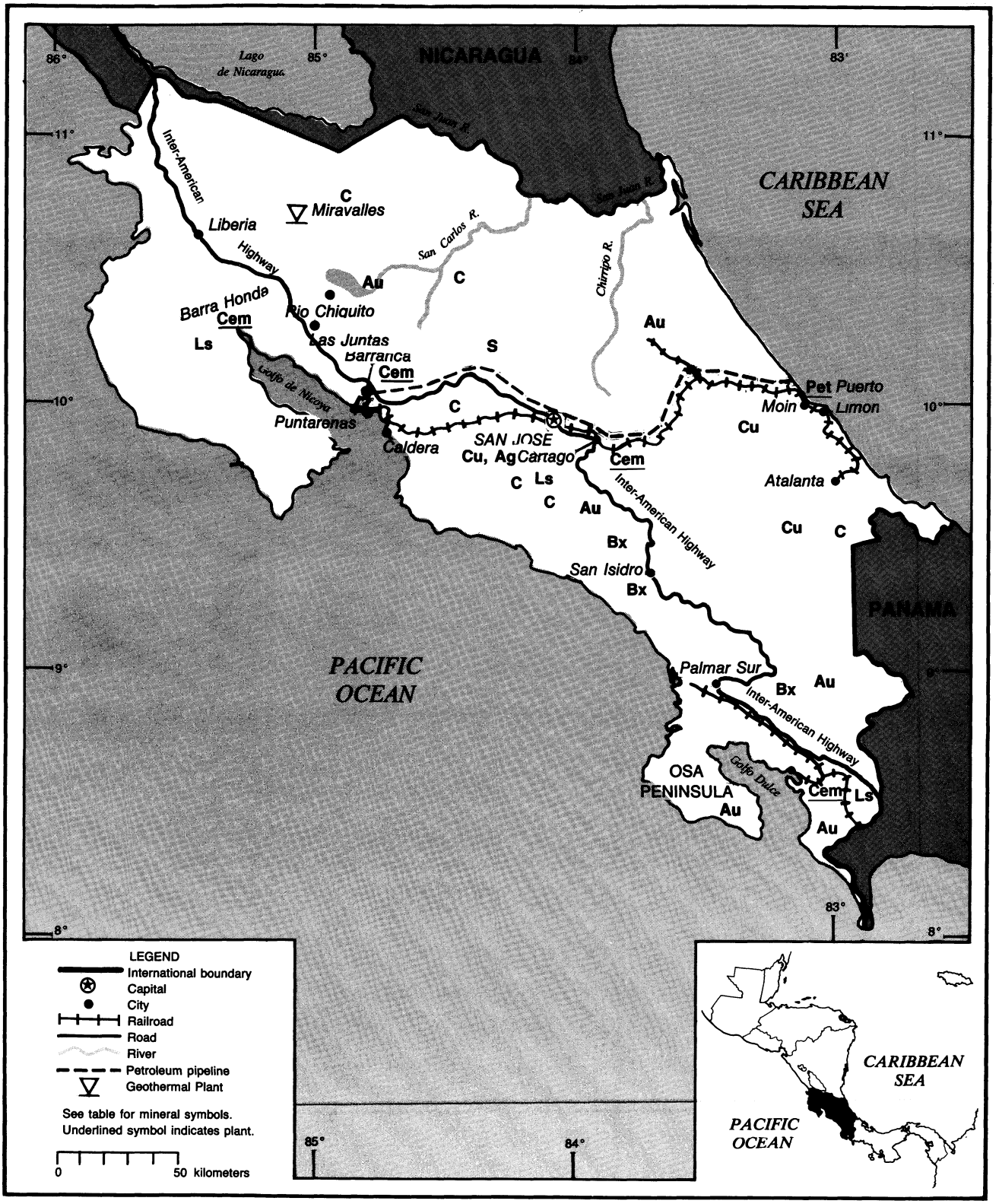
Commodity	Reserves
Asbestos, fiber	17,000
Coal, all types	22,000,000
Gold, metal	2
Iron ore, 45% Fe	100,000
Limestone	900,000
Natural gas million cubic meters	114,000
Nickel, 2% Ni	62,000
Petroleum million 42-gallon barrels	2,000
Phosphate rock	450,000
Platinum, metal	1
Sulfur, 28% to 34% S	300,000

COLOMBIA: COAL HANDLING FACILITY AT PUERTO BOLIVAR, A NEW PORT IN GUAJIRA PENINSULA FOR SHIPPING EL CERREJÓN COAL. (COURTESY OF EXXON COAL AND MINERALS CO.)



COSTA RICA

AREA 51,100 km² (includes Isla del Coco) **POPULATION 2.8 million**



THE MINERAL INDUSTRY OF

COSTA RICA

By Philip M. Mobbs

Manufacturing, agriculture, and tourism dominated Costa Rica's economy. The construction sector and its associated demand for industrial materials declined. Overall, the mineral industry was of minor importance to Costa Rica, contributing less than 1% to the nation's GDP. Limestone mining and cement manufacturing continued to overshadow other mineral commodity production.

The GDP was projected to be $5.60 billion[1] in current dollars for 1991, compared with $5.55 billion in 1990. GDP growth dropped to 1% from 3.7% in 1990. The inflation rate increased to 25.3% in 1991, down slightly from 27% in 1990.

Costa Rica's southeastern Caribbean coast was seriously damaged in April by a severe earthquake. Roads and docks in the vicinity of Puerto Limon were damaged, as well as the railroad leading to the port. Bridges along the main road to San José were repaired within 5 days after the tremor. The port facilities at Moin remained marginally operational.

GOVERNMENT POLICIES AND PROGRAMS

The principal legislation governing mining was Law 6797 of October 4, 1982. The Ministerio de Recursos Naturales, Energía y Minas was responsible for the control and development of Costa Rica's mineral resources through the Dirección de Geología, Minas y Hidrocarburos, the Minera Nacional, S.A. (MINASA), and the National Environmental Commission. The Refinadora Costarricense de Petróleo S.A. (RECOPE) maintained the Government's monopoly in oil refining operations.

At midyear, it was announced that the Government was considering privatizing Instituto Costarricense de Electricidad, the nation's electricity company. Consideration was given to dismantling Corporación Costarricense de Desarrollo S.A. (Codesa), which managed a cement plant.

Costa Rica had an extensive system of forest reserves, national parks, protected zones, and wildlife refuges. Approximately 28% of the country was within an environmentally protected area.

PRODUCTION

The mineral industry included gold and industrial mineral extraction and the production of iron, steel, and petroleum products. The Costa Rican Government continued to place emphasis on the development of the country's gold potential. *(See table 1.)*

TRADE

The United States continued to be Costa Rica's most significant trading partner. In 1991, the value of goods exported to the United States was estimated at $600 million. Costa Rica's total exports for 1991 were $1,593 million. Total imports reached $1,854 million, of which $823 million came from the United States. Costa Rica purchased crude petroleum from Mexico and Venezuela under the San José Accords. Additional crude was imported from Colombia and Ecuador. The bulk of petroleum products was imported from Netherlands Antilles and the United States. Colombia, Ecuador, Mexico, and Venezuela also supplied petroleum products.

Early in 1991, Costa Rica and other members of the Central American Common Market (El Salvador, Guatemala, Honduras, and Nicaragua) signed a framework agreement to encourage free trade with Mexico. A similar treaty was subsequently signed with Venezuela.

STRUCTURE OF THE MINERAL INDUSTRY

MINASA was responsible for coordination of mineral industry activities between other Government agencies and the private sector. It also had the authority to assess and develop mineral resources. RECOPE operated the country's petroleum refinery. Codesa owned Cementos del Pacífico S.A.

Canadian and U.S. companies were involved in a number of precious-metal exploration and mining operations. *(See table 2.)*

COMMODITY REVIEW

Metals

Declared gold production by individual operators, especially from the Osa Peninsula placer operations, was generally thought to be understated.

El Valiente Ascari, S.A., a subsidiary of Ariel Resources Ltd. of Vancouver, Canada, expanded the Tres Hermanos Mine's carbon-in-pulp mill to 200 mt/d and was planning additional expansion of the mill, near Matapalo, to 300 mt/d in 1992. The mine, near Las Juntas, was approximately 107 km west-northwest of San José, the capital. During 1992, the company was hoping to book additional reserves by drilling to the north of the present mine. During 1991, Ariel concluded the exploration program at the closed Esperanza Mine. Based on the

results of the exploration program, the equipment at Esperanza was earmarked for transfer to the Tres Hermanos operations.

Sunshine International Exploration Co. withdrew from the Río Chiquito Mining Co. that had been formed with Mallon Resources Corp. and Red Rock Ventures Inc. in 1990. The Río Chiquito joint venture had completed its drilling program earlier in 1991.

Minera Rayrock of Toronto ceded 50% interest in the company's Liberia and Turin gold prospects to Battle Mountain Gold.

Industrial Minerals

At the beginning of the year, the British Geological Survey and RECOPE released indepth studies of Costa Rica's bentonite and diatomite deposits and the Barra Honda limestone as part of the second phase of the Proyecto Anglo-Costarricense de Minerales Industriales.

Mineral Fuels

Production at the RECOPE oil refinery in Moin was temporarily curtailed to repair fire damage associated with the April earthquake. While the petroleum dock was accessible, dredging of a channel to the terminal would be necessary to restore the Moin operation to preearthquake conditions.

INFRASTRUCTURE

Costa Rica had a relatively well-developed transportation infrastructure. The national paved road system exceeded 7,030 km. Access to remote mining areas was provided by an additional 7,010 km of gravel roads, 1,360 km of dirt roads, and 730 km of seasonably navigable inland waterways.

There was 950 km of railroad track available at the beginning of the year. However, the line to the Caribbean coast was seriously damaged during the earthquake. The railroad had formerly linked Puerto Limon, the major Caribbean port, to Puntarenas, the major port on the Pacific coast. Petroleum was offloaded at the coastal refinery complex at Moin. RECOPE distributed refined petroleum products across the country by a 348-km pipeline network.

The country had an estimated 909-MW installed electrical generating capacity. Approximately 85% was from hydroelectric plants. Construction continued on the 32-MW Sandillal hydroelectric plant and the 55-MW Miravalles geothermal plant. Preliminary work was begun on the 90-MW Toro hydroelectric complex.

OUTLOOK

Costa Rica's central geographic position could support further growth of its mineral industry. The nation's extensive infrastructure and reserves of precious metals and bulk aggregates, such as limestone, pumice, and sand, could sustain increased demand. Increased silver recovery at the mills could be expected, provided silver prices rise.

With the regional emphasis on privatization of state-owned enterprises, the resurgence of public-sector strikes may be anticipated.

[1]Where necessary, values have been converted from Costa Rican colones (₡) to U.S. dollars at the rate of ₡137=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Ministerio de Recursos Naturales, Energía y Minas
Dirección de Geología, Minas y Hidrocarburos
Apartado 10104, Zona 1000
San José, Costa Rica
Telephone: (506) 33-2360

Minera Nacional, S.A.
Apartado 5298, Zona 1000
San José, Costa Rica
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Fax: (506) 57-0697

Refinadora Costarricense de Petróleo S.A.
Apartado 4351, Zona 1000
San José, Costa Rica
Telephone: (506) 33-0333
Fax: (506) 23-2748

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TABLE 1
COSTA RICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991e
Cement		581,740	556,360	r610,000	r620,000	2700,000
Clays, common e		200,000	200,000	2506,685	304,700	399,000
Diatomite e		4,500	24,500	4,500	4,400	12,000
Gold	kilograms	300	313	387	e460	550
Iron and steel: Semimanufactures		98,613	71,628	72,500	e65,000	65,000
Lime e		10,000	10,000	10,000	12,700	28,655
Petroleum refinery products	thousand 42-gallon barrels	4,594	4,557	4,724	e4,500	2,507
Pumice		12,000	14,000	14,000	e4,900	8,000
Salt, marine e		30,000	30,000	30,000	r40,000	50,000
Silver e	kilograms	62	62	2194	r200	370
Stone: e						
Crushed rock and rough stone	thousand tons	1,300	21,500	1,500	r1,450	2944
Limestone and other calcareous materials	do.	1,000	21,015	22,300	r1,600	1,300
Sand and gravel	do.	1,000	21,350	1,400	r1,020	21,047
Sandstone		1,000	21,000	1,000	650	650

eEstimated. rRevised.
[1]Includes data available through Aug. 14, 1992.
[2]Reported figure.

TABLE 2
COSTA RICA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

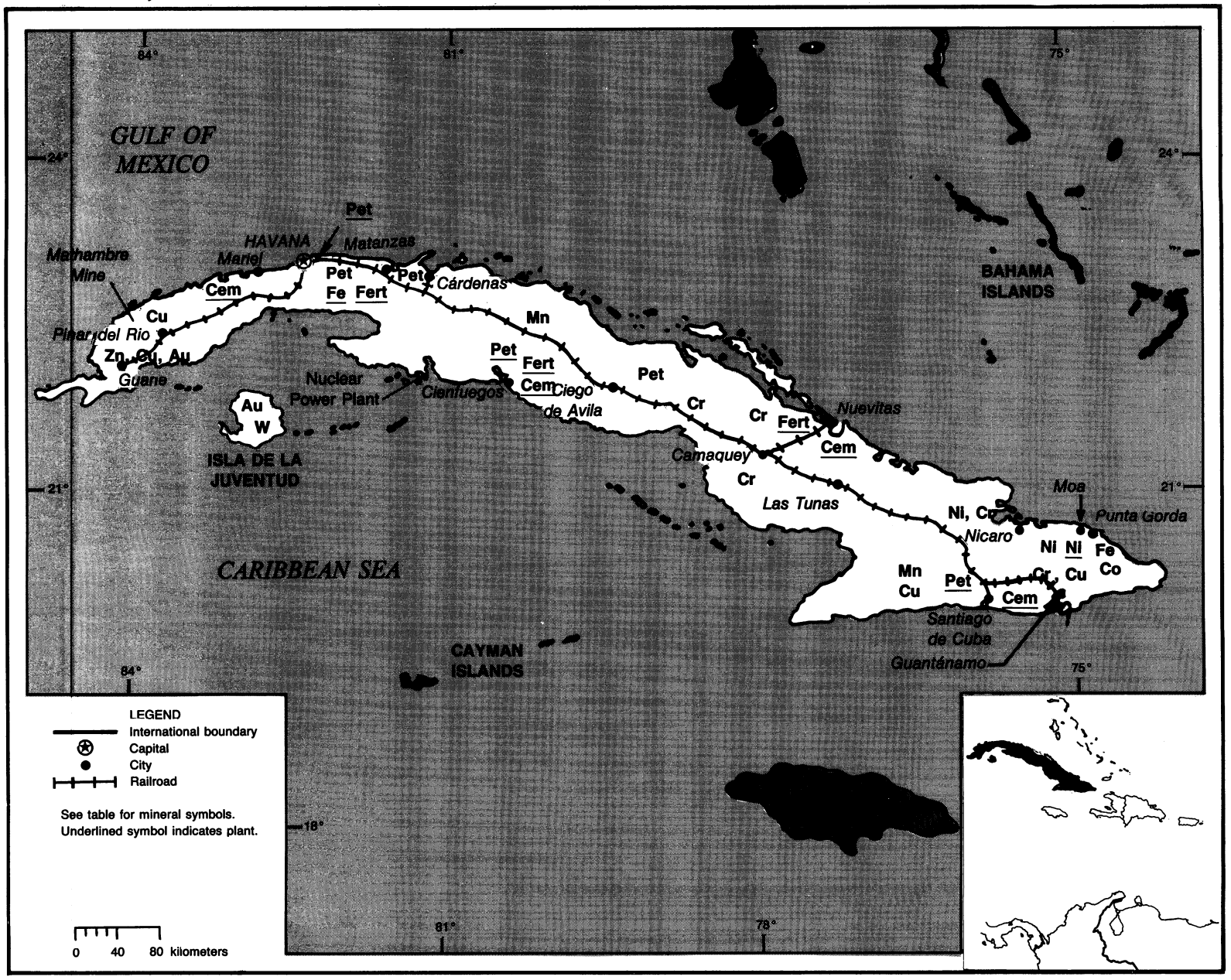
(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Industria Nacional de Cemento S.A. (INCSA) (private, 100%)	Aguas Calientes, Cartago, Cartago Province	425
Do.		Cementos del Pacífico S.A. (CEMPASA) (Subsidiary of Corporación Costarricense de Desarrollo S.A., Government, 100%)	Near Colorado, Guanacaste Province	400
Clays		CEMPASA	Tajo Finca, near Platanar, Guanacaste Province	100
Gold	kilograms	El Valiente Ascari, S.A. (Ariel Resources Ltd., Canada, 100%)	Tres Hermanos Mine, Las Juntas, Guanacaste Province	305
Do.	do.	Minera Macona Ltda. (Equinox Resources Ltd., 100%)	Santa Clara Mine, Puntarenas Province	160
Limestone		INCSA	La Chilena Quarry, near Cartago, Cartago Province	1550
Do.		CEMPASA	Cerro Peña Blanca Quarry, Guanacaste Province	300
Petroleum products	thousand 42-gallon barrels	Refinadora Costarricense de Petróleo S.A. (RECOPE) (Government, 100%)	Moin Refinery, Limón Province	5,760

[1]Includes 200,000 mt/a of interbedded limestone and shale.

CUBA

AREA 110,861 km² **POPULATION 10.7 million**



THE MINERAL INDUSTRY OF

CUBA

By Alfredo C. Gurmendi

Cuba is an important producer of nickel worldwide and has the largest known reserves. The country's main quarrying and mining activities were confined to the production of gypsum, lime, marble, and zeolite and base metals. Mostly for local consumption, Cuba produced hydraulic cement, iron and steel, nitrogen, and sulfur. Cuba's main mineral exports were nickel ore, nickel metallurgical products, and chromite. Cuba has no significant oilfields and continued to be heavily dependent on imported crude oil. Ninety percent of the natural gas produced was for local consumption and 10% for exports. The GNP for 1991 was $20.9 billion;[1] unemployment approached 6%. The mineral sector employed less than 5% of the total 3.4 million labor force; the total breakdown was 30% in services and Government, 22% in industry, 20% in agriculture, 11% in commerce, 10% in construction and mining, and 7% in transportation and communication. Cuba has had difficulty servicing its foreign debt of $7 billion since 1982, and its foreign reserves stand at less than $100 million. Cuba's centrally planned economy, largely state-owned, was highly dependent on its agricultural sector and foreign trade. The Government was encouraging foreign investment in tourism, sugar, basic foods, and nickel industries. The annual $4 billion Soviet subsidy was cut as a result of the U.S.S.R.'s mounting economic problems and internal breakup.

GOVERNMENT POLICIES AND PROGRAMS

Cuba was undergoing internal adjustments as a result of foreign debt problems, trade deficits, foreign exchange shortages, no subsidies from the U.S.S.R., and unpredictable Soviet trade; these adjustments were causing serious food and fuel shortages and reduced production of cement and nickel. However, Cuba has moved rapidly to establish trade relations with Russia and other former Soviet Republics since the disintegration of the U.S.S.R. All Russian-Cuban trade would be conducted at prevailing world market prices. Cuba also has signed trade agreements, involving bartering oil for sugar and other Cuban products, with Kazakhstan, Ukraine, and the mayoralty of Saint Petersburg. The Government is also seeking to expand trade with other countries. China will import Cuban nickel, sugar, citrus, and medical products and will export food, medicine, spare parts, and machinery. Spain, Canada, and Japan also rank among Cuba's leading trade partners. Cuba has expressed a desire to open up its economy to foreign investment and joint-venture operations, especially in oil exploration, nickel refinery, and tourism. The Cuban Government is strengthening its commercial deals with Brazil to develop the Cuban citrus fruit-growing and juice-processing industry. Havana also is approaching Colombia, Mexico, and Venezuela for oil and for technical assistance to develop Cuba's oil-refining industry. Iran has provided technical assistance for Cuba's oil-refining industry and is interested in participating in the recently built oil refinery of Cienfuegos. The Cuban Government stated that foreign investors in the country would be guaranteed the right to repatriate their capital. Developers from Mexico, Spain, Germany, and Jamaica are involved in hotel construction projects in Cuba. Havana is reported to offer foreign developers tax holidays and unlimited profit repatriation for 7 to 10 years with subsequent profit-sharing arrangements. French, Brazilian, and Swedish companies have signed oil exploration agreements. Total Compagnie Francaise des Petroles S.A. (TOTAL), a French company, has negotiated a production-sharing arrangement with Cuba in the event it discovers oil. Cuba made provisions to establish free-trade zones and to allow foreign investors to become majority owners in Cuban companies. "The degree of privatization in Cuba was attaining dramatic proportions compared to previous years." The Cuban Government initiated gasoline rationing, lowered the speed limits, and imposed cuts in electrical power consumption to realize savings of energy.

The stringent energy-saving measures adopted by Cuba included:

1. A 50% reduction in the supply of gasoline and diesel.
2. A 10% cutback in the domestic use of electricity.
3. Reversion to animal traction in agriculture.
4. An unspecified cutback in Government construction projects.
5. The shutdown of cement and nickel plants in Moa that resulted from the postponement of contruction projects and curtailment of oil supplies. The Soviet Government managed to deliver, on a delayed schedule, only about 58.6 million barrels of oil to Cuba in 1991.
6. Havana ordered from China 500,000 bicycles for public transportation.

The Legislative Decree No. 50 enacted in 1982 allowed Cuba to enter into commercial joint ventures with foreign investors. U.S.-based businesses were prohibited from participating because of U.S. Government restrictions. Additionally, constraints were placed on

third-party use of U.S. technology and machinery in joint ventures with the Cuban Government.

Cuba and Ghana signed an agreement of cooperation on mining projects. Ghanian engineers were to assist in the development of gold deposits on Isla de la Juventud and in Pinar del Río in western Cuba.

Finally, further developments in Cuba's mining industry will be tied to the political and social decisions made by the Government. Tourism probably provided Cuba an income of about $500 million during 1991.

PRODUCTION

Cuba has an internationally significant mineral resource. Overall, Cuba ranks sixth in world nickel output. Allowing for the Che Guevara nickel plant shutdown and mothballed construction for the Camariocas plant, nickel production in 1991 accounted for 35,400 tons. The mix was nickel oxide, 30%; nickel sinter, 35%; and nickel-cobalt sulfide, 35%, with an average cobalt content of 5%. The decision taken by the Government to shut down the Che Guevara nickel plant at Punta Gorda near Moa in southeastern Cuba caused decreased production from 17,000 mt/a to 12,000 mt/a. Canada imported 10,726 tons of Cuban nickel in 1991, and Sheritt Gordon Ltd. is believed to be one of the major customers. Che Guevara's shutdown was the result of energy shortages caused by reduced Soviet oil shipments. On an annual basis, production of 10,000 tons of nickel would require almost 1 Mbbl of fuel oil at a cost of more than $25 million in the open market. Most of the industrial minerals were produced for local consumption, although cement and marble were important exports. Cuba continued to be heavily dependent on imported crude oil. *(See table 1.)*

TRADE

During 1991, Cuban exports of nickel represented almost 5% of export revenues and were mostly exported to the U.S.S.R. and Canada. Total Cuban exports amounted to $5.4 billion. At the end of 1991, the Government had been trying to increase trade with Canada, Latin America, and China. Cuba's trade deficit grew as exports declined and imports increased to $8.1 billion. Ghana supplied aluminum to Cuba as part of a barter deal. Trade between Cuba and the U.S.S.R. amounted to about $1.5 billion in 1991, including Cuban nickel, chrome, and agricultural products. Cuba exported 9 million tons of sugar, of which 50% went to the U.S.S.R. After Mexico, Cuba is Canada's second largest trading partner in Latin America. Prensa Latina reported that Cuba-Canada trade for 1991 was $360 million, up 55% from that of the previous year. Canada imported mainly sugar, tobacco, and nickel in the form of oxide sinter with 5% cobalt content. Cuba imported livestock, powder milk, lumber, and other items from Canada. Cuba supplied the U.S.S.R. in 1991 with sugar, citrus fruits, and tobacco; however, the supply of goods from the U.S.S.R. was reduced.

The U.S. economic sanctions imposed against Cuba in 1962 continued throughout 1991. The U.S. trade embargo set in 1983 banned all imported third country products that contained Cuban nickel. Foreign subsidiaries of U.S. companies have increased trade with Cuba. The U.S. Treasury Department's Office of Foreign Assets Control, in its July 1991 report, indicated that total licensed trade between U.S. subsidiaries and Cuba amounted to $705 million in 1990, which is more than double the value of trade in 1989.

STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry, like the overall economy, was controlled by the Government. Mining and petroleum operations were centrally planned by the Ministerio de Industria Básica. The Ministerio de Industria Materia Construcción was in charge of the exploration and exploitation of construction-related industrial minerals. *(See table 2.)*

COMMODITY REVIEW

Metals

Iron and Steel.—Limonitic residues, byproducts from treatment of the nickel-cobalt laterite ores, contained from 48% to 52% of iron. From these, Cuba plans to produce 10 million tons of pig iron over the next 5-year planning period. During 1991 it was announced that Empresa Metalúrgica José Martí's steelworks at El Cotorro, Havana Province, expanded its capacity to almost 1 Mmt/a and that the Acinox stainless steel plant opened at the Las Tunas steel complex in Las Tunas Province. Acinox has a 60-ton electric furnace and a continuous-slab caster capable of producing 150,000 mt/a of stainless steel.

Nickel.—Cuba ranked sixth in world nickel production. The largest nickel plant in Cuba is Pedro Soto Alba at Moa with a rated capacity of 24,000 mt/a. The second largest nickel producer is the René Ramos Latour plant at Nicaro with a 22,500-mt/a capacity, followed by Che Guevara plant at Punta Gorda with 17,000-mt/a capacity; however, Che Guevara, when fully operational, could produce 30,000-mt/a nickel. Another plant of similar size was mothballed at Las Camariocas near Moa. If Las Camariocas is completed, Cuba could produce about 100,000 mt/a of nickel and rank third or fourth worldwide.

Industrial Minerals

Cement.—Empresa del Cemento opened a new 100,000-mt/a cement plant at Sancti Spiritus, Sancti Spiritus Province. Annual production for cement was 4 Mmt in 1991.

Marble.—Cuban marble is considered to be of high quality. About 70% of its production was bartered or sold to Italy, Mexico, and Spain.

Salt.—Cuba produces about 200,000 mt/a of salt from solar evaporation of seawater from small production centers along the northeast and south coasts.

Mineral Fuels

Unión de Petróleo de Cuba, a state-owned company, granted to two French companies, TOTAL and Compagnie Europeene des Petroles, a 6-year oil exploration contract in an approximately 1,800-km^2 concession off Cuba's north coast. The agreement stipulates production-sharing of any economic deposit found.

Oil production exceeded 1990 levels. Sulfur from domestically produced sour crude was processed at the Hermanos Díaz refinery in Santiago de Cuba. The Cienfuegos refinery was designed for a 19 Mbbl capacity, with planned expansion to a 38-Mbbl annual output. Mexico was planning to increase oil exports to Cuba for processing at Cienfuegos. Mexico planned to buy Cuba's cement, pharmaceutical products, and nickel.

Cuba was exporting its biogas technology. As part of a multimillion dollar barter deal with Uganda, a biogas plant was to be built in Kampala. The plant will use sugarcane to produce methane for residential and industrial use. It will also produce carbon dioxide for soft drinks and hydrogen sulfide for fertilizers.

Domestic oil extraction increased to 5.7 Mbbl. The main drilling area was Varadero, followed by Havana Province, where 14 new wells were being drilled. The internally produced oil was mostly consumed by the sugar, rum, and cement industries.

Uranium found in lead and zinc deposits in Pinar del Río Province was of interest because of the potential for accelerating Cuba's nuclear power program. The driving force behind Cuba's nuclear energy program was the fear that the U.S.S.R. and its successor states would greatly reduce crude oil shipments to Cuba in the 1990's. Cuba was installing the twin 440-MW Soviet nuclear power reactors and was storaging a 10-MW Soviet research reactor that uses enriched uranium. Originally, their operation was scheduled for 1993 but is likely to be delayed. Extensive training of Cuban personnel was under way. The Juraguá nuclear plant, near the Bay of Cienfuegos, at an estimated cost of $2.5 billion dollars, represented more than 1,600 MW of generating capacity and was designed to save about 15 Mbbl of crude oil every year.

INFRASTRUCTURE

The country had about 21,000 km of roads. Nine thousand km of road was paved; the remainder had gravel or earthen surfaces. Nickel ore was moved primarily by truck and conveyor belts from the mining areas to processing plants, although a new 2.5-km rail line was under construction from the mine to the Nicaro processing complex. Processed nickel was shipped by truck to port facilities at Nicaro and Moa. Other important mineral industry ports included Havana, Santiago de Cuba, Nuevitas, Matanzas, and Mariel.

The Matanzas supertanker complex, 150 km east of Havana, offloaded its first tanker in 1989. The port allowed for transshipment from supertankers to coastal tankers for the voyage to the Havana and Santiago de Cuba refineries. The docks, capable of handling a 150,000-dwt tanker and a 70,000-dwt tanker simultaneously, took 4 years to complete. A 187-km oil pipeline was built to connect the new port with the Cienfuegos refinery.

Other mineral production is transported by either truck or rail. The state maintained 5,295 km of standard-gauge (1.435 m) track. Most of the remaining 9,630 km of railroads was associated with sugar plantations.

OUTLOOK

Cuba's investment had been prioritized to food production, tourism, and medicinal goods. Mining took a second-tier position as a result of reduced crude oil shipments from the U.S.S.R. Production of cement and construction materials was expected to increase some because of hotel construction. The recently completed first line at the Cienfuegos crude oil refinery and the Punta Gorda nickel refinery in Moa were mothballed. Cuba's industrial output has fallen as imports of equipment and spare parts have been cut sharply. When the Juraguá nuclear reactor complex is fully operational, perhaps by the turn of the century, it could meet one-fifth of Cuba's energy needs. It was estimated that the first of the four reactors might start up in 1994. Meanwhile, the main immediate effort was directed toward energy conservation.

Changes in Eastern Europe are expected to accelarate Cuban trade links with other Latin American countries. Changes in the U.S.S.R. may result in the United States lifting the economic embargo of 30 years in exchange for the end of Soviet subsidies, which amounted to $4 billion in 1990. Cuba used to import 70% of its basic goods from the United States and exported 87% of its production. An advisory commission on U.S. policy toward Cuba would be required to review the trade embargo against Cuba.

In any event, Cuba's economic hardships most likely will continue as fuel and energy shortages persist, unless major oil findings take place in the near future. The Cuban Government is actively seeking private foreign investors to develop the country's hard-currency-generating industries, especially oil exploration, nickel industry, and tourism.

[1]Where necessary, values have been converted from Cuban pesos (CP) to U.S. dollars at the rate of CP1.00=US$1.00.

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The World Factbook, 1990, annual.

TABLE 1
CUBA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990e	1991e
Cement, hydraulic	thousand tons	3,535	3,566	e3,700	r3,500	4,000
Chromite	do.	52	52	51	50	50
Cobalt[3]		1,566	1,783	r1,825	1,600	1,600
Copper, mine output, Cu content		3,461	2,951	1,825	2,800	3,000
Gas, natural:						
Gross[e]	thousand cubic meters	65,129	21,900	34,000	34,000	34,000
Marketed	do.	e6,796	1,524	e4,000	4,000	4,000
Gypsum[e]	thousand tons	130	130	130	r130	130
Iron and steel: Steel, crude	do.	402	314	336	270	270
Lime	do.	185	179	e180	r180	180
Nickel:						
Mine output, Ni-Co content of oxide and sulfide		35,860	44,128	46,509	40,000	35,400
Metallurgical products, Ni content:[3]						
Granular oxide and powder		5,905	12,620	14,354	11,000	10,000
Oxide sinter		11,319	11,211	11,856	11,000	10,000
Sulfide		16,600	18,314	18,475	16,400	16,400
Total		33,824	42,145	44,685	38,400	36,400
Nitrogen: N content of anhydrous ammonia	thousand tons	148	135	134	140	140
Petroleum:						
Crude[4]	thousand 42-gallon barrels	5,950	4,768	5,200	5,738	5,000
Refinery products	do.	52,103	50,839	55,000	53,000	53,000
Salt	thousand tons	231	201	r206	200	200
Silica (Industrial-sand and gravel)	do.	518	550	e550	500	500
Sulfur, byproduct of petroleum[e]	do.	5	5	5	5	5

eEstimated. rRevised.

[1]Table includes data available through July 1992.

[2]In addition to commodities listed, crude construction materials (lime, salt, marble, sand and gravel, stone, etc.) may also be produced, but data on such production are not always available, and information is inadequate to make reliable estimates of output levels.

[3]Anuario Estadístico de Cuba provides figures of nickel-cobalt content of granular and powder oxide, oxide sinter, and sulfide production. Using an average cobalt content in these products of 0.9% in total granular and powder oxide, 1.1% in total oxide sinter, and 4.5% in total sulfide, the cobalt content of reported Ni-Co production was determined to be 1.16% of granular and powder oxide, 1.21% of oxide sinter, and 7.56% of sulfide. The remainder of reported figures would represent the nickel content.

[4]Cuba reports crude oil production in metric tons. A conversion to barrels was made using a factor of 6.652.

TABLE 2
CUBA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Empresa del Cemento (Government, 100%)	Mariel, Pinar del Río Province Cienfuegos, Cienfuegos Province	3,500
Chromite	Ministerio de Industria (Government, 100%)	Mercedita Mine and plant, Holguin Province	40
Copper	Empresa Minera de Occidente (Government, 100%)	Mantua, Matahambre, and Jucard Mines, Pinar del Río Province. Mina Grande, Santiago de Cuba Province	3

TABLE 2—Continued

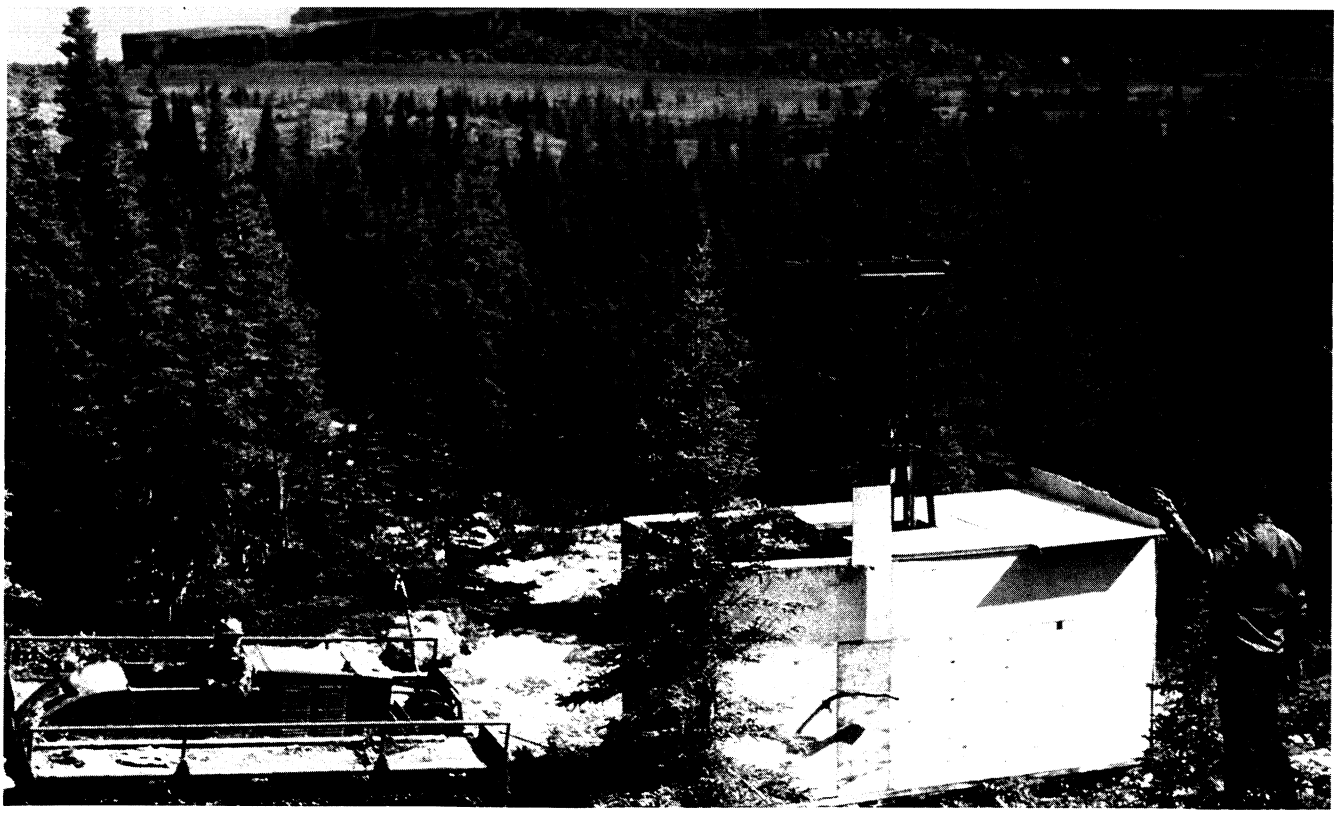
CUBA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

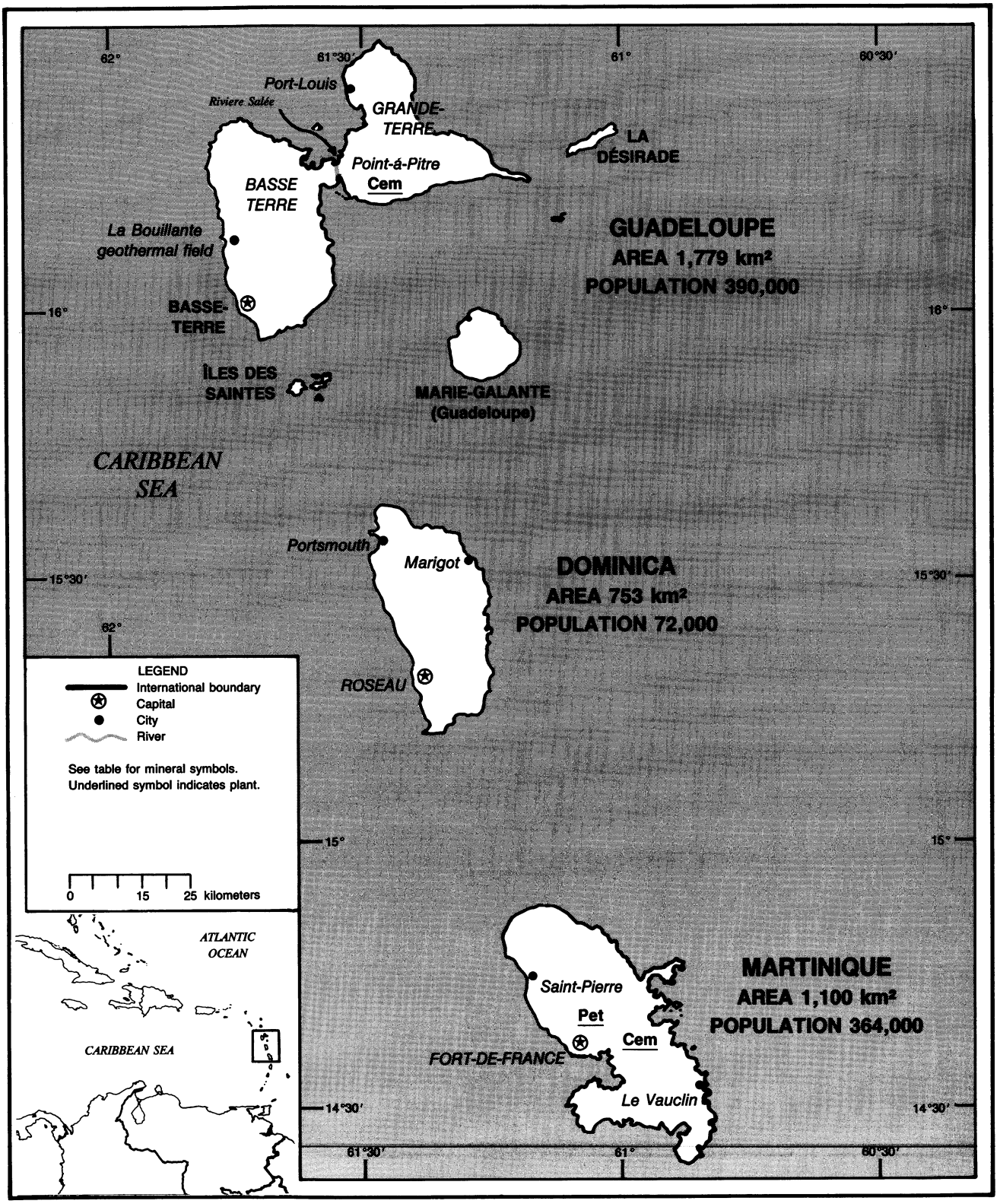
Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Nickel	Empresa Niquelífera Comandante René Ramos Latour (Government, 100%)	Nicaro, Holguín Province	23
Do.	Empresa Niquelífera Comandante Pedro Soto Alba (Government, 100%)	Moa, Holguín Province	24
Do.	Empresa Niquelífera Comandante Ernesto Che Guevara (Government, 100%)	Punta Gorda, Holguín Province	30
Petroleum:			
Crude 42-gallon barrels	Empresa de Perforación y Extracción de Petróleo (Government, 100%)	Northern coast area between Havana and Cárdenas	16,000
Refinery products do.	Instituto Cubano del Petróleo (Government, 100%)	Refineries at Cienfuegos, Havana, and Santiago de Cuba	160,000
Steel	Empresa Metalúrgica José Martí (Government, 100%)	Cotorro, Havana Province	1,000
Do.	Acinox (Government, 100%)	Las Tunas, Las Tunas Province	150

CANADA: THE DEHAVILAND BEAVER, A FAVORITE OF BUSH PILOTS SERVING THE MINING INDUSTRY IN THE CANADIAN NORTH. THE BEAVER CAN CARRY SIX PEOPLE AND THEIR EQUIPMENT, OR IT CAN DELIVER A DRILL RIG BROKEN DOWN FOR TRANSPORT. (PHOTO BY DAVID DOAN)

CANADA: TEST DRILLING FOR LEAD-ZINC-SILVER DEPOSITS ON THE EAST COAST OF HUDSON BAY IN NORTHERN QUEBEC. AFTER THE TRACTOR PULLED THE RIG ON LOCATION, THE DRILLERS ASSEMBLED THE PLYWOOD SHACK TO PROTECT THEM FROM THE ELEMENTS AND THE BITING FLIES. (PHOTO BY MICHAEL FENTON)



DOMINICA, GUADELOUPE, AND MARTINIQUE



THE MINERAL INDUSTRIES OF

DOMINICA, GUADELOUPE, AND MARTINIQUE

By Philip M. Mobbs

DOMINICA

Dominica, an independent state within the British Commonwealth, had primarily an agricultural economy. Mineral production in 1991 consisted of the mining of clay, limestone, pumice, volcanic ash, and quantities of sand and gravel for construction purposes. No significant expansion or diversification of the mining sector was considered likely. Roseau served as the island's major port of entry for the rest of the nation's mineral requirements.

In 1991, Dominica had an installed electrical generating capacity of 8 MW with approximately 60% derived from hydroelectric generation plants. Because of the projected increase in electricity demand, Dominica Electricity Services was considering additional hydroelectric plant capacity and investigating geothermal prospects. These actions should allow the nation to move toward its goal of reducing its reliance on imported mineral fuels by generating most of the country's electricity as hydroelectric power.

GUADELOUPE

Guadeloupe, an Overseas Department of France, includes the islands of Basse-Terre, Grande-Terre, Îles des Saintes, La Désirade, Marie-Galante, St. Barthélemy, and the French side of Sint Maarten. The mineral policy was the same as that of other French Overseas Departments. The mineral sector made a negligible contribution to the gross departmental product. The Department produced cement, lime, pumice, salt, sand and gravel, and stone in 1991. *(See tables 1 and 2.)*

The principal mineral commodity export in 1990 was cement. A small amount of scrap metal was also exported. *(See tables 3 and 4.)*

Guadeloupe has a total of 1,940 km of roads. Railroads were used for the agricultural industry. The Department's major shipping ports were Pointe-à-Pitre on Grande-Terre and Basse-Terre on Basse-Terre. The country's electrical energy generation capacity was 171.5 MW.

MARTINIQUE

The mineral sector was a small contributor to the island's economy. The mineral policy of Martinique is the same as other Latin American Overseas Departments of France. In 1991, Martinique's mineral industry included the production of cement, clays, petroleum refinery products, pumice, sand and gravel, and stone. The petroleum refinery produced fuel for domestic consumption and for export to Guadeloupe.

Principal mineral commodities exports in 1990 were fertilizers, petroleum products, and crushed rock. The major mineral commodities imports were cement, crude petroleum, fertilizers, gypsum, petroleum refinery products, and steel semimanufactures. *(See tables 5 and 6.)*

There was a total of 1,680 km of roads. The major shipping port was Fort-de-France on the west coast. The country's electrical energy generation capacity was 108 MW, all of it thermal.

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Agencies

Service des Mines et de L'Industrie
B.P. 448
97110-Point-a-Pitre
Guadeloupe, French West Indies

Bureau de Recherches Géoloques et Minières
Villa d'Huy
Morne Notre-Dame
97139 Abymes Cedex
Guadeloupe, French West Indies

Service des Mines et de L'Industrie
B.P. 458
97200 Fort-de-France
Martinique, French West Indies

Bureau de Recherches Géoloques et Minières
Km 0.9 Route de Didier,
B.P. 394
97204 Fort-de-France Cedex
Martinique, French West Indies

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TABLE 1
GUADELOUPE AND MARTINIQUE: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991e
Guadeloupe:						
Abrasives, natural: Pumice e		220	220	220	220	230
Cement		r222	r241	r215	r225	240
Martinique:						
Cement, hydraulic		r219	r240	r244	r250	245
Lime e	metric tons	5,000	5,000	5,000	5,000	5,000
Petroleum refinery products e	42-gallon barrels	4,800	4,800	4,800	4,800	4,800
Pumice e		130	130	140	140	150

eEstimated. rRevised.
[1]Table includes data available through June 29, 1992.
[2]In addition to commodities listed, crude construction materials (salt, sand and gravel, stone, etc.) may also be produced, but information is inadequate to make estimates of output levels.

TABLE 2
GUADELOUPE AND MARTINIQUE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons, unless otherwise specified)

Commodity	Major operating company and major equity owner	Location of main facilities	Annual capacity
Cement	Société des Ciments Antillais (Ciments Lafarge, 61%)	Fort de France, Martinique	250
		Pointe-á-Pitre, Guadeloupe	250
Petroleum products thousand 42-gallon barrels	Société Anonyme de la Raffinerie des Antilles (Government)	Fort de France, Martinique	5,000

TABLE 3

GUADELOUPE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Principal destinations, 1990
METALS				
Alkali metals		—	39	All to Netherlands Antilles.
Aluminum: Metal including alloys:				
Scrap		396	31,221	All to France.
Semimanufactures		3	1,585	Martinique 1,569; Haiti 16.
Copper: Metal including alloys:				
Scrap		468	43,293	All to France.
Semimanufactures		—	49	All to Martinique.
Gold: Metal including alloys, unwrought and partly wrought	kilograms	6	—	
Iron and steel: Metal:				
Scrap		—	1,321	All to France.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated		(2)	1,770	All to Dominica.
Clad, plated, coated		69	6,837	France 4,286; Trinidad and Tobago 1,390; Netherlands Antilles 780.
Bars, rods, angles, shapes, sections		45	1,623	France 1,410; French Guiana 213.
Wire		7	480	All to Dominica.
Tubes, pipes, fittings		40	814	Martinique 772; French Guiana 25; Haiti 17.
Nickel: Metal including alloys, semimanufactures		—	400	All to Martinique.
Other: Ashes and residues		47	2,088	All to France.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.		6	—	
Grinding and polishing wheels and stones		—	12	All to Martinique.
Cement		4,522	149,250	French Guiana 126,300; Dominica 22,950.
Clays, crude: Bentonite		8	—	
Fertilizer materials: Manufactured, ammonia		81	5,616	All to Martinique.
Gypsum and plaster		870	—	
Salt and brine		14	94	Martinique 86; French Guiana 8.
Stone, sand and gravel:				
Dimension stone, worked		—	581	All to Martinique.
Gravel and crushed rock		—	2,400	Do.
Other: Crude		—	2,220	All to France.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Liquefied petroleum gas	42-gallon barrels	r151	19,790	Martinique 13,282; France 6,508.
Bituminous mixtures	do.	—	23	All to French Guiana.
Unspecified	do.	8,169	637	Martinique 504; France 133.

rRevised.

[1]Table prepared by H. D. Willis. Guadeloupe did not report any exports of mineral commodities to the United States during 1990.

[2]Less than 1/2 unit.

TABLE 4

GUADELOUPE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS					
Alkali metals		(2)	195	—	All from France.
Aluminum:					
Oxides and hydroxides	value, thousands	$1	—		
Metal including alloys, semimanufactures		867	88,929	34,438	France 50,891; Italy 1,101.
Chromium: Oxides and hydroxides		1	552	—	France 353; West Germany 199.
Cobalt: Metal including alloys, all forms		—	1	—	All from France.
Copper: Metal including alloys:					
Unwrought		—	36	—	Do.
Semimanufactures		207	24,420	691	France 22,180; Italy 928.
Gold: Metal including alloys, unwrought and partly wrought	kilograms	14	400	—	Mainly from France.
Iron and steel: Metal:					
Pig iron, cast iron, related materials		5	1,100	—	All from France.
Ferroalloys: Ferrosilicon		—	1	—	Do.
Steel, primary forms		3	—		
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		586	75,775	—	Belgium-Luxembourg 61,677; France 14,098.
Clad, plated, coated		14,483	1,739,211	120	France 1,614,009; Spain 89,587; Belgium-Luxembourg 16,579.
Of alloy steel		354	14,691	—	France 14,603; Canada 88.
Bars, rods, angles, shapes, sections	thousand tons	22	3,061	—	Brazil 941; Trinidad and Tobago 651; Spain 515.
Rails and accessories		16	604	—	All from France.
Wire		959	138,684	118	Venezuela 111,353; France 14,620; Belgium-Luxembourg 12,593.
Tubes, pipes, fittings		3,558	1,024,619	1,224	France 845,749; Spain 162,682; Belgium-Luxembourg 11,529.
Lead:					
Oxides	value, thousands	$1	—		
Metal including alloys:					
Unwrought	do.	$1	—		
Semimanufactures		25	1,173	—	All from France.
Mercury		—	1	—	Do.
Nickel: Metal including alloys, semimanufactures		(3)	41	—	Do.
Platinum-group metals: Platinum metal including alloys, unwrought and partly wrought	value, thousands	$1	—		
Silver: Metal including alloys, unwrought and partly wrought	do.	$1	$6	—	All from France.
Tin: Metal including alloys:					
Unwrought		—	8	—	Do.
Semimanufactures		1	135	19	France 116.
Titanium: Oxides		27	150	—	All from France.

See footnotes at end of table.

TABLE 4—Continued

GUADELOUPE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS—Continued					
Zinc:					
Oxides		2	150	—	All from France.
Metal including alloys, semimanufactures		41	797	41	France 755.
Other:					
Oxides and hydroxides		—	36	—	All from France.
Ashes and residues		—	11,860	—	Do.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		88	2,198	—	All from France.
Artificial: Corundum		3	200	—	Do.
Grinding and polishing wheels and stones		24	2,719	—	France 1,883; Switzerland 344; Netherlands 315.
Asbestos, crude		107	10,250	—	Canada 8,773; France 1,477.
Barite and witherite		5	1,456	—	All from France.
Boron materials: Oxides and acids		—	44	—	Do.
Bromine, fluorine, and iodine		—	2	—	Do.
Cement	thousand tons	153	22,742	2	Venezuela 21,102; France 973; Tunisia 650.
Chalk		798	90,516	—	All from France.
Clays, crude:					
Bentonite		11	50	—	Do.
Kaolin		40	8,302	—	France 4,222; United Kingdom 4,080.
Unspecified		15	719	—	All from France.
Diatomite and other infusorial earth		51	3,214	91	France 3,123.
Fertilizer materials:					
Crude, n.e.s.		73	2,609	—	France 2,598; Netherlands 11.
Manufactured:					
Ammonia		121	9,076	—	All from France.
Nitrogenous		2,854	169,298	10,750	West Germany 104,729; Netherlands 33,355.
Phosphatic		84	12,540	—	France 10,440; Belgium-Luxembourg 2,100.
Potassic		426	19,400	10,750	Canada 4,300; France 2,250.
Unspecified and mixed		16,908	1,797,240	4,300	France 802,914; Martinique 651,153; Netherlands 265,017.
Gypsum and plaster		9,192	1,507,925	—	Dominican Republic 711,136; Spain 701,000; France 95,408.
Lime		2,562	54,967	—	France 37,767; Martinique 17,200.
Magnesium compounds:					
Magnesite, crude		76	—		
Oxides and hydroxides		94	24,340	—	France 16,350; Netherlands 7,990.
Mica:					
Crude including splittings and waste		—	2,297	—	All from France.
Worked including agglomerated splittings		—	662	—	Do.

See footnotes at end of table.

TABLE 4—Continued

GUADELOUPE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Pigments, mineral: Iron oxides and hydroxides, processed		19	2,003	—	France 1,517; West Germany 486.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$1	—		
Synthetic	do.	—	$2	—	All from France.
Salt and brine		2,309	204,177	2,091	France 71,047; West Germany 53,448; Netherlands 44,550.
Sodium compounds, n.e.s.: Soda ash, natural and manufactured		9	272	—	All from France.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		(4)	364	—	West Germany 156; France 149; Martinique 59.
Worked		442	45,029	191	Italy 19,682; France 14,470; West Germany 4,581.
Dolomite, chiefly refractory-grade		489	80,008	—	All from France.
Gravel and crushed rock	thousand tons	21	3,761	1,000	Martinique 1,098; Canada 1,060; Dominica 438.
Quartz and quartzite		13	2,933	—	All from France.
Sand other than metal-bearing	thousand tons	7	1,879	—	Antigua and Barbuda 1,265; Barbados 500; Dominica 70.
Sulfur:					
Elemental: Crude including native and byproduct		1	125	—	All from France.
Sulfuric acid		165	17,851	—	France 15,700; Belgium-Luxembourg 2,150.
Talc, steatite, soapstone, pyrophyllite		185	17,209	—	All from France.
Other:					
Crude		216	29,935	—	France 16,515; West Germany 9,323; Belgium- Luxembourg 4,097.
Slag and dross, not metal-bearing		108	16,800	—	All from Netherlands.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		(5)	40,819	—	Spain 39,822; France 997.
Carbon black		17	—		
Peat including briquets and litter		85	13,561	—	West Germany 7,142; Netherlands 2,691; France 1,919.
Petroleum refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	90	10,871	2,631	Netherlands Antilles 4,884; Trinidad and Tobago 1,924.
Mineral jelly and wax	do.	1	23	—	France 19; Belgium-Luxembourg 4.
Bitumen and other residues	do.	9	5,572	—	Netherlands Antilles 3,129; Venezuela 1,546; Trinidad and Tobago 881.
Bituminous mixtures	do.	2	172	(6)	Mainly to France.
Unspecified	do.	1,652	208,670	65	Netherlands Antilles 119,322; Trinidad and Tobago 30,395; Martinique 22,284.

[1]Table prepared by H. D. Willis.
[2]Quantity not available, valued at $2,000.
[3]Quantity not available, valued at $4,000.
[4]Quantity not available, valued at $6,000.
[5]Quantity not available, valued at $11,000.
[6]Less than 1/2 unit.

TABLE 5

MARTINIQUE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Destinations, 1990	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	203	14,456	1,640	France 12,182; French Guiana 634.
Semimanufactures	22	1,202	—	Guadeloupe 835; French Guiana 367.
Copper: Metal including alloys:				
Scrap	375	38,895	—	France 37,473; French Guiana 1,422.
Semimanufactures	5	—		
Gold: Metal including alloys, unwrought and partly wrought, kilograms	6	500	—	All to France.
Iron and steel: Metal: Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel: Clad, plated, coated	118	4,233	—	Guadeloupe 2,775; St. Vincent and the Grenadines 1,400; French Guiana 58.
Of alloy steel	—	150	—	All to French Guiana.
Bars, rods, angles, shapes, sections	528	115,294	—	Guadeloupe 74,906; French Guiana 36,438; Dominica 3,950.
Tubes, pipes, fittings	15	1,744	—	Guadeloupe 1,733; French Guiana 11.
Lead: Metal including alloys:				
Scrap	7	—		
Semimanufactures	—	1	—	All to France.
Silver: Metal including alloys, unwrought and partly wrought, value, thousands	$3	—		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Artificial: Corundum	—	200	—	All to Guadeloupe.
Cement	4,888	325,745	—	French Guiana 325,730; Dominica 15.
Clays, crude: Bentonite	—	436	—	All to French Guiana.
Fertilizer materials: Manufactured:				
Nitrogenous	639	53,365	—	Guadeloupe 25,065; French Guiana 10,800; St. Lucia 10,000.
Potassic	228	4,300	—	All to Guadeloupe.
Unspecified and mixed, thousand tons	19	1,775	—	Dominica 762; Guadeloupe 648; St. Lucia 150.
Gypsum and plaster	17	—		
Lime	828	85,950	—	Dominica 64,450; Guadeloupe 17,200; French Guiana 4,300.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	—	65	—	All to St. Lucia.
Worked	1	35	—	All to Guadeloupe.
Gravel and crushed rock, thousand tons	20	1,360	—	Guadeloupe 1,076; Netherlands Antilles 124; St. Christopher 160.
Sand other than metal-bearing	1,170	348,550	—	Netherlands Antilles 123,000; St. Lucia Guadeloupe 95,200.
Sulfur:				
Elemental: Crude including native and byproduct	1	50	—	All to Guadeloupe.
Sulfuric acid	—	78	—	All to French Guiana.
Other: Crude	8	758	—	All to St. Lucia.

See footnotes at end of table.

TABLE 5—Continued

MARTINIQUE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS					
Petroleum refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	22	4,151	—	Guadeloupe 4,150; French Guiana 1.
Mineral jelly and wax	do.	(2)	2	—	All to Guadeloupe.
Unspecified	do.	1,406	169,127	—	Guadeloupe 154,357; French Guiana 5,836; France 4,373.

[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

TABLE 6

MARTINQUE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS					
Alkali and rare-earth metals	value, thousands	$1	—		
Aluminum:					
Ore and concentrate		—	56	—	All from France.
Oxides and hydroxides	value, thousands	$2	—		
Metal including alloys:					
Unwrought		—	301	—	All from France.
Semimanufactures		318	50,898	2,754	France 37,964; West Germany 3,623; Italy 3,369.
Bismuth: Metal including alloys, all forms		—	19	—	All from France.
Chromium:					
Oxides and hydroxides		1	902	—	All from West Germany.
Metal including alloys, all forms		—	5	—	All from France.
Cobalt: Oxides and hydroxides	value, thousands	$2	—		
Copper: Metal including alloys:					
Unwrought		(2)	1,336	—	All from France.
Semimanufactures		256	25,490	291	France 24,155; Venezuela 450; Greece 310.
Gold: Metal including alloys, unwrought and partly wrought	kilograms	41	4,100	—	French Guiana 3,800; France 300.
Iron and steel: Metal:					
Pig iron, cast iron, related materials		3	65	—	All from France.
Steel, primary forms		77	112	—	Do.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		483	75,181	—	Belgium-Luxembourg 41,062; France 31,596; Brazil 2,000.
Clad, plated, coated		3,489	498,583	—	France 439,139; Belgium-Luxembourg 28,332; Spain 19,857.
Of alloy steel		311	13,250	—	All from France.

See footnotes at end of table.

TABLE 6—Continued

MARTINQUE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS—Continued					
Iron and steel: Metal—Continued:					
Semimanufactures—Continued:					
Bars, rods, angles, shapes, sections	thousand tons	29	2,886	—	Trinidad and Tobago 1,735; France 336; Spain 325.
Rails and accessories		143	9,627	—	France 5,579; Netherlands 4,048.
Wire		233	27,781	—	France 8,797; Venezuela 6,195; Belgium-Luxembourg 6,059.
Tubes, pipes, fittings		6,251	609,216	8	France 350,697; Spain 168,553; Canada 59,349.
Lead:					
Oxides		—	150	—	All from France.
Metal including alloys:					
Unwrought		1	21	—	Do.
Semimanufactures		13	617	—	France 567; Belgium-Luxembourg 50.
Mercury	value, thousands	$1	$1	—	All from France.
Nickel: Metal including alloys:					
Unwrought	do.	$1	$1	—	All from West Germany.
Semimanufactures	do.	$2	$3	—	All from United Kingdom.
Tin: Metal including alloys:					
Unwrought		—	52	—	All from Italy.
Semimanufactures		2	108	—	France 98; Italy 10.
Titanium:					
Oxides		194	15,813	1,418	United Kingdom 12,329; France 2,066.
Metal including alloys, semimanufactures		1	(2)	—	All from France.
Zinc:					
Oxides		29	1,100	—	Do.
Metal including alloys:					
Unwrought	value, thousands	$2	—		
Semimanufactures		8	687	—	All from France.
Other: Ashes and residues		—	2,100	—	Do.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		22	8,903	—	Netherlands 6,300; Guadeloupe 1,500; France 1,103.
Artificial: Corundum		(2)	83	—	All from France.
Grinding and polishing wheels and stones		57	2,952	—	France 2,666; Switzerland 90; Italy 88.
Asbestos, crude		61	8,759	—	All from Canada.
Barite and witherite		6	1,564	—	All from France.
Boron materials:					
Crude natural borates		3	1,005	—	Do.
Oxides and acids		(2)	27	—	Do.
Cement	thousand tons	187	22,096	—	Venezuela 18,081; Tunisia 2,068; France 1,055.
Chalk		809	83,582	—	All from France.
Clays, crude:					
Bentonite		40	2,529	—	Do.
Kaolin		35	3,358	—	United Kingdom 2,858; France 500.

See footnotes at end of table.

TABLE 6—Continued

MARTINQUE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Clays, crude—Continued:					
Unspecified		14	1,611	—	All from France.
Diamond: Gem, not set or strung	value, thousands	$8	$15	—	France $11; United Kingdom $4.
Diatomite and other infusorial earth		24	494	—	All from France.
Fertilizer materials:					
Crude, n.e.s.		140	13,425	—	France 11,775; Netherlands 1,650.
Manufactured:					
Ammonia		85	6,572	—	Guadeloupe 5,044; France 1,529.
Nitrogenous	thousand tons	7	1,457	144	Trinidad and Tobago 818; Netherlands 422.
Phosphatic		190	10,800	—	All from France.
Potassic	thousand tons	9	1,836	1,337	Canada 450; Belgium-Luxembourg 47.
Unspecified and mixed	do.	24	2,306	667	France 1,627; Belgium-Luxembourg 12.
Graphite, natural		1	—		
Gypsum and plaster	thousand tons	11	1,699	2	Dominican Republic 869; Spain 699; France 127.
Lime		252	24,175	—	France 20,915; Spain 3,260.
Magnesium compounds: Oxides and hydroxides		1,034	106,578	51,946	France 54,632.
Pigments, mineral: Iron oxides and hydroxides, processed		34	2,465	—	West Germany 1,756; France 709.
Precious and semiprecious stones other than diamond: Natural	value, thousands	$11	$2	—	All from Brazil.
Salt and brine		2,290	259,441	81	West Germany 186,095; France 61,117; Netherlands 10,125.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		4	106	—	All from France.
Sulfate, manufactured		—	300	—	Do.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		6	3,877	—	Trinidad and Tobago 2,267; France 1,610.
Worked		379	54,818	2,039	France 29,960; Italy 20,224.
Dolomite, chiefly refractory-grade		965	91,600	—	France 83,400; Belgium-Luxembourg 8,200.
Gravel and crushed rock		28	44,098	—	France 42,801; United Kingdom 1,240; Guadeloupe 57.
Quartz and quartzite	value, thousands	$1	—		
Sand other than metal-bearing		75	103,124	—	Antigua and Barbuda 60,000; France 38,924; Netherlands 4,200.
Sulfur:					
Elemental:					
Crude including native and byproduct		10	1,200	—	All from France.
Colloidal, precipitated, sublimed		3	38	—	Do.
Sulfuric acid		157	20,209	—	France 19,865; West Germany 344.
Talc, steatite, soapstone, pyrophyllite		51	5,547	195	France 5,352.
Vermiculite, perlite, etc.		6	—		

See footnotes at end of table.

TABLE 6—Continued

MARTINQUE: IMPORTS OF MINERAL COMMODITIES[1]

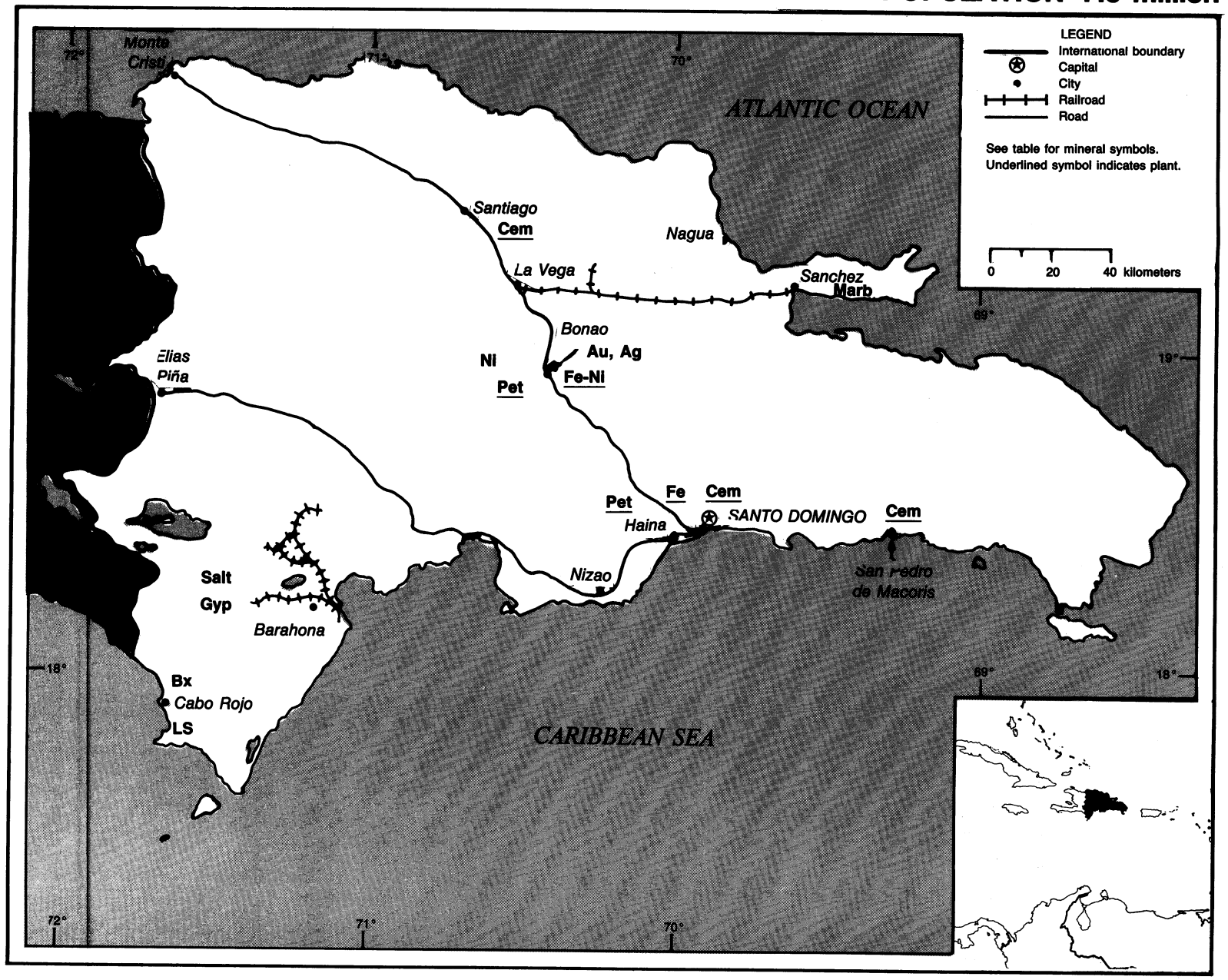
(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Other:					
Crude		509	56,930	—	France 30,040; West Germany 21,580; Netherlands 5,160.
Slag and dross, not metal-bearing		509	27,070	—	France 12,520; Netherlands 10,550; Belgium-Luxembourg 4,000.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		4	762	—	All from France.
Carbon black		35	2,245	—	French Guiana 1,322; Guadeloupe 913; France 10.
Peat including briquets and litter		364	36,031	—	Belgium-Luxembourg 18,400; West Germany 11,786; Netherlands 3,920.
Petroleum:					
Crude	thousand 42-gallon barrels	4,384	640,523	—	United Arab Emirates 395,657; United Kingdom 244,866.
Refinery products:					
Liquefied petroleum gas	do.	17	1,606	—	Netherlands Antilles 788; Venezuela 765; Guadeloupe 40.
Mineral jelly and wax	do.	2	186	—	All from France.
Bitumen and other residues	do.	52	2,380	—	Netherlands Antilles 1,277; Venezuela 590; Trinidad and Tobago 489.
Bituminous mixtures	do.	1	85	1	France 84.
Unspecified	do.	283	35,814	1	Netherlands Antilles 19,845; Trinidad and Tobago 12,609; France 1,512.

[1]Table prepared by H. D. Willis.
[2]Quantity not available, valued at $2,000.
[3]Less than 1/2 unit.
[4]Quantity not available, valued at $4,000.
[5]Quantity not available, valued at $2,000.

DOMINICAN REPUBLIC

AREA 48,700 km² **POPULATION 7.3 million**



THE MINERAL INDUSTRY OF

THE DOMINICAN REPUBLIC

By David B. Doan

Mineral production in 1991 in the Dominican Republic generally did not change greatly from the previous year. World markets for gold and nickel were sluggish at best, and prices weakened somewhat during the year. Dominican production and marketing, a major factor in its foreign-exchange position, thus was not greatly stimulated in the midst of high fuel costs and a deteriorating value of its currency.

In August 1990, the Government enacted a series of market-oriented reforms intended to decrease aggregate demand and improve overall economic performance. Public works outlays were sharply reduced, and prices were virtually doubled for staple commodities. Leading sectors of the GDP declined as economic stringency took hold. Construction and housing dropped 15%, electricity 11%, and mining about 11%. By the beginning of 1991 the Government had made real progress in catching up on its debt arrearage to the World Bank, International Monetary Fund (IMF), and the Inter-American Development Bank. Real GDP, however, had fallen by 5%, and the country's consumer price index increased by slightly more than 100% for the first time in modern Dominican history. During the year inflation eased and interest rates plummeted from 50% in April to 30% in September. The GDP was $5.1 billion[1] and the per capita income about $800 for the year. Unemployment was about 30%.

Weakness in production of bauxite, gold, and nickel did not bode well for at least the near future in mineral commodity export strength and the accumulation of hard currencies. Despite help from the IMF standby arrangement and Paris Club debt renegotiation, the Government was forecasting a balance of payments shortfall as early as 1993.

GOVERNMENT POLICIES AND PROGRAMS

In March 1983, the Government introduced Decree 900 to redefine and clarify the role of the State in mining as established by Mining Act 146 of June 1971. The intent was to broaden opportunities for the private sector to join in common participation with the public sector in mining projects, merging state ownership of the resources with the technology and capital investment of the private sector. The mineral policy continued to be considered too restrictive and investment has lagged. Also, low prices for mineral commodities in world markets have not helped to encourage potential investors to risk exploration capital.

The Government announced that, starting in 1993, Rosario Dominicana would commence gold extraction in the sulfide zone of the mine. After having taken over complete ownership of the mine from AMAX Inc. near the end of 1989, the Government had continued ongoing study of the potential for acid mine water contamination of groundwater and surfacewater supplies in a comparatively rich agricultural area. Major decisions were needed, however, on current operations as well as future exploitation of the sulfide zone. Operating equipment in disrepair required $25 million for upgrading to satisfactory condition. New processing facilities, dedicated to recovery from sulfide ore, required at least $200 million and probably 6 years' lead time. Tenders for bidders issued by the Government led to a response that was less than enthusiastic, and bidders complained of ambiguities in proposed agreements.

In September, the 5-year joint surveying and mapping project with the Government of Germany saw delivery of the first general geologic map of the Dominican Republic on a scale of 1:250,000. This was only a first step toward the further mapping on a scale of 1:50,000, required for efficient mineral exploration, that will require many more years for completion.

The Government's Director General of Mining commented that other Latin American governments are moving faster than the Dominican Republic to capitalize on mineral resources. He regretted that U.S. and Canadian firms were finding Mexico, Bolivia, and Chile more attractive because of their more straightforward and streamlined regulations governing exploration and mining. He noted that Mexico has literally revolutionized its mining laws, lowered taxes, allowed duty-free import of equipment, and done away with red tape, while still maintaining international environmental standards.[2]

PRODUCTION

With very few exceptions, output of mineral commodities generally varied slightly in either direction in 1991 compared with the previous year. This reflected several causes, among them serious power shortages and price weaknesses on international markets for mineral commodities. The best performance occurred in the output of refinery products, all of which showed increases from the year before.

The severe inflation caused a decline in real wages in 1991, accompanied by poor delivery of public services, including electricity and water. Higher prices for diesel fuel led to problems in purchasing and supply of fuel to the nation's thermal powerplants, with consequent electricity shortages and brownouts.

The continued sag in nickel prices on world markets hurt production of nickel and ferronickel. Gold prices worked lower through 1991. Silver, as has been true for several years, did not live up to projected price rises and remained lethargic. All in all, the Dominican Republic's premier mineral products, gold, nickel, and silver, offered little by way of mining incentive in 1991. Falconbridge Dominicana, however, was able to earn a small profit at lowered nickel prices after shutting down 50% of its capacity.

Other mineral-related commodities produced in the country included bauxite, cement, gypsum, lime, limestone, marble, petroleum refinery products, salt, and steel. Of these, output of bauxite continued its steep drop, continuing a trend of a number of years. Production of hydraulic cement increased a brisk 16% from the year before. Output of steel increased about 6% compared with 1990. *(See table 1.)*

TRADE

The Dominican Republic relies heavily on its export revenues from bauxite, ferronickel, gold, and silver for income in hard currency, although bauxite has nearly disappeared as an export factor in the past 2 years. In order of decreasing value, mineral commodity exports were tentatively projected at roughly 72,000 tons of ferronickel valued at $222 million, 3,100 kg of gold valued at $36 million, and 21,000 kg of silver valued at perhaps $3 million. About 7,000 tons of bauxite probably was exported at some nominal price. The United States imported a large proportion of these commodities. The total projected export value of these four mineral commodities, or roughly $261 million, was down about 12% from the total value of $296 million exported in 1990. This drop reflected the lesser production volumes of 1991 as well as price weaknesses. Exports of mineral commodities were thought to have amounted to about 40% of the value of all exports by the Dominican Republic. Falconbridge exported about 45% of its output to the United States, 40% to Europe, and 15% to Korea and Japan.

Imports of mineral commodities centered on coal, crude oil, and petroleum derivatives. In order of decreasing value, projected import data for 1990 showed about 22.5 Mbbl of petroleum and derivatives valued at $508.7 million as well as an undetermined amount of coal valued at $5 million. Although these data are for the prior year, they can be taken to represent probable magnitudes for 1991. In past years more than one-half of the Dominican Republic's imports of petroleum crude were from Venezuela and secondarily from Mexico. The degree to which the country benefits from the San Jose agreement on pricing of Mexican oil imports is not clear, partly because of the competitive nature of purchase agreements.

STRUCTURE OF THE MINERAL INDUSTRY

The Government agency responsible for promoting mining and metallurgical development, the Dirección General de Minería, is under the Secretaría de Estado de Industria y Comercio. Its functions cover technical, administrative, and legal matters. The Corporación Dominicana de Empresas Estatales a Government holding company, controls most of the mining entities owned by the Government.

Ownership of the mineral industry of the Dominican Republic, already somewhat mixed, is tending toward privatization. Rosario Dominicana S.A. in Pueblo Viejo is owned by the Government, which has the majority interest in Fábrica Dominicana de Cemento in Santo Domingo, but the two other cement companies, Cementos Cibao S.A. and Cementos Nacionales S.A., are privately owned. The Government has a minority interest in Falcondo, a subsidiary of Falconbridge Ltd. of Canada. The Refinería Dominicana de Petróleo in Haina is owned by the Government (50%) and Shell Internationale Petroleum Maatschappij B.V. (50%). During 1991, steps were taken toward joint-venture operations and possibly eventual private ownership in the gypsum and salt mining industries. *(See table 2.)*

COMMODITY REVIEW

Metals

Bauxite.—Production of bauxite in 1991 dropped precipitously to 7,000 tons, down 92% from the year before. Although the company had essentially departed from the Dominican Republic, it was announced in 1990 that the Aluminum Company of America (Alcoa) would again purchase Dominican bauxite. A local limestone-quarrying company was hired by the Government to extract 75 to 100 mt/a of bauxite to sell to Alcoa. Mining involved open pit operations in which the local company removed overburden and then reforested following removal. The effort worked satisfactorily until February 1991, at which time the Government, by presidential decree, suspended operations entirely. Observers said the decree was in response to increasing fears of severe, and perhaps irreversible, deforestation. The general manager of the mining operation indicated that it was not clear when, or if, bauxite mining operations would ever resume.

Gold and Silver.—Although nearly 3.2 tons of gold was produced during 1991, output was down more than 27% compared with that of 1990. Silver production, however, increased to almost 22 tons in 1990, up about 1.5% from the previous year. At the end of the year, gold production had dropped to less than 300 troy ounces per day, which is insufficient to maintain a profit. The mine has been kept in operation, nonetheless, because it generates hard currency in the amount of about $45 million per year. These hard dollars were much more important to the cash-poor Government than domestic peso profit or loss in the usual accounting terms.

