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LATIN AMERICA AND CANADA

U.S.
DEPARTMENT
OF THE
INTERIOR

Manuel Lujan, Jr.
Secretary

BUREAU
OF
MINES

T S Ary
Director

1989

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

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

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Preface

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

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

Volume III, Area Reports: International, contains the latest available mineral data on more than 160 foreign countries and discusses the importance of minerals to the economies of these nations. The 1990 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 U.S.S.R., 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 will be discontinued. The U.S. Bureau of Mines continually strives to improve the value of its publications to users. Comments and suggestions by readers of the Yearbook are welcomed.

T S Ary, *Director*

Acknowledgments

The Bureau of Mines, in preparing these Volume III Minerals Yearbook Reports, extensively utilized statistics and data on mineral production, consumption, and trade provided by various foreign government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations is gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, from United Nations publications, and from the domestic and foreign technical and trade press 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 a Bureau employee 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. His first contact with Latin America was in Cuba in 1954.

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MINERAL INDUSTRIES OF

Latin America and Canada

By 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. Puerto Rico is covered in Volume II of the Minerals Yearbook Area Reports—Domestic. It is natural to relocate Canada to this report by virtue of its location in the Western Hemisphere, its membership in the Inter-American Bank (IDB), and the Organization of American States (OAS), as well as its important involvement in Latin American affairs. Canada finally joined the OAS in 1989 after several decades in an observer status. Participation in the North American Free Trade Agreement will draw Canada further into the Latin American Region. Treatment of Antarctica has also been relocated because it is closest to South America. Argentina and Chile are signatories of the 1961 Antarctica Treaty and are among the seven countries making claims on Antarctic territories. Of all the claimant nations, Argentina has had the longest presence on Antarctica, dating back to 1904.

Latin America and Canada have a rich and diversified endowment of mineral fuels, metals, and industrial minerals. Tables 2 and 3 provide a summary view of the importance of Latin America and Canada's output of its major mineral commodities in world mineral supply in 1988 and 1989.

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 dominant world producers. In 1989, Canada was the world's leading producer of mine output of nickel, uranium, and zinc. In Latin America, Mexico was the world's leading producer of silver and strontium; Brazil led in columbium and tin, and Chile was the world leader in copper. 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. The second world rank included Brazil relative to iron ore output and Chile relative to iodine. After Brazil, the other significant iron ore producers in the hemisphere were Canada, Venezuela, Chile, and Mexico, in order of importance. 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.

Considering all the countries in Latin America, the most outstanding output from the region in terms of share of world output include silver, tin, copper, bauxite, iron ore, zinc, lead, gold, crude oil, and aluminum, in order of world percentage. 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 tin, gold, aluminum, crude oil, and copper, in order of greatest change as shown in Table 1.

It is remarkable that, after 450 years of mining operations, Latin America is still a key producer of silver and gold.

Latin America's proven oil reserves at the end of 1990, including condensates and NGL, amounted to about 122 billion barrels or 12.2% of the world total. As a region, Latin America ranks second to the Middle East. About 90% of these oil reserves is located in Venezuela and Mexico, with the remaining 10% distributed among Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, and Peru. In the past 25 years, about 150 billion barrels of new reserves was discovered in the region. This volume represents an increase of 600%, the highest rate of the world in the considered period, which evidences 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, 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-barrels-per-day level before the end of this decade. At the present production rate, Latin America oil reserves will last 50 years, more than 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.

TABLE 1
LATIN AMERICA: RELATIVE WORLD POSITION OF SELECTED MINERAL OUTPUT
(In percent share)

Mineral	1979	1989
Tin	14	32.9
Gold	4	10.2
Aluminum	5	9.3
Crude oil	8	10.1
Copper	21	25.6

Source: U.S. Bureau of Mines

As a region, Latin America is self-sufficient in refining. Regarding natural gas, Latin America holds a relative modest position in the world. The proven reserves are 7.3 trillion cubic meters, representing about 6% of the world total.

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.

Relative to growing domestic requirements, Latin America and Canada produce an important surplus of mineral commodities for international trade. In value terms, 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 greater role as exporter of steam coal by Colombia. Coal exports from Colombia increased from less than 1 million tons in 1983 to 15 million tons in 1989. Canada, in 1989, was the world's largest exporter of a diversity of mineral commodities.

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 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. Overall, in 1989, the United States imported 14% of its mineral fuels from Canada and 8% from Mexico, while the U.S. imported 28% of nonfuel minerals from Canada and 5% from Mexico.

In 1989, the United States imported crude oil from eight countries in Latin America as detailed in Table 5: Mexico, Venezuela, Colombia, Trinidad and Tobago, Ecuador, Peru, Argentina, and Guatemala, in order of magnitude. But 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. Total U.S. oil imports from Latin America in 1989 represented 25% of total U.S. oil imports of 2.1 billion barrels. Combined oil imports from both Latin America and Canada account for about 40% of total U.S. oil imports. In the Western Hemisphere, Canada surpasses Venezuela as the leading oil supplier to the United States. In sum, the United States relies heavily on the Western Hemisphere as a source of energy minerals. The good road, rail, and pipeline infrastructure between the United States and Canada and Mexico facilitate the importation of oil and natural gas.

The extensive mineral trade between the United States and Canada is expected to be 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. 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, the Canada, Mexico, and United States decided to proceed with trilateral negotiations to create a North America Free Trade Area (NAFTA). The NAFTA negotiations will include trade, and investment issues relating to energy and other mineral commodities. Canada is the most important trading partner of the United States while Mexico is third in importance after Japan. A NAFTA would create a formidable trading bloc with a population of 360 million and economic output of $6 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.

Mineral trade in the Western Hemisphere is also expected to be enhanced by the new U.S. policy enunciated in June 1990, the "Enterprise for the Americas Initiative." This initiative is centered on 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 intitiative, the U.S. signed framework agreements on trade and investment by mid-1991 with 16 Latin American countries. The framework agreements with Bolivia and Mexico actually predated the June 1990 initiative. Included in the 16 countries is a group of four countries, Argentina, Brazil, Paraguay, and Uruguay, that has agreed to form a Southern Cone Common Market (MERCOSUR) by the end of 1995. Also included is the Andean group formed by Bolivia, Colombia, Ecuador, Peru, and Venezuela, which has agreed to create an Andean Free Trade Zone by 1992 and a common market by 1996. The framework agreement with CARICOM (composed of 13 English-speaking Caribbean nations) was expected by late summer 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 this agreement, countries such as Bolivia, Chile, and Mexico have liberalized their foreign investment laws and mining codes to provide incentives for foreign 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.

Mineral development in Latin America was 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.

A review of the structure of the mineral industry in Latin America shows it to be dominated by oil companies, generally state-owned and of world class. The first Latin American company in Fortune Magazine's list of the 500 largest global companies is Petróleos de Venezuela, with 1990 sales of $23.5 billion giving it a world rank of 43. It is followed by two other state-owned oil companies, Petróleos Brasileiros (PETROBRAS) of Brazil, with rank of 52, and Petróleos Mexicanos (PEMEX) of Mexico, with rank of 57. All the companies moved up in rank relative to 1989. Petróleos de Venezuela jumped to rank 43 from rank 76 in 1989 with a 72% sales increase, partly because of its acquisition of Citgo, an Oklahoma-based refiner, and 50-50 joint venture with Veba Oil of Germany. The largest mining companies in Latin America of world class are Companhia Vale do Rio Doce (CVRD) in Brazil and Codelco in Chile, both state-owned with ranks of 374 and 404, respectively, in the Fortune 500. The largest Canadian company, and also mineral-related, is Alcan Aluminium with 150 rank. In a group of 14 world-rank companies devoted to mining or crude oil production, 4 are in Latin America and Canada; namely, Schlumberger in Netherlands Antilles, CVRD in Brazil, Codelco in Chile and INCO in Canada. Codelco-Chile was in eighth place in 1990 among 10 companies with the highest return on sales. In the global 500 list of the 10 companies with the highest returns on assets, Petróleos de Venezuela was listed in ninth place.

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

SELECTED GENERAL SOURCES OF REGIONAL INFORMATION

American Petroleum Institute, Washington, DC: Basic Petroleum Data Book, annual.

Barclays Bank International, London: ABECOR Group Country Reports.

British Sulphur Corp. Ltd., London:
Nitrogen, bimonthly.
Phosphorus and Potassium, bimonthly.
Sulphur, bimonthly.

Bureau de Recherches Geologiques et Minieres, Paris:
Chronique de la Recherche Miniere, quarterly.

Bureau de Documentation Miniere, Paris: Annales des Mines, monthly.

EMEP--Editorial Ltda. Sao Paul: Minerios Extracao and Processamento, monthly.

Instituto Latinoamericano del Fierro y el Acero (ILAFA), Santiago:
Anuario Estadístico de la Siderurgia y Minería del Hierro de América Latina, annual.

Siderurgia Latinoamericana, monthly.

Inter-American Development Bank, Washington, DC:
Economic and Social Progress in Latin America, annual report.

IDB News, monthly.

Intergovernment Council of Copper Exporting Countries (CIPEC): Quarterly Review.

International Bauxite Association (IBA), Kingston, Jamaica: Review, quarterly.

Institution of Mining and Metallurgy, London:
Transactions, monthly.
Bulletin.

International Lead and Zinc Study Group, London.

International Monetary Fund, Washington, DC:
International Financial Statistics, monthly.

Annual Yearbook.

Kal Wagenheim, Maplewood, NJ: Caribbean Update, monthly.

Latin American Newsletters Ltd., London:
Weekly Report.

Commodities Report, biweekly.

Latin American Economic Report, weekly.

McGraw-Hill, Inc., New York: Engineering and Mining Journal, monthly.

MIlDa Limited, London: Latin American Mining Letter, biweekly.

Miller Freeman Publications, San Francisco:
World Mining, monthly.
World Mining, yearbook.

Mining Journal Ltd., London:
Mining Magazine, monthly.

Mining Journal, weekly.

Mining Annual Review, July.

Metallgesellschaft Aktiengesellschaft, Frankfurt:
Metal Statistics, annual.

National Coal Association, Washington, DC: International Coal, annual.

Organization of American States, CECON, Washington, DC:
Trade News, monthly.

Organization of Petroleum Exporting Countries, Vienna, Austria:
Annual Report.
Annual Statistical Bulletin.

PennWell Publishing Co., Tulsa, OK: International Petroleum Encyclopedia.

Samim, Rome: Metalli Non Ferrosi, annual report.

Smithsonian Institution, Wilson Center: Latin American Program.

United Nations Economic Commission for Latin America and the Caribbean:
Preliminary Economic Overview, annual.
CEPAL News, monthly.
Statistical Office, U.N. Trade Statistics.

U.S. Central Intelligence Agency:
World Factbook, annual.

U.S. Department of Commerce:
Bureau of the Census, trade statistics.
International Trade Administration:
Foreign Economic Trade and Their Implications for the United States, semiannual by country.
International Marketing Information Series.

U.S. Department of Energy, Office of International Affairs:
International Energy Annual, DOE/EIA-0219.
Petroleum Supply Annual Vol. 1 and 2. DOW/E1A-0340.

U.S. Department of the Interior, Bureau of Mines:
Mineral Commodity Summaries, annual.
Minerals Yearbook, v. I, Metals and Minerals; v. III, Area Reports: International.
Mineral Perspectives Series:
Mineral Industries of Latin America, July 1988.
Mineral Facts and Problems, quinquennial.
(Discontinued after 1985.)
Information Circular 8610;
Summary of Mining and Petroleum Laws of the World (in five parts).
Information Circular IC 8482,
Summary of Mining and Petroleum Laws of the World (in five parts), V. 1, Western Hemisphere.

U.S. Joint Publications Research Service, Arlington, VA: Foreign Broadcast Information Service Regional Publications, weekly.

World Bank, Washington, DC:
Bank news releases.

World Bureau of Metals Statistics, London:
World Metal Statistics, monthly.

World Mining, San Francisco:
Yearbook.

World Reports Limited, New York:
The Latin American Times, monthly.

LATIN AMERICA

AREA 19.5 million km² **POPULATION 462 million**

MAJOR MINERALS IN LATIN AMERICA

TABLE 2

PRODUCTION OF SELECTED MINERALS IN LATIN AMERICA AND CANADA, 1988

(Thousand metric tons unless otherwise specified)

Country	METALS									
	Aluminum, metal	Bauxite	Copper, mine	Gold, (thousand kilograms)	Iron, ore	Lead, mine	Silver (thousand kilograms)	Steel, crude	Tin, mine	Zinc, mine
Argentina	155		—	0.9	674	29	79	3,624	—	37
Bolivia	—	—	—	4.9	34	13	232	—	11	57
Brazil	874	7,728	45	e100	145,040	14	124	24,657	44	156
Chile	—	—	1,472	20.6	7,710	1	507	899	—	19
Colombia	—	—	—	29.0	609	31	7	754	—	—
Costa Rica	—	—	—	0.3	—	—	—	—	—	—
Cuba	—	—	3	—	—	—	—	321	—	—
Dominican Republic	—	168	—	5.8	—	—	39	75	—	—
Ecuador	—	—	—	8.1	—	—	—	24	—	—
El Salvador	2	—	—	—	—	—	—	11	—	—
French Guiana	—	—	—	0.5	—	—	—	—	—	—
Guatemala	—	—	—	—	8	—	—	—	—	—
Guyana	—	1,339	—	e2.0	—	—	—	—	—	—
Honduras	—	—	1	0.1	—	17	58	e7	—	23
Jamaica	—	7,305	—	—	—	—	—	25	—	—
Mexico	68	—	280	9.1	8,431	171	2,359	7,779	—	262
Peru	—	—	302	9.1	4,171	149	1,552	481	4	485
Suriname	10	3,434	—	—	—	—	—	—	—	—
Trinidad and Tobago	—	—	—	—	—	—	—	361	—	—
Uruguay	—	—	—	—	—	—	—	29	—	—
Venezuela	455	550	—	3.7	18,789	—	—	3,677	—	—
Total Latin America[1]	1,56	20,524	2,103	194.1	185,466	425	4,957	42,724	59	1,039
Share of world total, percent	8.9	20.7	24.6	10.5	20.5	12.4	35.0	5.5	29.5	14.8
Canada	1,534	—	758	134.8	38,742	368	1,443	14,500	3	1,352
United States2/	3,944	588	1,417	200.	52,163	394	1,661	90,628	—	244
Total Western Hemisphere (excluding Greenland)	7,042	21,112	4,278	529.8	276,371	1,187	8,061	147,852	62	2,635
Share of world total, percent	40	21.3	50.1	28.7	30.5	34.8	56.9	19	31	37.6

See footnotes at end of table.

TABLE 2

PRODUCTION OF SELECTED MINERALS IN LATIN AMERICA AND CANADA, 1988—Continued

(Thousand metric tons unless otherwise specified)

Country	Industrial minerals						Fuels			
	Barite	Cement	Gypsum	Phosphate rock, P_2O_5	Salt, all forms	Sulfur, all forms	Coal, all grades	Natural gas, marketed[3]	Petroleum, crude (thousand barrels)	Petroleum Products (thousand barrels)
Argentina	49	6,048	513	—	1,245	—	505	17,831	164,418	158,187
Bahamas, Bermuda	—	—	—	—	616	—	—	—	—	—
Barbados	—	184	—	—	—			17	427	1,723
Bolivia	—	452	—	—	—	7	—	2,520	7,020	8,971
Brazil	85	25,328	789	1,663	4,356	322	7,428	5,844	210,605	429,500
Chile	43	1,833	316	9	1,043	454	2,470	1,390	8,934	35,846
Colombia	e4	6,764	307	e30	682	51	14,900	4,062	136,760	81,026
Costa Rica	—	556	—	—	30	—	—	—	—	4,557
Cuba	—	3,566	e130	—	201	—	—	2	4,768	50,839
Dominican Republic	—	1,495	153	—	38	—	600	—	—	9,278
Ecuador	—	2,200	50	—	—	e15	3	99	110,157	36,931
El Salvador	—	623	e5	—	3	—	—	—	—	5,113
Guadeloupe	—	e200	—	—	—	—	—	—	—	—
Guatemala	2	1,506	34	—	42	—	—	—	1,248	4,504
Haiti	—	250	—	—	—	—	—	—	—	—
Honduras	—	560	e22	—	e3	—	—	—	—	—
Jamaica	—	371	146	—	15	—	—	—	—	9,801
Martinique	—	e200	—	—	—	—	—	—	—	e4,800
Mexico	535	22,872	4,780	835	6,788	e2,378	10,586	34,512	919,710	522,074
Netherlands Antilles	—	—	—	e16	e350	e60	—	—	—	69,350
Nicaragua	—	e100	e7	—	e15	—	—	—	—	e3,500
Panama	—	e200	—	—	e9	—	—	—	—	e9,000
Paraguay	—	321	4	—	—	—	—	—	—	1,835
Peru	e8	e2,500	e150	13	e350	e66	e157	435	51,717	60,901
Suriname	—	e50	—	—	—	—	—	—	1,400	
Trinidad and Tobago	—	360	—	—	—	e5	—	e4,000	56,475	31,123
Uruguay	—	34	e100	—	—	e2	—	—		e9,630
Venezuela	—	6,199	250	e100	e500	e125	1,000	e12,700	575,970	368,260
Total Latin America[1]	726	85,172	7,756	2,666	16,313	3,485	37,649	83,412	2,249,609	1,916,749
Share of world total, percent	13.2	7.7	8.1	1.7	8.9	6.0	0.8	4.2	10.6	8.5
Canada	51	12,036	8,522	—	10,690	7,486	69,500	88,035	584,000	645,320
United States[2]	404	69,733	14,869	45,389	35,534	10,746	862,066	499,548	2,971,100	6,308,295
Total Western Hemisphere (excluding Greenland)	1,181	166,941	31,147	48,055	62,537	21,717	969,215	670,995	5,804,709	8,870,364
Share of world total, percent	21.5	15.1	32.4	30.0	34.0	37.4	20.1	34.4	27.3	39.2

eEstimated.

[1]Only countries with 1988 production of the selected minerals are shown.

[2]Included for comparison.

[3]In million cubic meters.

Note.—Dash indicates negligible or no production.

TABLE 3

PRODUCTION OF SELECTED MINERALS IN LATIN AMERICA AND CANADA, 1989

(Thousand metric tons unless otherwise specified)

Country	Metals									
	Aluminum, metal	Bauxite	Copper, mine	Gold, (thousand kilograms)	Iron ore	Lead, mine	Silver, (thousand kilograms)	Steel, crude	Tin, mine	Zinc, mine
Argentina	e162	—	1	1.1	635	27	83	3,874	—	43
Bolivia	—	—	—	3.6	14	16	267	—	16	75
Brazil	888	8,442	44	e100	153,700	16	124	25,018	50	176
Chile	—	—	1,645	21.4	8,474	1	536	813	—	18
Colombia	—	—	—	29.5	530	—	7	706	—	—
Costa Rica	—	—	—	0.4	—	—	—	—	—	—
Cuba	—	—	e3	—	—	—	—	e310	—	—
Dominican Republic	—	151	—	5.2	—	—	e23	55	—	—
Ecuador	—	—	—	13.0	—	—	—	e23	—	—
El Salvador	e2	—	—	—	—	—	—	e15	—	—
French Guiana	—	—	—	e0.6	—	—	—	—	—	—
Guatemala	—	—	—	—	e7	2	—	—	—	—
Guyana	—	1,281	—	3.2	—	—	—	—	—	—
Honduras	—	—	2	1.2	—	10	50	e7	—	37
Jamaica	—	9,601	—	—	—	—	—	34	—	—
Mexico	72	—	254	8.6	8,141	163	2,306	7,920	—	284
Nicaragua	—	—	—	1.2	—	—	1	—	—	—
Peru	—	—	353	e8.7	e4,300	192	1,840	401	5	597
Suriname	e10	3,530	—	—	—	—	—	—	—	—
Trinidad and Tobago	—	—	—	—	—	—	—	294	—	—
Uruguay	—	—	—	—	—	—	—	e47	—	—
Venezuela	e546	e800	—	3.9	18,053	—	—	3,390	—	—
Total Latin America[1]	1,680	23,805	2,302	201.6	193,854	427	5,237	42,907	71	1,230
Share of world total, percent	9.3	22.43	25.9	10.2	21.0	12.6	36.2	5.5	32.9	17.4
Canada	e1,550	—	722	158	40,900	275	1,262	14,500	—	1,215
United States[2]	4,030	W	1,497	265.5	59,000	419	2,007	88,813	—	276
Total Western Hemisphere (excluding Greenland)	7,260	23,805	4,521	625.1	293,754	1,121	8,506	146,220	71	2,721
Share of world total, percent	40.4	22.4	50.9	31.7	31.8	33.0	58.9	18.7	32.9	38.5

See footnotes at end of table.