The largest known single gold deposit in the Western Hemisphere, the Pueblo

Viejo Mine began as a private venture in 1975 but was purchased by the parastatal company Rosario Dominicana in 1979. Although Rosario manages the mine, the central bank owns the gold and silver produced. In the face of virtual exhaustion of gold ore in the oxide zone of its Pueblo Viejo Mine, Rosario Dominicana finally won Government permission to commence mining in the sulfide zone of the gold ore body where it had been feared that mine waters would develop a sulfuric acidity and exert a deleterious effect on surrounding civil water supplies. A series of studies showed that formation of acid mine water could be controlled and perhaps even utilized for commercial production of sulfuric acid. Transition-zone mining would require about 3 years at a projected output of 17 to 24 kg/d. Sulfide-zone mining would then last for 15 to 30 years depending upon rate of extraction, tentatively put at anywhere from 30 to 68 kg/d. The gold:silver ratio of the transition zone is about 1:4, indicating potential silver production there of 68 to 96 kg/d.

Troubles loom for the entire operation, however. Mining of the sulfide ore will require construction of processing facilities, costing on the order of $200 million, that should have been started 5 or 6 years ago. Although bidding got under way in December 1991, the procedure included no mining plan or feasibility study, and no equity-sharing proposals were entertained by the Government. Bidders were confused and some pulled out. Others tried to insist on equity arrangements.

Observers noted that mine equipment and facilities had deteriorated over the past several years and that Rosario accused the central bank of returning only miniscule resources back into the mine's budget. About $25 million was thought to be needed just to upgrade rolling stock and other equipment to minimal adequacy for normal operation. All indications were that 1992 would be pivotal to the future of gold mining at Pueblo Viejo.

Nickel.—Smelter production of ferronickel included 29,100 tons of contained nickel, an increase of less than 1.5% compared with 1990, and marked a slight reversal of the downtrend since 1988. Price weakness continued from the previous year, moving as low as $3.35 per pound late in 1991. Buyer diffidence also continued, with the result that in October Falconbridge Dominicana, the only producer in the Dominican Republic, shut down one of its two electric furnaces and thus reduced output by 50%. Simultaneously, the parent company reduced operations in Sudbury, Canada. Despite low prices, Falconbridge Dominicana estimated that, having the lowest production costs in the world, it could still earn a profit at $3.35 per pound, but excess output and inventory accumulation could push world prices lower.

The company owned and operated a 20-MW powerplant near the mine and smelting facilities and enjoyed independence from the uncertainties of the Dominican infrastructure, hence protecting its production and export earnings. Excess electricity, on the scale of 40 MW, was routinely sold to the State-owned electric utility for the national power grid, thus helping to alleviate chronic power shortages.

Industrial Minerals

Gypsum.—Privatization of the Dominican gypsum industry came a step closer as the Government signed a joint-venture agreement with a U.S. firm, Caribbean International Enterprise (CIE), for mining of a Government-owned deposit in the southwestern Province of Barahona. Agreement was reached requiring the U.S. firm to invest at least $3.25 million for quarry equipment and new docking facilities at the port city of Barahona. For its part, the Government will dredge the harbor and upgrade rail facilities for transport of the gypsum from mine to port. Production of gypsum in recent years has been less than 100,000 mt/a, but plans were for expansion to 1 Mmt/a. CIE agreed to pay $5.50 per ton for the exported gypsum, for which the current price varied between $7.50 and $8.00. The firm has also approached a private landholder in the same area who agreed to mining of another 10 million tons of gypsum, presumably at some time in the future. The Dominican Republic and Jamaica are the only sources of gypsum in the Caribbean, other than Cuba, but the Dominican product is reportedly of higher quality.

Marble.—Dominican marble comes in 14 varieties from quarries owned by the Government in the northeast corner of the country on the Samana Peninsula and in the southwestern Province of Barahona. Nearly all the marble produced is used locally for decorative pieces, tabletops, steps, and the like, with the market catering to private homes and tourist projects and not able to meet local demand. This demand, steady at 8,000 to 9,000 m^2 per month, has induced plans for expansion of the industry. Several Italian, Japanese, and Taiwanese companies have expressed interest in importing these various marbles but will not be able to do so until modernization of the physical plants for finishing the material.

Salt.—The Government was undertaking negotiations with the U.S. firm CIE for expansion of the rock salt mining industry to many times its size, targeting an annual output of 300,000 to 400,000 tons. Projections were based on the sales potential for rock salt for clearing ice and snow on roads in North America. Officials described the salt deposit as 7 km long and not more than 25 m deep. The new project envisioned the purchase of $1.5 million in new operating equipment.

Mineral Fuels

The petroleum scene, which has been developing for several decades, includes new efforts to entice capital and expertise to the area of the north coast and the valleys of the Río Yaque del Norte, the Río Camu, and the Río Yuna. Past drilling in these regions has resulted in oil shows but no production. There are signs that new activity will occur in 1992 and beyond, which could lead to domestic

production of the fuels so necessary to power generation and the economy.

Reserves

Falconbridge Dominicana estimated its nickel reserves at about 38 million dry tons grading 1.72% nickel. Rosario Dominicana's reserves at Pueblo Viejo in the sulfide zone of the ore body were estimated at 70 Mmt with gold and silver contents of 4.0 and 19 grams per ton, respectively. Reserves in the transition zone were estimated at 13 Mmt with 2.8 and 13 g/mt of gold and silver, respectively.

INFRASTRUCTURE

The Dominican Republic had 12,000 km of roads, including 5,800 km of paved roads, 5,600 km of gravel or other loose surface, and about 600 km of unimproved earth surface that may be seasonally impassable. The country had 1,655 km of railroads in four different gauges ranging from 0.558 m to 1.435 m. A total of 44 airports had been built at various times in past decades, but only 30 are presently in condition to be used. Of these, 14 have paved runways, 3 with runways from 2,440 to 3,659 m long, and 9 with runways 1,220 to 2,439 m long.

Major seaports include Santo Domingo, Haina, San Pedro de Macorís, Puerto Plata, and Barahona. A number of smaller ports line the coast, some of which may grow into major ports upon further development. Electricity is generated at diesel-fueled powerplants, having a total capacity of 1,376 MW, situated in various parts of the country. Private sources such as Falconbridge Dominicana sold excess electricity into the national grid. About 4 MGWh of electric power was produced in 1989, or roughly 560 kW•h per capita, versus a Latin American regional average of about 1,110 kW•h per capita.

OUTLOOK

The geology of the Dominican Republic has always suggested mineral wealth not yet known or tapped. Increased exploration can change this and has to some extent. The Government has been making a determined effort to get its fiscal house in order but not without pain to its consuming citizenry as well as to the overall economy. The Government also realized that the future of the Dominican Republic depends heavily on its existing mineral resources as well as those yet to be discovered. It is not only emphasizing the mineral search but calling international attention to the attractiveness of the exploration arrangements that can be made.

Although much will depend on agricultural production, as well as maintenance of fiscal and monetary stability, the mineral sector may well be the vehicle for increased stability and prosperity for the Dominican Republic.

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[1]Where necessary, values have been converted from Dominican Republic pesos (RD$) to U.S. dollars at the rate of RD$12.66=US$1.00.

[2]State Dep. telegram 00960, U.S. Embassy, Santo Domingo, Dominican Republic. Jan. 31, 1992, p. 5.

OTHER SOURCES OF INFORMATION

Agencies

Dirección General de Minería
Edificio Gubernamental
Avenida México
Santo Domingo, República Dominicana
Tel. 685-8191-95

Corporación Dominicana de Empresas Estatales
Ave. Gral. Antonio Duvergé
Esq. José Contreras
Santo Domingo, República Dominicana

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U.S. Embassy (Santo Domingo). Economic Trends Report.
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TABLE 1
DOMINICAN REPUBLIC: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[p]
Aluminum: Bauxite, dry equivalent, gross weight	thousand tons	187	168	151	85	7
Cement, hydraulic	do.	1,100	1,495	e1,600	1,060	1,231
Coal, subbituminous[e]		600	600	600	600	600
Gold	kilograms	7,651	5,785	5,238	4,354	3,160
Gypsum	thousand tons	59	153	171	78	118
Iron and steel:						
Ferroalloys, ferronickel		81,303	73,363	78,170	71,753	72,655
Steel, crude		87,800	75,327	54,855	r35,772	39,102
Lime		e36,000	e36,000	r18,000	r4,000	—
Limestone		254,251	525,946	1,127,397	491,265	448,654
Mercury	kilograms	69	207	35	—	—
Nickel:						
Mine output, Ni content		32,521	29,345	31,264	28,700	29,062
Metal:						
Smelter, Ni content of ferronickel		32,521	29,345	31,264	28,700	29,062
Shipments, Ni content of ferronickel		29,051	32,377	28,944	28,696	28,028
Petroleum refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	197	237	378	272	318
Gasoline, motor	do.	3,068	2,900	3,035	2,213	2,348
Kerosene and jet fuel	do.	1,113	1,038	1,042	692	1,144
Distillate fuel oil	do.	3,267	2,486	2,162	2,053	2,763
Residual fuel oil	do.	2,817	2,617	2,619	2,686	3,728
Total	do.	10,462	9,278	9,236	7,916	10,301
Salt[3]		e55,000	37,532	30,258	11,339	e11,400
Silver	kilograms	35,707	39,595	22,614	21,630	21,954

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

[1]Table includes data available through June 1, 1992.

[2]In addition to commodities listed, crude construction materials (sand and gravel, stone, etc.) may also be produced, but data on such production are not always available, and information is inadequate to make reliable estimates of output levels.

[3]Rock salt only.

TABLE 2
DOMINICAN REPUBLIC: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bauxite	Ideal Dominicana S.A. (Government, 100%)	Sierra de Bahoruco, Pedernales Province	200
Cement	Fabrica Dominicana de Cemento C. por A (Government, 78%; private, 22%)	Santo Domingo, Distrito Nacional	700
Do.	Cementos Cibao C. por A (private, 100%)	Santiago Province	400
Do.	Cementos Nacionales S.A. (private, 100%)	San Pedro de Macorís, San Pedro de Macorís Province	561

See footnotes at end of table.

TABLE 2—Continued

DOMINICAN REPUBLIC: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

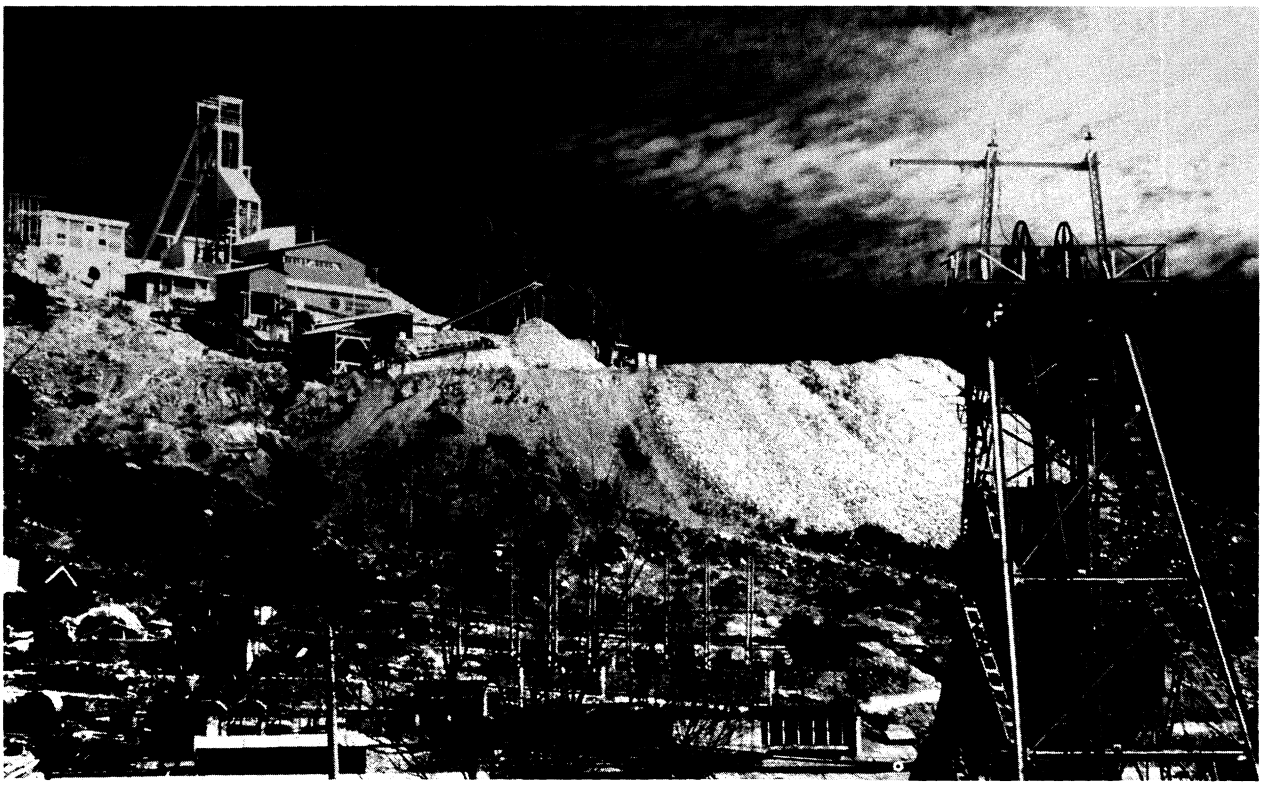
(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Dore (gold and silver) kilograms	Rosario Dominicana S.A. (Government, 100%)	Pueblo Viejo Mine, Cotui, Sánchez Ramírez Province	30,000
Gypsum	Sal y Yeso C. por A (Government, 100%; may privatize)	Barahona Province	NA
Nickel	Falconbridge Dominicana C. por A (Government, 10%; Falconbridge Ltd., 90%)	Mine and plant at Bonao, La Vega Province	30
Petroleum products thousand 42-gallons barrels per day	Refinería Dominicana de Petróleo S.A. (Government, 50%; Shell Oil Co., 50%)	Haina, Distrito Nacional	30
Do. do.	Falconbridge Dominicana C. por A (Government, 10%; Falconbridge Ltd., 90%)	La Peguera, La Vega Province	3
Salt	Sal y Yeso C. por A (Government, 100%; may privatize)	Barahona Province	NA
Steel	Metaldom (Government, 100%)	Santo Domingo, Distrito Nacional	100

NA Not available.

MEXICO: HOIST HOUSE AT IMMSA'S SAN MARTIN MINE UNIT IN ZACATECAS STATE.
(PHOTO BY ORLANDO MARTINO)

MEXICO: CIA MINERA LAS CUEVAS FLUORSPAR OPERATIONS IN SAN LUIS POTOSI.
(PHOTO COURTESY OF CIA MINERA LAS CUEVAS AND NORANDA SALES INC.)



ECUADOR

AREA 283,560 km² (including Galapagos Islands) **POPULATION 10.9 million**

THE MINERAL INDUSTRY OF

ECUADOR

By Pablo Velasco

The mineral sector of Ecuador continued to be dominated by petroleum, a significant contributor to Ecuador's economy. Output by the mineral sector increased 2.9% in 1991, as increased oil production offset weak oil prices. A country with abundant natural resources, Ecuador appears to have extensive, undeveloped mining potential.

Most of Ecuador's petroleum reserves are found in the Amazonian region. Petroleum and unprocessed or semiprocessed agricultural, fishing, and forestry products account for most of Ecuador's exports. The relatively small industrial sector produces largely for a protected domestic market. Exports of crude oil and its products accounted for 40.4% of the country's export earnings in 1991. Other major export commodities were bananas (25.1%), shrimp (17.2%), coffee (3%), and other minor exports (14.3%). The economy has grown at a 4.4% annual rate since 1987, when an earthquake severed the Transecuadorian oil pipeline for 6 months, causing economic contraction. Economic growth was 2.3% in 1990, improving to 2.9% in 1991. In 1991, the economy was led by the agricultural sector, which grew by 3.7% owing to very strong banana and shrimp exports. Manufacturing turned in a surprisingly strong performance, expanding by 3.9%, while the petroleum and mining sector grew by 2.9% to almost $12.0 billion in current dollars,[1] as increased oil production offset weak oil prices. The construction sector remained in the doldrums. The current administration brought inflation down from an annual rate of 99% in February 1989 to 54% by the end of 1989. Since then it has not reduced inflation significantly below 50%. At yearend 1991, the annual inflation rate was 49%.

The mining sector has been stated by the Government officials "to be the future alternative source of the National income," should oil reserves deplete. However, this objective has remained largely neglected; much foreign investment is needed to create adequate infrastructure and the right environment to stimulate exploration. In 1991, the nonfuel sector registered an estimated 60% growth, mainly in the areas of industrial minerals and, to a lesser extent, metallic minerals, mainly gold. Crude oil production amounted to 299,700 bbl/d in 1991; this was up 4.7% from that of 1990. This was far above the limits of 275,000 bbl/d stipulated by OPEC. In October 1989, the newly established state-owned Petróleos del Ecuador (Petroecuador) oil holding corporation took control of the 800-km Trans-Andean crude oil pipeline and 1,358-km refined products pipeline. Of the other activities in the mineral sector, the only ongoing polimetallic project is the San Bartolomé deposit (Pb, Zn, Ag, Au), a 50% joint venture between Armeno Resources Inc., a Canadian-based company, and Nissho Iwai Corp. of Japan. Gold mining was of some importance.

GOVERNMENT POLICIES AND PROGRAMS

Ecuador continued its efforts to create a favorable investment climate to foreign and domestic investors in exploration and mining activities. These activities had been stimulated by both the country's mineral potential and by implementation of the Mining Law of August 1985 (Decree Law 06). Further reforms to the country's mining legislation have been discussed in Congress before being submitted to the President. The proposed new law would emphasize rapid exploration and development of mineral resources; encourage private, national, and foreign investments; and at the same time, regulate the disorder prevalent in the small-scale gold mining activity. To promote the development of Ecuador's natural resources and in particular the nonrenewable ones, the National Congress enacted the Mining Law under Decree No. 126 of May 22, 1991. Legislation codifying the Mining Law has been set through Decree No. 2831 of October 24, 1991. The resulting law establishes the relations between the state and persons or entities engaged in all mining activities excluding exploitation of hydrocarbons, reactive minerals, and medicinal waters. Supplementary legislation as the Civil Code, Civil Procedures Code, Commercial Code, Investment Law, Law of Companies, and other related legal dispositions would apply wherever the mining code did not give express rules. The state could grant permits to private or legal persons and entities, national or foreign, for mining activities that were subject to Ecuadorian laws and jurisdictions. The law prohibited foreign entities to file claims through diplomatic or judiciary international organizations. Among the basic tenets of the new code were the inalienable and imprescriptible domain of the state over all mineral deposits in the national territory of Ecuador and the declaration of mining activities as of public utility. Nonetheless, the Ministry of Energy and Mines, (MEM), was the state office that granted permits to persons interested in the exploration and exploitation of mineral substances. This agency had the authority to plan and implement the mining policies of the country while the national Mining Office

of the same Ministry administered the procedures of granting concessions and terminating mining rights. Another office, the National Technical and Property register, controlled all the technical aspects related to the requirements of concession of permits, maintenance, and termination of mining rights and maintained the updating of the Mining Register nationwide. However, disputes over mining rights were to be submitted to the Administrative Litigation Courts. The Geology-Mining Metallurgical Corp. of Development and investigation was a public and autonomous entity, commissioned by the MEM for the promotion and the development of mining activities in Ecuador. The entity was empowered to approve all sorts of contracts of investment related to mining activities, to sign agreements of cooperative and technical/economic mining assistance projects for national or multinational projects, to perform research studies on geodynamic matters related to natural risk possibilities, to organize and monitor actions referring to seismology operations for the prevention of earthquakes, and to implement mining activities in the reserved areas. The state had exclusive rights for the implementation of mining activities. The state could develop its own mining projects or grants contracts to foreign or national individuals or private corporations. The President of the republic had the authority to establish reserved mining zones where those areas were of public interest owing to significant geographic or economic value. The declaration of a Special Mining Reserve Area was to include its expiration time, after which all legal restrictions are lifted. No private concessions were allowed in reserved mining zones. Foreign individuals and companies could acquire mining rights or enter into mining agreements within the international boundaries of the Ecuadorian territory, provided they obtained a special permit from the President after the submittal and approval of a report performed by the Armed Forces Command. Foreigners and foreign companies who planned to start mining activities in Ecuador could establish their domicile to enjoy the same legal rights established for citizens. Although mining concessions had been prohibited from subleasing contracts, such contracts became possible with prior consent of the main concessionaire. Equipment, surface and underground facilities, extracted minerals, and other accessories could be used as collateral to obtain loans and mortgages for mining activities. Before starting any mining activity, reports were to be submitted to the pertinent authorities for permission. Competent individuals and legal entities, national or foreign, whose social goals and operational structure fulfilled the requirements of Ecuadorian laws were entitled to hold mining rights. Such rights, however, did not extend to Federal or state public employees, unless their mining rights were obtained before or after their exercise of office; acquired through estate, legacy, or prescription; or when the public employee was a partner of a mining company before his appointment, provided that he would not have any administrative role. The specific stages set forth as constituting mining activities were as follows: prospection, exploration, mining, ore dressing or concentration, smelting, refining, and commercialization.

The new Mining Law dismantled the Ecuadorian Mining Institute (INEMIN) that had monopolized the granting of mining concessions and had created corruption and unnecessary bureaucratic confusion in the mining sector. It was replaced by four other new Government agencies. The general overview of the Ecuadorian investment laws is provided in the Constitution approved by referendum in 1978 and in laws issued by the National Congress. Laws are regulated by the President of the republic and applied by the different bodies of the administration. The Ecuadorian economy is divided into four sectors: public, mixed-economy, communitarian, and private.

The environmental impact of mining is beginning to be recognized as an issue in Ecuador. The 1991 code includes a provision requiring that an environmental impact statement be filed before mining activity. The statement would include a management plan to deal with issues such as protection of flora and fauna, avoidance of contamination of water supply, and clean up plans in the event of spills. The large foreign investors looking at Ecuador do not find the prospect of strict environmental regulation to be objectionable as they have long since confronted this issue in their home countries. However, they note that Ecuadorian environmental expertise is limited and directed more at the problems associated with the petroleum industry than those of mining. Ecuador's main environmental problem arises from the small-scale informal gold mining conducted by the "claim jumpers" in districts such as Nambija and Bella Rica. These operations use mercury in processing, which is burned off into the air and was harmful to the miners themselves. Water contaminated with arsenic and other harmful elements is commonly discharged directly into streams, which have become unpotable. The water pollution caused by these mines has begun to cause concern in Ecuador's coastal regions where aquaculture-raised shrimp have become a major nontraditional industry. However, a tough enforcement effort has not been made in these remote mining districts.

Ecuador, which has long ignored its potential as a minerals producer, could be the site of important investments in the medium term. Large multinational companies have undertaken exploration programs, while two small firms have begun production of gold and silver. The recent election of a free-market-oriented president should hearten potential investors. Some major policy changes are still needed to attract major investments. High royalties and discriminatory taxes on foreign investment needed to be addressed. The Government needed also to deal with the problem of small-scale miners who took over properties without legal rights. Ecuador's labor regime is inflexible, though companies probably could work around the difficulties. Environment was an emerging issue. For now, it is the

small artisanal miners who are polluting the soil and water, while big firms are confident that they can meet any reasonable standards. If all were to go well, the first major foreign investment project in mining could be announced in the next 2 to 3 years.

PRODUCTION

Production of nonfuel minerals showed modest growth in 1991 and contributed about 1% to the GDP, although limited to a few commodities: gold from placer operations; lead, silver, and zinc from polymetallic mines; and some industrial minerals, including clays, kaolin, limestone, marble, and sulfur. The total value and volume of mineral production was maintained at the same level of the previous year, but was expected to become increasingly important in the future. The total value of mineral output was estimated at $1.2 billion in 1991 compared with $1.4 million in 1990.

The mineral fuels and their derivatives accounted for 40% of the total value, and the nonfuel minerals, especially gold, accounted for the remaining 60%. Production of crude oil increased in 1991 owing to the fall in the international market price from an average of $20.20 per barrel in 1990 to $16.23 per barrel in 1991. Although having been producing near capacity, in response to lower prices, Ecuador increased oil production by 3.7% to about 8,200 bbl/d. Crude oil production declined in value to $1,059 million, a decrease of 15.8% compared with that of the previous year. *(See table 1.)*

TRADE

In 1991, the Ecuadorian economy registered further recovery from previous years, continuing the economic reactivation that was initiated in 1990. The GDP grew 4.4% compared to 2.3% in the previous year. In 1991, the economy was led by the agricultural sector, which grew by 6.6%, thanks to very strong banana and shrimp exports. The petroleum and mining sector grew by 4.8% due mainly to the increase in production of crude oil by 3.7% as increased oil production offset weak prices. Manufacturing turned in a surprisingly strong performance, expanding by 3.7%, reversing the negative trend of the past 2 years (-5.0% in 1989 and -1.3% in 1990). In 1991, total exports reached $2.851 million, $137 million more than that in the previous year. By proportion, petroleum exports decreased 18.2% while the nonfuel exports increased 30.2% compared with that of 1990. However, the mineral fuels sector was by far the most important in terms of its contribution to state revenues and foreign exchange earnings, generating 40.4%, or $1.152 million, somewhat less than one-half of central Government revenues because of lower crude export prices. The total exports of crude oil were 15.8% lower than those in the previous year valued at $ 1.059 million. A trade surplus of $644 million was recorded in 1991, 36% lower than that of 1990. Total exports grew by about 5%, while imports increased by 29%.

The United States continued as the principal trading partner of Ecuador. During 1991, the value of exports to the United States reached $1.33 billion (49.0%), while imports reached $948 million representing 32% of total imports. The export value of crude oil to the United States represented 40.6% of the total, followed by Korea (23.1%) and Peru (13.2%). Ecuador also exported a small amount of petroleum products to the United States, mostly residual fuel oil valued at $64.8 million. During 1991, Ecuador's total imports' value was $2.2 billion, $496 million higher than the level of 1990. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

The Ecuadorian Government exercised dominant control over the mineral industry through a new joint Committee for Mining Contracts Board of Directors, composed of the Ministers of Energy and Mines, Finance, Industry and Commerce, the Chief of the Joint Command of the Armed Forces, the Director General of the Central Bank, the Secretary General of Planning of the National Development Council, the President of the National Chamber of Mines, and a representative of the mining community. MEM is the state office that grants permits to persons interested in the exploration and exploitation (production) of mineral substances. This agency had the authority to plan and implement the mining policies of the country while the National Mining Office, of the same ministry, administers the procedures for granting concessions and terminating rights. Another office, the National Technical and Property Mining Register, controlled all the technical aspects related to the requirements of concession, permits maintenance, and termination of mining rights, and maintained the updating of the Mining Register nationwide. The Dirección Nacional de Hidrocarburos, under the Minister of Energy and Mines, oversaw the activities of the mineral industry. The country's mineral industry was dominated by the petroleum industry in terms of contribution to the Ecuadorian GDP, employment, and export earnings. Crude oil and natural gas were produced by companies with production-sharing agreements with the Government, namely, between the Petroecuador-Texaco Consortium (45.83%-27.50%), Northeastern Petroecuador (24.33%), Petroecuador-City Association (2.0%), and Petroecuador Santa Elena Peninsula (0.33%). Petroecuador-Texaco combined was also joint owner of the Trans-Ecuadorian 800-km-long crude oil pipeline with a 300,000-bbl/d capacity. On October 1, 1989, Petroecuador took charge of the administration of the Trans-Ecuadorian oil pipeline. Ever since, the operations were given to Petrotransporte, a subsidiary of Petroecuador. In November 1989, by Government decision another subsidiary of Petroecuador, Petropenínsula, took charge of the refinery operations of the Anglo Refinery, known now as Refinería La Libertad. In August 1990, the state took charge of the administration of the

refinery Repetrol. In July 1990, Petroamazonas took charge of the administration and operation of the oilfields of Petroecuador-Texaco consortium. Petroamazonas was authorized to invest in exploration, drilling one well in 1990 and three wells in 1991 to discover primary reserves in the order of 100 Mbbl.[2] In 1991, three new blocks in the Amazon region were offered to Mobil Oil, Arco-Mobil, and Conoco of the United States for an estimated investment of around $100 million. Petroecuador was considering expanding the pipeline's capacity to 350,000-bbl/d by mid-1992 by adding an additional pumping unit at each existing station, and further expanding capacity to 400,000-bbl/d by 1994 by adding another new pumping station. This 400,000-bbl/d capacity would be the limit of the pipeline's designed capacity. Petroecuador is the most important oil company in Ecuador, with sales of about $1.2 billion in 1991. The company produces, refines, stores, transports, and delivers crude oil and petroleum products.

In 1991, the total national work force was 2.8 million workers distributed as follows: 35% in the agricultural sector; 21% in manufacturing, 16% in commerce, and 28% in services and other activities. The mining and extractive industries employed approximately 25,000 persons, which represented less than 1% of the total labor force. Organized labor constituted less than 30% of the total. Petroecuador had a work force of about 4,300.

More than 150 small mining companies operated in the country. Ecuador's metallic mining activity was concentrated in the following eight major mining provinces: El Oro Province (stibnite, gold), Azuay Province (copper, gold, silver), Zamora-Chinchipe Province (gold, silver), Napo Province (gold), Cotopaxi Province (gold), Esmeralda Province (gold), Pichincha Province (gold), and Loja Province (copper, gold).

In 1991, several major multinational mining companies were present in Ecuador, all in exploration. Newmont (United States) was one of the most advanced with several properties identified in the central valley and an exploration budget of about $1 million. Gold Fields (Republic of South Africa) was looking to develop its Nambija area property, though it had been plagued by illegal claim jumpers. R.T.Z. (United Kingdom), Noranda (Canada), and Placer Dome (Canada) have also maintained exploration programs. Below this level were a number of projects, varying from the speculative to the highly dubious, mounted mainly by foreign geologists resident in Ecuador who were seeking to market them to majors or raise money from traditional sources of mining capital such as the Vancouver Stock Exchange (VSE).

Small-scale industrial mineral operations included marble—Industria Marmolera Ecuatoriana S.A., Mármoles Andinos Cía. Ltda., Mármoles Santa Rosa Cía Ltda., and Marmolera Chimborazo; calcium carbonate—Cecal. S.A.; bentonite—Mineral M.D.K. and Mineral Bentonite Charasol; and barite—Mineral Bomboiza. *(See table 4.)*

COMMODITY REVIEW

Metals

Gold.—The bulk of Ecuador's gold production came from the small scale, often illegal mining in the Nambija, Bella Rica, and Portovelo areas. But in fact, no one knew how much gold was mined in Ecuador. The Central Bank estimated 3.0 tons for 1991. However, much of Ecuador's gold production was not reported and is smuggled out of the country. Some industry observers speculated that illegal purchase of gold may be a vehicle by which Colombian drug traffickers launder their money. In 1991, it was reported unofficially that gold production reached about 12.0 tons, an increase of 12% compared with that of 1990. The gold was mined by underground methods and recovered by the gravimetric process followed by amalgamation or cyanidation methods. Placer gold was also extracted from alluvial deposits. Foreign firms engaged in precious-metal mining included Odin Mining and Investment from Australia, which recovered some gold in 1990-91 from dredging on the Río Chico, near the Bella Rica Mining District close to Ecuador's coast. The company estimated that there would be sufficient reserves to mine through December 1993, based on proven reserves of 500,000 m^3 at 0.33 g/m^3 and probable reserves of 1.1 Mm^3 at 0.37 g/m^3). Odin was also looking to develop other properties for hard-rock mining.

On July 6,1990, Armeno Resources Inc. from Canada signed a formal joint-venture agreement with Nissho Iwai Corp. of Japan for the production financing of the San Bartolomé deposit, forming an Ecuadorian company, Armenonic del Ecuador S.A. All the exploration, development, and mining rights held by Armeno with regard to the San Bartolomé, El Erivan, Peggy I, and Peggy II prospects were subsequently transferred to Armenonic del Ecuador S.A., in which Nissho acquired a 50% interest by providing a combination of equity and debt financing for the development and construction of a producing mine. Nissho had the exclusive rights to sell the concentrate production. Subsequently, Benguetcorp Canada Ltd. was appointed to operate the San Bartolomé property, and in November 1990, assumed its role as manager. After construction and development work was completed, the official commencement of commercial production of the San Bartolomé Mine took place on August 17, 1991. The project was an underground mining operation involving the cut-and-fill method. A 100-mt/d flotation plant has been installed that produces a bulk concentrate containing gold, lead, silver, and zinc. Armenonic del Ecuador S.A. continued to hold a 100% interest in the San Bartolomé Mine, the El Erivan prospect, and the Peggy I and Peggy II properties.

Copper.—Adding to a portfolio of copper-oxide properties. Kookaburra Gold Corp. (VSE) of Vancouver, British Columbia Canada reached an agreement with AG Armeno Resources (VSE) of

Canada to acquire up to a 65% interest in the Chaucha copper project in Ecuador. Kookaburra could earn an initial 50% interest in the property for cash payments to Armeno of $375,000 plus 200,000 shares as well as spending $3.5 million on exploration and development over a 4-year period. The company could earn an additional 15% interest by paying Armeno $2.5 million and spending a further $2.5 million on the property.

The property contains a large porphyry ore body measuring about 8 km by 8 km covering at least eight copper targets, only one of which has been tested. Two United Nations-sponsored teams drilled a total of about 7,620 m in 70 holes on the Naranjos Area in the late 1960's and early 1980's. The drilling outlined a large, shallow, and gently sloping supergene enrichment blanket measuring 1,219 m by 549 m and varying in thickness from 30.5 m to 122 m. Reserves in the zone, which is overlain by an oxidized zone and underlain by an untested copper-sulfide system, are estimated at about 60 Mmt grading 0.50% copper at 0.20% copper cutoff grade. The preliminary reserve figure includes a potential open pit, including about 27 Mmt grading 0.56% copper. A further extension to the south of the reserve is estimated to contain about 14.5 Mmt grading 0.34% copper. Kookaburra stated that it was highly impressed with the business climate in Ecuador and believed the Chaucha project has an excellent chance of being developed into a heap-leach solvent extraction and electrowinning operation. Kookaburra officials said the option agreement with Armeno should be finalized by the end of October 1992. The company would then work on a prefeasibility study, including preliminary pit designs, capital cost estimates, and metallurgical testing. Additional drilling would wait until road access to the property was completed. The Government was in the process of constructing a major road into the area, and it is expected to reach the Chaucha property in 12 to 15 months.

Industrial Minerals

Industrial minerals played a significant role in the nonfuel mineral sector. The most important operations were in the cement and cement-related industries involving limestone and clay.

Cement.—Production of cement increased 2.2% from that of 1990 to an estimated 2.3 Mmt. Domestic sales in 1991 totaled 2.2 Mmt. Most cement production was under Government control and managed by regional development corporations.

La Cemento Nacional C.A. (LCN), the largest manufacturer of cement in Ecuador, produced about 67% of the total output in the country. LCN was an established and well-organized cement company serving the entire Ecuadorian market and had been in the local cement business more than 60 years. In 1974, Holderbank FG of Switzerland, a major international cement operator, bought an important equity stake in the company and has since operated the two cement plants of the company, including implementation of two major expansions of LCN's production facilities. LCN shares were owned by Corporación Financiera Nacional (CFN), 47%; the Government-owned DFC-Holderbank, 47%; about 95 private Ecuadorian investors, 3.1%; and the U.S. International Finance Corp. (IFC), 2.9%.

Pumice.—Production of pumice stone was reported to have increased in 1991. A steadily increasing volume of this stone was coming to the United States via the port of New Orleans from Ecuador, Mexico, and Turkey. There was increased U.S. use of the floating stone, better known as pumice, in producing so-called stonewashed blue jeans.

Mineral Fuels

Gas.—During 1991, Ecuador produced 180 Mm^3 of natural gas. Most of the domestically produced gas was processed at the Petroecuador gas plant in the Shushufindi Oilfield in the Oriente region. To meet domestic demand, an additional quantity of natural gas was imported from Colombia. LPG was bottled and distributed by four private firms as well as by Petroecuador.

Petroleum.—Crude oil production in 1991 totaled 109.4 Mbbl, an increase of 3.2% from that of the previous year. Ecuador exported 65 Mbbl of crude oil and 9.4 Mbbl of refinery products in 1991 for a total value of $1.06 billion, a decrease of 15.8% compared with that of 1990. The increase in crude oil output was apparently due to the decrease in oil prices in response to the drop in world demand after the end of the war in the Persian Gulf. Ecuador, as a small oil producer (290,000 bbl/d), was a member of OPEC.

Oil accounted for 55% of the country's foreign earnings, and the Government gave priority to the acceleration of oil exploration programs in an effort to overcome the effect of its declining oil reserves, thought to be sufficient for only the next decade. Several major oil companies, besides the official Petroecuador, were involved in exploration activities, both offshore and inland; however, the results yielded only 50% of the hoped-for increase in reserves. The foreign companies involved include Belco Petroleum Corp. (BELCO), (United States), Elf Aquitaine S.A. (ELF), (France), Petrobrás International S.A. (PETROBRÁS), (Brazil), British Gas, Conoco, Texaco, Arco, Tenneco, and Occidental Petroleum Corp. Occidental made an additional oil discovery in Ecuador that confirmed sufficient reserves to warrant further commercial development of block 15. Two discovery wells in the eastern jungle, Laguna 1 and Laguna 2, were tested in August at a rate of 4,360 bbl/d and 3,385 bbl/d, respectively. The Laguna Field was the fifth discovery out of six exploratory wells drilled on block 15. Production from the five fields was to begin in late 1992 or early 1993. Occidental was the operator of the block, with 85% interest; the remainder was owned by Canadian Occidental, of which Occidental of the United States owned

48%. Following Oryx's introduction of horizontal drilling to Ecuador in 1991, the company has had continued success with completions in the Cretaceous Holling Formation. The latest, the Gacela 2, was completed in May following tests of 1,374 bbl/d from a lateral section in the upper Holling. Location is in Napo Basin block 7, about 4.8 km west of the Coca Field. In mid-May, Arco's Villano 2 wildcat in Block 10 tested 2,500 bbl/d from the lower Cretaceous Holling Formation. Further testing was planned. Ecuador's Tripetrol submitted its plan to develop discoveries on the Santa Elena Peninsula on acreage acquired from Belco Petroleum Corp. The plan includes drilling 22 wells, some possibly horizontal, to develop the Pacoa, Mata Chivato, Palo Santo, and Guayacán strikes. Total investment in the four fields was to be about $66 million. Petroecuador is reviewing the plan. Petroecuador completed the 269.6-km, 15.2-cm Libertad- Manta products pipeline constructed in Ecuador by Argentina's Techint with financial support from Argentina's Government. The line would transport gasoline and diesel from refineries at Santa Elena to Manta for distribution in Manabi Province. The Government and Petrecuador have been very slow in approving development plans for those foreign oil companies that have found petroleum. Thus far the only plan it has approved was for Oryx, which would jointly develop a field with Petroecuador able to produce up to 11,000 bbl/d. Had Conoco received approval for its development plan in the second quarter of 1991, it could have begun limited production by mid-1993. Conoco estimates that its field would have a maximum daily production of 45,000 to 50,000 bbl, and Occidental would be able to produce about 25,000 bbl/d. Elf found oil but its production capacity was uncertain (perhaps 10,000 to 15,000 bbl/d). Observers believed that Ecuador showed good potential for oil beyond what has been discovered, although new fields probably would be smaller and of lower quality than currently producing fields. Petroecuador solicited bids from foreign oil companies to improve reservoir management of Ecuador's two largest fields, Shushufindi and Sacha. This most likely would include secondary and tertiary recovery techniques to maintain current production for an extended period of time. Current production in the two fields of about 160,000 bbl/d was more than one-half of Ecuador's total output.

Reserves

Ecuador was believed to have gold reserves on a par with those of Peru and Colombia, and because gold mining essentially stopped after the colonial era (16th and 17th centuries), most of Ecuador's gold remained unexploited.

Ore reserves of metallic minerals and industrial minerals were small in world terms, but considered significant in Latin America. Crude oil proven reserves were estimated at 1.36 billion bbls and probable reserves at 700 Mbbl.

INFRASTRUCTURE

Ecuador is limited in the development of its infrastructure. The transportation network was composed of a total of 28,000 km of highways: 3,600 km paved, 17,400 km gravel and improved earth, and 7,000 km unimproved earth.

The railroad system consisted of 965 km total; all was 1.067-m-gauge single track. Mine production was transported by truck and rail to processing plants and shipping ports. The railroad system was operated by the state, with the main line running north-south. Crude oil and refined products were transported by two pipelines that were 800 and 1,358 km long, respectively, to Esmeraldas terminal and Quito from the oilfields in the Oriente region and to Napo Province for final processing, domestic distribution, and export. Four major ports served the country on the Pacific coast. The first (in order of importance) was Guayaquil, through which about 60% of the cargo by volume was channeled, followed by Esmeraldas, Puerto Bolívar, and Manta.

For international air transportation, there were two airports, one in Quito and the other in Guayaquil. Ecuatoriana de Aviación was the major domestic airline that covered several routes throughout Latin America and the United States. Ecuador had an installed electrical generating capacity of 1,657 MW, of which 46% came from thermal stations and 54% came from hydroelectric sources. Early in 1991, however, this ratio was changed in favor of hydroelectric power.

OUTLOOK

For a long time the potential to develop mining in Ecuador had been seen as promising. To promote the development of Ecuador's natural resources and, in particular, the nonrenewable ones, the National Congress enacted the Mining Law under Decree No. 126 of May 22, 1991. Legislation regulating the Mining Law has been set through Decree No. 2831 of October 24, 1991. The present law rules the relations between the state and persons or entities engaged in all mining activities, excluding exploitation of hydrocarbons, radioactive minerals, and medicinal waters. This new law enacted during 1991 would offer the prospect of enhanced contributions of the mining sector to the national income of the country.

The new state petroleum company Petroecuador was expected to expand its productive and transport capacity, most notably the construction of a LPG terminal and petroleum product pipelines. An increase in oil reserves may result from the 10 foreign consortia carrying out exploration activities and from the 7 blocks that were being offered for exploration. Development of two of the exploration blocks was begun during 1991. Observers believed that Ecuador has good potential for finding oilfields beyond those already discovered, although probably of smaller and lower quality than Ecuador's currently producing oilfields. The mining sector has been said by Government officials, "to be the future alternative source of the national income, should oil reserves deplete." However, this objective has remained largely neglected.

[1]Where necessary, values have been converted from Ecuadorian sucres (S/) to U.S. dollars at the rate of S/1,050=US$1.00.

[2]Informe de Labores, Agosto 89-Junio 90, Ministerio de Energía y Minas.

OTHER SOURCES OF INFORMATION

Agencies

Ministry of Energy and Mines
Ave. Santa Prisca 223
Quito, Ecuador

Petróleos del Ecuador (Petroecuador)
Alpallana y 6 de Diciembre
Edif. Alpallana P.O. Box 5007-8
Quito, Ecuador

Petroecuador-Texaco
(Petroamazonas)
Ave. 6 de Diciembre 4226 y Gaspar Cañero
Quito, Ecuador

Ministry of Energy and Mines
National Directorate of Mining
Casilla 23-A, Ave. 10 de Agosto #5540 y Villalengua
Quito, Ecuador

Cámara de Minería del Ecuador
Ave. Rep. del Salvador #525
Edif. Rosanía, Ofic. 14
Quito, Ecuador

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Banco Central del Ecuador—Memoria, annual 1991.

ENEMIN, Mining in Ecuador 1986, annual report, (latest available).

TABLE 1

ECUADOR: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
METALS						
Cadmium, mine output, Cd content[e]	kilograms	300	300	300	250	200
Copper, mine output, Cu content[e]		100	100	100	100	100
Gold, mine output, Au content	kilograms	9,500	10,200	10,390	r2,282	3,014
Iron and steel:						
Steel, crude		25,200	23,500	23,400	19,800	20,300
Semimanufactures		170,400	170,538	e178,000	172,600	196,100
Lead concentrate, Pb content[e]		200	200	200	200	200
Silver, mine output, Ag content[e]	kilograms	60	60	60	60	60
Zinc, mine output, Zn content[e]		100	100	100	100	100
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	2,145	2,200	e2,250	e2,250	2,300
Clays:						
Bentonite		155	100	250	e200	e200
Common:						
For cement	thousand metric tons	255	500	520	e500	e500
Other		29,200	50,000	150,250	r e300,000	370,000
Kaolin		11,017	e16,700	22,576	e20,000	25,000
Feldspar		1,558	5,000	21,814	r e23,000	26,000
Gypsum (for cement)		29,200	50,000	48,368	r e30,000	24,000
Sand:						
Silica (glass sand)		14,675	50,000	102,345	r e50,000	42,000
Ferruginous		6,000	6,000	15,334	e10,000	e10,000
Stone, sand and gravel:						
Limestone (for cement manufacture)	thousand metric tons	2,773	5,000	5,617	r e4,000	3,885
Marble		15,210	20,000	47,771	r e25,000	22,200
Pumice		—	90,000	144,836	e100,000	200,000
Sulfur:[e]						
Native		4,500	4,500	4,300	4,000	4,000
Byproduct:						
From petroleum		5,000	5,000	5,000	5,000	5,000
From natural gas		5,000	5,000	5,000	5,000	5,000
Total		14,500	14,500	14,300	14,000	14,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, lignite		1,541	3,000	5,000	e3,000	e3,000
Gas, natural:						
Gross[e]	million cubic meters	348	r177	180	r185	180
Marketed	do.	92	99	e100	r e100	e90
Natural gas, liquids:						
Natural gasoline	thousand 42-gallon barrels	186	232	e240	e250	e200
Liquefied petroleum gas	do.	278	533	e550	e560	e600
Total	do.	464	765	e790	e810	e800
Petroleum:						
Crude	do.	63,687	112,553	102,953	106,006	109,400
Refinery products:						
Liquefied petroleum gas	do.	770	1,549	r1,368	r1,714	2,234

See footnotes at end of table.

TABLE 1—Continued

ECUADOR: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
MINERAL FUEL AND RELATED MATERIALS—Continued						
Petroleum—Continued:						
Refinery products—Continued:						
Gasoline	thousand 42-gallon barrels	6,904	11,028	r10,244	r10,013	11,160
Jet fuel	do.	1,200	1,336	r1,279	1,368	1,418
Kerosene	do.	1,587	1,387	r1,871	1,402	1,140
Distillate fuel oil	do.	5,882	8,709	r7,888	r9,215	10,308
Lubricants	do.	502	475	r212	r213	212
Residual fuel oil	do.	11,769	15,012	r14,834	r17,439	17,996
Unspecified	do.	498	r921	r467	r472	454
Total	do.	29,112	r40,417	r38,163	r41,836	44,922

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes data available through Nov. 1992.
[2]Reported figure.

TABLE 2

ECUADOR: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
Abrasives, n.e.s.: Natural: Corundum, emery, pumice, etc.		40,558	33,994	16,075	Colombia 10,295; Venezuela 7,608.
Aluminum: Metal including alloys, semimanufactures		135	330	5	Colombia 245; Peru 56; Dominican Republic 19.
Copper: Metal including alloys, semimanufactures		9	—		
Gold: Metal including alloys, unwrought and partly wrought	kilograms	18,918	213,921	213,921	
Iron and steel: Metal:					
Scrap		—	13	—	All to Colombia.
Steel, primary forms		400	—		
Semimanufactures:					
Bars, rods, angles, shapes, sections		—	1	—	All to Venezuela.
Wire		15	—		
Tubes, pipes, fittings		671	279	—	Chile 179; Costa Rica 75; Colombia 8.
Castings and forgings, rough	value, thousands	$1	—		
Petroleum:					
Crude[2]	thousand 42-gallon barrels	r63,729	62,817	28,689	Panama 5,731; Peru 5,731.
Refinery products:					
Gasoline	42-gallon barrels	529,097	NA		
Kerosene and jet fuel	do.	288,510	NA		
Distillate fuel oil	do.	297,145	NA		
Residual fuel oil	do.	7,571,420	NA		
Bituminous mixtures	do.	115	NA		
Stone, sand and gravel:					
Dimension stone: Crude and partly worked	value, thousands	$3	$5	—	All to Colombia.

See footnotes at end of table.

TABLE 2—Continued

ECUADOR: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Destinations, 1990	
			United States	Other (principal)
Stone, sand and gravel—Continued:				
Quartz and quartzite	—	2	2	
Sulfur:				
Elemental: Crude including native and byproduct	185	—		
Sulfuric acid	—	38	—	All to Peru.
Other base metals: Ores and concentrates	—	1	—	All to Chile.

[r]Revised. NA Not available.
[1]Table prepared by H. D. Willis.
[2]Source: Organization of the Petroleum Exporting Countries (OPEC).

TABLE 3

ECUADOR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals:					
Alkali metals	value, thousands	—	$1	$1	
Alkaline-earth metals	do.	—	$2	$2	
Unspecified		1	—		
Aluminum:					
Ore and concentrate		—	2,250	—	All from Guyana.
Oxides and hydroxides		763	895	458	United Kingdom 163; Brazil 90.
Metal including alloys:					
Scrap		3	356	—	All from Canada.
Unwrought		4,256	103,428	5	Argentina 100,009; Canada 3,263; Brazil 100.
Semimanufactures		5,566	2,340	240	West Germany 556; Brazil 529; France 355.
Cadmium: Metal including alloys, semimanufactures	value, thousands	—	$2	$2	
Chromium:					
Oxides and hydroxides		17	20	6	West Germany 11; Brazil 2.
Metal including alloys, all forms		—	1	(2)	West Germany 1.
Cobalt:					
Oxides and hydroxides		1	2	2	
Metal including alloys, semimanufactures	value, thousands	—	$1	$1	
Copper:					
Matte and speiss including cement copper		—	36	—	All from Chile.
Metal including alloys:					
Unwrought		236	136	135	Netherlands 1.
Semimanufactures		3,914	3,744	801	Chile 1,200; Peru 1,108.
Iron and steel:					
Iron ore and concentrate		266	—		
Metal:					
Scrap		1,095	872	(2)	Brazil 860; West Germany 8; Belgium-Luxembourg 3.

See footnotes at end of table.

TABLE 3—Continued

ECUADOR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued:					
Pig iron, cast iron, related materials		41	43	11	Switzerland 21; Brazil 5.
Ferroalloys:					
Ferrochromium		NA	9	—	Sweden 1; Switzerland 1; unspecified 7.
Ferromanganese		278	353	—	Mexico 320; Switzerland 15; United Kingdom 8.
Ferrosilicon		124	144	5	Republic of South Africa 78; Argentina 45; Brazil 10.
Silicon metal		NA	1	1	
Unspecified		9	—		
Steel, primary forms		176,038	126,216	27,467	Venezuela 48,681; Brazil 35,004.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		NA	183,645	486	West Germany 96,414; Belgium-Luxembourg 24,251; Republic of Korea 19,948.
Clad, plated, coated		NA	49,788	1,079	Czechoslovakia 34,106; West Germany 4,220; Republic of South Africa 3,106.
Of alloy steel		NA	5,744	482	Chile 1,473; Brazil 714; Republic of South Africa 712.
Bars, rods, angles, shapes, sections		60,797	37,266	4,053	Brazil 9,229; Republic of South Africa 7,757; Venezuela 6,366.
Universals, plates, sheets		167,310	NA		
Hoop and strip		12,262	NA		
Rails and accessories		466	278	12	Panama 196; West Germany 38; Spain 26.
Wire		711	653	69	United Kingdom 114; Brazil 105; Republic of Korea 95.
Tubes, pipes, fittings		20,340	48,784	5,288	Mexico 9,632; Brazil 8,557; Argentina 6,962.
Castings and forgings, rough		26	NA		
Lead:					
Oxides		1,780	1,404	1	Peru 582; Panama 494; Mexico 280.
Metal including alloys:					
Unwrought		1,326	1,290	33	Peru 774; Panama 399; Colombia 76.
Semimanufactures		79	77	2	Unspecified 75.
Magnesium: Metal including alloys:					
Unwrought		—	1	1	
Semimanufactures		1	3	1	Unspecified 2.
Manganese: Oxides		560	710	8	Brazil 600; Mexico 100.
Mercury	kilograms	3,000	6,000	2,000	U.S.S.R. 2,000.
Molybdenum: Metal including alloys, semimanufactures	value, thousands	$39	$1	—	All from Italy.
Nickel: Metal including alloys:					
Unwrought		—	1	—	All from West Germany.
Semimanufactures		19	21	(e)	Japan 8; France 5; Canada 3.

See footnotes at end of table.

TABLE 3—Continued

ECUADOR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Sources, 1990	
			United States	Other (principal)
METALS—Continued				
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified value, thousands	$29	—		
Silver: Metal including alloys, unwrought and partly wrought do.	$60	$60	$14	Chile $45; West Germany $1.
Tin: Metal including alloys:				
Unwrought	4	7	—	Peru 5; Bolivia 1; United Kingdom 1.
Semimanufactures	20	20	1	Bolivia 8; West Germany 2.
Titanium: Oxides	308	357	84	West Germany 110; Belgium-Luxembourg 39.
Tungsten: Metal including alloys:				
Unwrought	(3)	1	1	
Semimanufactures	(4)	3	1	Italy 2.
Uranium and thorium:				
Oxides and other compounds value, thousands	—	$19	$12	Canada $6; France $1.
Uranium metal including alloys, all forms do	—	$8	$6	Canada $2.
Zinc:				
Oxides	33	98	5	Hong Kong 39; Peru 35; China 19.
Blue powder	11	47	2	Netherlands 43; Denmark 2.
Metal including alloys:				
Scrap value, thousands	$8	—		
Unwrought	2,696	2,649	6	Peru 1,382; Canada 1,102; West Germany 100.
Semimanufactures	3	3	3	
Zirconium: Ore and concentrate	—	162	162	
Other:				
Oxides and hydroxides	r66	63	17	Netherlands 24; Colombia 10.
Ashes and residues	337	32	19	Peru 12; Switzerland 1.
Base metals including alloys, all forms	1	—		
Metalloids[5]	—	11	2	Canada 5; Brazil 4.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	138	184	82	Colombia 70; Italy 13.
Artificial: Corundum	54	27	—	All from Brazil.
Dust and powder of precious and semiprecious stones value, thousands	—	$3	$3	
Grinding and polishing wheels and stones	346	315	50	Italy 49; Brazil 27.
Asbestos, crude	3,001	1,151	19	Canada 880; Republic of South Africa 182; Uruguay 65.
Barite and witherite	51	1,901	1,819	Peru 38; Brazil 30.
Boron materials:				
Crude natural borates	1	—		
Oxides and acids	196	423	(2)	Peru 295; Chile 120; Argentina 3.
Bromine[6]	2	1	1	
Cement	11,354	11,033	4	Peru 6,936; Colombia 3,990; Japan 60.
Chalk	563	653	18	Belgium-Luxembourg 340; France 130; United Kingdom 83.

See footnotes at end of table.

TABLE 3—Continued

ECUADOR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Clays, crude:					
Bentonite		NA	203	117	Colombia 81; Mexico 2.
Kaolin		NA	2,284	2,249	United Kingdom 18; West Germany 6.
Unspecified		8,153	257	257	
Cryolite and chiolite		17	—		
Diamond: Natural:					
Gem, not set or strung	value, thousands	$184	—		
Industrial stones	do.	—	$192	$1	Belgium-Luxembourg $191.
Diatomite and other infusorial earth		221	245	45	Mexico 190; Chile 10.
Feldspar, fluorspar, related materials:					
Feldspar		NA	65	—	Mainly from Peru.
Fluorspar		NA	37	—	Mexico 19; Switzerland 18.
Unspecified		929	—		
Fertilizer materials:					
Crude, n.e.s.		—	15	1	West Germany 7; Canada 3; Colombia 3.
Manufactured:					
Ammonia		29	26	—	Netherlands 23; West Germany 3.
Nitrogenous		104,231	121,042	24,129	West Germany 25,967; U.S.S.R. 25,759.
Phosphatic		6,164	8,971	7,567	Colombia 1,025; Brazil 200.
Potassic		19,344	35,867	25,819	West Germany 8,030; East Germany 2,000.
Unspecified and mixed		28,786	32,069	31,479	Colombia 235; Chile 201.
Graphite, natural		12	17	(2)	West Germany 12; Peru 5.
Gypsum and plaster		[7]30,791	8,501	1,133	Peru 6,337; Colombia 962.
Magnesium compounds:					
Magnesite, crude		4	5	—	Italy 3; Switzerland 2.
Oxides and hydroxides		—	33	38	Mexico 5.
Mica:					
Crude including splittings and waste		2	28	22	France 5; Switzerland 1.
Worked including agglomerated splittings	value, thousands	$1	$1	—	Unspecified $1
Nitrates, crude		341	66	2	Chile 59; West Germany 5.
Phosphates, crude		(3)	38	—	Belgium-Luxembourg 20; Colombia 10; Chile 8.
Pigments, mineral: Iron oxides and hydroxides, processed		222	302	3	Spain 115; Brazil 79; West Germany 70.
Potassium salts, crude		6,200	9,946	7,944	East Germany 2,000; Panama 2.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	—	$60	—	Brazil $39; Thailand $11; West Germany $9.
Synthetic	do.	$25	$18	$6	Unspecified $12.
Pyrite, unroasted		30	—		
Quartz crystal, piezoelectric	value, thousands	NA	$2	$1	Unspecified $1.
Salt and brine		1,330	254	1	United Kingdom 216; West Germany 29; Peru 8.

See footnotes at end of table.

TABLE 3—Continued

ECUADOR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sodium compounds, n.e.s.:					
Soda ash, natural and manufactured		13,338	4,558	2,005	France 1,276; West Germany 1,065.
Sulfate, natural and manufactured		6,480	6,030	4	Mexico 4,650; Chile 873; Venezuela 500.
Stone, sand and gravel:					
Dimension stone: Crude and partly worked		32	22	16	Italy 6.
Dolomite, chiefly refractory-grade		700	958	—	Peru 550; Colombia 300; Italy 89.
Quartz and quartzite		—	377	11	Argentina 366.
Sand other than metal-bearing		99	130	20	Argentina 65; Italy 38.
Sulfur:					
Elemental:					
Crude including native and byproduct		502	464	73	Colombia 385; West Germany 6.
Colloidal, precipitated, sublimed		75	57	32	Colombia 18; Peru 7.
Dioxide		—	18	18	
Sulfuric acid		6,473	8,050	2,313	Canada 3,106; Peru 2,538.
Talc, steatite, soapstone, pyrophyllite		756	972	277	Italy 279; Republic of Korea 90.
Vermiculite[9]	value, thousands	—	$2	$2	
Other:					
Crude		1,298	237	206	Mexico 27; Switzerland 2.
Slag and dross, not metal-bearing		4	—		
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		62	849	91	Brazil 702; Colombia 39.
Carbon: Carbon black		4,129	3,594	55	Colombia 2,309; Venezuela 1,042; Peru 100.
Coal:					
Anthracite		30	26	11	Belgium-Luxembourg 15.
Lignite including briquets		3	69	69	
Coke and semicoke		512	370	4	Colombia 346; West Germany 20.
Petroleum:					
Crude	42-gallon barrels	14	15	15	
Refinery products:					
Liquefied petroleum gas	do.	476	47	35	France 12.
Gasoline:					
Aviation	do.	29,999	NA		
Motor	do.	93,673	NA		
Mineral jelly and wax	do.	37,201	35,470	9,594	West Germany 16,936; Japan 1,613.
Lubricants	do.	1,778	NA		
Bitumen and other residues	do.	909	618	582	Brazil 24; Denmark 12.
Bituminous mixtures	do.	261	970	879	Costa Rica 55; Brazil 36.

[r] Revised. NA Not available.
[1] Table prepared by H. D. Willis.
[2] Less than 1/2 unit.
[3] Unreported quantity valued at $2,000.
[4] Unreported quantity valued at $10,000.
[5] Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."
[6] Includes fluorine and iodine.
[7] May include limestone other than dimension.
[8] Unreported quantity valued at $3,000.
[9] Includes chlorite and perlite.

TABLE 4

ECUADOR: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

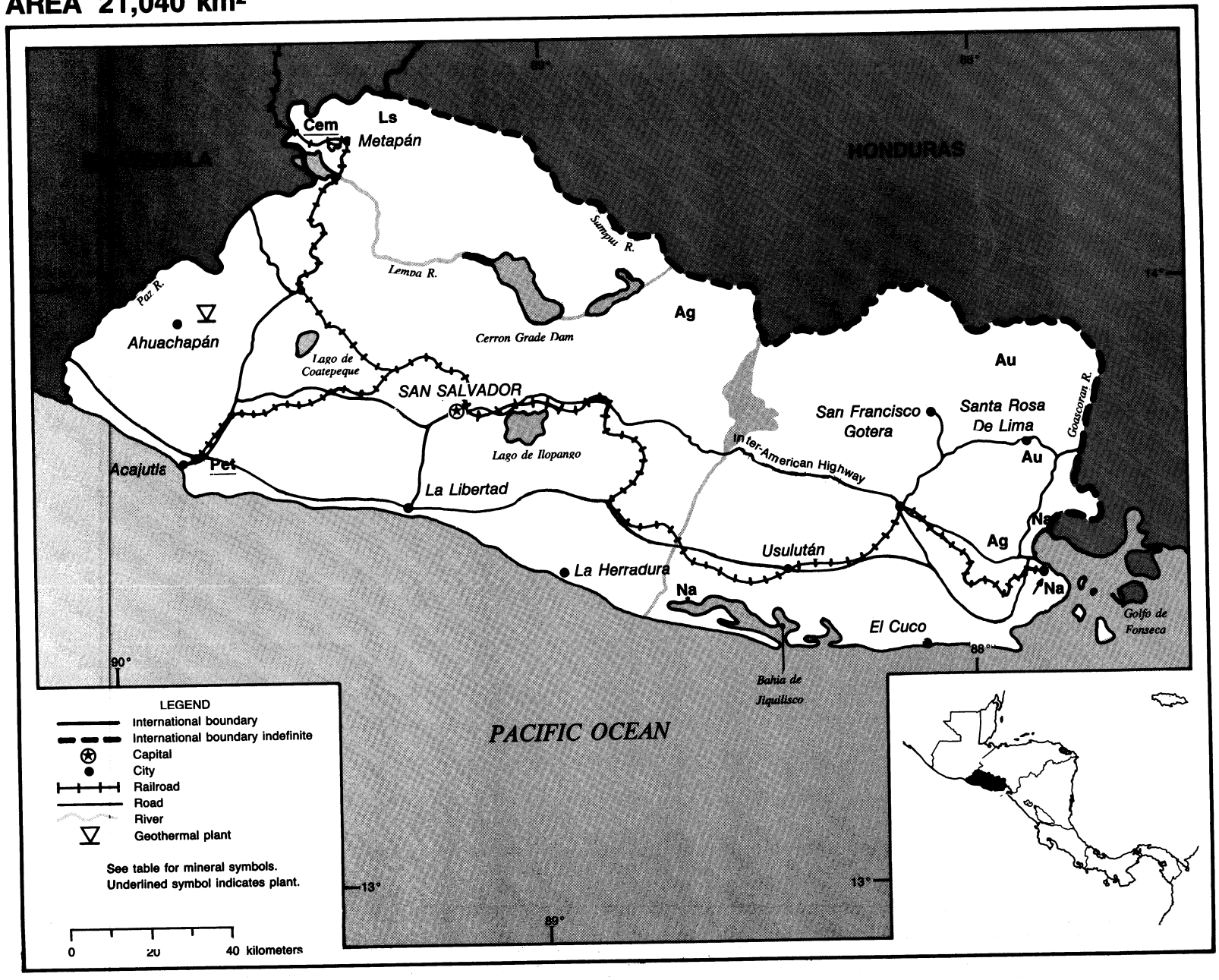
(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Cementos Selva Alegre S.A. (Government, 100%)	Near Octavalo, Pichincha Province	350
Do.		Cementos Chimborazo C.A. (Government, 100%)	Near San Juan Chico, Riobamba Province	250
Do.		La Cemento Nacional C.A. [Corporación Financiera Nacional (CFN, 47%)] Government-owned DFC-Holderbank, 47%); [private Ecuadorean investors, 3.1%; IFC (U.S.), 2.9%]	7.5 kilometers via a Salinas, Guayaquil Guayas Province	150
Do.		Empresa Industrias Guapan S.A. (Government, 100%)	Azogues, Canar Province	100
Do.		Cemento Cotopaxi C.A. (private, 100%)	Near Latacunga, Cotopaxi Province	50
Polimetallic (Au, Ag, Pb, Cd, Zn)		Cía. Armeno Resources Inc. of Vancouver, British Columbia, Canada (Jointly owned by Armenco Resources Inc. of Canada, 50%; Nissho Iwai Corp. of Japan, 50%)	San Bartolomé Mine, Azuay Province, 30 kilometers southeast from Cuenca	100
Polimetallic (Au, Ag, Cu, Pb, Zn)		Minera Toachi, S.A. (Owned by Outokumpu Oy of Finland, 33%; Cía. Buenaventura of Peru, 24%; International Finance Corp. of United States, 7%; Ancomin Ltd., 16%; and Vollmer Group, 12%)	La Plata Mine, 113 kilometers southwest of Quito, Cotopaxi Province (currently stagnant)	24
Do.		Ecuadorean Mining Institute (INEMIN) (Government, 100%)	Portovelo Mine, south of Ecuador Del Oro Province	6
Gold	kilograms	Cía. Minera Los Lilenes S.A. (Osborne & Chapel, 50%; Government, 50%)	Machala River gold placer, Del Oro Province	120
Do.	metric tons	Coperativa Gordillera Nambija (Goverment, 40%; private, 60%)	Cordillera Tunantza, southeast of Ecuador, 25 kilometers north of Zamora Chinchipe	10
Do.	kilograms	Coperativa Orquídea de Los Andes & Ciá. Mineral Cumbinamasa S.A.	Cordillera Las Brisas, Villa 4, Machala	10
Petroleum, crude	thousand 42-gallon barrels per day	Petroecuador (Formerly CEPE-Texaco, Inc.) (Government, 100%)	Lago Agrio, Sacha, Auca, Shushufindi-Aguarico Oilfields, Oriente region, Napo Province	243
Do.		do.	Shushuqui, Shuara, Secoya, Cuyabeno and other oilfields in the northeastern sector, Napo Province	45
Refinery products		do.	Esmeralda refinery, at Esmeralda city and Shushufindi refinery in the Oriente region	21
Do.		Petropenínsula, La Libertad (Government, 100%) (Formerly Anglo & Repetrol refineries)	Santa Elena Peninsula, Guayas Province	13

EL SALVADOR

AREA 21,040 km²

POPULATION 5.3 million



THE MINERAL INDUSTRY OF

EL SALVADOR

By Philip M. Mobbs

Gold and silver mining had been one of the principal industries of El Salvador. However, it declined rapidly in the 1920's, primarily due to the lack of inexpensive fuel. During 1991, industrial minerals, especially limestone mined for the domestic cement plants, dominated the country's mineral extraction industry.

The nation's mining industry continued to be constrained in 1991 by armed insurgent groups. The Government and the Frente Farabundo Martí de Liberación Nacional (FMLN) resumed peace talks in February. The civil war raged on although by September the combatants had essentially agreed on all provisions of a peace treaty. Representatives gathered at the end of the year and signed a peace agreement just after midnight on January 1, 1992. The cease-fire was to become effective January 16, 1992.

In 1991, El Salvador realized a 3.5% real GDP growth rate, compared with 3.4% in 1990 and 1.1% in 1989. The GDP was estimated to be $5.5 billion[1] in 1991. Inflation was reported to be 15% for the year.

GOVERNMENT POLICIES AND PROGRAMS

The mineral industry fell under the Mining Code of 1922, as amended by the Complementary Mining Law, Decree 930 of 1953. Petroleum operations were subject to the Hydrocarbon Law, Decree 626 of March 1981. The Salvadorian Legislative Assembly was studying a new mining law drafted in 1989. The proposed code would update the current mining law and provide incentives for foreign investment in the mining sector.

PRODUCTION

Clay, gravel, gypsum, limestone, miscellaneous rock, marine salt, sand, and tuff production made up most of the country's mineral production in 1991. Mineral-related production included the output of the country's cement, petroleum refining, and steel industries. *(See table 1.)*

TRADE

Early in 1991, El Salvador and other members of the Central American Common Market (Costa Rica, Guatemala, Honduras, and Nicaragua) signed a framework agreement to encourage free trade with Mexico. A similar treaty was subsequently signed with Venezuela. During May, El Salvador became a member of the GATT and also signed a bilateral trade and investment agreement with the United States.

Total exports in 1991 were estimated to be $775 million, of which $303 million or 39% was shipped to the United States. In 1990, 24% of El Salvador's exports went to the Federal Republic of Germany, 7% to Guatemala, and 4% to both Costa Rica and Japan. Total imports in 1991 were estimated at $900 million, of which $534 million or 59% was originated in the United States. In 1990, 12% of El Salvador's imports came from Guatemala, 7% from Mexico, 7% from Venezuela, 5% from Germany, and 4% from Japan. El Salvador purchased petroleum from Venezuela and Mexico under the San José Accord.

STRUCTURE OF THE MINERAL INDUSTRY

Private operations dominated the mineral extraction industry. State-controlled monopolies of mineral-related activities included energy, railroads, and port services. The Government also set prices for petroleum products and locally produced Portland grey cement. *(See table 2.)*

COMMODITY REVIEW

Domestic cement plants and associated mined limestone dominated the country's mineral industry. Gold and silver mining was discontinued in the early 1980's, due to insurgent activity.

INFRASTRUCTURE

El Salvador's 10,000-km road network included 1,500 km of paved road. Road and rail facilities connected the two major ports, Acajutla on the Pacific and the La Unión and Cutuco complex, off the Golfo de Fonseca. The railroad system consisted of 602 km of 0.914-gauge single track.

The country had 669 MW of installed electrical generating capacity, of which almost 60% was attributed to hydroelectric plants, 27% was contributed by petroleum-fired plants, and the remainder by geothermal. El Salvador ranked second in Latin America behind Mexico in installed geothermal electrical generating capacity.

During 1991, guerrilla sabotage was increasingly directed at larger targets. Instead of power pylons, the generation facilities and distribution stations of the country's electrical company, Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL), were targeted. By causing nationwide power failures, the FMLN hoped to force the Government to agree to a more favorable cease-fire. By May, less than one-half of the nation's generating capacity was available to the

power grid. Power generation was also affected by the drought, which resulted in record low river and reservoir levels. Much of the hydroelectric component of the system was shut down by midyear, thus overtaxing available petroleum-fired plants. By August, CEL restricted customers to 17 hours of power per day. The blackout was reduced to 3 hours per day in November.

OUTLOOK

Volcanic rocks cover about 80% of the country. There is the potential for exploitation of the volcanic material, especially perlite and pumice deposits. Significant expansion of mineral operations in El Salvador is not expected in 1992. However, the ending of hostilities brightens mining's prospects. Increased demand for industrial mineral production may be generated under the Government's announced 5-year, multibillion dollar infrastructure reconstruction program. Work on reopening precious-metals mines is expected to attract the initial interest of foreign investors returning to the country.

[1]Where necessary, values have been converted from Colones (₡) to U.S. dollars at the rate of 8.0₡=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Dirección de Recursos Mineros
Ministerio de Economía
4ta. Avenida Norte No. 233
San Salvador, El Salvador

Comisión Ejecutiva Hidroeléctrica del Río
Lempa 9na. Calle Poniente No. 950
Entre 15ta. y 17ma. Avenida Norte
San Salvador, El Salvador

Publications

Central Intelligence Agency: The World Factbook, annual.

Lorenz, W. Industriemerale, Steine und Erden in der Republik El Salvador, Mittlamerika. Geologisches Jahrbuch, Reihe D: Mineralogie, Petrographie, Geochemie, Lagerstättenkude. Hanover, 1986, 90 pp.

U.S. Department of Commerce, International Trade Administration:
Foreign Economic Trends and Their Implications for the United States, annual.

U.S. Department of the Interior, Geological Survey, Reston, Virginia:
Geological Survey Circular 925, Earth and Water Resources and Hazards in Central America, 1984.

TABLE 1
EL SALVADOR: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[p]
Aluminum metal, including alloys, semimanufactures		1,526	1,681	1,795	2,040	1,612
Cement		606,462	623,224	632,651	640,943	679,723
Fertilizer materials:						
Phosphatic		3,450	11,702	11,702	7,998	—
Other mixed chemical		1,560	43,794	45,484	53,430	48,697
Gypsum[e]		4,500	4,500	4,500	4,500	5,000
Iron and steel: Metal:						
Steel, crude		13,106	11,269	11,700	[e]12,000	[e]11,000
Semimanufactures		32,654	32,934	37,804	37,847	41,273
Limestone		1,450,000	1,450,000	1,600,000	1,700,000	1,900,000
Petroleum refinery products	thousand 42-gallon barrels	[e]4,800	5,113	5,000	[r]4,856	5,662
Salt, marine		3,100	3,200	5,000	8,000	15,000

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

[1]Table includes data available through Aug. 3, 1992.

[2]In addition to commodities listed, construction material (clays, gravel, miscellaneous rock, sand, and weathered tuffs) were presumably produced. Available information is inadequate to make reliable estimates of output levels of these commodities.

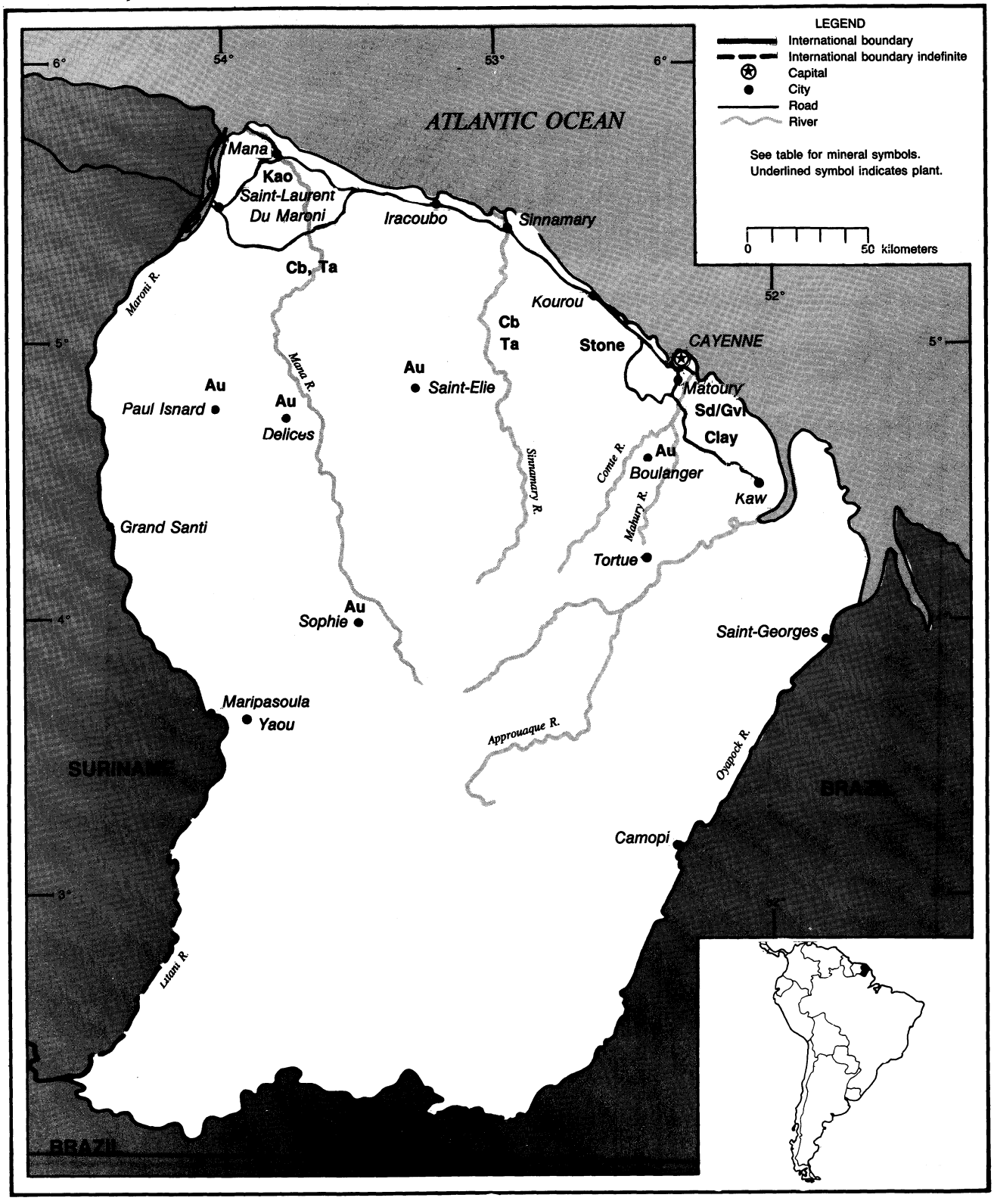
TABLE 2
EL SALVADOR: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Cemento de El Salvador S.A. (private, 100%)	El Ronco, near Metapán, Santa Ana Department	684
Do.		Cemento Maya S.A. de C.V. (private, 100%)	Cantón Tecomapa, Metapán, Santa Ana Department	240
Petroleum products	thousand 42-gallon barrels	Refinería Petrolera Acajutla, S.A. (Exxon, 60%; Shell, 40%)	Acajutla, Sonsonate Department	5,868
Steel, crude		Siderúrgica Centroamericana del Pacífico S.A. (Borgonovo Group, 100%)	Carretera del Litoral, Sonsonate Department	100

FRENCH GUIANA

AREA 90,909 km² **POPULATION 103,000**



THE MINERAL INDUSTRY OF

FRENCH GUIANA

By Philip M. Mobbs

French Guiana, an overseas department of France, was almost totally supported by the French Government. Funding of the Kourou Space Center and direct Government payments made up a majority of the Gross Departmental Product. The mineral industry formed a very small part of the department's economy in 1991, lagging considerably behind the contribution of the construction, shrimp, space, sugar cane, and timber industries.

GOVERNMENT POLICIES AND PROGRAMS

The mining laws and regulations of France prevailed in the department. Mineral deposits were classified as mines or quarries. The quarry designation included all materials mined for construction but excluded nitrates, associated salts, and phosphate deposits.

PRODUCTION

Mineral production consisted primarily of columbite and tantalite, gold, gravel, sand, and stone. Gold had been mined at a number of placer sites in the interior since 1853. Columbite and tantalite were also produced from alluvial deposits. Sand was dredged from the major rivers, primarily the Mahury and the Maroni. Stone was quarried at Cayenne and to the southeast of Kourou. *(See table 1.)*

TRADE

France dominated French Guiana trade, accounting for more than 50% of imports and exports. Most of the produced gold was exported to France. Stone, sand, and gravel were consumed by the local construction industry. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

Specific mine ownership information was unavailable. At the end of 1990, there were 47 mineral concessions and 65 exploration permits in effect. Of the latter, 50 were reportedly active. In general, existing mineral companies tended to be small and locally owned; however, the French state company, Bureau de Recherches Géologiques et Minières (BRGM), held a number of exploration permits in conjunction with its mineral inventory of French Guiana.