TABLE 3

PRODUCTION OF SELECTED MINERALS IN LATIN AMERICA AND CANADA, 1989—Continued

(Thousand metric tons unless otherwise specified)

Country	Industrial minerals							Fuels		
	Barite	Cement	Gypsum	Phosphate rock, P_2O_5	Salt, all forms	Sulfur, all forms	Coal, all grades	Natural gas, marketed[3]	Petroleum, Crude (thousand barrels)	Petroleum, Products (thousand barrels)
Argentina	e40	4,470	e300	—	e1001	—	e500	18,546	163,400	162,000
Bahamas, Bermuda	—	—	—	—	858	—	—	—	—	—
Barbados	—	e215	—	—	—	—	—	15	389	1,915
Bolivia	—	505	—	—	—	8	—	2,565	7,274	9,321
Brazil	e95	25,883	799	e1,300	3,646	301	7,186	e5,890	217,941	460,650
Chile	59	e1,700	276	16	907	436	2,399	1,377	8,065	36,000
Colombia	5	6,643	310	30	660	56	18,902	e4,100	147,563	82,410
Costa Rica	—	e800	—	—	e30	—	—	—	—	4,821
Cuba	—	e3,700	e130	—	e200	—	—	4	5,200	53,000
Dominican Republic	—	e1,600	171	—	e50	—	—	—	—	9,236
Ecuador	—	e2,250	48	—	—	14	5	100	105,000	43,100
El Salvador	—	633	e5	—	e5	—	—	—	—	5,000
Guadeloupe	—	200	—	—	—	—	—	—	—	—
Guatemala	4	1,613	28	—	63	—	—	—	1,328	4,249
Haiti	—	215	—	—	—	—	—	—	—	—
Honduras	—	649	e22	—	e30	—	—	—	—	5,000
Jamaica	—	412	78	—	10	—	—	—	—	5,928
Martinique	—	e200	—	—	—	—	—	—	—	4,800
Mexico	325	e23,500	5,390	655	6,703	2,369	9,983	30,414	919,710	539,902
Netherlands Antilles		—	—	e15	e350	e60	—	—	—	65,335
Nicaragua	—	131	12	—	e15	—	—	—	—	3,500
Panama	—	169	—	—	8	—	—	—	—	6,552
Paraguay	—	326	5	—	—	—	—	—	—	e2,000
Peru	e8	e2,100	e160	e13	e350	66	e160	283	47,597	55,570
Suriname	—	e50	—	—	—	—	—	—	1,442	—
Trinidad and Tobago	—	380	—	—	—	e5	—	3,833	56,189	28,225
Uruguay	—	560	e100	—	—	e2	—	—	—	9,630
Venezuela	—	4,510	332	237	e500	e125	1,500	14,160	638,020	380,075
Total Latin America[1]	536	83,414	8,166	2,266	15,436	3,442	40,635	81,287	2,319,120	1,978,219
Share of world total, percent	9.4	7.4	8.3	1.4	8.1	5.9	.8	4.0	10.6	8.7
Canada	42	11,832	8,830	—	11,140	6,714	71,000	92,530	583,827	639,485
United States[2]	290	71,668	15,988	49,817	35,623	11,592	889,703	510,524	2,778,745	6,323,625
Total Western Hemisphere (excluding Greenland)	868	166,914	32,984	52,083	62,199	21,748	1,001,338	604,341	5,681,690	8,941,329
Share of world total, percent	15.2	14.9	33.5	32.1	32.6	37.3	20.5	29.9	25.9	39.1

eEstimated. W Withheld.

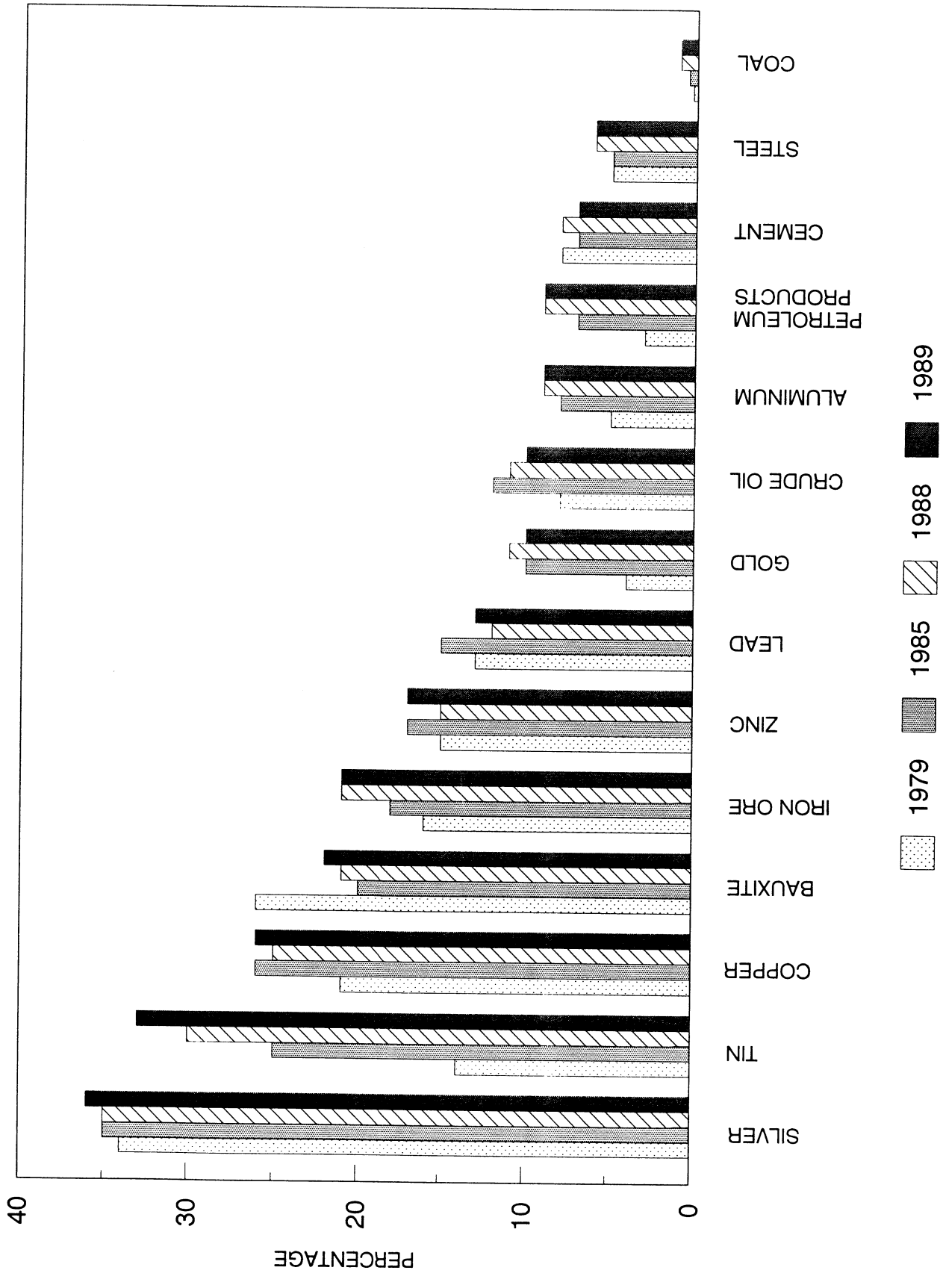
[1]Only countries with 1989 production of the selected minerals are shown.

[2]Included for comparison.

[3]In million cubic meters.

Note.—Dash indicates negligible or no production.

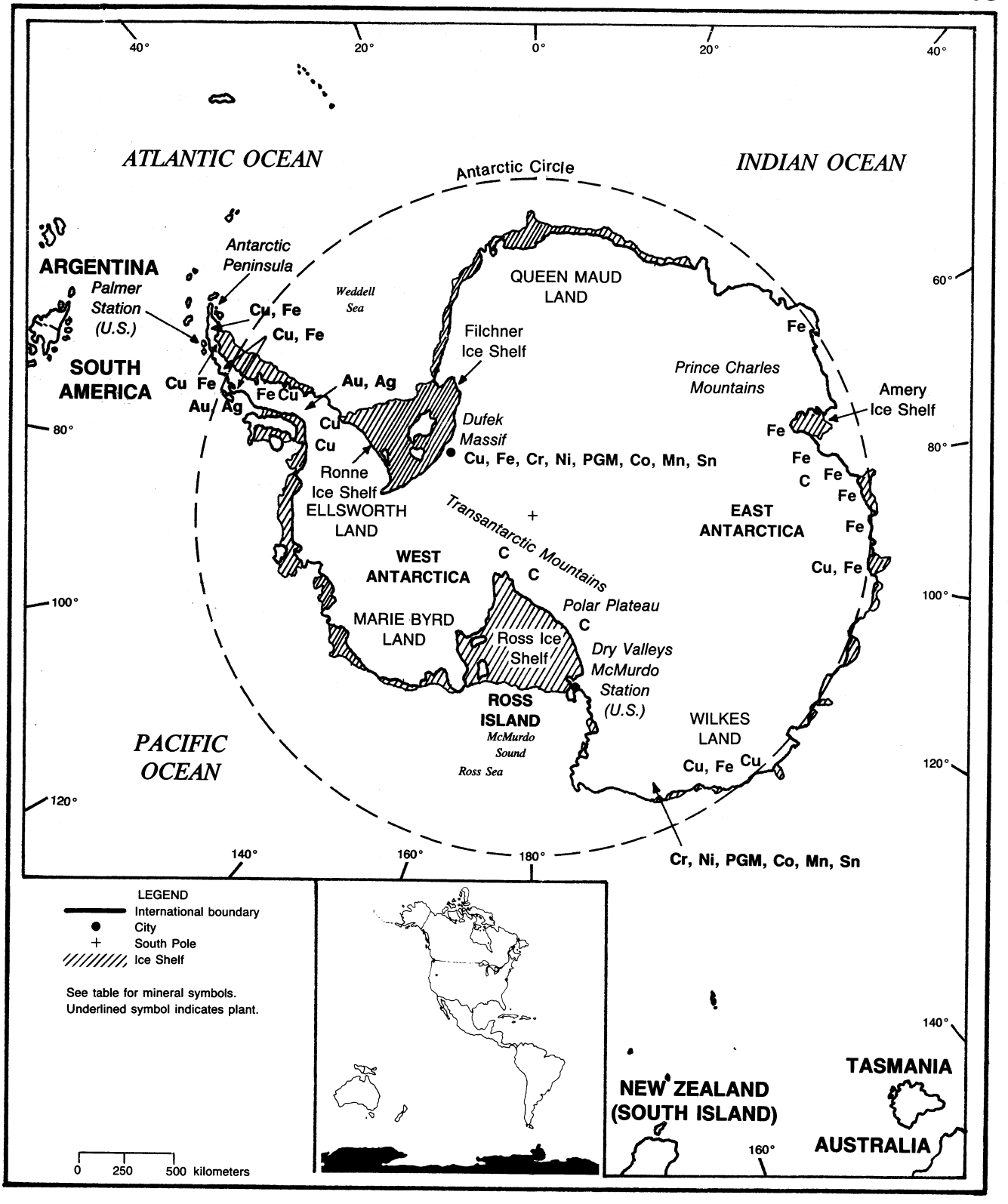
Figure 1.--LATIN AMERICA: MINERAL AND FUEL OUTPUT AS A PERCENTAGE OF TOTAL WORLD OUTPUT



SOURCE: Bureau of Mines.

ANTARCTICA

AREA 14.3 million km² **POPULATION varies**



THE MINERAL INDUSTRY OF

ANTARCTICA

By H. Robert Ensminger

Antarctica, a huge continent of about 14 million square kilometers in area, lies almost entirely within the Antarctic Circle. It is almost entirely surrounded by deep ocean basins and contains a thick ice sheet varying from 1,500 meters to 3,900 meters in thickness. Recent geophysical studies have revealed a reasonably complete physiographic picture beneath the ice cover. West Antarctica is connected to the main part of the continent by a mountain chain that lies well above sea level, though largely masked by ice and snow. The mountains of Marie Byrd Land are a large island mass surrounded by ice that extends well below sea level. The bedrock of most of East Antarctica apparently lies above sea level, with the high ranges of the Transantarctic Mountains and Queen Maud Land lying far above sea level.

The Antarctic 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 is carried out through consultative member meetings—the 14th and last meeting was held in Río de Janeiro (Brazil) in October 1987.

Consultative (voting) members include claimant nations, who claim portions of Antarctica as national territory and some claims overlap, and nonclaimant nations, who have made no claims to Antarctic territory, although the United States and U.S.S.R. have reserved the right to do so and 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 Antarctica 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 on Antarctica, dating back 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.

As to mineral occurrence in Antarctica, except for potentially sizable coal resources along the Transantarctic Mountains and iron ore in East Antarctica, the presence of significant exploitable mineral deposits has not been proved. There have been reports of minor amounts of valuable minerals and material such as chromium, cobalt, copper, iron, manganese, nickel, and tin as well as the precious metals such as gold, platinum group, and silver. Most of these minerals were reported to be in the Antarctic Peninsula, Dufek Massif, and coastal Wilkes Land.

Any technological and/or economic evaluation for a prospective mine can at best be based on circumstantial geologic evidence. However, there is a sound scientific basis for defining high-probability areas of ore-grade mineral concentrations in Antarctica. The area most commonly referred to is the Antarctic Peninsula. Rocks from this arcuate mountain belt closely resemble in type and association those rocks that constitute the basic structure of the Andes Mountains in South America; therefore, speculations about similar ore deposits are reasonable.

Based on geologic structure and geophysical evidence, there is a clear recognition by the scientific community that petroleum reserves 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. Any intended exploitation would be subject to a complex array of economic and political factors.

INFRASTRUCTURE

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

OUTLOOK

The Convention on the Regulation of Antarctic Mineral Resource Activities (Antarctic Minerals Treaty) was adopted in Wellington, New Zealand, on June 2, 1988. It seeks, among other things, to regulate a controlled, rational approach to future mineral exploration activities in the Antarctic. A special consultative meeting was being planned for yearend 1990 in Viña del Mar, Chile, to discuss a protocol to the Antarctic Treaty for the protection of the Antarctic environment and its associated ecosystems.

At present, there is no driving interest toward the economic feasibility of exploration and especially exploitation of onshore mineral wealth within the ensuing several decades. This is predicated on Antarctica's remoteness, its harsh climate, the amount of ice coverage (98%), the lack of suitable mining related technology, the over abundance of minerals elsewhere, and the potential opposition of environmentalists and conservationists.

OTHER SOURCES OF INFORMATION

Agencies

National Science Foundation
1800 G St., NW.
Washington, DC 20550
U.S. Geological Survey
12201 Sunrise Valley Dr.
Reston, VA 22092

Publications

Kimbell, C., T. Lyday, and H. Newman. Mineral Industries of Australia, Canada, and Oceania. BuMines Mineral Perspectives, 1985, 69 pp.

U.S. Department of State, Washington, DC. Incoming telegrams.

National Geographic Society, Washington, DC. National Geographic, Apr. 1990, pp. 2–51.

Oxford Science Publications (Clarendon Press), Oxford, England. Minerals and Mining in Antarctica, 1985, 123 pp.

U.S. Geological Survey, Reston, Virginia. The Antarctic and its Geology, 1978, 15 pp.

ARGENTINA

AREA 2.8 million km² **POPULATION 31.9 million**

THE MINERAL INDUSTRY OF

ARGENTINA

By Pablo Velasco

Argentina, the second largest country in Latin America, was a modest producer of minerals. Its mining activities, excluding hydrocarbons, accounted for an estimated 0.3% or less of the country's 1989 gross domestic product (GDP) of about $75 billion[1] (in current dollars).

In 1989, Argentina became almost self-sufficient in energy resources (petroleum, gas, coal, 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 fourth in world production of boron minerals. Argentina had the most advanced nuclear energy program in Latin America. With two nuclear plants in operation and another under construction, nuclear power provided about 13% of Argentina's electric power needs in 1989. Argentina has been an exporter of nuclear technology to countries in Latin America and other developing nations.

Argentina's mineral production and trade remained almost negligible in terms of the contribution to the GDP and total exports. Total mineral exports represented 3% of the total exports, with a value of about $400 million, and consisted primarily of crude oil and refinery products.

The mining and processing sectors comprised both Government-owned and private-sector enterprises. The state entities included petroleum producer Yacimientos Petrolíferos Fiscales (YPF) and its affiliate Gas del Estado and the iron and steel enterprises Hierro Patagónico de Sierra Grande S.A. Minera (HIPASAM) and Sociedad Mixta Siderúrgica Argentina (SOMISA). The major privately owned companies were Cía. Minera Aguilar S.A. (CMASA), which produced lead, silver, and zinc, and ACINDAR-Industria Argentina de Aceros S.A. (ACINDAR), which produced and manufactured steel.

GOVERNMENT POLICIES AND PROGRAMS

The newly appointed Secretary of Mining announced plans to stimulate development of nonfuel mineral deposits in the mining sector. The new mining legislation has been delayed by the switch in administrations. Representatives of the new Government indicated that the new mining program was aimed at reactivating local private sector participation and encouraging foreign investment, measures that were in line with the Government attack on the country's financial crisis. The old federal mining council was to be reactivated, and provincial mining organizations were to be given a boost.

Argentine small mining producers were intended to be the initial beneficiaries of the new legislation to improve the mineral industry. The National Development Bank would help support all the mining projects the Government recommends, but would give special emphasis to smaller operations when granting credits.

The Government stated that there had been an increase in foreign interest in Argentine mining projects. Representatives from the European Community and Canada were expected to send fact-finding missions to the Argentine capital city in the near future.

The Government became the subject of mounting criticism as talk of Yacimientos Mineros de Agua de Dionisio's (YMAD) privatization prompted protestations in the mineral-rich Catamarca Province. YMAD, the country's largest gold producer, owned the rights to the Farallón Negro gold-silver-manganese deposit, which annually produced approximately 1,000 kilograms of gold and 80,000 kilograms of silver. Those opposed to the divestment cited YMAD's sound financial standing and the importance of the Farallón Negro Mine as reasons why the Government should retain the company.

On August 18, the National Chamber of Deputies approved the privatization plans for the state coal producer Yacimientos Carboníferos Fiscales (YCF) and Carboquímica Argentina Anónima Mixta.

PRODUCTION

Argentina continued to be one of the world's largest producers and exporters of borax and other boron products. Small- and medium-sized mines were the major producers of metallic minerals in 1989. Smelter and refinery production of most metals including ferroalloys generally remained at about the same level as the previous year. In industrial mineral production 42 commodities went down, 10 of commodities went up, and 4 commodities remained even. In general, oil and natural gas maintained their previous output levels.

TRADE

The export value of Argentine minerals, including crude oil and refinery products, increased 138% to approximately $400 million, compared with that of 1988. This increase in value was partially due to domestic and foreign economic factors. The principal nonfuel mineral exports were bentonite, borates, borax, boric acid, celestite, dimensional forms of granite and marble, granite, gypsum, lead metal, lead ore and concentrate, portland cement, silver and tin ore and concentrates, sodium borate, ulexite, zinc ore and concentrate, and zinc metal. Marble and granite continued to show increasing promise in foreign markets. Brazil remained the single largest importer of Argentine minerals, accounting for approximately 60% of the total. Other important mineral markets included the Eastern Europe, Japan, the U.S.S.R and the United States.

Argentine imports of minerals and basic manufactured items derived from mineral substances declined to nearly $820 million. Imports of natural gas from Bolivia also decreased to an estimated $200 million in 1989.

STRUCTURE OF THE MINERAL INDUSTRY

Government participation in the mineral industry through the direction of the

TABLE 1

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum:						
Primary		135,700	147,600	152,500	155,100	162,000
Secondary		8,000	6,500	7,500	7,100	5,300
Beryllium: Beryl concentrate:						
Gross weight		31	50	46	39	85
BeO content		3	5	5	4	9
Cadmium: Smelter		46	47	46	46	40
Columbium: Columbite concentrate:	kilograms	—	—	—	51	[3]87
Gross weight	do.	—	—	—	[e]88	[3]116
Cb_2O_5 content	do.	—	—	—	[3]51	[3]87
Copper:						
Mine output, Cu content		391	317	379	492	[3]653
Refined		13,000	11,000	13,000	12,500	11,000
Gold: Mine output, Au content	kilograms	882	944	990	938	[3]1,086
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	639	810	567	674	[3]635
Fe content	do.	389	514	360	379	[3]340
Metal:						
Pig iron	do.	[r]1,310	[r]1,625	1,752	1,596	[3]2,105
Sponge iron (direct reduction)	do.	[r]989	[r]935	1,033	1,067	[3]1,165
Total	do.	[r]2,299	[r]2,560	2,785	2,663	[3]3,270
Ferroalloys, electric-furnace:						
Ferromanganese		23,663	19,782	21,407	19,737	[3]25,545
Ferrosilicomanganese		7,493	12,977	11,746	11,610	[3]16,857
Ferrosilicon		18,790	22,979	23,998	30,539	[3]28,381
Other		4,892	5,272	6,790	5,952	[3]7,461
Total		54,838	61,010	63,941	67,838	[3]78,244
Steel, crude	thousand tons	2,942	3,235	3,633	3,624	[3]3,874
Semimanufactures[4]	do.	2,269	2,977	3,912	3,126	[3]2,980
Lead:						
Mine output, Pb content		28,582	26,868	26,069	28,549	[3]26,650
Metal:						
Smelter, primary		15,088	15,700	16,200	14,000	13,000
Refined:						
Primary		15,088	15,700	16,200	14,000	13,000
Secondary		13,575	15,000	16,000	15,000	13,000
Total		28,663	30,700	32,200	29,000	26,000
Manganese ore and concentrate:						
Gross weight		7,276	9,886	6,393	9,339	[3]4,860
Mn content		1,728	2,458	1,324	1,817	[3]1,033
Silver, mine output, Ag content	kilograms	67,495	66,375	59,657	79,407	[3]83,388
Tin:						
Mine output, Sn content		451	379	186	446	[3]405
Metal, smelter		135	365	[e]350	280	280

See footnotes at end of table.

TABLE 1—Continued

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Tungsten, mine output, W content		17	20	14	13	8
Uranium, mine output, U_3O_8 content	kilograms	148,956	203,753	112,499	167,516	[3]60,257
Zinc:						
Mine output, Zn content		35,713	39,540	35,648	36,849	[3]43,155
Metal: Smelter:						
Primary		30,377	29,123	31,900	30,500	29,000
Secondary		2,500	3,000	2,600	2,500	2,500
Total		32,877	32,123	34,500	33,000	31,500
INDUSTRIAL MINERALS						
Asbestos		1,244	1,697	332	328	300
Barite		55,753	58,617	33,462	48,872	40,000
Boron materials, crude		158,252	191,871	184,786	257,140	260,000
Cement, hydraulic	thousand tons	4,630	5,553	6,302	6,048	[3]4,470
Clays:						
Ball clay (plastic clay), n.e.s.	do.	1,595	1,580	644	850	411
Bentonite		147,065	146,191	108,595	169,552	150,000
Foundry earth		96,821	102,551	107,000	NA	NA
Fuller's earth (decolorizing clay)[e]		[3]1,743	2,000	2,000	2,000	2,000
Kaolin		73,802	117,378	128,455	94,105	40,000
Laterite (aluminous)		32,086	38,816	44,518	65,651	55,000
Refractory		38,388	72,185	47,834	43,087	25,000
Other[5]		524,267	1,596,852	2,275,826	2,819,031	2,100,000
Diatomite		9,929	14,362	5,098	7,122	7,000
Feldspar		27,066	24,087	29,282	39,469	20,000
Fluorspar		30,612	39,076	84,924	27,011	30,000
Graphite		32	40	216	24	4
Gypsum, crude		460,816	462,195	618,817	512,588	300,000
Lithium: Spodumene, amblygonite, gross weight		35	184	178	119	120
Mica:						
Sheet		347	234	340	330	400
Waste and scrap		374	317	451	630	500
Nitrogen: N content of ammonia		64,900	62,879	80,600	78,100	74,000
Phosphates: Thomas slag[6]		[r]50	[r]16	[r]8	[3]55	50
Pigments, mineral, natural: Ocher		4,020	1,027	1,022	815	700
Pumice and related volcanic materials		44,350	22,957	99,093	160,100	100,000
Salt:						
Rock	thousand tons	1	1	1	1	1
Solar	do.	1,447	1,218	950	1,244	1,000
Total	do.	1,448	1,219	951	1,245	1,001
Sand and gravel:						
Sand:						
Construction	thousand tons	11,352	10,389	9,048	9,485	9,000
Silica sand (glass sand)	do.	275	292	283	294	[3]236
Gravel	do.	3,745	5,552	3,574	4,657	3,500

See footnotes at end of table.

TABLE 1—Continued

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Stone:						
Basalt	thousand tons	3,020	2,802	2,542	2,591	2,000
Calcareous:						
Calcite, nonoptical		8,220	7,687	2,800	41,130	40,000
Calcium carbonate (chalk)		12,629	13,448	28,500	21,300	21,000
Dolomite		97,146	254,966	372,173	464,017	250,000
Limestone	thousand tons	10,064	10,166	13,911	12,078	10,000
Marble:						
Aragonite, broken		1,032	513	2,160	5,504	2,000
Onyx, in blocks and broken		11,041	9,351	9,020	8,222	3,600
Travertine, in blocks and broken		6,007	4,423	14,462	16,127	11,300
Unspecified, in blocks and broken		71,042	98,227	49,007	62,452	34,500
Flagstone		61,425	53,943	64,945	42,809	26,000
Granite:						
In blocks		32,948	30,424	47,966	70,671	60,000
Crushed	thousand tons	3,653	3,747	3,693	5,316	4,000
Quartz, crushed		81,213	126,255	134,018	149,213	150,000
Quartzite, crushed	thousand tons	1,105	580	2,128	1,287	700
Rhodochrosite		6	13	NA	NA	NA
Sandstone		282	346	608	120	300
Serpentine, crushed		12,551	23,010	28,689	29,750	15,000
Shell, marl		431,990	320,898	618,536	166,070	400,000
Tuff and tufa	thousand tons	1,876	1,306	12,146	8,966	7,000
Strontium minerals: Celestite		983	1,133	1,349	2,120	1,800
Sulfates, natural:						
Aluminum (alum)		24,513	30,489	60,291	61,285	57,000
Magnesium (epsomite)		904	762	2,500	12,140	7,000
Sodium (mirabilite)		20,865	31,789	27,483	15,341	18,000
Talc and related materials:						
Pyrophyllite		2,785	2,812	1,260	671	1,000
Steatite		280	[e]300	[e]300	250	250
Talc		15,944	22,353	27,103	26,028	22,000
Total		19,009	25,465	28,663	26,949	23,250
Vermiculite		4,887	5,207	18,612	19,300	19,000
Water, mineral-containing		100,720	151,998	177,544	172,152	175,000
Zeolite		103	120	110	100	100
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bitumen, natural (asphaltite)		3,235	3,702	3,350	2,158	1,300
Coal, bituminous	thousand tons	400	370	381	505	500
Coke, all types, including breeze	do.	625	840	925	820	800
Gas, natural:						
Gross	million cubic meters	18,650	19,182	19,128	22,695	24,041
Marketed	do.	14,868	14,333	14,769	17,831	[7]18,546

See footnotes at end of table.

TABLE 1—Continued

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Natural gas liquids:						
Butane	thousand 42-gallon barrels	3,132	3,170	3,306	3,887	4,000
Propane	do.	2,996	3,030	4,967	5,283	5,300
Total	do.	6,128	6,200	8,273	9,170	9,300
Peat, agricultural (turba)		3,917	3,166	3,338	2,190	2,000
Petroleum:						
Crude	thousand 42-gallon barrels	167,781	158,467	156,348	164,418	163,400
Refinery products:						
Gasoline	do.	34,785	31,351	31,246	28,041	31,600
Kerosene	do.	3,449	3,675	3,778	3,503	3,500
Jet fuel	do.	4,685	5,028	5,384	5,176	5,100
Distillate fuel oil	do.	48,801	51,429	54,172	53,997	54,000
Residual fuel oil	do.	17,485	21,447	25,734	27,790	21,400
Lubricants	do.	1,593	1,792	1,868	1,781	1,900
Other	do.	10,417	16,148	16,445	16,499	14,500
Refinery fuel and losses	do.	43,982	25,337	14,205	21,400	30,000
Total		165,197	156,207	152,832	158,187	162,000

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

[1]Table includes data available through June 30, 1989.

[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 2,186 million cubic meters of natural gas imported from Bolivia.

Secretariat of Mining accounted for approximately 60% of the major operating mining companies in the country and included such companies as YCF and HIPASAM, which mined bituminous coal and iron ore for its SOMISA's pellet and steel plants. The state-owned YMAD controlled the exploitation and development of the Farallón Negro Mine (gold-silver-manganese), the Bajo la Alumbrera copper-gold-silver-molybdenum deposit, the Alto de la Blenda Mine (lead-zinc-silver), the Cerro Atajo and the La Josefa gold-copper deposits, and the Comisión Nacional de Energía Atómica (CNEA). 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 utilize the same source of uranium (U_3O_8) for its reactors when completed.

In the hydrocarbon sector, the Government, through the Secretariat of Energy, controlled YPF and Gas del Estado, which controlled the exploration, exploitation, marketing, and transportation of all petroleum and natural gas 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.

The mineral industry in the private sector was composed of several mining and manufacturing companies such as Aluminios Argentinos SAIC (ALUAR), Cementos Loma Negra C.I.A.S.A., Boroquímica S.A.M.I.C.A.F., CMASA, and hundreds of small metallic and industrial minerals companies engaged in mining activities throughout Argentina. At yearend, there were 10.9 million people employed in the country, of which 12% were employed 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 6.5% of the labor force was unemployed in 1989. 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.

COMMODITY REVIEW

Metals

Aluminum.—ALUAR, the country's only primary aluminum producer and the

TABLE 2

ARGENTINA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS					
Aluminum:					
Oxides and hydroxides		1	1	—	Mainly to Uruguay.
Metal including alloys:					
Unwrought		73,009	83,473	26,775	Japan 28,183; Netherlands 7,781.
Semimanufactures		17,995	25,186	8,932	Netherlands 11,505; Japan 1,733.
Chromium: Oxides and hydroxides		38	274	—	Venezuela 131; Chile 116; Belgium-Luxembourg 17.
Copper: Metal including alloys:					
Unwrought		2	1	—	Mainly to Uruguay.
Semimanufactures		3,217	4,783	4,209	Canada 363; Uruguay 81.
Iron and steel: Metal:					
Pig iron, cast iron, related materials		715	1,316	—	Italy 380; Chile 311; Venezuela 300.
Ferroalloys		16,511	21,616	11,778	Japan 6,394; Belgium-Luxembourg 1,572.
Steel, primary forms		132,360	177,639	10,364	Thailand 20,991; China 15,669; unspecified 110,424.
Semimanufactures:					
Bars, rods, angles, shapes, sections		193,648	357,045	81,569	Belgium-Luxembourg 58,966; Chile 34;883.
Universals, plates, sheets		379,387	591,821	218,338	China 92,195; Japan 91,789.
Hoop and strip		9	4,677	4,652	Paraguay 22; Uruguay 3.
Rails and accessories		530	12,372	—	Mexico 12,159; Bolivia 211; Paraguay 2.
Wire		4,410	6,739	3,453	Bolivia 736; Cuba 712.
Tubes, pipes, fittings		330,833	383,291	122,247	China 79,940; U.S.S.R. 72,264.
Castings and forgings, rough		39	52	—	Bolivia 50; Chile 1; Uruguay 1.
Lead:					
Ore and concentrate		19,727	9,812	—	Brazil 7,443; Belgium-Luxembourg 2,369.
Oxides		49	203	—	Spain 140; Uruguay 62; Paraguay 1.
Metal including alloys:					
Unwrought		400	900	—	All to Uruguay.
Semimanufactures	value, thousands	$6	$10	—	Bolivia $7; Peru $3.
Magnesium: Metal including alloys:					
Unwrought	do.	—	$1	—	All to Ecuador.
Semimanufactures		1	—		
Manganese: Oxides		2	2	—	All to Bolivia.
Nickel: Metal including alloys, semimanufactures	value, thousands	$2	$18	—	Uruguay $16; Paraguay $2.
Silver:					
Waste and sweepings	do.	$10	—		
Metal including alloys, unwrought and partly wrought	do.	—	$3	—	All to Chile.
Tin:					
Ore and concentrate		190	721	—	Netherlands 613; Switzerland 108.
Metal including alloys:					
Unwrought	value, thousands	—	$1	—	All to Paraguay.
Semimanufactures	do.	$12	$3	—	Mexico $1; Paraguay $1; Uruguay $1.

See footnote at end of table.

TABLE 2—Continued

ARGENTINA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Titanium: Oxides value, thousands	$1	—		
Zinc:				
Ore and concentrate	7,679	5,115	—	All to Brazil.
Oxides	278	100	—	Brazil 63; Chile 23; Uruguay 14.
Metal including alloys:				
Unwrought	—	3,254	—	Japan 1,122; Netherlands 1,101; Canada 1,004.
Semimanufactures	2	1	—	Mainly to Peru.
Other:				
Ashes and residues	10	—		
Base metals including alloys, all forms	89	39	30	Brazil 8; Spain 1.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	754	1,284	—	Brazil 511; Uruguay 489; Paraguay 244.
Artificial: Corundum	1	—		
Grinding and polishing wheels and stones	13	14	1	Chile 4; Uruguay 4; Bolivia 3.
Asbestos, crude	38	—		
Barite and witherite	676	10	—	All to Uruguay.
Boron materials:				
Crude natural borates	17,351	26,563	—	Brazil 14,602; Italy 11,524; Uruguay 436.
Oxides and acids	6,738	10,824	—	Brazil 5,364; Netherlands 1,626; Belgium-Luxembourg 1,510.
Cement	33,054	48,299	—	Brazil 19,816; Chile 17,843; Bolivia 10,486.
Chalk	5	5	—	All to Paraguay.
Clays, crude	11,539	11,321	—	Brazil 6,867; Chile 2,466; Uruguay 1,610.
Diatomite and other infusorial earth	50	30	—	Uruguay 20; Bolivia 10.
Feldspar, fluorspar, related materials	319	480	—	Chile 380; Paraguay 63; Ecuador 20.
Fertilizer materials: Manufactured:				
Ammonia	458	414	—	Uruguay 402; Paraguay 11; Canada 1.
Nitrogenous	360	119	—	Bolivia 60; Paraguay 50; Uruguay 9.
Phosphatic	—	78	—	All to Bolivia.
Potassic	—	32	—	Do.
Unspecified and mixed	2,159	3	—	All to Uruguay.
Graphite, natural	—	3,000	—	All to Netherlands.
Gypsum and plaster	12,350	20,335	—	Paraguay 19,222; Uruguay 1,111; Chile 2.
Lime	5,430	6,526	—	Chile 6,130; Bolivia 396.
Magnesium compounds: Magnesite, crude	100	125	—	All to Chile.
Mica:				
Crude including splittings and waste	16	46	—	Belgium-Luxembourg 20; France 16; Chile 10.
Worked including agglomerated splittings value, thousands	$8	—		
Pigments, mineral: Iron oxides and hydroxides, processed	362	479	—	Colombia 219; Uruguay 86; Singapore 58.
Precious and semiprecious stones other than diamond, natural value, thousands	$201	$313	$17	Hong Kong $167; West Germany $100; Japan $29.

See footnote at end of table.

TABLE 2—Continued

ARGENTINA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Salt and brine		130,608	24,340	—	Brazil 20,496; Paraguay 2,865; Uruguay 959.
Sodium compounds, n.e.s.: Soda ash, natural and manufactured		46	—		
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		3,083	10,204	—	Japan 4,548; Italy 4,365; Spain 851.
Worked		2,045	4,032	2,389	Japan 567; Uruguay 277.
Dolomite, chiefly refractory-grade		948	361	—	Chile 305; Paraguay 44; Uruguay 10.
Gravel and crushed rock		5	70	—	Brazil 50; Uruguay 20.
Quartz and quartzite		145	25	—	Mainly to Uruguay.
Sand other than metal-bearing		—	58	—	Do.
Sulfur:					
Elemental:					
Crude including native and byproduct		195	57	—	Uruguay 30; Paraguay 27.
Colloidal, precipitated, sublimed		—	4	—	All to Japan.
Sulfuric acid		2,136	2,997	2,970	Brazil 25; Uruguay 2.
Talc, steatite, soapstone, pyrophyllite		30	71	—	Chile 40; Paraguay 31.
Other:					
Crude		11,226	8,377	—	Brazil 8,083; Venezuela 220; Chile 54.
Slag and dross, not metal-bearing		59	180	54	Belgium-Luxembourg 78; Chile 30.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		532	1,441	—	Brazil 1,026; Chile 400; Republic of South Africa 15.
Carbon black		88,898	144,295	10,621	Brazil 63,332; Venezuela 29,798; Iran 19,701.
Coal: All grades excluding briquets		9	505	—	All to Uruguay.
Coke and semicoke		53,032	52,932	—	France 23,872; Netherlands 22,962; U.S.S.R. 4,102.
Peat excluding briquets and litter		—	14	—	All to Uruguay.
Petroleum:					
Crude	thousand 42-gallon barrels	599	1,446	743	Netherlands Antilles 703.
Refinery products:					
Liquefied petroleum gas	do.	7	559	—	Brazil 506; Uruguay 47; Paraguay 6.
Gasoline	do.	268	2,933	726	Netherlands 1,011; Nigeria 376.
Mineral jelly and wax	do.	66	51	—	Chile 28; Peru 19; Bolivia 3.
Kerosene and jet fuel	do.	293	520	492	Paraguay 28.
Distillate fuel oil	do.	526	942	—	All to Paraguay.
Lubricants	do.	101	106	5	Uruguay 93; Paraguay 6.
Residual fuel oil	do.	2,231	2,081	2,051	Paraguay 30.
Bitumen and other residues	do.	75	128	—	Bolivia 52; Paraguay 46, Chile 26.
Bituminous mixtures	do.	1	1	—	Mainly to Bolivia.
Petroleum coke	do.	307	301	84	Netherlands 107; Canada 104.