COMMODITY REVIEW

Metals

BRGM continued its exploration and studies of optimum methods for extraction of gold. In July, BRGM and the South African mining house, General Mining, Metals & Minerals Ltd. (Genmin), were permitted to jointly explore a gold deposit at Tortue. By October, development plans were terminated, owing to local protests. In December, it was reported that BRGM and BHP-Utah International Inc. were working on a gold prospect at Yaou.

A privately held gold company based in Saint-Laurent Du Maroni held the concessions on 10 placer sites in French Guiana. During 1991, the company increased output from 30 kg/month to 45 kg/month when its fourth site came on-line. Output was projected to increase to almost 70 kg/month during 1992.

Additionally, gold was mined and smuggled out of the country by Brazilian garimpeiros along the southeastern frontier.

Industrial Minerals

The significant increase in the production of construction materials can be attributed to the work on the dam on the Petit-Saut and continued construction at both the Kourou Space Center and in Cayenne.

INFRASTRUCTURE

Mineral production was transported down the department's inland waterway system, along the 700-km road system, or by airplane. Cayenne, the capital, was the sole ocean port.

The three diesel and gas-turbine powerplants of Electricité de France had a total installed electricity-generating capacity of 123 MW. Fuel for the power stations was imported. An additional 116 MW of installed capacity was scheduled to become available in 1994 when the hydroelectric station at Petit-Saut was scheduled for completion.

OUTLOOK

The interest in gold mining should continue to grow. Stone and sand and gravel should continue to be produced at present levels. Production of the bauxite deposits in the Kaw region is not expected to be economically feasible in the foreseeable future, due in part to the lack of a deepwater port.

OTHER SOURCES OF INFORMATION

Agencies

Direction Regional de l'Industrie, de la Recherche et l'Environnement
B.P. 7001
97307 Cayenne, French Guiana

Bureau de Recherches Géologiques et Minières
B.P. 552
97333 Cayenne Cedex, French Guiana
(594) 30-06-24

Institut National de la Statistique et des Etudes Economiques
Service Régional de la Guyane
1 rue Maillard de la Guyane
B.P. 6017
97306 Cayenne Cédex, French Guiana

Publications

Gédim (Paris, France):
Réalités Industrielles, Annales de Mines, monthly.

Central Intelligence Agency: The World Factbook, 1990.

TABLE 1
FRENCH GUIANA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991e
Clay		2,000	2,500	4,500	5,000	6,000
Columbite and tantalite	kilograms	—	566	r1,304	r1,076	1,100
Gold, mine output, Au content	do.	514	r530	r544	r870	1,417
Sand	thousand tons	149	359	1,925	1,456	1,500
Stone, crushed	do.	277	649	1,189	1,319	1,500

eEstimated. rRevised.
[1]Includes data available through June 19, 1992.

TABLE 2
FRENCH GUIANA: EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Principal destinations, 1990
Abrasives, n.e.s.: Grinding and polishing wheels and stones		—	1	All to France.
Alkali metals		—	75	Do.
Aluminum: Metal including alloys:				
Scrap		11	1,083	Do.
Semimanufactures		—	748	France 382; Guadeloupe 225; Belgium-Luxembourg 141.
Carbon: Carbon black		—	772	All to Martinique.
Copper: Metal including alloys, scrap		15	4,539	All to France.
Gold: Metal including alloys, unwrought and partly wrought	kilograms	217	48,000	France 40,200; Switzerland 4,500; Martinique 2,700.
Iron and steel: Metal:				
Scrap		—	8,089	Brazil 4,200; France 3,889.
Semimanufactures: Tubes, pipes, and fittings		25	75	Guadeloupe 72; France 3.
Lead: Metal including alloys, scrap		—	600	All to France.
Petroleum refinery products:				
Liquefied petroleum gas	42-gallon barrels	12	NA	
Unspecified	value, thousands	—	$41	Guadeloupe $19; Martinique $19; France $2.
Precious and semiprecious stones other than diamond, natural	do.	$1	—	
Stone, sand and gravel: Dimension stone, worked		—	39	All to Martinique.
Titanium: Ore and concentrate	value, thousands	$10	—	
Zirconium: Ore and concentrate		—	20	All to Belgium-Luxembourg.
Other metals: Ores and concentrates		1	133	Belgium-Luxembourg 131; France 2.

NA Not available.
[1]Table prepared by H. D. Willis. French Guiana did not report any exports of mineral commodities to the United States during 1990.

TABLE 3

FRENCH GUIANA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS					
Alkali metals		5	36	—	France 4; unspecified 32.
Aluminum:					
Oxides and hydroxides		—	5,035	—	All from Italy.
Metal including alloys:					
Scrap		8	—		
Semimanufactures		129	17,858	—	Italy 7,662; France 7,602; West Germany 945.
Chromium:					
Ore and concentrate	value, thousands	$3	—		
Oxides and hydroxides		2	—		
Cobalt: Metal including alloys, semimanufactures		—	10	—	All from France.
Copper: Metal including alloys, semimanufactures		123	11,293	1	France 9,896; Austria 1,244; Yugoslavia 99.
Gold: Metal including alloys, unwrought and partly wrought	kilograms	r30	—		
Iron and steel: Metal:					
Pig iron, cast iron, related materials		21	2,188	—	All from France.
Ferroalloys: Ferrosilicon	value, thousands	$2	—		
Steel, primary forms		—	2,356	—	All from France.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		395	107,159	—	France 80,954; Belgium-Luxembourg 18,299; Spain 7,257.
Clad, plated, coated		3,125	353,017	—	France 320,083; Spain 31,090; Austria 1,194.
Of alloy steel		314	13,843	6	France 11,131; Belgium-Luxembourg 2,665; Italy 42.
Bars, rods, angles, shapes, sections		7,674	794,018	85	France 336,213; Spain 205,755; Belgium-Luxembourg 103,787.
Rails and accessories		1,353	113,986	—	France 102,720; West Germany 11,261; Italy 5.
Wire		175	15,263	—	Netherlands 6,610; France 5,278; Italy 2,689.
Tubes, pipes, fittings		2,002	300,634	32	France 221,227; Spain 44,730; Italy 22,567.
Lead:					
Oxides	value, thousands	$1	—		
Metal including alloys:					
Unwrought		—	35	—	Martinique 31; France 4.
Semimanufactures		—	12	—	All from France.
Magnesium: Metal including alloys, semimanufactures	value, thousands	$1	—		
Mercury		(2)	46	—	All from France.
Tin: Metal including alloys, semimanufactures		(3)	8	—	Do.
Titanium: Metal including alloys, semimanufactures	value, thousands	$3	—		

See footnotes at end of table.

TABLE 3—Continued

FRENCH GUIANA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS—Continued					
Zinc: Metal including alloys:					
Unwrought		1	—		
Semimanufactures		1	1,322	—	Netherlands 1,287; France 35.
Zirconium: Metal including alloys, semimanufactures		—	7	—	All from Netherlands.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		20	—		
Artificial: Silicon carbide		—	4	—	All from France.
Grinding and polishing wheels and stones		12	1,621	—	France 1,321; Italy 161; Netherlands 42.
Barite and witherite		—	6,300	—	All from France.
Bromine, fluorine, and iodine		—	97	—	Do.
Cement	thousand tons	97	9,945	—	France 5,835; Trinidad and Tobago 1,294; Belgium-Luxembourg 1,240.
Clays, crude:					
Bentonite		52	523	—	All from France.
Kaolin		1	—		
Unspecified		213	220,508	3	France 220,505.
Diamond: Gem, not set or strung	value, thousands	$3	—		
Diatomite and other infusorial earth		6	1,412	—	All from France.
Fertilizer materials:					
Crude, n.e.s.		54	3,906	—	Do.
Manufactured:					
Ammonia		7	1,202	—	Do.
Nitrogenous		759	150,992	—	Netherlands 72,943; France 67,249; Trinidad and Tobago 10,800.
Phosphatic		123	26,331	—	Netherlands 20,000; France 6,331.
Potassic		14	2,450	—	All from France.
Unspecified and mixed		1,064	130,300	—	France 91,380; Netherlands 38,200; West Germany 720.
Gypsum and plaster		21	7,328	—	All from France.
Lime		233	17,806	—	France 16,006; Belgium-Luxembourg 1,800.
Pigments, mineral: Iron oxides and hydroxides, processed		6	399	—	All from France.
Precious and semiprecious stones other than diamond, natural	value, thousands	$21	$18	—	Colombia $7; Brazil $6; France $3.
Salt and brine		444	54,237	—	West Germany 34,695; France 19,536; Guadeloupe 6.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		2	972	—	All from France.
Sulfate, manufactured		—	272	—	Do.
Stone, sand and gravel:					
Dimension stone: Worked		114	6,819	—	France 5,296; Brazil 1,523.
Dolomite, chiefly refractory-grade		195	8,400	—	All from France.

See footnotes at end of table.

TABLE 3—Continued

FRENCH GUIANA: IMPORTS OF MINERAL COMMODITIES[1]

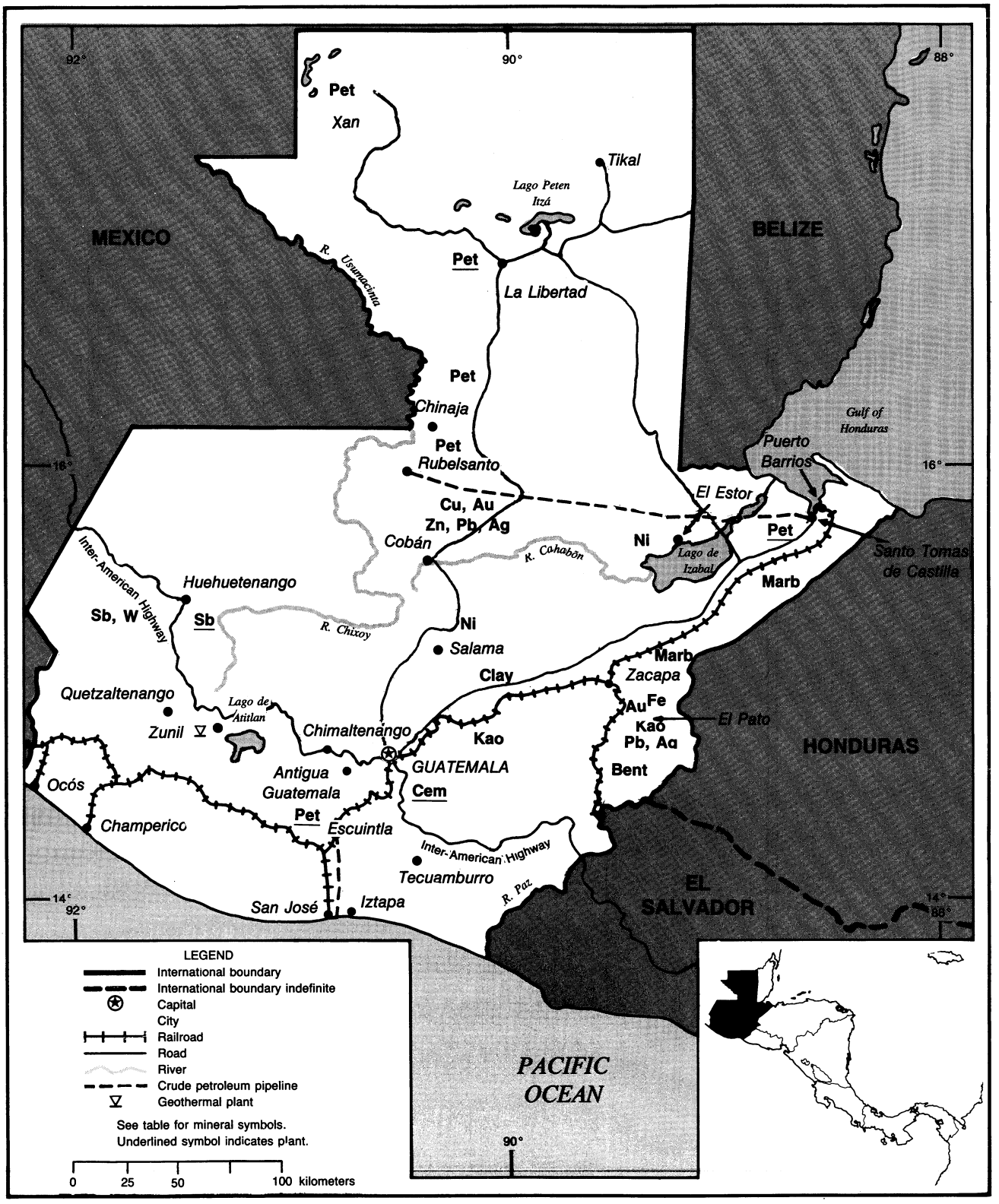
(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued:					
Gravel and crushed rock		9	—		
Sand other than metal-bearing		306	45,478	—	France 43,568; Switzerland 1,910.
Sulfur:					
Elemental:					
Crude including native and byproduct		(4)	52	—	All from France.
Colloidal, precipitated, sublimed		1	107	—	Do.
Sulfuric acid		24	988	—	France 986; Guadeloupe 2.
Other:					
Crude		107	9,184	—	France 6,459; West Germany 2,605; Brazil 120.
Slag and dross, not metal-bearing		5	—		
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		1,888	282,276	—	All from Trinidad and Tobago.
Carbon black		1	50	—	All from Netherlands.
Peat including briquets and litter		6	2,298	—	Belgium-Luxembourg 1,350; France 948.
Petroleum refinery products:					
Liquefied petroleum gas	42-gallon barrels	28,107	4,255,820	1,566	Netherlands Antilles 1,583,122; Venezuela 1,088,985; Trinidad and Tobago 686,755.
Mineral jelly and wax	do.	8	252	—	All from France.
Bitumen and other residues	do.	5,654	1,052,131	—	Trinidad and Tobago 871,301; Ireland 94,536; Belgium-Luxembourg 14,240.
Bituminous mixtures	do.	42	31,700	—	All from France.

[r] Revised.
[1] Table prepared by H. D. Willis.
[2] Quantity not available, valued at $7,000.
[3] Quantity not available, valued at $1,000.
[4] Quantity not available, valued at $1,000.

GUATEMALA

AREA 108,900 km² **POPULATION 9.4 million**



THE MINERAL INDUSTRY OF

GUATEMALA

By Philip M. Mobbs

In terms of value, antimony, feldspar, gold, gypsum, marble, sand and gravel, and silica sand were Guatemala's most notable minerals produced in 1991. The country's most significant mineral deposit, the lateritic nickel near El Estor, was worked from 1977 until 1980, when unfavorable economic conditions resulted in the termination of operations.

Economic policies introduced by the newly elected Guatemalan Government resulted in inflation dropping from 60.6% in 1990 to 9.2% in 1991. The GDP for 1991 was estimated to be $9.29 billion[1] in current U.S. dollars, a 3.2% increase in real terms. Traditional agricultural products, including bananas, cardamon, coffee, cotton, and sugar, dominated the Guatemalan economy, accounting for about 26% of the GDP.

The Government anticipated increased foreign investment in mining and petroleum during 1992. Economic growth could be stimulated by new investment. However, the drought, which began during late 1991, was expected to have a negative effect on the GDP in 1992, principally through the adverse impact on the agriculture sector and the limited availability of hydroelectric-generated power for commercial activity. Also, the proposed privatization of state-owned companies was proceeding more slowly than predicted.

GOVERNMENT POLICIES AND PROGRAMS

There were a number of new policies and programs in 1991. The labor law, promulgated at the beginning of the year, required all departing workers, both involuntary and voluntarily separated, be awarded severance pay based on their length of service. Employee health care was addressed by law 359-91, which effectively required that companies with more than 25 employees provide on-site medical staff for the employees, despite the fact that companies operating in the countryside were required to contribute 6% of payroll to Social Security, which provided basic national medical coverage. Local businesses objected to both of the new laws.

The nation's railroads were designated as a preliminary industry to be privatized. Privatization of fuel importation was also proposed for 1992. Companies were to be empowered to import their own fuel without going through the Government.

The controlling legislation for mining was Decree Law 69-85 of July 12, 1985. Small-scale mining came under Decree Law 55-90 of December 3, 1990. Petroleum activity was covered by the Hydrocarbon Law, Decree Law 109-83, and associated regulations, especially Government Edicts 1034-83 and 203-84.

PRODUCTION

Guatemala's metal output consisted of small amounts of antimony, gold, iron ore, and lead. Various industrial minerals formed the bulk of the country's production. These were primarily for domestic use. Guatemala was Central America's only crude oil producer. Oil production did not change significantly in 1991. *(See table 1.)*

TRADE

Guatemala became the 103d member of the GATT when the Congress ratified the accession protocol in October.

Preliminary data indicated that the United States remained the primary destination for 37% of the $1.202 billion Guatemalan export market in 1991. Petroleum exports to the United States decreased to 1.1 million 42-gallon barrels (Mbbl), down from 1.3 Mbbl in 1990.

The United States supplied 41% of the $1.851 billion Guatemalan imports, followed in importance by Venezuela and Mexico. Imports of crude oil and petroleum products increased in 1991. Guatemala obtained 2.6 Mbbl of reconstituted crude petroleum from Venezuela under the San José Accord. Another 1.7 Mbbl was imported from Ecuador.

STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry, like the overall economy, was dominated by the private sector. *(See table 2.)* For most of the year, the Government's involvement in the mineral sector was limited to promotion of the industry, regulation, and numerous mineral research projects.

COMMODITY REVIEW

Metals

Guatemala was the third largest producer of antimony in Latin America after Bolivia and Mexico. Both antimony ore and concentrate were produced from the Anabella, Los Liros, and Clavito Mines at Ixtahuacán, near the western border. Output was exported mainly to France, Japan, and the United States.

The Government pursued several projects with funding from the United Nations Revolving Fund for Natural

Resources Exploration (UNRFNRE). The UNRFNRE technical report on the El Pato-El Poxte gold project was scheduled to be available early in 1992. The Government of Guatemala was expected to open bidding on the El Pato-El Poxte concession during mid-1992. UNRFNRE-sponsored work at the Quebradas alluvial gold project continued into 1991.

The area covered under the Trinational Development Plan (Trifino) consisted of 3,392 km^2 in Guatemala and 4,192 km^2 in El Salvador and Honduras. Security and funding problems have limited the implementation of the plan.

At yearend, Inco transferred 30% of its interest in Exploraciones y Explotaciones Mineras Izabal, S.A. (Exmibal) to the Government.

Industrial Minerals

Cement, ceramics, construction, and glass industries were the country's leading users of industrial minerals. Cement, clays, feldspar, gypsum, lime, and sand and gravel were primarily produced for the local market.

Mineral Fuels

In April, the Government sponsored a seminar in Dallas, Texas, to acquaint the U.S. industry with exploration opportunities in Guatemala. During June, Guatemala and Venezuela signed an oil exploration agreement. Venezuela was scheduled to begin a 5-year exploration program during 1992. In October, the Government offered a number of oil exploration concessions for bidding and proposed to continue concession sales as demand warranted. Changes made in contracting procedures were designed to allow for more rapid contract signing. Also introduced in 1991 was a seismic option, which was to allow companies to obtain a concession and run seismic lines, without incurring the obligation to drill.

Crude oil production in Guatemala reached 1.35 Mbbl of which 1.06 Mbbl were exported through the port of Santo Tomás de Castilla on the Caribbean Sea.

Shell Guatemala, a subsidiary of N.V. Koninklijke Nederlandsche Petroleum Maatschappij and the Shell Transport and Trading Co., plc group, was exploring the Amatique Basin in Izabal Department.

Basic Resources International S.A., a Bahamian company, and Pan Petroleum were exploring in the Petén Department. Basic was the only company producing crude oil in Guatemala during 1991. Basic had bought out Repsol S.A.'s interest in the Caribe, Chinaja, and Rubelsanto Fields prior to 1991. Basic's 2,000-bbl/d refinery, 35 km from Santa Elena, in the El Naranjo region of the Department of Petén, was designed to process crude oil produced from the Xan Field. Initial startup has been extended to optimize operating procedures.

Deterrents to mineral operations in the north continued to be the lack of infrastructure and the threat of guerilla activity. The northern oil pipeline was reportedly attacked 17 times during the year.

INFRASTRUCTURE

Fuel wood satisfied more than 60% of Guatemala's energy needs, while petroleum products fulfilled an additional 30% of energy demand.

Electrical power accounted for only 4% of the nation's energy usage. The country had an installed generating capacity of 819 MW. Hydroelectric facilities, primarily the Chixoy plant, accounted for about 60% of this capacity. With the exception of the small 15-MW geothermal powerplant at Zunil, the remainder of the nation's electricity was generated by thermal plants.

Electrical energy was curtailed for up to 9 h/d in the capital during September and October as a consequence of the drought and resulting low level of water behind the hydroelectric dams. An increased reliance on thermal facilities during the rationing crisis escalated the country's dependence on imported petroleum. A new 45-MW electrical generator was purchased during the year and is to be on-line by early 1992.

The 1988 National Electrification Plan proposed an additional 252-MW of electrical generating capacity from hydroelectrical plants to be built on the Bobos, Grande, Samalá, and Serchil Rivers and geothermal plants at Zunil or Amatitlán with 55-MW electrical generating capacity. Exploration and feasibility studies shifted from Zunil to the Amatitlán geothermal field.

At the beginning of the year, there was 870 km of narrow-gauge railroad in southern Guatemala, of which almost 90% was state-maintained. The country's 26,400-km road network was also concentrated in the southern part of the country.

A 12,000-bbl/d capacity crude oil pipeline ran from the Rubelsanto Field to Santo Tomás de Castilla, a distance of 235 km. A 48-km pipeline ran between San José and the Texaco refinery at Esquintla.

Puerto Barrios and Santo Tomás de Castilla, 5 km southwest of Puerto Barrios, formed the country's major port complex on the Atlantic coast. San José and the adjacent Puerto Quetzal were the country's major ports on the Pacific coast. The country also had 260 km of inland waterways available for year-round traffic.

The Government was considering major improvements for Santo Tomás de Castilla, including a new 224-m petroleum loading dock.

OUTLOOK

Mining activity should continue to grow. Industrial mineral production may increase slightly if the construction industry persuades the Government to lower interest rates for new construction using funds generated by the 20% tax on housing construction. Peace talks between the Government and the guerrilla organization, Unidad Revolucionaria Nacional Guatemalteca (URNG), began in April. Until peace terms are agreed upon, physical security problems in the northern part of the country are expected to continue to plague mineral exploration and production. The lack of infrastructure will also need to be addressed.

[1]Where necessary, values have been converted from Guatemalan quetzals (Q) to U.S. dollars, at the rate of 5.06Q=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Ministerio de Energía y Minas
Diagonal 17, entre 20 y 30 Calles,
Zona 11
Guatemala City, Guatemala
Telephone: (502) (2) 76-0679 or 76-3091

Dirección General de Minería
Diagonal 17, 29-78, Zona 11
Guatemala City, Guatemala

Dirección General de Hidrocarburos
Diagonal 17, 29-78, Zona 11
Guatemala City, Guatemala
Telephone: (502) (2) 76-2044
Facimile: (502) (2) 76-3175

Publications

Instituto Latinoamericano Del Fierro y el Acero (ILAFA), Santiago, Chile: Anuario Estadístico de la Siderurgia y Minería del Hierro de America Latina, annual.

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TABLE 1

GUATEMALA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
METALS						
Antimony:						
Mine output, Sb content		1,758	1,335	1,348	e1,050	609
Trioxide		—	—	—	—	41
Gold	kilograms	—	—	48	62	31
Iron and steel:						
Iron ore, gross weight		10,724	8,092	6,541	6,370	5,103
Steel, crude		20,700	22,400	22,460	e22,000	e20,000
Steel, semimanufactures		43,422	50,400	49,401	e45,000	e45,000
Lead metal including secondary		100	70	149	109	28
INDUSTRIAL MINERALS						
Barite		1,202	5,064	3,995	421	—
Cement	thousand tons	r692	r802	r873	r889	e900
Clay:						
Bentonite		24,782	973	8,236	e5,000	12,000
Kaolin		1,880	3,459	2,573	2,050	3,281
Unspecified		1,468	3,667	3,200	1,260	1,639
Feldspar		7,669	8,959	7,000	11,895	6,961
Gypsum		51,495	34,448	57,268	65,560	51,519
Lime		79,418	71,306	79,359	e75,000	e70,000
Pumice and related materials:						
Pumice	cubic meters	24,305	22,843	100	e5,000	6,132
Volcanic ash	do.	2,446	2,500	2,400	e2,400	e2,400
Volcanic sand		73,435	75,000	137,000	110,125	e100,000
Volcanic scoria	cubic meters	—	—	—	2,275	e2,000
Volcanic tufa		—	—	596	610	2,476
Salt		37,088	42,184	63,063	108,720	e100,000
Stone, sand and gravel:						
Dolomite		8,824	3,909	10,947	14,900	8,318
Limestone	thousand tons	1,180	1,247	1,460	1,415	e1,000
Marble:						
Block		3,578	6,725	17,821	16,839	e17,000
Chips and fragments		8,709	7,808	9,389	8,260	1,851
Sand and gravel	thousand tons	957	952	865	1,088	1,033
Schist		223,500	254,940	292,000	260,000	e250,000
Silica sand		30,665	32,665	31,000	e30,000	17,300
Stone, crushed	thousand tons	1,014	1,236	1,414	e1,300	e1,000
Talc		1,114	616	650	545	861
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural, gross[e]	thousand cubic meters	[2]16,990	16,990	9,282	10,000	12,000
Petroleum:						
Crude	thousand 42-gallon barrels	1,327	1,248	1,328	1,439	1,352
Refinery products	do.	4,480	4,504	4,249	e4,000	4,639

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

[1]Table includes data available through Sept. 21, 1992.

[2]Reported figure.

TABLE 2
GUATEMALA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	Destinations, 1987	
		United States	Other (principal)
METALS			
Aluminum:			
Oxides and hydroxides	23	—	All to El Salvador.
Metal including alloys:			
Unwrought	117	73	Netherlands 44.
Semimanufactures	92	20	El Salvador 66; Nicaragua 2.
Beryllium: Metal including alloys, all forms	5	—	All to El Salvador.
Copper:			
Matte and speiss including cement copper	20	20	
Metal including alloys, semimanufactures	57	40	Mexico 12; Honduras 5.
Iron and steel:			
Iron ore and concentrate	2,489	1,208	El Salvador 593; Japan 306.
Metal:			
Scrap	651	—	All to El Salvador.
Pig iron, cast iron, related materials	2	—	Do.
Steel, primary forms	27	—	Do.
Semimanufactures:			
Bars, rods, angles, shapes, sections	3,145	—	El Salvador 3,117; Honduras 21; Belize 5.
Universals, plates, sheets	402	—	El Salvador 210; Honduras 188; Belize 3.
Hoop and strip	290	—	Mainly to Honduras.
Wire	427	—	El Salvador 409; Honduras 18.
Tubes, pipes, fittings	35,498	2,191	El Salvador 31,930; Ecuador 692.
Nickel: Metal including alloys, semimanufactures	20	—	All to El Salvador.
Tin: Metal including alloys, semimanufactures	2	—	Do.
Titanium: Oxides value, thousands	$1	—	All to Costa Rica.
Zinc: Oxides	1	—	All to El Salvador.
Other:			
Oxides and hydroxides	7	—	Do.
Ashes and residues	140	—	Netherlands 84; West Germany 20; United Kingdom 17.
Base metals including alloys, all forms	185	124	Japan 61.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc.	3,677	682	El Salvador 1,351; Costa Rica 1,143.
Grinding and polishing wheels and stones value, thousands	$1	—	All to El Salvador.
Asbestos, crude	2	—	Do.
Barite and witherite	248	—	All to Costa Rica.
Bromine, fluorine and iodine	31	—	Mainly to El Salvador.
Cement	189	—	All to El Salvador.
Chalk	220	—	Do.
Clays, crude	4,347	—	El Salvador 3,636; Costa Rica 474; Panama 236.
Diamond, natural: Gem, not set or strung value, thousands	$41	$21	Unspecified $20.

See footnotes at end of table.

TABLE 2—Continued

GUATEMALA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	Destinations, 1987	
		United States	Other (principal)
INDUSTRIAL MINERALS—Continued			
Diatomite and other infusorial earth	52	—	Honduras 35; El Salvador 17.
Feldspar, fluorspar, related materials	3,946	—	Costa Rica 3,674; El Salvador 212; Nicaragua 60.
Fertilizer materials: Manufactured:			
Ammonia	12	—	All to El Salvador.
Nitrogenous	86	—	El Salvador 66; Honduras 20.
Potassic	181	—	All to El Salvador.
Unspecified and mixed	177	40	Costa Rica 86; Dominican Republic 25.
Graphite, natural	5	—	Honduras 3; Costa Rica 2.
Gypsum and plaster	33,186	—	El Salvador 31,906; Costa Rica 1,164; Panama 116.
Lime	1,180	—	El Salvador 1,159; Honduras 20.
Phosphates, crude	20	—	All to El Salvador.
Pigments, mineral: Iron oxides and hydroxides, processed	5	—	Do.
Potassium salts, crude	73	—	All to Belize.
Salt and brine	20	—	All to Costa Rica.
Sodium compounds, n.e.s.:			
Soda ash, manufactured	1,015	—	El Salvador 470; Panama 415; Belize 89.
Sulfate, manufactured	5	—	All to El Salvador.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	4,940	218	El Salvador 2,211; Colombia 837; Japan 741.
Worked	1,008	386	El Salvador 564; Japan 47.
Dolomite, chiefly refractory-grade	4,968	—	Costa Rica 4,514; El Salvador 412; Honduras 41.
Gravel and crushed rock	817	—	El Salvador 812; Dominican Republic 5.
Limestone other than dimension	20	—	All to Costa Rica.
Quartz and quartzite	25	—	Do.
Sand other than metal-bearing	606	—	El Salvador 600; Costa Rica 6.
Talc, steatite, soapstone, pyrophyllite	482	—	El Salvador 296; Costa Rica 154; Panama 18.
Other: Crude	9,084	20	El Salvador 8,864; Panama 186.
MINERAL FUELS AND RELATED MATERIALS			
Carbon: Carbon black	1	—	All to El Salvador.
Coke and semicoke	22	—	All to Nicaragua.
Petroleum:			
Crude thousand 42-gallon barrels	1,300	1,300	
Refinery products:			
Liquefied petroleum gas 42-gallon barrels	93	—	Mainly to El Salvador.
Gasoline do.	1,275	—	El Salvador 986; Belize 119; Costa Rica 110.
Mineral jelly and wax do.	181	—	Mainly to El Salvador.
Lubricants do.	1,344	—	El Salvador 980; Costa Rica 357; Honduras 7.
Bituminous mixtures do.	61	—	Costa Rica 42; El Salvador 18.

[1]Table prepared by H. D. Willis. Export data for 1988-90 were not available at time of publication.

TABLE 3

GUATEMALA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	Sources, 1987	
		United States	Other (principal)
METALS			
Aluminum:			
Oxides and hydroxides	133	48	West Germany 28; United Kingdom 19.
Metal including alloys:			
Unwrought	446	—	Canada 201; Netherlands 199; Mexico 46.
Semimanufactures	21,410	19,377	El Salvador 950; Mexico 283.
Chromium: Oxides and hydroxides	4	3	Mexico 1.
Cobalt: Oxides and hydroxides value, thousands	$4	—	All from West Germany.
Copper:			
Matte and speiss including cement copper	25	(2)	Mainly from Mexico.
Metal including alloys:			
Unwrought	2	2	
Semimanufactures	751	134	El Salvador 267; Mexico 249.
Gold: Metal including alloys, unwrought and partly wrought kilograms	11	—	All from Canada.
Iron and steel:			
Iron ore and concentrate	52	35	Canada 5; United Kingdom 5.
Metal:			
Scrap	4,937	4,888	Nicaragua 3; Mexico 2.
Pig iron, cast iron, related materials	6	2	Mexico 2; West Germany 1.
Ferroalloys: Ferromanganese	313	2	Brazil 260; Mexico 51.
Steel, primary forms	39,054	3,896	Mexico 9,044; Venezuela 8,067; Chile 5,072.
Semimanufactures:			
Bars, rods, angles, shapes, sections	29,806	2,428	Brazil 7,135; Republic of Korea 4,714; Mexico 4,478.
Universals, plates, sheets	48,472	505	West Germany 9,837; Japan 7,473; Republic of Korea 7,366.
Hoop and strip	2,244	49	United Kingdom 501; West Germany 346; Brazil 281.
Wire	1,949	894	Mexico 373; Republic of Korea 327.
Tubes, pipes, fittings	2,377	824	Mexico 782; Japan 245.
Castings and forgings, rough	167	3	Belgium-Luxembourg 164.
Lead:			
Oxides	345	—	Mexico 333; Costa Rica 10.
Metal including alloys:			
Unwrought	72	(2)	Mainly from Mexico.
Semimanufactures	290	2	Mexico 260; Peru 27.
Magnesium: Metal including alloys, unwrought value, thousands	$1	NA	NA.
Manganese: Oxides	1,179	121	Mexico 596; West Germany 208; Gabon 153.
Mercury kilograms	21,000	1,000	Nicaragua 19,000; West Germany 1,000.
Molybdenum: Metal including alloys, unwrought value, thousands	$1	$1	
Nickel: Metal including alloys:			
Unwrought	1	—	All from Mexico.
Semimanufactures	10	1	Canada 3; West Germany 3; Mexico 3.

See footnotes at end of table.

TABLE 3—Continued

GUATEMALA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	Sources, 1987	
		United States	Other (principal)
METALS—Continued			
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$3	$3	
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$12	$6	Panama $4; Mexico $2.
Tin: Metal including alloys:			
Unwrought	6	(2)	Mexico 2; United Kingdom 2.
Semimanufactures	32	4	Canada 11; Mexico 1; unspecified 16.
Titanium: Oxides	848	76	Belgium-Luxembourg 226; Mexico 222; United Kingdom 164.
Zinc:			
Oxides	195	20	Mexico 62; West Germany 38; Netherlands 27.
Metal including alloys:			
Unwrought	2,823	20	Mexico 1,394; Canada 571; Belgium-Luxembourg 382.
Semimanufactures	132	6	Mexico 106; Costa Rica 20.
Other:			
Oxides and hydroxides	65	31	West Germany 14; Mexico 14.
Ashes and residues	1	1	
Base metals including alloys, all forms	18	11	Netherlands 2; West Germany 1.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc.	11	3	Canada 3; Mexico 3.
Grinding and polishing wheels and stones	143	26	Brazil 44; West Germany 19.
Asbestos, crude	80	6	Italy 47; Canada 27.
Barite and witherite value, thousands	$1	—	All from Mexico.
Boron materials: Oxides and acids	21	9	Argentina 4; Venezuela 4.
Bromine, fluorine and iodine	426	161	Mexico 191; Costa Rica 38.
Cement	108	10	Italy 23; Mexico 23; France 13.
Chalk	25	—	All from France.
Clays, crude	2,722	2,499	Mexico 208; Spain 8.
Diamond, natural: Gem, not set or strung value, thousands	$9	$4	West Germany $5.
Diatomite and other infusorial earth	289	25	Mexico 263.
Feldspar, fluorspar, related materials	2	—	All from Spain.
Fertilizer materials: Manufactured:			
Ammonia	3,229	59	Mexico 3,169; France 1.
Nitrogenous	21,193	122	West Germany 15,330; Belgium-Luxembourg 5,500; Mexico 240.
Phosphatic	42,370	26,934	Romania 12,000; Italy 3,414.
Potassic	4	4	
Unspecified and mixed	27,646	3,419	Norway 17,359; West Germany 5,520.
Graphite, natural	18	3	Mexico 12; Italy 3.
Gypsum and plaster	15	9	Mexico 6.
Lime	1,680	147	Mexico 1,448; Belgium-Luxembourg 84.
Magnesium compounds: Magnesite, crude	258	3	Mexico 205; France 30; Norway 11.

See footnotes at end of table.

TABLE 3—Continued

GUATEMALA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	Sources, 1987	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Mica:				
Crude including splittings and waste		16	16	
Worked including agglomerated splittings	value, thousands	$4	—	All from West Germany.
Nitrates, crude		294,514	10,853	Mexico 113,727; Venezuela 65,042; U.S.S.R. 32,978.
Phosphates, crude	value, thousands	$6	$6	
Pigments, mineral: Iron oxides and hydroxides, processed		120	7	West Germany 47; Spain 26; Canada 19.
Potassium salts, crude		16,804	1,618	Canada 15,129; Israel 50.
Precious and semiprecious stones other than diamond: Synthetic	value, thousands	$17	$1	Austria $14; unspecified $2.
Salt and brine		594	69	Mexico 471; Nicaragua 35.
Sodium compounds, n.e.s.:				
Soda ash, manufactured		9,268	5,022	Belgium-Luxembourg 1,087; West Germany 1,055.
Sulfate, manufactured		9,187	480	Mexico 2,397; Romania 2,000; West Germany 1,477.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		125	24	Mexico 98.
Worked		32	1	El Salvador 18; Mexico 10.
Dolomite, chiefly refractory-grade		211	80	Mexico 131; West Germany 1.
Limestone other than dimension	value, thousands	$8	—	All from Switzerland.
Sand other than metal-bearing		40	30	Mexico 8; Spain 1.
Sulfur:				
Elemental:				
Crude including native and byproduct		5,154	642	Mexico 4,250; West Germany 232.
Colloidal, precipitated, sublimed		325	31	Colombia 242; West Germany 45.
Sulfuric acid		2,188	772	El Salvador 868; Mexico 369.
Talc, steatite, soapstone, pyrophyllite		197	122	China 61; West Germany 12.
Other: Crude		188	187	West Germany 1.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		6,293	5,451	El Salvador 736; Mexico 106.
Carbon: Carbon black		1,842	15	Venezuela 1,377; Mexico 197; Belgium-Luxembourg 112.
Coal: Anthracite		476	476	
Coke and semicoke		436	432	Mexico 4.
Peat including briquets and litter		3	—	All from Costa Rica.
Petroleum:				
Crude	42-gallon barrels	3,681,244	22	Venezuela 1,935,327; Mexico 1,745,865.
Refinery products:				
Liquefied petroleum gas	do.	853,400	348,592	Venezuela 462,585; Mexico 25,508.
Gasoline	do.	3,343,568	3,015,010	Jamaica 36,720; Mexico 9,707.
Mineral jelly and wax	do.	53,319	8,256	West Germany 36,965; Japan 4,934.
Lubricants	do.	448	196	Mexico 140; Costa Rica 63.
Bitumen and other residues	do.	16,592	16,592	
Bituminous mixtures	do.	497	61	Mexico 412; Colombia 18.

NA Not available.

[1]Table prepared by H. D. Willis. Import data for 1988-90 were not available at time of publication.

[2]Less than 1/2 unit.

TABLE 4

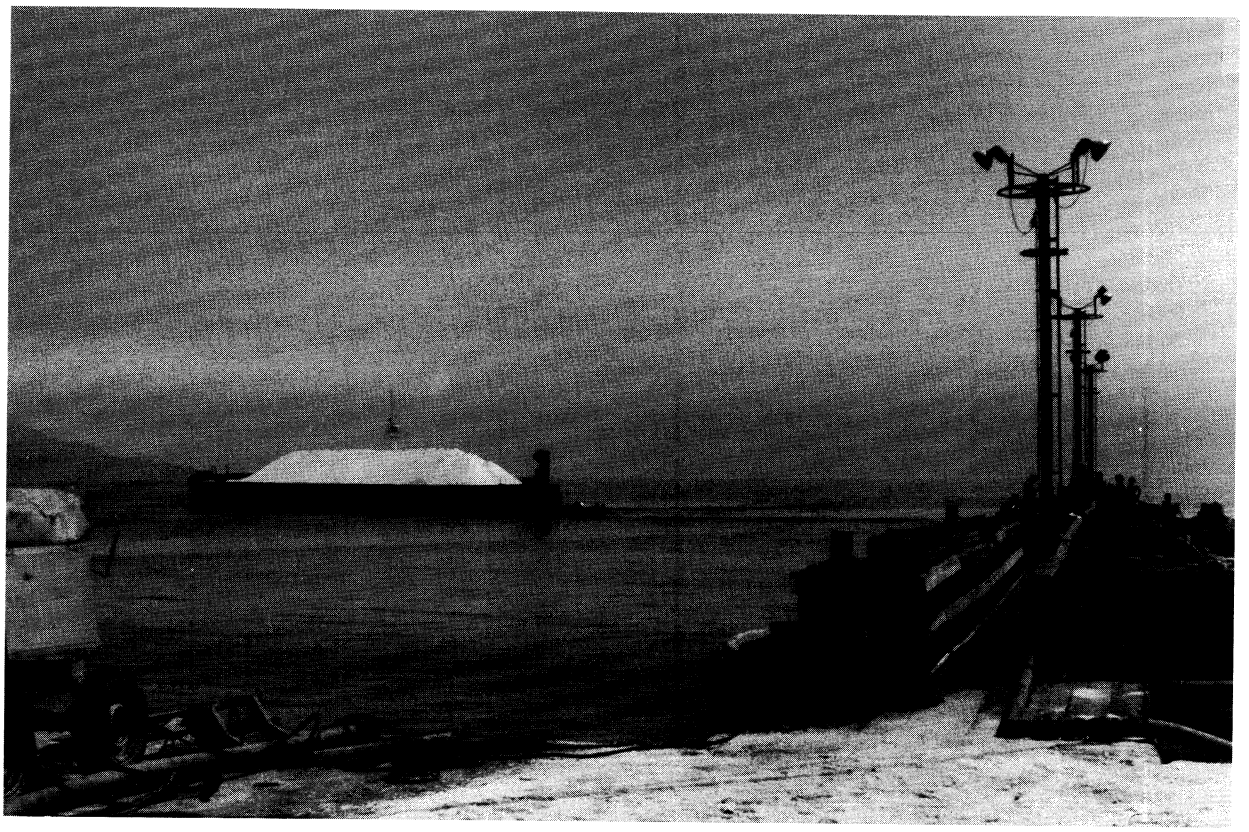
GUATEMALA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity		Major operating company and major equity owners	Location of main facilities	Annual capacity
Antimony		Minas de Guatemala S.A. (private, 100%)	Los Liros and Anabella Mines, Ixtahuacan, Huehueango Department	1
Cement		Cementos Progresso S.A. (Lambert Freres et Cie, 69.8%; others, 30.2%)	San Miguel Plant, Sanarate, El Progresso Department and La Pedrera Plant, Guatemala City	1,800
Nickel		Exploraciones y Explotaciones Mineras Izabal, S.A. (Exmibal) (Inco, 70%; and Government, 30%)[1]	Mine and processing plant near El Estor, Izabal Department[2]	9
Iron and steel		Hornos S.A.	Guatemala City	36
Petroleum:				
Crude	thousand 42-gallon barrels	Basic Resources International S.A. (Basic) (private, 100%)	Rubelsanto, West Chinaja, Fields, Alta Verapaz Department and Caribe, Tierra Blanca, and Xan Fields, Petén Department	2,000
Products	do.	Texas Petroleum Co. (Texaco Inc., 100%)	Refinery at Escuintla, Escuintla Department	6,200
do.	do.	Basic (private, 100%)	Refinery near Santa Elena, El Naranjo, Petén Department[3]	720

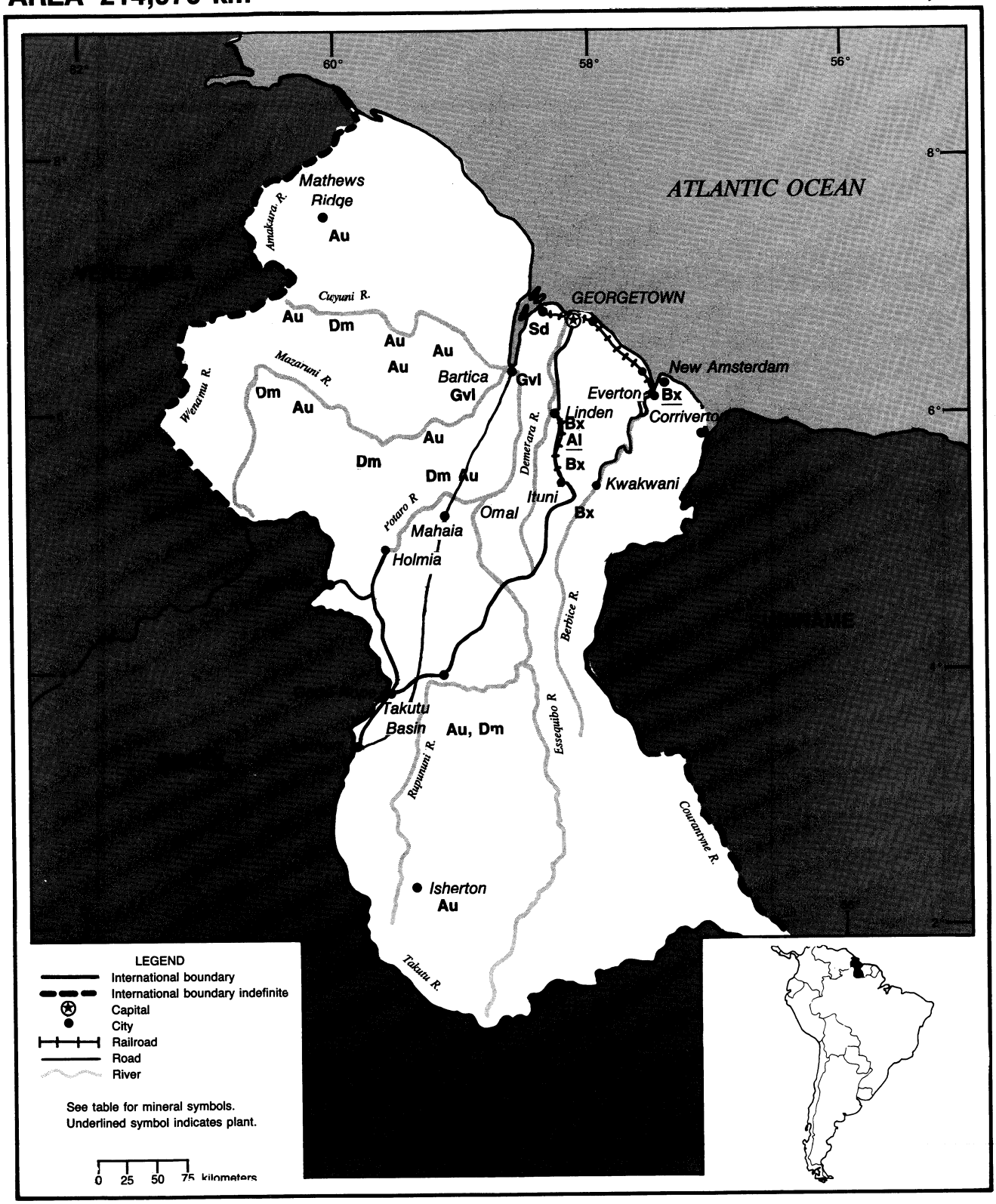
[1]Ownership equity change in 1991.
[2]Mine and processing plant closed Sept. 1980.
[3]Construction complete. Undergoing startup trials.

MEXICO: TRANSPORT OF SOLAR SALT BY BARGE TO CEDROS ISLAND SHIPPING TERMINAL, BAJA CALIFORNIA SUR. (PHOTO BY D. KOSTICK)



GUYANA

AREA 214,970 km² **POPULATION 802,000**



THE MINERAL INDUSTRY OF

GUYANA

By Philip M. Mobbs

Guyana ranked 11th in the world in bauxite production in 1991, yielding slightly more than 2% of the world's bauxite output. Within Latin America, the country was the fourth largest bauxite producer, after Brazil, Jamaica, and Suriname.

Diamonds and gold have been recovered in Guyana for more than 100 years. The recently renewed international interest in the country's minerals has generated a minor diamond and gold rush. The intensive exploration activity was expected to result in significantly larger gold production as early as 1993.

The Cooperative Republic of Guyana's economy finally made the expected rebound in response to the Government's Economic Recovery Program. The reforms included the reduction of the Government's role in the economy, the promotion of foreign investment, and the sale of Government-owned businesses. Real GDP posted a 6% growth rate in 1991, as the nominal GDP rose from $313 million in 1990 to $330 million in 1991. This was significantly better than the negative GDP growth rate of the 1988-90 period. The reversal was attributed to the production surge of the key export industries of rice and sugar and, to a lesser extent, the increased output of the bauxite, gold, and timber industries. Bauxite and gold accounted for almost 40% of the country's exports. During 1991, the United States, acting under the Enterprise for the Americas Initiative, wrote off $113 million of Guyana's bilateral debt. Also during the year, the Guyana Government eliminated the official exchange rate of 45 Guyanese dollars per 1 U.S. dollar in favor of the parallel free market rate of 101.75 Guyanese dollars per 1 U.S. dollar.

The year ended with the indefinite postponement of the nation's general elections.

GOVERNMENT POLICIES AND PROGRAMS

The Guyanese Government encouraged foreign investment. While joint ventures were preferred, 100% foreign ownership of Guyanese operations was allowed. The Government continued to pave the way for privatization of state companies.

All mineral rights were vested in the state. Mineral concessions were negotiated with Government agencies such as the Bauxite Industry Development Co. Ltd. (BIDCO) (bauxite), the Guyana Geology and Mines Commission (gold and diamonds), and the Guyana Natural Resources Agency (oil). The Guyana Gold Board was the sole official buyer of unprocessed gold. Environmental review of new projects was the responsibility of the Guyana Agency for Health Sciences Education, Environment, and Food Policy.

Mining regulations authorize exploration concessions ranging up to 52 km^2 per concession. The concessions, called Exclusive Permissions, could be issued for up to 5 years. Private-sector exploitation projects were carried out by Guyanese subsidiaries of international companies.

PRODUCTION

Bauxite production continued to recover from the 3-year decline posted during 1988-90, aided in part by the startup of the Aroaima Mine.

Declared gold production increased significantly. The amount declared (sold to the Gold Board) was estimated to be only 5% to 20% of the total gold mined. Miners had traditionally smuggled gold into Brazil or Venezuela and sold it for U.S. dollars, which were traded illegally for Guyana dollars at the higher exchange rates available at foreign exchange houses. During 1990, the Gold Board began paying miners on a scale based on the exchange house rate rather than the official rate, thus reducing the attractiveness of smuggling. *(See table 1.)*

TRADE

Guyana's major export commodities were bauxite, gold, and sugar. Sugar was the country's major export in 1991. Total imports of $252 million were not offset by total exports, which reached $239 million in 1991. The United States accounted for approximately 34% of Guyana's imports, primarily machinery, motor vehicles, steel goods, and wheat. The United States also garnered 35% of Guyana's exports, especially bauxite, gold, and shrimp. Approximately one-fourth of the value of official Guyanese imports was petroleum from Venezuela.

The country's parallel economy was about as large as the official economy. It consisted primarily of consumer goods shipped in from expatriates or funded by illegal gold sales. Little of the revenue generated from gold extraction entered the official economy.

STRUCTURE OF THE MINERAL INDUSTRY

The entire bauxite industry was overseen by BIDCO. Bauxite mining and processing were done by the BIDCO subsidiary, Guyana Mining Enterprise Ltd. (Guymine), or under contract to Guymine. Several foreign companies

were actively involved in the bauxite industry, including subsidiaries of the U.S. firms Reynolds International and Green Construction Inc., Alcan Aluminum Ltd. of Canada, and C.A. Dayco of Venezuela.

While the domestic private sector dominated the production of gold and diamonds during 1991, the participation of international companies was expected to mushroom in the near future.

Local subsidiaries of private foreign firms carried out petroleum exploration, both offshore and onshore. *(See table 2.)*

COMMODITY REVIEW

Metals

Bauxite.—Bauxite production rebounded to 1987 levels. Aroaima Bauxite Co., the Guymine and Reynolds International joint venture, reached its 1.5-Mmt/a production capacity during the first year of operations. The company's two mining sites provide bauxite to Clarendon Ltd.'s Vialco refineries on St. Croix, U.S. Virgin Islands, and at Burnside, Louisiana. Additional product was shipped to Reynold's Corpus Christi, Texas, refinery.

Guymine investigated the possibility of having a contractor prepare its Linden operations for privatization.

Gold.—Most gold and diamond mining during 1991 involved small-scale river dredging operations. There were several new major gold projects under way.

The Canadian firms Cambior and Golden Star Resources signed a mineral agreement with the Government concerning the Omai gold project. The Omai open pit mine, expected to open in early 1993, was projected to initially recover 7,800 kg/a of gold.

Besides Omai, Golden Star worked three additional Exclusive Permissions at the placer deposit near Mahdia. This exploration culminated in the submission of both a feasibility study and an environmental impact statement to the Government in 1991.

South American Goldfields Inc. continued field work at Akaiwong and Peter's Mine, properties originally part of a defunct joint venture with Homestake International Minerals Ltd. South American Goldfields also continued work on Quartz Hill and Five Stars, sites formerly included in the joint venture with Denison Mines Guyana Ltd. Work on Dazier Creek and West Kaburi was terminated during 1991. During the year, Denison restructured its Aurora Prospect joint venture with South American Goldfields. Additional drilling at Aurora was planned for 1992.

Sutton Resources Ltd. of Vancouver, British Columbia, worked on its 55-km^2 prospecting license in southern Guyana. Work during the year included mapping, sampling, and startup of drilling on the Marundi Mountain and Mazoa Hill areas.

The Guyana Gold and Diamond Association, the country's miners' association, agreed on a new system for pricing the gold bought by the Government. The Association projected that gold sold to the Gold Board would exceed 3,100 kg in 1992. The Gold Board announced a more modest projection of 2,500 kg of declared gold. *(See figure 1.)*

Industrial Minerals

Guyana's declared diamond production has been less than 10,000 carats/a since 1985. Production was from numerous small operations along the country's rivers and streams, especially along the Mazaruni and Potaro Rivers in western Guyana.

South American Goldfields was expected to exercise its option to acquire 65% interest in Golden Star's four-concession Mazaruni Project. During 1991, Golden Star proceeded with bulk sampling in the Eping River and Red Hill Loop areas along the Mazaruni River. The company installed a 1.5-m^3/h concentrating plant in the Eping River area in May. Recovery from the deposits was reportedly inverse of the traditional ratio of 60% industrial quality and 40% gem-quality stones.

Mineral Fuels

There were four oil concession holders in 1991. Guyana Hunt Oil Co. held a petroleum prospecting license for the Takutu Basin, where a well was planned for late 1992. London and Scottish Marine Oil Co. (LASMO) and Broken Hill Proprietary (BHP) of Australia continued exploratory operations on their offshore concession. TOTAL Compagnie Française des Pétroles S.A., Guyana Exploration Ltd., and Petrel Petroleum Corp. were exploring their offshore concession. The U.S. firm, Mobil Corp., also began exploratory work on an offshore concession.

INFRASTRUCTURE

Guyana's problems in maintaining its infrastructure severely limited the country's economic activity. Many remote mining areas relied mainly on barges, helicopters, light aircraft, and riverboats for movement of material. Guyana has 6,000 km of navigable waterways. The railroad connecting the Linden bauxite mines to the Linden plant was part of the country's 187 km of track. There were also 7,665 km of roads, mostly gravel or dirt.

The country had 221 MW of total installed electrical generating capacity, which included the Guyana Electricity Co. (GEC), Guymine, the Guyana Sugar Corp., and the Guyana Rice Export Board powerplants. About one-half of the oil imported from Venezuela was used by the bauxite industry. The lack of a reliable supply of electricity in and around Georgetown prompted many businesses to import small diesel-operated generators, increasing the total fuel demand.

Negotiations to privatize the country's electric utility stalled. Leucadia Corp. of Salt Lake City, Utah, had been expected to acquire 60% of GEC during the year. The Inter-American Development Bank approved $15.5 million of funding toward a $17.3 million rehabilitation of GEC's generation facilities. The project will also address transmission system

shortcomings and the spare parts shortage.

OUTLOOK

The expected increase in bauxite production with the opening of new bauxite mines is a key element of the Government's economic planning. The Government is involved in planning for the privatization of the bauxite industry within the next 2 years.

The Gold Board forecast that declared gold would continue to increase. The intensive internationally funded exploration activity is expected to result in significantly greater gold production. The output from the large-scale gold operations, such as the Omai Prospect, will significantly boost the nation's economy.

The rehabilitation of the nation's electrical system is expected to significantly improve the economy's outlook.

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[1]Where necessary, values have been converted from Guyanese dollars (G$) to U.S. dollars at the average exchange rate of G$116=U.S.$1.00.

OTIIER SOURCES OF INFORMATION

Agencies

Bauxite Industry Development Co. Ltd.
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Georgetown, Guyana
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Guyana Mining Enterprises Ltd. (Guymine)
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Mackenzie, Linden, Guyana
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Guyana Natural Resources Agency
41 Brickdam and Boyle Place
Stabroek
Georgetown, Guyana
Telephone: (592) 2-66549
Fax: (592) 2-71211

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American Embassy, Georgetown:
Minerals Questionnaire, annual.

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Mineral Resources of Guyana, 1985, 14 pp.

International Bauxite Association: IBA
Quarterly Review, quarterly.

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International Trade Administration:
Foreign Economic Trends and Their
Implications for the United States,
Guyana, annual.

TABLE 1
GUYANA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		1987	1988	1989	1990	1991
Aluminum: Bauxite, dry equivalent, gross weight	thousand metric tons	2,200	1,339	1,321	r1,424	2,204
Diamonds[3]	carats	7,420	4,242	7,842	r17,842	18,189
Gold, mine output, Au content[e]	kilograms	r5,600	r7,000	r9,000	r10,000	11,000
Stone, crushed	metric tons	r,e23,800	34,528	37,820	e42,000	e45,000

eEstimated. rRevised.
[1]Includes data available through July 16, 1992.
[2]In addition to the commodities listed, a variety of crude construction materials (common clays, gravel, and sand) were also produced. Available information was inadequate to make an estimate of production.
[3]Quantity of produced stones: 1987—59,901; 1988—36,707; 1989—66,377; 1990—145,655; and 1991—140,300.

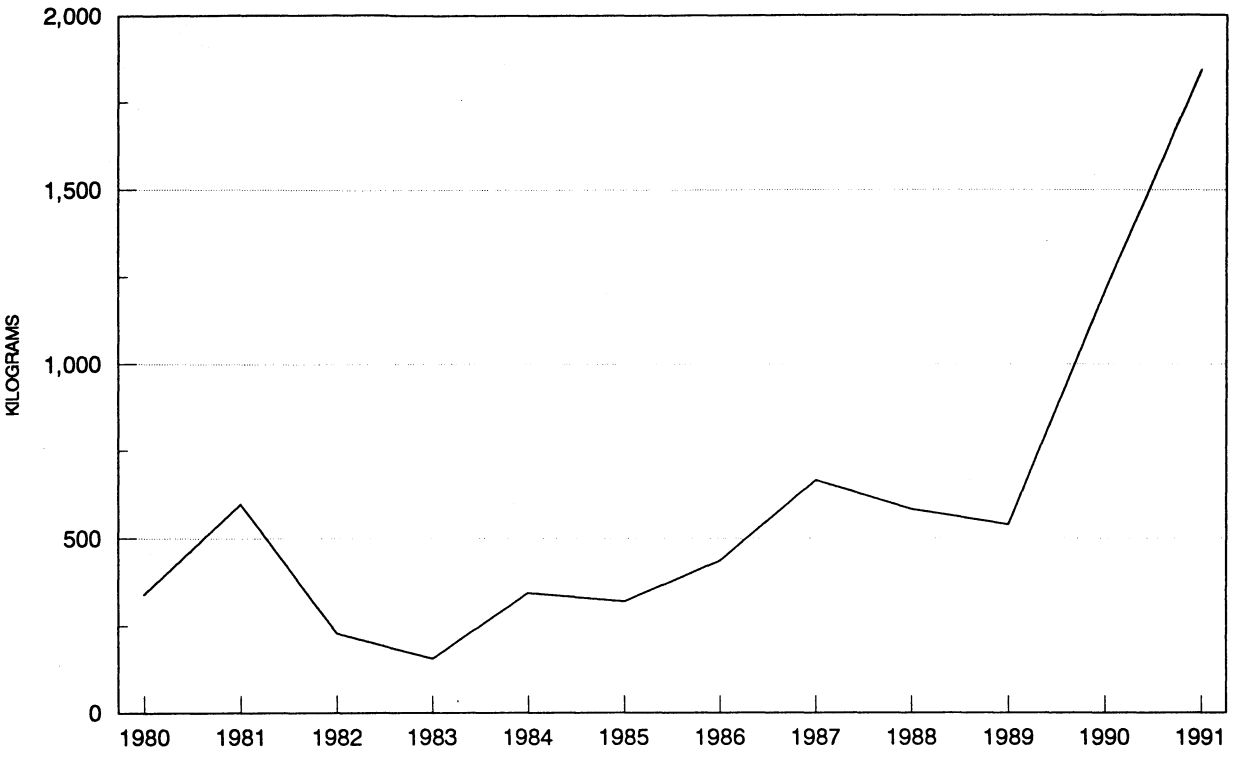
TABLE 2
GUYANA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons, unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bauxite	Guyana Mining Enterprise Ltd. (Guymine) (Government, 100%)	West Demerara District: Kara Kara, North Dorabece, and East Montgomery Mines, Mackenzie, Linden	3,500
Do.	do.	Processing plant at Linden	900
Do.	do.	Alumina refinery at Linden[1]	300
Do.	do.	East Berbice District: Kwakwani (three mines)	1,500
Do.	do.	Processing plant at Everton	700
Do.	C.A. Dayco (Private, Venezuela, 100%) (Guymine contract)	Kwakwani (one mine)	500
Do.	Green Mining, Inc. (Green Construction Co., U.S., 100%) (Guymine contract)	Dacoura Mine, Linden	NA
Do.	Aroaima Mining Co. (Government, 50%; Reynolds International, U.S., 50%)	Aroaima, East Berbice District	1,500
Gold kilograms	Omai Gold Mines Ltd (Cambior, Canada, 60%; Golden Star Resources, Canada, 35%; Government, 5%)	Omai Mine, Mazaruni-Potaro District[2]	7,800
Gravel	Independent operator	Quarry at St. Mary's, Mazaruni-Potaro District	200
Silica sand	Minerals and Technology Ltd. (Minerals and Chemicals of Texas, U.S., 100%)	Sand Hills, Demerara River, West Demerara District	300

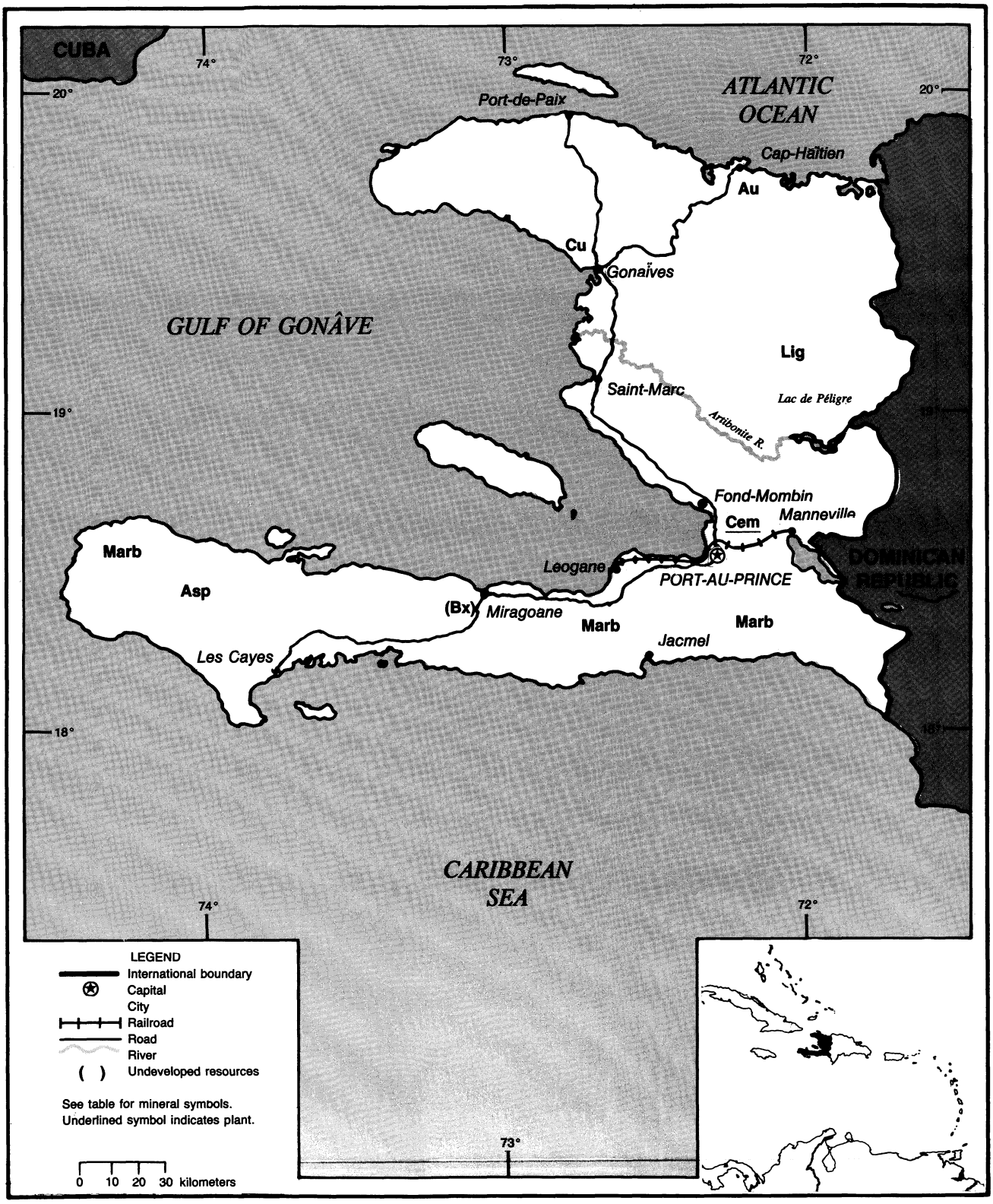
NA Not available.
[1]Refinery closed since 1982.
[2]Production scheduled to start in 1993.

FIGURE 1
GUYANA: OFFICIAL SALES TO THE GUYANA GOLD BOARD



HAITI

AREA 27,750 km² **POPULATION 6.6 million**



THE MINERAL INDUSTRY OF

HAITI

By Philip M. Mobbs

Haiti's mineral industry revolved around the production of cement, marble, and stone used in the nation's construction industry. The contribution of the mineral industry to the economy has been relatively insignificant since bauxite mining was terminated in 1982.

In 1991, the country's GDP was estimated to have been $2.1 billion.[1] The inflation remained at 20% for the second straight year.

Political and economic instability continued to plague the nation. In January, a coup put the provisional Government out of power. Ten hours later, the revolt was quashed by the military, restoring the provisional Government. Haiti's first democratically elected civilian Government was inaugurated in February. However, at the end of September, the military revolted and overthrew the civilian Government. During October, the second provisional Government of the year was confronted with an economic embargo by the Organization of American States. Japan and several countries in Europe supported the embargo. The United States' reaction was embodied in Executive Orders 12775 and 12779. By November, all sectors of Haiti's economy were reported to be affected by the embargo.

GOVERNMENT POLICIES AND PROGRAMS

The Mining Law of 1976 and the creation of the Ministrère des Mines et des Resources Energétiques in 1978 established a framework for orderly relationships between the Government and private investment. Mining companies may be privately owned. There were no restrictions on the repatriation of capital or profits or distinctions between foreign or domestic investors.

The Central Bank moved to a free-floating market exchange rate from the former fixed exchange rate of 5 gourdes per U.S. dollar on September 16, 1991.

PRODUCTION

Haiti's mineral industry was dominated by construction material production.

Cement and marble led the industry in terms of value. *(See table 1.)*

TRADE

Before October, the United States was Haiti's main trading partner, buying approximately 87% of Haiti's exports. Assembled materials, such as garments and toys, and agricultural products formed the bulk of exports.

Before the embargo, Haiti had duty-free access to the United States on certain products under the Caribbean Basin Initiative (CBI). Other significant Haitian trading partners had included Canada, France, Germany, Italy, Japan, the Republic of Korea, the Netherlands Antilles, and Taiwan.

The United States had provided approximately 60% of Haiti's official imports. A significant amount of the imported material was raw or semifinished stock intended for Haiti's assembly industry. In addition to official imports, a substantial contraband market existed. Petroleum products, formerly imported from Venezuela under the San José Agreement, were smuggled into the country from the Dominican Republic or obtained from ships diverted from their scheduled destinations.

STRUCTURE OF THE MINERAL INDUSTRY

Mineral-related industries were primarily owned by private concerns. The Government had an active interest in the nation's 350,000-ton-annual-capacity cement plant at Fond-Mombin, which Le Ciment D'Haiti S.A. operated.

COMMODITY REVIEW

Silver Standard Resources Inc. of Vancouver, Canada, signed a mining convention with the Government for the Grand Bois gold prospect. The convention has not yet been ratified. The Grand Bois deposit had been studied by the UN Development Program during 1987-88.

Development of the nation's marble industry continued. While produced marble was still used primarily in local construction, an international consortium was attempting to establish a viable marble export industry.

Clay, limestone, gravel, salt, and rock were also produced for local consumption. The installation of additional electrical generating capacity at the Government cement plant allowed an increase in production. However, contraband cement imports continued to satisfy the demand unfulfilled by local cement production.

INFRASTRUCTURE

There was 4,000 km of road. The country's 40-km railroad operated intermittently hauling sugar cane. Port-au-Prince was the country's major seaport.

During 1991, Haiti continued to suffer from a severe drought. Less than normal precipitation resulted in reduced water

levels. This, combined with the lack of spare parts, led to the diminished generating capability of the Péligre hydroelectric plant.

More than 50% of the nation's electricity was generated by petroleum-burning plants. Because of the drought and Venezuela's suspension of petroleum products shipments, at the end of the year Electricitié d'Haiti (EDH) was reported providing only 15% of the normal electricity supply. EDH had sought funding from the Inter-American Development Bank and the World Bank's International Development Association for additional power generation projects.

OUTLOOK

Haiti has not had the financial resources to develop its natural resources. The continuing political instability may prevent Haiti from obtaining the needed technical and economic support from foreign investors and multilateral financial institutions. Haiti's potential commercially exploitable mineral deposits include precious metals, copper, and marble.

[1]Where necessary, values have been converted from Haitian gourdes (G) to U.S. dollars at the rate of G8.0=US$1.00.

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B.P. 2174
Port-au-Prince, Haiti

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United Nations Industrial Development Organization, Vienna, Austria: Stone in Haiti, 1980, 63 pp.

TABLE 1

HAITI: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991e
Cement, hydraulic		252,000	250,000	e215,000	r e200,000	250,000
Clays, for cement		35,726	27,083	42,890	48,000	40,000
Sand and gravel:						
Gravel	cubic meters	2,255,686	2,405,646	3,809,700	3,967,928	3,900,000
Sand	do.	1,127,843	1,368,328	2,166,952	2,256,952	2,200,000
Stone:						
Limestone, for cement		246,387	208,118	322,949	286,600	250,000
Marble	cubic meters	179	595	595	595	600

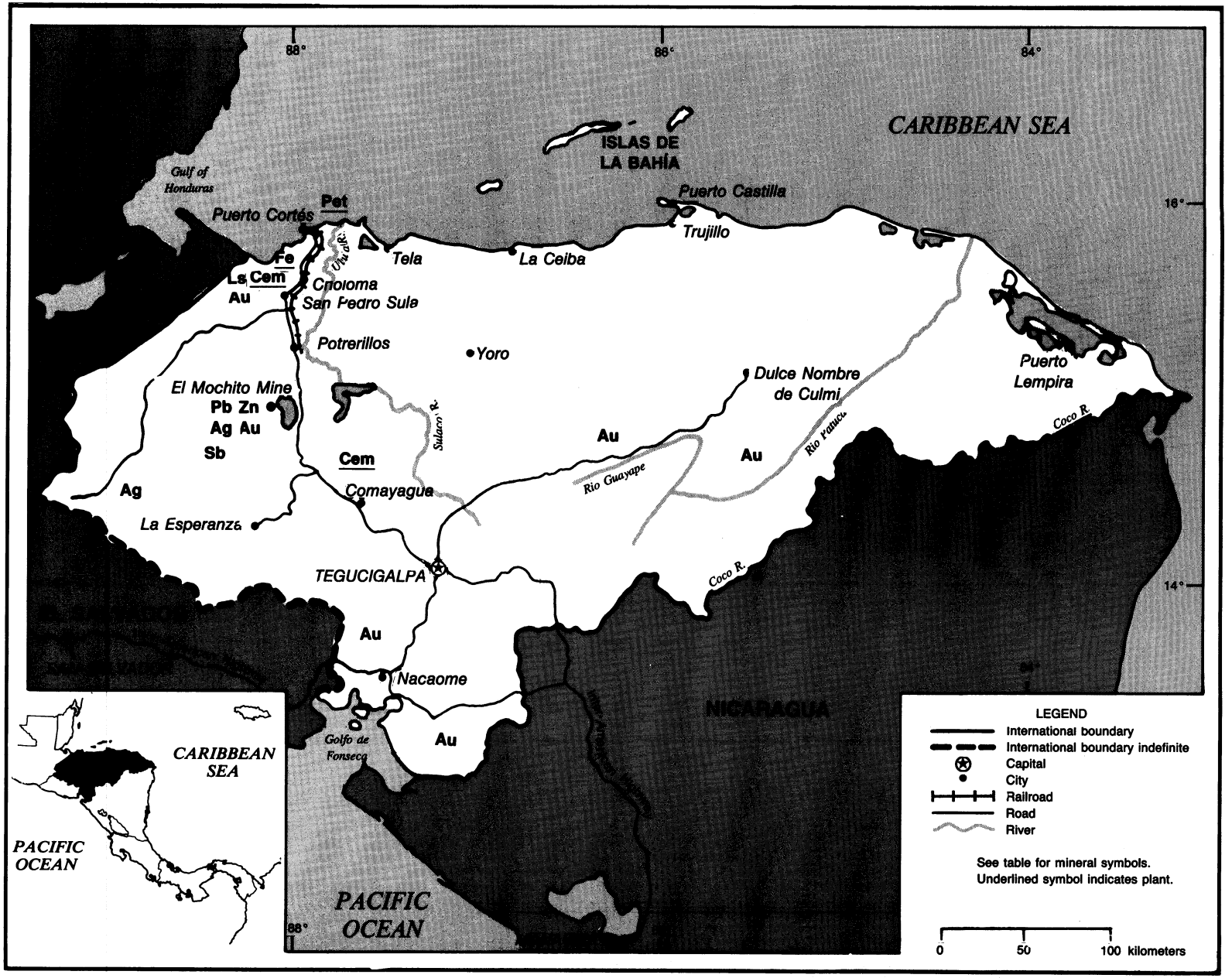
eEstimated. rRevised.

[1]Table includes data available through June 24, 1992.

[2]In addition to commodities listed, asphalt, lime, and salt may also be produced, but data on such production are not available, and information is inadequate to make reliable estimates of output levels.

HONDURAS

AREA 112,100 km² **POPULATION 5.3 million**



THE MINERAL INDUSTRY OF

HONDURAS

By Philip M. Mobbs

Honduras has a centuries-long history of mining and, in 1991, the largest active mine in Central America was Honduras' El Mochito lead-zinc mine. Honduras' zinc production ranked it among the top 40 zinc-producing countries in the world. Other metals production included antimony, cadmium, copper, gold, and silver. A variety of industrial minerals and construction materials was also produced.

Agriculture continued to carry the Honduran economy. This sector's dominance of the nation's GDP, exports, and work force employment was not expected to diminish in the foreseeable future. The GDP increased by 2.2% in 1991 to an estimated $4 billion.[1] The rate of inflation moderated in response to the Government's reform program, which featured liberalized trade and foreign exchange policies, privatization of the state's interest in companies, and external debt reduction. The Consumer Price Index increased by slightly more than 21%, down from a record 35% in 1990.

Private and foreign investment did not respond to opportunities in Honduras as enthusiastically as expected. Privatization stagnated during 1991, but was expected to gain momentum in 1992. Approval of a proposed foreign investment bill was also expected to kindle investor interest and boost economic growth in 1992.

GOVERNMENT POLICIES AND PROGRAMS

Mineral industry activity took place under the Mining Code of 1968 and a number of revisions, most notably Decree 79 of 1982 and Decree 168 of 1987. The Hydrocarbon Law, Decree No. 194-84, covered the petroleum industry.

Although exports were encouraged by the Government, transactions were licensed and often taxed. A 5% tax was levied on gold exports. Foreign exchange regulations required that almost all export earnings be returned to Honduras and surrendered to the Central Bank. Mineral exporters had 120 days to surrender export earnings, although exporters were eligible to negotiate for the retention of up to 30% of their export earnings to finance their import requirements.

Exporters and importers were both required to be registered. At the beginning of the year, the Central Bank licensed both imports and exports valued at more than $5,000. However, during February, the requirement to license most imports was abolished.

There were no legal restrictions on remittances of capital and profits. In practice, however, they were subject to delays because of the country's chronic foreign exchange shortage.

PRODUCTION

Lead and zinc concentrates from the El Mochito Mine represented a significant facet of the nation's mineral production. These lead and zinc concentrates also contained some cadmium, copper, gold, and silver. Honduras also produced cement, marble, and salt in amounts exceeding domestic requirements. *(See table 1.)*

TRADE

As Honduras' principal trading partner, the United States purchased 48% of Honduran exports and supplied 31% of imports. Honduras was a beneficiary of both the Caribbean Basin Initiative (CBI) and the Generalized System of Preferences (GSP).

Honduras was the ninth CBI country to qualify for section 936 funds when it signed a tax information exchange agreement with the United States at the end of September.

Honduras entered into a trade agreement with Mexico and the other members of the Central American Common Market (Costa Rica, El Salvador, Guatemala, and Nicaragua). A bilateral trade agreement was negotiated with Venezuela. Honduras was also pursuing membership in GATT.

Mexico and Venezuela supplied crude petroleum to Honduras under the San José Accord.