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

TABLE 3

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS					
Alkali and rare-earth metals		19	30	8	Canada 11; France 7.
Aluminum:					
Ore and concentrate		31,325	20,457	(2)	China 12,638; Brazil 7,747; Guyana 72.
Oxides and hydroxides		239,225	270,999	805	Australia 219,705; Austria 40,000; Brazil 9,537.
Metal including alloys:					
Scrap		—	2	—	NA.
Unwrought		21	55	30	Brazil 25.
Semimanufactures		8,814	9,207	150	Brazil 8,737; West Germany 87.
Antimony: Oxides		[3]12	NA		
Cadmium: Oxides and hydroxides		[3]59	NA		
Chromium:					
Ore and concentrate		27,558	14,776	—	Republic of South Africa 11,780; Cuba 2,996.
Oxides and hydroxides	value, thousands	$13	$8	$8	
Cobalt: Oxides and hydroxides		29	28	17	Finland 5; Belgium-Luxembourg 3.
Columbium and tantalum: Tantalum metal including alloys, all forms	value, thousands	$27	$4	$1	France $3.
Copper:					
Ore and concentrate		1	—		
Metal including alloys:					
Scrap		106	—		
Unwrought		50,987	31,952	2	Chile 29,683; Peru 2,206.
Semimanufactures		1,420	1,154	141	Japan 385; West Germany 208; Brazil 168.
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite	thousand tons	3,342	3,260	(2)	Brazil 2,970; Peru 123; Venezuela 89.
Pyrite, roasted		4,203	—		
Metal:					
Scrap		671	2,507	10	Bolivia 1,552; Venezuela 206; Brazil 185.
Pig iron, cast iron, related materials		17,800	112,770	634	Brazil 91,124; Paraguay 20,008.
Ferroalloys:					
Ferromanganese		2,913	3,917	—	Brazil 3,024; Norway 543; Sweden 255.
Ferrosilicon		—	204	—	West Germany 109; Republic of South Africa 95.
Unspecified		4,079	2,941	103	Zimbabwe 1,228; Brazil 425; Chile 405.
Steel, primary forms		401,000	744,456	20,670	Brazil 408,750; Japan 124,897; France 65,950.
Semimanufactures:					
Bars, rods, angles, shapes, sections		18,100	17,373	481	Brazil 4,054; Uruguay 2,591; Paraguay 2,450.
Universals, plates, sheets		257,948	170,406	6,357	Brazil 84,687; Japan 22,696; West Germany 19,595.
Hoop and strip		5,782	4,128	445	Brazil 904; West Germany 886; Japan 717.
Rails and accessories		436	377	101	Austria 124; Belgium-Luxembourg 102.
Wire		4,657	5,209	58	Uruguay 3,499; Brazil 1,211.
Tubes, pipes, fittings		72,870	45,016	546	France 29,697; Italy 4,782; West Germany 4,207.
Castings and forgings, rough		34	38	3	Chile 24; Sweden 5.

See footnotes at end of table.

TABLE 3—Continued

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Lead:				
Oxides	180	16	15	Peru 1.
Metal including alloys:				
Scrap	35	40	—	All from Chile.
Unwrought	172	(2)	—	All from France.
Semimanufactures	1	5	(2)	Bolivia 4; Netherlands 1.
Lithium: Oxides and hydroxides	[3]124	NA		
Magnesium: Metal including alloys:				
Unwrought	746	1,022	834	Norway 188.
Semimanufactures	67	—		
Manganese:				
Ore and concentrate	60,353	78,395	247	Brazil 78,125; Netherlands 23.
Oxides	631	425	17	Brazil 398; Morocco 10.
Mercury	45	57	(2)	Mexico 51; China 6.
Molybdenum: Metal including alloys, all forms	4	1	—	All from France.
Nickel:				
Matte and speiss	17	30	—	All from Cuba.
Oxides and hydroxides	[3]24	NA		
Metal including alloys:				
Unwrought	844	322	8	Norway 155; Canada 113; Brazil 30.
Semimanufactures	256	201	48	West Germany 52; Canada 43.
Platinum-group metals: Platinum metal including alloys, unwrought and partly wrought value, thousands	$340	$242	$65	Spain $93; West Germany $72.
Silver: Metal including alloys, unwrought and partly wrought do.	$2,884	$111	$3	West Germany $67; Italy $16.
Tin:				
Ore and concentrate	161	60	—	Mainly from Bolivia.
Metal including alloys:				
Unwrought	727	550	—	Brazil 445; Bolivia 105.
Semimanufactures	24	15	3	Bolivia 6; Republic of Korea 3.
Titanium: Oxides	1,085	486	4	Belgium-Luxembourg 272; West Germany 142.
Tungsten:				
Ore and concentrate	97	105	—	Bolivia 70; Sweden 35.
Metal including alloys, all forms	9	3	3	
Uranium and thorium: Oxides and other compounds value, thousands	$325	$507	$402	France $35; Italy $21.
Zinc:				
Oxides	29	8	5	West Germany 3.
Metal including alloys:				
Scrap	34	247	—	Canada 119; Spain 64.
Unwrought	5,867	1,880	—	Mexico 1,586; Canada 245.
Semimanufactures	46	11	(2)	Mexico 4; Japan 3; West Germany 2.
Other:				
Ores and concentrates	2,659	2,878	3	Republic of South Africa 2,104; Bolivia 743.
Oxides and hydroxides	75	1,543	424	Chile 806.

See footnotes at end of table.

TABLE 3—Continued

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Other—Continued					
Ashes and residues		24	85	—	Chile 76; China 9.
Base metals including alloys, all forms		339	411	336	Republic of South Africa 21; Peru 19.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		290	164	164	
Artificial: Corundum		6,961	7,196	203	Brazil 6,701; Austria 112.
Dust and powder of precious and semi-precious stones	value, thousands	$750	$564	$360	Republic of South Africa $178.
Grinding and polishing wheels and stones		209	236	4	Italy 107; Sweden 67; Brazil 45.
Asbestos, crude		14,324	8,109	20	Canada 2,870; Brazil 2,684; Zimbabwe 1,600.
Barite and witherite		1,577	212	11	Bolivia 150; Brazil 45.
Boron materials: Oxides and acids		—	7	—	Italy 6; Belgium-Luxembourg 1.
Bromine		[3]24	[4]33	—	Israel 20; Chile 12; Japan 1.
Cement		1,176	2,314	258	France 823; Canada 350.
Chalk		1	17	—	Denmark 15; West Germany 2.
Clays, crude		34,118	24,732	10,195	Brazil 14,128.
Cryolite and chiolite		28	22	—	Denmark 20; Belgium-Luxembourg 2.
Diamond:					
Gem, not set or strung	value, thousands	—	$39	—	Republic of South Africa $27; Brazil $12.
Industrial stones	do.	$468	$353	$86	Republic of South Africa $177; Belgium-Luxembourg $40.
Diatomite and other infusorial earth		1,822	2,037	293	Mexico 1,219; Chile 526.
Fertilizer materials: Manufactured:					
Nitrogenous		59,470	104,809	14,656	Bulgaria 41,725; Romania 20,273.
Phosphatic		34,911	30,508	8,991	Israel 15,000; Brazil 4,216.
Potassic		20,651	25,542	4,537	Canada 12,850; Israel 2,320.
Unspecified and mixed		65,421	101,786	97,956	Chile 2,295.
Graphite, natural		435	552	56	Brazil 370; China 95.
Gypsum and plaster		6	9	7	Italy 2.
Iodine		[3]16	NA		
Magnesium compounds: Magnesite, crude		20,179	24,487	102	Brazil 12,572; Mexico 10,913.
Mica:					
Crude including splittings and waste		2	24	22	Belgium-Luxembourg 1; India 1.
Worked including agglomerated splittings		13	11	2	Belgium-Luxembourg 2; France 2.
Nitrates, crude		3,900	3,265	—	All from Chile.
Pigments, mineral: Iron oxides and hydroxides, processed		83	59	21	West Germany 31; Spain 5.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$21	$14	—	Brazil $6; West Germany $3; Uruguay $2.
Synthetic	do.	$89	$48	$27	Brazil $12; Republic of South Africa $7.
Pyrite, unroasted		40	22	—	All from Italy.
Salt and brine		33	52	19	West Germany 27; Switzerland 3.
Sodium compounds, n.e.s.:					
Soda ash, natural and manufactured		199,572	163,854	64,739	Spain 37,923; Romania 17,262.
Sulfate, natural and manufactured		[3]2,384	NA		

See footnotes at end of table.

TABLE 3—Continued

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		1,453	1,831	—	Uruguay 738; Italy 549; Brazil 522.
Worked		659	825	(2)	Italy 343; Uruguay 258; Spain 182.
Dolomite, chiefly refractory-grade		350	300	—	Brazil 260; West Germany 36.
Gravel and crushed rock		160,654	195,650	—	Paraguay 143,250; Uruguay 52,400.
Quartz and quartzite		281	134	—	Sweden 76; Belgium-Luxembourg 41; West Germany 17.
Sand other than metal-bearing		211,024	182,470	6,716	Uruguay 174,350; Brazil 1,403.
Sulfur:					
Elemental:					
Crude including native and byproduct		105,896	53,882	4,193	Canada 49,544.
Colloidal, precipitated, sublimed		22	14	13	West Germany 1.
Sulfuric acid		2,287	4,163	(2)	Mainly from Uruguay.
Talc, steatite, soapstone, pyrophyllite		1,049	778	202	China 449; Uruguay 80.
Other:					
Crude		7,637	8,047	383	Brazil 5,396; Republic of South Africa 1,118; West Germany 843.
Slag and dross, not metal-bearing		368	795	10	Brazil 700; Uruguay 70.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		77	129	129	
Carbon black		617	732	474	Brazil 97; West Germany 64.
Coal:					
Anthracite		—	2,110	1,010	Brazil 1,100.
Bituminous		—	1,250	442	Colombia 343; Australia 300.
Anthracite and bituminous excluding briquets	thousand tons	1,110	—		
Lignite including briquets		100	(2)	—	All from France.
Coke and semicoke		—	96	96	
Gas, natural	million cubic meters	2,121	2,228	—	All from Bolivia.
Peat excluding briquets and litter		[3]100	136	136	
Petroleum:					
Crude	value	$1,000	$3,000	$2,000	Switzerland $1,000.
Refinery products:					
Liquefied petroleum gas	42-gallon barrels	1,467,608	546,615	11	Kuwait 546,604.
Gasoline, motor	do.	1,126,539	11,118	1,632	Brazil 8,917.
Mineral jelly and wax	do.	7,114	5,777	1,810	Brazil 2,739; Spain 527.
Kerosene and jet fuel	do.	1,461,774	1,290,468	8	Brazil 739,505; Italy 201,515; Saudi Arabia 164,967.
Distillate fuel oil	do.	4,003,752	2,938,240	286,882	Brazil 1,625,251; Saudi Arabia 510,794.
Lubricants	do.	477,722	439,705	35,532	Italy 325,927; France 50,974.
Residual fuel oil	do.	5,126,955	5,862,532	262,584	Venezuela 1,582,096; Romania 1,174,771; Trinidad and Tobago 1,130,841.
Bitumen and other residues	do.	109	—		
Bituminous mixtures	do.	—	73	—	All from Brazil.
Petroleum coke	do.	847	6	6	

NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]Estadistica Minera de la Republica Argentina, 1988.
[4]Includes fluorine and iodine.

largest of its products producers, continued operating its Puerto Madryn refinery in Chubut Province in 1989. Kicsa, the second-largest producer of aluminum products in 1988, completed the expansion of its plant at Abastos in Buenos Aires Province in 1989. Kicsa undertook its expansion program at a cost of $7 million in 1987 and $22 million in 1988 to double aluminum foil output and to produce aluminum cans for beverages in 1989. Aluminum output during 1989 reached 155,000 tons.

Imports of aluminum products in all forms increased from 2,500 tons in 1988 to 2,700 tons, and exports rose from 87,100 tons to 90,000. Apparent consumption of aluminum in 1989 increased to 74,000 tons.

Copper.—As announced in 1988, the Provincial Government of Mendoza auctioned the Paramillos Sur copper-molybdenum deposit in 1989, and bids were open to both national and foreign companies. The Paramillos Sur copper deposit consisted of nine concessions of 100 hectares each and contained a total of 186 million tons of ore reserves with an average grade of 0.58% copper with economically recoverable gold and molybdenum values. The Dirección de Minería in Mendoza selected Minerex S.A., a subsidiary of Allgemeine Finanz, and Handels Aktiengesells Chaft, a foreign consortium made up of U.S. and Japanese investors. The price paid by Minerex S.A. was $735,000, and the company plans to invest $2 million in exploration and exploitation during the first 2 years beginning in 1990.

Gold and Silver.—The Government reported that gold production increased 15.7% and that silver production increased 5.0%. Gold and silver were produced from several small- and medium-sized mines and as a byproduct of two polymetallic mines, Farallón Negro Mine in Catamarca Province and the Angela Mine in Chubút Province. The Farallón Mine was owned by YMAD, a state company controlled by the Provincial Governments of Catamarca and Tucumán. YMAD, in addition to producing gold and silver from the Farallón Negro Mine, recovered manganese concentrate that was sold to the steel industry. Gold and silver were produced from the Alto de la Blenda Mine, also by YMAD. YMAD continued mining gold on a pilot basis using the heap-leaching process from the Bajo de la Alumbrera deposit. The company planned to quadruple its production of gold to 2,000 kilograms per year in the near future.

Iron Ore.—Argentina's leading iron ore producer, HIPASAM, which owned the important Sierra Grande iron ore deposits, may receive some help from Chile's Cía. Minera del Pacífico (CMP) to extricate it from its $28 million debt. Without CMP's assistance, HIPASAM would be hard pressed to increase its annual production by 100,000 tons to 700,000 tons in order to pay off the debt. The company had a long way to go to achieve the 2-million-ton-per-year target it set for itself in 1986. CMP's interest in the company revolved around the presence of ytterbium contained in the 2.5 million tons of tailings at the Río Negro deposits. Ytterbium, one of the rare earths, is used in the production of high-quality superconductors.

CMP reportedly was also interested in HIPASAM's pelletizing plant at the Sierra Grande Mine, whose greater capacity and proximity to the Atlantic Ocean make it more economical than its own Huachipato plant in Chile. The Sierra Grande Mine, 1,200 kilometers (km) from Buenos Aires, has proven iron ore reserves of 113 million tons grading 54.8% iron, 5.95% silica, 4.85% alumina, 3.3% calcium, 1.43% phosphorus, and 0.44% sulfur per ton. Argentine iron ore pellet production by HIPASAM increased considerably in 1989, enabling the company to move closer to achieving its 700,000-ton goal in 1990. SOMISA consumed HIPASAM's entire production of pellets at the same cost as the Brazilian pellets produced at Tubarao, plus the differential price of shipping.

Iron and Steel.—With the help of Japanese and Brazilian investors, Argentine private steel producer ACINDAR planned to invest a $100 million on expansion of its 700,000-ton direct-reduction plant (sponge iron). The company produced 355,000 tons of crude steel in 1989, which generated about $80 million in revenue. In 1989, ACINDAR managed to reduce its external debt from $850 million to $80 million, increasing production at its La Tablada steel plant and modernizing its continuous casting mill for a total investment of $30 million.

SOMISA, the largest of the two Government-owned steel plants, turned in a record performance from June 1988 through June 1989 because the firm reported export earnings of $330 million. More than 4 million tons of steel was produced during the period, another company record. SOMISA exported more than 2.9 million tons of steel to 29 countries during 1989 and planned to export 350,000 tons more by yearend. By yearend, SOMISA had invested $125 million in modernization and expansion of its rolling mill plant for making structural steelplate, mainly to be used by the naval industry and for the construction of gas pipelines. At yearend, SOMISA continued negotiating with various business firms to join a partnership to complete its modernization and expansion project. One of the most interested firms was Techint-Siderca through its subsidiary, Propulsora Siderúrgica, which was the chief user of wide sheets. The Government agency, Dirección General de Fabricaciones Militares (DGFM), decided to tender its Altos Hornos Zapla smelter for private international and national bids. DGFM was forced to make this decision to avoid further economic problems.

Lead and Zinc.—CMASA continued to lead in the production of lead and zinc concentrates. Enough ore was extracted from its mines to supply the national demand for lead and zinc and a good portion of the demand for silver. The Argentine market, therefore, constituted the greatest incentive for its operation. Because the domestic demand for lead and zinc began dropping significantly in 1978, CMASA decided to market part of its concentrates abroad. The high quality of its concentrates allowed it to establish new markets rapidly, especially in Europe. CMASA concentrates were further processed in the major smelters of Australia, Brazil, Finland, France, the Federal Republic of Germany, Italy, the U.S.S.R., the United Kingdom, and the United States. Even in 1989, 40% of its production of lead concentrate continued to be exported. Conversely, the recovery of the domestic zinc market brought exports partially to an end in 1982.

Aguilar produced about 33,000 tons of lead concentrate annually with an average metallic content of 76% and 1,700 grams of silver per ton, plus 73,000 tons of zinc concentrate with an average metallic content of 49% zinc. CMASA signed a contract with Wright Engineers Ltd. of Canada for a feasibility study on the expansion of production and processing capacity by 50%.

Tin.—Like many of Argentina's mining companies affected by the country's severe economic recession, Sociedad

Minera Pirquitas Picchetti y Cía. S.A., Argentina's largest tin mining company, struggled to avoid bankruptcy. The company managed to maintain its extractive operation at its usual level, despite the negative effects of international prices and the stiff import competition of Brazilian tin. The tin smelter of La Cuprífera Argentina S.A., the Argentano S.A. (formerly ESTANSA) processing plant, and the Pirquitas Mine continued normal operations in spite of difficulties that included the negative effect of some Government mining policies. The mine's decline in production of tin not only affected the mine employees, but also those employees at the La Cuprífera smelter and at the Argentano processing plant.

Uranium.—Production of yellow cake (U_3O_8) decreased 36% compared with that of 1988, reaching an estimated 60.3 tons. The Embalse nuclear powerplant in Córdoba Province went off-line for 48 hours in late April to effect what was described as "minor electrical repairs" at the plant. The downtime did, however, revive discussions over the need for the Embalse nuclear powerplant to complete a 5- to 6-week shutdown for maintenance. CNEA officials indicated that the projected date for the start of the maintenance should remain July 7, 1989, by which time CNEA officials hoped to have brought Atucha I back on-line temporarily. CNEA officials noted that the dates for the Embalse and Atucha I moves were chosen to coincide with reduced energy consumption experienced during the winter months. The Argentine Government signed a decree authorizing CNEA to sign three supplements to the loan contracts offered by the Federal Republic of Germany for the completion of construction work of the Atucha II nuclear powerplant. The supplements totaled $230 million and will be added to the $1.1 billion financing at the outset of the project.