STRUCTURE OF THE MINERAL INDUSTRY

The state had little active participation in mineral operations, although the Dirección General de Minas e Hidrocarburos (DGMH) participated in the Mineral Inventory Program administered by the French Bureau de Recherches Géologiques et Minères (BRGM). The DGMH granted mining and petroleum concessions and registered exploration and production companies. Honduran law required a minimum capitalization of at least $5,631 for foreign-owned businesses.

The Government sold its controlling interest in the cement industry. A local group invested in one of the plants sold. The second plant was sold to a Venezuelan-Canadian group. Private companies dominated the rest of the nation's mineral extraction and petroleum refining activity.

Breakwater Resources Ltd. of Vancouver, British Columbia, Canada,

operated the lead-zinc El Mochito Mine. A wholly owned subsidiary of Breakwater, Compañía Minera Santa Barbara, formerly operating under the name American Pacific Mining Co., Inc., operated the mine and proceeded to explore for additional metal deposits on the company's concessions.

The Fischer-Watt Gold Co., Inc., of Sparks, Nevada, obtained the right to explore the acreage of Madeleine Mines and partner Milner Consolidated Silver Mines, both Toronto-based, which held majority interest in Cía. Minerales de Copán S.A. de C.V., a 9,000-mt/month heap-leach gold operation at San Andrés in Copán Department. *(See table 2.)*

COMMODITY REVIEW

Metals

Gold and Silver.—A United Nations Development Program-funded Italian study reportedly determined that the Yuscarán gold and silver deposit in El Paraíso Department was a viable candidate for production operations.

Melinga Resources Ltd. of Vancouver, British Colombia, has begun preliminary field exploration work at Vueltas del Río, a copper-gold porphyry prospect near its Macuelizo oxide gold prospect. Drilling the prospect was planned for 1992.

Fischer-Watt Gold Co., Inc. and Kennecott Exploration Co. extended their exploration agreement through 1992. Copper-gold prospects on the Minas de Oro concession were drilled as well as the Tembladera gold-silver prospect. Exploration of the La Victoria concession and a lead-silver prospect on the Suyatal concession were planned.

Placer production predominated gold operations to the east in Olancho Department. Many small companies worked the Río Guyape; however, dredges were not used by the numerous small-scale operations. During the dry season, as many as 1,000 panners and their families flocked to the Río Patuca. The possibility of mercury contamination of the rivers from gold recovery procedures was potentially an environmental problem for the river itself as well as for the miners and their families living on the remote rivers.

Lead and Zinc.—Cía. Minera Santa Barbara continued to upgrade the El Mochito Mine in Santa Bárbara Department, about 130 km northwest of the capital, Tegucigalpa. While renovations-in-progress resulted in 1991 ore production declining to 441,361 tons from the 446,212 tons mined in 1990, concentrate production in 1991 actually increased by almost 39% over that of 1990. Exploration of adjacent concessions was also undertaken during 1991. El Mochito Mine lost 33 days to labor disputes during the year.

Industrial Minerals

The state sold its interest in Cementos de Honduras S.A. (CEHSA) and Industria Cementera Hondureña S.A. de C.V. (INCEHSA) to a Venezuelan-Canadian consortium and a local investor group. CEHSA had been the subject of a proposed debt-for-equity exchange in which the Government would swap its interest in CEHSA to the Mexican company Cementos Mexicanos S.A. in exchange for the debt owed to Mexico for petroleum. Local opposition scuttled the suggestion.

Cement production increased slightly compared with that of 1990, setting yet another annual production record.

Mineral Fuels

Petroleum exploration activity revived in Honduras as Venezuela's Cambria Co. prepared to drill the Brus Laguna concession in Gracias a Dios Department. Also during 1991, Texaco signed a 4-year agreement with the Government that authorized Texaco to explore the northeast coastal region.

A feasibility study of a second refinery in Honduras, proposed for Trujillo, was undertaken by a team of Venezuelan experts.

INFRASTRUCTURE

Much of the nation's energy was derived from traditional fuels, primarily wood. Twenty-five percent was provided by imported crude petroleum and petroleum products, supplied principally by Mexico and Venezuela. Hydroelectric power accounted for 10% of total demand. The remaining 3% was provided by thermal generation plants.

The 552-MW installed generating capacity electricity sector was state-dominated. Empresa Nacional de Energía Eléctrica, the state company, relied on hydropower for 76% of its 538-MW generating capacity. The most significant powerplant was the 292-MW El Cajón hydroelectric plant on the Humuya River, 5 km downstream from the junction with the Sulaco River. Private producers accounted for an additional 14 MW of capacity.

The transportation system in Honduras improved in 1991; however, access to many areas remained generally difficult. Most mineral production was trucked out on the country's 9,000 km of roads. The primary metal shipping point was Puerto Cortés. Other Caribbean ports included La Ceiba, Puerto Castilla, Tela, and Trujillo. San Lorenzo served the Pacific coast.

OUTLOOK

The mineral potential of Honduras is considered to be promising, and foreign investment interest in the country's unexploited mineral resources is expected to increase.

Honduran mineral deposits are expected to be better defined through the proposed UN's Trifino Plan exploration program along the western border and with the continued work of the BRGM.

Suspicion of direct foreign investment, fostered by the country's former vulnerability to a handful of large multinational companies, is expected to eventually subside. Many of the problems encountered by new investors are bureaucratic. Improvement is anticipated. However, short-term labor

disruptions may ensue from the wave of privatizations proposed for 1992.

A new investment law was expected to be enacted during 1992.

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[1]Where necessary, values have been converted from Honduran lempiras (L) to U.S. dollars at the annual average rate of L5.32=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

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TABLE 1

HONDURAS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
Antimony, mine output, Sb content		28	19	e10	—	—
Cadmium, Cd content of lead and zinc concentrates		124	276	350	372	212
Cement		451,180	560,065	648,763	652,111	693,040
Copper, Cu content of lead and zinc concentrates		582	538	2,419	1,388	1,000
Gold	kilograms	131	127	r160	r156	179
Gypsum[e]		22,000	22,000	25,000	25,000	27,000
Iron and steel:[e]						
Steel,crude		7,200	7,200	8,000	8,000	7,500
Semimanufactures		12,000	12,000	17,210	15,000	15,000
Lead, mine output, Pb content		5,041	16,906	9,610	5,785	8,719
Petroleum refinery products	thousand 42-gallon barrels	e1,500	e1,500	3,299	r3,106	e3,000
Salt[e]		30,000	30,000	30,000	30,000	30,000
Silver	kilograms	23,234	58,447	r49,559	r18,246	39,359
Stone:						
Limestone[e]		2448,820	450,000	450,000	460,000	500,000
Marble[3]	square meters	e962	e3,175	74,250	84,400	95,937
Zinc, mine output, Zn content		15,417	23,475	37,184	29,628	38,280

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

[1]Includes data available through Nov. 7, 1992.

[2]Reported figure.

[3]Prior to 1989, official marble production was reported in metric tons.

TABLE 2

HONDURAS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	Destinations	
		United States	Other (principal)
METALS			
Aluminum: Metal including alloys:			
Unwrought	56	56	
Semimanufactures	3	—	All to Guatemala.
Copper:			
Matte and speiss including cement copper	318	318	
Metal including alloys, semimanufactures	26	—	All to El Salvador.
Gold: Metal including alloys, unwrought and partly wrought kilograms	25,989	14,210	Belgium-Luxembourg 11,779.
Iron and steel:			
Iron ore and concentrate	91	90	Japan 1.
Metal: Semimanufactures:			
Bars, rods, angles, shapes, sections	7	—	Belize 6; Nicaragua 1.
Hoop and strip	3	—	Mainly to Guatemala.
Wire	89	—	All to El Salvador.
Tubes, pipes, fittings	1	—	All to Belize.
Castings and forgings, rough	3	(2)	Mainly to Guatemala.
Lead: Metal including alloys, unwrought	8,311	2,739	United Kingdom 3,232; Belgium-Luxembourg 2,340.
Silver: Metal including alloys, unwrought and partly wrought	8,089	1,670	United Kingdom 3,189; Belgium-Luxembourg 2,968.
Zinc: Metal including alloys, unwrought	61,750	161	United Kingdom 29,799; Belgium-Luxembourg 24,682; Australia 7,108.
Other: Base metals including alloys, all forms	1,528	—	Belgium-Luxembourg 761; United Kingdom 616; Australia 151.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.: Grinding and polishing wheels and stones	40	—	All to El Salvador.
Asbestos, crude	15	—	All to Guatemala.
Cement	250,897	95,017	Belize 60,630; Haiti 43,325; Dominican Republic 38,111.
Clays, crude	4	—	Costa Rica 3; Guatemala 1.
Diatomite and other infusorial earth	2	—	All to Panama.
Gypsum and plaster	4	—	All to El Salvador.
Nitrates, crude	14	—	All to Belize.
Salt and brine	60	—	El Salvador 40; Guatemala 20.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	171	—	El Salvador 130; Switzerland 22; West Germany 19.
Worked	1,135	722	Colombia 181; West Germany 161.
Dolomite, chiefly refractory-grade	520	—	All to Costa Rica.
Gravel and crushed rock	27	27	
Limestone other than dimension	1,956	—	Guatemala 1,374; El Salvador 582.
Sand other than metal-bearing	87	—	All to Cayman Islands.
Sulfur: Sulfuric acid	21	—	All to West Germany.
Other: Slag and dross, not metal-bearing	2	—	All to Guatemala.

See footnotes at end of table.

TABLE 2—Continued

HONDURAS: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	Destinations	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline	42-gallon barrels	344,140	256,862	Haiti 86,334; Belize 935.
Bituminous mixtures	do.	12	—	All to Costa Rica.

[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

TABLE 3

HONDURAS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	Sources	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides		1	1	
Metal including alloys, semimanufactures		1,183	392	El Salvador 280; Mexico 172.
Chromium: Oxides and hydroxides		1	1	
Cobalt: Oxides and hydroxides		27	5	Mexico 22.
Copper:				
Matte and speiss including cement copper	value, thousands	$3	$3	
Metal including alloys:				
Unwrought		9	1	Republic of South Africa 8.
Semimanufactures		665	484	Mexico 80; China 32.
Iron and steel:				
Iron ore and concentrate		24	24	
Metal:				
Scrap		1	1	
Pig iron, cast iron, related materials		13	5	Guatemala 4; Mexico 4.
Ferroalloys: Ferromanganese		242	229	West Germany 8; El Salvador 5.
Steel, primary forms		1,622	32	France 763; United Kingdom 507; Venezuela 100.
Semimanufactures:				
Bars, rods, angles, shapes, sections		36,505	1,078	Venezuela 25,280; Nicaragua 4,122; Brazil 4,112.
Universals, plates, sheets		23,121	7,487	Venezuela 6,997; Japan 2,424.
Hoop and strip		285	67	Belgium-Luxembourg 131; West Germany 55.
Rails and accessories		8	8	
Wire		4,836	14	Venezuela 4,588; Mexico 127; Belgium-Luxembourg 50.
Tubes, pipes, fittings		2,361	888	Guatemala 654; Costa Rica 211.
Castings and forgings, rough		12	(2)	Hong Kong 6; France 5.
Lead:				
Oxides		160	6	Mexico 149; Guatemala 5.
Metal including alloys:				
Unwrought		528	—	All from Mexico.
Semimanufactures		31	1	Mexico 20; France 10.

See footnotes at end of table.

TABLE 3—Continued

HONDURAS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	Sources	
			United States	Other (principal)
METALS				
Manganese: Oxides		284	—	Mexico 163; Belgium-Luxembourg 41; Guatemala 38.
Mercury	value, thousands	$2	$2	
Nickel: Metal including alloys:				
Unwrought	do.	$5	$5	
Semimanufactures		2	2	
Silver: Metal including alloys, unwrought and partly wrought	value, thousands	$6	$6	
Tin: Metal including alloys, semimanufactures		15	5	Bolivia 4; United Kingdom 1.
Titanium: Oxides		545	65	Mexico 399; Panama 21.
Zinc:				
Oxides		121	36	Mexico 50; Nicaragua 20.
Metal including alloys:				
Unwrought		1,029	—	Peru 501; Mexico 325; Brazil 199.
Semimanufactures		319	57	Mexico 259; West Germany 2.
Other:				
Oxides and hydroxides		13	13	
Base metals including alloys, all forms		22	3	China 11; Republic of South Africa 5.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.		29	29	
Artificial: Corundum		26	26	
Grinding and polishing wheels and stones		71	5	Spain 23; West Germany 17; Brazil 9.
Asbestos, crude		1,375	(2)	Canada 1,374; Guatemala 1.
Barite and witherite	value, thousands	$3	$1	Switzerland $2.
Boron materials: Oxides and acids		4	2	France 1; West Germany 1.
Bromine, fluorine, iodine		667	158	Nicaragua 485; Guatemala 24.
Cement		3,882	38	Mexico 2,436; Denmark 870; Belgium-Luxembourg 241.
Clays, crude		2,553	1,941	Guatemala 595; Italy 16.
Diamond: Natural: Gem, not set or strung	value, thousands	$3	$3	
Diatomite and other infusorial earth		501	341	Mexico 148; Guatemala 12.
Fertilizer materials:				
Crude, n.e.s.	value, thousands	$1	$1	
Manufactured:				
Ammonia		76	58	Guatemala 6.
Nitrogenous		42,471	17,370	Japan 12,795; Poland 6,325.
Phosphatic		8,903	6,784	West Germany 1,515; Dominican Republic 498.
Potassic		10,556	6,307	West Germany 3,607; Guatemala 631.
Unspecified and mixed		1,506	55	Netherlands 726; El Salvador 701.
Graphite, natural	value, thousands	$1	—	All from West Germany.
Gypsum and plaster		20	15	Guatemala 5.
Magnesium compounds: Magnesite, crude		15	15	
Mica: Worked including agglomerated splittings	value, thousands	$6	$2	France $2; West Germany $1.
Nitrates, crude		19,822	—	Canada 15,866; Nicaragua 3,535; Venezuela 399.

See footnotes at end of table.

TABLE 3—Continued

HONDURAS: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	Sources	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Phosphates, crude		1,218	798	East Germany 410; Mexico 10.
Pigments, mineral: Iron oxides and hydroxides, processed		40	4	West Germany 33; Mexico 3.
Potassium salts, crude		1	1	
Salt and brine		112	62	Canada 22; Netherlands 20.
Sodium compounds, n.e.s.:				
Soda ash, natural and manufactured		1,870	274	West Germany 486; Guatemala 374.
Sulfate, natural and manufactured		38	—	West Germany 36; United Kingdom 2.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		16	—	Guatemala 9; Italy 7.
Worked		10	3	Guatemala 7.
Dolomite, chiefly refractory-grade		9	9	
Gravel and crushed rock		93	93	
Quartz and quartzite		163	—	West Germany 84; Venezuela 41; Spain 38.
Sand other than metal-bearing		50	47	Brazil 3.
Sulfur:				
Elemental:				
Crude including native and byproduct		241	228	West Germany 13.
Colloidal, precipitated, sublimed		103	62	Guatemala 21; West Germany 20.
Sulfuric acid		301	56	Mexico 110; Netherlands 68.
Talc, steatite, soapstone, pyrophyllite		313	206	China 38; Guatemala 28.
Other:				
Crude		13	(2)	West Germany 11; Coata Rica; Guatemala 1.
Slag and dross, not metal-bearing		3	3	
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		431	2	Netherlands Antilles 404; Mexico 20; El Salvador 5.
Carbon: Carbon black		78	1	Belgium-Luxembourg 76; West Germany 1.
Coal: Anthracite		23	23	
Coke and semicoke		609	534	Colombia 70; France 5.
Petroleum:				
Crude	thousand 42-gallon barrels	3,257	(2)	Mexico 1,731; Venezuela 1,526.
Refinery products:				
Liquefied petroleum gas	do.	494	480	Venezuela 14.
Gasoline	do.	2,558	456	Netherlands Antilles 1,519; Panama 423.
Mineral jelly and wax	42-gallon barrels	16,590	2,070	West Germany 5,942; Dominican Republic 2,093.
Lubricants	do.	491	359	Guatemala 63; Netherlands 63.
Bitumen and other residues	do.	97	97	
Bituminous mixtures	do.	473	473	

[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

TABLE 4

HONDURAS: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

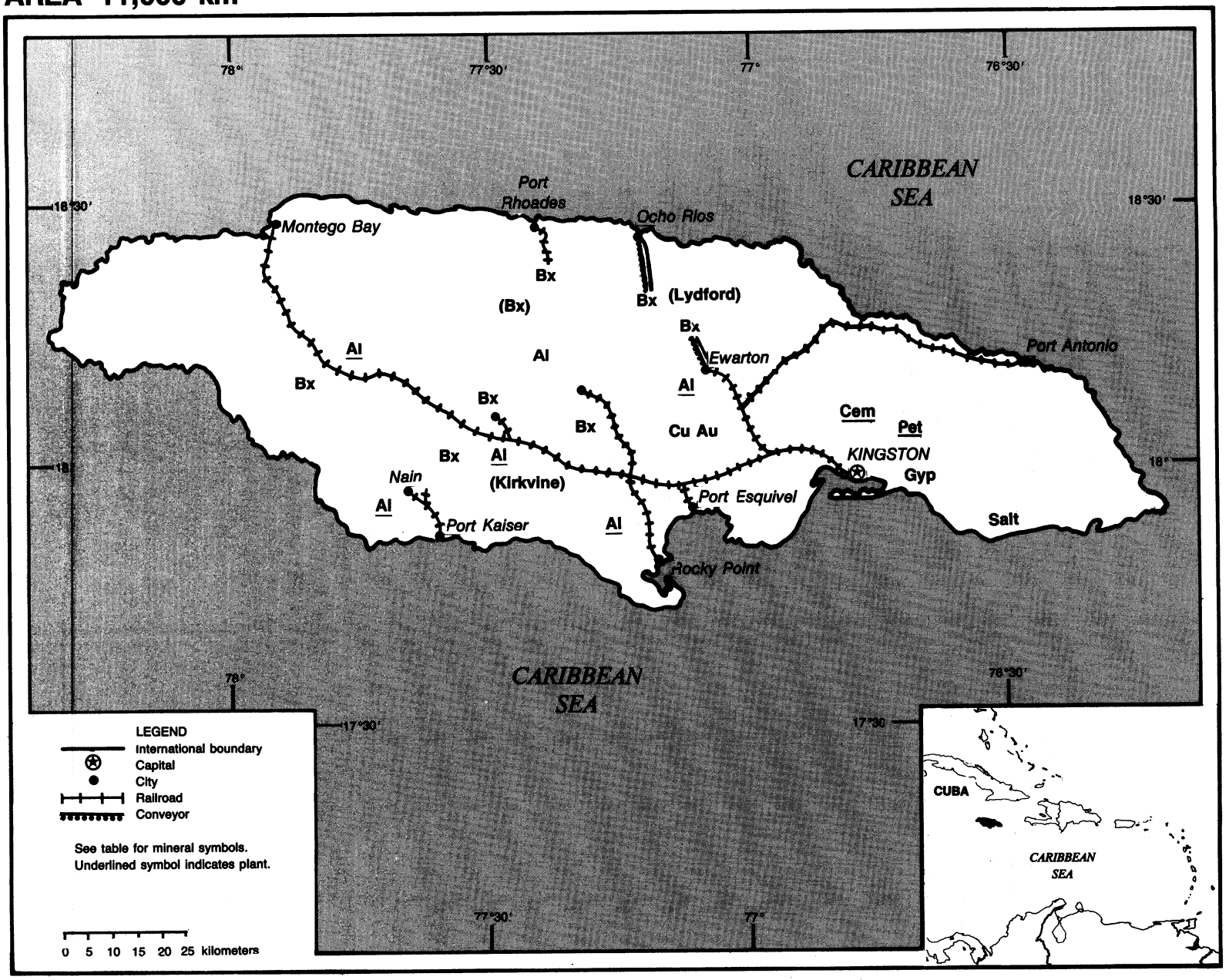
(Metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Industria Cementera Hondureña S.A. de C.V. (private, 100%)	Piedras Azules plant, Comayagua Department	450,000
Do.		Cementos de Honduras S.A. (private, 100%)	Rio Bijao plant, San Pedro Sula, Cortés Department	600,000
Gold	kilograms	Compañía Minera Santa Barbara (Breakwater Resources, Ltd., 100%)	El Mochito Mine, Santa Bárbara Department	1,500
Do.	do.	Cía. Minerales de Copán S.A. (Madeleine Mines, 25.5%; Milner Consolidated Silver Mines, 25.5%)	San Andres Mine, Copán Department	400
Lead		Cía. Minera Santa Barbara (Breakwater Resources, Ltd., 100%)	El Mochito Mine, Santa Bárbara Department	24,000
Petroleum products	thousand 42-gallon barrels	Refineria Texaco de Honduras S.A. (Texaco, Inc. 100%)	Puerto Cortés, Cortés Department	5,040
Silver		Cía. Minera Santa Barbara (Breakwater Resources, Ltd., 100%)	El Mochito Mine, Santa Bárbara Department	50
Do.		Cía. Minera El Paso Mining (private, 100%)	La Pochota Mine, Valle Department	NA
Steel		Aceros de Honduras S.A.	Choloma, Cortés Department	14,000
Zinc		Cía. Minera Santa Barbara (Breakwater Resources, Ltd., 100%)	El Mochito Mine, Santa Bárbara Department	45,000

NA Not available.

JAMAICA

AREA 11,000 km² **POPULATION 2.4 million**



THE MINERAL INDUSTRY OF

JAMAICA

By Philip M. Mobbs[1]

Jamaica had a moderately diversified mineral industry that was dominated by the mining of bauxite and the subsequent production of alumina. In 1991, the country ranked third in the world in bauxite output after Australia and Guinea and fourth worldwide in the production of alumina. Alumina output set a new volume record, and bauxite production reached a 10-year high. Earnings declined despite the increased volume of product because of a drop in aluminum prices.

Jamaica's GDP was estimated at $4.1 billion.[2] The nation's economy grew 2%, about one-half of the 3.8% increase posted in 1990. The Government had initiated a 5-year plan in 1990 containing a series of economic reforms to deregulate, liberalize, and privatize industry and designed to obtain a sustained annual growth rate of 3%. The growth of the mining sector slowed to a 5.8% increase for the year, compared with almost 18% growth in 1990. Construction was anemic, posting a reported 0.2% increase for 1991.

Inflation was again in double digits, exceeding 80% for the year. The rapid depreciation of the Jamaican dollar and the removal of price controls helped push the rate upward. Jamaica's foreign exchange regime was subsequently deregulated during the year to help brace the Jamaican dollar.

GOVERNMENT POLICIES AND PROGRAMS

The National Resource Conservation Authority (NRCA) was created in 1991 after the National Resource Conservation Authority Act was passed. Programs of a number of Government agencies involved in environmental protection were to be consolidated within the NRCA.

The Government proposed to privatize Petrojam Ltd.'s oil refinery and 63 other Government-owned companies. The Government continued to investigate ways to substitute imported petroleum with coal, deregulate petroleum trade, and use energy in more efficient ways. The year marked the first that petroleum price controls were removed for a full 12-month period.

Legislation that impacted the Jamaican mining industry included the Minerals Vesting Act of 1947, the Mining Act of 1947, the Mining Regulations of 1947, the Town and Country Planning Act of 1957, the Quarries Control Act of 1958, the Mining (Safety and Health) Regulations of 1977, and the Petroleum Act of 1979. New mining legislation was being prepared.

PRODUCTION

Jamaica produced approximately 10% of the world's bauxite and 6% of the world's alumina. A healthy industrial minerals sector produced cement, lime, and salt and mined gypsum, marble, sand and gravel, silica sand, and stone. The metals sector produced steel and recycled lead. Most of the industrial mineral commodities were manufactured or mined for the domestic market. *(See table 1.)*

TRADE

The continental United States, Puerto Rico, and the Virgin Islands continued as Jamaica's main trading partners. Jamaica also conducted significant trade with the United Kingdom, Trinidad and Tobago, and Canada.

Alumina and crude bauxite were the major export commodities. Bauxite exports increased to 4.26 Mmt from the 3.89 Mmt shipped in 1990. Alumina exports, 3.03 Mmt in 1991, exceeded the 1990 record shipment of 2.89 Mmt.

STRUCTURE OF THE MINERAL INDUSTRY

The Jamaican Government was involved in the development, production, and trade of mined bauxite and alumina produced in Jamaica. The Government was directly involved in Jamaican Bauxite Mining Ltd., Clarendon Alumina Production Ltd., Bauxite and Alumina Trading Co. of Jamaica Ltd., and the Jamaican Bauxite Institute Ltd. Most of the alumina and bauxite operations were joint ventures between the Government and international companies.

Additional Government agencies associated with the mining industry included the Ministry of Production, Mining and Commerce's Commissioner of Mines, and the Jamaican Geological Survey.

Canadian mining companies concentrated on metal exploration, and the industrial minerals sector was dominated by small privately held concerns.

Petroleum exploration and refining were the responsibility of the state-owned Petroleum Corp. of Jamaica. Its subsidiary, Petrojam Ltd., operated the Kingston oil refinery. Petroleum Corp. of Jamaica also imported most of the nation's petroleum products; however, bauxite companies generally imported mineral fuels for their own operations. *(See table 2.)*

COMMODITY REVIEW

Metals

Alumina and Bauxite.—The quantity of bauxite mined in 1991, 11.55 Mmt,

was the greatest volume produced since 1981 when 11.61 Mmt was extracted. Alumina processing produced a record tonnage of 3.02 Mmt. The rise in alumina was attributed to the increased production at the Alpart and the Jamalco refineries.

Jamaica had shipped approximately 10% of its bauxite to the former U.S.S.R. Bauxite shipments to the former U.S.S.R. were temporarily suspended early in the year after only 30,000 tons was exported, resulting in an initial slowdown of bauxite production during January and February. Shipments were resumed in June only to be curtailed again later in the year. Barely 50% of the 1 Mmt of bauxite called for under the 1990 contract with the former U.S.S.R. was shipped during 1991.

The Ministry of Mining and Energy was planning the feasibility studies for the long-proposed bauxite mine along the border of St. Ann and Trelawny Parishes and an associated 1-Mmt/a alumina plant in Trelawny Parish.

Alcan Aluminum Ltd. proposed a $200 million rehabilitation of Alcan Jamaica Co.'s Kirkvine and Ewarton alumina plants and Port Esquivel dock facilities. A portion of the financing was to be from Puerto Rican "Section 936" funds. The modernization was to be achieved by 1993.

Kaiser Aluminum Corp. and Hydro Aluminum Jamaica a.s. signed an agreement with the Government to proceed with a $180 million expansion, raising the Alpart alumina refinery's 1.2 Mmt/a capacity to 1.5 Mmt/a by early 1993. Kaiser and Hydro Aluminum were 65%-35% partners, respectively, in the refinery.

A 33% expansion was also proposed for Jamalco's alumina refinery. A project to supply the Nikolaev Alumina Plant in the Ukraine with bauxite from the inactive Lydford Mine was under discussion. Production of 1.5 Mmt/a was projected, beginning in 1993. The Government, the Nikolaev plant, and U.S. investors would fund the rehabilitation of the mine, the conveyor belt transportation system to the port, and the shipping station at Ocho Rios.

Copper and Gold.—Vancouver-based Golden Ring Resources began drilling on Trev Corp.'s Bellas Gate property at the end of the year. The Connors, Camel Hill, and Geo Hill copper and gold prospects in the Bellas Gate area were the initial targets. Other Canadian junior companies actively engaged in pursuing copper and gold properties identified by Jamaica's Geological Survey Division in the mid-1980's included Citadel Gold Mines, Galico Resources, and Tantalus Resources. The original exploration program had been funded by the Jamaican Ministry of Mining, Energy, and Tourism and the Canadian International Development Agency.

Industrial Minerals

Cement.—Jamaican cement was produced by one company, Caribbean Cement Co. Ltd., at Rockfort in St. Andrews Parish. Production decreased 11% from the 1990 tonnage.

Other Industrial Minerals.—The industrial minerals sector also produced gypsum, lime, marble, salt, construction and industrial sand and gravel, and crushed stone. The World Bank sponsored a conference in February 1991 that highlighted potential investment opportunities in the Jamaican industrial mineral industry.

Reserves

The estimated reserves of bauxite were 2 billion mt. Gypsum reserves were estimated to be 5 Mmt.

INFRASTRUCTURE

The country had two major ports at Kingston and Montego Bay. Bauxite was exported through Port Rhoades and Rocky Point. Alumina was shipped from Port Kaiser and Port Esquivel.

There were 370 km of railroad and more than 18,200 km of highways. The country's mining sector moved ore by road, railroad, and conveyor.

The Jamaican economy was highly dependent upon energy availability. As in past years, Jamaica imported much of its total energy needs. Imported petroleum and refinery products supplied about 83% of the energy consumed in 1991. Other sources included locally produced bagasse and fuelwood (16%), imported coal (<1%), and hydroelectric power (<1%).

The Jamaica Public Service Company had an installed electrical generating capacity of approximately 544 MW, primarily oil-fired. Private companies operated plants with an installed generating capacity of approximately 265 MW, of which the bauxite companies were responsible for 168 MW.

During 1991, a proposal to connect Caribbean Cement's 27-MW installed generating capacity to the national grid was suggested.

OUTLOOK

Firm bauxite and alumina demand accompanied by strong prices have the Jamaican Government and the private sector working together to increase output. Demand and sales should be buoyed when the United States recovers from the recession, provided oil prices remain stable. A potential near-term disruption is the 1992 expiration of the bauxite union's labor contract, which is presently being renegotiated.

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[1]With the collaboration of Doss H. White, State Mineral Officer, Tuscaloosa, Alabama.

[2]Where necessary, values have been converted from Jamaican dollars (J$) to U.S. dollars at the rate of J$14.9=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Geological Survey Division
Ministry of Production, Mining and Commerce
P.O. Box 141
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(809) 927-1936

Commissioner of Mines
Ministry of Production, Mining and Commerce
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Kingston 6, Jamaica, W.I.

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TABLE 1

JAMAICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
Aluminum:						
Bauxite, dry equivalent, gross weight	thousand tons	7,802	7,305	9,601	10,921	11,550
Alumina	do.	1,609	1,514	2,221	2,869	3,015
Cement, hydraulic	do.	306	371	r436	r442	395
Gypsum		176,300	145,500	78,010	82,200	135,844
Iron and steel: Steel, crude		20,629	27,578	36,732	23,820	e25,000
Lead, refined (secondary)e		1,000	1,000	1,000	1,000	1,000
Lime	thousand tons	90	80	e90	e90	e95
Petroleum refinery products	thousand 42-gallon barrels	9,108	9,801	5,928	8,203	e6,600
Salt		15,665	15,466	15,621	12,124	e14,000
Silica sand		19,930	13,000	15,200	r16,643	15,622
Stone:						
Limestone	thousand tons	5,848	5,984	6,800	7,072	5,480
Marble		500	2,700	5,000	4,000	12,000
Marl and fill	thousand tons	7,560	7,020	7,560	7,830	2,950
Sand and gravel	do.	1,700	2,025	2,250	2,375	1,214

eEstimated. pPreliminary. rRevised.

[1]Table includes data available through July 24, 1992.

TABLE 2

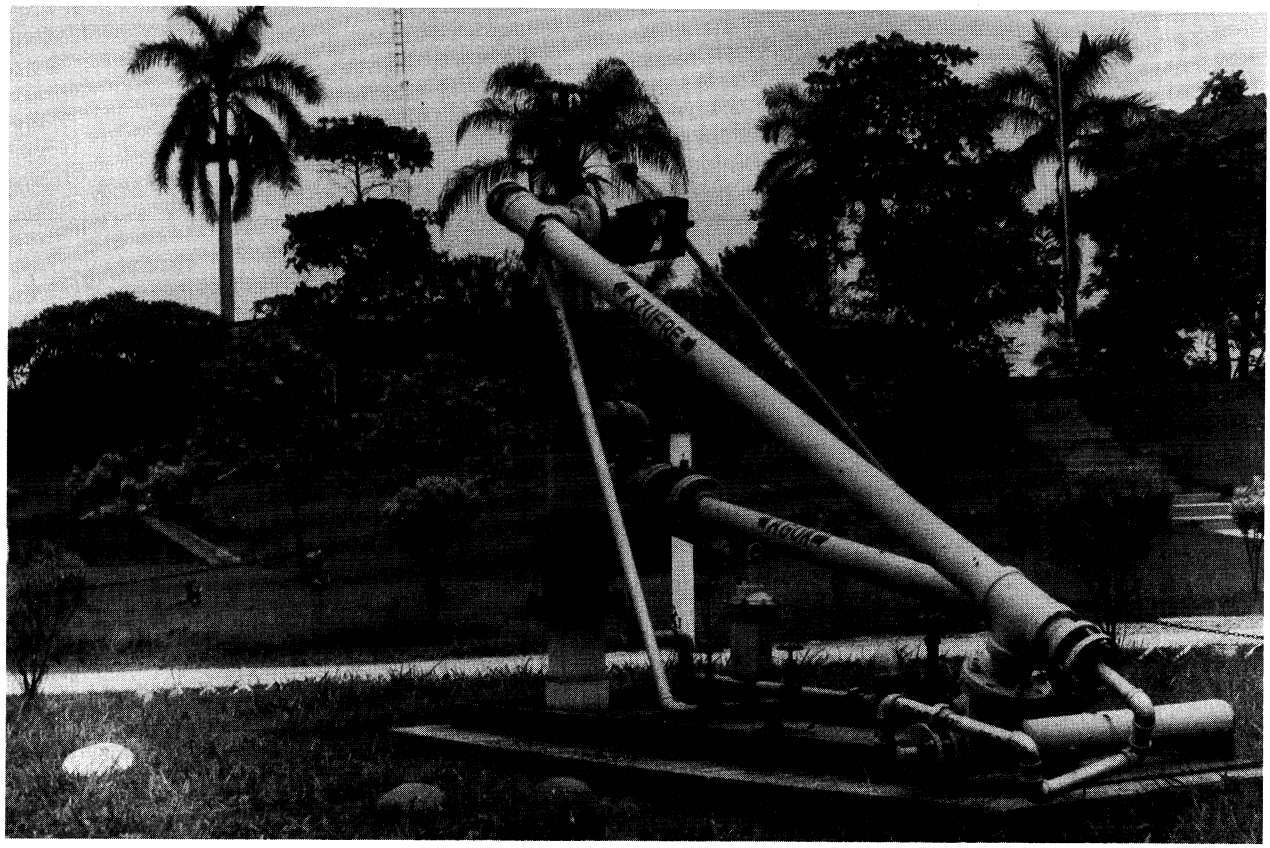
JAMAICA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina		Jamalco (Aluminum Co. of America/Government, 50%; Clarendon Alumina Production Ltd., 50%)	Clarendon, Clarendon Parish	750
Do.		Alumina Partners of Jamaica (Alpart) (Kaiser Aluminum Corp., 65%; Hydro Aluminum Jamaica a.s., 35%)	Nain, St. Elizabeth Parish	1,200
Do.		Alcan Jamaica Co. (JAMALCAM) (Alcan Aluminum Ltd. Canada, 93%; Government, 7%)	Kirkvine, Manchester Parish and Ewarton, St. Catherine Parish	547.5 547.5
Bauxite		Jamaica Bauxite Mining Ltd. Lydford Mines[1] (Jamaica Bauxite Mining Ltd., 100%)	Lydford, St. Ann Parish	2,500
Do.		Kaiser Jamaica Bauxite Co., Ltd. (Government, 51%; Kaiser Aluminum Corp., 49%)	Discovery Bay, St. Ann Parish	4,500
Cement		Caribbean Cement Co. Ltd. (Private, 100%)	Rockfort, St. Andrews Parish	830
Petroleum products	thousand 42-gallon barrels	Petrojam Ltd. (Petroleum Corp. of Jamaica, 100%)	Kingston, St. Andrews Parish	12,958

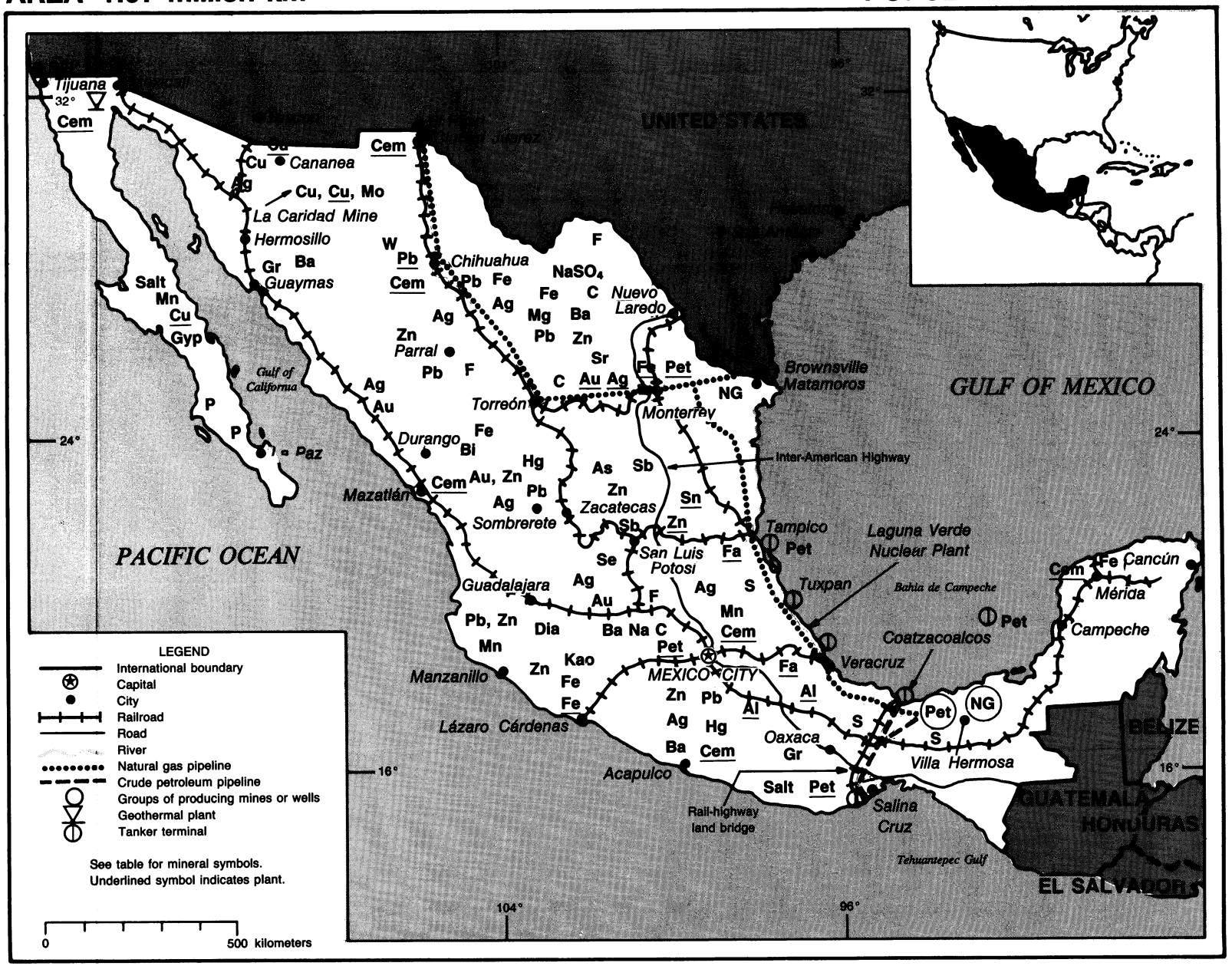
[1]Formerly Jamaica Reynolds Bauxite Partners. Closed since 1984.

MEXICO: FRASCH SULFUR WELL AT TEXISTEPEC, STATE OF VERACRUZ.
(PHOTO COURTESY OF CIA. EXPLORADORA DEL ISTMO)



MEXICO

AREA 1.97 million km² **POPULATION 87.8 million**



THE MINERAL INDUSTRY OF

MEXICO

By Gary R. Peterson

Mexico, one of the world's leading mineral producers, ranked first in the production of silver and celestite (strontium mineral) in 1991. It was among the top five producers of antimony, white arsenic, bismuth, cadmium, fluorspar, graphite, and mercury. The production of barite, copper, diatomite, feldspar, gypsum, lead, lime, nitrogen in ammonia, sulfur, and zinc was of world significance also. In those commodities, Mexico was among the top 10 producers. In the Western Hemisphere, only Brazil and Mexico produced manganese in significant quantities.

A number of mines closed during 1991. Mine closings included Minera Río Colorado, a fluorspar mine in Guanajuato; Minera Mexicana Peñoles at Topia, a silver mine; Minera Capela in Michoacán, a barite and zinc mine; Compana de Plata in Zacualpan, a silver mine; Minera La Negra in Querétaro, a copper, lead, and zinc mine; and La Perla in Monclova, an iron mine. Grupo Catorce closed almost all of its mining properties, located near San Luis Potosí. These mines had produced gold, lead, silver, and zinc. The Frisco Group closed the Cumobabi Mine, which had produced copper and molybdenum, and reduced the operations of the Lampazos silver mine. Real de Angeles stopped mining ore and waste (a planned stoppage) but continued to supply the flotation plant from the ore stockpile. Some mines sold part of their fixed assets to survive the year. For instance, the Santa Fe de Guanajuato Cooperative sold 11 ha of prime land in the Guanajuato area.

Several new projects were being developed during 1991. These included La Cienega, a gold and silver mine in Durango; Tizapa, a silver, lead, and zinc mine in the State of Mexico; Bismark, a zinc mine in Chihuahua; Rey de Plata, a lead and zinc mine in Guerrero, Minera María, a high-grade copper mine in Sonora; and Santa Gertrudis, a gold mine in Sonora.

Mexico was in sixth place as a producer of crude oil in the world and ranked eighth in terms of oil reserves. Average production of crude oil amounted to 2.68 Mbbl/d in 1991, a 5% increase over that of 1990. In the Western Hemisphere, only the United States (at 7.37 Mbbl/d) produced more oil than Mexico. Venezuela, the second leading producer of crude oil in Latin America, produced about 89% of that produced by Mexico. During 1991, Mexico exported crude oil to 22 countries. A majority (56.4%) of Mexican crude oil exports went to the United States, followed by Spain (18.1%), Japan (10.6%), France (3.5%), and Israel (2.1%). The petroleum industry continued to dominate the Mexican economy, although dependence on oil has been reduced significantly in recent years, from almost 80% of the value of total exports in 1982 to approximately 37% in 1990 and 29% in 1991. Approximately 89% of the value of petroleum exports (including petrochemicals) was from crude oil, about the same as that in 1990.

Mexico's gross domestic product (GDP) was estimated at $283.6 billion, up from $241.9 billion (revised) in 1990.[1] Government economic policies continued to be geared toward reducing inflation and maintaining economic growth, which began at the end of 1987 with the Economic Solidarity Pact and was followed by the Pact for Stability and Economic Growth. The current pact, an extension of the Pact for Stability and Economic Growth, announced in November 1990, would continue until December 31, 1991. In 1991, inflation, as indicated by the consumer price index, decreased to 18.8%, compared with 29.9% in 1990. Inflation levels continued to be low when compared with those of previous years, except in 1989, when it was 19.7%. In 1987 and 1988, inflation had been 150% and 57%, respectively. Inflation was projected to decrease to 11% in 1992.

The success of Mexico's external debt renegotiation has increased interest by domestic and foreign investment and credit communities. In December 1991, Mexico's total external debt was $104.1 billion, 77% of which was held by the public sector. Total external debt as a proportion of GDP fell from 58% in 1988 to 39% (revised) in 1990, 36% in 1991, and will be an estimated 32% of GDP at the end of 1992.

GOVERNMENT POLICIES AND PROGRAMS

The Government's privatization efforts continued during 1991 with success in the area of commercial banking and the steel industry. Nine commercial banks were privatized in 1991, including Banco Nacional de México (BANAMEX), Mexico's largest bank, which was sold in August to the G.F. Banacci group for $3.2 billion. The second largest bank to be privatized was BANCOMER, which was sold in October to the G.F. Vamsa group for $2.8 billion. The steel industry was privatized in 1991 with the sale of Sidermex assets, including those of Altos Hornos de México S.A. (AHMSA), Siderúrgica Lázaro Cárdenas-Las Truchas S.A. (SICARTSA), and Siderúrgica del Balsas S.A (Sibalsa). On November 22, the Ministry of Hacienda announced the sale of most of Mexico's parastatal steel

industry in three packages. The deal totaled about $1.5 billion, of which $340 million represented cash payments to the Government. The winners agreed to assume $195 million in short- and medium-term debt and $350 million in long-term obligations. In addition, the purchasers pledged to invest $585 million in the facilities. The Government will retain a $45 million capital position in one of the firms.

Government plans for divestment of State-owned enterprises covered many sectors. Although in 1982 the Government owned 1,155 parastatal enterprises, it planned to hold equity in only about 150 entities when all privatization efforts are concluded. In early 1992, there were 223 companies left in the public sector and approximately 87 of those companies were in the process of being privatized. In 1992, the Government of Mexico was expected to offer MICARE, the northern Mexican coal producer, for privatization and will solicit new offers for Minera Autlán, the manganese producer. Minera Autlán was offered for sale in 1991 but was not sold because of a lack of buyers. The Government was studying the sale of its shares in Exportadora de Sal, a salt mine. Other mining properties that the Government may offer in 1992 include Roca Fosfórica, a phosphate rock producer, and the two Government-owned sulfur operations.

In 1991, the Mexican Government removed 1,793,215 ha from the National Mining Reserves in the States of Baja California Sur, Chiapas, Chihuahua, Guanajuato, Guerrero, Hidalgo, Jalisco, Mexico, Michoacán, Nayarit, Nuevo León, Puebla, San Luis Potosí, Sinaloa, Tabasco, and Veracruz. Between February 1990 and December 31, 1991, 2,425,185 ha had been removed from the National Mining Reserves.

PRODUCTION

The value of Mexican nonfuel mineral output plus coal (mining and metallurgical sector) in 1991 was about $2.67 billion, a decrease of approximately 13% in real terms from the revised figure of $3.07 billion in 1990.[1] Nonferrous and precious metals accounted for about 49% and 16% of the total, respectively. Individually, copper was the most important in terms of value ($718 million), followed by zinc ($402 million) and silver ($320 million). In the industrial mineral sector, sulfur, which accounted for almost 7% of the total value (37% of the total industrial mineral value), was the most important in terms of value, followed by salt and fluorspar. The value of many industrial minerals, such as abrasive materials, cement, common clays, diatomite, feldspar, lime, magnesium compounds, mica, nitrogen in ammonia, perlite, sand and gravel, sodium compounds, stone, and talc, are not included in this total. During the year, production of gray portland cement was valued at more than $1.46 billion.

In general, the production of Mexico's leading metal commodities—copper, lead, silver, and zinc—decreased, and low silver prices were a concern for the industry during the year. Production from the Met-Mex Peñoles smelting and refining complex in Torreón, Coahuila, was affected by a 28-day strike during February and March. The Peñoles strike cost about $10 million in lost production and caused economic hardship for many small mines in the Torreón region that depend on the Peñoles smelter to process their ore. The Peñoles strike is a major reason, along with low silver prices, that caused a decline in lead, silver, and zinc production in 1991. With respect to industrial minerals (nonmetals), production of cement increased, while that of celestite, sulfur, and flourspar decreased.

Output from the large mining sector represented by Grupo Industrial Minera México (IMMSA), Corporación Industrial Sanluís, Empresas Frisco, and Industrias Peñoles remained at about 90% of total production. Mexico's newest group is Autrey-Ancira, which owns Real del Monte, Bastan del Cobre, Barita de Sonora, and in 1991 purchased Altos Hornos from the Mexican Government. *(See table 1.)*

TRADE

In 1991, total Mexican exports (f.o.b.), which exclude exports from maquiladoras, totaled $27.12 billion. Nonfuel minerals plus coal and coke contributed about 4.6% of export revenues, valued at $1.25 billion. Relative to total trade, the United States was Mexico's leading trading partner. Other important partners were France, Japan, and Spain. Approximately 68% of Mexico's total exports was to the United States, while about 66% of its total imports came from the United States. The mineral trade between the United States and Mexico was just as important to Mexico. In 1989, the last year for which information was available, about 63% of Mexico's mineral exports went to the United States, while 65% of its mineral imports was from the United States.

Total value of hydrocarbons exports, including refinery products, was $7.9 billion (29% of total exports). Mexico's hydrocarbon imports totaled $1.15 billion; therefore, net export earnings were $6.75 billion. In addition, Mexico exported petrochemicals valued at $1.39 billion ($246 million from Pemex), but petrochemical imports were valued at $1.8 billion ($105 million to Pemex), leaving a trade deficit in petrochemicals of $410 million. Total export earnings from hydrocarbons and petrochemicals produced by Pemex amounted to 31% of total exports. Crude oil accounted for 91.9% of hydrocarbon exports and refined products, 8.1%. In terms of volume, Mexico exported 499.5 Mbbl (1.369 Mbbl/d) of crude oil to 22 countries. The United States received 56.4% of the total, while Spain was the second largest market receiving 18.1%, and Japan received 10.6% of Pemex's crude oil exports. In addition, Mexico exported 3.2% of its total crude oil to several Caribbean and Central American countries under the San José Accord.

In metals, Mexico was a major exporter of copper, lead, manganese, silver, and zinc. In industrial minerals, it was a major exporter of cement,

fluorspar, graphite, gypsum, salt, sodium sulfate, and sulfur.

In June 1990, the Presidents of Mexico and the United States, after meeting in the United States, announced their endorsement of the objective of entering into a free trade agreement between the two countries. In late September 1990, after the President of Mexico officially requested such agreement and the Prime Minister of Canada requested participation in a trilateral agreement, the President of the United States notified the U.S. Congress of his intention of entering into an agreement among the three countries. In May 1991, Congress authorized the extension of the "fast track" negotiating authority. Formal negotiations among Canada, Mexico, and the United States began in June 1991. Six general categories of issues are to be negotiated in 19 working groups: (1) market access, including tariffs, rules of origin, and government procurement; (2) trade rules; (3) services; (4) investment; (5) intellectual property rights; and (6) dispute settlement. Negotiations for the proposed agreement, which became known as the North American Free Trade Agreement (NAFTA), were expected to be completed by late 1992.

Mexico signed a free trade agreement with Chile in September 1991 that will eliminate tariffs on most traded goods over a 4-year period commencing in January 1992. Tariffs on more sensitive products will be phased out over 6 years. Although trade has quadrupled since the agreement was signed, it is still relatively small.

In January 1991, Mexico and five Central American countries (Costa Rica, Guatemala, Honduras, El Salvador, and Nicaragua) signed the Tuxtla Gutiérrez Framework Agreement, which outlined general guidelines for future bilateral trade agreements. Mexico held bilateral consultations with each country with the aim of signing a framework agreement to create a free trade zone of 110 million people by 1996. Mexico also signed a Cooperation Agreement with the EC in April 1991. It is expected to promote and diversify Mexico's foreign trade; encourage economic, scientific, and financial cooperation; promote investment; and increase protection of intellectual property. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

Under the 1917 Mexican Constitution, minerals are considered to be part of the patrimony of the nation. The Government awards concession for the exploration and exploitation of nonfuel minerals. In most cases, foreign participation in the nonfuel mineral sector is limited to 49% ownership. The 1961 Mining Law imposed the requirement for a majority Mexican participation, both in equity and management, of mining companies. The 1961 law granted a 25-year grace period for Mexicanization of the industry, but most companies in the mining industry were Mexicanized within 10 years. The 1975 Mining Law gave the Government even more control over mining activities. The law limited foreign participation to 34% in gaining concessions on national reserves and for the exploitation of certain minerals, such as iron ore and coal. Exploitation of oil and gas, phosphate rock, potassium, sulfur, and uranium was reserved for the Government. In 1990, a new regulation was issued by SEMIP, which among other things, allowed more flexibility in foreign ownership through exploration and production trusts under the 1975 mining law.

In 1991, the nonfuel mineral sector in Mexico was formed by a mix of Government-owned companies, privately owned companies, companies with the Government as a majority partner, companies with the Government as a minority partner, and companies with foreign equity participation.

The Government's participation in the minerals sector continued to be substantial under the policy guidance and coordination of SEMIP, although equity participation in the industry has declined dramatically because of privatization policies. Three SEMIP autonomous agencies, Comisión de Fomento Minero (CFM), Consejo de Recursos Minerales (CRM), and Fideicomiso de Fomento Minero (FFM), formerly the Fideicomiso de Minerales No-Metálicos (FMNM), operated in the production, exploration, and development of the mining sector. CFM was founded in 1934 with the objective of promoting the mining activity through financial support, technical advice, and assistance to the medium and small mining sector. It was also responsible for constructing and operating regional mineral beneficiating plants and mineral research facilities. CRM, formed in 1975, was given the responsibility for mineral exploration and statistics. FMNM's functions had been to promote the development, mining, and processing of the industrial minerals (nonmetal) sector. In 1991, both CFM and FFM participated in the production of minerals through majority or minority ownership of a number of mineral companies, although CFM's participation in producing companies has decreased significantly over the past several years. CFM's 33% share of Minera Real de Angeles was sold in 1989. During the year, management of CFM and FFM was merged with certain operations such as research laboratories assigned to CRM.

The Dirección de Minas, as part of SEMIP's Subsecretaría de Minas e Industria Básica, had control of mineral concessions and the minerals register, as well as responsibility for updating and revising the mining law and regulations.

Other organizations helped shape the Mexican mining industry. One of them, Cámara Minera de México (CAMIMEX), promoted the interest of the mining industry and was a way for industry and Government to communicate and cooperate. In this industry group, both the private and Government companies were represented. One union represented the mineral industry workers, the Sindicato Nacional de Trabajadores Mineros, Metalúrgicos y Similares de la República Mexicana. In addition, various professional associations complemented the industry.

In the private sector, four large and diversified companies dominated the

production of nonfuel minerals. These were Corporación Industrial Sanluís S.A. de C.V. (Sanluís), Empresas Frisco S.A. de C.V. (Frisco), Grupo Industrial Minera México S.A. de C.V. (Grupo IMMSA), and Industrias Peñoles S.A. de C.V. (Peñoles).

Direct employment in the mining sector, at 220,000, was 20,000 less than that in 1990. Mining employment should stabilize in 1992 as new projects come on-stream.

The production of crude oil, natural gas, and basic petrochemicals was reserved for the Government operating through Petróleos Mexicanos (PEMEX), the Government-owned monopoly. PEMEX, in 1991, operated 7 refineries and 21 basic petrochemical complexes throughout the country. PEMEX was organized into eight subdirectorates, as follows: construction, primary production, industrial transformation, sales, finances, administration, planning, and petrochemicals. The petrochemicals subdirectorate was created in 1990 to consolidate petrochemical activities previously dispersed throughout the company. Enterprises affiliated with PEMEX were regulated and controlled by different subdirectorates. Among them, under the Petrochemical Subdirectorate, were the following: Distribuidora de Gas Natural del Estado de México S.A., (for the distribution of natural gas in the Mexico Valley) owned by PEMEX (51%) and the Government of the State of Mexico (49%); Distribuidora de Gas de Querétaro S.A. (distribution of natural gas in the City of Querétaro) owned by PEMEX (96%); and Cloro de Tehuantepec S.A. de C.V. (manufactures chlorine, caustic soda, and sodium carbonate and its derivatives in Pajaritos, State of Veracruz) owned by PEMEX (20%) and Química Penwalt S.A. de C.V. (80%). Under the Subdirectorate of Primary Production was the Compañía Mexicana de Exploraciones S.A. (exploration). Under the Subdirectorate of Marketing was the Compañía Operadora de Estaciones de Servicio (service stations), which operated 30 service stations. Petróleos Mexicanos Internacional (Grupo PMI) was formed in 1988-89 to market crude oil and refinery products and provide market and financial services, and analysis internationally. In 1990, the companies within Grupo PMI were the following: PMI Holdings N.V. in Curaçao, PMI Holdings B.V. and PMI Services B.V. in Amsterdam, PEMEX Services North America Inc. in Houston, PEMEX Services Europe Ltd. in London, and PEMEX Internacional España S.A. in Madrid. In 1990, through its subsidiary PMI Holdings B.V., PEMEX acquired part of the Spanish company Repsol S.A. in exchange for stock it owned of Petróleos del Norte S.A. (Petronor). Direct employment in PEMEX in 1991 was approximately 160,000, which was 10,000 less than at yearend 1990. About 5,000 workers were dismissed when the Azcapotzalco refinery in Mexico City was shut down in March for environmental reasons. *(See table 4.)*

COMMODITY REVIEW

Metals

Copper.—Copper mine production in 1991 decreased slightly from the historic high level of 1990. Mexicana de Cobre was the leading producer with 50% of total output, from its La Caridad Mine, followed by Mexicana de Cananea S.A. de C.V. with 32%. In 1990, Mexicana de Cobre and Cananea had produced 54% and 35% of the total copper produced in Mexico, respectively. In 1991, the bulk of the copper was produced in the State of Sonora where the largest three mines, La Caridad, Cananea, and María, are located. Other important copper-producing States were, in descending order of output, Zacatecas, Chihuahua, San Luis Potosí, Querétaro, Michoacán, and Durango.

Smelter output increased modestly to 182,565 tons in 1991. Output was from Mexicana de Cobre (62%); Mexicana de Cananea (22%); and Industrial Minera México (16%), a subsidiary of Grupo IMMSA and ASARCO Incorporated.

Mexico's production of 159,383 tons of refined copper was 4.6% above that of 1990. The Cobre de México refinery accounted for 120,824 tons, and Mexicana de Cananea produced 32,059 tons of electrolytic copper. Much of the blister copper produced by Cananea and La Caridad is transported to Mexico City where it is refined in the Cobre de México electrolytic refinery. In response to the environmental problems of Mexico City, the refinery has transferred some of its production to its new facility in Celaya, Guanajuato.

The newest copper producer in Mexico is Minera María, a joint venture between Empresas Frisco (51%) and Cominco Resources (49%). The underground María Mine started up late in 1990 and achieved full production in 1991. The mine produced 138,000 tons of 13% copper ore during the year. The 1,000-mt/d concentrator came on-stream in November and was expected to achieve full operating capacity in the spring of 1992.

The Cumobabi Mine, a Frisco subsidiary in the State of Sonora, was shut down in 1991. A significant increase in stripping ratio had made the operation uneconomic. Frisco began an extensive exploration program in the area to increase reserves, as well as began a study on the possibility of copper leaching.

Industrias Unidas S.A. (IUSA) imported a used refinery from Japan and opened the refinery in Huejotitlan, State of Mexico, in mid-1991. The Cobre de Pasteje (COBREMEX) refinery, which was purchased from Japan for about $25 million, will add 60,000 mt/a to Mexico's refined copper capacity. COBREMEX produced approximately 6,500 tons of refined copper during the last half of the year. Mexico's only other refinery, Cobre de México, had a capacity of 180,000 mt/a. Cobre de México, owned by Nacional Financiera (48%), Cía. Minera de Cananea (15%), and six other companies that use the refined copper, also planned to expand its refining capacity to 200,000 mt/a. When Cobre de México's expansion is completed, Mexico's total copper refining capacity will increase to 260,000 mt/a.

Copper reserves of the two most important mines in Mexico were reported at levels of 1,500 Mmt of ore with an

average grade of 0.393% copper for La Caridad Mine and for Cananea, 1,677 Mmt with an average grade of 0.618% copper for concentrate to be smelted, plus 850 Mmt of semioxidized or low-grade ore averaging 0.250% copper for solvent extraction and electrowinning (SX-EW).

Gold.—Most of Mexico's modest gold output was a byproduct of silver ores. However, interest in gold exploration has increased significantly as a result of the new mining regulations published in 1990 by SEMIP. The most important development in gold in 1991 was the increased interest by both Mexican and foreign mining companies to explore for gold in Sonora, Baja California, and Chihuahua. Many of the foreign companies have established investment trusts (which allow 100% foreign ownership) for their exploration efforts in Mexico. On November 25, 1991, the Santa Gertrudis open pit gold mine was inaugurated in the Cucurpe municipality of Sonora. The mine is owned 51% by the Aristegui Group of Mexico and 49% by Phelps Dodge. The total investment was about $30 million.

During the year, production increased by 4.6% to almost 9,000 kg, about 0.4% of world output. The gold-producing area of Guanajuato, with the Guanajuato Group, the Santa Fe Mining Cooperative, and El Cubo Mine, accounted for more than one-third of Mexico's annual gold production. All of these mines produce silver as their primary product. Other important sources of gold production were the San Luis Mines in the San Dimas District near Tayoltita, and Durango and the Real del Monte Mine in Pachuca, Hidalgo. Guanajuato continued to be the leading producing State, contributing 35.4% of the national volume of production, followed by Durango (17.9%), Sonora (10.3%), Sinaloa (8.8%), Zacatecas (6.6%), and Chihuahua (5.4%). However, with the development of Santa Gertrudis and current exploration activities for gold in Sonora, Baja California, and Chihuahua, the gold picture should change beginning in 1992 as more heap-leach gold operations are developed.

Iron and Steel.—Production of pig iron and directly reduced (sponge) iron in Mexico decreased 19% and 3%, respectively, to 2.96 Mmt and 2.46 Mmt. Mexico was the second largest producer of steel in Latin America after Brazil. Together, Brazil and Mexico produced more than 77% of the Latin American output. Mexico's share of the Latin American output was about 20%. Mexican production of crude steel decreased almost 10% from that of 1990 and represented about 1% of the world total. Brazil, with an increase of about 11%, was the only important Latin American steel producer that had a production increase during the year.

The most important development in 1991 for the steel industry was the privatization of Sidermex, the State holding company formed in 1978 to administer parastatal steelmaking operations. On November 22, the Ministry of Hacienda announced the sale of most of Mexico's parastatal steel industry in three packages. The deal totaled about $1.5 billion, of which $340 million represented cash payments to the Government. The winners agreed to assume $195 million in short- and medium-term debt and $350 million in long-term obligations. In addition, the purchasers pledged to invest $585 million in the facilities. The Government will retain a $45 million capital position in one of the firms. The largest sale involved the company known as Altos Hornos de México S.A. (AHMSA). The winning consortium bidder was Grupo Acerero Del Norte headed by Xavier Autrey and Alonso Ancira, with Hoogovens of the Netherlands and Mission Energy of California as minority partners. The terms included $145 million in cash, $535 million worth of facility improvements, and $350 million in long-term debt. The assets of AHMSA include a blast furnace and basic oxygen furnace (BOF) shops at Monclova, Coahuila; a continuous casting plant at Ciudad Lázaro Cárdenas, Miochoacán; a flat products mill at Monterrey; and a 29% share of the Peña Colorada iron ore mine in Colima. The second sale involved Siderúrgica Lázaro Cárdenas-Las Truchas S.A. (SICARTSA), a rebar and wire producer was acquired by Grupo Villacero, a Monterrey steel tube manufacturer for $170 million in cash and $42.5 million in promised improvements. The Government will retain a 20% share, valued at $45 million. The third sale transferred Siderúrgica del Balsas S.A (Sibalsa), also referred to as Sicartsa II, to Ispat Mexicana S.A. de C.V., which is owned by Caribbean Ispat India. Terms of the sale include $25 million in cash, $195 million in assumed debt, and $50 million in promised investments. Assets include the Sicartsa II plant facilities at Lázaro Cárdenas plus a 29% share in the Peña Colorada Mine. An unassembled, 1.5-Mmt/a Davy Mckee plate mill will finally be installed, 4 years after delivery.

With these privatization sales, the ownership of the Peña Colorada iron ore mine is now split between Acerero del Norte and Caribbean Ispat, with 29% each, and HYLSA (Grupo ALFA) retaining the balance.

The largest steel producer in 1991 was Altos Hornos de México S.A. (AHMSA), with 2.7 Mmt, followed by Hylsa de México S.A. (HYLSA) in Monterrey, with an output of 1.92 Mmt, and Siderúrgica Lázaro Cárdenas-Las Truchas S.A. (SICARTSA), with an output of 1.46 Mmt. Tubos de Acero de México S.A. (TAMSA), with facilities in Veracruz and headquartered in Mexico City, was the fourth largest producer of crude steel with an output of 517,000 tons. TAMSA's most important domestic client was PEMEX.

In terms of process, 57% of crude steel was produced by electric furnace, 39.6% was produced by BOF, and 3.3% was produced by open hearth.

Mexico exported about 1.3 Mmt of semifinished and finished steel products with a value of $997 million, while it imported 2.56 Mmt of semifinished and finished products with a value of $1.76 billion. Exports of semifinished and finished products in 1990 were 1.7 Mmt (revised) valued at $840 million, while imports of semifinished and finished products in 1990 were 1.2 Mmt (revised) valued at $964 million. Mexican steel

producers were extremely concerned because steel production in Mexico decreased by 10% in 1991 while imports increased by 118%. *(See tables 3 and 4.)*

Lead and Zinc.—Mine production of lead and zinc decreased about 8% and 7%, respectively, from that of 1990. Both metals continued to be important to the Mexican mining industry. Mine production of zinc ranked second in terms of value after copper, but ahead of silver. Mine production of lead ranked fifth in terms of value, ahead of gold. Mexico produced 5% of the world mine output of lead and 4% of world output of zinc, ranking sixth in the production of zinc and seventh in the production of lead. Most of the production of lead and zinc was associated with the production of silver. The leading producers of lead and zinc were Frisco, IMMSA, and Peñoles, together producing about 85% of the zinc and 81% of the lead output in Mexico. Frisco was the leading producer of lead. Together, Frisco's subsidiaries, Minera Real de Angeles S.A. de C.V. and Minera Francisco del Oro S.A. de C.V., produced about 30% of the total lead and 18% of the zinc output. Grupo IMMSA, in a joint venture with Asarco, was the leading producer of zinc in Mexico. During the year, their subsidiaries, through México Desarrollo Industrial Minero S.A. de C.V. (MEDIMSA), produced 54% of the zinc and 24% of the lead. Peñoles produced 27% of the lead and 14% of the zinc. The five leading States in the production of lead in 1991, in order of importance, were Chihuahua, Zacatecas, Durango, San Luis Potosí, and Sinaloa. The five leading States in the production of zinc were Zacatecas, San Luis Potosí, Chihuahua, Michoacán, and Guerrero. The three leading recipients of Mexican zinc in all forms were the United States and Germany, followed by Belgium.

Silver.—Although silver in recent years has decreased in relative importance in Mexico's mineral sector, falling third behind copper and zinc in terms of production value, the country continued to be the world's leading producer of silver in 1991. Mine production was 2.224 Mkg, about 16% of the total world output. This represents a 5.3% decrease from production levels of 1990, when output was 2.346 Mkg. The top producers were Peñoles (about 750,000 kg), Frisco (353,600 kg, 264,000 kg of which was from Real de Angeles S.A. de C.V.), and Grupo IMMSA (373,750 kg). The Fresnillo Mine in Fresnillo, Zacatecas, a joint venture between Peñoles (60%) and AMAX (40%), remained the world's largest individual silver producer in 1991, a position previously held by the Real de Angeles Mine in Noria de Angeles, Zacatecas.

In December 1990, the Tayoltita Mine in Durango, owned by Grupo Sanluís, was closed because of low silver prices and labor problems and remained closed through February 1991. The mine, of great historical significance, produces doré bars with 95% silver and 2% gold. A total restructuring was carried out at Tayoltita during the year. This program included the shutdown through February and negotiations with the union; an agreement between the company, the union and the Department of Labor authorities with a new contract based on a productivity scheme; and a personnel reduction of 66%. As a result, the company claimed a reduction in production costs at Tayoltita from $5.20 per equivalent troy ounce of silver to $3.05 during 1991. Production from the Grupo Sanluís in 1990 was 72,600 kg of silver, an increase of 6% over that of 1990. Its gold production decreased by 24%, however, over the same period from 1,116 kg to 849 kg.

Industrial Minerals

Cement.—Mexican cement production increased almost 12% in 1991 compared with that of 1990, making cement one of the bright spots in an otherwise difficult year for the Mexican mineral industry. Sales of cement, both domestic and foreign, amounted to $1.45 billion in 1991. Mexico was a leading exporter of cement to the United States.

The Mexican cement industry produced 26.7 Mmt of cement in 1991. About 87% was for the domestic market and 13% was exported. Cementos Mexicanos S.A. de C.V. (CEMEX) was the leading producer of cement with about 75% of the national capacity of about 30 Mmt and 70% of domestic sales. CEMEX ranked as the fourth largest cement producer in the world. In September 1991, CEMEX established a stock exchange deposit facility in the United States so that U.S. investors may invest in CEMEX stock without being subject to the limitations and logistical difficulties of buying stock in Mexico. The new CEMEX plant in Sonora started operating during 1991 and the 1-Mmt expansion to the plant in Hermosillo was completed. Including the new Sonora plant, there were 30 cement plants in Mexico.

Other cement producers included Cemento Cruz Azul S.C.L., Cementos Apascos S.A., and nine independent producers. Apasco, which is partially owned by Holderbank of Switzerland, was Mexico's second largest cement producer, with two plants. Cementos Cruz Azul, a worker's cooperative with two plants, was Mexico's third largest cement producer.

Most Mexican cement plants have switched to fuel oil from natural gas since the first priority for natural gas is Mexico's petrochemical sector, followed by industries located in cities with environmental problems. Many cement plants would prefer to burn natural gas if it were available.

Fluorspar.—Fluorspar production plunged to slightly more than 370,000 tons in 1991, a decrease of 41% from that of 1990. Strong environmental pressures, beginning with the Montreal Protocol, have continued to affect the use of acid-grade fluorspar in the production of chlorofluorocarbons. Moreover, aggressive marketing by Chinese fluorspar producers has depressed the price for fluorspar by more than 30% over the past 2 years, causing the closure of several Mexican fluorspar producers.

Mexico's most important fluorspar deposits are in the northern portion of the State of Coahuila, in Zaragoza, San Luis Potosí, and the Río Verde area in Guanajuato State. Fluorite is also found in many lead-zinc-silver veins and is recovered as a byproduct of mining operations in the Hidalgo del Parral, Santa Bárbara, San Francisco del Oro region of Chihuahua. Mexico's largest fluorspar producer is Minera Las Cuevas near Zaragoza, San Luis Potosí. Presently installed capacity is 320,000 mt/a of acid-grade concentrates and 200,000 mt/a of metallurgical grades. Las Cuevas fluorspar has a relatively high arsenic content that limits the use of the material in hydrofluoric acid plants and, thus, limits export sales. The firm was in the process of a 4-year expansion program to reach a total capacity of 750,000 mt/a of fluorspar production. Minera Las Cuevas is 51% owned by Mexican nationals and 49% owned by Noranda Inc. of Canada. Fluorspar operations that closed in 1991 include Fluorita Río Verde and Fluorita de Río Colorado, both owned by Peñoles. The La Domincia Mine of the Sanluís Group also ceased production in 1991. Fluorspar production of Zinc de México, of the IMMSA group, dropped from 25,000 tons in 1989 to 9,150 tons in 1990, and the operation closed in 1991. Output from Frisco's fluorspar operation dropped in 1991 because of a 138-day strike. Thus, the only two large fluorspar operations remaining in Mexico are Fluorita de Mexico and Minera Las Cuevas, both operating at about 50% of capacity.

Mexico exports about 60% to 75% of its fluorspar production, with the United States as its most important market. Significant quantities of Mexican fluorspar are converted into hydrofluoric acid, most of which is exported to the United States.

Graphite.—Mexico ranks as the number three producer of graphite in the world, behind the Republic of Korea and India. Graphite production in 1991 amounted to approximately 37,300 tons, an increase of 50% over that of 1990. Approximately 95% of Mexican graphite production is amorphous graphite. The most important center for graphite production in Mexico is southeast of Hermosillo, Sonora, where amorphous graphite is mined from altered coal seams. Grafitera de Sonora and related companies are the largest producers. This group, which is an affiliate of Cummings Moore Graphite Co. of the United States, accounts for about 75% of the graphite production of Sonora. Other companies that produce amorphous graphite are Grafito Superior and Exploradora Sonorense de Grafito.

Grafito de México produces flake (crystalline) graphite at Telixtlahuaca, Oaxaca. This firm was sold by the Government in 1989 to Minerales no Metálicos Mexicanos, a mining company specializing in barite, kaolin, bentonite, and phosphate rock. The plant has an annual capacity to produce about 2,000 tons of flake graphite from 50,000 tons of ore. Mexico exports about one-half of its graphite production to the United States and supplies about one-half of the U.S. demand for imported graphite.

Sulfur.—Two companies with large Government equity participation, Azufrera Panamericana S.A. (APSA) and Cía. Exploradora del Istmo S.A. (CEDI), produced 1.04 Mmt of Frasch sulfur in 1991, a decrease of 28% from that of 1990. PEMEX produced 754,000 tons as a byproduct of petroleum and natural gas operations, and an estimated 280,000 tons was produced as a byproduct of metallurgical operations. APSA was controlled by the Government through majority ownership by Comisión de Fomento Minero (55.33%), Nacional Financiera S.N.C. (40.65%), Banco Nacional de México S.N.C. (4.00%), Roca Fosfórica Mexicana S.A. (0.01%), and Minera Carbonífera Río Escondido (0.01%). CEDI was also majority owned by the Government entities Comisión de Fomento Minero (51%) and Fertilizantes Mexicanos (13%), and by Texas Gulf Inc. (34%), and two Mexican private concerns (2%).

About 65% of the sulfur produced by APSA and CEDI was for export. In addition, APSA handled all sulfur exports for PEMEX.

Mineral Fuels

Hydrocarbons output continued to dominate Mexico's energy sector. Production of crude oil and natural gas in 1988 (the last year for which energy source information was available) represented about 90% of all energy produced compared with that of 1975, when hydrocarbons accounted for about 80% of the total. In 1988, the remaining 10% of primary energy produced was from coal (1.6%), firewood and sugarcane (4.9%), geothermal (0.9%), and hydroelectric sources (2.6%).

Coal.—Production (run of mine) of steam and metallurgical coal decreased about 6% from that of 1990 to 9.4 Mmt. Minera Carbonífera Río Escondido (MICARE), the principal coal producer in Mexico, owned by Comisión de Fomento Minero (32.91%), the national electric company Comisión Federal de Electricidad (CFE) (48.14%), Nacional Financiera (18.92%), Altos Hornos (0.02%), and IMMSA (0.01%), was scheduled for privatization in 1992. The principal coal mining area of Mexico is the northern part of the State of Coahuila, where MICARE operates.

Natural Gas and Petroleum.—Worldwide, Mexico, at yearend 1991, ranked ninth and sixth in the production of natural gas and oil, respectively. In terms of reserves, it ranked 8th for oil and 12th for natural gas. Internationally, PEMEX (as a company), in 1991, ranked third in the production of crude and fifth in the production of natural gas. The company, in terms of sales, was 14th worldwide, with a total of $13 billion. In 1991, PEMEX had its best year for producing oil since its peak year in 1984. Average daily crude oil production was 2.68 Mbbl, up 5% compared with 2.55 Mbbl in 1990. Mexican output of natural gas decreased slightly. Total production of refinery products increased moderately to a record high.

For administrative purposes and to further reporting simplification, Mexico's national territory has been divided into three regions, North, South, and Marine. The North Region includes the Northeast Frontier, North, South, Poza Rica, and the Papaloapán Basin producing Districts. The South Region includes the Agua Dulce, El Plan, Nanchital, Ciudad Pemex, Comalcalco, and Villahermosa Districts. The Marine Region refers to the Bay of Campeche. Oil and gas producing fields are found in each of the Districts. The most important producing regions in 1991, the Marine and South Regions, produced 71% and 25%, respectively, of the total Mexican crude oil. Those two regions also dominated the production of natural gas. The South Region, mostly the Villahermosa District, produced 55% of Mexico's natural gas output in 1991. The Marine Region (Bay of Campeche) accounted for 32% of total natural gas output for the year.

In 1991, Mexico completed 51 exploration wells, of which 17 had oil, 7 wells located natural gas and condensate, and 1 well found dry natural gas. The remainder was unproductive. This result represents 8 more completed exploration wells than in 1990, with 11 more productive wells. PEMEX had a 52% success rate for its exploratory wells completed in 1991, the highest percentage in more than a decade. According to PEMEX, yearend 1991 proven hydrocarbon reserves were 65.0 billion bbl, a slight decrease (about 1%) from that of yearend 1990. This decrease continued the decline in reserves that began in 1983, but at a much slower rate than in previous years. About 56% of the oil, 44% of the condensate, and 16% of the gas reserves are found in the Marine Region.

PEMEX provided 31% of Mexico's total export earnings in 1991 and brought in 34% of all public sector income in 1991. Exports of crude averaged 1.37 Mbbl/d, 91,000 bbl/d more than that in 1990. PEMEX announced that petrochemical production for 1991 increased by 2.3% to 18 Mmt. This was the highest level in the history of the company. Total revenues from petroleum exports reached $7.9 billion; $7.27 billion from crude oil sales and the remainder from petroleum products. Petrochemical exports accounted for an additional $246 million in export revenues. In 1991, 56.4% of Pemex's oil exports went to the United States.

Imports of natural gas from the United States surged in 1991 to an average of 4.64 Mm^3/d and were valued at $106 million in 1991, compared with $31 million in 1990. In addition to natural gas, Mexico imported gasoline, amounting in 1991 to 68,689 bbl/d, more than double the 30,605 bbl/d imported in 1990. To help alleviate air pollution in Mexico, the Government has encouraged the use of unleaded gas, but PEMEX does not have the refining capacity to meet demand. *(See tables 7 and 8.)*

Reserves

Most of the mineral reserves data were developed between the U.S. Bureau of Mines Divisions of Mineral Commodities and Resource Evaluation based on the definitions by the U.S. Bureau of Mines and the U.S. Geological Survey as published in the Geological Survey Circular 831, 1980. The term reserves refers to economic reserves.