Industrial Minerals

Boron.—According to statistics released by the Government, Argentina ranked fourth in the world as a boron producer after Turkey, the United States, and the U.S.S.R. Revised figures for 1988 indicated that the production of boron minerals increased by 39.2%, compared with 1987 instead of 6% as reported in 1989. However, in 1989 boron output increased only 1.1%, compared with that of the previous year. In terms of foreign exchange generated, this industry ranked first among all mining industries in the

TABLE 4

ARGENTINA STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities		Capacity[1]
Aluminum	Aluminios Argentinos S.A.I.C. (ALUAR) (52.1% state, 47.9% private	Puerto Madryn, Chubut Province		165
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		200
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		10,000
Coal	Yacimientos Carboníferos Fiscales (Government 100%)	Río Turbio, Santa Cruz Province.		1,600
Gold, silver	Yacimientos Mineros de Agua de Dionisio (YMAD) (Government 100%), Angela Mine (100% private)	Farallón Negro, Hualfín and Belén Depts. Gastre Dept., Chubut Province	Gold Silver	[2]33 [2]74,648
Iron ore	Hierro Patagónico de Sierra Grande S.A. Minera (HIPASAM) (Government 100%)	Sierra Grande, Río Negro Province		2,000
Lead, silver, zinc	Cía. Minera Aguilar S.A. (owned 100% by a Bolivian Consortium Cía. Minera del Sur, [COMSUR])	Estación Tres Cruces, El Aguilar, Jujuy Province	Silver Pb Zn	[2]49,766 24,000 30,000
Natural gas	Yacimientos Petrolíferos Fiscales (YPF) (Government 100%)	Neuquén Santa Cruz, Tierra del Fuego, Salta, and Río Negro Provinces.		[3]24,069
Petroleum	do.	Chubut, Santa Cruz, Neuquén, Río Negro, Mendoza, Salta, Tierra del Fuego, Jujuy, La Pampa, and Formosa Provinces		[4]180
Steel	Sociedad Mixta Siderúrgica Argentina (SOMISA) (3% private, 97% Government)	7 kilometers from San Nicolás de los Arroyos, Buenos Aires Province		2,100
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		1,000
Uranium (ore)	Empresa Nuclear Mendoza, subsidiary of Comisión Nacional de Energía Atómica (Government 100%)	Sierra Pintada, San Rafael, Mendoza Province		600
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

[1]Thousand metric tons per year unless otherwise specified.
[2]Kilograms per year.
[3]Million cubic meters per year.
[4]Million barrels per year.

country. More than 90% of the boron minerals and derivatives, mainly sodium borate, and 67% of the boric acid output were exported, mainly to Brazil. The largest boron mineral producer in Argentina was Cía. Boroquímica S.A.M.I.C.A.F., owned by Río Tinto Zinc Corp. Ltd. and Industrias Químicas Baradero S.A. Boroquímica has an installed capacity of 37,000 tons per year at its plants in Campo Quijano and Tincalayu in the Province of Salta. Exports from the company reached 26,500 tons in 1989.

Cement.—The Argentine production of cement continued its downward trend, which began in 1987 and reached 4.5 million tons in 1989. This was a 26.1% decline, compared with 1988 output. For the year, the cement industry operated at 37.4% of its installed capacity. The decrease in production during the past 3 years was due primarily to the stagnant demand in the construction industry and to the modernization and installation of new plants. There were 19 cement plants operating in Argentina belonging to 6 companies, of which the largest were Cementos Loma Negra C.I.A.S.A. with 6 plants having a total installed capacity share of 44% (5,262,400 tons); Juan Minetti S.A. with 5 plants and a 19% share (2,272,400 tons); and Corporación Cementera Argentina S.A. (Corcemar) with 3 plants and 18% share (2,152,800 tons) of the total. Despite the discouraging situation created by price controls, there were some important investments in this sector. Cementos Loma Negra expanded its Zapala plant capacity to 312,000 tons per year, a 72,000-ton increase. It also modernized some sectors of the Olavarría plant.

Granite.—On November 24, 1989, the Provincial Government of Córdoba and representatives of Technostone S.p.A. of Italy signed an agreement for the development and exploitation of granite deposits in the Province of Córdoba and at other locations. In addition, construction of a granite industrial plant was also agreed to. The initial investment for the project will be $11 million. The agreement, to last for 32 months, was signed in late December 1988 and included the following:

1. An engineering and geological study of the region,
2. Preparation of a granite pilot exploitation site,
3. Installation of a granite pilot industrial plant,
4. A technical course for Argentine technicians and skilled laborers, and
5. Materials and services by the Italians (technical assistance).

In the nearby Cruz del Eje City, Córdoba Province, another granite plant was inaugurated by KURSAAL S.A. with an industrial production capacity of 800 to 1,000 tons of granite per month. Both plants, when completed, will employ a total exceeding 340 workers including professionals, technicians, and laborers. The economic impact of this new activity in the area of Córdoba will extend to the northeastern provinces of Catamarca, La Rioja, Mendoza, San Juan, and San Luis.

Authorities from the Province of Córdoba and representatives from the Romanian enterprise Rompetrol-Geomin have joined forces in an agreement that envisages technology transfer, personnel training, and construction of a new granite industrial plant. The agreement also included the upgrading of machinery and equipment and the exploitation and reactivation of mineral deposits (mines), including the installation of a manganese processing plant at Pozo Seco in the Sobremonte Department, Córdoba Province.

The Argentina mining concern, Yacimientos Mineros Riojanos (Yamiri), formed a company with Central Minera S.A. to exploit granite deposits in Chamical in La Rioja Province. The joint venture created the company Unión Transitoria de Empresas to manage the project. It will require an estimated $23 million over 10 years with an estimated output of about 24,000 tons per year, most of which will be for export.

Sodium Carbonate.—A sodium carbonate plant, under construction in Punta Delgado in Río Negro Province by Alcalis de la Patagonia, was expected to come on-stream in 1992, according to officials. Most of the production will be for export. Its proximity to the deepwater Port of Punta Villarino, to the calcium carbonate deposits, and to the sodium chloride supplier should allow the company to keep its production costs low. Alcalis de la Patagonia's Piedras Blancas limestone deposit, with estimated reserves of 100 million tons, and the salt mines at El Gualicho, 48 km from the plant, should enable the company to obtain high-purity salt well into the next century.

Mineral Fuels

In 1989, Argentina's estimated production of commercial energy totaled nearly 66.6 million tons of standard coal equivalent, almost 1.8% above the 1988 level. Of the total, solid fuels accounted for only 0.6%, liquid fuels for 51.8%, gas fuel for 42.3%, and primary electricity for 5.3%. Energy consumption data were not available for years subsequent to 1987, when, of a total consumption of 59.5 million tons, of standard coal equivalent, solid fuels provided 2.4%, liquid fuels contributed 48.9%, gas fuels supplied 42.8%, and primary electricity accounted for 5.9%.

Of total installed electrical generating capacity of 16,593 kilowatt hours in 1987, 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 in detailed form, a total of 52,165 kilowatt hours was produced, 45.6% by conventional thermal plants, 42% by hydroelectric plants, and 12.4% by nuclear plants. In 1988, total electric power output declined 7.2%, but its distribution by source was not available, and 1989 power output was not yet reported.

Coal.—Production of bituminous coal increased from the depressed level of the prior year by 33%. YCF, the state-owned coal company, produced coal from the Río Turbio Mine in Santa Cruz Province. Under a 5-year project, YCF planned to increase annual coal production to 650,000 tons by 1990 and to 1.6 million tons by 1992. Officials from YCF announced the possibility of a joint agreement with the Spanish company IMENOSA to continue producing bituminous coal from the Río Turbio Mine. The agreement would require the presentation of a feasibility study within 45 days. Under terms of the proposed agreement IMENOSA would be responsible for operating the Río Turbio Mine, processing its output, and transporting the product to the consuming area. The agreement also would establish that the Government prepare the necessary arrangements for the signing of the contracts within 90 days after the agreement. The Spanish firm had an ambitious program that consisted of mining coal by the open pit method, the construction of thermal plants in Punta Loyola as well as in Litoral, and possible exports to Spain. The new project would require an investment of approximately $200 million.

Natural Gas.—Natural gas production increased almost 6% to a record high. To

supplement domestic natural gas production, Argentina imported an estimated 2,186 million cubic meters of gas from Bolivia, 2% less than in 1988, for at an estimated cost of $200 million. Natural gas was imported under a bilateral agreement between Argentina and Bolivia due to expire in 1992. Of the total production of natural gas during the year, 16% was used by home consumers, 15% by thermoelectric plants, and 32% by industrial plants. Four percent was consumed at the production site, 14% was flared or vented, 8% was reinjected into the reservoir for repressuring, and 11% represented losses. Proven recoverable reserves of natural gas at yearend were 700 billion cubic meters, most of which was in the Neuquén Basin.

In Santa Fé Province, the Unión de Empresas Argentinas y Mexicanas completed 390 km of a 36-inch-diameter pipeline that joined the central and southern regions of the country. The project was entirely financed by Mexican banks, which invested $40 million over an 8-year term.

Petroleum.—The slight decrease in crude oil production in 1989 apparently had little effect on Argentina's overall petroleum supply picture. Refinery output, based entirely on domestic crude oil as it has been in each year subsequent to 1982, advanced slightly. For the fifth consecutive year, there was a modest supply of crude oil available for export: Notable was 552,000 barrels of Argentine crude oil received by the United States in 1989, a quantity somewhat less than that of 1988.

Efforts that started in 1988 to both increase domestic crude oil production and reduce petroleum product consumption continued in 1989. These aimed at reducing the foreign exchange expenditure for refined product imports, which had leaped to record levels in 1987. Net imports of refinery products in that year totaled nearly 9.8 million barrels. In 1988, they were reduced to under 3.5 million barrels as imports declined and exports increased. Final returns for 1989 were not available, but a further drop in the net import was anticipated. YPF had intensified efforts to reestablish self-sufficiency by yearend.

The Government has turned increasingly to the private sector to boost the country's petroleum production. In 1985, the Government developed the Houston Plan, designed to attract private investment to high-risk areas. To date, three international tenders have been issued under the Houston Plan, and the fourth was launched later in 1989. Under this round of bidding, 35 bids on 24 areas out of a total of 63 oil exploration areas were put on YPF the block. The fourth round of bidding under the Houston Plan was opened March 2. The Government of Argentina announced later that a much simpler method of contracting will be used for awarding these areas.

INFRASTRUCTURE

The Argentine road network consists of about 208,350 km, of which 47,500 were paved, 39,500 were gravel, 101,000 were improved earth, and 12,500 were 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 7,000 km of pipeline for transport of crude oil and refined products and 10,900 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 34,000 km. It transported about 19 million tons of freight and 300 million passengers per year. Of the total network, 164 km were electrified. The network was owned and operated by the state enterprise, Ferrocarriles Argentinos.

OUTLOOK

Argentinians believe that the mining sector, unlike the rest of the economic sectors of the country, is reliable and they consider it profitable. Argentina has large reserves of various mineral commodities, many of which should continue to be in demand throughout the industrial nations of the world. Its ample sources of petroleum, natural gas, coal, and uranium, as well as its vast nonfuel mineral resources remain 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.

The Secretariat of Mining has already designated a number of mineral deposits as being of special interest. These deposits were being offered to national as well as international bidders. They were as follows:

1. Bajo de la Alumbrera, copper and gold deposit, Catamarca Province.
2. Mina Ethel, manganese, Mendoza Province.
3. Mina Santa Elena, lead and zinc, San Juan Province.
4. Mina Alto de la Blenda, gold and silver, Catamarca Province.
5. Mina King Tut, cobalt and gold, La Rioja Province.
6. Mina Offir, copper, gold, and silver, La Rioja Province.
7. Mina Erika, gold, Neuquén Province.
8. Mina Angela, copper, gold, lead, zinc, and, Chubut Province.
9. Mina El Carmen, Tungsten, Córdoba Province.
10. Mina Concordia, copper, lead, silver, and zinc, Salta Province.
11. Mina Vicentito, lead, silver, and zinc, Río Province.
12. Mina San Martín, Tungsten, Río Negro Province.
13. Mina Farallón Negro, gold, manganese, and silver, Catamarca Province.

The Argentine steel industry experienced a record performance in 1989. SOMISA, the largest Government-owned steel plant, reported export earnings of about $300 million. ACINDAR, the second-largest private steel plant, generated about $80 million in revenue. Production of basic steel was maintained and was expected to continue.

[1] Where necessary, values have been converted from Argentine australes to U.S. dollars at the rate of Australes 356.81 = US$1.00, the average exchange rate in 1989.

OTHER SOURCES OF INFORMATION

Agencies

Secretaría de Estado de Minería
Ave. Santa Fé 1548
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Yacimientos Petrolíferos Fiscales
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Sociedad Mixta Siderúrgica Argentina
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Comisión Nacional de Energía Atómica
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Buenos Aires, Argentina

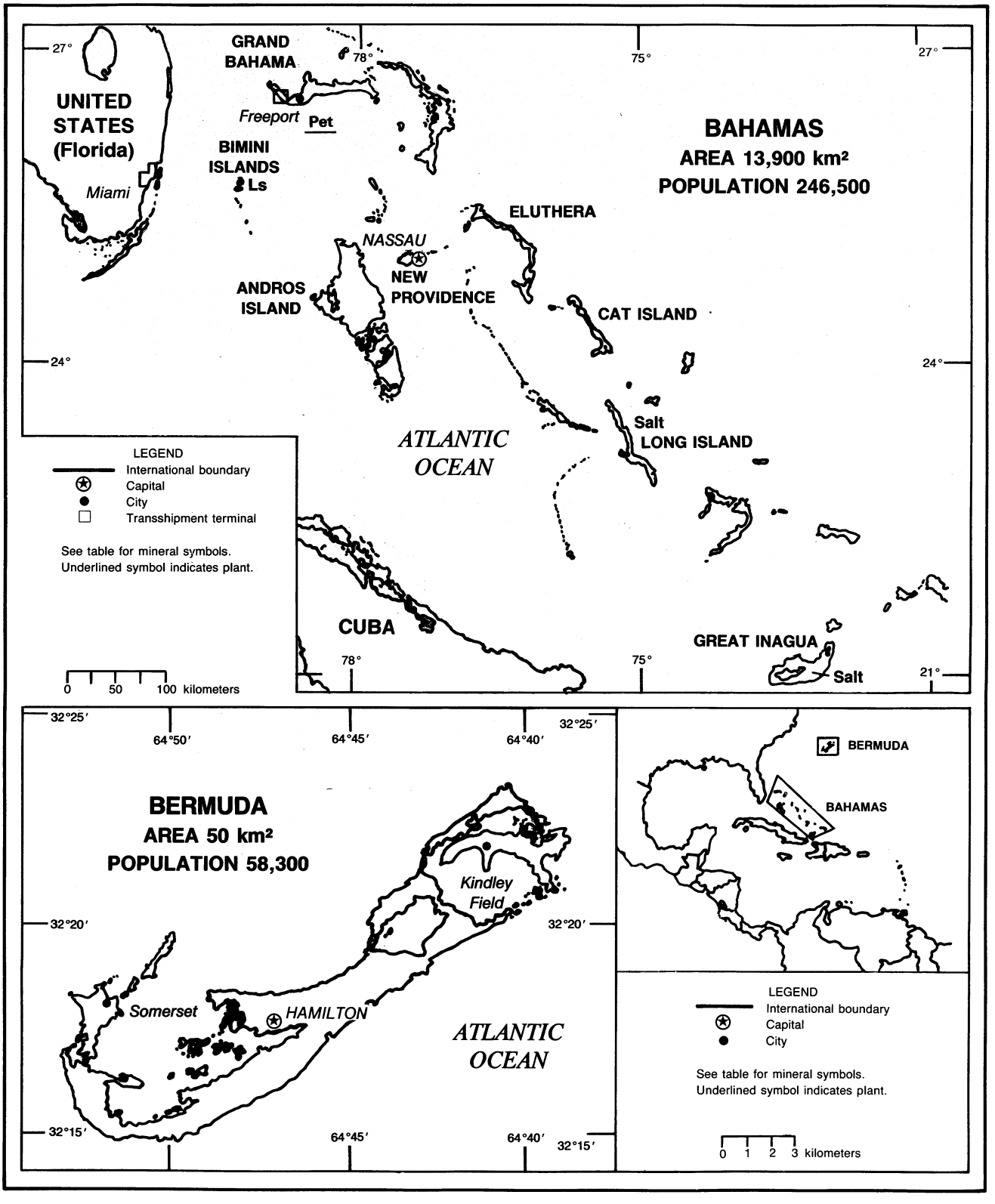
Gas del Estado
Alsina 1169
1088 Buenos Aires, Argentina

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

Publications

1. Estadística Minera de la República Argentina (Annual Report), Secretaría de Estado de Minería, Ave. Santa Fé 1548, 1060 Buenos Aires: Annual Report.
2. Panorama Minero mining magazine Santa Fé 2069, 7mo Piso C, 1123 Capital Federal, Argentina monthly.
3. Minería, Revista especializada, Ave. de Mayo 1370, 9no Piso, Ofic. 236, Buenos Aires, Argentina.
4. Tendencias Económicas (Business Trends), Esmeralda 320, 6to Piso, Buenos Aires, Argentina: Annual Report.

BAHAMAS AND BERMUDA



THE MINERAL INDUSTRY OF

THE BAHAMAS AND BERMUDA

By Ivette E. Torres

Mineral production in the Bahamas in 1989 was limited to aragonite, salt, and small amounts of sand and gravel and stone for construction. Two other mineral-related commodities that had been produced in the Bahamas, cement and petroleum products, were not produced in 1989. A small amount of cement was last produced in 1986, after 2 years of inactivity. The petroleum refinery in Freeport was closed in 1985, but the site facilities continued to be used for transshipment.

PRODUCTION

The value of mineral production in 1989 was $15.9 million.[1] Salt and aragonite (a form of calcium carbonate) accounted for the majority of that figure, and production of those two commodities increased 17% and 39%, respectively.

TRADE

The United States continued to be the Bahamas' most significant trading partner. Other trading partners included the European Community, Gabon, Iran, and Nigeria. Within the European Community, the United Kingdom was the leading trading partner.

INFRASTRUCTURE

The Bahamas had two major commercial ports, Freeport in Grand Bahama Island and Nassau on New Providence Island. Also, nine small ports were used mainly for interisland transport. Of the 2,400-kilometer road system, 1,350 kilometers were paved and 1,050 were gravel roads. In 1989, installed electric power generating capacity totaled 386 megawatts.

OUTLOOK

Higher oil prices could be an incentive for reopening the oil refinery. Employment in the mineral sector, when the refinery was in operation, was less than 1% of the total work force. In 1989, the Bahamas was considering reopening the cement plant.

TABLE 1

BAHAMAS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
Petroleum refinery products[e]	thousand 42-gallon barrels	—	91	—	—	—
Salt	thousand tons	6,000	899	736	616	[3]858
Stone: aragonite	do.	[e]2,000	426	1,524	897	[3]1,086
Sulfur, byproduct of petroleum[e]	do.	1	—	—	—	—

[e]Estimated. [p]Preliminary.
[1]Table includes data available through Aug. 31, 1990.
[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]Reported figure.

TABLE 2

BAHAMAS: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	Bahamas Cement Co. (Int. Devel. Corp. S.A. and Tag Group S.A.)	Grand Bahama Island	690
Limestone	Marcona Ocean Ind. Inc. (Marcona Corp., 100%)	Ocean Cay	2,500
Petroleum products	Bahamas Oil Refining Co. (Chevron Corp., 100%)	Grand Bahama Island[1]	[2]350
Salt	Morton Bahamas Ltd. (Morton Salt Co., 100%)	Great Inagua Island	1,500

[1]Chevron Corp. closed refinery operation in 1985. The Charter Co., formerly part owner of the refinery, ceased processing crude oil at this plant in early 1984.
[2]Thousand 42-gallon barrels per day.

BERMUDA

The mineral industry of Bermuda was insignificant. Although small quantities of coral limestone have been quarried for use as construction material for building, roofing, and water storage tanks, statistics on production are not available. Bermuda, an archipelago of small islands about 1,770 kilometers east of South Carolina, has no rivers or streams, and groundwater resources are not potable. Rain and seawater desalinization provide the fresh water supply. Electric power generating capacity in 1989 was 134 megawatts, all from oil-fired plants. Imports of petroleum products supplied all energy requirements.

Bermuda is an independent territory of the United Kingdom whose main industry is tourism, which provides about 60% of the country's earnings.[2] The gross domestic product (GDP) in 1989 was estimated at $1.3 billion.[3] The production of stone in Bermuda constituted a negligible part of the GDP, and the country's limited mineral requirements had to be imported. The United States continued to be one of Bermuda's most important trading partners. Other significant partners included Canada, Italy, and the United Kingdom.

[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.

[2]Financial Times, London, Aug. 30, 1990, section III, p. I.

[3]Where necessary, values have been converted from Bermudian dollars (Ber$) to U.S. dollars at the rate of Ber$1.05 = US1.00.

OTHER SOURCES OF INFORMATION

Agency

Ministry of Agriculture, Trade and Industry
P.O. Box N3028
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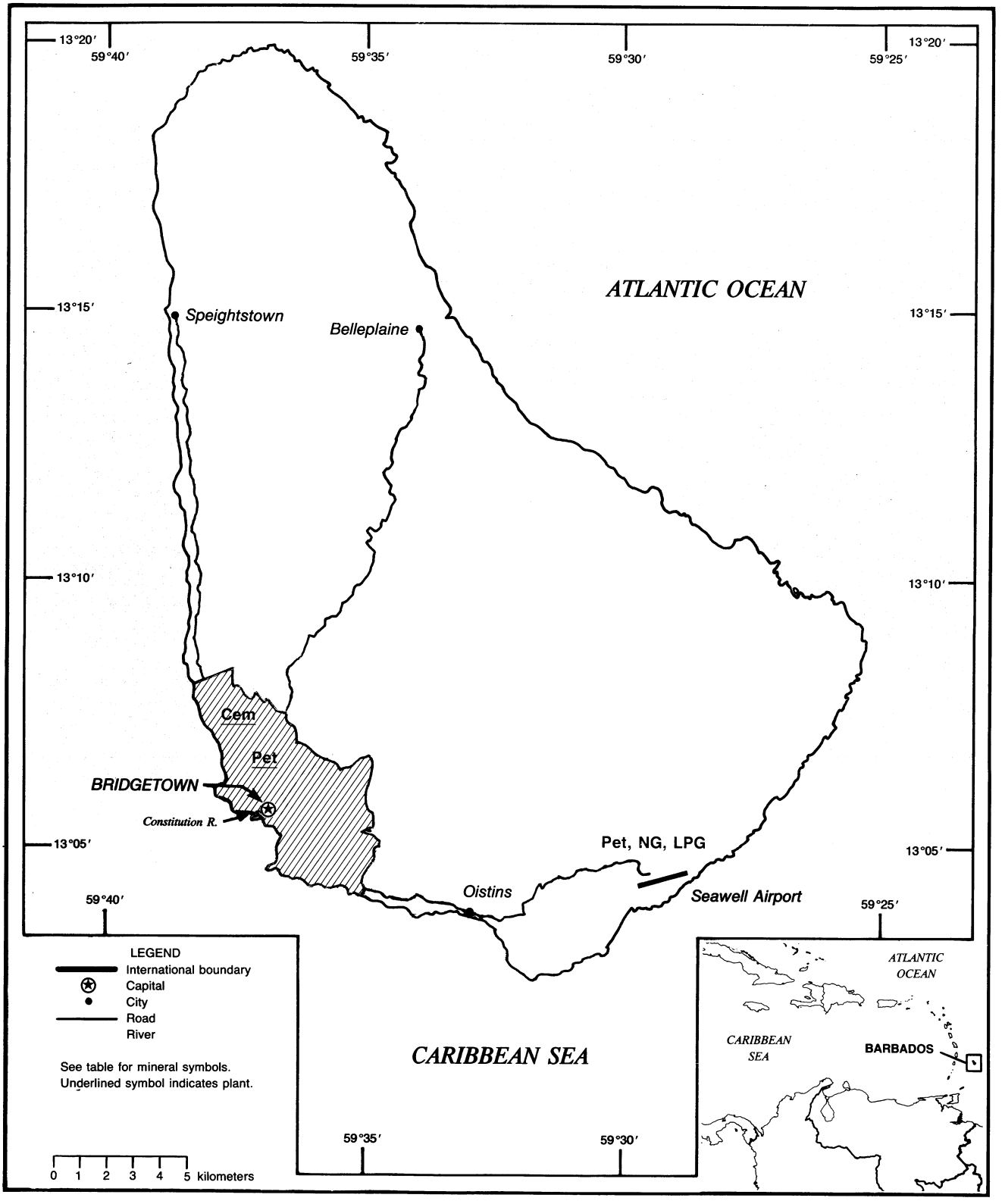
BARBADOS

AREA 430 km² **POPULATION 258,100**



THE MINERAL INDUSTRY OF

BARBADOS

By Ivette E. Torres

Oil and gas continued to dominate the mineral industry of Barbados. Other mineral commodities produced in Barbados such as cement were related to the construction industry. Mining and quarrying continued to represent a very small sector of the gross domestic product, about 1%. The mineral industry also contributes an unspecified amount through oil refining and cement production. Construction activity remained strong in 1989.

The Barbados economy continued to expand. For the first 6 months of the year, the increase was estimated between 2.5% to 3.0%. Tourism continued to contribute significantly to the country's economic growth. Output by the manufacturing, chemicals, and electronic components sectors increased also.

TABLE 1

BARBADOS: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		1985	1986	1987	1988[p]	1989[p]
Cement, hydraulic	thousand metric tons	[e]215	199	205	184	[e]215
Gas, liquefied petroleum	42-gallon barrels	—	—	—	16,632	16,824
Gas, natural:						
Gross	million cubic meters	26	27	30	35	32
Marketed	do.	11	11	10	17	15
Petroleum:						
Crude	thousand 42-gallon barrels	679	559	497	427	389
Refinery products	do.	1,506	1,697	1,669	1,723	1,915

[e]Estimated. [p]Preliminary.
[1]Table includes data available through Apr. 1990.
[2]In addition to commodities listed, crude construction materials (lime, 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.

GOVERNMENT POLICIES AND PROGRAMS

Foreign investment is encouraged by tax advantages and other incentives. The nonfuel mineral production is too small to attract foreign investment, except on an individual basis. Concessions for petroleum exploration can be granted to foreign companies.

PRODUCTION

Output of cement increased, reflecting the elevated construction activity in 1989. Production of natural gas (marketed) and crude petroleum decreased 7% and 9%, respectively. Output of refinery products increased by 11%. Production of liquefied petroleum gas from the new plant in Woodbourne Field, inaugurated in March 1988, remained at about the same level as that of 1988.

TRADE

The United States continued to be Barbados' leading trade partner. Barbados received preferential trade benefits under the Caribbean Basin Initiative, and it was also eligible to receive investment funds generated in Puerto Rico at reduced interest rates through the Tax Information Exchange Agreement. Barbados also qualifies for trade benefits with Canada and Europe through CARICAN and the Lomé Convention, respectively. Other trade partners include Guyana, Jamaica, and Trinidad and Tobago. Mineral trade with the United States in 1986, the last year for which detailed mineral trade information was available, was small. Crude oil was imported from the United States. Refinery products were imported from Andorra, Brazil, Guatemala, Trinidad and Tobago, the United Kingdom, and Venezuela.

In 1986, mineral commodities with a value of $84.2 million[1] constituted only about 14% of total imports. Mineral fuels represented 72% of the mineral commodity total. Exports of mineral commodities produced or processed were valued at $7.8 million, or only 3.7% of total exports, with cement accounting for 83.5% of the total. However, $46.1 million worth of mineral commodities were reexported, about 67% of the total reexports. This figure includes $45 million of mineral fuels, of which about $34 million was provided as bunker loadings for visiting vessels.

STRUCTURE OF THE MINERAL INDUSTRY

The petroleum and cement companies are the largest mineral sector employers. Nonetheless, employment by the mineral sector is less than 2% of the estimated 123,000 labor force. Industry ownership is by the Government, in joint venture or alone, and private companies. Petroleum activities are under the control of the National Petroleum Corp., which assumed ownership of Mobil Oil Corp.'s assets in 1982. Petroleum exploration ventures are conducted in cooperation with the Barbados National Oil Co. Ltd., a National Petroleum Corp. subsidiary. Small mining and quarrying operations are privately owned.

COMMODITY REVIEW

Industrial Minerals

Production of cement began in 1984 with the construction of the Arawak

TABLE 2

BARBADOS: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity
Cement	Arawak Cement Co. (Governments of Barbados 51%, Trinidad and Tobago 49%)	Checker Hall, St. Lucy Parish	[1]300
Gas, liquefied petroleum	Barbados National Oil Co. Ltd. (Government, 100%)	Woodbourne Field, St. Philip Parish	[2]68
Petroleum:			
Crude	do.	Woodbourne Field, St. Philip and Christ Church Parishes	[2]1,900
Refinery products	Mobile Oil Barbados Ltd. (Mobil Oil Co., 100%)	Bridgetown	[2]3,000

[1]Thousand metric tons per year.
[2]Barrels per day.

Cement Co. plant in Cheker Hall, St. Lucy Parish. In 1989, the plant operated at 72% of rated capacity. Exports increased to 118,800 tons from 105,800 tons in 1988. Domestic consumption was about 100,000 tons. Reportedly, the Government of Trinidad and Tobago was trying to sell its 49% ownership of the cement plant because of the virtual collapse of the cement market in that country.[2]

Mineral Fuels

In May, the Barbados National Oil Co. awarded a contract to Skinner Marine of Trinidad and Tobago to drill 20 onshore wells in St. Philip Parish. All of Barbados' energy requirements are met by petroleum and natural gas. Installed electric power capacity in 1988 was 132 megawatts, all based on thermal plant generation.

INFRASTRUCTURE

Barbados has no railroad; therefore, mineral production is transported over a 1,570-kilometer road system. Petroleum is imported at terminals on the south and west coasts. The capital, Bridgetown, is also a port. Natural gas is piped through an expanding network to commercial and residential consumers.

OUTLOOK

Production of nonfuel minerals has been restricted to the construction, ceramics, and pottery industries because of limited resources. The mineral fuels have assumed a greater economic role as increased production of natural gas and petroleum decrease the need for petroleum imports and the corresponding demand for foreign exchange.

[1]Where necessary, values have been converted from Barbadian dollars (BD$) to U.S. dollars at the rate of BD$2.0 = US$1.00.
[2]Rock Products, v. 93, No. 4, Apr. 1990.

OTHER SOURCES OF INFORMATION

Agencies

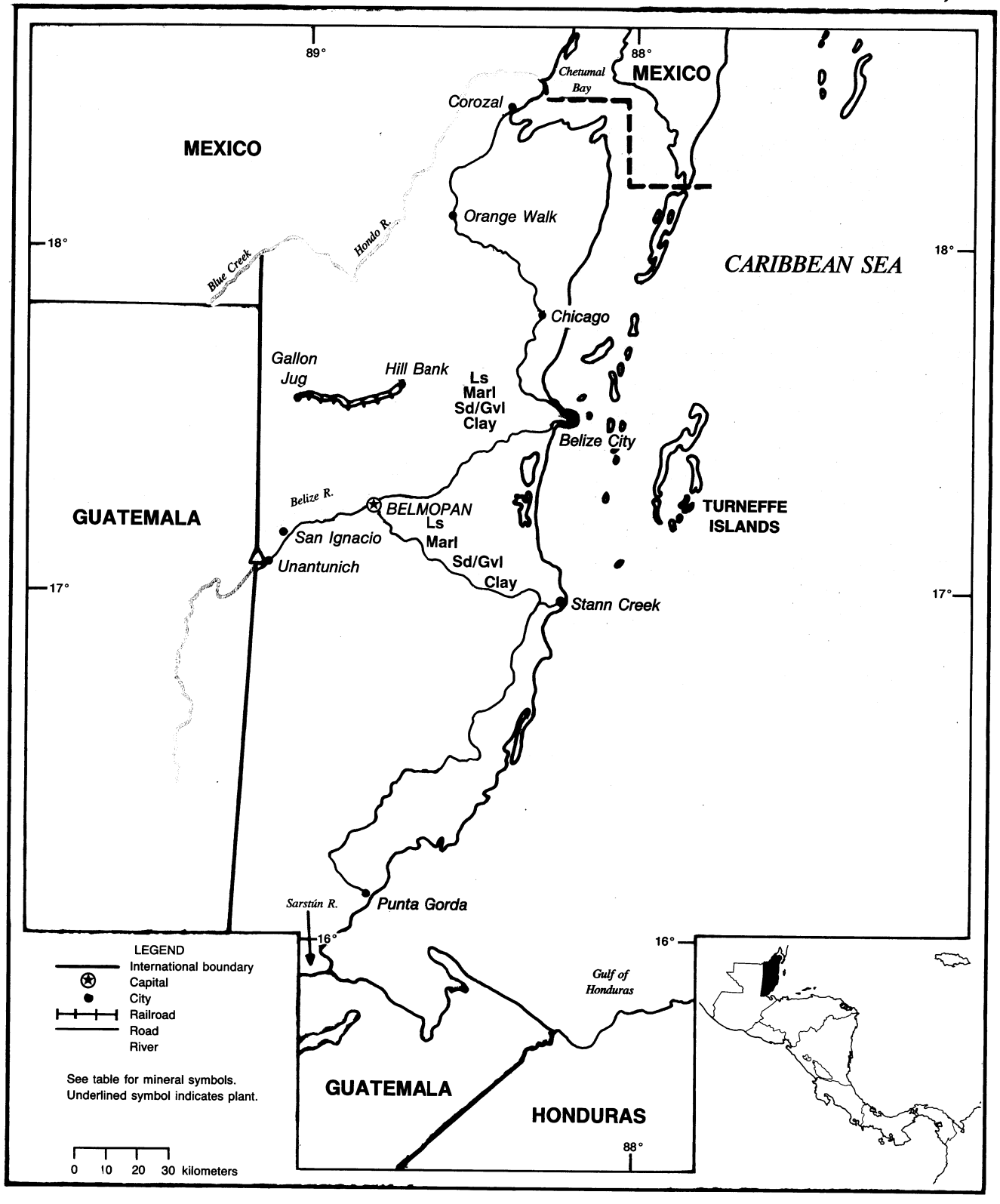
Ministry of Trade, Industry and Commerce
Reef Road, Fontabelle
Bridgetown, Barbados, W.I.

Publications

Prime Minister's Office, Economic Affairs. Division, Bridgetown, Barbados.
Economic Report.

BELIZE

AREA 23,000 km² **POPULATION 176,000**



THE MINERAL INDUSTRY OF

BELIZE

By Pablo Velasco

Belize's mining activities accounted for an estimated 1.3% of the country's 1989 gross domestic product (GDP) of $261 million.[1] The country's mining activity was limited to the production of limestone, clay, marl, and sand and gravel, all of which were primarily used in the construction industry. Production of minerals is almost negligible in Belize for the majority of metals and industrial minerals; therefore, the Government of Belize is actively encouraging foreign investment in an effort to stimulate the economy and introduce new technology. The Government is supporting the development of a privately owned free zone and is giving incentives to investors, foreign and domestic, such as duty-free entry of capital equipment and tax holidays. It is also encouraging increased domestic production of foodstuffs and basic commodities.

GOVERNMENT POLICIES AND PROGRAMS

In 1989, the economy of Belize grew by about 6% as a result of Belize's economic support fund agreement with the United States, successful implementation of an International Monetary Fund adjustment program, and a favorable external trade environment, particularly the increases in agricultural products, tourism, and new construction projects.

The Government of Belize, through its Geology and Petroleum Office, announced that during 1989 new mining licensing and reporting regulations were promulgated, and management of the office was handed over from the United Nations Development Program advisor to a Belizean national.

In April 1989, the Geology and Petroleum Office of the Ministry of Natural Resources sponsored a conference for leaseholders to discuss the state of exploration in Belize. All the petroleum companies involved in exploration for crude oil in Belize complained about the 18% royalty being too high, considering the unproven nature of Belize's petroleum resources and the high exploration costs. As a result of this meeting, the new royalty rate was lowered to 12.5% for leases offshore to a water depth of 20 meters, 10% for lease areas covered by 20 meters to 100 meters of water, and 7.5% for leases at depths in excess of 100 meters. In addition to reduced royalty rates, the Government of Belize has introduced an amendment to a special tax law covering petroleum income into the National Assembly. Petroleum income was considered separate from normal corporate income and was taxed at a 50% rate.

Two U.S. firms were considering new exploratory drilling in Belize. Alston Oil and Gas Co. and Texas Refining Co. (TEXREF) announced plans for drilling in July 1989, but financing difficulties delayed its start. TEXREF announced plans for drilling in February 1990.

PRODUCTION

The Belizean mining industry showed little growth in 1989. Production of industrial materials, which consisted of small quantities of clay, limestone, marl, and sand and gravel, increased slightly. Belize is 100% dependent on imports for its mineral and fuel requirements.

TRADE

Belize is highly dependent on foreign trade. Despite an abundance of arable land, Belize utilizes only a fraction of it for the production of basic commodities. Exports are composed almost entirely of agricultural goods, and in 1989, were valued at approximately $100 million. Belize is totally dependent on imported oil for electricity generation. The Belize Electricity Board (BEB) owns 10 separate diesel generating plants with a gross generating capacity of 25 megawatts. Electricity is sold to all classes of consumers at $0.21 per kilowatt hour. Many industries and individuals generate their own electricity, and the total electric power capacity for the country approaches 35 megawatts. The Government of Belize and BEB recently entered into a loan and power project agreement with the International Bank for Reconstruction and Development (World Bank) to improve distribution facilities and upgrade diesel generation to bridge the gap until an indigenous energy supply can be provided.

STRUCTURE OF THE MINERAL INDUSTRY

The Government's Department of Public Works produced about 90% of the

TABLE 1

BELIZE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1985	1986	1987	1988	1989[p]
Stone, sand and gravel:[e]					
Clays	—	—	—	—	127,670
Limestone	[r]350,000	[r]350,000	[r]350,000	[r]350,000	216,588
Marl	900,000	900,000	900,000	900,000	1,350,299
Sand and gravel	500,000	500,000	500,000	500,000	363,655

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes data available through June 30, 1990.

industrial minerals output. The remainder was produced by small private companies. The labor force consisted of 58,000 workers, of which 30% was in agriculture, 16% in services, 15% in Government, 11% in commerce, and the remainder in manufacturing. Belize has a shortage of skilled labor and technical personnel. Of the total work force, 15% belong to seven active labor unions.

INFRASTRUCTURE

There are no railroads in Belize, and quarried industrial material is trucked to consumers over a 2,575-kilometer (km) road system, of which 340 km is paved, 1,190 km is gravel, 735 km is improved earth, and 310 km is unimproved earth. Limited infrastructure is a major constraint in development in Belize. Some roads, including sections of the major highway system, are subject to closure or damage during rainy periods. Electricity is expensive and sometimes erratic. Inadequate roads and ports limit external marketing. The U.S. Agency for International Development, the World Bank, and the Governments of the United Kingdom and Canada all have infrastructure projects in Belize. Steel and concrete bridges are being constructed to ensure year-round passage to some remote portions of the country.

OUTLOOK

Areas of possible metallic mineral deposits are poorly explored, but available occurrences of all the base metals, including tin, exist in the centrally located Maya Mountains where past geologic events have provided the conditions for metallic deposition. The prospect of a commercial crude oil and natural gas discovery onshore and offshore in the country continues to bring exploration ventures to Belize.

TABLE 2

BELIZE: STRUCTURE OF THE MINERAL INDUSTRY

(Thousand metric tons per year)

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year)
Limestone	Department of Public Works (Government, 100%)	Near Belize City	500
Do.	Belize Aggregates Ltd. (private)	Near Belmopan	150
Clay	Department of Public Works (Government, 100%)	Near Belize City	130
Marl	do.	do.	1,500
Sand and gravel	do.	do.	300
Do.	Commercial quarries (private)	Near Belmopan	250

[1]Where necessary, values have been converted from Belizean dollars (Bz$s) to U.S. dollars at the (fixed rate) of Bz$2.00 = US$1.00 (the average rate for 1989).