Mexico ranked second in reserves of graphite and silver (tied with Canada), with about 15% and 13% of total world reserves, respectively. The country was among the top five reserveholders of antimony (4%), bismuth (9%), cadmium (7%), fluorspar (9%), mercury (4%), selenium (5%), soda ash (0.7%), and sodium sulfate (5%). In reserves of lead and zinc, Mexico ranked sixth each (4% each). It also ranked seventh in reserves of molybdenum (1.6% of world reserves) and eighth for copper and manganese (less than 0.5%), respectively. Mexico had 5% of sulfur reserves, ranking eighth in the world. World reserves of antimony, bismuth, and fluorspar excluded those of the United States. Mexico ranked in eighth place worldwide in terms of proven reserves of crude oil, after Venezuela. *(See table 9.)*

INFRASTRUCTURE

Mexico had 20,680 km of railroads, 19,950 km of which was 1.435-m gauge and 730 km of 0.914-m gauge. It contained 210,000 km of roads, of which 65,000 km was paved, 30,000 km was semipaved or cobblestone, 60,000 km was rural roads (improved dirt), and 55,000 km was unimproved dirt. The Government has begun to allow the private sector to participate in infrastructure projects that previously were restricted to the public sector. One of the most important programs has involved granting temporary concessions to the private sector for the construction and operation of highways. The concessionholder is allowed to charge tolls on projects developed until construction costs have been recovered and a reasonable profit made at which time ownership of the highway reverts to the Government. During the Salinas administration, 724 km of new highways has been opened and an additional 1,900 km is being built through this mechanism. The Government estimates that it will grant concessions to build and operate another 3,046 km of highways in 1992, including highways linking Mexico City-Guadalajara, Pachuca-Tampico, and Tehuacan-Oaxaca.

The country had 11 ports and 2,900 km of navigable rivers and coastal canals. Of the country's 64 ships in the merchant marine, at least 44 were available for the transportation of mineral products. PEMEX had 35 ships in its fleet, 11 of which were at least 20 years old and 2 that were commissioned in 1989. Capacity utilization in 1990 was 74%.

The Government has also opened certain operations in ports and airports to private investment, such as the loading and unloading of cargo, pilot services on tug boats, and the operation of storage facilities. Private-sector companies were planning to invest more than $150 million in port facilities under building-operate-transfer arrangements, as much as the total public investment program of 1988 and 1989 in this area.

Most ore and metallurgical products in Mexico were transported by truck. Railways declined in importance during the 1980's, as the volume of freight and passenger transport dropped by more than 25%, owing to increasingly poor and unreliable service. Railroads were used mainly for bulk items such as iron ore, coal, and coke. Gray portland cement was transported by railroads (26%), by roads (63%), and by ship (13%). About 65% of the cement was sold in bulk.

Crude oil and natural gas are transported mainly through pipelines within Mexico. Of the nine refineries, eight receive crude oil by pipeline. By law, only PEMEX may own pipelines to distribute oil and oil products in Mexico. At yearend 1991, PEMEX owned and operated almost 60,000 km of pipelines. About 28,000 km of the pipelines was for the collection of hydrocarbons at the wellhead. Of the 393 specialized pipelines, 102 (about 113,000 km) were used for gas, 57 (about 5,100 km) for crude oil, 132 (about 9,900 km) for refinery products, 75 (1,357 km) for petrochemicals, and 27 (196 km) for fuel oil. Finally, there were 5 pipelines under construction, and 13 were inoperative at the end of 1991.

OUTLOOK

In recent years, the Government of Mexico has implemented fiscal and economic programs aimed at reducing inflation and promoting sustained economic growth, particularly in the mineral sector. Among the programs introduced in 1990 was the new mining regulations, which in agreement with other programs, attempted to increase interest of domestic and foreign investors in the mining sector, without changing the mining law of 1975, through exploration and production trusts (fideicomisos). The exploration boom in Sonora, Baja California, and Chihuahua was partly a result of this program. A new mining law designed to simplify the onerous law of 1975 was expected to be issued during 1992.

Another significant step taken by the Government in recent years has been the privatization of Government-held corporations. Many of the mineral producing companies have been privatized recently or were on the block waiting privatization, and this process was expected to continue. Foreign ownership was allowed in the cement and steel industries.

According to Mexican Government officials, Mexico needed to increase its exploration program to sustain or increase output levels. The country had planned to increase mining output by 2% to 2.6% by 1991 and by 4.5% to 5% by 1994. Government programs were aimed at facilitating mining activities by simplifying administrative procedures, removal of 2.4 Mha from National Mining Reserves, opening more areas for exploration, and modernizing the tax regime.

The Mexican Government has been highly successful in promoting investment, both foreign and domestic, in the mining sector. However, continuing low prices for base metals (except copper) and precious metals have had a negative effect on the mining industry worldwide. When prices do begin to recover, Mexico will be well placed to meet or surpass its mining output objectives, particularly from the gold projects in the northern part of the country.

Looking toward 1992 and beyond, the North America Free Trade Agreement (NAFTA) should play a significant role in attracting foreign investment into Mexico's mineral sector and stimulating expanded international trade in minerals as Mexican mineral tariffs are reduced.

[1]Where necessary, values have been converted from Mexican pesos (Mex$) to U.S. dollars at the rates of Mex$2,827=US$1.00 and Mex$3,018=US$1.00 for the years 1990 and 1991, respectively.

OTHER SOURCES OF INFORMATION

Agencies

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TABLE 1

MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[p]
METALS						
Aluminum:						
Primary		60,200	68,337	71,691	67,515	50,827
Secondary		8,765	4,474	13,172	56,803	63,823
Antimony:						
Mine output, Sb content[3]		2,839	2,185	1,906	2,614	2,753
Metal (in mixed bars and refined)		1,602	1,207	1,192	942	1,284
Arsenic, white[4]		5,304	5,164	5,551	4,809	4,922
Bismuth[5]		1,012	958	883	733	651
Cadmium:						
Mine output, Cd content		1,249	1,726	1,439	1,414	1,797
Metal, refined		935	1,117	976	882	688
Copper:						
Mine output, Cu content[6]		243,977	273,544	r249,328	298,695	284,174
Metal:						
Blister (primary only)		126,310	150,334	174,294	175,374	182,565
Refined:						
Primary[e 7]		114,576	119,097	124,058	131,689	139,085
Secondary[e 8]		21,185	21,750	22,971	21,150	20,298
Total		135,761	140,847	147,029	152,839	159,383
Gold:						
Mine output, Au content	kilograms	7,988	9,098	8,613	8,338	8,937
Metal, refined	do.	6,392	6,369	5,919	5,789	5,022
Iron and steel:						
Iron ore, mine output:						
Gross weight[9]	thousand tons	7,523	8,431	8,141	8,073	7,539
Fe content	do.	4,965	5,564	5,373	5,328	4,976
Metal:						
Pig iron	do.	3,712	3,678	3,230	3,665	2,962
Sponge iron	do.	1,551	1,686	r2,164	2,525	2,462
Total	do.	5,263	5,364	5,394	6,190	5,424
Ferroalloys:						
Ferromanganese	do.	161	165	168	186	147
Silicomanganese	do.	80	80	99	r71	67
Ferrosilicon	do.	18	17	9	r7	6
Ferrochromium	do.	6	9	3	(10)	(10)
Other	do.	1	1	(10)	(10)	(10)
Total	do.	266	272	279	264	220
Steel, crude	do.	7,642	7,779	7,851	8,726	7,883
Rolled products	do.	5,954	6,207	r5,959	r6,705	6,249
Forgings and castings	do.	r53	107	74	r68	61
Lead:						
Mine output, Pb content		177,161	171,337	163,017	179,947	165,182
Metal:						
Smelter:						
Primary		176,986	171,087	162,478	178,947	163,186

See footnotes at end of table.

TABLE 1—Continued

MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[p]
METALS—Continued						
Lead—Continued:						
Metal—Continued:						
Smelter Continued:						
Secondary (refined)[e]		r65,000	70,000	75,000	65,000	60,000
Total[e]		241,986	241,087	237,478	243,947	223,186
Refined:						
Primary (including lead content of antimonial lead)		173,830	168,093	160,035	167,191	151,817
Secondary[e]		r65,000	r70,000	r75,000	r65,000	60,000
Total		235,830	238,093	235,035	233,191	211,817
Manganese ore:						
Gross weight[11]		385,282	443,613	394,408	365,395	319,600
Mn content		146,407	168,573	149,875	138,850	114,497
Mercury, mine output, Hg content		124	345	r651	735	720
Molybdenum, mine output, Mo content		4,400	4,456	4,189	r2,000	1,716
Selenium, mine output, Se content		29	13	20	12	3
Silver:						
Mine output, Ag content	kilograms	2,414,954	2,358,907	2,306,091	2,346,336	2,223,647
Metallurgical products:						
Impure bars	do.	156,463	247,619	241,211	224,897	210,114
Mixed bars	do.	45,257	76,423	83,801	72,809	73,112
Metal, refined, primary	do.	2,142,280	1,975,996	1,904,286	1,895,527	1,778,739
Other	do.	9,006	16,585	28,251	77,485	161,682
Tin:						
Mine output, Sn content		369	274	r11	r5	12
Metal, smelter, primary		2,103	1,812	4,752	5,004	2,262
Tungsten, mine output, W content		213	206	170	183	194
Zinc:						
Mine output, Zn content		271,480	262,228	284,058	322,487	300,706
Metal, refined, primary		184,755	192,529	193,279	199,295	189,082
INDUSTRIAL MINERALS						
Abrasives, natural[12]		12,390	r15,458	r22,022	e25,000	e25,000
Barite		401,336	534,954	324,739	304,996	203,975
Cement, hydraulic	thousand tons	22,347	r22,513	r22,766	23,824	26,700
Clays:						
Bentonite		129,596	163,916	123,927	144,895	145,347
Common		178,347	158,153	e168,000	e175,000	175,000
Fuller's earth		49,112	37,226	24,603	29,865	41,078
Kaolin		151,104	162,415	141,519	156,140	167,238
Diatomite		34,708	36,524	44,920	r51,084	45,966
Feldspar		106,490	83,170	r121,978	163,011	151,678
Fluorspar:						
Acid-grade	thousand tons	291	338	359	268	132
Ceramic-grade	do.	—	27	27	11	—
Metallurgical-grade	do.	244	253	225	192	90
Submetallurgical-grade	do.	189	138	168	163	148
Total	do.	724	756	779	634	370

See footnotes at end of table.

TABLE 1—Continued

MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[p]
INDUSTRIAL MINERALS—Continued						
Graphite, natural:						
Amorphous		36,674	47,871	38,304	r22,553	35,315
Crystalline		1,787	1,735	1,942	r2,365	1,943
Gypsum and anhydrite, crude (yeso)		4,575,416	4,779,827	5,390,391	r5,423,804	4,774,130
Lime, hydrated and quicklime[e]	thousand tons	6,250	6,000	6,000	6,000	6,500
Magnesium compound:						
Magnesia[13]		118,332	141,014	125,210	r121,897	111,987
Magnesite		7,351	5,384	4,229	579	600
Mica, all grades		3,419	6,228	4,510	5,863	5,587
Nitrogen: N content of ammonia		r1,743,346	r2,067,330	r2,100,154	2,163,672	2,221,374
Perlite		39,428	39,169	37,354	42,439	48,860
Phosphate rock[14]		688,973	835,093	655,477	r623,481	596,392
Salt, all types	thousand tons	6,199	6,788	6,703	7,135	7,533
Sodium compounds, n.e.s.:						
Carbonate (soda ash):[15]						
Natural[e]		175,000	176,000	190,000	190,000	e190,000
Synthetic[e]		242,000	245,000	267,000	259,000	e259,000
Sulfate, natural (bloedite)[16]		480,642	r422,000	r478,000	r545,157	517,600
Stone, sand and gravel:						
Calcite, common		486,740	436,183	444,000	r445,415	457,925
Dolomite		411,601	340,671	469,564	482,168	470,668
Limestone[17]	thousand tons	23,735	24,741	r25,232	r27,405	29,765
Marble		261,000	468,000	r524,160	681,408	749,548
Quartz, quartzite, glass sand (silica)		965,921	926,166	r1,216,443	1,298,283	1,330,693
Sand and gravel:						
Sand	thousand cubic meters	52,513	51,904	r42,773	r44,700	44,012
Gravel[e]	do.	34,007	33,477	r36,801	r37,737	39,747
Strontium minerals: Celestite		47,739	51,626	67,658	66,254	62,180
Sulfur, elemental:						
Frasch process	thousand tons	1,806	1,628	r1,531	1,441	1,040
Byproduct:						
Of metallurgy[e]	do.	154	240	286	290	280
Of petroleum and natural gas	do.	498	510	555	r682	754
Other		—	—	—	—	20
Total[e]	do.	2,458	2,378	2,372	2,413	2,094
Talc		17,469	13,645	r13,534	r13,477	11,883
Vermiculite		161	r218	300	132	150
Wollastonite		10,993	10,506	10,618	11,442	13,877
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Run-of-mine:						
Metallurgical	thousand tons	7,014	6,439	5,847	5,544	5,316
Steam	do.	4,122	4,147	4,136	4,470	4,085
Total	do.	11,136	10,586	9,983	10,014	9,401
Washed metallurgical coal	do.	3,026	2,340	2,761	2,850	2,206

See footnotes at end of table.

TABLE 1—Continued

MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1987	1988	1989	1990	1991[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Coke:[18]	thousand tons					
Metallurgical	do.	2,330	2,322	2,260	2,315	2,005
Imperial	do.	6	5	6	6	3
Breeze	do.	4	5	4	16	98
Total	do.	2,340	2,332	2,270	2,337	2,106
Gas, natural:						
Gross	million cubic meters	36,154	36,046	36,919	37,741	37,555
Marketed	do.	33,816	34,512	30,414	34,138	33,655
Natural gas plant liquids	thousand 42-gallon barrels	r123,116	r133,320	r139,254	155,575	e155,000
Petroleum:						
Crude	do.	927,333	r917,416	917,355	930,023	976,682
Lease (field) condensate	do.	2,563	1,857	2,355	1,831	1,444
Total	do.	929,896	r919,273	919,710	931,854	978,126
Refinery products:						
Gasoline:						
Aviation	do.	418	430	409	372	75
Motor, leaded and unleaded	do.	134,291	137,044	140,988	153,731	151,702
Liquefied petroleum gas	do.	70,306	75,704	79,530	88,639	91,357
Jet fuel	do.	15,141	16,495	r15,890	18,598	22,502
Kerosene	do.	11,009	9,961	9,075	5,778	3,577
Distillate fuel oil (diesel)	do.	84,817	75,465	85,518	94,387	101,634
Lubricants	do.	2,602	2,842	r2,727	2,678	2,803
Residual fuel oil	do.	154,939	154,003	155,832	158,811	164,576
Asphalt	do.	6,655	5,463	5,484	5,765	7,825
Unfinished crude oil[19]	do.	660	—	—	—	—
Unspecified and refinery fuel and losses	do.	38,843	44,667	44,400	43,467	35,994
Total	do.	519,681	522,074	r539,853	572,226	582,045

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

[1]Table includes data available through Feb. 29, 1992.

[2]In addition to the commodities listed, additional types of crude construction materials are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Sb content of ores for export plus Sb content of antimonial and impure bars plus refined metals.

[4]Gross weight of white and black (impure) arsenic trioxide.

[5]Refined metal plus Bi content of impure smelter products.

[6]New series as reported by CAMIMEX. Tonnages reflect a 2.5% metal loss in smelter.

[7]Includes cathode copper from the Cia. Mexicana de Cananea S.A. de C.V. electrowinning plant in metric tons as follows: 1987—8,1662; 1988—11,380; 1989—10,299; 1990—26,945; and 1991—32,059.

[8]Secondary refined copper production is estimated to be 16.8% of the total refined copper produced by Cobre de Mexico S.A.

[9]Calculated from reported Fe content on the basis of concentrate and pellets containing 66% iron. Total run-of-mine output in 1986 was just under 15 million tons.

[10]Less than 1/2 unit.

[11]Calculated from production of Mn content reported by the Consejo de Recursos Minerales.

[12]Based on exports, comprised mostly of pumice stone and emery (a granular, impure variety of corundum).

[13]Reported by Industrias Penoles S.A. de C.V. as the only major producer.

[14]Includes only output used to manufacture fertilizers.

[15]Total sodium carbonate reported by Asociacion Nacional de la Industria Quimica.

[16]Series reflects output reported by Industrias Penoles plus an additional 22,000 tons estimated production by Sulfato de Viesca.

[17]Excludes that for cement production.

[18]Includes coke made from imported metallurgical coal.

[19]Specified by PEMEX as "virgin stock-28" and processed at its refineries primarily for export.

TABLE 2

MEXICO: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Destinations, 1990	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	1	—		
Alkaline-earth metals	(2)	24	24	
Aluminum:				
Ore and concentrate	19	155	—	All to Argentina.
Oxides and hydroxides	680	28,903	28,692	Panama 101; Guatemala 78.
Ash and residue containing aluminum kilograms	300	NA		
Metal including alloys:				
Scrap	10,977	17,041	16,678	Japan 360; Republic of Korea 2.
Unwrought	883	1,476	1,476	
Semimanufactures	7,324	3,713	1,549	Cuba 856; El Salvador 233.
Antimony:				
Ore and concentrate	3,857	NA		
Oxides	76	NA		
Metal including alloys, all forms	67	237	217	Uruguay 17; El Salvador 3.
Arsenic: Metal including alloys, all forms	63	NA		
Beryllium: Metal including alloys, all forms value, thousands	—	$2	$2	
Bismuth: Metal including alloys, all forms	1,174	871	509	Belgium-Luxembourg 247; United Kingdom 54.
Cadmium: Metal including alloys, all forms	1,061	691	638	Belgium-Luxembourg 18; Netherlands 18.
Chromium:				
Oxides and hydroxides	154	410	18	West Germany 232; United Kingdom 57.
Metal including alloys, all forms kilograms	15	NA		
Cobalt:				
Ore and concentrate	2	5	5	
Metal including alloys, all forms kilograms	560	NA		
Columbium and tantalum: Ore and concentrate including vanadium	—	271	—	Peru 172; Cuba 66; Ecuador 21.
Copper:				
Ore and concentrate	221,195	286,724	249,936	Japan 22,288; United Kingdom 9,500.
Matte and speiss including cement copper	11,229	17,517	16,224	Belgium-Luxembourg 670; United Kingdom 622.
Oxides and hydroxides	368	NA		
Sulfate	2,178	NA		
Ash and residue containing copper	182	NA		
Metal including alloys:				
Scrap	7,937	12,311	12,157	West Germany 102; Spain 52.
Unwrought	56,903	56,258	9,667	Belgium-Luxembourg 45,586; Venezuela 502.
Semimanufactures	59,155	42,406	35,652	Spain 2,022; Cuba 1,647.
Germanium: Metal including alloys, all forms kilograms	38	NA		

See footnotes at end of table.

TABLE 2—Continued

MEXICO: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS—Continued					
Gold:					
Waste and sweepings	kilograms	—	41	33	Spain 7.
Metal including alloys, unwrought and partly wrought	value, thousands	$73,644	$97,076	$2,613	Switzerland $92,708; Canada $1,001.
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite		—	579	575	Unspecified 4.
Pyrite, roasted		—	1	—	All to Guatemala.
Metal:					
Scrap		30,296	44,569	43,463	Japan 456; Colombia 362.
Pig iron, cast iron, related materials		29	662	662	
Ferroalloys:					
Ferrochromium		2,082	69	27	United Kingdom 31; Venezuela 10.
Ferromanganese		34,372	51,598	44,434	Colombia 2,756; Japan 2,550.
Ferrosilicomanganese		46,971	24,976	24,254	Peru 526; Colombia 195.
Ferrosilicon		1,538	3,084	2,978	El Salvador 80; Colombia 15.
Ferrovanadium		3	NA		
Silicon metal		2	—		
Unspecified		661	35	35	
Steel, primary forms		247,144	569,769	569,713	Panama 56.
Semimanufactures:					
Flat-rolled products:					
Of iron or nonalloy steel:					
Not clad, plated, coated		133,867	114,035	95,425	Switzerland 8,665; West Germany 4,365.
Clad, plated, coated		124,196	129,587	111,928	Switzerland 8,659; United Kingdom 3,206.
Of alloy steel		25,028	46,153	22,516	Italy 9,931; West Germany 3,808.
Bars, rods, angles, shapes, sections		267,430	278,585	252,553	United Kingdom 5,438; Colombia 3,953.
Rails and accessories		256	75	75	
Wire		5,356	5,113	908	Cuba 2,131; Belize 516.
Tubes, pipes, fittings		383,841	382,160	140,039	India 52,541; U.S.S.R. 40,384.
Lead:					
Ore and concentrate		6,671	3,080	—	All to Belgium-Luxembourg.
Oxides		32,499	27,138	14,128	Japan 9,004; Brazil 843.
Metal including alloys:					
Scrap		1,401	935	918	Guatemala 17.
Unwrought		94,399	111,698	43,176	Belgium-Luxembourg 25,871; Italy 9,865.
Semimanufactures		1,376	1,505	1,362	United Kingdom 63; Cuba 51.
Lithium: Oxides and hydroxides					
Magnesium: Metal including alloys:					
Scrap		349	161	161	
Unwrought		20	74	74	
Semimanufactures		5	40	40	
Manganese:					
Ore and concentrate		127,227	65,263	1,412	Venezuela 26,150; Spain 15,000; Canada 14,793.
Oxides		1,184	816	101	Guatemala 530; Honduras 160.

See footnotes at end of table.

TABLE 2—Continued

MEXICO: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS—Continued					
Manganese—Continued:					
Metal including alloys, all forms		4,869	206	5	El Salvador 140; Brazil 35; Cuba 26.
Mercury		91	23	—	Brazil 18; Argentina 5.
Molybdenum:					
Ore and concentrate:					
Roasted		299	—		
Unroasted		4,357	22,693	22,635	Belgium-Luxembourg 58.
Oxides and hydroxides		1,741	NA		
Metal including alloys:					
Unwrought[3]	value, thousands	$5	$3	$3	
Semimanufactures		(2)	1	(2)	Mainly to Brazil.
Nickel:					
Oxides and hydroxides	kilograms	110	NA		
Metal including alloys:					
Scrap		69	38	38	
Unwrought		9	4	4	
Semimanufactures		29	27	27	
Platinum-group metals: Metals including alloys, unwrought and partly wrought:					
Platinum	value, thousands	$547	$782	$562	Spain $179; Canada $41.
Unspecified	do.	—	$43	$14	Spain $28.
Rare-earth metals including alloys, all forms		37	NA		
Silver:					
Ore and concentrate		5,144	2,463	2,398	Argentina 65.
Waste and sweepings[4]	kilograms	—	9	9	
Metal including alloys, unwrought and partly wrought	value, thousands	$344,896	$300,099	$221,961	United Kingdom $28,631; Japan $13,190.
Tin: Metal including alloys:					
Scrap		152	24	24	
Unwrought		424	1,986	1,961	Christmas Island 25.
Semimanufactures		1,636	807	677	Cuba 124; Guatemala 4.
Titanium:					
Oxides		1,727	706	332	Guatemala 168; El Salvador 114.
Metal including alloys:					
Unwrought[3]		6	1	1	
Semimanufactures		52	187	17	Brazil 153; West Germany 15.
Tungsten:					
Ore and concentrate		321	333	333	
Metal including alloys:					
Unwrought[3]		100	36	36	
Semimanufactures		6	2	1	Brazil 1.
Vanadium: Ash and residue containing vanadium		587	NA		
Zinc:					
Ore and concentrate		162,937	239,115	51,376	Switzerland 99,560; West Germany 37,965.
Oxides		29,958	33,189	32,003	Canada 852; Costa Rica 200.
Blue powder		145	[5]1,880	1,838	Canada 19; Venezuela 19.

See footnotes at end of table.

TABLE 2—Continued

MEXICO: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Destinations, 1990	
			United States	Other (principal)
METALS—Continued				
Zinc—Continued:				
Metal including alloys:				
Scrap	235	306	298	West Germany 8.
Unwrought	90,880	94,033	74,717	Belgium-Luxembourg 6,595; Switzerland 3,118.
Semimanufactures	2,014	767	37	Guatemala 730.
Zirconium:				
Ore and concentrate	159	334	—	Chile 298; Argentina 20; Cuba 6.
Metal including alloys, semimanufactures kilograms	112	NA		
Other:				
Base metals:				
Ores and concentrates	405	1,122	992	Spain 100; Japan 30.
Oxides and hydroxides	76	5,439	5,184	New Zealand 67; Brazil 65.
Ashes and residues	1,557	2,233	2,159	Uruguay 73; West Germany 1.
Base metals including alloys, all forms	3	34	31	Cuba 3.
Metalloids	—	[6]24	—	Brazil 21; United Kingdom 2; Netherlands 1.
Precious metals, n.e.s.: Ores and concentrates kilograms	—	848,713	848,563	Guatemala 150.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	21,636	15,957	15,869	Dominican Republic 81; Spain 4.
Artificial:				
Corundum	186	226	189	Japan 37.
Silicon carbide	5,722	NA	NA	
Dust and powder of precious and semiprecious stones including diamond value, thousands	$6	$7	$3	Belgium-Luxembourg $3.
Grinding and polishing wheels and stones	229	180	169	Guatemala 6; Republic of Korea 2.
Asbestos, crude value, thousands	—	$1	$1	
Barite and witherite	54,243	41,395	41,395	
Boron materials:				
Crude natural borates	1	2	2	
Elemental	[7]2	NA		
Oxides and acids	3	5	4	Guatemala 1.
Bromine[8]	—	19	19	
Cement thousand tons	4,367	2,054	1,608	Cayman Islands 351; Belize 72.
Chalk	891	208	197	Italy 11.
Clays, crude:				
Bentonite	5,345	1,127	504	Venezuela 316; Colombia 210.
Fuller's earth	2	NA		
Fire clay kilograms	128	NA		
Kaolin	277	92	66	Guatemala 25.
Unspecified	126	113	—	Colombia 23; Argentina 18; Peru 17.
Diamond, natural: Gem, not set or strung				
Gem, not set strung value, thousands	$11	—		
Industrial stones do.	$34	$62	$27	Colombia $32; Guatemala $3.

See footnotes at end of table.

TABLE 2—Continued

MEXICO: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Diatomite and other infusorial earth		7,986	5,192	990	Brazil 1,978; West Germany 1,309.
Feldspar		11,764	10,227	9,315	China 872; Dominican Republic 40.
Fertilizer materials:					
Crude, n.e.s.		33	33	16	Ghana 16.
Manufactured:					
Ammonia		319,759	540,290	494,004	Costa Rica 38,000; Belgium-Luxembourg 8,004.
Nitrogenous		113,577	412,525	233,018	Colombia 43,892; United Kingdom 29,509.
Phosphatic		159	6,920	21	Guatemala 6,520; Belize 375.
Potassic		—	6	6	
Unspecified and mixed		77,578	422,504	403,496	Nicaragua 18,290; Belize 422.
Fluorspar		554,390	381,353	212,355	Canada 94,078; United Kingdom 55,373.
Graphite, natural		18,645	10,586	10,384	Japan 202.
Gypsum and plaster	thousand tons	2,604	1,520	1,315	Canada 63,914; Japan 63,670; New Zealand 32,668.
Lime		24,017	28,031	27,165	Belize 803; Guatemala 55.
Magnesium compounds:					
Magnesite, crude		6	50	—	All to Venezuela.
Oxides and hydroxides		84,716	64,215	28,157	Austria 10,764; Belgium-Luxembourg 10,336.
Mica:					
Crude including splittings and waste		91	5	—	All to Venezuela.
Worked including agglomerated splittings		52	64	13	Cuba 51.
Nitrates, crude		19	—		
Phosphorus, elemental		70	NA		
Pigments, mineral:					
Natural, crude	kilograms	150	—		
Iron oxides and hydroxides, processed		4,852	3,925	3,568	Colombia 104; Australia 67.
Potassium salts, crude		—	4	—	All to Switzerland.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$387	$215	$154	Japan $42; West Germany $16.
Synthetic	do.	$72	$6	$2	West Germany $4.
Pyrite, unroasted		2	20	20	
Quartz crystal, piezoelectric	kilograms	25	—		
Salt and brine	thousand tons	5,526	4,899	1,696	Japan 2,726; Canada 156.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		449	—		
Sulfate, manufactured		130,022	159,148	60,416	Brazil 69,744; Venezuela 6,473.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		5,351	22,276	19,189	Italy 2,302; China 279.
Worked		23,915	22,655	20,284	Italy 803; Canada 740.
Dolomite, chiefly refractory-grade		1,062	790	210	El Salvador 300; Panama 280.
Gravel and crushed rock		14,806	878,205	877,713	Panama 466; El Salvador 20.
Limestone other than dimension		1	38	34	Unspecified 4.

See footnotes at end of table.

TABLE 2—Continued

MEXICO: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued:					
Quartz and quartzite		20	17	17	
Sand other than metal-bearing		31,171	13,683	13,353	El Salvador 170; Venezuela 72.
Sulfur:					
Elemental:					
Crude including native and byproduct	thousand tons	1,209	1,331	1,145	Morocco 89; Tunisia 50.
Colloidal, precipitated, sublimed		25	29	—	Costa Rica 15; Guatemala 14.
Dioxide		6	—		
Sulfuric acid		222,616	141,274	37,121	Switzerland 102,348; Panama 1,621.
Talc, steatite, soapstone, pyrophyllite		245	255	255	
Vermiculite, perlite, chlorite		118	142	11	Venezuela 77; Colombia 54.
Other:					
Crude		44,868	45,517	45,266	Canada 74; Japan 70.
Slag and dross, not metal-bearing		805	17,015	17,015	
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		2,729	6	4	Belize 2.
Carbon black		59,007	58,575	9,532	The Bahamas 16,683; Switzerland 6,080.
Coal:					
Bituminous		10,133	NA		
Briquets of anthracite and bituminous coal		29,673	6,472	6,472	
Lignite including briquets		201	326	18	United Kingdom 237; Cuba 71.
Coke and semicoke		18,201	3,962	3,885	Guatemala 36; unspecified 41.
Peat including briquets and litter	value, thousands	—	$3	$3	
Petroleum:					
Crude	thousand 42-gallon barrels	467,133	454,244	255,588	Spain 75,572; Japan 53,800.
Refinery products:					
Liquefied petroleum gas	do.	10,143	16,815	13,465	Guatemala 865; El Salvador 443.
Gasoline	do.	15,730	269	NA	NA.
Mineral jelly and wax	do.	48	46	45	Guatemala 1.
Kerosene and jet fuel	do.	3,817	5,388	NA	NA.
Distillate fuel oil	do.	8,862	17,234	NA	NA.
Lubricants	do.	5	NA		
Residual fuel oil	do.	10,153	11,369	NA	NA.
Bitumen and other residues	do.	4	16	16	
Bituminous mixtures	do.	2	1	(2)	Mainly to Costa Rica and Honduras.
Petroleum coke	do.	1	1	NA	NA.
Unspecified	do.	1,316	—		

NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.
[3]Includes waste and scrap.
[4]May include other precious metals.
[5]Includes zinc dust, powders, and flakes.
[6]Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."
[7]Includes tellurium.
[8]Includes fluorine and iodine.

TABLE 3

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Sources, 1990	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	4,895	4,575	4,573	Brazil 2.
Alkaline-earth metals	287	472	378	U.S.S.R. 69; Zimbabwe 19.
Aluminum:				
Ore and concentrate	51,247	46,030	30,808	China 11,895; Guyana 2,125.
Oxides and hydroxides	194,601	182,094	178,623	West Germany 1,931; Japan 818.
Ash and residue containing aluminum	884	NA		
Metal including alloys:				
Scrap	23,826	16,460	16,393	West Germany 21; Austria 20.
Unwrought	26,087	32,969	22,351	Venezuela 8,595; Canada 1,108.
Semimanufactures	52,021	67,800	51,762	Venezuela 9,352; Japan 3,381.
Antimony:				
Ore and concentrate	407	NA		
Oxides	126	NA		
Metal including alloys, all forms	168	495	454	Bolivia 20; China 10.
Arsenic:				
Oxides and acids	41	NA		
Metal including alloys, all forms	101	NA		
Beryllium: Metal including alloys, all forms	2	3	3	
Bismuth: Metal including alloys, all forms value, thousands	$9	$21	$20	Canada $1.
Cadmium: Metal including alloys, all forms	6	3	3	
Chromium:				
Ore and concentrate	29,376	29,037	9,030	Mozambique 17,265; Cuba 1,530.
Oxides and hydroxides	299	539	395	China 144.
Metal including alloys, all forms	30	49	43	West Germany 3; United Kingdom 3.
Cobalt:				
Ore and concentrate	1	1	1	
Oxides and hydroxides	200	182	93	Belgium-Luxembourg 88.
Metal including alloys, all forms	121	31	21	Sweden 3; Zaire 3.
Columbium and tantalum:				
Ore and concentrate	NA	[2]18	7	Italy 9; France 1.
Tantalum metal including alloys, all forms value, thousands	$85	$160	$118	West Germany $41.
Copper:				
Ore and concentrate value	$406	$1,000	$1,000	
Matte and speiss including cement copper	1	—		
Oxides and hydroxides	50	NA		
Sulfate	157	NA		
Metal including alloys:				
Scrap	26,483	25,679	25,442	Venezuela 196; Spain 20.
Unwrought	24,221	11,576	7,978	U.S.S.R. 2,520; Peru 998.
Semimanufactures	22,427	14,783	12,850	West Germany 501; Belgium-Luxembourg 267.
Germanium:				
Oxides kilograms	150	NA		

See footnotes at end of table.

TABLE 3—Continued

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Sources, 1990	
			United States	Other (principal)
METALS—Continued				
Germanium—Continued:				
Metal including alloys, all forms kilograms	45	—		
Gold: Metal including alloys, unwrought and partly wrought do.	246	8,216	7,380	Italy 822; Japan 9.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	153,640	1,854	1,846	West Germany 3; Switzerland 3.
Pyrite, roasted	459	4	4	
Metal:				
Scrap	656,303	737,344	689,102	U.S.S.R. 22,051; United Kingdom 20,322.
Pig iron, cast iron, related materials	422,337	361,297	56,747	Chile 123,055; Brazil 120,010;
Ferroalloys:				
Ferrochromium	4,602	6,219	5,080	Netherlands 520; United Kingdom 343.
Ferrocolumbium	338	NA		
Ferromanganese	472	308	302	West Germany 6.
Ferromolybdenum	82	NA		
Ferronickel	27	54	54	
Ferrosilicochromium	9	—		
Ferrosilicomanganese	172	282	282	
Ferrosilicon	8,872	14,078	13,573	Brazil 300; Switzerland 70.
Ferrovanadium	31	NA		
Silicon metal	2,828	[3]3,507	2,965	Brazil 311; Hong Kong 211.
Unspecified	1,838	3,353	3,069	Spain 85; Brazil 62.
Steel, primary forms	7,877	17,356	15,520	Brazil 1,479; West Germany 148.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	358,691	444,796	276,266	West Germany 73,920; Argentina 21,965.
Clad, plated, coated	243,950	338,075	100,808	Japan 77,274; Spain 65,950.
Of alloy steel	104,461	139,384	55,988	Spain 23,870; Belgium-Luxembourg 17,355.
Bars, rods, angles, shapes, sections	175,212	308,737	158,088	Venezuela 51,476; Brazil 27,451.
Rails and accessories	125,540	143,984	96,644	France 19,476; Canada 16,884.
Wire	20,543	15,999	9,361	West Germany 1,528; Sweden 995.
Tubes, pipes, fittings	88,237	108,004	74,741	West Germany 8,721; Japan 6,852.
Lead:				
Ore and concentrate	36,797	15,058	2,729	Peru 12,329.
Oxides	77	4,416	4,411	France 5.
Ash and residue containing lead	364	NA		
Metal including alloys:				
Scrap	1,552	2,671	2,671	
Unwrought	197	59	45	Canada 9; West Germany 5.
Semimanufactures	267	185	184	Switzerland 1.
Lithium: Oxides and hydroxides	217	NA		

See footnotes at end of table.

TABLE 3—Continued

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS—Continued					
Magnesium: Metal including alloys:					
Scrap		135	29	19	West Germany 10.
Unwrought		903	771	696	Canada 74.
Semimanufactures		264	420	410	Belgium-Luxembourg 8; West Germany 2.
Manganese:					
Ore and concentrate		167,577	137,416	68,469	Australia 65,401; Gabon 3,000.
Oxides		3,234	2,390	903	Japan 1,355; Belgium-Luxembourg 92.
Metal including alloys, all forms		711	314	296	Switzerland 17; West Germany 1.
Mercury		276	1	(4)	Mainly from Netherlands.
Molybdenum:					
Ore and concentrate:					
Roasted		—	38	38	
Unroasted		2,163	4,744	4,744	
Oxides and hydroxides	kilograms	568	NA		
Metal including alloys:					
Unwrought[5]		22	12	12	
Semimanufactures		17	21	12	Netherlands 4; West Germany 3.
Nickel:					
Ore and concentrate		1,170	—		
Matte and speiss		145	37	1	Cuba 36.
Oxides and hydroxides		83	NA		
Ash and residue containing nickel		528	NA		
Metal including alloys:					
Scrap		6	3	1	Canada 2.
Unwrought		1,258	1,885	632	Canada 808; Netherlands 223.
Semimanufactures		1,100	839	542	Canada 174; West Germany 70.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:					
Palladium	grams	658	NA		
Platinum	value, thousands	$1,574	$601	$573	West Germany $28.
Rhodium	grams	24	NA		
Iridium, osmium, ruthenium	do.	21	NA		
Unspecified		—	$1,285	$1,044	West Germany $116; Sweden $54.
Rare-earth metals including alloys, all forms		177	NA		
Selenium, elemental		38	NA		
Silicon, high-purity		62	NA		
Silver:					
Ore and concentrate[6]	kilograms	96	70,051	70,051	
Waste and sweepings[6]	do.	7	1,102	1,102	
Metal including alloys, unwrought and partly wrought	value, thousands	$58	$285	$245	West Germany $19; Switzerland $8.
Tellurium, elemental	kilograms	280	NA		
Tin:					
Ore and concentrate		13,081	8,732	3,988	Peru 2,533; Canada 1,067.
Oxides		52	NA		

See footnotes at end of table.

TABLE 3—Continued

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS—Continued					
Tin—Continued:					
Ash and residue containing tin		115	NA		
Metal including alloys:					
Scrap		432	266	266	
Unwrought		285	512	512	
Semimanufactures		239	161	160	West Germany 1.
Titanium:					
Ore and concentrate		60,533	123,280	6,328	Australia 116,952.
Oxides		2,840	2,470	1,514	West Germany 518; Japan 156.
Metal including alloys:					
Unwrought[5]		208	108	104	United Kingdom 4.
Semimanufactures		142	128	128	
Tungsten:					
Ore and concentrate	kilograms	303	1,000	1,000	
Metal including alloys:					
Unwrought[5]		50	39	37	Brazil 1; West Germany 1.
Semimanufactures		126	161	154	France 3; Netherlands 3.
Uranium and thorium:					
Thorium ore and concentrate	value, thousands	—	$21	—	All from West Germany.
Oxides and other compounds	do.	$18	$10	$3	France $6.
Uranium metal including alloys, all forms	do.	—	$9	$9	
Vanadium:					
Oxides and hydroxides		143	NA		
Metal including alloys, all forms	kilograms	70	NA		
Zinc:					
Ore and concentrate		19,573	7,121	—	All from Peru.
Oxides		1,626	923	777	Denmark 80; China 50.
Blue powder		486	[7]618	617	West Germany 1.
Ash and residue containing zinc		26,426	NA		
Metal including alloys:					
Scrap		307	119	119	
Unwrought		464	925	210	Peru 666; Italy 49.
Semimanufactures		457	288	243	Japan 35; Italy 10.
Zirconium:					
Ore and concentrate		244	76	37	Italy 20; Brazil 19.
Oxides		262	NA		
Metal including alloys, all forms		1	2	1	United Kingdom 1.
Other:					
Ores and concentrates		25	171	150	Cuba 18; West Germany 2.
Oxides and hydroxides		136	1,329	846	China 103; United Kingdom 93.
Ashes and residues		—	39,394	39,027	Spain 189; United Kingdom 178.
Base metals including alloys, all forms		1	7	7	
Metalloids		—	[8]3,744	3,689	Canada 54; Chile 1.

See footnotes at end of table.

TABLE 3—Continued

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		1,214	922	871	West Germany 51.
Artificial:					
Corundum		2,003	5,811	2,518	Brazil 2,192; West Germany 632.
Silicon carbide		450	NA		
Dust and powder of precious and semiprecious stones excluding diamond	value, thousands	$41	[9]$1,551	$1,315	Belgium-Luxembourg $222; Spain $13.
Grinding and polishing wheels and stones		1,393	1,749	1,180	Italy 277; Canada 82.
Asbestos, crude		35,428	39,316	5,331	Canada 27,975; Brazil 3,130.
Barite and witherite		233	36,085	830	China 25,249; United Kingdom 10,000.
Boron materials:					
Crude natural borates		2,154	1,088	1,088	
Elemental	kilograms	121	NA		
Oxides and acids		3,009	3,677	1,947	Chile 1,294; Italy 416.
Bromine and fluorine		227	[10]348	322	Japan 23; Chile 1.
Cement		10,706	15,440	13,535	Yugoslavia 1,638; China 196.
Chalk		1	143	143	
Clays, crude:					
Bentonite		2,900	4,671	4,666	West Germany 4; France 1.
Chamotte earth	kilograms	3,013	NA		
Fuller's earth		48	NA		
Fire clay		179,402	NA		
Kaolin		107,638	104,613	104,257	United Kingdom 166; Spain 81.
Unspecified		597	180,315	179,735	China 322; West Germany 156.
Cryolite and chiolite		78	92	33	Denmark 56; Switzerland 2.
Diamond, natural:					
Gem, not set or strung	value, thousands	$1,328	$1,988	$1,137	Belgium-Luxembourg $487; Israel $269.
Industrial stones	do.	$693	$768	$692	West Germany $34; Japan $15.
Dust and powder	kilograms	3,112	NA		
Diatomite and other infusorial earth		2,095	522	522	
Feldspar		21,314	28,344	27,992	Canada 331; Spain 9.
Fertilizer materials:					
Crude, n.e.s.		443	1,413	1,412	Spain 1.
Manufactured:					
Ammonia		47	892	889	West Germany 3.
Nitrogenous		14,941	5,549	5,388	Norway 109; Chile 27.
Phosphatic		903	2,307	2,307	
Potassic		110,625	98,578	50,052	Israel 26,528; Canada 21,983.
Unspecified and mixed		81,234	7,969	7,107	West Germany 500; Belgium-Luxembourg 361.
Fluorspar		47,265	33,307	33,303	West Germany 4.
Graphite, natural		1,229	1,746	659	China 674; Zimbabwe 221.
Gypsum and plaster		15,025	42,409	42,386	Spain 23.
Iodine		261	NA		
Kyanite and related materials:					
Andalusite, kyanite, sillimanite		1,326	NA		

See footnotes at end of table.

TABLE 3—Continued

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Sources, 1990	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Kyanite and related materials—Continued:				
Mullite	1,939	NA		
Lime	9,182	3,800	3,800	
Magnesium compounds:				
Magnesite, crude	277	8,611	4,182	Japan 4,245; West Germany 121.
Oxides and hydroxides	20,576	23,975	21,475	China 2,246; West Germany 176.
Sulfate	156	NA		
Mica:				
Crude including splittings and waste	206	280	261	West Germany 14; China 5.
Worked including agglomerated splittings	111	72	62	Japan 4; Republic of Korea 2.
Nitrates, crude	8,918	13,580	12,902	Chile 640; Denmark 20.
Phosphates, crude thousand tons	1,457	2,278	1,317	Morocco 804; Togo 157.
Phosphorus, elemental	4,509	NA		
Pigments, mineral:				
Natural, crude	217	NA		
Iron oxides and hydroxides, processed	1,080	1,731	1,378	Netherlands 163; West Germany 131.
Potassium salts, crude	16	—		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$657	$632	$359	Thailand $125; West Germany $59.
Synthetic do.	$290	$540	$226	Switzerland $159; France $77.
Pyrite, unroasted	123	148	50	West Germany 98.
Quartz crystal, piezoelectric value, thousands	$8	$4	$4	
Salt and brine	7,376	37,266	37,083	West Germany 178; United Kingdom 3.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	131,688	189,638	189,633	West Germany 5.
Sulfate, manufactured	4,300	3,187	3,149	West Germany 19; Poland 18.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3,876	5,044	2,106	Italy 1,639; Guatemala 818.
Worked	16,167	18,665	13,517	Italy 3,262; Guatemala 846.
Dolomite, chiefly refractory-grade	17,417	11,378	11,259	West Germany 93; Guatemala 24.
Gravel and crushed rock	1,697	2,597	2,366	France 170; United Kingdom 40.
Limestone other than dimension	23	38	38	
Quartz and quartzite	263	507	122	France 360; China 16.
Sand other than metal-bearing	97,911	114,591	113,600	British Virgin Islands 895; Belgium-Luxembourg 70.
Sulfur:				
Elemental:				
Crude including native and byproduct	284,990	517,159	192,237	Canada 324,917; France 3.
Colloidal, precipitated, sublimed	288	372	361	West Germany 11.
Dioxide	2	3	3	
Sulfuric acid	33,929	134,052	20,483	West Germany 48,746; Spain 44,321; Netherlands 20,500.
Talc, steatite, soapstone, pyrophyllite	109,965	97,153	96,930	United Kingdom 102; France 82.
Vermiculite, perlite, chlorite	3,090	4,589	4,589	

See footnotes at end of table.

TABLE 3—Continued

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Other:					
Crude		13,544	12,232	11,905	Spain 173; Italy 140.
Slag and dross, not metal-bearing		40,731	5,182	5,182	
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		15,849	8,240	8,239	United Kingdom 1.
Carbon: Carbon black		4,078	6,713	6,066	West Germany 436; Belgium-Luxembourg 107.
Coal:					
Anthracite		11,250	10,365	10,365	
Bituminous		3,040	268,997	268,997	
Briquets of anthracite and bituminous coal		5,939	6,631	3,929	Spain 2,702.
Lignite including briquets		1,459	1,631	1,628	France 3.
Coke and semicoke		269,905	123,937	93,428	China 10,500; Poland 10,068.
Gas, natural, liquefied	thousand cubic meters	338,603	355,445	355,445	
Peat including briquets and litter		243	136	136	
Petroleum:					
Crude	42-gallon barrels	NA	12,002	12,002	
Refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	7,861	2,348	2,348	
Gasoline	do.	8,931	NA		
Mineral jelly and wax	do.	431	382	256	China 91; Japan 24.
Kerosene and jet fuel	do.	229	NA		
Distillate fuel oil	do.	725	NA		
Lubricants	do.	1,859	NA		
Residual fuel oil	do.	20,862	NA		
Bitumen and other residues	do.	31	34	34	
Bituminous mixtures	do.	6	35	35	
Petroleum coke	do.	674	639	638	Japan 1.

NA Not available.
[1]Table prepared by H. D. Willis.
[2]Includes vanadium.
[3]Includes high-purity silicon.
[4]Less than 1/2 unit.
[5]Includes waste and scrap.
[6]May include other precious metals.
[7]Includes zinc dust, powders, and flakes.
[8]Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."
[9]Includes diamond dust and powder.
[10]Includes iodine.

TABLE 4

MEXICO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Aluminum	Aluminio S.A. (Alcoa, 44%; private Mexican, 30%; Intercontinental, 26%)	Smelter at Veracruz, Ver	94
Antimony	Cía. Minera y Refinadora Mexicana S.A. (private Mexican, 51%; Cookson Ltd., 49%)	San José mine, Catorce, S.L.P.	NA
Barite	Barita de Sonora S.A. (Mexican private, 100%)[2]	Mazatán, Son	165
Do.	Minera Capela S.A.11 (Peñoles, 100%)	La Minita Mine, Michoacán	150
Cement	Cementos Mexicanos S.A. (private Mexican, 100%)	Monterrey, N.L.; Torreón, Coah.; Huichapán, Hg.; Valles, S.L.P.; Antotonilco, Hgo.; Zapotiltic, Jal; Tolteca, Hgo.; and Mixcoac, Mex	[3]19,800
Do.	Cementos Anahuac S.A. (Cementos Mexicanos, 100%)	México D.F. y Tamuín, S.L.P.	4,500
Do.	Cementos Cruz Azul S.C.L. (private Mexican, 100%)	Cruz Azul, Hgo.; Laganeas, Oax	3,900
Do.	Cementos Apasco S.A. (Holderbank, 49%)	Mex. and Tab	2,600
Coal	Minerales Monclova S.A. (Altos Hornos de México S.A., 100%)	Mimosa, Palau mines, Múzquiz Washing Plant at Palau, Coah., and Coking Plant at Monclova, Coah	2,500
Do.	Minera Carbonífera Río Escondido S.A. (MICARE)[4] (Major Government equity, minor private)	Mina I, Mina II, and Tajo I at Nava and Piedras Negras, Coah	4,000
Copper	Mexicana de Cobre S.A. (Medimsa, 83.2%; Grupo Perforadora México, 9.8%; other and Workers Union, 7%)	La Caridad mine and smelter Nacozari de García, Son	150
Do.	Mexicana de Cananea S.A.[5] [Mexicana de Cobre, 76%; ACEC Union Miniere S.A. (Belgium), 21%; other, principally the Workers Union, 3%][5]	Mine and smelter at Cananea, Son	170
Do.	Minera María S.A. de C.V. (Empresas Frisco, 51%; Cominco Resources International, 49%)	Cananea District, Son	18
Ferroalloys and manganese	Cía. Minera Autlán S.A.[6]	Mines at Molango and Nonoalco, Hgo	500
Do.	do.	Plants in Puebla and Tamos, Ver	185
Fluorspar	Cía. Minera Las Cuevas S.A. (Grupo Industrial Camesa S.A.)[7]	Salitrera (Zaragoza), S.L.P.	520
Do.	Fluorita de México, S.A. de C.V.	Mines at La Encantada range and plant at Muzquiz, Coah	500
Do.	Fluorita del Río Verde S.A. (Industrias Peñoles S.A., 60%, Int'l. Minerals, 40%)	Río Colorado and Río Verde mines, S.L.P.	160
Gold kilograms	Cía. Fresnillo S.A. (Penoles, 60%; AMAX, 40%)	Fresnillo mine, Zac	1,866
Do. do.	Minas de San Luis S.A. (Industrials Luismin, 100%)	Tayoltita, Durango	1,400
Do. do.	Cía. Minera de Santa Gertrudis (Grupo Ariztegui, 51%; Philps Dodge, 49%)	Santa Gertrudis Mine, Sonora	1,600
Do. do.	Walhalla Mining Co. NL (private foreign, 100%)	Amelia Mine, Sonora	1,300
Graphite	Grafitos Mexicanos S.A. [Cummings Moore Graphite Co. (United States), 25%; private Mexican, 75%]	Lourdes and San Francisco mines, Son	60
Gypsum	Cía. Occidental Mexicana S.A. (private Mexican, 51%; Domtar Inc. of Canada, 49%)	Santa Rosalía on San Marcos Island, B.C.S.	1,500

See footnotes at end of table.

TABLE 4—Continued

MEXICO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Lead and zinc	México Desarollo Industrial Minero S.A. [Grupo IMMSA, 68.8%; ASARCO Incorporated (United States, 31.2%]	Charcas, S.L.P.; San Martín, Zac.; Santa Eulalia, Chih.; Taxco, Gro.; Rosario, Sin.; lead smelter at Chihuahua, lead refinery at Monterrey, N.L., zinc refinery at at S.L.P.	70 (lead) 150 (zinc)
Do.	Industrias Peñoles S.A. (private Mexican, 97%; U.S. private, 3%)	La Encantada, Coah.; La Negra, Que.; Fresnillo, Zac.; Naica, Chih. mines; Bismark, Son. (Peñoles, 60%; Cyprus Minerals, 40%). Rey de Plata, Gro. (Peñoles, 60%; Outokumpu, 40%) Metallurgical complex at Torreón with silver, lead, and zinc smelters and/or refineries operated by Met-Mex Peñoles (Peñoles, 100%)	50 (lead) 60 (zinc)
Molybdenum	Mexicana de Cobre S.A. (Medimsa, 83.2%; Perforadora México, 9.8%; other and Workers Union, 7%)	La Caridad Mine, Molybdenum plant, Son.	6
Do.	Minera Cumobabi S.A. de C.V. (Empresas Frisco S.A., 100%)	Cumpas, Son.	2
Petroleum thousand 42-gallon barrels per day	Petróleos Mexicanos (PEMEX) (Government, 100%)	Comalcalco, Poza Rica, and Golfo de Campeche districts	[8]3,500
Salt	Exportadora de Sal S.A. (ESSA) (Fomento Minero, 51%; Mitsubishi Corp., 49%)	Solar salt complex at Guerrero Negro, B.C.S.	6,000
Silver kilograms	Industrias Peñoles S.A.[9]	Naica, Chih.; Fresnillo, Zac.; Las Torres, Gto.; Cuale, Jal. La Negra, Qro; La Encantada, Coah.; La Minita, Mich. Refinery at Torreón, Coah.	654,000
Do. do.	México Desarollo Industrial Minero S.A. [Grupo IMMSA, 68.8%; ASARCO Inc. (United States), 31.2%]	San Martin Mine, Sombrerete, Zac.; Taxco, Gro.; Charcas, S.L.P. Santa Eulalia, Chih. Refinery at Monterrey, N.L.	467,000
Do. do.	Minera Real de Angeles S.A. de C.V. (Frisco, 51%; Placer Development Ltd. Canada, 49%)	Open pit mine and concentrator at Noria de Angeles, Zac.	373,000
Sodium carbonate	Sosa Texcoco S.A. (private Mexican, 100%)	Lake Texcoco, Mex., from subsurface brines	200
Sodium sulfate	Quimica Magna S.A. de C.V. (Grupo Penoles, 100%)	Subsurface brines at Laguna del Rey, Coah.	350
Steel	Altos Hornos de Mexico S.A. (AHMSA), (subsidiary of Siderurgica Mexicana-SIDERMEX) (Government, 100%)	Steelworks at Monclova, Coah. Iron ore from La Perla and Hercules Mines	3,900
Do.	Hylsa S.A. (Grupo Industrial ALFA, 100%)	Direct-reduction units at Monterrey, N.L., and Puebla; Cerro Nahuatl iron ore mine in Colima.	1,800
Do.	Siderurgica Lazaro Cardenas-Las Truchas S.A. (SICARTSA) (SIDERMEX Unit) (Government, 100%)	Port of Lazaro Cardenas, Michoacan	1,300
Iron ore	Consorcio Minero Benito Juarez-Pena Colorada (Federal Government, Comision de Fomento Minero and SIDERMEX, 55%; Hylsa, 28.5%; TAMSA, 16.5%)	Pena Colorada Mine and pellet plant near Manzanillo, Col. Colina State	3,000
Do.	Siderurgica Lazaro Cardenas-Las Truchas S.A. (SICARTSA) (Grupo SIDERMEX, 100%)	Ferrotepec, Volcan, and Mango deposits in Las Truchas project area, and pellet plant, Michoacan	1,900
Strontium (celestite)	Cia. Minera La Valenciana (private Mexican, 100%)	San Agustin Mine in Coah.	50

See footnotes at end of table.

TABLE 4—Continued

MEXICO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity
Sulfur	Azufrera Panamericana S.A. (APSA)[10] (Government-Fomento Minero, 96%; private, 4%)	Coachapa, Patapa, Jaltipan, Ver	1,230
Do.	Cia. Exploradora del Istmo S.A. (Government, 64%; Texasgulf Inc. (France), 34%; private, 2%)	Texistepec, Ver	750
Tin[11]	Metales Potosi S.A. (private Mexican, 100%)	San Luis de Potosi, S.L.P.	6.4
Do.	Estano Electro S.A. (private Mexican, 100%)	Tlalnepantla, Mexico D.F.	1.3
Do.	Fundidora de Estano S.A. (private Mexican, 100%)	San Luis Potosi, S.L.P.	1.2

[1]State abbreviations: Baja California Sur (B.C.S.), Chihuahua (Chih.), Coahuila (Coah.), Colima (Col.), Durango (Dgo.), Guerrero (Gro.), Hidalgo (Hgo.), Jalisco (Jal.), Michoacan (Mich.), Nuevo Leon (N.L.), Oaxaca (Oax.), Queretaro (Qro.), San Luis Potosi (S.L.P.), Sinaloa (Sin.), Sonora (Son.), Veracruz (Ver.), and Zacatcas (Zac.).
[2]Formerly owned by Fideicomiso de Fomento Minero.
[3]Includes capacity from Cementos Tolteca S.A., purchased by CEMEX in 1989.
[4]Only significant producer. Government equity in MICARE is represented by Fomento Minero, Comision Federal de Electricidad, Nacional Financiera, and AMSHA. Private equity is by Grupo IMMSA. During 1991, CFM's operations were merged into FFM and CRM.
[5]New owners, purchased Cananea in 1990.
[6]Company in receivership, and scheduled for reorganization; at time of writing equity interest held by NAFINSA.
[7]Carnesa S.A. de C.V. is owned by private Mexican (59.4%) and Noranda Inc. of Canada (40.6%).
[8]PEMEX operates nine refineries with an installed capacity of 1.68 million barrels per day.
[9]Includes capacity from Cia. Fresnillo S.A. de C.V.
[10]Handles all exports of sulfur including sulfur recovered by PEMEX.
[11]Smelter output from mostly imported concentrated.

TABLE 5

MEXICO: PRODUCTION OF CRUDE STEEL, BY COMPANY

(Thousand metric tons)

Company	1989	1990	1991[p]
Government-owned companies:			
Siderúrgica Mexicana (SIDERMEX) Group:			
Altos Hornos de México S.A. (AHMSA)	2,862	3,096	2,659
Siderúrgica Lázaro Cárdenas-Las Truchas S.A. (SICARTSA)	1,336	1,802	1,455
Total	4,198	4,898	4,114
Private companies:			
Tubos de Acero de México S.A. (TAMSA)	468	503	517
Hylsa de México S.A. (HYLSA)	1,812	r1,882	1,920
Others	1,373	r1,443	1,332
Total	3,653	r3,828	3,769
Grand total	7,851	r8,726	7,883

[p]Preliminary. [r]Revised.

Source: Camara Nacional de la Industria del Hierro y del Acero, Informe Anual 1990, Mexico, D.F.

TABLE 6
MEXICO: PRODUCTION OF FINISHED STEEL, BY PRODUCT TYPE

(Thousand metric tons)

Product type	1989	1990	1991[p]
Castings and forgings	74	68	61
Rolled products:			
Flat-rolled	2,580	2,685	2,572
Nonflat products	[r]3,024	[r]3,685	3,276
Seamless tubes	355	[r]335	401
Total	[r]6,033	[r]6,773	6,310

[p]Preliminary. [r]Revised.

Source: Cámara Nacional de la Industria del Hierro y del Acero, Informe Anual 1990. México, D.F.

TABLE 7
MEXICO: PROVEN HYDROCARBON RESERVES

(Million 42-gallon barrels unless otherwise specified)

Region	Dry natural gas (billion cubic meters)	Liquid hydrocarbons				
		Crude oil	Condensate	Dry natural gas-liquid equivalent	1990 total	1992 total
1991 total	[r]2,082	44,560	6,738	14,202	65,500	XX
1992:						
Marine (Bay of Campeche)	315	25,016	2,908	2,214	30,427	30,138
North[1]	1,039	12,273	1,780	7,285	21,462	21,338
South[2]	655	7,003	1,945	4,576	13,611	13,524
Total	2,009	44,292	6,633	14,075	XX	65,000

XX Not applicable.
[1]Includes North, South, and Northeastern Frontier, Poza Rica, and Papaloapan Basin Districts.
[2]Includes Agua Dulce, El Plan, Nachital, Comalcalco, Villahermosa, and Ciudad PEMEX Districts.

Source: Petróleos Mexicanos S.A., Statistical Yearbook 1990, México, D.F.

TABLE 8

MEXICO: PETROLEUM AND NATURAL GAS PRODUCTION

Region and district	Natural gas (million cubic meters)			Crude oil[1] (thousand 42-gallon barrels)		
	1989	1990	1991	1989	1990	1991
North region:						
Northeastern Frontier	2,460	2,543	2,408	110	73	—
North	424	434	434	8,505	9,235	9,599
South	196	206	248	6,424	6,132	6,169
Poza Rica	506	465	507	19,382	18,360	19,418
Papaloapan Basin	1,044	1,261	1,292	1,679	4,088	3,687
Total[2]	4,630	4,909	4,889	36,099	37,887	38,878
South region:						
Agua Dulce	692	734	817	14,929	14,308	15,257
El Plan	465	486	475	7,629	6,826	7,118
Nanchital	21	31	21	1,314	1,314	1,314
Ciudad PEMEX	1,809	2,201	2,047	37	73	182
Comalcalco	145	165	196	4,490	4,782	4,599
Villahermosa[3]	18,005	17,664	17,116	217,102	210,131	214,255
Total[2]	21,137	21,281	20,672	245,499	237,433	242,725
Marine region	11,152	11,555	11,989	635,757	654,701	695,070
Grand total[2]	36,919	37,741	37,550	917,355	930,023	976,668

[1]Does not include condensate.
[2]Data may not add to totals shown because of independent rounding.
[3]Referred to as Mesozoic.

Source: Petroleos Mexicanos, Statistical Yearbook 1990, Mexico, D.F.

TABLE 9

MEXICO: RESERVES OF SELECTED MINERAL COMMODITIES—YEAREND 1991

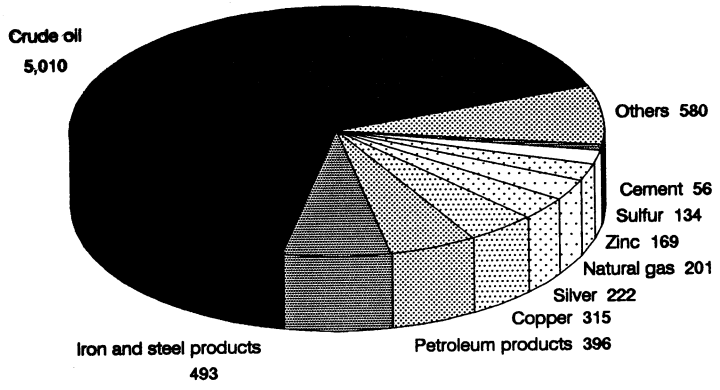
(Thousand metric tons unless otherwise specified)

Mineral[1]		Reserves
Antimony		181
Barite		7,000
Bismuth	metric tons	10,000
Cadmium	do.	35,000
Copper		14,000
Fluorspar[2]		19,000
Gas, natural[3]	billion cubic meters	2,009
Graphite, natural		3,100
Lead		3,000
Manganese		3,600
Mercury	metric tons	5,000
Molybdenum	do.	90,000
Petroleum, crude[3]	million 42-gallon barrels	50,900
Salt		Large
Selenium	metric tons	4,000
Silver	do.	37,000
Sodium carbonate, natural		180,000
Sodium sulfate, natural		165,000
Sulfur[4]		75,000
Zinc		6,000

[1]All metals expressed in metal content.
[2]Measured as 100% calcium fluoride.
[3]Yearend 1991. Source: PEMEX Statistical Yearbook 1992.
[4]Sulfur in all forms.

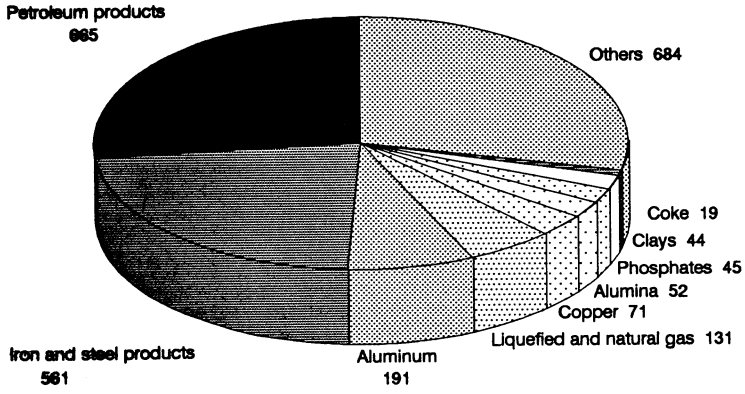
RELATIVE IMPORTANCE OF MEXICO'S MINERALS AND MINERAL PRODUCTS TRADED WITH THE UNITED STATES

1990 Mexican mineral exports to the United States
(Millions of U.S. dollars)



Total mineral exports to the United States	7,576
Total exports to the United States	18,837

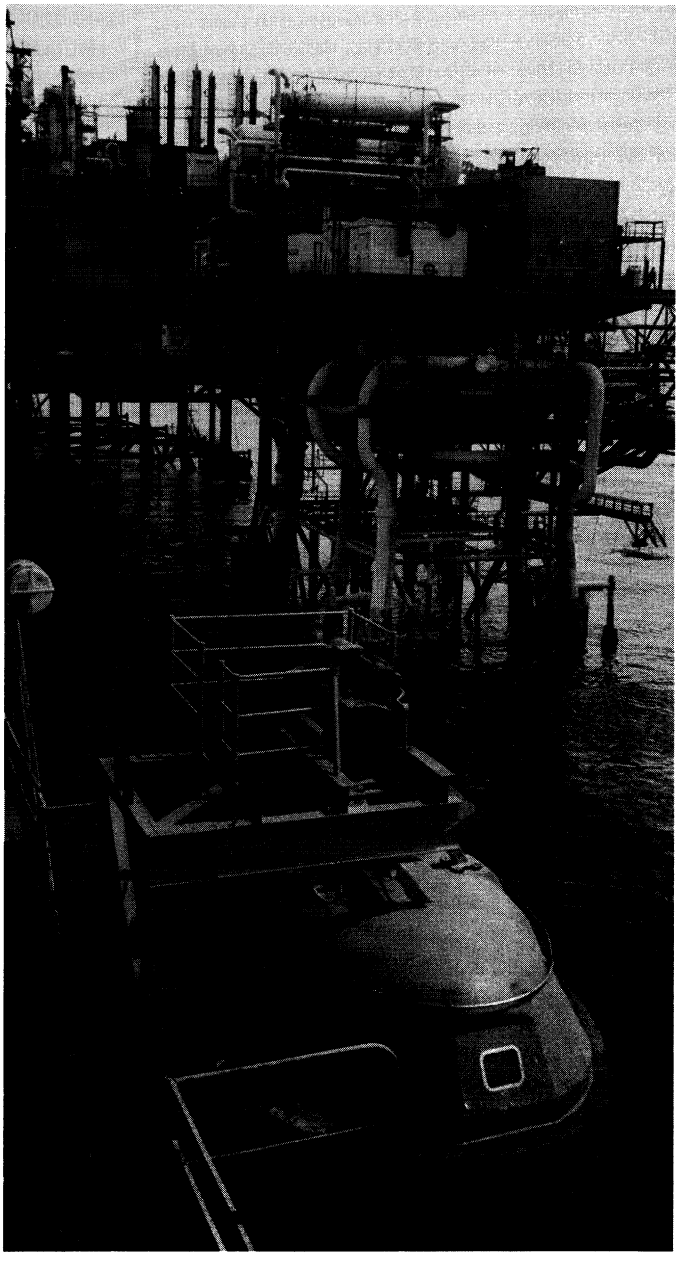
1990 Mexican mineral imports from the United States
(Millions of U.S. dollars)



Total mineral imports from the United States	2,494
Total imports from the United States	18,159

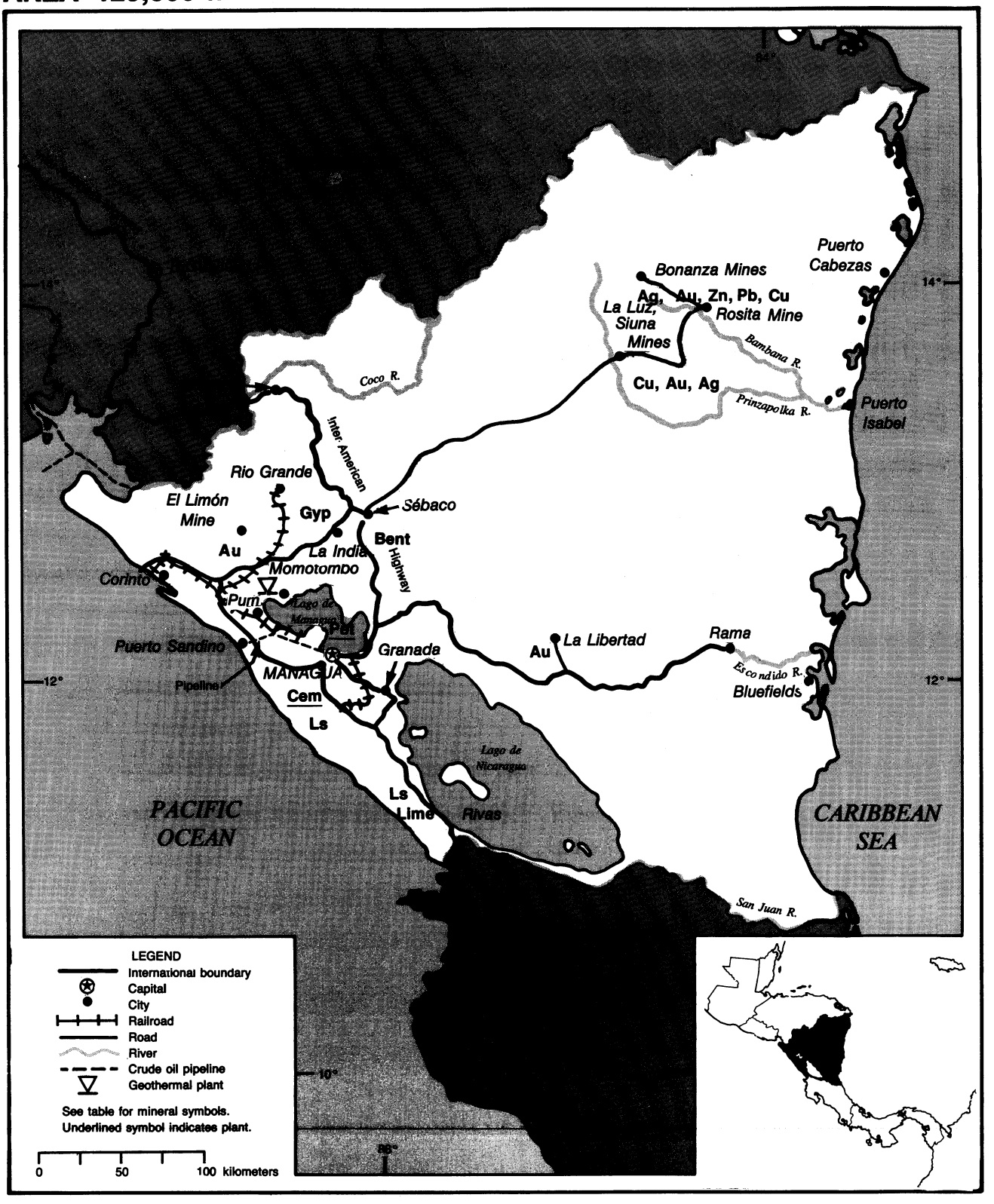
Source: Statistical Office of the United Nations, Commodity Trade Statistics.

MEXICO: OFFSHORE OIL PLATFORM IN CAMPECHE ZONE. (PHOTO COURTESY OF PEMEX)



NICARAGUA

AREA 129,500 km² **POPULATION 3.9 million**



THE MINERAL INDUSTRY OF

NICARAGUA

By Philip M. Mobbs

Mining was a minor facet of the economy of Nicaragua. Most of the country's mining and quarrying activity revolved around gold, silver, and industrial minerals production.

The manufacturing sector dominated the economy, accounting for more than 20% of the GDP. Agriculture accounted for almost 15% of the GDP and was the primary source of Nicaragua's export earnings. GDP growth broke from the negative trend begun in 1984. The growth rate for 1991 was estimated at 1.0%, resulting in a GDP estimated to be $1.42 billion.[1] In 1991, annual inflation topped 773%, down from the 13,536% rate in 1990.

More than 100 of the 351 companies that were state-owned at the beginning of 1991 were privatized by Corporaciones Nacionales del Sector Público (CORNAP), the Government holding company. CORNAP expected to return 160 to 170 state-owned companies to the private sector in 1992, including some of the country's mining operations.

GOVERNMENT POLICIES AND PROGRAMS

The Government of Nicaragua devoted itself to pursuing an export-based economic development strategy. The new foreign investment law was finally approved as part of the Government's continuing effort to attract additional foreign resources. Investment incentives for new foreign capital ventures include the right to repatriate profits, repatriation of new capital 3 years after the initial investment, freedom to import essential equipment, and the right to bank export earnings in dollar-based accounts instead of in córdoba accounts.

In February, the Government deregulated all exports, except for gold, and imports. Import licenses were to be issued to companies registered with the Central Bank by the Ministry of Economic Affairs and Development. Exporters were required to be registered with both the Central Bank and the Ministry of Economic Affairs and Development. Gold exports continued to be handled by the Government. Additionally, the 1991 Export Promotion law provided tax benefits to exporters.

Decree 11-90 of May 1990 established the Comisión Nacional de Recision and the formal procedure for filing claims on properties confiscated by the Sandinista Government. During May 1991, the Nicaragua Supreme Court found articles 7 and 11 of Decree 11-90 to be unconstitutional. These articles dealt with the return of confiscated property. Nicaragua's continued failure to resolve disputes resulting from the Sandinista Government's nationalization policies was identified as a major problem in attracting risk-sensitive private foreign investment.

In 1990, the Government introduced the gold córdoba, which was convertible at par with the U.S. dollar. During March 1991, the gold córdoba was devalued from parity to 5 gold córdobas to the U.S. dollar. The old córdoba notes were withdrawn by the end of April 1991.

The Government initiated a stabilization program on March 3, 1991, to reduce the deficit with the assistance of the International Monetary Fund (IMF).

PRODUCTION

Most of Nicaragua's industrial minerals, such as cement, sand and gravel, and salt, were produced for local consumption. Gold and silver production was primarily for export. Increased production was posted for all reported commodities, except gold. *(See table 1.)*

TRADE

Nicaragua's export earnings were estimated to be $302.5 million in 1991, a 7% decrease compared with the 10% increase during 1990. Mineral commodities, primarily gold and silver, accounted for approximately 3% of the nation's total export earnings.

The United States garnered 23% of Nicaragua's exports and supplied 19% of its imports. Nicaragua was eligible for trade benefits under the Caribbean Basin Initiative.

Nicaragua signed a framework agreement on trade liberalization with Costa Rica, El Salvador, Guatemala, Honduras, and Mexico in January. In November, a bilateral Framework Agreement on Trade and Investment was signed by Nicaragua and the United States. Nicaragua was also negotiating preliminary free trade agreements with Colombia and Venezuela.

Nicaragua was totally dependent on imports for its oil supply. During 1991, petroleum was imported from Venezuela under the San José Accord. In September, Nicaragua renegotiated its debt with Mexico, much of which was outstanding obligations for imported petroleum. Mexico had halted petroleum shipments to Nicaragua in 1985 because of the unserviced debt.

STRUCTURE OF THE MINERAL INDUSTRY

During the Sandinista years, the

Government nationalized many industries. Companies were administered through the Government holding company CORNAP.

The Corporación Nicaragüense de Minas (INMINE), a CORNAP subsidiary, controlled most of the country's mineral exploration and production operations. Güiriseros, local prospectors, ran small private placer gold mining operations, usually in co-operative groups. Cement was produced by the state-owned Compañía Nacional Productora de Cemento. Salt was produced by privately owned operations. *(See table 2.)*

COMMODITY REVIEW

Metals

Foreign-owned mining operations were nationalized by the Sandinista Government in November 1979. Compensation of the former owners has not been settled.

The INMINE-operated gold and silver mines at Bonanza, El Limón, and La Libertad were producing in 1991. A number of companies expressed interest when the Government announced that the mines would be offered for bids. However, the September 1991 tender for the La Libertad Mine was canceled in October, due to perceived irregularities in the tender process. The tender was to be resumed in 1992.

Industrial Minerals

INMINE's Empresa Nicaragüense de Minerales No Metálicos (COMNOMET) supervised the state's six industrial mineral companies, which included: the bentonite operations of Empresa Rotowa S.A.; the gypsum plant and quarries of Yesera Centroamericana S.A.; the limestone operations of Empresa Piedra Cal S.A. and Empresa Cal El Pueblo; the dimension stone works of Empresa Canteras; and Empresa Areneras Nacionales, which produced volcanic sand for the construction industry.

COMNOMET was a candidate for privatization.

Mineral Fuels

With the removal of the economic embargo by the United States in 1990 and new legislation allowing private-sector participation proposed for 1992, Nicaragua hoped to attract international exploration interest in its petroleum potential, especially on the Caribbean coast.

INFRASTRUCTURE

Instituto Nicaragüense de Energía (INE), the Government-owned utility, operated the country's 415-MW installed electrical generating capacity. This included the Italian-built 70-MW Momotombo geothermal plant, 100 MW ascribed to hydroelectric plants, and 190 MW attributed to older thermal plants. However, by yearend, only 250 MW of the generating capacity was reported to be available. A small amount of electrical energy was imported from Costa Rica to satisfy national energy demand.

INE was planning an additional 140 MW of hydroelectric and geothermal capacity. An Atlantic coast electrification project was also proposed.

Road construction and maintenance were high-priority projects of the Government. Most mineral products were trucked along the nation's 25,000 km of road. Both the roads and the sections of the 373-km railroad system were used in the movement of gypsum from the mine to the cement plant.

Ports on the Pacific coast included Corinto and Puerto Sandino. A 56-km crude oil pipeline (15,000 bbl/d) extended from Puerto Sandino to the Esso refinery in Managua. Denmark assisted in the renovation of Puerto Sandino during 1991. Port facilities at Corinto were scheduled to be upgraded during 1992.

Puerto Cabezas, El Bluff, and Rama serviced Caribbean traffic. Inland waterways totaled 2,220 km, including Lake Nicaragua and the San Juan River.

OUTLOOK

Nicaragua was expecting significant expansion in the precious-metals sector by the turn of the century, given the hoped-for infusion of new capital into the mining sector via the privatization program. The Government was also looking for technical support to assist the nation's small-scale mining sector.

Nicaragua became eligible for new development lending when it cleared its arrears with the World Bank in September. However, the anticipated return of private foreign investment in Nicaragua had not occurred.

Labor and property issues were cited as the primary reasons behind the continued lack of private investment in the country. Potential problems were attributed to labor unions associated with the mining operations to be privatized. While some former Contras and Sandinistas had re-armed and taken to fighting in the countryside, little of the paramilitary activity occurred in mining districts.

Nicaragua's failure to satisfactorily resolve the controversy resulting from the Sandinista Government's confiscation of mines and other properties continued to muddy the investment picture.

Nicaragua, because of its financial difficulties, has had problems importing sufficient petroleum. Until recently, the former U.S.S.R. supplied most of Nicaragua's crude oil needs. However, the change in Soviet willingness to supply petroleum at discounted prices will force Nicaragua to look elsewhere for fuel.