OTHER SOURCES OF INFORMATION

Publications

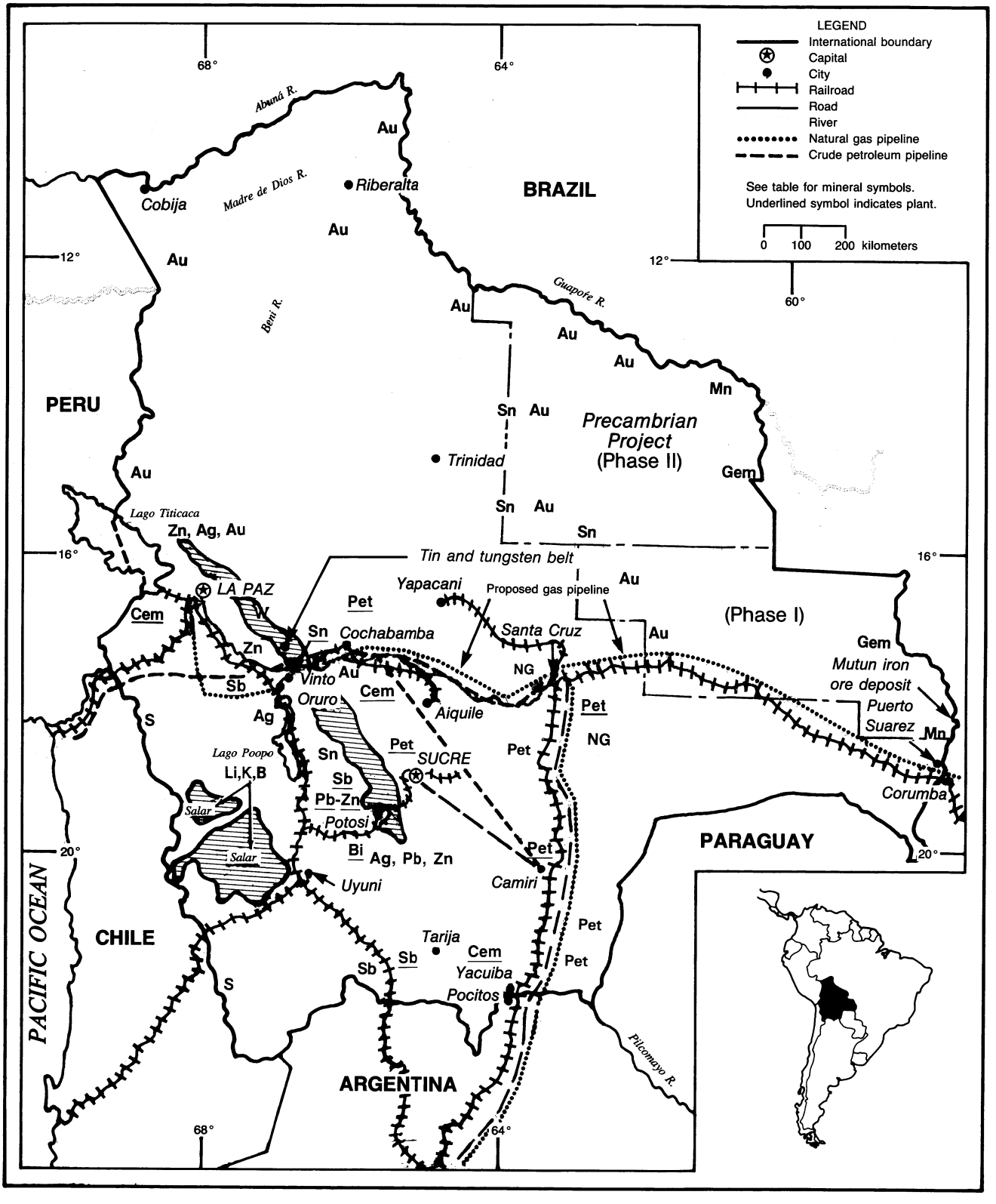
The Geology of the Maya Mountains, Belize. Inst. of Geol. Sci., Nat. Environ. Res. Council, London, Overseas Memoir 3, 43 pp., map.

Earth and Water Resources and Hazards in Central America. U.S. Geol. Surv. Circ. 925, 1984, 40 pp.

Petroleum Office, Ministry of Natural Resources. Annual Petroleum and Natural Gas Questionnaire.

BOLIVIA

AREA 1.1 million km² **POPULATION 6.7 million**



THE MINERAL INDUSTRY OF

BOLIVIA

By Pablo Velasco

In 1989, Bolivia's mining industry began to extricate itself 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 that of tin, and the austerity programs of the previous Government resulted in more than one-half of the mines being closed in 1986. Many of them have not reopened by yearend. The mining industry now is much more responsive to market forces, and it is less dependent upon a single commodity than in the past. Although it has access to more credit now than at any time during the past 10 years, investment capital continued to be scarce. The value of nonfuel mineral exports increased to $403.4 million, a 48% change relative to that of 1988, surpassing hydrocarbons for the second consecutive year as Bolivia's leading foreign exchange earner.

Tin and zinc production led the expansion in the nonfuel mineral sector, with strong performances by silver and tungsten. Gold exports dropped 25% as contraband trade increased, especially with alluvial gold mined in the Araras area in Department of Beni and around Consata-Guanay gold fields in the Department of La Paz. Tin output—traditionally the most important in the sector—recovered slightly from the crisis of late 1985, reaching almost 16,000 tons of fine tin content in 1989, an increase of 51% from that of 1988. As a result, Bolivia improved its position as the fourth largest tin producer in the world.

The state mining corporation, Corporación Minera de Bolivia (COMIBOL), formerly the largest mineral producer in the country, was still reorganizing company operations and reopened some mines in order to improve their mineral output in 1989. The private mining sector composed of medium- and small-scale mining entities and cooperatives became the largest producers of antimony, gold, lead, tin, tungsten, and zinc in the country. As a result of COMIBOL's reduced production, the private sector increased its relative importance in terms of output distribution and contribution to the economy.

Bolivia's economy continued to grow for the third consecutive year despite the serious midyear slump due to political uncertainty. The Government estimated that the gross domestic product (GDP) grew by 2.5% to $4.7 billion[1] in real terms from that of 1988. Preliminary data showed a positive trade balance of $200 million as exports increased by more than 34%, while imports rose only about 5%. Inflation slowed from 22% in 1988 to 17% in 1989, among the lowest in Latin America.

Exports of hydrocarbons continued to be the second largest foreign exchange earner, contributing to 37% of Government revenues. Exports of natural gas to Argentina were valued at almost $219 million compared to $216 million in 1988.

GOVERNMENT POLICIES AND PROGRAMS

As a part of a general program for the stabilization and restructuring of the Bolivian economy, the new Government introduced its economic policy through a series of decrees published in late 1989. The new policy was widely discussed beforehand, notably with the International Monetary Fund (IMF). A review of the Government's policy toward the country's mineral sector was made by Congress for revision of key aspects of the mining legislation with emphasis on the concerns of the potential foreign investors. The old policy lacked a stable and clearly defined legal framework. The proposed changes to the previous mining code were intended to reflect the overall thrust of Government policy to open the economy to market forces, making Bolivia more attractive to potential investors and to also encourage private-sector investment. The aim has been to introduce incentives to create an investment climate as favorable as those in other countries with substantial mining industries. Most of the legislative changes were finalized and then presented to Congress. The Congress had not acted by the closing of the session for the May 1989 elections. The proposed new mining code was designed to make Bolivia more attractive to potential investors and to simplify procedures. The old mining legislation provided assurances of nondiscrimination for national and foreign investors. The only limitation on foreign investors in mining was the prohibition in Article 13 and 14 of the 1965 Mining Code on foreign ownership of mining rights or foreign investment within 50 kilometers (km) of Bolivia's international boundaries. However, the proposed new mining law would permit foreign investment in the 50-km belt through a Bolivian subsidiary company. Because many potentially exploitable mineral reserves lie within this zone, the economic impact could be considerable. Licensing procedures would be modernized and simplified. Proposed basic fees are quite low, with an annual fee payment of 1 dollar per hectare while in production. There would be a limit of 30,000 hectares per company, but holding companies may have several subsidiaries, each entitled to work 30,000 hectares.

Bolivia's mineral sector is characterized by the existence of fiscal reserves. These are mineralized areas where exploration and exploitation require special authorization. Until recently, the most promising mineralized areas in Bolivia were tied up in fiscal reserves. During 1989, the Government enacted several other laws, Supreme Decrees (D.S.) and Supreme Resolutions (R.S.) regulating the different activities of the mining industry. The most important ones were D.S. 22123, February 9, 1989—established that gold as ore-in-preconcentrates, ore-in-concentrates, and ore-in-precipitates will pay a royalty of 3% of the net value if and when exported. Gold nuggets and flakes sold domestically will continue to pay 1.5% royalty; D.S. 22175, April 13, 1989—established that all mineral and metal traders in the country must register with the Ministry of Mines and Metallurgy; D.S. 22236, August 30,

1989—established that the Bolivian Ambassador to the United States was authorized to sign a credit of $26 million to finance mining projects in Bolivia with the International Financing Association.

PRODUCTION

Official figures for 1989 indicated that the volume and value of Bolivia's mineral production increased by one-third compared with that of 1988, and that the contribution of mining to the gross domestic product of the country rose from 7% to 9%.

COMIBOL's overall mineral output improved modestly in 1989 for the second consecutive year. The tin industry showed a slight recovery from the tin market crisis of late 1985. Bolivia's primary tin output increased by 50% to 15,849 tons in 1989 from 10,573 tons in 1988, making Bolivia the fourth largest tin producer in the world.

The mine output of the private mining sector surpassed past levels in 1989, with moderate growth expected in the future. During the past 2 years, the Bolivian mining industry has tried to diversify its mineral production by increasing production of lead and zinc ores and associated silver. With zinc prices topping out in 1989, zinc production reached a record figure of 74,848 tons.

COMIBOL's efforts are still concentrated on reorganizing the company and reopening those mines that can be exploited without economic losses. In 1989, COMIBOL's losses totaled $4.2 million. COMIBOL continued to operate as a holding company with 5 autonomous subsidiary mining companies and 2 autonomous subsidiary smelting companies. In 1989, lead prices reached their highest level since 1981, a total of 15,738 tons of lead concentrate. Silver production increased 15% over that of the previous year. As prices declined because of sales of excess Chinese tungsten, Bolivia's tungsten production reached a modest 1,476 tons of WO_3. Antimony production dropped owing to declining international prices, to 9,771 tons from 9,945 tons produced in 1988. There was a large decrease of officially recorded gold production, from 4,889 kilograms in 1988 to 3,595 kilograms. Gold production from the Araras area and from the Consata-Guanay area were not sold to the Bolivian Mining Bank (BAMIN). It was assumed that about 6,500 kilograms of gold was smuggled out of the country. The most accurate official figures were for gold produced as precipitates in heap-leaching operations and exported as such. The mining sector work force (including the mining cooperatives) remained constant for the past 3 years at about 3% of Bolivia's total work force.

TRADE

Minerals and hydrocarbons continued to be Bolivia's leading exports; in combination, they contributed 87% of the national treasury revenues. Minerals accounted for 49% of the total exports. Exports of nonfuel minerals increased 48% in value to $403.4 million in 1989 compared with that of 1988. This was

TABLE 1

BOLIVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988	1989[p]
METALS[3]						
Antimony:						
Mine output, Sb content		8,925	10,243	10,635	9,943	8,533
Metal including Sb content of trioxide		762	1,171	1,723	1,015	1,236
Arsenic, mine output, arsenic trioxide, arsenic sulfide		361	241	132	191	338
Beryllium: Beryl concentrate:						
Gross weight		—	—	42	—	—
BeO content		—	—	3	—	—
Bismuth, mine output, Bi content		159	45	1	13	41
Cadmium, mine output, Cd content[4]		104	36	15	39	79
Copper, mine output, Cu content		1,665	338	9	153	292
Gold, mine output, Au content[5]	kilograms	561	763	2,755	4,889	3,595
Iron ore:[6]						
Gross weight		—	10,586	7,490	33,840	14,254
Fe content		—	6,669	4,718	21,319	8,980
Lead:						
Mine output, Pb content		6,242	3,121	9,043	12,544	15,728
Metal, smelter		231	182	201	24	12

See footnotes at end of table.

TABLE 1—Continued

BOLIVIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988	1989[p]
METALS[3]—Continued						
Manganese, mine output, Mn content		—	—	—	—	100
Silver, mine output, Ag content	kilograms	111,351	95,115	141,987	231,766	267,084
Tin:						
Mine output, Sn content		16,471	10,462	8,128	10,504	15,849
Metal, smelter		12,859	7,673	2,667	5,373	9,448
Tungsten, mine output, W content		1,643	1,095	638	900	1,118
Zinc:						
Mine output, Zn content		37,110	33,472	39,292	56,957	74,789
Metal, smelter		—	—	—	—	37
INDUSTRIAL MINERALS						
Barite		1,282	129	1,337	—	—
Calcite		23	300	600	[e]600	[e]500
Cement, hydraulic		379,500	295,176	396,018	452,285	505,426
Gypsum, crude[e]		[r]100	[r]100	[r]100	[r]100	100
Marble		—	—	—	187	70
Salt[e]		[r]100	[r]100	[r]100	[r]100	[7]60
Sulfur, native		2,741	4,730	8,746	6,733	8,167
Ulexite		—	—	—	586	9,609
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	4,647	4,555	4,565	4,811	5,290
Marketable	do.	2,414	2,444	2,394	2,520	2,565
Natural gas liquids:						
Natural gasoline	thousand 42-gallon barrels	593	540	514	544	627
Other	do.	1,460	1,406	2,097	[e]2,600	2,628
Petroleum:						
Crude including condensate	do.	7,245	6,956	6,890	7,020	7,274
Refinery products:						
Liquefied petroleum gas	do.	1,788	542	473	1,859	1,971
Gasoline	do.	2,784	2,988	3,318	3,347	3,570
Jet fuel	do.	573	587	547	578	631
Kerosene	do.	578	358	360	325	317
Distillate fuel oil	do.	2,204	2,432	2,330	2,275	2,358
Residual fuel oil	do.	—	—	—	—	49
Lubricants	do.	67	107	107	107	75
Unspecified	do.	12	66	73	311	164
Refinery fuel and losses	do.	8	5	348	169	186
Total	do.	[r]8,014	7,085	7,556	8,971	9,321

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

[1]Table includes data available through Oct. 1990.

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

[3]Unless otherwise specified, data represent actual production by COMIBOL and small- and medium-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 mine 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]Reported figure.

due to increased international market prices and mine output. The nonfuel minerals sector surpassed the hydrocarbon sector as the leading foreign exchange earner for the second consecutive year.

All mineral export values increased with the exception of gold and antimony, which decreased 26% and 9%, respectively. Tin export earnings, historically Bolivia's most important mineral export, increased by 35% in volume and about 65% in value to $49.6 million in 1989. Most other metal exports also increased in value. Those with the largest increases were lead, 89%; silver, 31%; and zinc, 120%.

Empresa Metalúrgica de Vinto, formerly ENAF, the former foreign exchange leader in the mining sector, had a healthy 89% increase in sales in 1989. The medium-size mine group, for the second consecutive year, was the largest exporter of mineral products within the mining sector. Its exports increased 39% and represented about 39% of Bolivia's total mineral exports.

The small-size mine group, including the mining cooperatives, accounted for 24% of the country's total mineral exports. In 1989, hydrocarbons were the second largest export earner, contributing 37% or $223.7 million of the country's total export value. Natural gas exports to Argentina were $218.5 million compared with $215.9 million in 1988. The increase in value was due to sales for wettergas (higher content of condensates). Argentina continued to be the sole importer of Bolivia's natural gas.

In terms of value, the European Community continued to be Bolivia's leading importer of ore concentrates and metallurgical products with 55% of the export value. It was followed by the United States with 17% and the Latin American Integration Association with 14%; the European Free Trade Association, the Centrally Planned Economic Countries, the Andean market, Canada, Asia, and others composed the remaining 14%.

STRUCTURE OF THE MINERAL INDUSTRY

The Ministry of Mining and Metallurgy and the Ministry of Energy and Hydrocarbons are the principal policy-making regulatory agencies within the mining and petroleum sectors of the country. The Bolivian Government controls the mineral industry with the following autonomous entities: (1) Corporación Minera de Bolivia (COMIBOL), which was reorganized as a holding company with five subsidiaries. The subsidiaries are Empresa Minera Quechisla, which controls the mines of Tasna, Chocaya, Tatasi, and San Vicente; Empresa Minera de Potosí, which controls the mines of Unificada del Cerro Rico de Potosí; Empresa Minera de Oruro, which controls the mines of Huanuni, Bolívar, San José, María Luisa, Santa Fé, and Poopó; Empresa Minera de La Paz, which controls the mines of Viloco, Colquiri, and Caracoles; and Empresa Minera del Oriente, which controls the El Mutún iron ore deposit. Some of the mines listed above were originally tin mines, but are now producing associated metals. (2) Servicio Geológico de Bolivia (GEOBOL), whose basic functions are to prospect for and explore the mineral resources of Bolivia. (3) The Instituto de Investigaciones Minero-Metalúrgicas (IIMN). (4) The Banco Minero (BAMIN), which provides credits to small-scale miners and purchases the output of small mines and sells minerals to mineral market traders, and (5) The Fondo Nacional de Exploración Minera (FONEM), which finances and supervises the development of small mining projects. Despite the scaling down of its operations, COMIBOL is still the major single producer of various minerals in the country and may become more important now that its reorganization has been implemented. COMIBOL now operates about 10 mining operations and has the responsibility for running the Vinto Smelter and for maintenance of the Karachipampa smelter. Furthermore, COMIBOL holds some very interesting properties, which have been explored in varying degrees. It is now particularly interested in forming joint ventures with private-sector investors. In the private sector, there were 18 affiliated mining companies under the National Association of Medium-size Miners. 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 important entity in the mineral sector. During 1989, with the exception of antimony and tin, this group registered production increases in all of its mined minerals.

The most significant antimony producers in this group were Empresa Minera Unificada S.A. (EMUSA), San Juan Ltda., and Hermanos Bernal S.A. Tin producers were Consultora y Promotora Minera S.A.(COPROMIN), International Mining Co. (IMCO), Barrosquira Ltda., and Empresa Minera Quioma S.A.

The principal lead and zinc producers were Compañía Minera del Sur S.A. (COMSUR), Empresa Minera Quioma S.A., and Thiawanacu Ltda. Tungsten producers were IMCO and San José de Berque. Grouped under the Cámara Nacional de Minería are 1,200 small mines registered in 1989, an increase of 400 mines over that of 1988. Organized mining cooperatives under the Federación Nacional de Cooperativas Mineras (FECOMIN) included most of the gold-mining cooperatives of Tipuani, Guanay, and Mapirí. There were more than 200 mining cooperatives in the country, of which about 85% was mining gold in 1989, mainly in the Province of Larecaja, La Paz Department. 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), both subsidiaries of COMIBOL.

COMMODITY REVIEW

Metals

Antimony.—Bolivia's antimony output fell 14% below that of 1988, the lowest production since 1980. However, it remained as 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 70% of the total production. Their 1989 production decreased about 9%. The largest producer of antimony continued to be EMUSA with its Chilcobija and Caracota Mines, followed by Empresa Minera Hermanos Bernal S.A. The small-size mining sector contributed 14% of the total production, with the remainder by cooperatives and others.