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[1]Where necessary, values have been converted from Nicaragua córdobas (C$) to U.S. dollars at the rate of C$5.05=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Corporación Nicaragüense de Minas
(INMINE)
Apartado Postal No. 195
Managua, Nicaragua
Telephone: (505) 2-52071
Fax: (505) 2-51043

Corporaciones Nacionales del Sector Público
(CORNAP)
Km 7½ Carretera Norte
Managua, Nicaragua
Telephone: (505) 2-31289
Fax: (505) 2-31193

Publications

Instituto Nacional de Estadísticas y Censos: Annuario Estadístico de Nicaragua, Managua, Nicaragua, annual.

INMINE, 1991, Oportunidades de Inversión Extrajera en el Sector Minero de Nicaragua, Alianza Minera Entre America Latina y Estados Unidos, 32 pp.

Roberts, R. J., and E. M. Irving. Mineral Deposits of Central America, Geological Survey Bulletin 1034, 1957, 205 pp.

U.S. Department of Commerce, International Trade Administration: Foreign Economic Trends and Their Implications for the United States, annual.

TABLE 1

NICARAGUA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
Bentonite		[r]7,707	[r]8,494	[r]4,164	[r]4,592	5,070
Cement		[e]100,000	[e]100,000	131,011	[r]219,400	239,300
Gold, mine output, Au content	kilograms	948	878	1,410	1,200	1,154
Gypsum and anhydrite, crude		7,299	[e]7,000	11,570	13,444	16,200
Lime[e]		3,500	3,500	3,500	[r]1,770	[2]2,120
Petroleum refinery products[e]	thousand 42-gallon barrels	3,620	3,500	3,500	[r]4,000	[2]4,543
Salt, marine[e]		15,000	15,000	15,000	15,000	15,000
Sand and gravel[e]	thousand tons	1,125	1,125	1,125	[2]1,064	[2]1,170
Silver, mine output, Ag content	kilograms	888	776	1,113	1,095	1,543

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

[1]Includes data available through Sept. 29, 1992. In addition to the commodities listed, Nicaragua continued to produce a variety of industrial minerals to meet domestic needs. Output of these materials was not reported, and there is insufficient general information for formulation of estimates.

[2]Reported figure.

TABLE 2

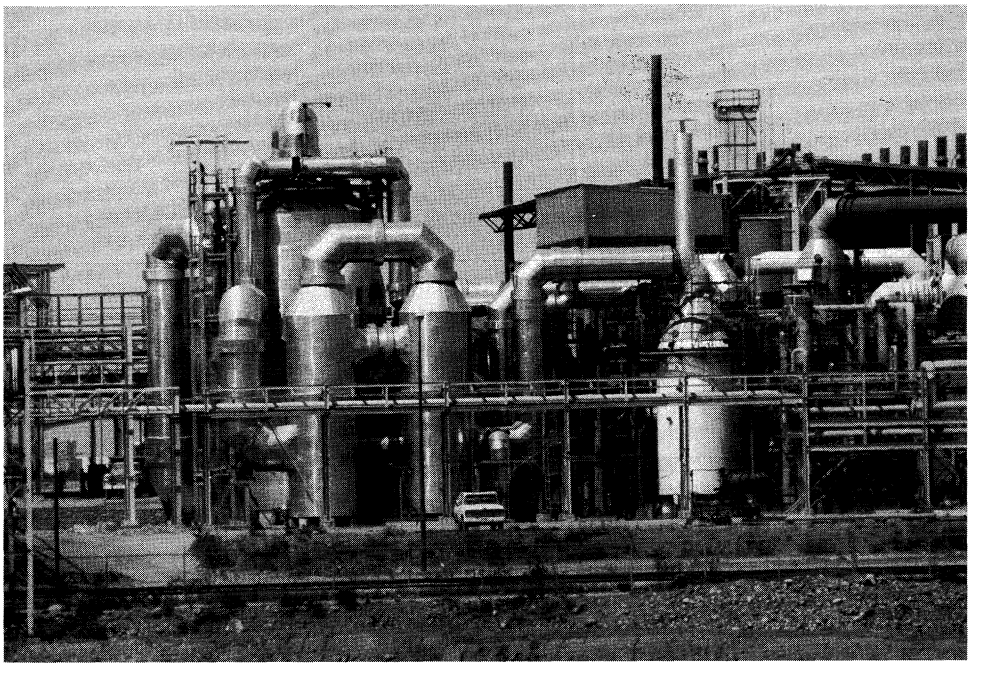
NICARAGUA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity ownership	Location of main facilities	Annual capacity
Bentonite		Empresa Rotowa S.A. [Corporación Nicaragüense de Minas (INMINE), Government, 100%]	South of Sébaco, Matagalpa Department	4
Cement		Compañia Nacional Productora de Cemento (Government, 100%)	San Rafael del Sur, Managua Department	330
Gold	tons	INMINE, 100%	El Limón Mine, León Department; La Libertad Mine, Chontales Department; Bonanza mining complex, Zelaya Department; Siuna mining complex,[1] Zelaya Department	3
Gypsum		Yesera Centroamericana S.A. (INMINE, 100%)	Santa Rosa del Peñón, Leon Department	15
Petroleum products	thousand 42-gallon barrels	Esso Standard Oil S.A. Ltd.	Managua, Managua Department	5,400
Silver	tons	INMINE, 100%	Bonanza and Siuna[1] mining complexes, Zelaya Department; El Limón Mine, León Department	3

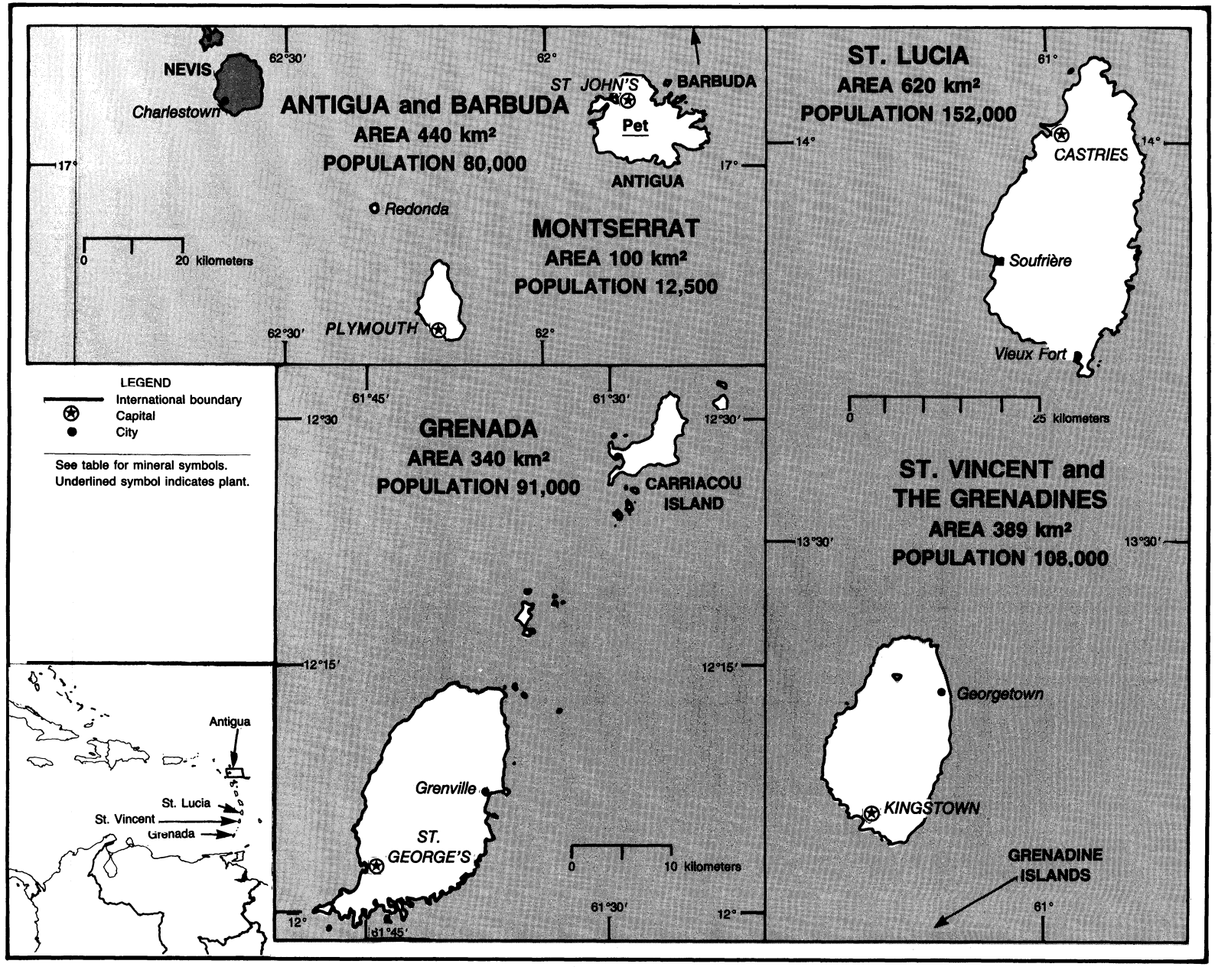
[1]The Siuna Mine is inactive.

MEXICO: INDUSTRIAL MINERA MEXICO'S ZINC ELECTROLYTIC PLANT IN SAN LUIS POTOSI. (PHOTO COURTESY OF GRUPO IMMSA S.A. DE C.V.)



MEXICO: PLANT SAFETY CAMPAIGN: "SAFETY FIRST, YOUR FAMILY AWAITS YOU." IMMSA COPPER SMELTER, SAN LUIS POTOSI. (PHOTO BY O. MARTINO)

OTHER LESSER ANTILLES



THE MINERAL INDUSTRIES OF

OTHER LESSER ANTILLES

By Philip M. Mobbs

ANTIGUA AND BARBUDA

The three-island Commonwealth member became independent from the United Kingdom in 1981. Antigua, a volcanic island with some limestone deposits along the north coast, was one of the first Caribbean islands to promote tourism, thus indirectly boosting mineral-related activity through the construction industry. Barbuda produced a small amount of salt and, in the past, phosphate was collected on the uninhabited island of Redonda.

The nation's mineral industry continued to partially supply the requirements of the construction industry. New construction focused attention on the necessity of additional infrastructure upgrades, especially increased electrical power generation capability and road rehabilitation.

GRENADA

The most southern of the Windward Islands, Grenada consists of Grenada and several islands of the southern Grenadines. The nation became independent from the United Kingdom in 1974. During 1991, Grenada was reportedly involved in talks broaching the possibility of a unification of the nation with Dominica, St. Lucia, and St. Vincent and the Grenadines.

A proposal to refine Venezuelan crude oil on Grenada by 1996 was put forward during 1991. Funding to build the refinery on land supplied by the Government was to be provided by an unnamed Texas group.

Much of the road network ringing the island had been rehabilitated since repairs on the infrastructure began in 1983. St. George's was the nation's primary port.

MONTSERRAT

The economy of this small volcanic island was centered on tourism and construction. Small quantities of sand and gravel and other quarry products constitute the mineral industries of Montserrat.

The port of Plymouth was impaired when Hurricane Hugo swept away the seaport's only jetty in September 1989. Almost 95% of the island's residential units was also destroyed by the hurricane. By yearend, the United Kingdom had increased its commitment to assist with the rebuilding of the colony to almost $34.6 million.[1] The Caribbean Development Bank was also to assist with the redevelopment of the port with a $6 million loan.

ST. LUCIA

Mineral production in St. Lucia, the second largest island in the British Lesser Antilles, has not been reported regularly. A few small gravel, pumice, and sand operations continued to supply the island's construction sector. During 1991, taxes on water pipes and residential fittings were abolished. Later in the year, almost $8.5 million was committed to construction of governmental housing units. The housing and associated infrastructure was to be completed by early 1993. During 1991, the Caribbean Development Bank agreed to loan $4.8 million to upgrade approximately 10% of the nation's secondary roads.

ST. VINCENT AND THE GRENADINES

Local mineral production was used to augment materials needed for the construction industry. There was also private salt production in noncommercial volumes. The construction industry and island's infrastructure were given a minor boost when the Government announced a 3-year, $18.5 million dollar airport improvement and road construction and upgrading program. Funding was to be provided by the Government of St. Vincent, the Government of Taiwan, the Caribbean Development Bank, and the OPEC Fund. Included in the program was a $1.1 million asphalt plant.

[1]Where necessary, values have been converted from East Caribbean dollars (EC$) to U.S. dollars at the rate of EC$2.70=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Ministry of Economic Development and Energy
Queen Elizabeth Highway
St. John's, Antigua
Telephone: (809) 462-1960

Ministry of Communications
Young St.
St. George's, Grenada
Telephone: (809) 440-3598

Ministry of Trade, Industry, and Agriculture
Castries, St. Lucia
Telephone: (809) 452-2611

Ministry of Trade, Industry, and Agriculture
Kingstown, St. Vincent
Telephone: (809) 456-1223

Publications

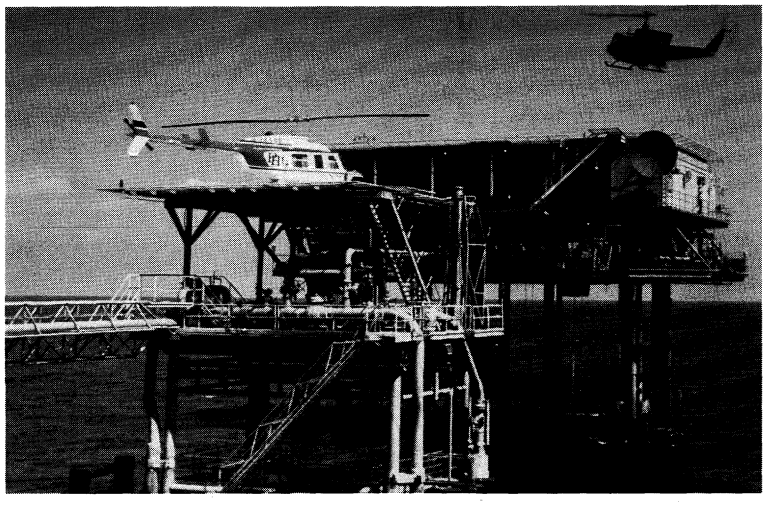
Central Intelligence Agency: The World Factbook, annual.

U.S. Department of Commerce, International Trade Administration: Foreign Economic Trends and Their Implications for the United States, Grenada, annual.

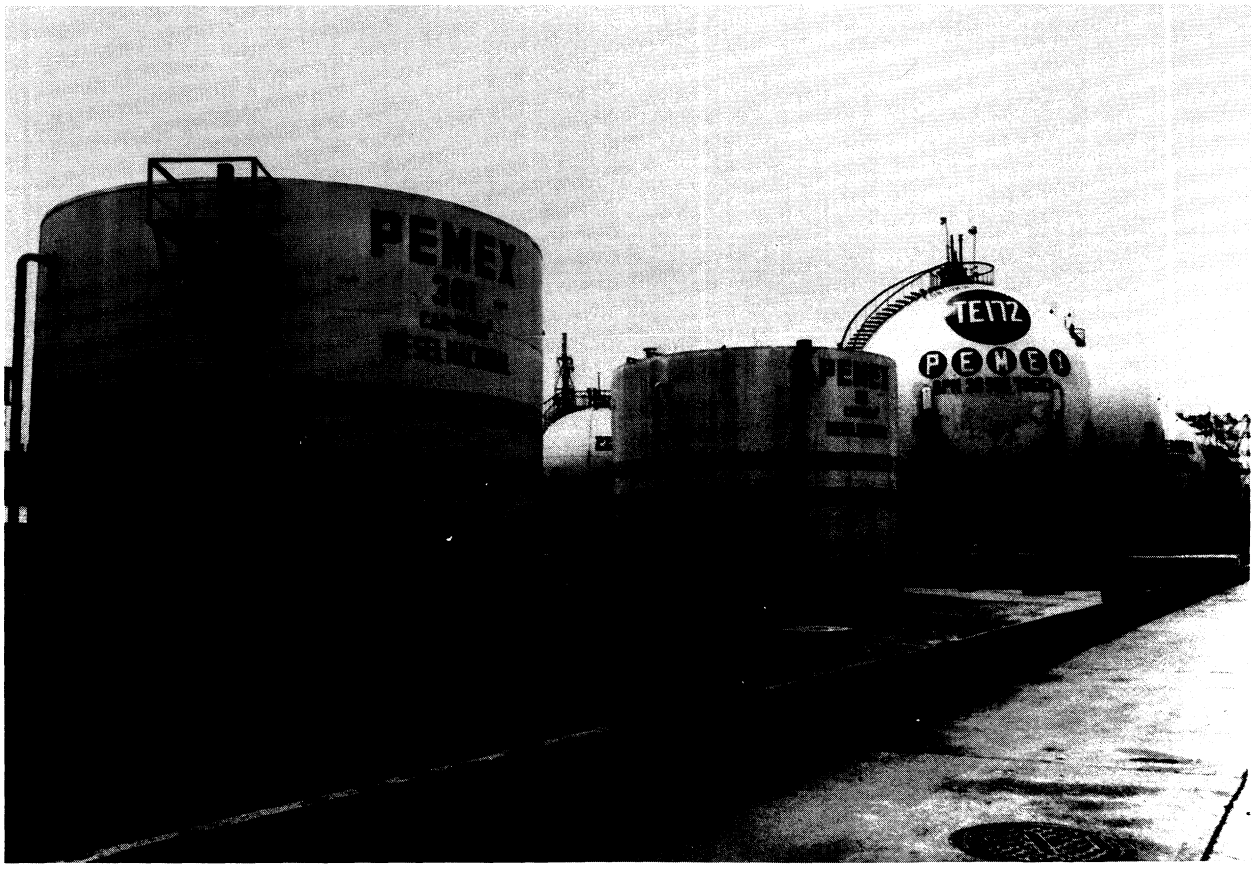
Foreign Economic Trends and Their Implications for the United States, St. Lucia, annual.

Foreign Economic Trends and Their Implications for the United States, St. Vincent and the Grenadines, annual.

MEXICO: PEMEX HYDROCARBONS PRODUCTION PLATFORM IN THE GULF OF MEXICO. (PHOTO COURTESY OF THE AMERICAN PETROLEUM INSTITUTE)

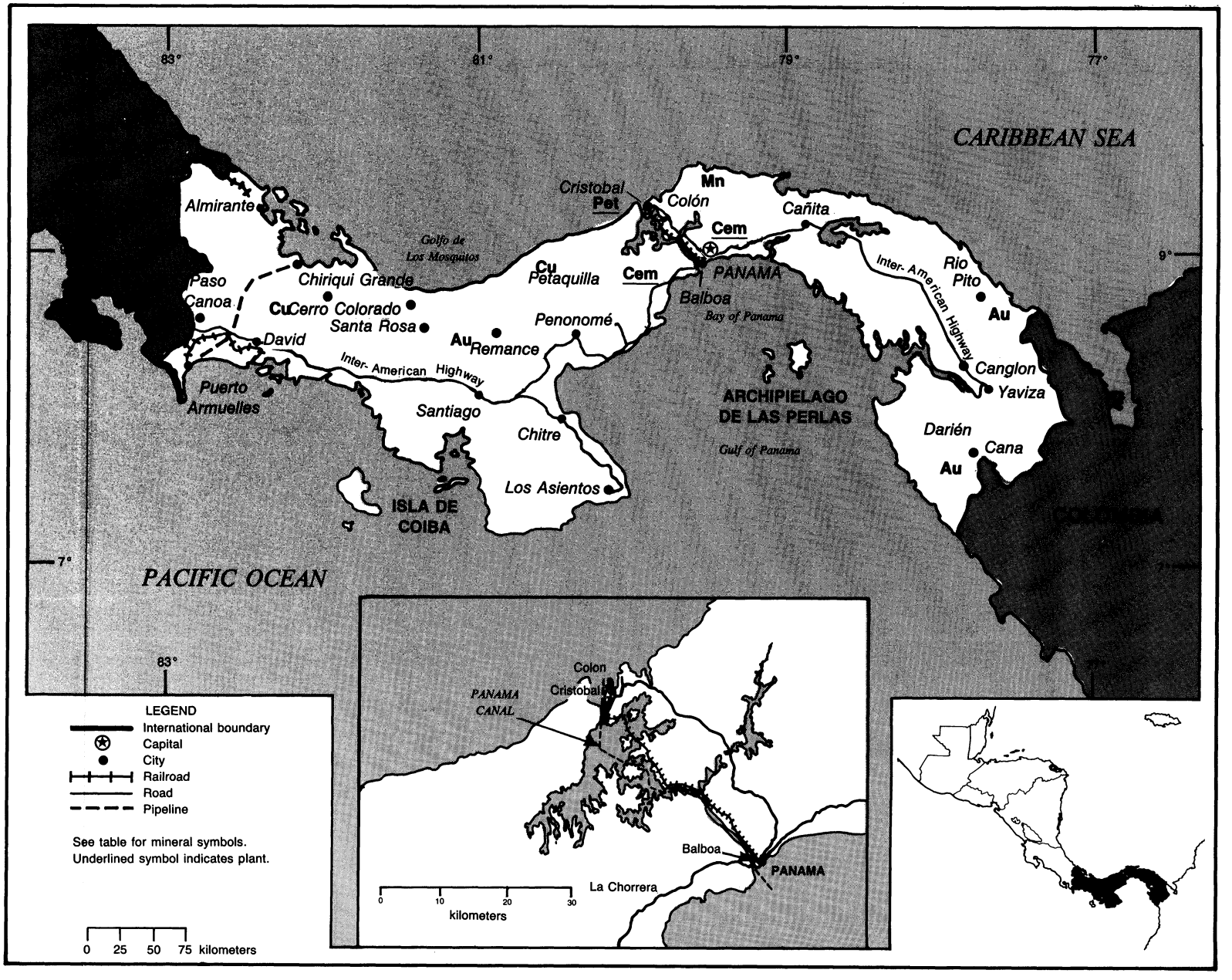


MEXICO: AZCAPOTZALCO REFINERY, MEXICO, D.F. CLOSED MARCH 1991 FOR ENVIRONMENTAL CONTROL REASONS. (PHOTO COURTESY OF PEMEX)



PANAMA

AREA 75,990 km² **POPULATION 2.5 million**



THE MINERAL INDUSTRY OF

PANAMA

By Philip M. Mobbs

Production of construction-related industrial minerals continued to dominate Panama's mineral sector during 1991. The nation's construction sector was expected to continue its growth. Construction had accounted for 3% of GDP in 1991, up from 1.7% in 1990 and 1.3% in 1989.

In 1991, Panama realized a 9.3% real GDP growth rate, compared with 4.6% in 1990 and -0.4% in 1989. The GDP at current prices was estimated to be $5.5 billion[1] in 1991. Approximately 5% of the country's economy was attributed to mineral transportation and industrial mineral production. Transportation of mineral products, shipped through the canal or sent through the oil pipeline, historically has been a significant facet of the minerals industry in Panama during the 20th century.

Minerals produced for local use included cement, clay, limestone, salt, and sand and gravel. The perennial small amount of placer gold production was augmented by two gold mines. Panama imported all other mineral requirements for its limited industrial base. Mineral-related exports consisted mainly of scrap metal and of petroleum products that were provided to ships and aircraft in transit.

GOVERNMENT POLICIES AND PROGRAMS

The controlling legislation for mining is The Code of Mineral Resources, Decree Law No. 23 of August 22, 1963, as amended by Decree No. 126, July 21, 1964; Decree No. 142, August 31, 1964; Cabinet Decree No. 26, August 21, 1969; Cabinet Decree No. 404, December 29, 1970; Law No. 55, July 10, 1973; Law No. 70, August 22, 1973; Law No. 89, October 4, 1973; Law No. 109, October 8, 1973; Law No. 9, January 8, 1974; Law No. 22, February 16, 1974; Law No. 33, November 8, 1984; Law 20, December 20, 1985; and Law No. 3, January 28, 1988.

The Government proposed to privatize 28 state-owned companies, including its interest in a cement company and infrastructure concerns such as the national telephone company, selected port operations, and portions of the national electricity company. However, during 1991, Congress successfully contested the privatization bill.

PRODUCTION

The mineral industry continued its rebound from its late 1980's decline. Construction-related material production prospered with the continued surge of activity in Panama's construction industry.

Trans-Isthmian oil pipeline shipments were reduced because of declining Alaskan crude oil shipments. *(See table 1).*

TRADE

Panama's main trading partner was the United States, which accounted for 43% of Panama's exports and sourced 44% of its imports in 1991. Panama was eligible for trade benefits under the U.S. Generalized System of Preferences and the Caribbean Basin Initiative. In June, a bilateral Framework Agreement on Trade and Investment was signed by Panama and the United States.

During the year, Panama began preparing to join the General Agreement on Tariffs and Trade (GATT).

Seventy percent of Panama's crude petroleum imports were from Ecuador. Venezuela provided 22% of petroleum imports under the San Jose Accords. Saudi Arabia and Peru supplied the balance of Panama's crude petroleum imports.

Transportation of bulk commodities through the canal was the most prominent aspect of the mineral industry in Panama's economy. Owing to increased trade attributed to the Persian Gulf War at the beginning of 1991, Panama Canal transits increased 5.8% and tonnage increased 3.6% compared with that of 1990. Statistics were based on a fiscal year ending in September. Increased tonnages of iron and steel products and phosphates were noted. However, the general trend of decreasing shipments of petroleum and petroleum products, ores, and metals through the canal continued. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

Most of the mineral industry ownership was private. The Government held a 50% interest in Empresa Estatal de Cemento "Bayano" and a 40% interest in Petroterminal de Panama, S.A., the crude oil transshipment and pipeline activity. The Government was considering divesting itself of its interest in the cement company and its 51% interest in the Cerro Colorado porphyry copper project. The Government and RTZ Corp. PLC, which held the remaining 49%, continued to maintain the project in caretaker status. *(See table 4).*

COMMODITY REVIEW

Metals

Gold.—Gold mining in Panama included small-scale placer operations in Darién Province. The Remance

underground mine and carbon-in-pulp plant of Transworld Exploration S.A. of Panama and Minera Remance of Peru began operations during the year. Sociedad de Inversiones IXTAPA, S.A., was working the Espiritu Santo de Cana Mine in Darién Province.

Minnova Inc. of Toronto, Canada, began a gold exploration program after acquiring an option on the Petaquilla porphyry copper prospect. Indications of gold dissemination were discovered around the Petaquilla and Botija copper deposits at Petaquilla. Further exploration was planned for 1992. Petaquilla had been held by Panama Resource Development Co., a venture of a Japanese consortium composed of Mitsui Mining and Smelting Co., Dowa Mining Co., and Mitsubishi Metal Corp.

Boliden International Mining AB of Sweden (51%) and Greenstone Resources Ltd. (49%) of Toronto continued work on the Santa Rosa and Cerro Alto de la Mina Prospects, 40 km north of Santiago. A new mineralized area was discovered at Cerro Otero, 365 m southwest of the Santa Rosa deposit. Greenstone will operate the prospects through the joint venture's Panamanian subsidiary, Minas Santa Rosa, S.A. A heap-leach test pad was constructed in 1991. Also during 1991, a feasibility study was completed. Production has been projected to be in the range of 1,400 to 1,800 kg/a.

Manganese.—Caribbean Mining was reportedly interested in reopening an open pit manganese mine northeast of Colón. Mitsui began a feasibility study of the projected 100,000-mt/a open pit mine. Results are expected to be available in early 1992.

Mineral Fuels

Texaco Exploration Panama Inc. and the Government successfully concluded contract negotiations on Blocks 1 and 2. The 4,500-km^2 area included both onshore and offshore acreage along the northwest coast in Bocas del Toro Province.

INFRASTRUCTURE

Oceangoing ships with beams up to 32.3 m can transit the 82-km Panama Canal. Normal maximum transit draft was 12 m tropical freshwater. During the year, the Panama Canal Commission indicated its intention to increase the width of the Gaillard Cut (Corte Culebra). Larger ships were restricted to one-way daylight passage of the Gaillard Cut, due to its narrowness. Excavation along the 13-km long section of the canal was expected to begin in 1992.

There was 238 km of railroad track in the country. Paved highways accounted for 2,745 km of the approximately 8,500 km of roads. The remainder consisted of gravel or earthen surfaces.

Crude oil was transshipped through a 130-km pipeline extending from Puerto Armuelles on the Pacific coast to Chiriqui Grande on the Atlantic coast. Pipeline capacity was about 800,000 barrels per day. Minor modifications would be needed to reverse flow direction.

Panama's public electric power was provided by state-owned Instituto de Recursos Hidraulicos y Electrificación. Its system capacity was rated at 848 MW, of which 65% was hydroelectric based. Private companies and the Panama Canal Commission generators added another 265 MW to the country's total capacity. Some energy was obtained from the use of biomass residues and fuel wood. A geothermal energy region in southwestern Panama had an estimated potential of 400 MW.

OUTLOOK

Industrial mineral development is expected to continue to dominate Panama's mineral industry, given the recuperation of commercial and residential construction. The construction industry's demand for industrial minerals is also expected to remain strong because the Government has planned a number of new highway and bridge projects.

There appears to be an increased level of foreign investment in the metals sector. Given the Government's emphasis on promoting development of the country's mineral resources, foreign interest in Panama's mineral industry should continue to grow.

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[1]Where necessary, values have been converted from Panamanian balboas (B) to U.S. dollars at the rate of B1.00=US$1.00.

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Agency

Dirección General de Recursos
Minerales (DGRM)
Ministerio de Comercio e Industrias
Apartado 8515
Panama 5, Panama
Telephone: (507) 36-1823
Fax: (507) 36-3173

Publications

Dirección de Estadística y Censo, Panama: Panama en Cifras (annual).

Dirección General de Recursos Minerales, Ministerio de Comercio e Industrias, Panama: The Mining Sector of Panama, 1991, 27 pp.

Dirección General de Recursos Minerales, Ministerio de Comercio e Industrias, Panama: Panama, A Directory of Mineral Resources, Results from the National Mineral Inventory Project 1988-1990, 1991, 11 pp.

TABLE 1
PANAMA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
Cement		[r]430,000	[r]220,000	168,500	300,000	[e]275,000
Clay:						
For cement		78,000	56,000	43,047	[e]90,000	78,428
For products		79,452	49,553	[e]36,000	122,332	383,866
Gold[2]	kilograms	—	—	—	85	194
Lime[e]		1,500	1,500	[3]2,000	3,000	1,320
Manganese ore		[e]6,000	—	—	—	—
Petroleum refinery products	thousand 42-gallon barrels	[e]9,000	[e]9,000	6,552	8,466	8,000
Salt, marine[e]		10,000	9,000	8,000	9,000	5,000
Silver	kilograms	—	—	—	41	91
Stone, sand and gravel:						
Limestone:						
For cement		226,000	185,000	181,304	315,955	289,855
For other uses		17,884	9,358	16,509	[r]77,098	47,968
Sand and gravel	thousand tons	1,980	1,390	[e]1,000	470	1,941
Sand, silica		[e]17,000	[e]15,000	[e]12,000	14,829	17,613

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes data available through Sept. 3, 1992.
[2]An unquantifiable amount of gold was recovered from placer deposits in Darién Province during the period 1987-89.
[3]Reported figure.

TABLE 2
COLON FREE TRADE ZONE: REEXPORTS OF MINERAL COMMODITIES[1]

(Kilograms unless otherwise specified)

Commodity	1989	Destinations	
		United States	Other (principal)
METALS			
Aluminum:			
Oxides and hydroxides	45	—	All to Nicaragua.
Metal including alloys:			
Scrap	30	—	All to Dominican Republic.
Unwrought	346,351	—	All to Panama.
Semimanufactures	47,938	—	Panama 20,999; Venezuela 9,761; Ecuador 5,334.
Cobalt: Oxides and hydroxides	3,300	—	All to Panama.
Copper: Metal including alloys, semimanufactures	33,349	—	Nicaragua 16,525; Cuba 8,615; Panama 4,994.
Gold: Metal including alloys, unwrought and partly wrought	488	6	Colombia 186; Switzerland 148; Guatemala 45.
Iron and steel: Metal:			
Pig iron, cast iron, related materials	89	—	Panama 38; Honduras 8; unspecified 43.
Steel, primary forms	48,129	—	Cuba 23,912; Panama 6,198; Nicaragua 6,057.
Semimanufactures:			
Bars, rods, angles, shapes, sections	59,437	—	Nicaragua 59,396; Panama 26; Cuba 15.
Universals, plates, sheets	373,577	—	Panama 332,988; Nicaragua 589; unspecified 40,000.
Hoop and strip	9,890	—	Panama 7,621; Colombia 2,128.
Wire	13,579	—	Panama 10,531; Nicaragua 1,769; Ecuador 154.
Tubes, pipes, fittings	58,251	7,872	Ecuador 26,853; Panama 17,319.

See footnotes at end of table.

TABLE 2—Continued

COLON FREE TRADE ZONE: REEXPORTS OF MINERAL COMMODITIES[1]

(Kilograms unless otherwise specified)

Commodity	1989	Destinations	
		United States	Other (principal)
METALS—Continued			
Lead: Metal including alloys:			
Scrap	1,361	—	All to Nicaragua.
Semimanufactures	19,598	—	Panama 13,665; Honduras 3,545; Costa Rica 2,388.
Magnesium: Metal including alloys, semimanufactures	485	—	Nicaragua 325; Panama 160.
Mercury	3,732	—	Aruba 3,720; Panama 12.
Platinum-group metals: Metals including alloys, unwrought and partly wrought	5	—	All to Chile.
Silver: Metal including alloys, unwrought and partly wrought	975	—	Switzerland 576; Colombia 303; Paraguay 38.
Tin: Metal including alloys, semimanufactures	1,098	—	All to Nicaragua.
Tungsten: Metal including alloys, semimanufactures	528	—	All to Panama.
Zinc: Metal including alloys, semimanufactures	769	—	All to Nicaragua.
Other:			
Base metals: Ashes and residues	2,497,240	—	Costa Rica 3,000; unspecified 2,494,240.
Metalloids[2]	9,629	—	Panama 5,676; unspecified 3,953.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc.	8	—	All to Colombia.
Grinding and polishing wheels and stones	41,227	—	Ecuador 17,394; Costa Rica 14,808; Panama 4,753.
Bromine and fluorine	10,389	—	Aruba 3,720; Nicaragua 1,000; unspecified 5,669.
Cement	455	—	All to Nicaragua.
Diamond: Natural: Gem, not set or strung	27	—	Colombia 12; Ecuador 5; Honduras 5.
Fertilizer materials:			
Crude, n.e.s.	8	—	All to Panama.
Manufactured:			
Nitrogenous	8,394	—	Argentina 8,361; Colombia 33.
Unspecified and mixed	880	—	All to Panama.
Gypsum and plaster	1,415	—	Do.
Iodine	1,485	—	All to Costa Rica.
Lime	20,170	—	Panama 20,000; Nicaragua 170.
Magnesium compounds: Unspecified	15,974	—	All to Panama.
Precious and semiprecious stones other than diamond:			
Natural	16	12	Ecuador 2; Honduras 1.
Synthetic	105	—	Colombia 64; Bolivia 13; Ecuador 7.
Salt and brine	68,270	—	Nicaragua 43,044; Honduras 9,980; Ecuador 4,854.
Sodium compounds, n.e.s.:			
Soda ash, natural and manufactured	15,030	—	All to Dominican Republic.
Sulfate, natural and manufactured	105	—	All to Mexico.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	64,024	—	Panama 62,424; El Salvador 1,400; Cuba 200.
Worked	19,928	—	Panama 15,838; Ecuador 2,980; Colombia 353.
Sand other than metal-bearing	2,722	—	NA.
Sulfur: Sulfuric acid	131	—	All to Panama.
Talc, steatite, soapstone, pyrophyllite	15,909	—	Do.

See footnotes at end of table.

TABLE 2—Continued

COLON FREE TRADE ZONE: REEXPORTS OF MINERAL COMMODITIES[1]

(Kilograms unless otherwise specified)

Commodity		1989	Destinations	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		26,322	—	Cuba 16,918; Panama 2,586.
Coke and semicoke		33	—	Panama 19; unspecified 14.
Petroleum refinery products:				
Liquefied petroleum gas	42-gallon barrels	151	—	NA.
Mineral jelly and wax	do.	7	—	Cuba 3; Panama 2.
Kerosene and white spirits	do.	78	—	All to Panama.
Lubricants	do.	471	—	Panama 277; Nicaragua 58; Costa Rica 55.

NA Not available.
[1]Table prepared by H. D. Willis.
[2]Reported SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

TABLE 3

COLON FREE TRADE ZONE: IMPORTS OF MINERAL COMMODITIES[1]

(Kilograms unless otherwise specified)

Commodity	1989	Sources	
		United States	Other (principal)
METALS			
Aluminum:			
Oxides and hydroxides	7,541	7,541	
Metal including alloys:			
Scrap	643	—	All from Belgium-Luxembourg.
Unwrought	99,482	—	All from Chile.
Semimanufactures	77,391	60,220	Taiwan 5,199; Venezuela 4,867.
Columbium and tantalum: Tantalum metal including alloys, semimanufactures	697	—	All from Taiwan.
Copper: Metal including alloys, semimanufactures	50,197	17,898	Taiwan 21,197; West Germany 9,981.
Gold: Metal including alloys, unwrought and partly wrought	445	19	Switzerland 117; Italy 116; Ecuador 112.
Iron and steel: Metal:			
Pig iron, cast iron, related materials	1,275	1,275	
Steel, primary forms	261,270	154,192	Belgium-Luxembourg 82,156; Greece 20,312.
Semimanufactures:			
Bars, rods, angles, shapes, sections	170,044	150,487	Belgium-Luxembourg 19,057; Venezuela 500.
Universals, plates, sheets	44,864	—	All from Venezuela.
Hoop and strip	18,136	—	All from Mexico.
Rails and accessories	22,843	22,843	
Wire	87	10	Unspecified 77.
Tubes, pipes, fittings	64,677	800	India 29,188; China 27,419; Chile 6,350.
Lead: Metal including alloys, semimanufactures	2,147	2,147	
Magnesium: Metal including alloys, semimanufactures	325	325	
Mercury	3,720	—	All from Spain.

See footnotes at end of table.

TABLE 3—Continued

COLON FREE TRADE ZONE: IMPORTS OF MINERAL COMMODITIES[1]

(Kilograms unless otherwise specified)

Commodity		1989	Sources	
			United States	Other (principal)
METALS—Continued				
Nickel: Metal including alloys, semimanufactures		7,739	—	West Germany 6,676; Aruba 1,063.
Platinum-group metals: Metals including alloys, unwrought and partly wrought		66	66	
Silver: Metal including alloys, unwrought and partly wrought		524	—	Ecuador 450; Italy 74.
Tin: Metal including alloys, semimanufactures		1,370	272	Panama 1,098.
Zinc: Metal including alloys, semimanufactures		750	—	All from Costa Rica.
Other:				
Base metals: Ashes and residues		277,103	—	All from Panama.
Metalloids[2]		11,887	545	France 6,510; Netherlands 2,625.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.		24	24	
Grinding and polishing wheels and stones		28,835	946	Taiwan 10,740; West Germany 8,792; Israel 3,920.
Bromine and fluorine		2,716	2,716	
Cement		278	278	
Diamond: Natural: Gem, not set or strung		45	3	Panama 14; Thailand 11; Austria 5.
Fertilizer materials: Manufactured:				
Ammonia		15,311	2,811	France 12,500.
Unspecified and mixed		731	725	Panama 6.
Lime		45,800	—	All from Colombia.
Precious and semiprecious stones other than diamond:				
Natural		29	—	Thailand 19; Colombia 8; Switzerland 1.
Synthetic		22	—	Hong Kong 13; Italy 4; Switzerland 3.
Salt and brine		100,424	100,154	
Sodium compounds, n.e.s.:				
Soda ash, manufactured		42,494	—	All from Belgium-Luxembourg.
Sulfate, manufactured		333	—	Do.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		274,221	1,339	Cuba 206,880; Italy 47,732; Spain 18,270.
Worked		25,967	10,746	Mexico 7,545; Japan 5,125.
Gravel and crushed rock		1,618	470	Panama 1,148.
Sulfur: Elemental: Colloidal, precipitated, sublimed		4,512	—	All from Belgium-Luxembourg.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		23,394	23,394	
Carbon: Carbon black		150	—	All from Taiwan.
Coke and semicoke		1,900	1,900	
Petroleum refinery products:				
Liquefied petroleum gas	42-gallon barrels	665	588	Brazil 77.
Mineral jelly and wax	do.	(3)	(3)	
Lubricants	do.	487	421	Brazil 61; West Germany 3.
Bitumen and other residues	do.	56	—	All from Belgium-Luxembourg.

[1]Table prepared by H. D. Willis.
[2]Reported SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."
[3]Less than 1/2 unit.

TABLE 4
STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

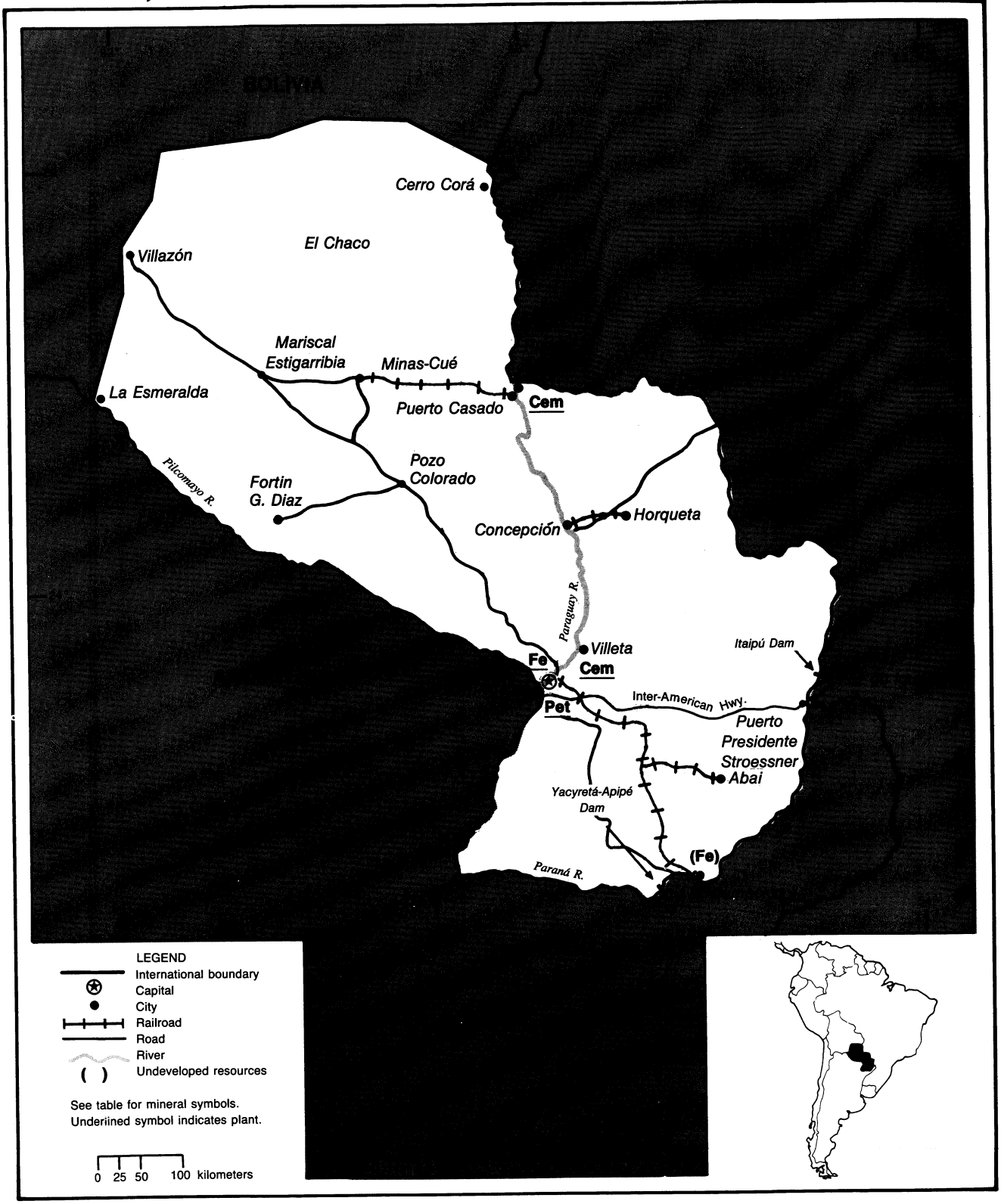
(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Empresa Estatal de Cemento "Bayano" (Government, 50%; private, 50%)	Calzada Larga, Panamá Province	300
Do.		Cemento Panamá S.A. (private, 100%)	Quebrancha, Panamá Province	310
Gold	kilograms	Transworld Exploration S.A. and Minera Remance (Peru)	Remance Mine, Veraguas Province	293
Do.	do.	Sociedad de Inversiones IXTAPA, S.A. (private, 100%)	Espíritu Santo de Cana Mine, Darien Province	NA
Do.	do.	Minas Santa Rosa, S.A. (Greenstone Resources Ltd. (Canada), 49%; Boliden International Mining AB (Sweden), 51%)	Santa Rosa Mine, Veraguas Province	1,800
Petroleum products	million 42-gallon barrels	Refinería Panamá S.A. [Texaco Panama Inc. (U.S.), 100%]	Las Minas, Colón Province	36
Silver	kilograms	Transworld Exploration S.A. and Minera Remance (Peru)	Remance Mine, Veraguas Province	2,000

NA Not available.

PARAGUAY

AREA 407,000 km² **POPULATION 4.4 million**



THE MINERAL INDUSTRY OF

PARAGUAY

By Alfredo C. Gurmendi

Mining accounted for about 0.5% of Paraguay's GDP, compared to 21% for the agricultural sector. Minerals produced in Paraguay included clays, glass sand, gypsum, kaolin, limestone, pigments, small amounts of iron oxide, stone, and talc. Mineral processing activities included manufacture of cement and lime from indigenous raw materials, as well as pig iron, steel, and refined petroleum from imported raw materials. Paraguay's petroleum needs were supplied by Algeria. Exploration for hydrocarbons in Paraguay was limited, and none of the discoveries proved viable. Paraguay's economic performance continued to improve in 1991 with a GDP growth of 2.5% to $7.0 billion.[1] Inflation decreased to 12.1% in 1991 after a high of 24% the previous year. Unemployment decreased to 7%, and the country's international reserves increased to $935 million.

In April 1991, the Government reached an agreement with the Paris Club and other creditors; by paying $27 million in amortization, the country reduced its foreign debt to $1.7 billion.

The Paraguayan work force in 1991 reached 1.4 million. Employment was distributed as follows: 49% in agriculture, 32% in industry (minerals, cement, and petroleum refining included) and commerce, 16% in services, and 3% in Government.

Discovery of Paraguay's potential mineral resources did not increase, largely because of extremely limited exploration, inadequate infrastructure, large fiscal and trade deficits, scarcity of foreign exchange, and limited private investment. However, business opportunities appeared to exist for developing natural resources such as hydropower, iron ore, limestone, manganese, and timber. The Government announced that projects such as the Yacyreta hydroelectric dam, road paving, rural settlements, and electrification would be open to bidding by U.S. firms.

The Paraguayan economy showed at least some strength, with established export industries of cotton, soybeans, cattle, and electricity and lucrative, yet volatile, petroleum refining and cement industries.

GOVERNMENT POLICIES AND PROGRAMS

Paraguay reinstated itself into western democracy. There have been some positive developments such as in January 1991, under the Generalized System of Preferences (GSP), when the United States lifted sanctions allowing Paraguayan exports to enter the U.S. market with much more ease. The signing of the Treaty of Asuncion, creating the Southern Cone Common Market (MERCOSUR), will bring economic and commercial benefits to the country. The Government announced the privatization of two state-owned companies: the Industria Nacional del Cemento (INC) and the Aceros del Paraguay S.A.

PRODUCTION

Mineral commodities produced in Paraguay included clays, glass sand, gypsum, kaolin, limestone, and stone, all for internal consumption. Inadequate infrastructure was a major constraint on both exploration and mineral development in Paraguay. Production of petroleum refinery products for domestic consumption was about 70% of apparent refinery capacity. Rolled steel production was 55,000 tons and pig iron 62,000 tons in 1991. To date, none of the petroleum discoveries proved viable. *(See table 1.)*

TRADE

Exports in 1991 amounted to $730 million.[1] Lower production of cotton and soybeans, which accounted for two-thirds of exports, coupled with lower prices for soybeans, resulted in reduced value of exports. The United States maintained a healthy trade surplus with Paraguay, amounting to about $200 million. The value of Paraguayan mineral exports in 1991 was negligible. Imports of crude oil and petroleum products amounted to $200 million. Argentina and Brazil were the primary sources for refinery products and Algeria for crude oil. There were plans for all of Paraguay's fuel needs to be supplied from the Formosa Oilfield in Argentina, with savings in freight estimated at $7 per ton. The total value of Paraguayan imports was $1.3 billion. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

The main mineral activities were the Government-owned cement plants and petroleum refinery. The limestone deposits along the Paraguay River were worked by INC for cement production. The Puerto Vallemí cement plant in Concepción Department had a 400,000-mt/a capacity, and the Itapucumi clinker plant in Villeta Department had a 600,000-mt/a capacity. The Paraguayan national steel corporation, Aceros del Paraguay S.A. (Acepar), operated a plant at Villa Hayes, 20 km north of Asunción. Production was based on iron ore and coal imported from Brazil. The Villa

Hayes steel plant, which cost $290 million, was a joint venture of Brazil and Paraguay. During 1991, the Government-owned company, Petróleos Paraguayos S.A. (Petropar), produced in excess of 1,825,000 bbl of refined petroleum products for domestic consumption at its Santa Elisa refinery in Asunción. *(See table 4.)*

COMMODITY REVIEW

Metals

Shortages of raw materials continued to affect output by Acepar. The Villa Hayes plant was able to supply only reinforcing bars and some wire. Imports of rolled steel increased by about 10% to 45,000 tons in 1991. Other minerals known to occur included copper, lateritic iron ore, lignite, manganese, peat, pyrite, and uranium. Discussions between the Governments of Bolivia and Paraguay continued concerning imports of 500,000 mt/a of iron ore from the Mutún Mine near the Bolivian border.

Mineral Fuels and Energy

Exploration for hydrocarbons in Paraguay was very limited. Early in 1991, Santa Fe Energy of Texas started exploration for oil in the Pilar Basin of the Chaco region. Occidental Petroleum Co. identified a potential oil- and natural gas-bearing structure in northwestern Paraguay, near Villazón. Texaco Co. continued with geophysical surveys in southern Paraguay near the Argentinean border.

The Itaipú Dam complex, a joint Brazilian-Paraguayan hydroelectric powerplant on the Paraná River, will be operating at full capacity in 1992 with a 12,600-MW output. The Yacyretá-Apipé Dam, a joint Argentinean-Paraguayan hydroelectric project 320 km downstream from Itaipú, will become operational in mid-1993 with a capacity of 2,760 MW.

Reserves

There are large resources of limestone along the Paraguay River. Lateritic iron ore deposits along the Paraná River near Encarnación were estimated at 300 Mmt with 35% iron. Other minerals known to occur included azurite, barite, gypsum, lignite, malachite, mica, peat, pyrite, pyrolusite, soapstone, and uranium.

INFRASTRUCTURE

The transportation system in Paraguay improved somewhat in 1991, but remained generally inadequate. The country is linked to the outside world via air and inland river transport. There were 886 airports, of which 768 were usable; 6 had permanent-surface runways ranging from 1,220 to 3,700 m. Other transportation modes comprised inland waterways, 3,100 km; railways, 970 km; and highways, 21,960 km. The most important commercial transportation connections were with Argentina, and the shipping lanes on the Atlantic Ocean were the navigable Paraguay and Paraná Rivers in this landlocked country. The inland waterways and the Río de la Plata handled about 65% of Paraguay's foreign trade with Argentina, Brazil, Chile, Europe, Japan, and the United States. Most of Paraguay's exports and imports are transshipped to Buenos Aires, Argentina, or Montevideo, Uruguay. The main port of Asunción and nine minor ports on the inland rivers are managed by the Administración Nacional de Navegación y Puertos, a Government-owned corporation.

OUTLOOK

The economic slowdowns in Japan, the United States, and parts of Europe will lessen demand for Paraguay's main exports, leading to downward pressure on prices. Approval by the International Monetary Fund (IMF) of Paraguay's standby program would allow Paraguay access to sizable new multilateral credits. Also, tax and financial reforms in Paraguay will ease loans from the World Bank linked to approval of Paraguay's IMF programs. The decision to restore the U.S. GSP benefits will create favorable conditions for Overseas Private Investment Corporation (OPIC) to resume its operations in Paraguay, leading to capital availability for Paraguay's economic development.

Mineral surveys have identified the presence of iron ore, uranium, and other minerals in Paraguay, particularly lateritic iron ore on the Paraná River near Encarnación. Geophysical surveys have identified oil and natural gas potential in the El Palma Largo and Gran Boquerón Chaco regions in northwest Paraguay. Paraguay's accession to GATT would provide an opportunity to expand its trade position worldwide.

[1]Where necessary, values have been converted from Paraguayan guaraníes (G) to U.S. dollars at the average market rate of G1,290=US$1.00.

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Azara 179
Asunción, Paraguay

Administración Nacional de Combustibles, Alcohol y Portland
Asunción, Paraguay
Palma 1084 y Hernanderías
Asunción, Paraguay

Administración Nacional de Navegación y Puertos (ANNP)
Plazoleta Isabel La Católica y Colón
Asunción, Paraguay

Dirección General de Recursos Minerales (DGRM)
Oliva y Alberdi
Asunción, Paraguay

Industria Nacional del Cemento (INC)
Humaitá 357, Edificio Humaitá 5to Piso
Asunción, Paraguay

Ministerio de Industria y Comercio
Ave. España 477 (Esq. Estados Unidos)
Asunción, Paraguay

Ministerio de Obras Públicas y Comunicaciones
General Días (Esq. Alberdi)
Asunción, Paraguay

Petróleos Paraguayos S.A. (PETROPAR)
Edificio Bank of América
4to Piso, Oliva 299
Asunción, Paraguay

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TABLE 1

PARAGUAY: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		1987	1988	1989	1990[p]	1991[e]
Cement, hydraulic	thousand metric tons	261	321	326	326	326
Clays:						
Kaolin	metric tons	72,000	76,000	74,000	74,000	74,000
Other	thousand metric tons	1,898	1,910	1,860	1,900	1,900
Gypsum	metric tons	3,100	3,600	4,500	4,500	4,500
Iron and steel:						
Pig iron	do.	50,278	62,724	63,000	61,000	60,000
Steel, crude	do.	13,167	62,273	62,500	63,000	63,000
Lime	do.	92,500	96,000	103,000	100,000	100,000
Petroleum refinery products:						
Liquefied petroleum gas	do.	91	96	e100	100	100
Gasoline	thousand 42-gallon barrels	494	512	e560	560	560
Jet fuel	do.	152	146	e160	160	160
Kerosene	do.	33	38	e40	40	40
Distillate fuel oil	do.	821	675	e740	740	740
Lubricants:						
Oil	do.	14	19	e20	20	20
Grease	do.	2	5	e5	5	5
Residual fuel oil	do.	350	323	e350	350	350
Refinery fuel and losses	do.	NA	21	e25	25	25
Total	do.	1,957	1,835	e2,000	2,000	2,000
Pigments, mineral: Natural, ocher	metric tons	285	310	320	330	330
Sand, including glass sand	thousand metric tons	1,893	1,926	1,939	2,000	2,000
Stone:						
Dimension	do.	65	73	65	70	70
Crushed and broken:						
Limestone (for cement and lime)	do.	507	550	566	600	600
Other	do.	1,990	2,070	1,960	2,000	2,000
Marble	metric tons	600	750	730	750	750
Talc, soapstone, pyrophyllite	do.	180	210	200	200	200

[e]Estimated. [p]Preliminary.

[1]Includes data available through mid-June 1992.

[2]In addition to the commodities listed, common gravel undoubtedly was also produced, but output was not reported, and available information was inadequate to make reliable estimates of output levels.

TABLE 2
PARAGUAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Sources, 1990	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate		101	—	All from Brazil.
Oxides and hydroxides		833	(2)	Brazil 828; Uruguay 3; Argentina 1.
Metal including alloys:				
Unwrought		74	—	All from Argentina.
Semimanufactures		466	3	Brazil 214; Argentina 177; West Germany 28.
Chromium: Ore and concentrate		2	—	All from Argentina.
Copper: Metal including alloys:				
Unwrought		545	—	All from Chile.
Semimanufactures		219	(2)	Chile 177; Brazil 27; Italy 9.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite		1,500	—	All from Brazil.
Pyrite, roasted		51,176	—	Do.
Metal:				
Scrap		572	—	Do.
Pig iron, cast iron, related materials		50	—	Do.
Ferroalloys:				
Ferromanganese		476	—	Brazil 351; Argentina 125.
Ferrosilicomanganese		15	—	All from Brazil.
Ferrosilicon		280	—	Brazil 227; Argentina 53.
Unspecified		1	—	All from Brazil.
Steel, primary forms		9	—	Argentina 6; Brazil 3.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated		18,268	—	Brazil 7,478; Italy 6,010; Republic of South Africa 4,069.
Clad, plated, coated		9,801	(2)	Republic of South Africa 4,584; Argentina 2,621; Brazil 2,561.
Of alloy steel		264	—	Brazil 224; Republic of South Africa 26; Spain 9.
Bars, rods, angles, shapes, sections		6,901	1	Brazil 4,260; Italy 1,542; Republic of South Africa 800.
Rails and accessories		22	—	All from Brazil.
Wire		645	3	Argentina 613; Brazil 27.
Tubes, pipes, fittings		5,170	87	Argentina 2,597; Brazil 1,406; France 566.
Lead:				
Oxides		1	—	All from Argentina.
Metal including alloys, semimanufactures		7	—	Do.
Magnesium: Metal including alloys, semimanufactures	value, thousands	$22	—	All from Brazil.

See footnotes at end of table.

TABLE 2

PARAGUAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	Sources, 1990	
		United States	Other (principal)
METALS—Continued			
Manganese:			
Ore and concentrate: Metallurgical-grade	500	—	Do.
Oxides	3	—	All from West Germany.
Tin: Metal including alloys, semi- manufactures value, thousands	$4	—	Mainly from Argentina.
Titanium:			
Ore and concentrate	1	—	All from West Germany.
Oxides	120	—	Mexico 84; West Germany 26; United Kingdom 10.
Zinc:			
Oxides	9	—	West Germany 8; Argentina 1.
Metal including alloys:			
Unwrought	34	—	Peru 29; Brazil 5.
Semimanufactures	10	—	Mainly from Brazil.
Other:			
Oxides and hydroxides	16	(2)	Mainly from West Germany.
Ashes and residues	42	—	All from Republic of South Africa.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc.	97	—	All from Argentina.
Artificial: Silicon carbide	26	—	Do.
Grinding and polishing wheels and stones	58	(2)	Brazil 51; West Germany 3; Hong Kong 1.
Asbestos, crude	518	—	All from Brazil.
Boron materials: Oxides and acids	3	—	West Germany 2; Italy 1.
Bromine, fluorine, iodine	1	—	Mainly from West Germany.
Cement	1,924	—	Brazil 1,724; Argentina 200.
Chalk	327	—	All from Argentina.
Clays, crude:			
Bentonite	149	101	Mexico 28; Argentina 16.
Kaolin	74	—	Brazil 68; Argentina 5; West Germany 1.
Unspecified	171	19	Chile 70; Mexico 61; Argentina 20.
Diatomite and other infusorial earth	124	18	Chile 106.
Fertilizer materials:			
Crude, n.e.s.	300	—	All from Brazil.
Manufactured:			
Ammonia	181	—	Argentina 113; Brazil 33; Belgium- Luxembourg 22.
Nitrogenous	2,006	—	Brazil 1,394; West Germany 612.
Phosphatic	3,022	—	Argentina 1,494; Brazil 1,387; Uruguay 140.
Potassic	488	—	Brazil 301; Uruguay 130; Argentina 56.

See footnotes at end of table.

TABLE 2
PARAGUAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Sources, 1990	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Fertilizer materials:—Continued				
Manufactures:—Continued				
Unespecified and mixed		39,501	—	Brazil 37,106; Uruguay 2,134; Argentina 223.
Gypsum and plaster		5,667	—	Argentina 5,666; Japan 1.
Mica: Worked including agglomerated				
splittings	value, thousands	$1	—	All from Brazil.
Nitrates, crude		6	—	All from Chile.
Phosphates, crude		74	—	Chile 72; West Germany 2.
Pigments, mineral: Iron oxides and				
hydroxides, processed		63	—	Brazil 41; Argentina 17; Belgium- Luxembourg 5.
Salt and brine		1,125	—	Argentina 1,061; Brazil 47; Denmark 8.
Sodium compounds, n.e.s.:				
Soda ash, natural and manufactured		4,436	—	Spain 1,948; Romania 1,746; Poland 492.
Sulfate, natural and manufactured		1	—	Mainly from Argentina.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		577	—	Brazil 541; Argentina 36.
Worked		95	—	Brazil 73; Argentina 22.
Quartz and quartzite		5	—	All from Argentina.
Sand other than metal-bearing		31	—	Brazil 20; Chile 8.
Sulfur:				
Elemental:				
Crude including native and byproduct		1,505	—	Argentina 700; Canada 500; West Germany 301.
Colloidal, precipitated, sublimed		20	—	All from West Germany.
Sulfuric acid		6	3	West Germany 1.
Talc, steatite, soapstone, pyrophyllite		264	16	Brazil 201; Argentina 36.
Other: Crude		3	—	All from Switzerland.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		6,334	—	Argentina 6,284; Chile 50.
Carbon black		93	—	Argentina 89; Brazil 4.
Petroleum:				
Crudebarrels		2,214,752	—	Algeria 2,214,358; Argentina 259; Japan 235.
Refinery products:				
Liquefied petroleum gas	do.	520,248	—	Argentina 457,701; Brazil 62,547.
Gasoline:				
Aviation	do.	20,064	—	NA.
Motor	do.	442,274	—	NA.
Mineral jelly and wax	do.	661	142	Brazil 346; West Germany 150.
Kerosene and jet fuel	do.	57,898	605	NA.

See footnotes at end of table.

TABLE 2
PARAGUAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Sources, 1990	
			United States	Other (principal)
MINERALS FUELS AND RELATED MATERIALS—Continued				
Petroleum:—Continued				
Refinery products:—Continued				
Distillate fuel oil	do.	1,896,925	—	NA.
Lubricants	do.	214,738	20,580	NA.
Residual fuel oil	do.	111,562	—	NA.
Bitumen and other residues	do.	2,969	—	All from Argentina.
Bituminous mixtures	do.	23,295	(2)	Argentina 21,325; Brazil 1,970.
Petroleum coke	do.	407	—	All from Argentina.

NA Not available.
[1]Table prepared by H. D. Willis. Import data for 1989 and 1991 were not available at time of publication.
[2]Less than 1/2 unit.

TABLE 3
PARAGUAY: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons)

Commodity	1990	Principal destinations
Iron and steel: Metal:		
Scrap	4,225	Uruguay 2,800; Brazil 1,400; Bolivia 25.
Pig iron, cast iron, related materials	2,650	All to Uruguay.
Steel, primary forms	5,710	Argentina 5,200; Bolivia 510.
Semimanufactures: Bars, rods, angles, shapes, sections	1,674	Bolivia 1,049; Argentina 625.
Stone, sand and gravel:		
Dimension stone, crude and partly worked	6,100	All to Argentina.
Gravel and crushed rock	14,836	All to Brazil.
Tin: Metal including alloys, unwrought	41	Belgium-Luxembourg 21; Malaysia 20.

[1]Table prepared by H. D. Willis. Export data for 1989 and 1991 were not available at time of publication. Paraguay did not report any exports of mineral commodities to the United States during 1990.

TABLE 4
PARAGUAY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

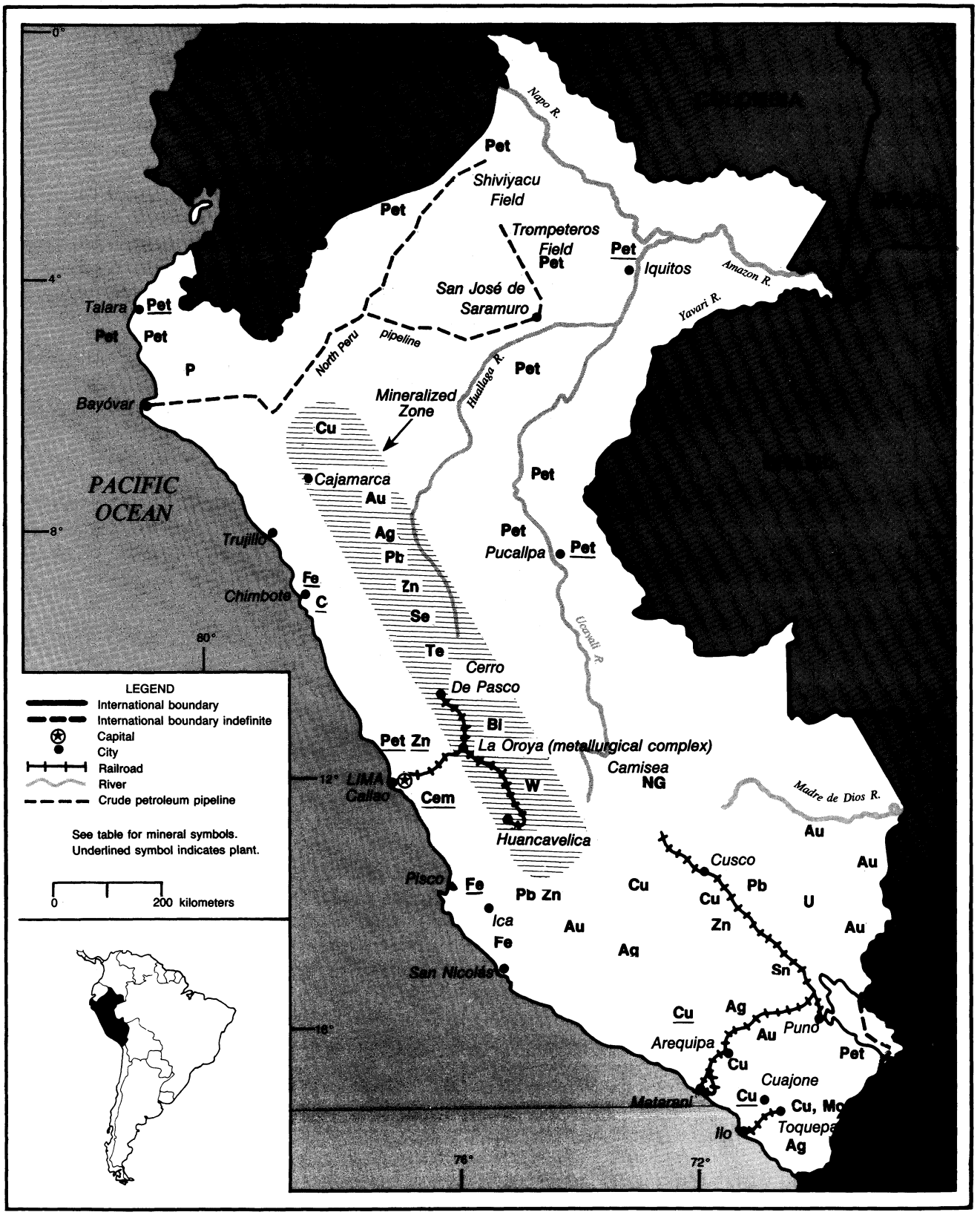
(Thousand metric tons per year unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Industria Nacional del Cemento (Government, 100%)	Puerto Vallemi, (finished cement) Concepción Department	200
Do.		do.	Villeta, (finished cement) Central Department	300
Do.		do.	Itapucumi (clinker), Central Department	600
Steel products		Aceros del Paraguay S.A. (ACEPAR) (Government, 60%; Siderúrgica Paraguaya S.A.-Sidepar, 40%)	Villa Hayes, President Hayes Department (20 kilometers north of Asunción)	150
Petroleum products[1]	thousand barrels	Petróleos Paraguayos S.A. (PETROPAR) (Government, 60%; Refinería Paraguaya S.A., 40%)	Santa Elisa, Asunción (near Asunción)	2,738

[1]Effective capacity is reportedly only 2,190,000 barrels per year.

PERU

AREA 1,285,200 km² **POPULATION 22.1 million**



THE MINERAL INDUSTRY OF

PERU

By Philip M. Mobbs and George A. Rabchevsky

Peru is one of the more important mining countries of the world. More than 19 metallic and 30 industrial minerals were produced or processed within the country during 1991. Peru was a major world source for arsenic, copper, lead, molybdenum, silver, tellurium, and zinc. In the Latin American region, Peru was the leading producer of zinc.

Overall national mineral production dropped by 1.9% in 1991. The 5.4% increase in metals production could not overcome the drag of a 10.9% drop in crude petroleum production.

Minerals accounted for approximately 45% of the total value of exports. The preliminary estimate of foreign exchange generated in 1991 by mineral exports was $1,472 million.[1] Total exports were valued at $3,307 million.

The Peruvian GDP increased by almost 3% in 1991 to an estimated $20.6 billion, reversing the negative growth rates of the 1988-90 period. The annual inflation rate responded to the country's austere economic stabilization policies and dropped to 139% in 1991 compared with the 7,650% rate posted in 1990.

Most mineral industry companies reported losses in 1991. Twelve medium-sized operations and 14 small-scale operations closed during the year. Mining companies continued the survival procedures instituted over the past few years, such as working higher grade areas of their deposits, curtailing exploration and production operations, and reducing plant and equipment expenditures. On April 19, 1991, the Government declared that the mining industry was in a state of emergency, thus allowing most companies some relief from taxes and exemption from some labor laws. The mineral industry work force was reduced by more than 23% over the course of the year.

GOVERNMENT POLICIES AND PROGRAMS

Most mining activity falls under Legislative Decree 708, which became effective December 14, 1991. Decree 708 liberalized the General Mining Law, Legislative Decree 109 of June 12, 1981. Hydrocarbon legislation was updated with Legislative Decree 655 of August 1991.

Environmental impact studies for each phase of mining and petroleum activity were required by the Environmental and Natural Resources Law, Decree Law 611 of September 1990. The Government continued to encourage the reduction of waste streams from all mineral industry activities that adversely affected the environment.

New labor laws affecting the industry included Decree Law 677, which reduced workers' equity participation to 8% of the company's annual income (before taxes), and Decree Law 728, which allowed companies to dismiss workers for justifiable cause.

The Foreign Investment Promotion Law (Decree Law 662) of September 2, 1991, and the Framework Law for Private Investment Growth (Decree Law 757) of November established rights and guarantees for foreign investors and strengthened the incentives for private investment in Peru. Decree Law 757 empowered the Government's Executive Branch to authorize foreign investment in projects along the nation's border. The law's initial impact on the mining industry was the authorization of the French company Bureau de Recherches Géologiques et Miniéres to operate the Tambo Grande pyrite deposit, which was within the 50-km border corridor where foreign operations had been restricted by the Peruvian Constitution.

Supreme Decree 607 of March 27, 1991, abolished the monopolies reserved for state enterprises. Decree 647 issued on July 12, 1991, authorized up to 51% local or foreign ownership in each state-owned company. The Government's nominal 49% share in newly privatized companies could be reduced by an additional 10% by worker groups acquiring equity in their companies.

The nuevo sol (S/.) currency began to circulate on October 1, replacing the inti (I/.) at the rate of S/.1=I/.1 million. Peru regained eligibility for loans from both the International Monetary Fund and the Inter-American Development Bank during the year.

PRODUCTION

Metal production increased by 5.4% in 1991 compared with 1990 output. This increase was led by the 20% increase in copper output. Hydrocarbon production continued to decline.

Time lost to labor actions dropped to 2.3 million hours in 1991 from 5.8 million hours in 1990. Empresa Minera del Centro del Perú (Centromín Perú) was subject to a 3-week strike. *(See table 1.)*

TRADE

Mineral commodities dominated the country's exports with 45% of the total value. Copper accounted for 22% of the $3,307 million export market. Zinc garnered 10% of the value of exports. Lead secured 5% of the value of export activity, followed by gold with 3% and silver with 2%.

Peru exported 15.4 Mbbl of residual fuel oil. In addition, 378,900 bbl of crude oil was exported to the United States. Peru imported 8.5 Mbbl of crude oil from Ecuador and 4.1 Mbbl from Colombia. Peru also imported 501,000 bbl of gasoline, including jet fuel, and 2.4 Mbbl of kerosene.

The United States remained the destination for an estimated 25% of total exports. Europe and Asia received a similar percentage of Peruvian goods.

Peruvian imports reached an estimated $3,515 million. Imports from the United States accounted for 24% of Peru's official purchases.

Peru was a member of the Andean Pact. During the past few years, trade with other Andean countries was less than 10% of total Peruvian trade. In an attempt to increase interregional trade, the Andean Free Trade Zone was formed in December when Peru joined with Bolivia, Colombia, Ecuador, and Venezuela in a preliminary agreement to unify external tariffs. Also in December, Peru became eligible to apply for benefits under the United States Andean Trade Preference Act.

STRUCTURE OF THE MINERAL INDUSTRY

Peruvian mining law defined large-scale companies as those processing more than 5,000 mt/d of ore. Medium-scale companies were those with a daily output of 350 to 5,000 tons. Small companies processed less than 350 tons of ore daily.

Most of the large mining companies, such as Centromín Perú, Empresa Minera del Perú S.A. (Minero Perú), Empresa Minera del Hierro del Perú S.A. (Hierroperú), and Empresa Regional Minera Tintaya S.A. (Tintaya), were state-owned. Southern Perú Copper Corp. (SPCC), the other large mining company, was privately owned. Large companies produced 94% of the nation's copper, 100% of the iron ore, 38% of the lead, 28% of the silver, and 37% of zinc output.

Twenty-three of the 39 registered medium-sized companies were operating at the end of the year. The medium-sized companies accounted for 4% of copper production, 54% of lead, 58% of silver, and 56% of zinc output. Private companies, mostly controlled by local interests, dominated the medium and small mining sectors.

The state company, Empresa Comercializadora de Productos Mineros (Minpeco S.A.), had the exclusive right to market ores, metals, and minerals produced by other state-run mining companies; however, its monopoly expired at the end of the year. Minpeco negotiated agreements with many of the state-owned companies to continue to market their products through the end of 1992.

Petroleum activities were administered by the state-owned Petróleos del Perú (Petroperú). The new hydrocarbon law eliminated the company's exclusive rights in the industry, such as control over secondary recovery operations, refining, and the importation and subsequent resale of crude petroleum and byproducts. The law enhanced oil and gas exploration and production contract terms, which resulted in an increased number of domestic and foreign firms expressing interest in participating in exploration contracts with Petroperú.

During the year, SPCC bought out Billiton's 9% interest in the Cuajone Mine. Billiton had entered the investment 17 years earlier.

The Government planned to sell a significant percentage of its interest in a number of companies. In March, 3 wholly owned and 20 partially owned companies were proposed for privatization. However, with the July sale of the Government's interest in Cía. de Minas Buenaventura S.A. (Buenaventura), sales activity effectively ground to a halt. Although the remainder of the year saw continued preparation for privatization, such as significant work force reductions, no additional companies were divested by the Government. In October, it was announced that Centromín Perú, Hierroperú, and Minero Perú were to be privatized during the first part of 1992. The Government anticipated a flurry of sales activity in 1992 under the privatization program. *(See table 2.)*

COMMODITY REVIEW

Metals

Copper.—Copper production increased by 20% from 1990 levels. SPCC continued to dominate the nation's copper sector, with approximately 65% of total copper output. The company also dominated the mineral industry in general. In 1991, SPCC accounted for 15% of all Peruvian official export earnings.

In August, the Dirección General de Minería announced that it had requested that SPCC install a sulfuric acid plant at the Ilo smelter on the Pacific coast. In December, the Government and SPCC resolved the longstanding conflict over investment recovery from the Cuajone Mine operation. The Government had disagreed with SPCC's determination that interest on a $400 million loan for the startup of the Cuajone Mine was recoverable under the 1969 contract. This recovery prolonged the timeframe under which SPCC operated under more favorable tax rates. There were also differences in opinion over the exchange rates used for remittances and the rate of depreciation that SPCC used. As a result, the Government claimed that SPCC had remitted approximately $72 million in excess of that allowed by the contract. SPCC and the Government had pursued the matter through the courts since 1989.

As part of the December agreement, SPCC agreed to a 5-year $300 million investment program that included the construction of a sulfuric acid plant at Ilo, solvent extraction-electrowinning units at the Cuajone and Toquepala Mines, and a waste-water-treatment plant.

Tintaya was Peru's second largest copper producer. Its 46,418 tons of copper comprised 12% of the nation's total production. Tintaya also generated 22,051 kg of silver.

Centromín Perú produced 9% of Peru's copper from the Casapalca, Cobriza, Morococha, and Yauricocha Mines and

from ore treated at the Mahr Tunnel concentrator. The company's La Oroya metallurgical complex accounted for 22% of the nation's refined copper.

Minero Perú accounted for 8% of Peru's copper output from Cerro Verde in Arequipa. The Cerro Verde complex includes the Cerro Verde and Santa Rosa Mines, three heap-leaching pads, and a concentrator. The company began expanding the concentrator from 1,800 mt/d to 3,000 mt/d and proposed an additional 10,000 mt/d concentration plant for the site. Minero Perú also operated the copper refinery at Ilo, which produced 173,000 tons of copper cathodes. In addition, the Ilo plant refined 48,547 kg of silver and 86 kg of gold in 1991.

Cía. Minera Pativilica, S.A., the fifth ranking copper producer, accounted for slightly less than 2% of Peru's production from its Raúl Mine, 98 km south of Lima. From the 24,784 tons of concentrates produced, 6,540 tons of copper was recovered.

The Minero Perú subsidiary, Cía. Minera Condestable, S.A., produced 3,944 tons of copper or 1% of the country's output. More than 22 additional companies reported smaller amounts of copper production.

Gold.—The region between Ica and Arequipa and the Pataz area, a 130-km strip along the east side of the Rio Marañón, were Peru's main sources of vein gold production. Placer gold production was concentrated in the Inka and Puno Regions, although gold was recovered from placers in rivers and streams throughout the jungle. Gold was also recovered as a byproduct from the concentrates of the nation's polymetallic mines.

Cía. de Minas Orcopampa S.A., the country's largest producer of gold, totaled 2,382 kg of output during the year. The company's 15,063 tons of concentrate also yielded 138 tons of silver.

Minera Aurífera Retamas, S.A. (Marsa), operated a mine at Pataz, about 350 km east of Trujillo, until closing down operations. Cía. Minera Poderosa continued its operations at Pataz.

Centromín Perú produced 1,168 kg of refined gold. Asesoría Contable Minera S.A. almost doubled its gold output with 1,006 kg produced in 1991 from the Ocona, Santa Clarita, Explatoro, and Molino de Oro Mines in the Arequipa Region.

Minero Perú curtailed exploration at the San Antonio de Poto placer operation during the year. The San Antonio de Poto operation suffered both from the drought and Minero Perú's financial crunch. The 1,500-m^3/d washing plant produced 81 kg of gold during 1991. Minero Perú also recovered 90 kg of gold during operations at the Ilo copper smelter during the course of 1991 operations.

Peru's placer production was formerly calculated on the basis of gold purchases by Banco Minero. The data were somewhat suspect because many placer operations bypassed the official production tally by selling their gold production privately. With the March 20, 1991, decree eliminating restrictions on trade of raw gold, including the removal of the requirement to sell gold to Banco Minero or the Central Bank, the Government was forced to seek a new methodology for estimating gold production.

Iron and Steel.—Hierroperú produced direct reduction iron pellets, pelletized fines, blast furnace pellets, and sinter feed. The company's product was exported through the Port of San Nicolás, 15 km from the Marcona Mine. In 1991, the company increased production 8.6% to 3.95 Mmt. The Republic of Korea received 62.5% of iron ore exports, followed by Japan (18%) and Yugoslavia (12%). Additional sales were made to Argentina, China, and the United States and locally to Empresa Siderúrgica del Perú (Siderperú). As a byproduct, the company generated 940 tons of copper concentrate.

Production at Siderperú, the state-owned steel company, dropped to 156,270 tons in 1991 from the 202,256 tons produced in 1990. Siderperú suffered through a 49-day strike in January and February and was not able to fire up the electric furnace during January and July and for parts of August and December due to enforced electricity rationing.

Lead and Zinc.—Lead production increased by 6.4% in 1991, and zinc production increased by 7.4%. Centromín Perú was again the leading lead-zinc producer, with 75,936 tons of lead accounting for 38% of the nation's lead production and capturing 37% of the country's total zinc output with its production of 229,336 tons of zinc.

Cía. Minera Milpo S.A. (MILPO) operated a lead-zinc-silver deposit in the Central Mining District. Milpo's production ranked it second in the nation in lead, seventh in silver, and fourth in zinc. Milpo's concentrates yielded 19,532 tons of lead, 88,477 kg of silver, and 39,905 tons of zinc.

Sociedad Minera San Ignacio de Morococha S.A. (SIMSA) operated the San Vicente Mine 328 km east of Lima, in the central jungle. This private company was the country's second largest zinc producer, with 10% of the nation's total output. SIMSA recovered 2,532 tons of lead and 60,917 tons of zinc from concentrates which, for the most part, were shipped through Callao.

Cía. Minera Atacocha, S.A. (Atacocha), also operated in the Central Mining District. Atacocha generated 817 tons of copper, 17,379 tons of lead, 64,203 kg of silver, and 30,477 tons of zinc. The company ranked third in lead production and sixth in zinc production for 1991. The company completed an expansion project, increasing mining and milling capacity to 2,700 mt/d. Zinc production was projected to be increased by 40%, lead by 25%, and silver by 11%.

The Marc Rich & Co. Minera A.G. subsidiary, Perubar, S.A., mined lead-zinc-silver and barite in the Lima Region. In 1991, the company processed 358,622 tons of ore, slightly higher than the 349,800 tons processed during 1990, and generated 106,045 tons of zinc concentrates and 10,864 tons of lead concentrates that contained 55,582 tons of zinc and 8,138 tons of lead, respectively.

The company's barite production plunged to 32,156 tons.

Cía. Minera Santa Luisa, S.A., operated the Hunzala Mine in the Cáceres Region, northeast of Lima. The company was wholly owned by Japanese mining interests. In 1991, the company produced 24,711 tons of lead concentrates containing 15,633 tons of lead and 75,545 tons of zinc concentrates containing 37,892 tons of zinc. The concentrates also contained 64,433 kg of silver. The company ranked fourth overall in lead production, fifth in zinc, and ninth in silver.

Sociedad Minera El Brocal S.A. worked a polymetallic deposit in the Central Mining District. Operations continued at Tajo Chocayoc-Mercedes and the Tajo Principal. Preliminary results of exploration carried out in the Marcapunta area indicated the potential to develop the area as a gold prospect. El Brocal generated 13,248 tons of lead, 51,969 kg of silver, and 27,966 tons of zinc from 81,443 tons of bulk concentrates. The company ranked fifth overall in lead production and seventh in zinc.

Cía. Minera Huaron, S.A., produced 925 tons of copper concentrates, 4,570 tons of lead concentrates, and 10,868 tons of zinc concentrates from the company's lead-zinc-silver deposit in the Central Mining District. The concentrates contained 36,047 kg of silver, 297 tons of copper, 2,692 tons of lead, and 5,881 tons of zinc. Production was significantly down from 1990 volumes. Financial problems continued to affect Huaron's activity. The mine was forced to reduce operations by two-thirds in February when the company was unable to purchase fuel and supplies.

Cía. Minera Raura, S.A., increased its lead production by 18% compared with that of 1990. This Central Mining District lead-zinc-silver-copper producer produced 6,923 tons of copper concentrates, 28,908 tons of lead concentrates, and 46,435 tons of zinc concentrates. The lead and zinc concentrates contained 51,947 kg of silver, 9,120 tons of lead, and 25,737 tons of zinc. The company ranked sixth overall in lead production and ninth in zinc.

Corporación Minera Nor Peru, S.A., ranked eighth in lead production and ninth in copper production, with its output of 2,518 tons of copper concentrates, 7,656 tons of lead concentrates, and 24,181 tons of zinc concentrates. ASARCO Incorporated controlled 80% of the company's shares.

Minero Perú's zinc refinery at Cajamarquilla, northwest of Lima, increased production to 92,881 tons, a significant improvement over the 60,964 tons produced in 1990. Increased electric power availability and the decreased time lost to worker strikes were the primary reasons for the increase. The company planned to double the capacity of the 10,000-mt/a lead-silver tailings flotation plant at the Cajamarquilla Refinery. The 120-mt/a cadmium and selenium pigment plant opened in 1990 on the site was closed during 1991, due in part to high energy costs and global market conditions. The industrial complex also produced 163,246 tons of sulfuric acid, 1,396 tons of copper cement, 917 tons of silver concentrates, and refined cadmium.

Empresa Minera Especial Iscaycruz S.A. was organized to work the Iscaycruz lead-zinc deposit. Partners in the venture were Companhia Paraibuna Metais, 45%; Minero Perú, 25%; Construtora Norberto Odebrecht, 15%; and Buenaventura, 15%. Minero Perú's 100-mt/d pilot plant produced 3,834 tons of zinc concentrates from 13,600 tons of ore in 1991, the plant's second year of operations.

Silver.—Silver production reached 1,770 tons during 1991, of which the medium-sized companies accounted for 58%. Large mining companies furnished 28% of total output, and small companies contributed the remaining 14%.

Centromín Perú led silver producers with 370,206 kg, 21% of the nation's total silver output. Buenaventura and its subsidiary, Orcopampa, dominated the medium-sized silver mining sector with 18% of the country's total silver production. Buenaventura was Peru's second largest silver producer, and Orcopampa was rated as the nation's third leading silver producer.

During 1991, Buenaventura produced 2,190 tons of zinc, 179,528 kg of silver, 3,778 tons of lead, and 655 tons of copper from the Julcani Unit in Huancavelia and the Uchucchacua deposit near Cerro de Pasco. This represented a 30% increase in lead production over that of 1990.

Minas de Arcata S.A. was the fourth largest silver producer in 1991, operating its lead-zinc-silver deposit in the Cayarani District of the Arequipa Region. The company produced concentrates containing 427 kg of gold, 1,553 tons of lead, 102,494 kg of silver, and 3,527 tons of zinc.

Societa Minera Carolina S.A. was the fifth largest silver producer in 1991 with 107,783 kg, a 75% increase over 1990 production.

Cía. Minera de Caylloma, S.A., operated a silver mine in the Caylloma District of the Arequipa Region. The Eureka and San Cristóbal veins yielded 48,201 kg of silver and 195 kg of gold.

Minera Pachapaqui S.A. operated a polymetallic deposit 380 km north of Lima. Minpeco assisted with the financing of the company's expansion of daily capacity to 1,200 tons. Output declined precipitously during the year. From the concentrates, Pachapaqui tallied 15,042 kg of silver, 448 tons of copper, 2,722 tons of lead, and 4,457 tons of zinc. This represented a 53% drop in copper, a 28% decline in lead, and a 47% tumble in silver output compared with that of 1990.

Tin.—Minsur, S.A., was Peru's only tin producer. Production from its San Rafael and Santa Barbara deposits during 1991 included 6,559 tons of tin concentrates.

Industrial Minerals

During July 1991, Minero Perú transferred the 90,000-mt/a phosphate plant to Empresa Minera Regional Grau Bayóvar S.A. under Law 24,793 and retained the mining concession. Phosphate shipments continued to New

Zealand under a 100,000-ton contract signed with Norphos International Ltd. of Auckland. Other shipments through the Port of Paita went to Chile and Costa Rica.

Mineral Fuels

In 1991, Peru's gross production of natural gas amounted to 2.8 Mm^3/d. Most produced gas was piped from the Talara Basin in the northwest to the Talara refinery.

Two gasfields in the Ucayali Basin were candidates for development. The Aguaytia Gasfield, approximately 41 km west-northwest of Pucallpa, had proven reserves of 12.5 billion m^3 of gas and 13.2 Mbbl of condensate. The country's largest potential gasfield was in the Camisea area, on block 42. The San Martin and the Cashiriari prospects at Camisea had estimated reserves of about 305.8 billion m^3 of gas and 725 Mbbl of condensate.[2] The breakdown of negotiations between the Government and Shell Exploradora y Productora del Peru BV (Shell) in 1988 impeded the development of the Camisea natural gas resources.[3] Because of the estimated $1.2 billion cost of field development and construction of pipelines to Cuzco and to Lima, Government authorities considered breaking the project into smaller segments. Shell continued to express reserved interest in the project, pending positive stabilization of the price of natural gas.

In 1991, crude petroleum production in Peru fell 10.9% to 114,790 bbl/d, the lowest output since 1977. Most of Peru's oil production came from the northern jungle and northwest coast. Petroperú produced 35% of the nation's total crude from its north coast and northern and central jungle fields. The Petroperú subsidiary, Petroleros del Mar S.A. (Petromar), produced approximately 15% of the nation's crude oil from fields formerly operated by Belco Petroleum, offshore Talara in the Grau Region. Occidental Petroleum Corp. del Perú (Oxy), a subsidiary of the U.S.-based Occidental Petroleum Corp., accounted for the balance of national production, with 45% from its northern jungle operations and 5% from the Oxy/Bridas Exploración y Producción S.A. Talara joint venture.

There were 18 identified sedimentary basins in Peru. Offshore and coastal basins were, from north to south: Tumbes-Progreso, Talara, Lancones, Sechura, Trujillo, Salaverry, Lima, Pisco, Moquegua, and Mollendo. Interior basins were, from north to south: Marañón, Santiago, Bagua, Huallaga, Ucayali, Ene, Madre de Dios, and Titicaca.[4] Production was from fields in the Talara, Marañón, and Ucayali Basins. Seven of the basins reportedly have yet to be drilled.

Fields along the northwest coast of Peru, in the Talara Basin, have been producing oil since the mid-19th century, with a cumulative output of 1,243 Mbbl. Production from the Aguas Calientes Field in the Ucayali Basin began in 1939. The Maquia and the Pacaya Fields in the Ucayali Basin were also producing. There were 17 producing fields in the Marañón Basin. The three large interior basins, Madre de Dios, Marañón, and Ucayali, appear to have the greatest development potential.[5]

Peru's total proven, probable, and potential recoverable petroleum reserves had been estimated to be 17.9 billion bbl.[6] Through 1991, approximately 1.8 billion bbl had been produced, leaving more than 16 billion bbl potentially recoverable. However, proven oil reserves have fallen dramatically with the decline of exploration drilling. Proven reserves dropped from 835 Mbbl in the early 1980's to 330 Mbbl at yearend 1991, barely sufficient for 7 or 8 years of pumping at current production levels.[7] Peru's proven reserves and production volumes would be expected to increase relatively rapidly if several of the basins are successfully explored and developed.

In 1991, 10 companies were conducting or were contracted for exploration or production operations in seven of Peru's basins. Petroperú was negotiating contracts on 17 more blocks and had a number of additional onshore and offshore blocks available for exploration contracts.

Early in 1991, Petroperú was interested in farming out operations in the Talara area. The declining fields of the Talara blocks averaged 19,000 bbl/d in 1991,[8] down from about 26,000 bbl/d in 1985.[9]

An 11-well development drilling and workover package was proposed for the Corrientes and Pavayacu Fields in the northern jungle. Marc Rich & Co. was to provide financing with repayment to be made in fuel oil over a 3-year period.[10]

Petroperú continued with the appraisal work on the Chambira Field. Financial assistance for the development of this field in block 8 was sought from the Andean Development Fund. Chambira's reserves were estimated to be 18 Mbbl. Petroperú planned to begin development drilling in 1992. Construction of a 30-km pipeline from Chambira to the North Peruvian Pipeline station at San Jose de Saramuro was proposed for 1993.[11]

Petroperú employed approximately 7,300 workers in 1991, down from about 10,000 in 1990.[12] The state oil company has struggled in recent years to maintain oil production and exports. A lack of cash often caused it to fall behind in payments to service and supply companies as well as to foreign companies contracted to operate oilfields, in part due to the former Government's decision to freeze Petroperú's product prices well below actual cost.

At yearend, Petroperú signed a number of contracts. The Cavelcas del Perú and Geopet Asociados S.A. joint venture signed a 20-year service contract on the 7,000-ha block 1 with Petroperú. The Cavelcas-Geopet combine had been negotiating for 2 years for this property in the Talara Basin on Peru's northern coast.[13]

On December 21, Eurocan Ventures Ltd. (Eurocan), a unit of International Petroleum Corp., Vancouver, British Columbia, became the first company to sign an exploration contract under the new hydrocarbon law. Eurocan's exploration and development contract was for the 735,000-ha block 16-A in Peru's central jungle, just east of Mobil's block 29.

Also in December, VG Exploración-Producción S.A. (VG Expro) secured a

contract on block S-3 in the Titicaca Basin. Lima-based VG Expro had signed a 30-year exploration and development contract for the 500,000-ha block S-2 in 1990. Sojuzkarta of Moscow, Russia, continued geochemical studies for both GMP S.A. and VG Expro. Sojuzkarta also collected 100 line-km of seismic data for VG Expro in 1991. Sojuzkarta was also to supply VG Expro with a Russian drilling rig, peripheral equipment, and technical personnel.[14]

GMP S.A., a subsidiary of the Peruvian construction company Grana y Montero S.A., prepared to spud its second wildcat near Carpitas Field. GMP had signed a 30-year contract in 1990 to operate fields north of Talara. The company continued testing its first wildcat in the area.[15]

Mobil Exploration & Producing Peru Inc. had contracted to explore blocks 28, 29, 30, and 53 in the Upper Huallaga Valley in 1989. A Sendero Luminoso (Shining Path) attack on a Mobil contractor's camp in December 1990 delayed the acquisition of seismic data by 6 months.[16] Seral, a subsidiary of Halliburton Geophysical Services Inc., had completed collection of 578 line-km of seismic data for Mobil prior to the attack. Mobil continued seismic and geological studies in the northern portion of its acreage, just south of Petroperú's block 8. In October, Mobil spudded the projected 5,000-m wildcat Ponacillo 1 on block 30.[17]

Oxy completed 20 years of petroleum operations in Peru with the resolution of its longstanding payment dispute with Petroperú. Oxy began to increase its production from its concession in the jungle near the Ecuadorian border and proposed an additional 20 wells, primarily infill, to be drilled over the next 2 years.

Petromar, a subsidiary of Petroperú, operated blocks Z1-A and Z2-A, Peru's only offshore oilfields. Petromar was preparing itself for eventual divestiture in the Government's privatization program.

Texas Crude Exploration Inc. terminated negotiations with Petroperú for the 971,245-ha block 61 in Peru's northern jungle, approximately 850 km northeast of Lima. Texas Crude had been subject to significant negative publicity; its Houston offices had been picketed, and the company had received a number of protest letters. The environmental lobby opposed petroleum activity on block 61 because a significant portion of the surface area of the block covered by the contract extended into the Pacaya-Samiria National Wilderness Reserve.[18]

Although about 200 troops were assigned to protect the oil pipeline, stretching from the northern jungle fields to the Bayóvar terminal, successful guerrilla attacks did occur during the year.

The largest oil refinery in Peru, La Pampilla, with a capacity of about 102,000 bbl/d, processed about 65,000 bbl/d. The second largest oil refinery in Peru, Talara, had a capacity of about 60,000 bbl/d. Smaller refineries were in Iquitos, Marsella, Pucallpa, and near Lima.

INFRASTRUCTURE

Liquid fuels provided more than 60% of Peru's total energy requirements. Traditional fuels accounted for 23% of energy consumption, and electricity met 10% of energy needs. Natural gas supplied 7% of the country's energy mix. Gas was projected to provide a significantly increased share with the development of the fields in the Camisea area.

Peru had an installed electrical generating capacity of 4,867 MW, with about a 60-40 split between hydroelectric and thermoelectric generation. Most of the mining operations depended on dedicated hydro or thermal generating plants for energy. During 1991, the Andean Development Corp. approved a $20 million loan to Electroperú to recondition transmission lines.

The country had 1,884 km of railroads and 56,645 km of roads. Power and telecommunications lines, railroads, and roads in the mountains were subject to damage by landslides and guerrilla attacks. The lack of adequate road maintenance has increased transportation costs due to the deterioration of the nation's highways.

Peru had 8,600 km of navigable waterways associated with the Amazon River and Lake Titicaca. Important mineral industry ports included Callao, Ilo, Matarani, Paita, San Nicolás, and Talara on the Pacific Ocean and Iquitos on the Amazon River. There was also a petroleum depot at Bayóvar, the ocean terminus of the 860-km North Peru crude oil pipeline.

OUTLOOK

Mineral industry output is not expected to increase much during 1992 and in the near term. Local economic conditions have resulted in declining domestic demand. The continued international recession does not bode well for increased exports in the short term. Mineral companies will continue to be buffeted by the increased tax burden of the Government's economic adjustment program. Additionally, the overvalued exchange rate and high interest rates should continue to contribute to the losses most mineral exporters experienced in 1991. Given the massive reduction in work force, there exists the possibility of an industrywide strike in 1992. However, work stoppages would be tempered by the fact that almost any mine closed by a strike may not be able to reopen.

With the new Government's emphasis on reducing the threat of guerrilla actions and increasing the economic stimulus provided by mining ventures, increased international interest in Peru is expected.

The Government continued to encourage foreign investment with new legislation. The Ministry of Mines and Energy actively promoted minerals development. There were numerous promising mineral projects available as well as the potential to enter into joint ventures with existing companies or purchase interest in existing state-owned firms. Foreign investors, however, continued to be wary, expressing concern about the country's economic and security problems. Announced investment plans appeared to be pursuing new development

rather than focusing on existing operations of the small- and medium-sized mining sector or pieces of the large companies.

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[1]Where necessary, values have been converted from Peruvian nuevos soles (S/.) to U.S. dollars using the average exchange rate for 1991 of S/.0.78=US$1.00.
[2]Petroperú. Peruvian Petroleum, 1991, 101 pp.
[3]Oil & Gas Journal. V. 89, No. 26, July 1, 1991, p. 24.
[4]Bhattacharjee, S. K. Peru's Basins Hold Opportunities. Oil & Gas J., V. 90, No. 13, Mar. 30, 1992, pp. 76-78.
[5]Work cited in footnote 2.
[6]Work cited in footnote 2.
[7]Petroleum Economist. V. 58, No. 11, Nov. 1991, pp. 11-12.
[8]Oil & Gas Journal. V. 90, No. 27, July 6, 1992, pp. 57-63.
[9]International Petroleum Encyclopedia. PennWell Publ., 1992, 358 pp.
[10]Work cited in footnote 8.
[11]Work cited in footnote 8.
[12]Work cited in footnote 8.
[13]Oil & Gas Journal. V. 90, No. 1, Jan. 6, 1992, p. 92.
[14]Oil & Gas Journal. V. 90, No. 12, Mar. 23, 1992, p. 46.
[15]Work cited in footnote 8.
[16]Work cited in footnote 8.
[17]Bulletin, Houston Geological Society. Feb. 1992, p. 56.
[18]The New York Times. July 2, 1991, p. C4.

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TABLE 1

PERU: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
METALS						
Antimony:						
Mine output, Sb content		590	e420	519	e560	e400
Metal		318	246	304	313	227
Arsenic, white[2]		1,757	828	563	e500	661
Bismuth:						
Mine output, Bi content		412	363	687	e555	e610
Metal		387	341	646	521	576
Cadmium:						
Mine output, Cd content		461	368	472	378	e180
Metal		351	303	352	265	135
Chromium, mine output, Cr content		461	368	e430	e400	e410
Copper:						
Mine output, Cu content		391,050	316,355	368,168	317,706	381,991
Sulfate (Cu content)		5,218	3,185	4,663	e3,500	5,083
Metal:						
Smelter		323,009	246,879	241,424	195,539	268,784
Refined		199,390	158,466	204,608	165,483	228,228
Electrowon		26,520	21,126	19,652	16,307	17,908
Total refined		225,910	179,592	224,260	181,790	246,136
Gold:						
Mine output, Au content[3]	kilograms	8,486	9,164	9,898	e10,000	8,682
Metal	do.	2,021	2,392	2,923	r1,270	1,343
Indium	do.	3,890	2,120	3,026	2,801	3,142
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	5,019	4,171	r4,507	r3,307	3,593
Fe content	do.	3,305	2,839	2,923	2,147	2,161
Metal:						
Pig iron	do.	185	202	r199	r93	207
Sponge iron		50,891	51,000	r45,746	r28,968	24,064
Ferroalloys		2,362	1,621	e1,600	e1,600	e1,600
Steel ingots and castings	thousand tons	503	481	401	284	418
Semimanufactures	do.	396	390	222	243	250
Lead:						
Mine output, Pb content		203,950	149,037	192,213	r187,827	199,811
Metal		71,333	56,523	73,402	69,305	74,510
Manganese, mine output, Mn content[e]		200	146	150	150	160
Molybdenum, mine output, Mo content		3,353	2,444	3,177	2,510	3,045
Selenium, metal, refined	kilograms	11,430	4,937	e9,000	8,913	12,422
Silver:						
Mine output, Ag content		2,054	1,552	1,840	r1,762	1,769
Metal, refined		662	510	658	623	631
Tellurium, metal	kilograms	7,457	4,078	e8,000	7,842	13,355
Tin, mine output, Sn content		5,263	4,181	5,082	5,134	6,559
Tungsten, mine output, W content		205	432	970	1,536	1,229

See footnotes at end of table.

TABLE 1—Continued

PERU: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
METALS—Continued						
Zinc:						
Mine output, Zn content		612,477	485,429	597,413	r583,934	627,824
Metal		144,169	123,125	126,698	120,631	154,294
INDUSTRIAL MINERALS						
Barite		8,354	162,625	e150,000	e150,000	150,200
Boron materials, crude (borates)e		e22,710	15,000	18,000	15,000	15,000
Cement, hydraulic	thousand tons	2,584	2,514	2,105	2,185	e2,200
Chalke		470,000	470,000	470,000	r200,000	e91,500
Clays:						
Bentonite		16,194	50,741	e40,000	re45,000	55,300
Fire clay		50	5,880	e5,000	e5,000	7,320
Kaolin		626	8,449	e200	e8,000	7,100
Common clay		1,083,528	94,098	e100,000	e100,000	395,890
Diatomite		20,916	29,650	e20,000	e20,000	25,500
Feldspar		64,749	2,378	e10,000	e10,000	3,000
Gypsum, crudee		e228,845	150,000	160,000	150,000	160,000
Lime[e]		12,500	13,000	13,000	13,000	14,000
Mica[e]		550	e93	100	100	100
Nitrogen, N content of ammonia[e]		80,000	95,000	91,000	90,000	95,000
Phosphates, crude		60,713	r13,465	r14,804	r47,333	18,239
Salt, all types		444,894	125,500	e200,000	e200,000	e200,000
Stone, sand and gravel:						
Stone:						
Dolomite		60	9,200	e9000	e9,000	43,800
Flagstone[e]		400,000	300,000	300,000	300,000	300,000
Granite		64,296	1,647	e2,000	e2,000	e2,000
Limestone	thousand tons	1,657	3,650	e3000	e3,000	3,199
Marble		9,926	35,996	e20,000	e20,000	30,000
Onyx		577	350	e500	e500	e500
Quartz and quartzite (crushed)		848	50,000	e40,000	e40,000	40,505
Shell, marle		5,000	4,000	4,000	4,000	4,000
Slate[e]		18,000	18,000	18,000	18,000	18,000
Travertine[e]		e6,524	5,000	5,000	5,000	5,000
Sand and gravel:						
Construction	thousand tons	8,013	3,877	e5,000	e5,000	3,100
Silica sand	do.	76	158	e75	e100	150
Sulfur:						
Elemental:[e]						
Native		100	100	100	100	100
Byproduct of metallurgy		66,000	66,000	66,000	66,000	66,000
Sulfuric acid, gross weight		181,054	173,722	e180,000	e150,000	206,828
Talc and related materials:						
Talc		1,447	1,450	e1,500	e1,500	2,100
Pyrophyllite		705	9,200	e7,500	e7,500	e8,000
Total		2,152	10,650	e9,000	e9,000	e10,100

See footnotes at end of table.

TABLE 1—Continued

PERU: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		5,877	7,081	5,028	e5,000	e6,000
Coal:						
Anthracite, run-of-mine[e]		90,000	101,000	100,000	125,000	r125,300
Bituminous, run-of-mine		107,501	49,200	e50,000	e50,000	25,500
Total		197,501	e150,200	e150,000	e175,000	150,800
Coke, all types[e]		10,000	10,000	10,000	10,000	10,000
Gas, natural:						
Gross	million cubic meters	1,395	1,359	1,125	e1,100	1,012
Marketed	do.	493	435	283	e280	566
Natural gas liquids:						
Natural gasoline and others[5]	thousand 42-gallon barrels	335	368	e240	226	299
Propane	do.	29	24	e20	93	--
Butane	do.	9	5	e5	6	4
Total	do.	373	397	e265	325	303
Petroleum:						
Crude	do.	59,730	51,717	47,597	47,050	41,898
Refinery products:						
Liquefied petroleum gas	do.	1,620	1,649	1,685	1,471	1,476
Gasoline, motor	do.	11,425	11,694	10,916	10,476	9,123
Jet fuel	do.	2,260	1,991	1,970	2,034	2,526
Kerosene	do.	6,464	7,404	6,484	5,699	5,468
Distillate fuel oil	do.	10,444	9,503	8,547	8,578	9,586
Lubricants	do.	63	54	48	38	54
Residual fuel oil	do.	28,829	27,306	24,751	24,762	10,366
Asphalt	do.	446	1,009	871	134	264
Other[6]	do.	399	291	298	888	16,704
Total		61,950	60,901	55,570	54,080	55,567

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

[1]Table includes data available through Nov. 30, 1992.

[2]Output reported by Empresa Minera del Centro del Perú S.A.

[3]Much of Peru's placer gold production was not reported. During 1991, the Ministry of Energy and Mines sought the appropriate methodology to estimate gold placer production.

[4]Reported figure.

[5]Includes hexane.

[6]Includes refinery fuel and losses.

TABLE 2

PERU: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

Commodity		Major operating companies and major equity ownership	Location of main facilities	Capacity
Antimony	tons	Empresa Minero del Centro del Perú (Centromín Perú) (Government, 100%)	Smelter at La Oroya, Andres A. Caceres Region	530
Arsenic		Centromín Perú	Refinery at La Oroya	4
Barite		Barmine S.A. (private, 100%)	Mine in Huánuco	324
Do.		Perubar S.A. (Marc Rich & Co. Minera A.G., 100%)	Santa Cruz de Cocachacra, Lima Region	100
Bentonite		Minerales Andinos S.A. (NL Industries, 90%)	Vichayal Mine, Grau Region	9
Bismuth	tons	Centromín Perú	Refinery at La Oroya	816
Cadmium	do.	do.	do.	215
Copper		Southern Perú Copper Corp. (SPCC) (Asarco Inc., 52.3%; Phelps Dodge Overseas Capital Corp., 16.3%; The Marmon Group Inc., 20.7%; Newmont Mining Corp., 10.7%)	Cuajone Mine, Jose Carlos Mariategui Region Toquepala Mine, Jose Carlos Mariategui Region Smelter at Ilo, Jose Carlos Mariategui Region	 300 300
Do.		Empresa Regional Minera Tintaya S.A. (Government, 100%)	Tintaya Mine, Inka Region	60
Do.		Centromín Perú	Cobriza Mine, Los Libertadores-Wari Region; Casapalca and Yauricocha Mines, Lima Region; Morococha Mine, Andres A. Caceres Region Smelter at La Oroya Refinery at La Oroya	 60 70 58
Do.		Empresa Minera del Perú S.A. (Minero Perú) (Government, 100%)	Cerro Verde Mine, Arequipa Region Refinery at Ilo	33 175
Dolomite		Minera Baribent S.A. (private, 100%)	Esperanza Mine, Chavin Region	25
Gold	kilograms	Cía. de Minas Orcopampa S.A. (Orcopampa) (Cía. de Minas Buenaventura, 99.9%)	Orcopampa Mine, Arequipa Region	2,000
Do.	do.	Cía. Minera Poderosa S.A. (Private, 100%)	Poderosa Mine, San Martin La Libertad Region Refinery at Pataz, San Martin La Libertad Region	1,600 4,800
Do.	do.	Centromin Perú	Refinery at La Oroya	1,720
Do.	do.	Cía. Aurífera Río Inambari S.A. (Cía. Minera del Sur S.A., 84%; Aurífera Claudia, 16%)	Río Caichive, Inka Region	200
Iron ore		Empresa Minera del Hierro del Perú S.A. (Government, 100%)	Marcona Mine, Los Libertadores-Wari Region	13,000
Lead		Centromín Perú	Cerro de Pasco, Casapalca, San Cristóbal, Morococha, Yauricocha, and Andaychagua Mines Smelter at La Oroya Refinery at La Oroya	 85 93 87
Do.		Cía. Minera Milpo S.A. (Milpo) (private, 100%)	El Porvenir Mine, Andres A. Caceres Region	24
Do.		Cía. Minera Atacocha S.A. (private, 100%)	Atacocha Mine, Los Libertadores-Wari Region	16
Do.		Cía. Minera Santa Luisa, S.A. (Mitsui Mining and Smelting Co. Ltd., 70%; Mitsui & Co. Ltd., 29.99%; and Tomiya Nitta, 0.01%)	Huanzala Mine, Andres A. Caceres Region	16
Do.		Fundición de Concentrados S.A. (private, 100%)	Smelter at Oyón, Lima Region[1]	24

See footnotes at end of table.

TABLE 2—Continued

PERU: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons per year unless otherwise specified)

Commodity		Major operating companies and major equity ownership	Location of main facilities	Capacity
Molybdenum		SPCC	Cuajone and Toquepala Mines	NA
Petroleum, crude thousand 42-gallon barrels		Occidental Petroleum Corp. del Perú (Occidental Petroleum Co., 100%)	Northeastern jungle, Amazonas Region	33,000
Do.	do.	Petróleos del Perú (Petroperú) (Government, 100%)	Onshore Talara area, Grau Region; Ucayali area, Ucayali Region; Marañon area, Amazonas Region	25,000
Do.	do.	Petróleos del Mar S.A. (Petroperú, 100%)	Offshore Grau Region	10,500
Petroleum products	do.	Petroperú	Refineries at Talara, Lima, Iquitos, Marsella, and Pucallpa	67,000
Silica sand		Minera Baribent S.A. (private, 100%)	María G. and Martín I. Quarries, Andres A. Caceres Region	27
Silver	tons	Centromin Perú	Casapalca, Cerro de Pasco, Cobriza, Morococha, San Cristóbal, Yauricocha, and Andaychagua Mines	466
			Refinery at La Oroya	809
Do.	do.	Cía. de Minas Buenaventura S.A. (private, 100%)	Julcani Mine, Los Libertadores-Wari Region; Uchucchacua Mine, Lima Region	187
Do.	do.	Orcopampa	Orcopampa Mine, Arequipa Region	161
Do.	do.	Soc. Minera Carolina S.A. (private, 100%)	Mine in Hualgayoc, Cajamarca, San Martin La Libertad Region	110
Steel		Empresa Siderúrgica del Perú (Government, 100%)	Chimbote, Chavin Region	550
Do.		Empresa Lamidora del Pacifico S.A. (private, 100%)	Pisco, Los Libertadores-Wari Region	180
Tellurium	tons	Centromín Perú	Refinery at La Oroya	21
Tungsten	do.	Minera Regina S.A. (private, 100%)	Palca XI Mine, Puno Region	1,400
Do.	do.	Fermín Málaga Santolalla e Hijos (private, 100%)	Pasto Bueno Mine, Chavin Region	1,000
Zinc		Centromín Perú	Casapalca, Cerro de Pasco, Morococha, San Cristóbal, Yauricocha, and Andaychagua Mines	235
			Refinery at La Oroya	70
Do.		Sociedad Minera San Ignacio de Morococha (private, 100%)	San Vicente Mine, Andres A. Caceres Region	70
Do.		Milpo	El Porvenir Mine, Andres A. Caceres Region	24
Do.		Perubar S.A.	Santa Cruz de Cocachacra Mine, Lima Region	65
Do.		Minero Perú	Refinery at Cajamarquilla	102

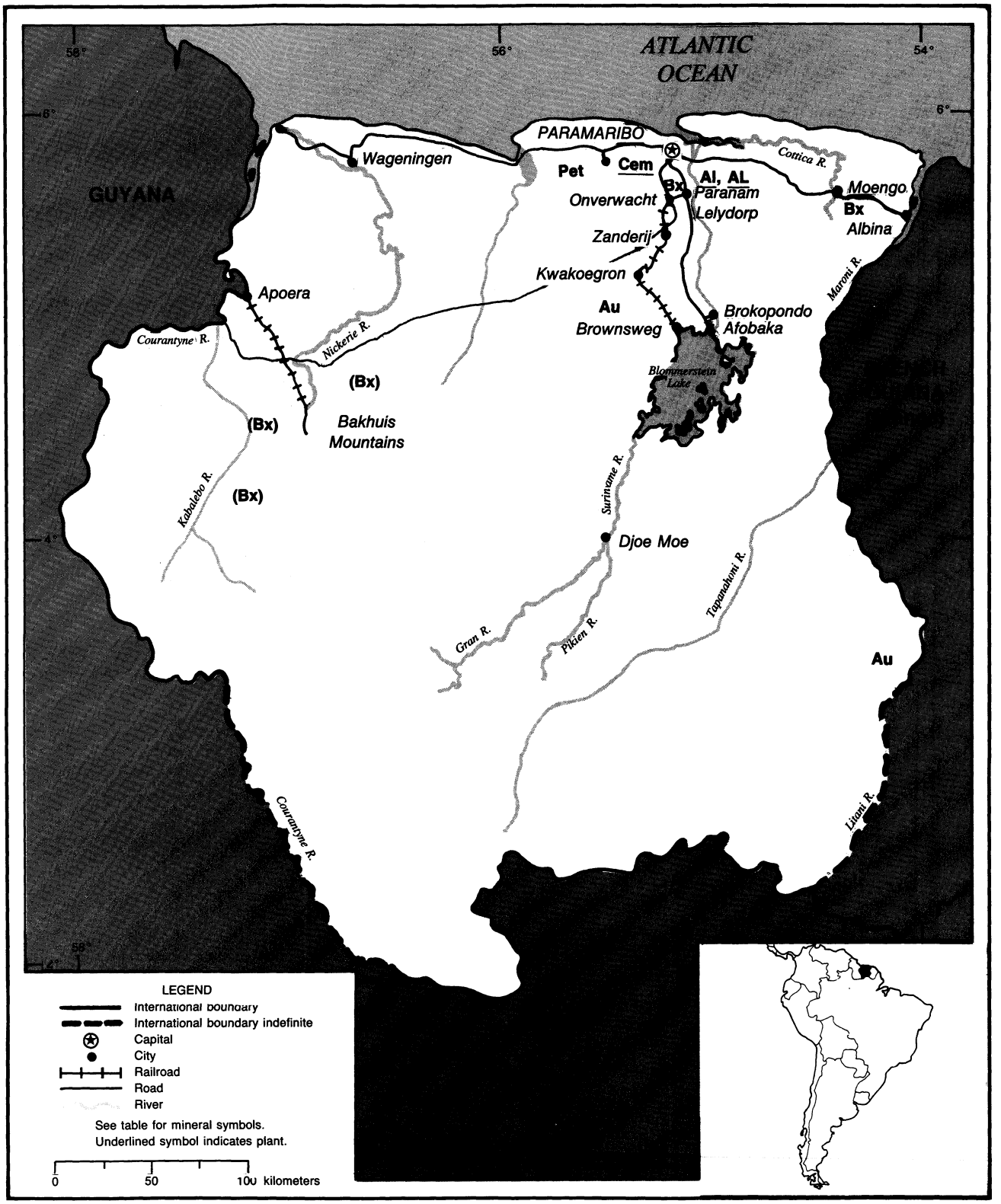
NA Not available.

[1]Operations suspended during 1989.

MEXICO: MEXICAN GOLD USED IN THE WORK OF LOCAL ARTISANS IN A CHURCH IN PUEBLA. (PHOTO BY ORLANDO MARTINO)

SURINAME

AREA 163,270 km² **POPULATION 457,000**



THE MINERAL INDUSTRY OF

SURINAME

By Philip M. Mobbs

Mineral commodities formed a key sector of Suriname's economy. Bauxite and alumina had accounted for more than 80% of the country's foreign exchange earnings in recent years. Suriname was the sixth largest producer of bauxite and fifth largest producer of alumina in the world.

During 1991, the Government worked on an economic reform program. Lower world prices for the country's exported raw materials and foodstuffs, coupled with higher costs for petroleum imports, intensified the nation's chronic foreign exchange shortage.

In November, the leaders of the newly elected Government met with representatives from the Netherlands on Bonaire. Eventual revocation of the 1990 resuspension of the Dutch development aid treaty was an anticipated outcome of the bilateral talks. The Government was also involved with peace talks with the Jungle Commando insurgent group.

Among the campaign promises of the new Government were plans to consider the promotion of the undeveloped western bauxite reserves; to develop the gold, kaolin, and stone industries; and to promote the production of sand and gravel.

GOVERNMENT POLICIES AND PROGRAMS

A structural adjustment program was being prepared by the Government. If accepted, its proposed 1992 implementation may relax the country's strict foreign exchange controls, which required companies to exchange all export earnings at the Central Bank at the official exchange rate.

PRODUCTION

Mineral commodity production data are shown in table 1. Reported output volume of the country's major mineral commodities continued to decline. *(See table 1.)*

TRADE

The Netherlands and the United States supplied approximately 60% of the value of Suriname's imports and garnered more than 40% of the country's exports. Suriname's bauxite companies exported much of the produced alumina to Canada, France, the Netherlands, Norway, and the United States. During the period 1987-90, Suriname accounted for 7% of U.S. imports of alumina, ranking the country second, behind Australia as a source of alumina.

STRUCTURE OF THE MINERAL INDUSTRY

Suriname's mineral industry was based on bauxite and alumina. Privately owned companies mined bauxite and processed alumina and aluminum. Bauxite, alumina, and aluminum traditionally accounted for about 70% of the country's export earnings and employ almost 4% of the nation's work force. Gold was produced by numerous small placer operators. A state-owned company was involved in the development and production of petroleum. Summary information on major mineral commodity operations is shown in table 2. *(See table 2.)*

COMMODITY REVIEW

Metals

NV Billiton Maatschappij Suriname (Billiton) provided about 55% of the feedstock for the Paranam alumina refinery from its Onverdacht Mine, about 6 km northeast of Onverwacht. The remaining feedstock had been obtained from the Suriname Aluminum Co.'s (Suralco) operations at Moengo.

Intermittent disruptions during 1990 inadvertently extended mining activity in the Moengo area. Suralco commenced the relocation of its operations to Coirmotibo, 10 km northeast of Moengo, during 1991. It was estimated that the reserves at Coirmotibo would allow mining operations to continue another 12 years.

Billiton began stripping overburden at Accaribo with a newly imported 600-ton bucket wheel excavator and continued reclamation work at Smalkalden, on the Suriname River, north of Paranam.

Mineral Fuels

Staatsolie Maatschappij Suriname NV (Staatsolie), the Suriname state oil company, was planning to construct an $8 million pipeline during 1992. It will transport crude from Tambaredjo to the Suriname river export terminal.

Pecten International Co. of Houston, Texas, was proceeding with negotiations with the Government for an offshore license.

Reserves

Suriname's bauxite reserves were estimated at 575 million tons.

Government estimates of gold and petroleum reserves were not available.

INFRASTRUCTURE

Military operations involving the Jungle Commando and the national army badly damaged Albina and the road connecting Moengo to the eastern border. General lack of maintenance on roads, canals, and port facilities resulted in degraded infrastructure and higher local transportation costs. Transportation costs represented a crucial aspect of the marketing of Suriname's bulk commodities of alumina, bauxite, and rice.

The country's exports were shipped in seagoing vessels with drafts of less than 7 meters. Vessel drafts were limited by the depth of water over shifting rivermouth bars and channel depths shallowing to almost 4 meters at upriver docks.

Suriname's bauxite industry and the energy sector were closely entwined. The country had an installed electrical generating capacity of 458 MW. Suralco owned and operated the 189-MW hydroelectric plant at Afobaka and another 47-MW oil-fired turbine plant. Suralco has sold electricity to the Government since 1964.

Petroleum-fired electrical generating plants owned by the Government energy company, Energie Bedrijven Suriname (EBS), accounted for the remainder of the country's installed generating capacity. The Inter-American Development Bank was studying a proposal to fund two barge-mounted 15-MW diesel electric generators to provide additional power to Paramaribo. EBS was also responsible for electricity distribution within the country.

OUTLOOK

There was no mine development between 1983 and 1988. As higher grade bauxite mines come on-stream over the next 4 years, the older exhausted mines will be phased out. Production costs may remain static with higher labor expenses offsetting decreased operating costs. However, the deterioration of the international alumina market seriously threatens Suriname's economy. While spot market prices buoyed the alumina industry in the late 1980's, prices have dropped precipitously during the 1990's. Spot prices ranged from $225 per ton to $150 per ton during 1991. This trend was expected to continue into 1992. The fate of Suriname's bauxite industry was uncertain as sales prices approached production costs. The Government may be forced at some point to consider importing lower cost bauxite to keep the alumina and aluminum operations going.

[1]Where necessary, values have been converted from Surinamese guilders (Sf) to U.S. dollars at the rate of Sf1.7850=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Geologisch Mijnbouwkundige Dienst
Klein Waterstraat 2-6
Paramaribo, Suriname
Staatsolie Maatschappij Suriname NV
Industrieterrein 21, Flora
P.O. Box 4069
Paramaribo, Suriname

Publications

International Bauxite Association, Kingston, Jamaica:
IBA Quarterly Review.
U.S. Department of Commerce, International Trade Administration:
Foreign Economic Trends and Their Implications for the United States, annual.

TABLE 1
SURINAME: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991e
Aluminum:						
Bauxite, gross weight		2,522	3,434	3,530	r3,283	23,198
Alumina		1,363	1,632	1,567	r1,532	21,510
Metal, primary[3]		2	10	28	r32	229
Cement, hydraulic[e]		50	50	50	50	50
Clays, common[e]		16	16	16	16	16
Gold, mine output, Au content[e]	kilograms	22	22	231	r30	30
Petroleum, crude	thousand 42-gallon barrels	956	1,400	e1,442	r1,436	1,500
Sand and gravel:[e]						
Gravel		219	235	35	35	35
Sand, common		2156	160	160	160	160
Stone, crushed and broken[e]		50	50	50	50	50

eEstimated. rRevised.
[1]Includes data available through June 19, 1992.
[2]Reported figure.
[3]Data represent exports.

TABLE 2
SURINAME: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

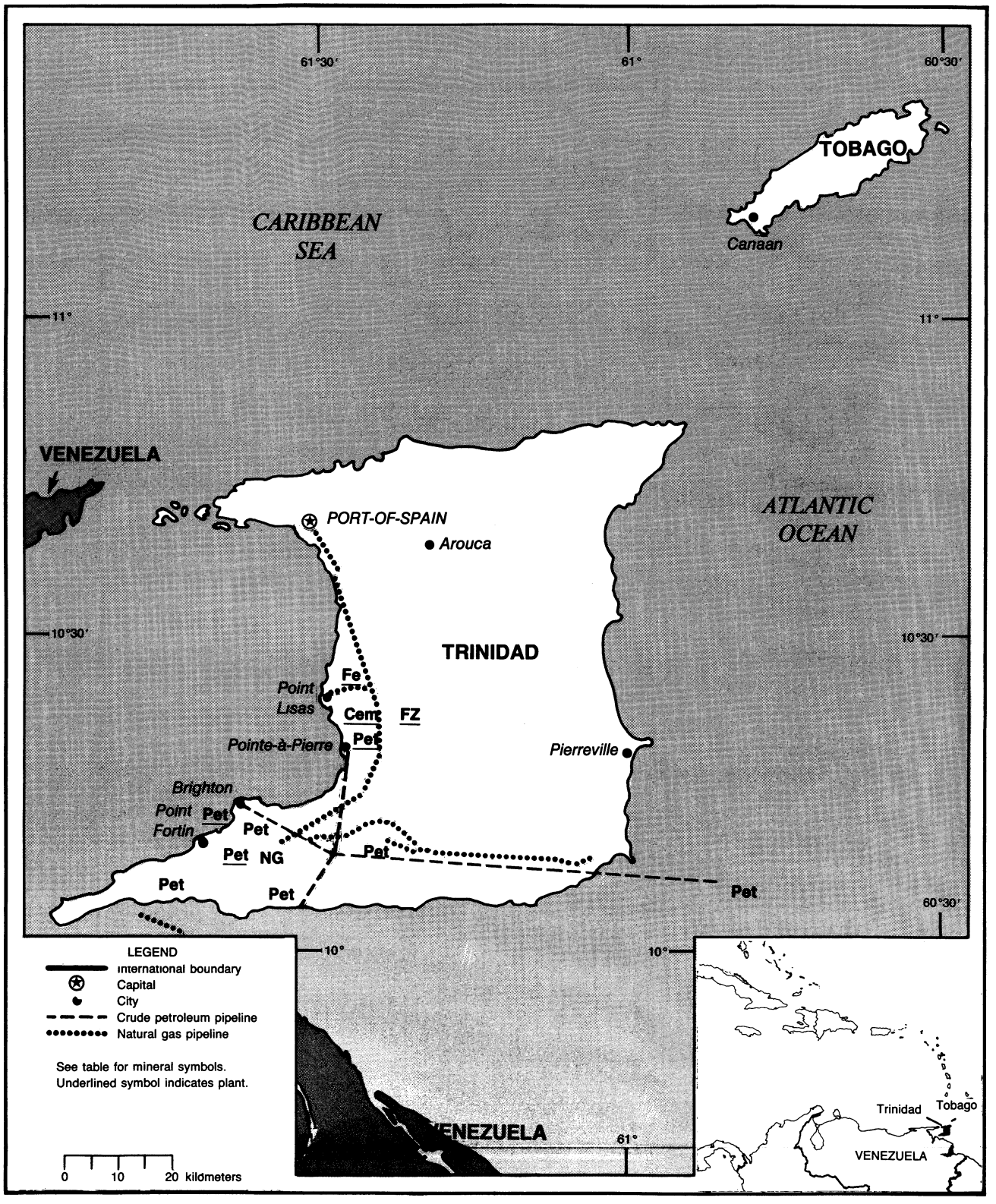
(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina		Suriname Aluminum Co. (Suralco) (Aluminum Co. of America), 55%; and NV Billiton Maatschappij Suriname (Billiton) (Royal Dutch/Shell Group), 45%	Refinery at Paranam, District of Para	1,600
Aluminum		Suralco, 100%	Smelter at Paranam, District of Para	66
Bauxite		do.	Mines at Moengo[1] and Coirmotibo, District of Marowijne	1,800 1,500
Do.		Billiton, 76%; and Suralco, 24%	Mines at Onverdacht and Accaribo, District of Para	2,500 1,000
Cement		Vensur NV (private, 100%)	Paramaribo, District of Para	60
Gold		No major operating companies	South and east Suriname	NA
Petroleum	42-gallon barrels per day	Staatsolie Maatschappij Suriname NV (Staatsolie) (Government, 100%)	Tambaredjo Field, District of Saramacca	5,000

NA Not available.
[1]Mine being phased out during 1991.

TRINIDAD AND TOBAGO

AREA 5,130 km² **POPULATION 1.2 million**



THE MINERAL INDUSTRY OF

TRINIDAD AND TOBAGO

By Alfredo C. Gurmendi[1]

In 1991, Trinidad and Tobago continued to rank third in GDP per capita in the Western Hemisphere after the United States and Canada. This enviable position has resulted from the discovery and development of extensive petroleum and natural gas fields. The country was the smallest producing nation of petroleum, natural gas, and refinery products in the Western Hemisphere; it ranked 10th in the world in oil production per capita.

Trinidad and Tobago had an economic turnaround during 1991. Its GDP growth rate increased to 1.5% from 0.7% the previous year; however, unemployment continued at about 20% and inflation at about 11.4%. Revenue from the oil sector alone was $639.3 million in 1991. Hydrocarbon-based exports, including petrochemicals, accounted for about 90% of the country's export earnings and about 30% of the GDP of $5.2 billion.[2]

GOVERNMENT POLICIES AND PROGRAMS

In 1990, Trinidad and Tobago and the United States signed a tax agreement that allowed the islands to become a major recipient of 936 funds, and potential American investors were encouraged to consider the 936 funding option for Trinidad and Tobago enterprises.

The islands' Government continued to maintain a major percentage of most state-industry corporations. The Government's desire for increasing hydrocarbon reserves has led to favorable concessions for exploration activity that, in turn, have led to increased exploration. The Government has increasingly sought direct foreign investment to fund joint ventures in its downstream petrochemical industry. Private investment in the petroleum and gas sectors amounted to $268 million in 1991.

The Government-owned Trinidad and Tobago Oil Co. Ltd. borrowed $260 million from the ordinary capital fund of the Inter-American Development Bank (OC/IDB) and cofinanced an additional $75 million from the Export Import Bank of Japan (EIBJ) and the European Investment Bank, including a technical cooperation grant of up to $95,000 from the fund for special operations (FSO/IDB). The money will be used to expand the country's oil exporting capacity. The country's oil extraction infrastructure will be expanded, and refinery facilities are scheduled for upgrading.

The 1990 Legislature replaced several restrictive foreign ownership laws with a more liberal Foreign Investment Act (FIA). It is too early, however, to determine the effects of the new FIA on new investments in the Trinidad and Tobago economy. A Government official noted that the islands intended to sell some state-owned enterprises. The country's energy sector attracts foreign investment because the Government has helped to restore investor confidence by dismantling foreign exchange controls, easing investment rules, and enhancing joint-venture opportunities. Also, development of the country's abundant natural gas reserves is one of the Government's priorities to reduce its dependency on crude oil, promote the use of gas, and further development of the gas-based industries.

PRODUCTION

The mineral industry of Trinidad and Tobago produced crude hydrocarbons, petrochemicals, industrial minerals, and metals. Approximately three-fourths of the hydrocarbon output is from wells drilled on the southeastern Continential Shelf. Petroleum production is divided evenly between the state-owned oil companies and American Oil Company (AMOCO). Petroleum production in 1991 was reported to be 53.4 Mbbl, but crude oil output was down 2%. *(See table 1.)*

TRADE

The United States, Puerto Rico, and the Virgin Islands continued as Trinidad and Tobago's major trading partners. Exports to the United States totaled $900 million, an increase of $40 million over the previous year. Imports to Trinidad and Tobago from the United States totaled $660 million. The 1991 exports to the United States represented 53% of the country's total exports. U.S. imports were about 51% of Trinidad and Tobago's total imports. Exports to the United States consisted of anhydrous ammonia, crude oil, diesel fuel, methanol, and urea; imports from the United States were hydrocarbon drilling equipment and parts, chemicals, plastics, and foodstuffs. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

The Government and private sector controlled much of the mineral industry by joint ventures; all petroleum operations were state-owned with minority participation by private companies or investors. Major foreign investment in the nation's mineral industry included American firms in the petroleum and anhydrous ammonia sectors and an Indian group in the steel industry. Several mineral producers are

completely owned by the Government. *(See table 4.)*

COMMODITY REVIEW

Metals

The country's single steel mill, the largest of four in the Caribbean island arc, was the state-owned Iron and Steel Co. of Trinidad and Tobago. The mill was operated by Caribbean Ispat Ltd., a subsidiary of the ISPAT Steel Group of India. In May 1989, ISPAT entered into a 10-year agreement with the Government to operate the mill on the western coast of Trinidad north of Point Lisas.

The direct-reduced iron process and furnace feed plants used iron ore pellets imported from Brazil and Venezuela. The plants primary mill output, wire rod, was exported to Canada, the Caribbean, Central America, Japan, Taiwan, South America, and the United States. The year marked the first full year that the new electric ladle furnace, installed in 1990, was in operation. Long-term plans call for ISPAT to invest $300 million to upgrade plant equipment.

In 1990, the plant produced 355 kmt of steel; the tonnage increased to 444 kmt in 1991. Direct-reduced-iron production in 1990 was 700 kmt, and output in 1991 was 710 kmt.

Industrial Minerals

Aggregate Materials.—Sand and gravel and crushed stone were produced by small companies for use primarily in concrete manufacture. Crushed stone was used in the manufacture of cement clinker. Data on the number of firms, production, and value, other than stone for cement manufacture, were not available.

Ammonia.—Federation Chemicals (FEDCHEM), a subsidiary of W. R. Grace & Co., owned an anhydrous ammonia plant in Point Lisas. FEDCHEM was a minority participant with the Government (49% to 51%) of the Tringen I and Tringen II ammonia plants. The former had a capacity of 450,000 mt/a of anhydrous ammonia (about 372,000 mt/a of nitrogen), and the latter had a design capacity of 370,000 mt/a of anhydrous ammonia (about 300,000 mt/a of nitrogen). Ammonia production was reported as 1.5 Mmt in 1991.

Cement.—Trinidad and Tobago's single cement plant, Trinidad Cement Ltd., Government-owned, was on Trinidad's western coast near Point Lisas. Cement production in 1991 was 486 kmt an increase of about 11% above the 438 kmt produced in 1990.

Mineral Fuels

Liquefied Petroleum Gas.—The Phoenix Park Gas Processors Ltd., a joint venture between the state-owned National Gas Co. of Trinidad, Pan West Engineers and Constructors of Texas, and Continental Oil Company (CONOCO) of the United States, operated an 18-Mm^3/d facility to extract gas liquids from crude hydrocarbons. The gas liquids, primary butane and propane, were produced for export.

Natural Gas.—Trinidad and Tobago's natural gas industry consisted of the American firm AMOCO, responsible for about 80% of the production, and Trintomar, a joint venture of Trinidad and Tobago Oil Co. Ltd. (TRINTOC), Trinidad and Tobago Petroleum Co. Ltd. (TRINTOPEC), the National Gas Co. of Trinidad, and Trinmar. Trinmar is a consortium of TRINTOC, TRINTOPEC and Texaco, each with a 33 1/3% interest. Natural gas production in 1991 was approximately 7 billion m^3, about the same as in 1990.

At midyear, one of the largest gas-processing plants in Latin America began operations in the Point Lisas Industrial Estate in the western part of Trinidad. The state-of-the-art, $100 million, high-recovery cryogenic gas plant is capable of removing 98% of the propane and all heavier components. The plant is a joint venture of the National Gas Co. of Trinidad, CONOCO, and Pan West Engineers & Constructors, both of the United States.

All natural gas produced was used domestically. Approximately 70% was piped to the country's natural gas-based ammonia, methanol, and urea plants; the state-owned steel mill; and the Trinidad and Tobago electric utility sector. The remainder was used in the oil recovery process or was flared.

Petroleum.—The petroleum sector consisted of Amoco Trinidad Oil Co. Ltd., a subsidiary of Amoco International Oil Co. Ltd., and the state-owned companies TRINTOC and TRINTOPEC. AMOCO and the state-owned companies each produced approximately 50% of the total.

In 1991, petroleum production was about 55 Mbbl, the same as in 1990. Approximately 75% of the crude was produced from offshore wells. Offshore production was from the southeastern Continental Shelf, and onshore production was primarily from the southwestern area of Trinidad.

Several joint ventures for hydrocarbon exploration and production were in place at the beginning of the year. These included (1) Mobil and TRINTOPEC, (2) Pecten (the U.S. division of Shell Oil Co.) and TRINTOC, and (3) EXXON, Chevron, TOTAL (U.S. division of Compagnie Francaise de Petroles, a French company), TRINTOC, and TRINTOPEC. This latter joint venture was formed to explore for deep-producing horizons in southern Trinidad.

The secondary oil recovery and refinery modernization program financed by the OC, EIBJ, and FSO consisted of three components: (1) the onshore recovery of approximately 13.2 Mbbl of heavy oil using steam-injection methods, (2) the offshore recovery of about 17 Mbbl of medium-density petroleum using water-injection recovery, and (3) the conversion capacity increase of the Pointe-a-Pierre refinery to raise the processing capacity and obtain a higher percentage of light products.

Reserves

Proven oil reserves were reported to be about 600 Mbbl. Natural gas reserves as of January 1991 were 280 billion m^3 (proven) and 210 billion m^3 (probable). Reserve data on construction and cement mineral commodities were not available.

INFRASTRUCTURE

Trinidad had three major ports, all on the west coast: Port-of-Spain, Point Lisas, and Pointe-a-Pierre. The country has about 8,000 km of roads, but only about one-half of the total is paved. The hydrocarbon industry had constructed 1,032 km of crude petroleum pipelines and 1,904 km of natural gas pipelines. The crude oil pipelines extended from the offshore fields on the southeastern coast to Brighton on the southwest coast and from the south coast north to Pointe-a-Pierre. The natural gas pipelines were onshore paralleling the petroleum pipeline, and a second gas pipeline extended from the gasfields in the southwestern part of Trinidad along the western coast to Port-of-Spain.

OUTLOOK

A major part of the country's income is derived from the production and sales of hydrocarbon-based industries. The country has sufficient reserves for several years of production. By meeting the terms of the Enterprise for the Americas Initiative, formulated in mid-1990, Trinidad and Tobago can apply for reductions in its foreign debt. An upgrading of one port and its major airport, along with major projects in the housing, petrochemical, refining, and medical sectors, will increase construction activity, employment, and the demand for construction mineral commodities for the next several years. As noted in previous U.S. Bureau of Mines annual reports, Trinidad and Tobago's economic base, dominated by hydrocarbon production and refinery products, will be broadened by the above activities. Domestic sands and silica are being tested at the University of Leuven, Belgium, to compare their quality and potential with imported products.

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[1]With the collaboration of Doss H. White, State Mineral Officer in Tuscaloosa, Alabama.

[2]Where necessary, values have been converted from Trinidad and Tobago's dollar (TT$) to U.S. dollars at the rate of TT$4.25=US$1.00.

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Level 11, Riverside Plaza
Besson Street
Trinidad

Publication

Ministry of Energy, The Petroleum Industry of Trinidad and Tobago, monthly bulletin.

TABLE 1

TRINIDAD AND TOBAGO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991e
Asphalt, natural		e26,000	21,000	27,231	e19,155	20,000
Cement, hydraulic		327,000	360,000	380,000	437,954	2485,396
Gas, natural:						
Gross	million cubic meters	7,646	e7,700	7,146	e7,000	7,000
Marketede [3]	do.	3,820	4,000	23,833	3,750	3,750
Iron and steel:						
Iron, sponge		475,000	593,000	612,000	697,000	2710,000
Steel, crude		361,000	361,000	294,000	372,000	2444,000
Semimanufactures (wire rod)		291,000	251,000	e250,000	e290,000	290,000
Lead, refined (secondary)e		1,800	1,800	1,800	1,800	1,800
Natural gas liquidse	thousand 42-gallon barrels	40	40	40	40	40
Nitrogen: N content of ammonia	thousand tons	1,127	1,388	e1,550	e1,850	21,524
Petroleum:						
Crude	thousand 42-gallon barrels	56,621	56,476	56,189	56,000	255,000
Refinery products	do.	31,392	31,123	28,225	28,130	230,200
Stone: Limestonee		600,000	600,000	600,000	600,000	600,000
Sulfur, byproduct of petroleume [4]		5,000	5,000	5,000	5,000	5,000

eEstimated.

[1]Table includes data available through July 1992.

[2]Reported figure.

[3]Excludes natural gas used in field operations. In 1989, 2,344 Mm^3 was used in field operations.

[4]Sulfur as a byproduct of natural gas may also be produced, but information is inadequate to make reliable output estimates.

TABLE 2

TRINIDAD AND TOBAGO: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS					
Aluminum: Metal including alloys:					
Scrap		2,058	1,599	878	United Kingdom 478; Venezuela 194.
Unwrought		31	31	17	United Kingdom 14.
Semimanufactures		55	65	25	Grenada 18; Barbados 15.
Chromium: Oxides and hydroxides	kilograms	2	—		
Copper:					
Matte and speiss including cement copper		—	12	12	
Sulfate	kilograms	50	—		
Metal including alloys:					
Scrap		234	145	56	United Kingdom 89.
Unwrought		42	75	—	All to United Kingdom.
Semimanufactures		638	96,016	96,005	Jamaica 10.
Iron and steel: Metal:					
Scrap		10,075	116,350	3	West Germany 110,330; Indonesia 6,017.

See footnotes at end of table.

TABLE 2—Continued

TRINIDAD AND TOBAGO: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS—Continued					
Iron and steel: Metal—Continued:					
Pig iron, cast iron, related materials		235,734	442,035	—	Venezuela 433,655; United Kingdom 5,379; Indonesia 3,001.
Steel, primary forms		13,705	30,007	—	Saudi Arabia 20,031; Indonesia 8,066; Jamaica 1,910.
Semimanufactures:					
Bars, rods, angles, shapes, sections		376,980	940,046	50,187	Guadeloupe 418,668; Jamaica 58,352; Venezuela 54,206.
Universals, plates, sheets		182	282	—	Guyana 167; Grenada 29; Jamaica 22.
Hoop and strip	value	$485	—		
Wire		608	1,776	—	St. Lucia 1,050; Jamaica 667; Barbados 37.
Tubes, pipes, fittings		1,979	1,061	(2)	St. Lucia 503; Guyana 327; Grenada 158.
Castings and forgings, rough		2	(2)	—	All to St. Lucia.
Lead:					
Oxides		(2)	34	—	All to Barbados.
Metal including alloys:					
Scrap		1,286	35	—	All to Venezuela.
Semimanufactures		1	—		
Nickel: Metal including alloys, scrap		6	—		
Silver:					
Waste and sweepings[3]	kilograms	3	807	755	Canada 52.
Metal including alloys, unwrought and partly wrought	do.	31	—		
Titanium: Oxides		8	—		
Zinc: Metal including alloys, semimanufactures	kilograms	1,620	—		
Other:					
Oxides and hydroxides	do.	257	—		
Ashes and residues		160	139	—	All to Brazil.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.: Grinding and polishing wheels and stones		16	66	—	Guyana 64; Grenada 2.
Asbestos, crude	value	$282	$1,000	—	All to Guyana.
Barite and witherite	do.	$295	—		
Cement	thousand tons	176	2,379	—	Guyana 2,137; Haiti 35; St. Lucia 30.
Chalk		6	—		
Clays, crude		1	—		
Fertilizer materials: Manufactured:					
Ammonia	thousand tons	1,569	1,555	961	Belgium-Luxembourg 185; France 153.
Nitrogenous	do.	485	8,793	132	Ecuador 8,310; United Kingdom 58.
Potassic	value	$5,222	—		
Unspecified and mixed		1	—		
Gypsum and plaster		(4)	1	—	NA.
Lime		752	—		
Pigments, mineral: Iron oxides and hydroxides, processed	value	$4,472	$1,000	—	All to Grenada.
Salt and brine		106	103	—	Barbados 100; unspecified 3.

See footnotes at end of table.

TABLE 2—Continued

TRINIDAD AND TOBAGO: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sodium compounds, n.e.s.:					
Soda ash, manufactured	kilograms	(2)	—		
Sulfate, manufactured	do.	(2)	—		
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	value	$318	—		
Worked	do.	$556	—		
Gravel and crushed rock		23,108	54,152	—	St. Lucia 29,654; St. Vincent and the Grenadines 10,192; Guadeloupe 7,925.
Sand other than metal-bearing		8,311	29,405	—	St. Lucia 13,646; Netherlands Antilles 11,234; St. Kitts and Nevis 1,600.
Sulfur: Sulfuric acid	kilograms	126	—		
Talc, steatite, soapstone, pyrophyllite		2	—		
Other:					
Crude		—	9	—	All to Suriname.
Slag and dross, not metal-bearing		—	11,641	—	All to India.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		41,669	27,074	1,400	West Germany 12,403; French Guiana 5,255; United Kingdom 3,737.
Petroleum:					
Crude	thousand 42-gallon barrels	26,722	30,715	30,715	
Refinery products:					
Liquefied petroleum gas	do.	174	233	—	Barbados 49; St. Lucia 28; Guadeloupe 26.
Gasoline	do.	2,449	3,367	903	Barbados 353; Netherlands Antilles 331.
Mineral jelly and wax	do.	(2)	(2)	—	Mainly to Barbados.
Kerosene and jet fuel	do.	r2,390	2,540	1,067	Barbados 547; French Guiana 199.
Distillate fuel oil	do.	r4,878	6,064	2,321	French Guiana 568; Cuba 522.
Lubricants including nonlubricating oils	do.	19	51	(2)	Barbados 25; Suriname 11; Jamaica 4.
Residual fuel oil	do.	14,123	15,760	5,992	Netherlands Antilles 2,133; Cuba 1,561.
Bitumen and other residues	do.	2	(2)	—	Mainly to St. Lucia.
Bituminous mixtures	do.	14	22	—	Dominican Republic 9; Grenada 4; St. Vincent and the Grenadines 4.

rRevised. NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Quantity not available valued at $416.

TABLE 3

TRINIDAD AND TOBAGO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS					
Aluminum:					
Ore and concentrate		500	160	150	United Kingdom 10.
Oxides and hydroxides		111	91	1	United Kingdom 90.
Metal including alloys:					
Scrap		5	(2)	—	All from St. Vincent and the Grenadines.
Unwrought		—	21	—	All from Canada.
Semimanufactures		1,498	2,222	1,488	Venezuela 207; Belgium-Luxembourg 188.
Chromium: Oxides and hydroxides		67	4	1	United Kingdom 3.
Copper:					
Sulfate		13	NA		
Metal including alloys:					
Scrap		170	19,203	19,125	Grenada 75.
Unwrought		3	4	1	United Kingdom 3.
Semimanufactures		6,872	21,186	20,502	United Kingdom 641; Netherlands 10.
Iron and steel:					
Iron ore and concentrate	thousand tons	1,338	914	—	Brazil 586; Venezuela 272; India 56.
Metal:					
Scrap		10,590	10,170	4,047	Netherlands Antilles 2,721; Dominica 1,199.
Pig iron, cast iron, related materials		8	111	5	Brazil 97; Netherlands 5.
Ferroalloys:					
Ferromanganese		460	1,780	95	Venezuela 1,610; Mexico 75.
Ferrosilicon		1,264	498	178	Venezuela 220; Hong Kong 100.
Unspecified		931	2,415	1,014	Venezuela 1,400; Netherlands 1.
Steel, primary forms		524	642	—	United Kingdom 242; Netherlands 202; Finland 105.
Semimanufactures:					
Bars, rods, angles, shapes, sections		7,347	184,939	44,820	United Kingdom 136,279; West Germany 3,158.
Universals, plates, sheets		39,108	564,134	58,339	Venezuela 320,194; United Kingdom 131,736.
Hoop and strip		542	2,789	2,044	United Kingdom 738; Canada 7.
Rails and accessories		9	1,154	11	United Kingdom 1,143.
Wire		5,183	22,134	40	United Kingdom 21,269; Venezuela 581; Brazil 138.
Tubes, pipes, fittings		82,621	214,297	67,069	Argentina 32,235; Brazil 7,674.
Castings and forgings, rough	value	$330	$1,000	$1,000	
Lead:					
Oxides		14	49	1	United Kingdom 33; Spain 12; Canada 2.
Metal including alloys:					
Scrap		39	456	403	Barbados 53.
Unwrought		13	234	210	United Kingdom 24.
Semimanufactures		1,671	41,180	333	Venezuela 40,847.
Magnesium: Metal including alloys, semimanufactures		8	3	1	United Kingdom 2.
Manganese: Ore and concentrate		3,071	2	—	All from United Kingdom.

See footnotes at end of table.

TABLE 3—Continued

TRINIDAD AND TOBAGO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
METALS—Continued					
Nickel:					
Matte and speiss	value	$611	—		
Metal including alloys, semimanufactures		1	1	—	Mainly from United Kingdom.
Platinum-group metals: Metals including alloys, unwrought and partly wrought	kilograms	50	—		
Silver: Metal including alloys, unwrought and partly wrought	value, thousands	$181	$142	$14	Canada $127; Australia $1.
Tin: Metal including alloys:					
Unwrought		6	—		
Semimanufactures		9	487	60	Japan 168; unspecified 259.
Titanium: Oxides		855	635	272	United Kingdom 328; Finland 22.
Tungsten: Metal including alloys:					
Unwrought	value, thousands	$69	$52	$52	
Semimanufactures		5	1	1	
Zinc:					
Ore and concentrate		—	22,229	—	All from Venezuela.
Oxides		88	130	35	Venezuela 58; France 38.
Metal including alloys:					
Unwrought		12	25	3	Canada 18; United Kingdom 4.
Semimanufactures[3]		149	19,727	30	Canada 19,687; Norway 5.
Other:					
Oxides and hydroxides		160	185	45	Netherlands 49; Sweden 40.
Ashes and residues		311	360	360	
Base metals including alloys, all forms		10	10	10	
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		5	57	5	Dominica 21; Guatemala 21; China 5.
Grinding and polishing wheels and stones		1,203	61	8	United Kingdom 16; Venezuela 15.
Asbestos, crude		18			
Barite and witherite		48,304	20,687	2,152	Morocco 17,935; United Kingdom 600.
Boron materials: Crude natural borates		6	456	456	
Cement		5,280	3,787	124	West Germany 2,568; East Germany 850.
Chalk		321	20,485	26	United Kingdom 20,154; France 175.
Clays, crude		2,992	5,111	4,776	Canada 136; United Kingdom 127.
Diamond, natural: Gem, not set or strung	value, thousands	$122	$472	—	India $401; United kingdom $59; Canada $12.
Diatomite and other infusorial earth		73	44	42	West Germany 2.
Feldspar, fluorspar, related materials		12,072	152	—	All from United Kingdom.
Fertilizer materials: Manufactured:					
Ammonia		9	6	2	United Kingdom 3; West Germany 2.
Nitrogenous		2,681	2,564	1,598	Dominican Republic 442; Canada 369.
Phosphatic		982	1,052	745	Dominican Republic 273; Canada 20.
Potassic		3,461	22,178	210	West Germany 21,500; Dominican Republic 355.

See footnotes at end of table.

TABLE 3—Continued

TRINIDAD AND TOBAGO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Fertilizer materials: Manufactured—Continued:					
Unspecified and mixed		3,129	8,133	3,081	Dominican Republic 2,954; West Germany 1,583.
Graphite, natural		123	—		
Gypsum and plaster		13,925	19,650	33	Venezuela 19,604; United Kingdom 10.
Lime		11,347	3,175	18	Venezuela 2,095; United Kingdom 1,062.
Magnesium compounds: Magnesite, crude		252	1,346	—	Venezuela 1,181; Austria 159; Switzerland 6.
Mica:					
Crude including splittings and waste		43	108	—	Norway 73; United Kingdom 35.
Worked including agglomerated splittings	value, thousands	$20	$2	$2	
Phosphates, crude		226	228	88	Dominican Republic 140.
Pigments, mineral: Iron oxides and hydroxides, processed		49	66	(2)	Spain 20; United Kingdom 14; West Germany 13.
Potassium salts, crude		—	635	635	
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$590	$2	$2	
Synthetic	do.	$30	$5	$3	France $2.
Salt and brine		153,628	89,334	36	Jamaica 70,805; Netherlands Antilles 13,660; Canada 2,682.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		8,684	6,044	5,636	West Germany 182; United Kingdom 169.
Sulfate, manufactured		2,575	1,705	72	Belgium-Luxembourg 1,540; Netherlands 84.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		5	8	—	All from Italy.
Worked		827	85	2	Italy 61; India 17; Barbados 3.
Dolomite, chiefly refractory-grade		1,195	5,484	815	Venezuela 4,664; Norway 5.
Gravel and crushed rock		4,622	15,981	424	China 15,373; Italy 152.
Limestone other than dimension		33,423	48,634	—	Netherlands Antilles 18,911; Venezuela 11,550; Jamaica 10,049.
Quartz and quartzite		(2)	23	—	All from Netherlands.
Sand other than metal-bearing		393	1,893	1,654	United Kingdom 161; Guyana 75.
Sulfur:					
Elemental:					
Crude including native and byproduct		46	—		
Colloidal, precipitated, sublimed		23	38	23	United Kingdom 11; Venezuela 3.
Dioxide	kilograms	3	—		
Sulfuric acid		4,137	4,919	352	Italy 3,001; Spain 1,303.
Talc, steatite, soapstone, pyrophyllite		604	77,895	54,635	Norway 21,146; Hong Kong 2,113.
Other:					
Crude		5	2,530	2,530	
Slag and dross, not metal-bearing		58	97	97	
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		18,228	32	—	Republic of South Africa 18; Venezuela 14.
Carbon: Carbon black		886	749	114	Venezuela 632; United Kingdom 2.

See footnotes at end of table.

TABLE 3—Continued

TRINIDAD AND TOBAGO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Anthracite		536	402	402	
Lignite including briquets	value	$3,287	—		
All grades including briquets		5	—		
Coke and semicoke		89	123	123	
Peat including briquets and litter		81	15,231	1	Canada 15,229.
Petroleum:					
Crude	thousand 42-gallon barrels	2,047	5,148	(2)	Venezuela 1,951; Angola 1,408; Colombia 516.
Refinery products:					
Liquefied petroleum gas	42-gallon barrels	21,493	35	35	
Gasoline	do.	22,926	—		
Mineral jelly and wax	do.	4,361	4,494	1,299	Venezuela 905; West Germany 818.
Kerosene and jet fuel	do.	7,743	7,084	—	Netherlands Antilles 7,060; United Kingdom 23.
Distillate fuel oil	do.	932,062	369,420	—	Argentina 196,564; Colombia 172,856.
Lubricants including nonlubricating oils	do.	95,378	419,573	6,027	Jamaica 331,814; Netherlands Antilles 61,593; Venezuela 16,212.
Residual fuel oil	do.	178,096	108,252	51,162	Venezuela 57,090.
Bitumen and other residues	do.	—	61	61	
Bituminous mixtures	do.	479	5,151	4,969	United Kingdom 133; Canada 42.
Petroleum coke	do.	660	1,870	1,326	West Germany 544.

NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.
[3]Includes zinc dust, flakes and powders.

TABLE 4

TRINIDAD AND TOBAGO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Major commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Anhydrous ammonia[1]	Trinidad Nitrogen Co. Ltd. (W.R. Grace & Co., 49%; Government, 51%)		
	Tringen I	Point Lisas, Caroni Co.	370.
	Tringen II	do.	450.
Do.	Fertilizers of Trinidad and Tobago Ltd. (Amoco International Oil Co. Ltd., 49%; Government, 51%)	do.	710.
Do.	Federation Chemicals (W.R. Grace & Co., 100%)	do.	230.
Asphalt	Lake Asphalt of Trinidad and Tobago (1978) Ltd. (Government, 100%)	Brighton, St. Patrick Co.	60.

See footnoted at end of table.

TABLE 4—Continued

TRINIDAD AND TOBAGO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

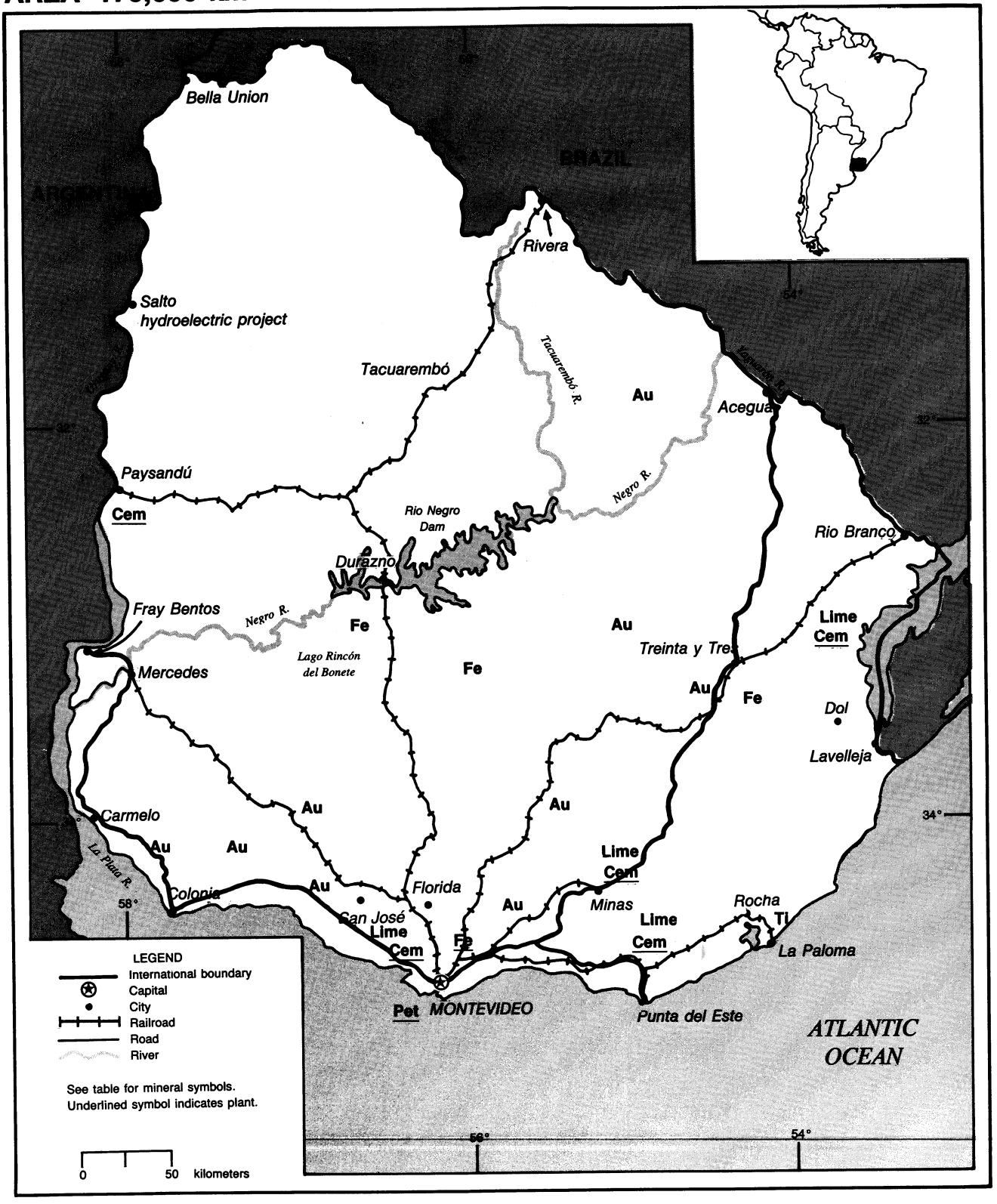
(Thousand metric tons unless otherwise specified)

Major commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	Trinidad Cement Ltd. (Government, 100%)	Claxton Bay, Caroni Co.	540 cement, 600 clinker.
Iron and steel	Iron and Steel Co. of Trinidad and Tobago (Government, 100%)	Point Lisas, Caroni Co.	900 sponge iron, 700 steel, 600 wire rod.
Petroleum:			
Crude	Amoco Trinidad Oil Co. Ltd. (Amoco International Oil Co. Ltd., 100%)	Poui, Samaan, Teak, and Cassia Fields, offshore, east of Guayaguayare	[2]95,000.
Do.	Trinidad and Tobago Oil Co. Ltd. (Government, 100%) (Texaco Trinidad Inc., Trinidad and Tobago Oil Co. Ltd., and Trinidad and Tobago Petroleum Co. Ltd., 33 1/3% each)	Point Fortin, Ortoire, Penal Forest Fields, offshore, east of Guayaguayare offshore in Gulf of Paria	[2]20,000.
Do.	Trinidad and Tobago Petroleum Co. Ltd. (Government, 100%)[3]	Soldado Field, onshore; Galeota Field offshore (exported)	[2]24,000.
Products	Trinidad and Tobago Oil Co. Ltd. (Government, 100%)	Point Fortin, St. Patrick Co.	[2]80,000.
Do.	do.	Pointe-a-Pierre, Victoria Co.[4]	[2]220,000.

[1]Capacity based on 340-day operation year.
[2]Barrels per day.
[3]Formerly Trinidad-Tesoro Petroleum Co., 49% owned by Tesoro Petroleum Co.
[4]Formerly owned by Texaco (Trinidad) Inc.

URUGUAY

AREA 176,000 km² **POPULATION 3.1 million**



THE MINERAL INDUSTRY OF

URUGUAY

By Alfredo C. Gurmendi

Uruguay is a country with a largely agrarian economy and limited mineral reserves. Its mineral industry made a negligible contribution to the economy in 1991. Mineral production for domestic consumption and exports was generally confined to industrial minerals. Uruguayan marble is considered to be of excellent quality. Uruguay has no known oilfields and continued to be heavily dependent on imported crude oil. Natural gas reserves remained uneconomical, and coal was of poor quality. The gross domestic product grew by 1.5% to $9.2 billion,[1] while the rate of inflation was 89% by yearend, which was 40% lower than that in 1990. The foreign debt increased to $7.2 billion, while unemployment reached 9.0%. The mineral sector accounted for 0.5% of the gross domestic product of Uruguay in 1991. The Government was seeking to increase exports by relaxing regulations on participation of foreign investors in the mineral industry. Uruguay attracted more than $150 million of new mineral investment in 1991.

GOVERNMENT POLICIES AND PROGRAMS

The Uruguayan Congress has approved the sale of public utilities in 1991. Monetary and exchange rate policy changes were aimed at curbing inflation. Privatization of additional state concerns was debated at yearend. Economic growth recovered somewhat in 1991. An important event for Uruguay in 1991, which will have a positive effect on its mineral development, was the signing of the Brasilia Protocol at the first meeting of the Mercado Comun del Sur (MERCOSUR). The Government has plans to regulate the "right to strike" and to provide for a secret ballot in union elections.

The growth of the services sector was based largely on the strength of Uruguay as a regional financial center and its serving as a capital refuge for Argentinean and Brazilian investors, who were lured by the free-floating exchange rate, absence of capital controls, and traditional banking secrecy. The impressive response to the Government's recent offer of debt equity indicated that private investment was recovering, though public investment remained low because of budgetary reasons. Uruguay continued to maintain its liberal import policy and unrestricted foreign exchange market. Uruguay's market share of U.S. exports has excellent opportunities to increase in the 1990's. In 1991, the United States maintained its third place among exporters to Uruguay. The Export-Import Bank offers a full range of financing and credit insurance programs for exports to the Uruguayan market. The Trade Development Program offers financing grants for major project prefeasibility studies to enhance the competitiveness of U.S. bidders in the Uruguayan mineral industry. Uruguay receives loans from the World Bank, the Inter-American Development Bank (IDB), and other multilateral institutions for major energy, agricultural services, and mining industries. The Uruguayan Government encourages foreign investment through its Foreign Investment Act and the Industrial Promotion Act of 1974. Tariff exemptions exist for imports of capital goods, accelerated depreciation, and export financing. Restrictions on foreign investment in Uruguay are nonexistent. In December 1987, Uruguay passed a law creating "free trade zones" particularly meant to improve trade. Uruguay's debt-equity program offers incentives for foreign investment; included are no time restrictions on profit repatriation. The "Treasury Bonds" issued by the Central Bank in the repurchase of the external debt notes were competitively traded in Uruguay at no discount rate. Recent debt swaps amounted to $400 million. A growing number of companies took advantage of Uruguay's liberal foreign investment policies, which increased mineral exploration activities.

In November 1990, the Uruguayan Government issued Decree No. 516/990 authorizing the Administración Nacional de Combustibles, Alcohol y Portland (ANCAP) to call for tenders from companies interested in offshore drilling. The mining companies that took advantage of the new investment climate and new decree were San José Mining Co., a subsidiary of Canada's Bond International Gold Ltd., and Steel S.A., a subsidiary of Brazil's Mineracao e Participacoe S.A. It was expected that more companies would follow.

It was announced during 1991 that a Uruguayan-Bolivian joint-venture iron-production facility was to be built, possibly with Japanese technology, at the mouth of the Parana River. Bolivia will supply iron ore from the Mutum deposit and gas to power the plant. Electricity will be generated by Uruguayan dams. The projected output was about 2 Mmt/a of high-quality iron worth $300 million.

PRODUCTION

Uruguay has few internationally significant mineral resources but does have hydropower potential. The country is heavily dependent on imported crude oil. Uruguay's quarrying and mining was for construction minerals such as clays, dimension stone, dolomite, granite,

gypsum, limestone, marble, quartz, and sand and gravel. About 19,000 mt/a of dolomite was mined in Lavalleja, 250 km east of Montevideo, for use in the glass and construction industries, steel, and in refractories. Limestone was produced in Cerro Largo, Lavalleja, Maldonado, and Paysandú Departments, principally for portland cement production. Various clays were mined in Durazno, Maldonado, Montevideo, and San José Departments for producing brick, pipe, tile, and whiteware. Talc was mined in Colonia and Lavalleja Departments for use in the paper industry and in ceramics, cosmetics, insecticides, and pharmaceutics. Feldspar was mined in Florida Department for the ceramics industries and glass. Uruguay was noted for the quality of its marble mined in Lavalleja, Maldonado, and Soriano Departments. Agate and amethyst were produced from Artigas Department. *(See table 1.)*

TRADE

During 1991, Uruguay exported clays, gravel, limestone, precious stones, and sands valued at $12 million. Imports of crude oil, lubricants, and petroleum products were estimated at $280 million. ANCAP imported crude oil and refined petroleum from Argentina, Brazil, Colombia, Iran, Mexico, and Nigeria. ANCAP and Petro-Canada renewed efforts to explore Uruguay's outer continental shelf and were reprocessing seismic data from previous exploration activities.

Imports from the United States amounted to $103 million. Ammonium phosphate for fertilizer was valued at $20 million. Mineral products, sulfur, lubricants, and petroleum byproducts and chemicals were valued at $65 million. Uruguay's exports to the United States were valued at $255 million. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

The Instituto Nacional de Minería y Geología (INMG) of Uruguay delineated 14 areas with precious-metal and base metal potential. Investment in prospecting and mining increased as a result of favorable legislation designed to relax regulations of foreign companies in the minerals sector. San José Mining Co., a subsidiary of Canada's Bond International Gold (BIG), and Steel S.A., a subsidiary of Brazil's Mineracao e Participacoe, were planning to invest $36 million in precious-metal and other metal exploration. BIG was developing a 930-kg/a gold mine at Mahoma, 130 km from Montevideo. Two gold refineries with a combined output of 4 kg/d and 5 kg/d of gold started operations at the beginning of 1991. One was at Mahoma Sur in San José Department owned by Australia's BIG Resources Management Pty. Ltd., and the other was at Minas de Corrales in Rivera Department operated by Brazil's Steel S.A.

ANCAP operated its cement plants at more than 90% capacity. Uruguay continued its dependency on imports of petroleum and natural gas. During 1991, 80% of its fuel energy requirements was refined by ANCAP at its Teja plant in Montevideo. Minas de Talco Narancio S.A. produced talc in Colonia and Lavalleja Departments for use in the paper industry and in ceramics, cosmetics, pharmaceuticals, and insecticides. Industria Nacional Laminadora S.A. produced 54,000 tons of rolled steel products at its plant near Montevideo, Montevideo Department. *(See table 4.)*

COMMODITY REVIEW

Metals

Uruguay has provided BIG with exclusive rights to explore and develop Mahoma leases in San José Department. Operations had begun at the end of 1990 with a series of open pits. The gold ore will be processed in a conventional mill using gravity separation and carbon-in-pulp recovery at a rate of 930 kg/a of refined gold. The U.S. company Gold Standard Inc. of Salt Lake City, Utah, continued exploration at its San Juan Hills gold leases in the San José area of San José Department. Big Pony Gold Inc. of Salt Lake City, Utah, 50% owned by Gold Standard, continued exploration over a large tract of Archaen greenstone, locating several gold occurrences. Big Pony's subsidiary, Tormin S.A., continued exploring encouraging prospects near Montevideo. The iron ores at Valentines in Florida and Treinta y Tres Departments and at Zapucay in the northern Department of Durazno were marginally viable.

Industrial Minerals

Uruguay's main quarrying and mining activities included production of clays, dimension stone, dolomite, granite, gypsum, limestone, quartz, and sand and gravel. Uruguay is noted for the excellent quality of its marble, mined in Lavalleja, Maldonado, and Soriano Departments, which is exported to Western Europe and Canada. The country is also well known for its production of agate and amethyst from Artigas Department. Large reserves of dolomite occur at Lavalleja, 250 km east of Montevideo. About 19,000 mt/a of dolomite was mined in Lavalleja and Maldonado Departments for use in construction, glass, the steel industry, and refractories. ANCAP produced limestone in Cerro Largo, Lavalleja, Maldonado, and Paysandú Departments. Titanium-bearing sands suitable for the extraction of ilmenite and monazite were surveyed, and a feasibility study continued in the Rocha Department. Corundum was produced for natural abrasive applications, although demand in the optical lens grinding field continued to be limited.

Mineral Fuels

Exploration did not delineate any oilfields of economic value in 1991. Natural gas reserves remained

unquantified, and coal continued to be of poor quality. Recently, ANCAP and Petro-Canada renewed efforts to explore Uruguay's outer continental shelf. In an effort to reduce its heavy dependence on crude oil imports, Uruguay maintained a well-developed hydroelectric power system, as well as the potential for alternative energy sources from small uranium deposits. ANCAP has also been seeking joint-venture partners interested in new exploration for oil in the River Plate area.

In 1991, total installed electric power capacity was about 1,700 MW, of which 32% was generated by thermal plants and 68% by hydroelectric plants. The energy industry has eased Uruguay's trade problem with the opening of the 1,890-MW-capacity Salto Grande hydroelectric plant, a cooperative project with Argentina, on the Uruguay River in Salto Department. Uruguay shared 32% of Salto Grande's production and 34% of the El Palmar powerplant in Salto Department.

Reserves

Uruguay's mineral reserves are modest compared with some other mineral-producing countries in South America. Bond developed a 930-kg/a gold mine at Mahoma in Canelones Department, 130 km from Montevideo, containing an estimated 330,000 tons of ore grading 8.9 g of gold per ton. Uruguay has two iron ore deposits; each has proven reserves of 45 Mmt of 40% iron. They are in Florida and Treinta y Tres Departments. In addition, the Zapucay deposit in the northern Department of Durazno includes 400 Mmt of iron ore containing 40% iron.

INFRASTRUCTURE

The mineral production, including mineral fuels, is transported primarily by road and rail system. In 1991, there was 49,900 km of roads, of which 6,700 km was paved, 3,000 km was gravel, and 40,200 km was dirt.

In 1986, IDB approved a loan of $36 million to help finance a project that consisted of two sections of highway, Routes 1 and 5, and a main artery, which now funnels traffic to Montevideo and its port areas. There is 3,000 km of railroad in the country, all standard gauge (1.4 m) and owned by the Government.

The major ports are Montevideo on the Atlantic Ocean, Colonia on the Río de la Plata, and Fray Bentos and Paysandú on the Uruguay River. Virtually all of Uruguay's industry and about 44% of the population are within the Montevideo Province.

OUTLOOK

The country encourages free-market policies to reactivate its economy in addition to policies of gradual reduction in import tariffs and private investment with foreign participation.

Uruguay has no known gasfields or oilfields and only poor-quality coal. Most of the country's energy requirements will be supplied by hydroelectric plants; however, potential alternative energy resources could be provided by small uranium deposits for nuclear power and biogas generation using garbage. Unless exploration reveals significant exploitable mineral deposits or hydrocarbons, Uruguay's mineral sector is expected to remain of minor importance to the economy.

[1]Where necessary, values have been converted from Uruguayan New Pesos (N$) to U.S. dollars at the average market rate of N$2,674=US$1.00.

OTIIER SOURCES OF INFORMATION

Agencies

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Montevideo, Uruguay

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Montevideo, Uruguay

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Economic and Social Progress in Latin America, 1989 Report.

TABLE 1

URUGUAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991e
Aluminum, secondary		56	65	e42	e42	42
Barite		e15	15	15	e15	15
Cement, hydraulic		401,000	434,000	560,000	e500,000	500,000
Clays, unspecified[e]		150,000	2130,170	150,000	150,000	150,000
Coke, gashouse[e]		8,000	8,000	8,000	8,000	8,000
Corundum[e]		40	245	45	45	45
Feldspar		e1,000	2,787	r2,680	r3,000	3,000
Gemstones, semiprecious:[e]						
Agate		90	2142	90	100	100
Amethyst		20	279	20	80	80
Gypsum[e]		100,000	2145,10	r145,000	145,000	145,000
Iron and steel: Iron ore		—	2,545	5,000	e5,000	5,000
Metal:						
Ferroalloys: Electric-furnace ferrosilicon crust[e]		250	250	250	250	250
Steel, crude		30,200	r29,971	r37,150	r34,400	40,000
Semimanufactures		43,500	18,000	e18,000	e18,000	18,000
Lime		13,000	e10,000	12,000	e12,000	12,000
Petroleum refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	580	e600	e600	698	700
Gasoline	do.	1,540	e1,550	e1,550	1,849	1,850
Jet fuel	do.	264	e300	e300	201	200
Kerosene	do.	457	e500	e500	409	410
Distillate fuel oil	do.	3,290	e3,300	e3,300	2,963	2,970
Lubricants	do.	56	e60	e60	60	60
Residual fuel oil	do.	2,418	e2,500	e2,500	2,573	2,580
Unspecified	do.	826	e800	e800	501	500
Refinery fuel and losses[e]	do.	20	20	20	229	30
Total	do.	9,451	e9,630	e9,630	9,283	9,300
Sand and gravel:[e]						
Sand, common	thousand metric tons	1,500	21,240	1,500	1,500	1,500
Gravel	do.	500	500	500	500	500
Stone:[e]						
Dimension		10,000	10,000	10,000	10,000	10,000
Crushed and broken:						
Alum schist		8,000	8,000	8,000	8,000	8,000
Dolomite		3,000	218,990	r19,000	r19,000	19,000
Limestone		700,000	2749,63	750,000	750,000	750,000
Marble		5,000	22,557	4,000	4,000	4,000
Marl		7,000	7,000	7,000	7,000	7,000
Quartz		300	279	300	300	300
Other, including ballast	thousand metric tons	2,000	2,000	2,000	2,000	2,000
Sulfur, elemental, byproduct[e]		2,000	2,000	2,000	2,000	2,000
Talc, soapstone, pyrophyllite[e]		1,500	21,460	1,500	1,500	1,500
Tuff: Tufa[e]		3,500	3,500	3,500	3,500	3,500

eEstimated. rRevised.

[1]Includes data available through July 1, 1992.

[2]Reported figure.

TABLE 2

URUGUAY: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
METALS					
Aluminum:					
Oxides and hydroxides		5	2	—	All to Paraguay.
Metal including alloys, semimanufactures		321	663	—	Brazil 287; Argentina 190; Japan 41.
Copper: Metal including alloys:					
Unwrought		—	282	—	All to Argentina.
Semimanufactures		4	33	—	Netherlands 30; West Germany 2.
Gold: Metal including alloys, unwrought and partly wrought	kilograms	—	1,482	—	All to Canada.
Iron and steel: Metal:					
Steel, primary forms		2	2	—	Mainly to Argentina.
Semimanufactures:					
Bars, rods, angles, shapes, sections		1,787	350	—	All to Argentina.
Universals, plates, sheets		2,699	1,344	—	Brazil 1,308; Argentina 28.
Hoop and strip		250	382	—	All to Argentina.
Wire		3,741	930	—	Argentina 707; Brazil 201; Chile 22.
Tubes, pipes, fittings		3,674	2,484	—	Brazil 2,396; Argentina 88.
Castings and forgings, rough		12	2	1	Argentina 1.
Lead: Metal including alloys:					
Scrap		—	1,100	—	All to Argentina.
Semimanufactures		1	—		
Platinum-group metals: Metals including alloys, unwrought and partly wrought	value, thousands	—	$4	—	All to West Germany.
Zinc: Oxides		246	328	—	All to Brazil.
INDUSTRIAL MINERALS					
Cement		36,651	37,866	—	Do.
Clays, crude		—	20	—	Do.
Fertilizer materials: Manufactured:					
Nitrogenous		36	—		
Phosphatic		54,764	34,310	—	Brazil 32,200; Argentina 1,910; Chile 200.
Unspecified and mixed		19,219	21,897	—	Brazil 17,755; Paraguay 2,698; Bolivia 1,425.
Precious and semiprecious stones other than diamond, natural	value, thousands	$681	$778	$277	West Germany $349; Switzerland $31.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		43	86	—	Argentina 64; Brazil 22.
Sulfate, manufactured		4,404	7,650	—	Brazil 2,977; Argentina 2,744; Peru 622.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		18,603	14,166	—	Japan 9,379; Argentina 1,298; Italy 1,250.
Worked		653	1,189	152	Argentina 452; Belgium-Luxembourg 247; Italy 157.
Gravel and crushed rock		5,607	—		
Sand other than metal-bearing		134,2200	97,350	—	All to Argentina.

See footnotes at end of table.

TABLE 2—Continued

URUGUAY: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Destinations, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sulfur:					
Elemental: Crude including native and byproduct		250	—		
Sulfuric acid		5,469	4,613	—	Argentina 3,224; Brazil 1,389.
Talc, steatite, soapstone, pyrophyllite		140	20	—	All to Argentina.
Other: Slag and dross, not metal-bearing		70	187	—	Argentina 142; Brazil 45.
MINERAL FUELS AND RELATED MATERIALS					
Petroleum refinery products:					
Gasoline	42-gallon barrels	5,228	272	—	Argentina 187; unspecified 85.
Lubricants	do.	3,108	1,708	—	Brazil 161; Peru 29; Ecuador 27.

[1]Table prepared by H. D. Willis.

TABLE 3

URUGUAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Sources, 1990	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	1,661	1,335	1	Brazil 1,223; West Germany 88; United Kingdom 19.
Metal including alloys:				
Scrap	1,439	2,090	—	Argentina 2,042; Brazil 47; United Kingdom 1.
Semimanufactures	536	681	6	Brazil 314; Argentina 311; Venezuela 16.
Chromium: Oxides and hydroxides	14	17	—	West Germany 10; Argentina 7.
Cobalt: Oxides and hydroxides	1	2	—	Belgium-Luxembourg 1; West Germany 1.
Copper: Metal including alloys:				
Unwrought	101	2	—	Mainly from Argentina.
Semimanufactures	2,645	1,934	(2)	Chile 1,071; Peru 345; Brazil 344.
Iron and steel:				
Iron ore and concentrate: Pyrite, roasted	5,666	3,919	—	Brazil 3,374; Paraguay 495; China 50.
Metal:				
Scrap	2,405	4,463	—	Paraguay 3,493; Brazil 970.
Pig iron, cast iron, related materials	1,802	349	(2)	Paraguay 275; Argentina 58; Brazil 16.
Ferroalloys, unspecified	908	632	—	Brazil 544; Argentina 45; Republic of South Africa 30.
Steel, primary forms	12,951	7,583	81	Argentina 4,277; Brazil 2,446; United Kingdom 237.
Semimanufactures:				
Bars, rods, angles, shapes, sections	17,362	11,444	1	Brazil 7,232; Argentina 2,844; Poland 837.
Universals, plates, sheets	47,304	49,300	321	Brazil 29,065; Argentina 16,488; Republic of South Africa 1,439.
Hoop and strip	1,015	1,512	37	Brazil 790; West Germany 340; Canada 140.

See footnotes at end of table.

TABLE 3—Continued

URUGUAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Sources, 1990	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued:				
Metal—Continued:				
Semimanufactures—Continued:				
Rails and accessories	28	—		
Wire	1,595	1,149	4	Brazil 705; Argentina 396; Italy 16.
Tubes, pipes, fittings	2,192	1,849	3	Brazil 797; Argentina 773; Republic of South Africa 131.
Castings and forgings, rough	446	515	30	Brazil 235; Argentina 148.
Lead:				
Oxides	89	121	—	Argentina 99; Mexico 22.
Metal including alloys:				
Scrap	1,137	856	—	Argentina 762; Mexico 94.
Semimanufactures	3	2	—	All from Netherlands.
Magnesium: Metal including alloys:				
Scrap	5	4	4	
Semimanufactures	10	10	4	Italy 5; Argentina 1.
Manganese: Oxides	10	9	5	West Germany 4.
Mercury kilograms	1,000	7,000	NA	Mainly from Netherlands.
Molybdenum: Metal including alloys, unwrought including waste and scrap value, thousands	$11	$12	$5	Netherlands $7.
Nickel:				
Matte and speiss	11	6	—	Mainly from Canada.
Metal including alloys, semimanufactures	39	14	(2)	France 12; Canada 1; West Germany 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified value, thousands	$9	$12	—	All from West Germany.
Silver: Metal including alloys, unwrought and partly wrought do.	$9	$8	—	Chile $4; Argentina $1; West Germany $1.
Tin: Metal including alloys:				
Unwrought	28	14	—	All from Brazil.
Semimanufactures	4	1	—	NA.
Titanium: Oxides	21	19	6	United Kingdom 10; West Germany 3.
Tungsten: Metal including alloys, unwrought including waste and scrap value, thousands	$2	$16	$1	Austria $6; Brazil $5; United Kingdom $4.
Uranium and thorium: Oxides and other compounds do.	$54	$289	$13	Japan $233; Mexico $24; Bolivia $14.
Zinc:				
Oxides	23	50	—	Argentina 45; France 4; West Germany 1.
Metal including alloys:				
Unwrought	1,487	1,455	—	Mexico 1,084; Argentina 316; Peru 42.
Semimanufactures	21	41	3	Argentina 13; Netherlands 12; West Germany 11.
Other:				
Oxides and hydroxides	84	33	4	West Germany 19; Italy 5.
Ashes and residues	357	285	22	Chile 145; Mexico 72; Peru 45.

See footnotes at end of table.

TABLE 3—Continued

URUGUAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1989	1990	Sources, 1990	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	560	913	17	Argentina 884; Italy 7.
Grinding and polishing wheels and stones	153	187	1	Brazil 66; Czechoslovakia 26; Italy 22.
Asbestos, crude	1,509	1,794	—	Brazil 1,464; Zimbabwe 226.
Barite and witherite	49	25	1	Brazil 14; Argentina 10.
Boron materials:				
Crude natural borates	717	641	—	Argentina 231; Chile 210; Peru 201.
Oxides and acids	432	231	8	Argentina 221; West Germany 2.
Cement	69	100	10	France 56; Argentina 34.
Chalk	13	14	3	Argentina 11.
Clays, crude	5,314	8,139	445	Brazil 5,810; Argentina 1,848.
Diatomite and other infusorial earth	153	195	10	Mexico 146; Argentina 33.
Feldspar, fluorspar, related materials	31	120	—	All from Argentina.
Fertilizer materials:				
Crude, n.e.s.	—	6	—	All from Chile.
Manufactured:				
Ammonia	419	359	(2)	Argentina 238; Brazil 121.
Nitrogenous	58,215	53,517	19,190	Brazil 18,016; East Germany 11,000.
Phosphatic	32,433	25,647	25,501	Republic of South Africa 146.
Potassic	17,754	12,936	5,500	West Germany 7,005; Brazil 431.
Unspecified and mixed	57,631	55,035	44,759	Brazil 9,568; Belgium-Luxembourg 611.
Graphite, natural	9	27	—	West Germany 14; Brazil 13.
Gypsum, plaster, and calcareous stone	2,684	1,474	—	Argentina 1,039; West Germany 434.
Magnesium compounds: Magnesite, crude	25	51	3	West Germany 27; Netherlands 9; Brazil 4.
Mica:				
Crude including splittings and waste	31	45	9	Norway 18; Brazil 15.
Worked including agglomerated splittings	2	3	—	Spain 2; Belgium-Luxembourg 1.
Phosphates, crude	72,200	56,236	—	Panama 41,236; Tunisia 15,000.
Pigments, mineral: Iron oxides and hydroxides, processed	169	150	1	Argentina 78; West Germany 60; Spain 11.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$5	$21	$9	Brazil $9; Israel $3.
Synthetic do.	$16	$25	$4	Switzerland $21.
Salt and brine	78,706	67,816	35	Chile 62,284; Argentina 5,270; West Germany 219.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	9,529	16,649	4,676	Spain 6,753; Poland 2,074.
Sulfate, manufactured	2,496	2,776	1	Spain 1,878; Chile 443; Mexico 150.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,596	2,042	—	Argentina 1,030; Brazil 979; Italy 33.
Worked	275	248	—	Argentina 207; Italy 25; Brazil 16.
Dolomite, chiefly refractory-grade	259	146	—	All from Brazil.
Quartz and quartzite	151	215	—	Argentina 214; Brazil 1.
Sand other than metal-bearing	24	1	—	All from West Germany.

See footnotes at end of table.

TABLE 3—Continued

URUGUAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1989	1990	Sources, 1990	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sulfur:					
Elemental:					
Crude including native and byproduct		18,700	14,000	—	All from Canada.
Colloidal, precipitated, sublimed		1	2	(2)	Mainly from West Germany.
Sulfuric acid		1	1	—	Do.
Talc, steatite, soapstone, pyrophyllite		26	11	4	West Germany 4; Brazil 3.
Other: Crude		660	776	28	Republic of South Africa 430; Australia 107; Spain 103.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		1	29	NA	NA.
Carbon: Carbon black		2,502	2,975	55	Argentina 2,759; Brazil 130.
Coal: Anthracite		71	247	51	Argentina 196.
Coke and semicoke		214	111	—	All from Argentina.
Peat including briquets and litter		81	36	—	Do.
Petroleum:					
Crude	thousand 42-gallon barrels	5,536	8,864	—	Iran 3,060; Mexico 1,760; U.S.S.R. 1,756.
Refinery products:					
Liquefied petroleum gas	do.	91	(2)	—	All from Brazil.
Gasoline	do.	17,189	2,013	247	Brazil 650; Argentina 583.
Mineral jelly and wax	do.	6	6	(2)	Argentina 4; Brazil 1.
Lubricants	do.	12	8	1	West Germany 6.
Bituminous mixtures	do.	(2)	(2)	—	All from Argentina.
Petroleum coke	do.	16	31	NA	NA.

NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

TABLE 4

URUGUAY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Administración Nacional de Combustibles, Alcohol y Portland (Government, 100%)	Minas and Paysandu Plants, Montevideo	1,000
Dolomite		do.	Lavalleja, 250 kilometers east of Montevideo	30
Gold	kilograms	Bond International Gold (private, 100%)	Mahoma, 130 kilometers from Montevideo	930
Do.	do.	BIG Resources Management, Pty. Ltd. (private, 100%)	Mahoma Sur, San José Department	1,800
Do.	do.	Stell S.A. (private, 100%)	Minas de Corrales, Rivera Department	1,440
Petroleum products	thousand 42-gallon barrels	Administración Nacional de Combustibles, Alcohol y Portland (Government, 100%)	Refinería de la Teja, Montevideo	13,400

TABLE 4—Continued

URUGUAY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Steel	Industria Nacional Laminadora S.A. (Government, 43%; private, 57%)	Planta Pandos and Barros Arana near Montevideo	60
Talc	Minas de Talco Narancio S.A. (private, 100%)	Minas de Talco in Colonia and Lavalleja Departments	1,460

VENEZUELA

AREA 911,700 km² **POPULATION 20.7 million**

THE MINERAL INDUSTRY OF

VENEZUELA

By Staff

Historically, petroleum production has dominated the Venezuelan mineral industry, and 1991 was no exception. Although petroleum revenues accounted for approximately 23% of the nation's GDP, the nonfuel mining sector's estimated contribution was only about 1%. Within the Latin American region, Venezuela increased its position as a producer of bauxite.

By the end of 1991 political unrest still had not abated. The GDP had climbed 33%, in Venezuelan bolivars, from the year before to a new high of $53.4 billion.[1] The real growth rate was about 10.4%, still the highest in the hemisphere and rivaled only by certain Southeast Asian countries. The value of mineral production increased sharply, and Venezuela seemed to have the resources and opportunities for major investment. Inflation was a factor to be reckoned with, however, amounting to about 31% for the year.

The machinery for accommodating investment, particularly foreign investment in Venezuela's petroleum industry, had not been entirely conducive because of excessive taxation and the lack of enforcement of private contracts, giving rise to wariness on the part of some potential sources. However, in addition to the passage of more moderate tax laws during the year, there were signs in political circles that the problems were understood and would receive increased attention in the months to come. The Government was instrumental in increasing petroleum production during the Gulf War.

GOVERNMENT POLICIES AND PROGRAMS

Venezuela continued its efforts to shift the economy from Government control to one operated by free market forces. In July, the Congress approved the administration plan to reform the Venezuelan income tax law. The revised law lowered the rate for corporations from 60% to 30%. This included those firms engaged in mining "...and certain joint venture hydrocarbon activities." The exploitation tax was reduced from 6% to 2%, and foreign-made equipment was allowed to enter the country duty free. The new law went into effect on September 1. It was hoped that the new tax law would work to expand the mining and hydrocarbon sectors.

A spokesperson for the Finance Ministry predicted that the revised tax law would generate less revenue for the first 2 years but would bring in increased monies in the following years. The new laws make Venezuela more attractive to investors; consequently, economic activity and taxable income are expected to increase significantly. Economic contracts, however, are subject to frequent intervention by the Government in the areas of prices and wages, vitiating to some extent the reforms in taxation.

A joint Venezuela-United States Science and Technology Review meeting was held in Caracas in April. Memorandums of Understanding between the Ministry of Energy and Mines (MEM), Corporation Venezuelan de Gayana (CVG), and the U.S. Department of Interior agencies were discussed. These included geological studies by Interior personnel and computer modeling using the U.S. Bureau of Mines Mineral Resource Data System.

PRODUCTION

Production of mineral commodities was valued at more than $441 million, up 39% from that of the year before, owing mainly to increases in iron (67%) and coal (225%) mining. At 1.99 Mmt, bauxite production reached a new high. All of this was in spite of a 43% drop in gold output and a 3.3% drop in diamond production. Because the mining sector has customarily played a minor role in the Venezuelan economy, particularly in comparison with the petroleum industry, the Government has been encouraging increased mining activity. Although showing negative growth in the early 1980's, mining as a whole grew between then and 1991, achieving total consolidated net earnings of $140 million in the latter year. The mineral sector's principal products were aluminum, cement, diamonds, ferroalloys, gold, iron ore, iron and steel, petroleum, natural gas, and petroleum products. *(See table 1.)*

TRADE

Venezuela, Colombia, and Mexico agreed to sign an economic cooperation pact in 1992. The three countries established a committee to study the possibility of a land route connecting South and Central America through Panama. Venezuela and Colombia announced plans to study the possibility of connecting their natural gas supply lines.

During the year, problems surfaced with the trade agreement between Venezuela and the United States. Two areas, cement and shipping, were of special concern to the mineral industry. The two nations established a binational council to negotiate an improved agreement. The threat to Venezuelan shipping was the most significant because

it could affect all exports to the United States. A U.S. shipping firm complained that Venezuela was "foot dragging" on its application to operate a shipping route to Venezuela.

U.S. cement companies complained of unfair trade by Venezuela's cement industry. It was charged that Venezuelan cement prices were kept low with the aid of Government subsidies. Roughly one-half of Venezuela's cement exports was to the United States.

Venezuela and Romania signed a commercial trade agreement to establish "permanent institutional and communication links to increase...exchange of information on economic issues."

In order of volume, the major metal mineral commodities exported in 1990, the last year in which data were available, were fabricated steel, pig iron, unwrought aluminum, rolled steel, steel bars, primary steel, coated steels, aluminum oxides, aluminum semimanufactures, and manganese oxides.

Industrial mineral exports were nitrogenous fertilizer materials, ammonia, gypsum, gravel and crushed rock, sand, elemental sulfur, and carbon black. About $1 million in precious and semiprecious stone dusts and powders was also marketed abroad.

Mineral fuel exports to the United States included about 244 Mbbl of petroleum crude as well as 134 Mbbl of petroleum products. In 1991, Venezuela was the leading supplier in Latin America of crude and petroleum products combined to the United States, followed in importance by Mexico. *(See tables 2 and 3.)*

STRUCTURE OF THE MINERAL INDUSTRY

Historically, the major mineral producers have been predominately State-owned, but beginning in 1989 the Government has worked to privatize Venezuela's mineral industry. Comprising more than 450 separate companies, the industry anticipated increasing private investment in aluminum, coal, and petrochemicals, and perhaps later in steel and petroleum, which have not yet been opened up. In 1990, the mineral labor force totaled 47,000 in petroleum, 29,000 in iron and steel, and 26,000 in mining and quarrying. This was approximately 6% of the 1.7 million in the industrial sector of a labor force totaling 7.4 million overall. *(See table 4.)*

COMMODITY REVIEW

Metals

Alumina, Aluminum, and Bauxite.—In 1991, alumina output increased only 2,000 tons over that reported in 1990, while aluminum ingot production increased somewhat more than 10,000 tons. Bauxite production, however, skyrocketed from 771,000 tons in 1990 to 1,992,000 tons in 1991. Interalumina, the country's only alumina producer, completed a $350 million expansion that increased capacity from 1.3 Mmt/a to 2 Mmt/a. Interalumina processed bauxite from the Los Pijiguaos Mine.

In December, a spokesperson for Bauxiven, the country's only bauxite mine at Los Pijiguaos, noted that 1991 bauxite output would total a record of almost 2 Mmt. Production is expected to increase to the 3.5- to 4.0-Mmt/a level by mid-1992 when the main crusher and new ore transportation and storage systems are fully operational. Through 1991 Bauxiven had invested about $85 million on upgrading mine facilities.

Although production was up, the year was a poor one for the nation's alumina industry. At yearend, prices had declined from U.S. $1,500 per metric ton to U.S. $1,100 per metric ton, the latter price having been below the break-even cost for Venezuelan producers. Venalum, the largest State-owned aluminum producer, announced a 26% slump in profits and a plan to cut 10,000 workers in 1992 if prices failed to improve. Venalum blamed the slump on the U.S.S.R.'s dumping of 300,000 to 500,000 tons of aluminum on the world market.

In March, a consortium headed by Alcoa was awarded a contract to construct a 300,000-mt/a greenfield primary aluminum smelter. Alcoa's share of the venture was to be about 60%, and the shares of CVG and Grupo Sural of Venezuela would be about 15% each. The smelter was to be constructed at the Gulf of Cariaco in the State of Sucre.

In June, the Government approved debt-to-equity swaps for two additional smelter projects. Orinoco Holdings (a Korean consortium), Kaiser Aluminum, and CVG will build a 169,000-mt/a smelter using Granges Kaiser F 86 aluminum technology. The smelter site is near Ciudad Guayana and will use hydroelectric power generated by a plant on the nearby Orinoco River.

A second project involving CVG, the Franco Italian group Italimpianti, Alumix, Techint, Pechiney, and the Venezuelan private sector will add 215,000 mt/a to Venezuela's alumina capacity.

If constructed, the three new smelters, along with the 230,000-mt/a fifth potline at the Alcasa State-owned smelter, would raise Venezuela's primary aluminum production to 1,615,000 mt/a. However, in November Alcoa announced plans to postpone the 300,000-mt/a smelter project, citing "industry conditions that have gone from boom to bust."

Gold.—Venezuela's 1991 gold output, 4,215 kg, fell almost 3,500 kg below the 1990 estimate. This represented only reported production and did not include output by unlicensed miners. An industry spokesperson blamed the decline on "a change to more environmentally friendly gold mining techniques." During the years 1988-90, Venezuela's gold production had grown at 2%, then 10%, and finally 99% before the slump in 1991.

Monarch Resources and CVG's joint gold tailings retreatment plant, Revemin II, was reported to be in production at an annual rate of about 900 kg. Minerven, the State-owned mining company, announced plans to double the treatment capacity at the plant at the Colombia mine. When completed, the facility will have the capability of treating 1,500 mt/d of gold ore.

Caromin Mining Co. sold its 3,707-ha Alfa concession in the Guri El Merey mining district to a subsidiary of Gold Reserve Corp., Cia. Minera Uniornio S.A. The new owners plan to produce 60 kg/a of gold and 2,000 carats per month of diamonds from the district's alluvial deposits on the Caromin River.

Cyprus Minerals announced that it would abandon the La Comorra joint-venture gold project with Monarch Resources. Monarch will continue the project, which, upon completion, will be the first private underground gold mine developed in the country in 50 years.

Iron Ore.—CVG Ferrominera Orinoco C.A. operated the San Isidro Cerro Boliver and Los Barrancos Mines. Ore output rose almost 1 Mmt over the production reported in 1990.

Iron and Steel.—The year marked the first full year of production for the 600,000-mt/a Midrex direct reduction plant. Output from the hot briquetted iron plant was exported to the United States, Europe, and Southeastern Asia. The new plant boosted Venezuela's direct-reduced iron (DRI) capacity to 3 Mmt/a. Production of DRI in 1991 was 3.5 Mmt.

Industrial Minerals

Production data were reported for 12 industrial minerals. Production rose for cement, gemstones, feldspar, gypsum, and kaolin. Output declined for common clay, diamonds, industrial nitrogen, phosphate rock, sand and gravel, silica sand, and stone.

At yearend, the U.S. Department of Commerce (DOC) was conducting an antidumping investigation of Venezuelan cement and clinker exports to the United States. Approximately one-half of Venezuela's exports was to the United States, or 2.5 Mmt in 1990. The Venezuelan producers argued that the dumping charges were "blatant protectionism." A DOC decision on the charges was expected early in 1992.

Mineral Fuels

Coal.—The state coal company, Carbozulia S.A., announced plans to increase production from the 1.5 Mmt mined in 1990 to 11.5 Mmt in 1996. The increase will involve the opening of several new mines in the Guasare coalfield and require investments of approximately $1.8 billion in joint ventures to be shared by Carbozulia and international partners.

About $50 million was spent on the El Paso Diablo Mine, which produced about 85% of the 1.5 Mmt exported in 1990, the most recent year with available data. With these expenditures, production capacity was raised to 2.5 Mmt.

Several companies conducted coal exploration programs in the Guasare region. These included Shell Coal International, Veba A.G. of Germany, and Massey Coal Co. Coal from mines in this region was shipped through the Port of Maracaibo to Western Europe, primarily Italy.

The Ministry of Mines approved a long-term permit for the British Young Group PLC to expand the coal reserves of its subsidiary, Carbones de Naricula CA. Mining operations are to be expanded to allow the company to ship 1 Mmt of coal to United Kingdom electric generating plants.

Natural Gas and Petroleum Crude.—Production of crude in 1991 averaged 2.338 Mbbl/d, plus 37,000 bbl/d of condensates and 117,000 bbl/d of natural gas liquids, amounting overall to 2.492 Mbbl/d of hydrocarbon liquids, the highest output since 1973. Production of natural gas averaged 120 Mm^3/d, with about 31% of this having been reinjected for reservoir stimulation.

The Venezuelan Government increased petroleum production during the Gulf War at the request of its allies. The reformation of the country's restrictive income tax law was believed to have been the final step in initiating a new $3 billion natural gas project.

Early in the year, British Petroleum announced that it would not participate in the development of the Orinoco heavy oil belt. The company had signed a letter of intent to determine the possibility of a joint venture to upgrade and refine the extra heavy crude.

Late in 1990, Petróleos de Venezuela SA announced plans to drill five horizontal wells in the Barina, Anaco, and San Tome crude fields. The project, scheduled for 1991, was projected to increase production threefold.

Reserves

Venezuela has significant reserves of bauxite, coal, gold, iron ore, natural gas, and petroleum. The reserves of the country's major mineral commodities, as projected by Government officials are shown in *(See table 5.)*

INFRASTRUCTURE

Venezuela's rail system had 542 km of single-track 1.435-m-gauge rail, 363 km of this being Government owned and the remainder privately owned. The country's road system consisted of 22,780 km of paved highway and 24,720 km of gravel-surfaced roadway. An additional 14,450 km was loose-surface road, and 15,835 km was unimproved loose-surface road. The country had 308 airports, 287 of them in usable condition; 135 of them had paved runways. No runways exceeded 3,659 m; 14 had runways 2,440 to 3,659 m long and 88 had runways 1,220 to 2,439 m long. Venezuela's navigable waterways for oceangoing vessels totaled 7,100 km, including the Orinoco River and Lake Maracaibo. The country's hydrocarbon pipeline system consisted of 6,370 km for crude petroleum, 480 km for refined products, and 4,010 km for natural gas. Thirty of the 58 ships in the Venezuelan merchant marine were available for mineral products transportation.

Coal produced in the Guasare coal basin was hauled by highway trucks approximately 85 km to the Santa Cruz port facilities on Lake Maracaibo, and then barged by canal to oceangoing vessels. Plans were being considered for construction of a railroad and new port

facilities to expedite coal exports.

OUTLOOK

The tax reform enacted in midyear was expected to stimulate foreign investment in the hydrocarbon and other mineral industries. The Ministry of Energy and Mines acted to break a backlog of approximately 800 applications for mining contracts and concessions; almost 100 had been approved by midyear.

The suspension of the Government's plans to invest in two greenfield aluminum smelters, which would have raised capacity to more than 330,000 mt/a, signaled severe trouble with plans to raise aluminum output. Venezuela expected to increase coal output by 20 to 25 mt/a by the end of the decade by developing four new mines in the Guasare coal basin.

Venezuela is endowed with natural resources that could make the country relatively wealthy provided political stability, technology, and infrastructure are encouraged to develop in such a way as to build a strong economic base. The country may be expected to continue its efforts toward diversification of its mineral sector to reduce its heavy dependency on petroleum.

[1]Where necessary, values have been converted from Venezuelan bolivars (Bs) to U.S. dollars at the rate of Bs56.90=US$1.00, the average exchange rate for 1991.

OTHER SOURCES OF INFORMATION

Agencies

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Caracas, Venezuela
Dirección General Sectorial de Minas
Ministerio de Energía y Minas
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TABLE 1

VENEZUELA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
METALS						
Aluminum:						
Bauxite		245,157	521,504	701,770	771,422	1,992,348
Alumina		1,360,000	1,284,000	e1,350,000	1,293,000	1,295,000
Metal, primary, unalloyed		428,013	436,703	539,647	590,379	600,544
Gold, mine output, Au content	kilograms	3,417	3,502	3,867	7,700	4,215
Iron and steel:						
Iron ore and concentrate	thousand tons	17,782	18,932	18,390	20,365	21,241
Metal:						
Pig iron	do.	473	503	489	314	—
Direct-reduced iron	do.	3,151	2,710	2,773	r3,085	3,476
Total	do.	3,624	3,213	3,262	r3,399	3,476
Ferroalloys:						
Ferrosilicomanganese	do.	28	34	r32	e29	e30
Ferrosilicon[2]	do.	52	51	e55	e55	e55
Total	do.	80	85	r e87	84	85
Steel, crude	do.	3,297	3,165	2,941	r3,176	3,119
Semimanufactures, hot-rolled	do.	3,081	2,994	2,734	r2,335	2,609
Lead, secondary, smelter		18,000	10,000	13,000	14,000	6,000
INDUSTRIAL MINERALS						
Amphibolite	thousand tons	261	174	144	188	212
Cement, hydraulic	do.	6,110	6,199	4,510	5,230	6,337
Clays:						
Kaolin	do.	30	28	15	12	39
Other	do.	2,176	2,239	1,903	3,057	2,747
Diamond:						
Gem	carats	37,880	53,704	69,724	e85,000	102,034
Industrial	do.	67,767	74,701	184,846	e248,000	111,523
Total	do.	105,647	128,405	254,570	333,000	213,557
Feldspar	thousand tons	43	97	97	91	138
Gypsum	do.	247	221	332	201	244
Nitrogen, N content of ammonia	do.	577	481	532	648	479
Phosphate rock	do.	99	e100	237	165	162
Pyrophyllite[e]		32,000	32,000	32,000	32,000	32,000
Salt, evaporated		e500,000	e500,000	r365,000	r439,400	430,000
Serpentinite, crushed[e]		580,000	580,000	550,000	550,000	550,000
Stone, sand and gravel:						
Stone:						
Dolomite	thousand tons	257	313	383	300	e300
Granite	do.	418	353	440	262	370
Limestone	do.	17,520	16,775	15,371	12,563	11,440
Marble	do.	—	101	—	—	—
Sand and gravel	do.	7,226	7,305	5,789	5,332	4,608
Silica, sand	do.	455	455	378	443	343
Sulfur, byproduct of petroleum and natural gas		e125,000	e125,000	e125,000	105,760	82,855

See footnotes at end of table.

TABLE 1—Continued

VENEZUELA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	1989	1990	1991[p]
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]	thousand tons	61	60	60	60	60
Coal, bituminous	do.	238	1,072	2,113	2,190	2,700
Gas, natural:						
Gross	million cubic meters	36,600	e28,500	38,097	40,516	42,326
Marketed	do.	e13,180	e12,750	e14,160	15,600	25,427
Natural gas liquids:[3]						
Natural gasoline	thousand 42-gallon barrels	r7,930	r7,290	r7,380	r e7,500	e8,190
Liquefied petroleum gas	do.	r25,462	r27,248	r29,963	r e30,044	e33,290
Total	do.	r33,392	r34,538	r37,343	r e37,544	e41,480
Petroleum:						
Crude[4]	do.	664,125	690,916	696,407	770,133	871,762
Refinery products:						
Liquefied petroleum gas	do.	2,768	r3,650	r3,650	2,920	e3,000
Gasoline:						
Aviation[e]	do.	5286	r240	r300	r178	350
Motor	do.	76,884	r96,360	r93,440	r e122,111	115,227
Naphtha[e]	do.	518,760	15,000	r17,000	22,000	6,000
Jet fuel	do.	21,229	r22,995	r21,535	r e24,000	28,058
Kerosene	do.	32,640	r2,920	r2,190	r2,325	803
Distillate fuel oil	do.	76,884	r94,170	r84,680	r99,934	106,952
Lubricants	do.	2,566	r2,920	r2,920	r e2,975	2,946
Residual fuel oil	do.	89,760	r105,850	r100,000	r e89,217	106,952
Asphalt and bitumen	do.	11,983	r e9,000	r e9,000	r12,120	9,037
Refinery fuel gas[e]	do.	57,400	r8,500	r8,200	9,000	9,100
Unspecified[e]	do.	522,640	r3,760	r10,030	r1,365	1,213
Total[e]	do.	5363,800	r365,365	r352,945	r388,145	389,638

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

[1]Table includes data available through May 30, 1992.

[2]Figures represent combined 45% silicon content and 75% silicon content production.

[3]From nonassociated natural gas only.

[4]Includes associated natural gas lease condensate and natural gasoline. Lease condensate is included as follows, in thousand 42-gallon barrels: 1987—60,225; 1988—68,620; 1989—58,400; 1990—13,505; and 1991—14,600. Natural gasoline is included as follows, in thousand 42-gallon barrels: 1987—34,310; 1988—35,770; 1989—39,420; 1990—41,610; and 1991—not available.

[5]Reported figure.

TABLE 2

VENEZUELA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1990	Destinations, 1990	
		United States	Other (principal)
METALS			
Aluminum:			
Oxides and hydroxides	83,608	6,115	Brazil 70,055; Tunisia 4,144.
Metal including alloys:			
Scrap	31,708	6,640	Netherlands 20,778; Colombia 1,217.
Unwrought	452,178	76,423	Japan 224,426; Netherlands 100,135.
Semimanufactures	87,823	27,048	Netherlands 43,624; Mexico 6,875.
Antimony: Metal including alloys, all forms	44	—	All to Colombia.
Chromium: Oxides and hydroxides	35	—	Costa Rica 18; Trinidad and Tobago 16.
Copper:			
Ore and concentrate	340	102	Italy 238.
Matte and speiss including cement copper	4,185	1,550	West Germany 683; Italy 561.
Metal including alloys:			
Scrap	8,654	4,101	West Germany 1,248; Republic of Korea 1,077.
Unwrought	941	435	Colombia 162; Netherlands 93.
Semimanufactures	2,074	675	Colombia 1,226; West Germany 67.
Iron and steel:			
Iron ore and concentrate	100	—	All to Colombia.
Metal:			
Scrap	13,838	1,244	Colombia 12,402; Netherlands 65.
Pig iron, cast iron, related materials	453,648	153,453	Trinidad and Tobago 217,893; Egypt 30,000.
Ferroalloys:			
Ferrosilicon	29,123	18,880	Japan 6,000; Netherlands 3,300.
Ferrosilicomanganese	2,156	1,250	Trinidad and Tobago 650; Colombia 256.
Steel, primary forms	273,887	67,901	Iran 29,584; Turkey 25,000.
Semimanufactures:			
Flat-rolled products:			
Of iron or nonalloy steel:			
Not clad, plated, coated	355,633	64,674	Colombia 103,562; Thailand 59,105.
Clad, plated, coated	38,903	7,087	Mexico 7,057; Italy 5,686.
Of alloy steel	6,883	43	Thailand 3,379; Colombia 3,190; Jamaica 108.
Bars, rods, angles, shapes, sections	306,772	23,067	Hong Kong 62,827; Mexico 30,229; Thailand 27,181.
Rails and accessories	34,358	20,318	Japan 9,300; Trinidad and Tobago 3,110.
Wire	11,101	4,109	Jamaica 849; Panama 799.
Tubes, pipes, fittings	460,707	127,743	Trinidad and Tobago 173,379; Colombia 20,967.
Lead:			
Oxides	66	4	Dominican Republic 54; Jamaica 8.
Metal including alloys:			
Scrap	612	—	All to Brazil.
Unwrought	3,438	397	Dominican Republic 1,663; Trinidad and Tobago 707.
Semimanufactures	296	232	Dominican Republic 60; Cuba 3.
Magnesium: Metal including alloys, scrap	11	11	

See footnotes at end of table.

TABLE 2—Continued

VENEZUELA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Destinations, 1990	
			United States	Other (principal)
METALS—Continued				
Manganese:				
Ore and concentrate, metallurgical-grade		98	—	All to Ecuador.
Oxides		36,627	5,798	Brazil 30,290; Japan 500.
Metal including alloys, all forms		10	—	All to Colombia.
Nickel:				
Matte and speiss		37	—	All to Mexico.
Metal including alloys:				
Scrap		1	NA	NA.
Unwrought	value, thousands	$1	—	All to Norway.
Silicon, high-purity		19	—	Colombia 16; Netherlands Antilles 3.
Silver: Metal including alloys, unwrought and partly wrought	value, thousands	$497	$390	Switzerland $92; Cuba $12.
Tin: Metal including alloys:				
Scrap		1,198	1,198	
Semimanufactures		2	1	Peru 1.
Titanium: Oxides		10	—	All to Colombia.
Tungsten: Metal including alloys, semimanufactures	value, thousands	$1	$1	
Zinc:				
Oxides		88	—	Costa Rica 39; Trinidad and Tobago 37; Barbados 10.
Metal including alloys:				
Scrap		20	20	
Semimanufactures[2]		1,190	1	Colombia 1,035; Italy 131; Netherlands 19.
Other:				
Oxides and hydroxides		50	23	Colombia 26.
Ashes and residues		1,089	317	Belgium-Luxembourg 772.
Precious metals waste and scrap	kilograms	1,433	1,410	Cuba 12; Netherlands Antilles 8.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.		1	—	All to Netherlands Antilles.
Artificial: Corundum		208	—	Brazil 191; Colombia 17.
Dust and powder of precious and semiprecious stones	value, thousands	$1,000	$751	Netherlands Antilles $205; Switzerland $31.
Grinding and polishing wheels and stones		63	2	Italy 34; Trinidad and Tobago 15; Netherlands Antilles 7.
Asbestos, crude		1,218	—	All to Chile.
Cement	thousand tons	2,469	1,355	Dominican Republic 323; Guadeloupe 226.
Barite and witherite		540	—	All to Aruba.
Clays, crude:				
Bentonite		119	—	Mainly to Colombia.
Kaolin		262	—	Colombia 186; Aruba 75.
Unspecified		17	—	All to Portugal.
Cryolite and chiolite		245	38	Colombia 207.

See footnotes at end of table.

TABLE 2—Continued

VENEZUELA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Destinations, 1990	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Diamond:				
Natural:				
Gem, not set or strung	value, thousands	$10,049	—	Belgium-Luxembourg $8,836; Israel $711; India $490.
Industrial stones	do.	$3,130	—	All to Belgium-Luxembourg.
Diatomite and other infusorial earth		17	—	All to Aruba.
Fertilizer materials:				
Crude, n.e.s.		14	—	Aruba 6; unspecified 8.
Manufactured:				
Ammonia		82,539	22,019	Chile 19,735; France 15,490.
Nitrogenous		410,648	93,729	Colombia 83,829; China 42,192.
Unspecified		7	—	Aruba 6; Jamaica 1.
Graphite, natural				
Gypsum and plaster		38,059	—	Trinidad and Tobago 26,000; Barbados 12,000.
Lime		2,903	15	Trinidad and Tobago 2,642; Antigua and Barbuda 114.
Magnesium compounds: Oxides and hydroxides		11	—	All to Colombia.
Mica: Worked including agglomerated splittings		38	18	Mexico 19; Netherlands Antilles 1.
Phosphates, crude		2		All to Trinidad and Tobago.
Pigments, mineral: Iron oxides and hydroxides, processed	value, thousands	$1	NA	NA.
Sodium compounds, n.e.s.: Sulfate, natural and manufactured		34	—	All to Netherlands Antilles.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		5,835	—	Trinidad and Tobago 4,766; Colombia 750; Netherlands Antilles 299.
Worked		885	353	Netherlands Antilles 271; Aruba 146.
Dolomite, chiefly refractory-grade		4,825	25	Trinidad and Tobago 4,800.
Gravel and crushed rock		25,575	—	Colombia 25,400; Netherlands Antilles 94; St. Vincent and the Grenadines 52.
Limestone other than dimension		40	—	All to Brazil.
Quartz and quartzite		3	3	
Sand other than metal-bearing		25,591	—	Costa Rica 24,000; U.S. Virgin Islands 1,000; Panama 280.
Sulfur:				
Elemental:				
Crude including native and byproduct		16,712	16,462	Costa Rica 250.
Colloidal, precipitated, sublimed		250	—	Guatemala 162; El Salvador 88.
Sulfuric acid		4	—	All to Netherlands Antilles.
Talc, steatite, soapstone, pyrophyllite		103	—	All to Colombia.
Other: Crude		8	—	Netherlands Antilles 3; unspecified 5.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black		13,924	—	Chile 6,036; Guatemala 2,250; Trinidad and Tobago 894.
Coal: Bituminous	thousand tons	1,711	217	France 458; Sweden 334.

See footnotes at end of table.

TABLE 2—Continued

VENEZUELA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Destinations, 1990	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum:				
Crude	value, millions	$8,700	NA	NA.
Refinery products:				
Gasoline	42-gallon barrels	144	—	All to Guatemala.
Bituminous mixtures	do.	364	—	All to United Kingdom.

NA Not available.
[1]Table prepared by H. D. Willis. Export data for 1989 and 1991 were not available at time of publication.
[2]Includes blue powder.

TABLE 3

VENEZUELA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Sources, 1990	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	value, thousands	$3	—	All from United Kingdom.
Alkaline-earth metals		79	55	France 20; West Germany 4.
Aluminum:				
Ore and concentrate	thousand tons	2,423	6	Brazil 1,341; Australia 711; Guyana 282.
Oxides and hydroxides		5,304	2,443	West Germany 1,764; Netherlands 654.
Metal including alloys:				
Scrap		257	157	Brazil 52; Netherlands Antilles 10.
Unwrought		258	12	Belgium-Luxembourg 112; Brazil 110; West Germany 13.
Semimanufactures		17,461	7,680	France 4,360; West Germany 4,153.
Antimony: Metal including alloys, all forms		17	17	
Beryllium: Metal including alloys, all forms	value, thousands	$2	$2	
Bismuth: Metal including alloys, all forms	do.	$2	$2	
Chromium:				
Ore and concentrate		3,383	383	Republic of South Africa 3,000.
Oxides and hydroxides		172	55	Colombia 65; West Germany 27.
Metal including alloys, all forms		7	6	United Kingdom 1.
Cobalt:				
Oxides and hydroxides		28	27	United Kingdom 1.
Metal including alloys, all forms		1	1	
Columbium and tantalum: Tantalum metal including alloys, semimanufactures	value, thousands	$1	$1	
Copper:				
Ore and concentrate		25	2	Aruba 23.
Matte and speiss including cement copper		4,255	1,421	Peru 1,594; Mexico 905.
Metal including alloys:				
Scrap		404	24	Colombia 353; Netherlands Antilles 12.
Unwrought		8,914	2,551	Peru 3,715; Mexico 1,315.
Semimanufactures		3,859	1,093	Peru 1,367; Mexico 363.
Gold: Metal including alloys, unwrought and partly wrought	kilograms	4,116	9	Italy 4,106; Spain 1.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	thousand tons	1,105	3	Australia 508; Brazil 379; Guyana 188.
Pyrite, roasted		19	17	Italy 2.
Metal:				
Scrap		84	60	Netherlands Antilles 20.
Pig iron, cast iron, related materials		116,118	595	Trinidad and Tobago 106,256; France 7,500; West Germany 928.
Ferroalloys:				
Ferrochromium		245	82	Netherlands 135; Mexico 20.
Ferromanganese		13,867	159	France 12,933; Republic of South Africa 330; Switzerland 259.

See footnotes at the end of table.

TABLE 3—Continued

VENEZUELA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Sources, 1990	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued:				
Metal—Continued:				
Ferroalloys—Continued:				
Ferronickel	value, thousands	$1	$1	
Ferrosilicon		18	18	
Ferrosilicomanganese		5	—	All from West Germany.
Unspecified		1,277	348	Brazil 674; Belgium-Luxembourg 138.
Steel, primary forms		5,289	1,194	Brazil 3,063; West Germany 895.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated		52,576	9,532	West Germany 20,536; Brazil 16,257.
Clad, plated, coated		1,058	843	Japan 93; France 52.
Of alloy steel		8,162	3,310	West Germany 1,251; Brazil 1,132.
Bars, rods, angles, shapes, sections		37,997	6,770	Trinidad and Tobago 8,364; Belgium-Luxembourg 6,340.
Rails and accessories		6,246	427	France 5,000; Belgium-Luxembourg 396.
Wire		539	365	Belgium-Luxembourg 74; Italy 37.
Tubes, pipes, fittings		424,034	69,061	Trinidad and Tobago 150,412; Brazil 63,928.
Lead:				
Ore and concentrate		16	16	
Oxides		1,600	75	Argentina 1,078; Mexico 210; Peru 175.
Metal including alloys:				
Scrap		798	777	Trinidad and Tobago 20; Italy 1.
Unwrought		8,213	1,133	Peru 6,785; Mexico 110.
Semimanufactures		135	24	United Kingdom 64; Mexico 21.
Magnesium: Metal including alloys:				
Unwrought		688	472	Norway 195; Canada 20.
Semimanufactures		205	50	Netherlands 152; Norway 1.
Manganese:				
Ore and concentrate: Metallurgical-grade		29,521	1	Brazil 23,576; Uruguay 3,944; Italy 2,000.
Oxides		3,703	2,558	Mexico 396; West Germany 242.
Metal including alloys, all forms		48	43	Republic of South Africa 4; Brazil 1.
Mercury		9	2	West Germany 6; Netherlands 1.
Molybdenum: Metal including alloys:				
Unwrought[2]	value, thousands	$1	—	All from West Germany.
Semimanufactures		3	3	
Nickel:				
Ore and concentrate	value, thousands	$1	$1	
Matte and speiss		44	8	Canada 18; Netherlands 13.
Metal including alloys:				
Scrap		10	7	Canada 3.
Unwrought		242	68	Italy 114; Canada 44.
Semimanufactures				

See footnotes at end of table.

TABLE 3—Continued

VENEZUELA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Sources, 1990	
			United States	Other (principal)
METALS—Continued				
Platinum-group metals: Metals including alloys, unwrought and partly wrought	value, thousands	$89	$70	West Germany $10; Italy $5.
Silicon, high-purity		1,575	264	Brazil 914; United Kingdom 161.
Silver: Metal including alloys, unwrought and partly wrought	value, thousands	$50	$17	Italy $18; West Germany $14.
Tin: Metal including alloys:				
Scrap		40	36	Brazil 4.
Unwrought		491	77	Chile 151; Brazil 132; Netherlands 101.
Semimanufactures		51	23	Italy 22; Colombia 1.
Titanium:				
Ore and concentrate		478	53	Australia 258; Netherlands 122.
Oxides		799	445	Norway 108; West Germany 103.
Metal including alloys:				
Unwrought[2]		3	3	
Semimanufactures		3	3	
Tungsten: Metal including alloys:				
Unwrought[2]		4	3	France 1.
Semimanufactures		3	2	Unspecified 1.
Uranium and thorium:				
Oxides and other compounds	value, thousands	$1	$1	
Uranium metal including alloys, all forms	do.	$156	$131	Canada $13; Spain $10.
Vanadium: Metal including alloys, all forms		7	7	
Zinc:				
Oxides		100,114	99,898	United Kingdom 161; Colombia 30.
Metal including alloys:				
Scrap		3	3	
Unwrought		13,255	33	Peru 12,348; Canada 849.
Semimanufactures[3]		1,389	348	Peru 646; West Germany 240.
Zirconium:				
Ore and concentrate		785	293	Republic of South Africa 301; West Germany 157.
Metal including alloys:				
Unwrought[2]	value, thousands	$1	$1	
Semimanufactures		1	(4)	Mainly from West Germany.
Other:				
Ores and concentrates	value, thousands	$3	$3	
Oxides and hydroxides		253	137	West Germany 56; Spain 22.
Ashes and residues		33	18	Aruba 15.
Base metals including alloys, all forms	value, thousands	$13	$6	Peru $7.
Metalloids[5]		32	8	West Germany 20; Chile 3.
Precious metals waste and scrap	kilograms	10,418	352	Italy 9,892; Mexico 133.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.		6,892	157	Ecuador 6,091; Guatemala 202.

See footnotes at end of table.

TABLE 3—Continued

VENEZUELA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Sources, 1990	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Abrasives, n.e.s.—Continued:				
Artificial: Corundum		6,023	48	Brazil 342; West Germany 231; unspecified Asia 5,299.
Dust and powder of precious and semiprecious stones	value, thousands	$35	$24	Spain $5; Denmark $2.
Grinding and polishing wheels and stones		221	36	Italy 74; West Germany 34.
Asbestos, crude		1,417	239	Canada 1,178.
Barite and witherite		80,738	12,211	Peru 29,025; Morocco 21,214; Brazil 12,408.
Boron materials:				
Crude natural borates		167	167	
Oxides and acids		32,261	31,310	Chile 424; Netherlands 306.
Bromine[6]		12	9	Brazil 1; Chile 1.
Cement		2,734	910	Netherlands 408; West Germany 264.
Chalk		271	—	France 235; West Germany 36.
Clays, crude:				
Bentonite		10,004	9,568	Colombia 366; Mexico 66.
Kaolin		20,373	19,035	Brazil 518; France 428.
Unspecified		1,923	1,843	France 66; Italy 7.
Cryolite and chiolite		1,327	555	Brazil 336; Netherlands 20.
Diamond, natural:				
Gem, not set or strung	value, thousands	$43	$43	
Industrial stones	do.	$271	$196	West Germany $42; Belgium-Luxembourg $26.
Unsorted	do.	$2	—	All from Switzerland.
Diatomite and other infusorial earth		2,837	1,808	Mexico 915; Chile 53.
Feldspar		575	510	West Germany 29; Netherlands 17.
Fertilizer materials:				
Crude, n.e.s.		19	—	All from Mexico.
Manufactured:				
Ammonia		130	1	Hong Kong 125; West Germany 4.
Nitrogenous		22,886	—	Trinidad and Tobago 20,327; Costa Rica 2,260; Austria 244.
Phosphatic		42,673	16,740	Norway 25,933.
Potassic		93,771	45,679	Canada 30,957; U.S.S.R. 17,128.
Unspecified and mixed		162,781	68,305	Norway 47,216; Italy 26,250.
Fluorspar		499	239	Mexico 110; West Germany 62.
Graphite, natural		1,525	578	Italy 330; West Germany 109.
Gypsum and plaster		34,464	647	France 33,574; Netherlands 80.
Lime		13	—	All from Panama.
Magnesium compounds:				
Magnesite, crude		37,567	5	Italy 15,784; Austria 5,260; Brazil 4,000.
Oxides and hydroxides		31,401	4,679	Brazil 5,500; Austria 5,234; Italy 3,981.
Mica:				
Crude including splittings and waste		230	164	West Germany 46; Switzerland 13.
Worked including agglomerated splittings		21	5	Colombia 12; Spain 2.
Nitrates, crude		55	—	All from Chile.

See footnotes at end of table.

TABLE 3—Continued

VENEZUELA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Sources, 1990	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Phosphates, crude		74,404	8	Republic of South Africa 74,382; Netherlands 14.
Pigments, mineral: Iron oxides and hydroxides, processed		231	64	West Germany 119; Argentina 30.
Precious and semiprecious stones other than diamond:				
Natural	value, thousands	$111	$59	West Germany $17; Italy $13.
Synthetic	do.	$86	$6	Belgium-Luxembourg $52; Italy $10.
Pyrite, unroasted		123	123	
Salt and brine		27,363	25	Netherlands Antilles 22,871; Netherlands 1,992; Aruba 1,000.
Sodium compounds, n.e.s.:				
Soda ash, natural and manufactured		110,370	107,647	Brazil 2,041; Poland 502.
Sulfate, natural and manufactured		33,224	10,971	Mexico 22,232; Poland 16.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		3,923	68	Italy 2,987; Peru 784; Spain 75.
Worked		323	35	Italy 186; Peru 98.
Dolomite, chiefly refractory-grade		326	114	Italy 212.
Gravel and crushed rock		249	7	Dominican Republic 150; Italy 91.
Quartz and quartzite		36	36	
Sand other than metal-bearing		2,051	1,957	Colombia 41; West Germany 20.
Sulfur:				
Elemental:				
Crude including native and byproduct		164	161	Hong Kong 3.
Colloidal, precipitated, sublimed		65	43	Colombia 18; France 3.
Dioxide	value, thousands	$1		All from Netherlands.
Sulfuric acid		30,398	9,728	Mexico 10,448; Spain 10,015.
Talc, steatite, soapstone, pyrophyllite		1,603	1,096	Brazil 157; Canada 125.
Vermiculite, perlite, chlorite		72	14	Mexico 56.
Other:				
Crude		5,506	1,525	Turkey 2,001; West Germany 610.
Slag and dross, not metal-bearing		1	1	
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		69,798	54,741	Argentina 15,000; West Germany 56.
Carbon: Carbon black		320	230	West Germany 65; Netherlands 24.
Coal:				
Anthracite		14,953	9,893	Spain 5,050; Colombia 10.
Bituminous		20,950	1,266	Colombia 19,684.
Briquets of anthracite and bituminous coal		298	—	All from Colombia.
Lignite including briquets		509	509	
Coke and semicoke		98,194	22,769	Colombia 55,620; Canada 19,800.
Petroleum:				
Crude	value, thousands	$178,631	$126,740	Colombia $15,570; Argentina $7,937.

See footnotes at end of table.

TABLE 3—Continued

VENEZUELA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1990	Sources, 1990	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum—Continued:				
Refinery products				
Liquefied petroleum gas	42-gallon barrels	37,978	37,793	Netherlands 70; France 58.
Gasoline	do.	1,592,806	1,479,450	Netherlands Antilles 113,296; Netherlands 34.
Mineral jelly and wax	do.	9,664	6,847	Spain 1,385; West Germany 771.
Kerosene and jet fuel	do.	488	8	Belgium-Luxembourg 480.
Distillate fuel oil	do.	827,269	698,002	Argentina 129,267.
Lubricants	do.	2,340,835	1,464,393	Colombia 727,867; Netherlands Antilles 62,286.
Residual fuel oil	do.	87	87	
Bitumen and other residues	do.	126,521	126,515	West Germany 6.
Bituminous mixtures	do.	4,266	3,660	Colombia 485; United Kingdom 121.
Petroleum coke	do.	657,904	451,512	Argentina 165,033; United Kingdom 40,876.

[1]Table prepared by H. D. Willis. Import data for 1989 and 1991 were not available at time of publication.
[2]Includes waste and scrap.
[3]Includes blue powder.
[4]Less than 1/2 unit.
[5]Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."
[6]Includes fluorine and iodine.

TABLE 4
VENEZUELA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	Interamericana de Alumina C.A. (INTERALUMINA) (Government, 88.7%; Aluminio Suizo S.A., 11.3%)	Ciudad Guayana, Bolívar State	1,300
Aluminum	Aluminio del Caroní S.A. (ALCASA) (Government, 72%; Reynolds International, Inc., 27.9%)	do.	300
Do.	Industria Venezolana de Aluminio C.A. (Government, 80%; 6 Japanese companies, 20%)	do.	366
Bauxite	CVG Bauxita Venezolana C.A.	Los Pijiguaos, Bolívar State	1,000
Cement	C.A. Venezolana de Cementos	Barquisimeto, Lara State Maracaibo, Zulia State Pertigalete, Anzoatequi State	2,750
Coal	Carbones del Guasare S.A.[1]	Paso Diablo, Zulia State Guasare coal basis	1,500
Gold	Revemin II (CVG, 49%; Monarch, 49%; public, 2%)	El Callao, Bolívar State	.9
Iron ore	C.V.G. Ferrominera del Orinoco C.A. (Government, 100%)	Cerro Bolívar, El Pao, and San Isidro Mines, Bolívar State.	20,000
Petroleum thousand 42 gallon barrels per day	Petróleos de Venezuela S.A. (PDVSA) (Government, 100%)	Fields in Anzoatequi, Apara, Falcón, Guarico, Monagas, and Zulia States.	1,822
Petroleum products do.	do.	Major refineries at Amuay Bay, and Cardón, both in Falcón State	1,588
Steel	CVG Siderúrgica del Orinoco C.A. (SIDOR) (Government, 100%)	Ciudad Guayana, Bolívar State	4,300

[1]Established by Carbones del Zulia S.A. (Carbozulia) or the operating company for the Guasare coal project.

TABLE 5
VENEZUELA: RESERVES OF MAJOR MINERAL COMMODITIES FOR 1991

(Thousand metric tons unless otherwise specified)

Commodity		Reserves
Bauxite		300,000
Coal		10,200,000
Gold	metric tons	8,000
Iron ore		2,000,000
Natural gas	million cubic meters	3,582,000
Petroleum:		
Light and medium grades	million 42-gallon barrels	60,000
Heavy and superheavy grades	do.	270,000

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/beryl	Be
Bismuth	Bi
Bitumen (natural)	Bit
Boron	B
Bromine	Br
Cadmium	Cd
Calcium/calcite	Ca
Carbon black	CBl
Cement	Cem
Cesium	Cs
Chromite	Cr
Clays	Clay
Coal	C
Cobalt	Co
Columbium (niobium)	Cb
Copper	Cu
Corundum	Cn
Cryolite	Cry
Diamond	Dm
Diatomite	Dia
Dolomite	Ds
Emerald	Em
Emery	E
Feldspar	Feld
Ferroalloys	FA
Ferrochrome	FeCr
Ferromanganese	FeMn
Ferronickel	FeNi
Ferrosilicon	FeSi
Fertilizer	Fz
Fluorspar	F
Gallium	Ga
Garnet	Gt
Gemstones	Gm
Germanium	Ge
Gold	Au
Graphite	Gr
Gypsum	Gyp
Indium	In
Iron and steel	Fe
Iron ore	Fe
Jade	J
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
Marl	Ma
Mercury	Hg
Mica	M
Molybdenum	Mo
Natural gas	NG
Natural gas liquids	NGL
Nepheline syenite	Neph
Nickel	Ni
Nitrates	Nit
Nitrogen (ammonia plants)	N
Ochre	Oc
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
Pozzolana	Pz
Pumice	Pum
Pyrite	Py
Pyrophyllite	Pyrp
Quartz or quartzite	Qtz
Rare earths	RE
Rhenium	Re
Salt	Salt
Sand and gravel	S/Gvl
Sandstone	Ss
Selenium	Se
Sepiolite, meerschaum	Sep
Serpentine	Serp
Shale	Sh
Silicon	Si
Sillimanite	Slm
Silver	Ag
Soapstone	So
Soda ash, trona	NaAsh
Sodium sulfate	$NaSO_4$
Stone	St
Strontium	Sr
Sulfur	S
Talc	Tc
Tantalum	Ta
Tellurium	Te
Thorium	Th
Tin	Sn
Titanium (rutile or ilmenite)	Ti
Titanium dioxide (processed)	TiO_2
Tungsten	W
Umber	Um
Uranium	U
Vanadium	V
Vermiculite	Vm
Wollastonite	Wo
Yttrium	Y
Zinc	Zn
Zircon	Zr

MAP LEGEND

Symbol =	Mine, including beneficiation plants, wells
Circled Symbol =	Group of producing mines or wells
Underlined Symbol =	Processing plant or oil refinery, including smelters and metal refineries
(Symbol) =	Undeveloped significant resource

UNITS OF MEASURE AND ABBREVIATIONS

Symbol	Unit of Measure
a =	year
° API =	American Petroleum Institute gravity
bbl =	barrel(s)
cal =	calorie(s)
c =	centi (prefix)
cm =	centimeter(s)
m^3 =	cubic meter(s)
d =	day(s)
dwt =	ton(s), deadweight
G =	giga (prefix)
GW =	gigawatt(s)
GW•h =	gigawatt hour(s)
g =	gram(s)
g/mt =	gram(s) per metric ton
ha =	hectare(s)
k =	thousand
kcal =	kilocalorie(s)
kg =	kilogram(s)
kL =	kiloliter(s)
km =	kilometer(s)
km^2 =	square kilometer(s)
kmt =	thousand metric ton(s)
kV =	kilovolt(s)
kW =	kilowatt(s)
kW•h =	kilowatt hour(s)
L =	liter(s)
M =	mega (prefix)
MW =	megawatt(s)
MW•h =	megawatt hour(s)
m =	meter(s)
M =	million
Mmt =	million metric ton(s)
m^2 =	square meter(s)
mt =	ton(s), metric
SCE =	standard coal equivalent
V =	volt
W =	watt
W•h =	watt hour

Abbreviation	
API =	American Petroleum Institute
EC =	European Community
EFTA =	European Free Trade Association
FTA =	Free Trade Agreement
GATT =	General Agreement on Tariffs and Trade
GDP =	gross domestic product
GNP =	gross national product
IDB =	Inter-American Development Bank
LNG =	liquefied natural gas (methane)
LPG =	liquefied petroleum gas (propane-butane)
NAFTA =	North American Free Trade Agreement
OECD =	Organization for Economic Cooperation and Development
OLADE =	Latin America Energy Orgnization
OPEC =	Organization of Petroleum Exporting Countries
UN =	United Nations
UNDP =	United Nations Development Program