TABLE 2

BOLIVIA: EXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	1989	Principal destinations, 1989
METALS				
Antimony:				
Ore and concentrate		7,381	7,973	NA.
Trioxides		554	836	United Kingdom 732; Chile 53; United States 51.
Metal including alloys:				
Regulus		124	121	Peru 109; Chile 12.
All forms		337	279	United Kingdom 130; United States 111; Peru 19.
Arsenic: Trioxides and other compounds		191	338	NA.
Bismuth:				
Ore and concentrate		11	18	NA.
Metal including alloys, all forms		—	32	All to United States.
Cadmium: Ore and concentrate		4	22	NA.
Columbium and tantalum: Tantalum ore and concentrate	kilograms	—	1,984	NA.
Copper: Ore and concentrate		111	—	
Gold:				
Ore and concentrate, Au content	kilograms	r1,070	1,251	NA.
Metal including alloys, unwrought and partly wrought	do.	r3,183	2,350	NA.
Iron and steel: Iron ore and concentrate		r9,357	24,553	NA.
Lead:				
Ore and concentrate		9,871	17,009	NA.
Metal including alloys		24	12	All to Panama.
Manganese: Ore and concentrate		—	101	NA.
Silver:				
Ore and concentrate	kilograms	213,134	296,529	NA.
Metal including alloys, unwrought and partly wrought	do.	3,550	35,568	France 11,002; United Kingdom 10,691; United States 6,986.
Tin:				
Ore and concentrate		4,734	5,103	NA.
Metal including alloys, all forms		6,297	9,909	Chile 5,288; United States 2,396; Colombia 375.
Tungsten: Ore and concentrate		1,033	1,390	NA.
Zinc:				
Ore and concentrate		53,969	80,491	NA.
Metal including alloys, all forms		—	37	Ecuador 19; Republic of Korea 18.
INDUSTRIAL MINERALS				
Boron materials: Crude natural borates		586	9,609	NA.
Precious and semiprecious stones other than diamond: Natural		—	70	NA.
Salt, natural		—	60	NA.
Sodalite		4	—	
Stone, sand and gravel: Dimension stone:				
Crude and partly worked		187	284	NA.
Sulfur, all forms		6,733	8,167	NA.
MINERAL FUELS AND RELATED MATERIALS				
Gas, natural	million cubic meters	2,228	2,210	All to Argentina.
Petroleum refinery products:				
Liquefied petroleum gas	42-gallon barrels	—	6,100	NA.
Distillate fuel oil	do.	175,026	—	
Lubricants	do.	8,926	—	

rRevised. NA Not available.

[1]Table prepared by H. D. Willis. Table includes partial provisional export data. Import data for 1988 and 1989 were not available at time of publication.

TABLE 3

BOLIVIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Antimony	Empresa Minera Unificada S.A. (EMUSA) (private, 100%)	Caracota, Chilcobija, and Espiritu Santo Mines, Potosi Department	2.7
Do.	Empresa Minera San Juan Ltda. (private, 100%)	Candelaria Mine, Potosi Department	2.1
Antimony trioxides	Empresa Minera Hermanos Bernal S.A. (private, 100%)	Palala smelter, Tupiza, Potosi Department	1.0
Gas, natural	Yacimientos Petroliferos Fiscales Bolivianos (YPFB) (Government, 100%)	Rio Grande, Caranda, Colpa, and La Pena Gasfields, Santa Cruz Department	[1]61,900
Do.	do.	San Roque, Vuelta Grande Gasfields, Southern District	[1]42,000
Do.	do.	Santa Cruz, Naranjillos Gasfield Central District	[1]21,600
Do.	Occidental Boliviana Inc., Tesoro Bolivia Petroleum Co., (U.S.) and Empresa Naviera Perez-Compac-Sacfic (Argentina) contractors	El Porvernir, La Vertiente, and Caranda Gasfields, Santa Cruz Department	[1]58,300
Gold	Cooperatives (private ownership), some U.S. companies are shareholders	Tipuani, Guanay, Mapiri, Huayta, Kaka, and Teaponte Rivers, La Paz Department	[2]2.2
Do.	Empresa Inti Raymi S.A. (private, 100%) (Battle Mountain Gold Mining Co., United States, 51%)	Gold Leaching, open pit operation at La Joya, near Oruro, Oruro Department	[2]1.5
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	[2]6.0
Lead	Empresa Minera Quioma S.A. (COMSUR S.A.) (Formerly owned by ASARCO Incorporated of the United States)	Asientos, lead-silver-zinc mine at Mizque, Cochabamba Department	6.5
Do.	Corporacion Minera de Bolivia (COMIBOL) (Government, 100%)	Santa Fe, Tatasi, Animas-Inocente, and San Jose Mines, Potosi Department	3.2
Lead/silver smelter (to be fired up in 1991)	Empresa Metalurgica de Karachipampa (Government, 100%) (Autonomous subsidiary company of COMIBOL.)	Karachipampa, Potosi Department	24.0
Petroleum	Yacimientos Petroliferos Fiscales Bolivianos (YPFB) (Government, 100%)	La Pena, Vuelta Grande, Rio Grande San Roque, and Monteagudo Oilfields Santa Cruz Department	[3]6,037
Do.	Occidental Boliviana Inc. and Tesoro Bolivia Petroleum Co., both U.S. companies, and others contractors (private, 100%)	Porvenir, La Vertiente, and Tita Oilfields	[3]1,238
Silver	Corporacion Minera de Bolivia (COMIBOL), Compania Minera de Oruro, Cia Minera Quechisla, and Cia. Minera de Potosi subsidiaries	San Jose, Bolivar, Poopo, Santa Fe, San Vicente, Tatasi, Animas-Inocente, and Unificada Mines, Ururo and Potosi Departments	[2]126,000
Do.	Cia Minera del Sur, S.A. (COMSUR) (private, 100%) (RTZ of the United Kingdom, 30% interest.)	Martha, Huari, Porco, and Milluni Mines, La Paz, Department	[2]38,600
Tin	COMIBOL: Cia Minera de Oruro, Cia Minera Quechisla, Cia. Minera de Potosi, and Cia. Minera La Paz (Government, 100%)	Huanuni, Colquiri, Caracoles, Viloco, and Chorolque Mines, Oruro, Potosi, 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, Bolivar Viloco, Colquiri, and Colquechaca Mines	6.4
Tin, refined	Empresa Metalurgica de Vinto (COMIBOL's subsidiary)	Vinto, Oruro Department	9.0

See footnotes at end of table.

TABLE 3—Continued

BOLIVIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Tin, refined—Continued	Fundestano de Oruro S.A.	City of Oruro, Oruro Department	5.0
Do.	Cia Metalurgica Industrial y Comercial-Hormet S.A.	City of La Paz, La Paz Department	.2
Tungsten	COMIBOL-Cia Minera La Paz (Government, 100%)	Kami, Tasna, and Bolsa Negra Mines, La Paz Department	([4])
Do.	International Mining Co. (IMCO) (private, 100%)	Chojlla Mine, La Paz Department	.5
Do.	Empresa Minera San Jose Berque (private, 100%)	Esmoraca, Pueblo Viejo, Espanola, and La Argentina Mines, Sudchichas Province, Potosi Department	.2
Zinc	COMIBOL, Cia. Minera de Oruro, Cia Minera Quechisla, Cia Minera de Potosi	Santa Fe, Colquiri, San Vicente, Tatasi, Animas-Inocente, and Unificada Mines, Oruro, Potosi, and La Paz Departments	16.3
Do.	COMSUR S.A., Maragua Ltda., Caballo Blanco S.A., Tiwanacu Ltda., (private, 100%)	Porco, Asientos, Maragua, Huari-Huari, Monserrat and Monte Blanco Mines, Cochabamba, Oruro, and Potosi Departments	50.0

[1]Million cubic feet per year.
[2]Kilograms per year.
[3]Thousand barrels per year.
[4]Shut down in 1987.

In 1989, Bolivia exported 9,208 tons of antimony, a 10% increase in volume and a 9.0% decline in value from that of 1988. Of the total amount of antimony exported, 8% was in concentrates and 35% was as antimony trioxide, with the remainder as regulos and alloys. The Vinto antimony smelter of COMIBOL has remained closed for the past 3 years; however, in August 1989, the antimony smelter was fired up to test a new smelting method to produce antimony metal and trioxide provided by the Laurel Industries of Ohio, of the United States. As a part of a 3-year toll contract agreement signed in March 1989 between the U.S. firm and the Bolivian Committee of Antimony Producers, the Vinto smelter will smelt and refine antimony concentrate purchased locally by Laurel for an agreed toll fee of about $300 per ton. Vinto and Laurel planned to treat 200 tons per month of antimony concentrates (58% Sb and 0.5% Pb-As) starting in August 1990 and doubling this volume to 400 tons per month by January 1991. The end product will be crude antimony trioxide (80% Sb). The Vinto labor force was reduced to 807 workers from more than 2,000 workers in 1985. The private Palala antimony smelter of the Hermanos Bernal in Tupiza, Department of Potosí, produced all of the antimony trioxide and alloys exported by Bolivia in 1989. The trioxides and alloys produced by the Palala smelter were exported to the United Kingdom (60%), with the remainder going to Chile, Peru, and the United States.

Gold.—Official gold production, based on gold sold to the Banco Minero de Bolivia (BAMIN), decreased by about 26% to about 3,595 kilograms. The decline in output was largely due to the Government increase in royalties, 1.5% to 3% of the gross value, paid by the gold producers.

Official gold production figures were unreliable. They reflected the reported figures, not the actual production total, and failed to account for the considerable quantities of gold that were smuggled out of the country. Unofficial but more reliable estimates by industry watchers placed production near 20,000 kilograms. The U.S. Embassy estimated that gold production in 1989 was more than 10,000 kilograms. The principal source of gold production in Bolivia continued to be the 78 gold-mining cooperatives operating in the gold fields of Guanay, Huayti, Mapiri, Teoponte, and Tipuani (120 km north of La Paz), which accounted for approximately 61% of the total production. The medium-size mining sector contributed 39% of the total output. Most of the cooperatives are small-size operations, poorly organized and seriously undercapitalized, and according to industry watchers, these cooperatives continued selling a large part of their gold production to private buyers instead of to BAMIN. This resulted in unregistered exports of unknown amounts of gold. The U.S. Embassy estimated that at least 6,000 kilograms of gold was sold to local and foreign traders without being registered. It was estimated that the cooperatives included more than 25,000 miners, including more than 10,000 barranquilleros or small-scale miners, all of them grouped under the National Mining Cooperatives Federation (Federación Nacional de Cooperativas Mineras de Bolivia—FENCOMIN). According to the National Institute of Cooperatives (INALCO), about 166 cooperatives are still awaiting legal approval to begin mining operations on 52,248 hectares 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, and it is jointly owned by the U.S. companies Battle Mountain Gold Co. (51%) and Westworld Resources of Texas Inc. (24.5%) and EMUSA of Bolivia (24.5%). Inti-Raymi is mining gold at its Kori Khollo open pit mine next to the old La Joya Mine near Oruro. In 1989, Inti-Raymi produced about 302,000 tons of ore, yielding 1,231 grams of gold and 7,040 kilograms of silver using the heap-leaching method. In 1989, Inti-Raymi conducted an intensive drilling program to determine reserves of sulfide gold mineralization below the oxide cap currently under exploitation. Preliminary indications were that the Kori Khollo sulfide mineralization will be in the range of 25 to 35 million tons, with an average grade of 2.32 grams of gold per ton.

In the past, the largest gold-mining operation in the medium-size mining sector was by South American Placer Inc. (SAPI), which was dredging gold in the Mapiri River. The company later became a subsidiary of COMSUR. In 1987, COMSUR bought the mining company South American Gold and Platinum of New York, which was the main shareholder of SAPI. Since then, COMSUR has operated the dredge.

SAPI's 20-year mining contract was terminated in 1984. At the end of its contract, SAPI was transformed into a new company named CODEMA, which started its dredging operation with the Armed Forces Development Corp. (COFADENA) in the Mapiri and Kaka Rivers in June 1986. COFADENA was founded in 1972 as a public corporation under the Ministry of Defense with as its mission the execution of business projects and programs promoting national development. They own a substantial number of gold concessions in the country.

Gold exploitation began 6 years ago on the Brazilian border in the Araras on the Madera River, 80 km north of the city of Guajara-Merín in Beni Department. Three separate groups formed by a small private mining company, the Empresa Minera Comercial Boliviana, included a large cooperative Buena Esperanza and COFADENA, which dredged on the Bolivian side of the Madera River. They rented Brazilian suction dredges for their operations. Empresa Minera INGEOBOL, a subsidiary of ESTALSA, bought three small suction dredges from Brazil for use in its operations. Lack of roads on the Bolivian side forced Bolivian operators to use the Brazilian roads that join Guajara-Merín to Presidente Márquez for transportation of gold production and supplies. 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 kilograms. Production of gold from the Madre de Dios River was substantially increased by new cooperatives and miners that moved into the area. More than 15,000 new gold concessions were granted to the village of Nueva Esperanza. Estimates by the Ministry of Mines indicated that between 200 to 500 small suction dredges were operating on the Madre de Dios River and produced 200 to 400 grams of gold per day. COMIBOL had a very large gold mining concession in the Madre de Dios River, and from December 1985 through July 1989, it granted 39 mining concessions totaling 14,668 hectares. Thirty one of the concessions were canceled due to irregularities in the contracts.

Legal export of gold in 1989 declined 15% in volume and 26% in value, while legal gold exports amounted to a meager 3,600 kilograms in 1989. It was reported that 6 kilograms of gold per month were being extracted from northeastern Bolivia by more than 300 small dredges, mostly belonging to Brazilians by the National Secretariat of Pastoral Work (SEMPAS), a Bolivian Church organization. A SEMPAS representative indicated that most of the companies were working without legal concessions. He added that 200 dredges were operating in the Araras region under the protection of COFADENA, which charged them one-third of their daily production or about 60 grams of gold per week. SEMPAS also accused the Navy of granting permission for the operation of 100 foreign dredges to work in the Cachuela Esperanza region in return for 50 grams of gold per week. Adding weight to SEMPAS' findings, the Sub-secretary of Migration was quoted as saying "this is precisely what has always existed (complicity between COMIBOL and COFADENA) and what we are trying to stop." However, both COMIBOL and COFADENA have denied these allegations.

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

Iron Ore.—Empresa Minera del Oriente (EMEDO), a subsidiary of COMIBOL, resumed mining and exporting iron ore from the rich Mutun iron ore mine near the Brazilian border and near neighboring Paraguay's state steel plant operated by Aceros del Paraguay S.A. (ACEPAR). After the completion of a successful pilot operation and the signing of the contract in October 1989, the go-ahead was given to export 250,000 tons of iron ore grading 62% iron over the next 2 years. The pilot operation began in August 1989 when about 30,000 tons of iron ore was sold to Paraguay's ACEPAR. Over the next 2 years, sales should generate about $3.2 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 than it was previously 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.

Production statistics by the Ministry of Mining and Metallurgy of Bolivia indicated the output of iron ore decreased by about 58% compared with that of 1988.

Lead, Silver, and Zinc.—Production of all three commodities was up substantially compared with that of 1988. Lead ore and concentrate increased 29%, silver was up 13%, and zinc was up 24%. Metallic lead, including alloys, decreased more than 100% compared with that of 1988. Output of metallic silver and zinc increased 100% and 109%, respectively, over that of previous year. The medium-size mines sector was the dominant lead and zinc producer with its mines producing 54% of the lead and 67% of the zinc. In the medium-size sector, the major producers were Cía. Quioma S.A., COMSUR, and Tiahuanacu Ltda. COMIBOL mines continued to be the largest silver producer in the country with 46% of the total output. The medium-size mines produced 40%, and the small mines, 14%. Cía. Minera de Oruro, one

of the five subsidiary companies of COMIBOL in charge of six COMIBOL mines, reopened the San José lead-silver mine and the Bolívar silver-tin-zinc mine in July 1987. A technical mission from the Inter-American Development Bank (IDB) carried out two feasibility studies to assess the quantities of silver and lead at the two mines owned by COMIBOL subsidiaries. One was the San José Mine (silver and lead) near Oruro city, and the other one was the Unificada Mine (silver-zinc-tin) near Potosí city. According to officials, once the studies were completed, COMIBOL would seek $10 million from IDB to increase production at the San José Mine from 400 tons per day to 600 tons per day, and the Unificada Mine from 300 tons per day to 500 tons per day.

The purpose of the IDB funding for the Unificada Mine would be to improve production from the well known Cerro Rico deposit, described by officials as the richest mineral reserves in the country. Estimates of its mineral value ranged from $6 billion to $23 billion. The local official of the Unificada Mine stated that the Potosí seam ("veta de Potosí"), which was discovered in 1988, would be mined in April 1989. COMIBOL also planned to install a pilot heap-leaching plant within 5 months to treat the estimated 800 million tons of tailings and waste dumps assaying 120 to 150 grams of silver per ton and 0.3% tin.

Golden Star Resources Ltd., Canada's main interest, was in COMIBOL's troubled Bolívar Mine, having estimated reserves of 4 million tons grading 17% zinc and 400 grams per ton silver, which it planned to mine jointly with COMIBOL and Placer Dome of Canada.

The ongoing controversy over foreign company interest in COMIBOL's Bolívar Mine was thought to have ended with the company's announcement that there would be no joint venture with the Canada-based firm Placer Dome, and that COMIBOL would develop the mine alone. However, despite the statement, Golden Star and Placer Dome, who are already working together developing the Omani gold mine, are still confident that they will eventually get the go-ahead from the Government. Under the deal drawn up with the former Government, which still holds valid under Bolivian law, COMIBOL would retain ownership of the mine while the joint venture between Golden Star and Placer Dome would manage it. Investment for the first 2 years was to be $45 million and another $16 million after 3 years. Profits would be shared 55% and 45%, in favor of COMIBOL.

COMSUR, Bolivia's largest private-sector mining firm, was seeking $26 million in foreign financing to carry out its ambitious plans to increase production at its existing deposits. The company was about to secure a $7 million loan from the International Finance Corp. (IFC), a private lending arm of the World Bank. The bulk of the IFC fund was destined to improving infrastructure and the construction of a new mill at COMSUR's Porco Mine (lead, silver, and zinc) at Potosí, which the company has been leasing from COMIBOL since 1964. COMSUR also planned to increase capacity at its heap-leaching plant from 500 tons per day to 1,000 tons per day at the giant Cerro Rico deposits. Another operation to benefit from COMSUR's expansion was its Asientos Mine (lead, silver, and zinc) at Cerro Grande. Looking eastward to boost its gold output, the company has centered its dredge operations in the Teoponte River in La Paz Department. The operation produced about 9 to 11 kilograms of gold per year through 1989. Río Tinto Zinc Corp. Ltd. (RTZ) has taken 30% interest in COMSUR, and together they are assessing the silver reserves of the Cerro Rico de Potosí deposit. The Karachipampa lead-silver smelter in Potosí now operates as an autonomous subsidiary company of COMIBOL as the Empresa Metalúrgica de Karachipampa. The smelter has never been fired, although this may occur in 1991. Shortage in mineral feed and lack of operating capital continue as the main problem.

Tin.—Tin continued to be Bolivia's most important nonfuel mineral commodity. Its output increased about 51% from that of 1988 to about 15,850 tons. The largest production increase in the private sector was by the small-size mines and cooperatives, which for the third consecutive year replaced COMIBOL as the leading tin-producing sector, and in 1989, accounted for about 60% of Bolivia's tin production. The COMIBOL mines produced about 25% of the total, and the remaining 15% was produced by the medium-size mining sector.

Bolivia's position as a world tin producer jumped to the fourth place after Brazil, Indonesia, and Malaysia.

COMIBOL continued to work under the restructuring program established by Supreme Decree 21377 of August 1986. Tin mines rich in complex silver ores, such as the San José and Unificada del Cerro de Potosí Mines, have been able to remain open, although tin is 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 the output of tin, as did production from the private sector's mines. There were strong allegations that tin smuggled from Brazil was sold as Bolivian tin production. It has been estimated that about 3,000 tons of tin in concentrates was smuggled into Bolivian and sold to ENAF in 1989.

In August 1989, the Colquiri Mine was reopened with a new 1,000-ton-per-day mill for ores grading 1.2% tin and 6.6% zinc. Production of tin at Catavi-Siglo XX Mine, once the largest tin mine in the world, remained shut down; however, Catavi's large mine and mill dumps are currently being recycled by small mining cooperatives formed by former COMIBOL miners. The Huanuni Mine has become the largest and the richest tin mine in the country since its reopening in September 1988.

In the private sector, COPROMIN S.A. was the largest single tin producer in the country in 1989 with 503 tons of tin concentrate. COMSUR's Empresa Minera Quioma, a subsidiary of Minera Bolivia S.A., was no longer the country's largest producer of tin. Tin production at the Chojlla tin-tungsten mine of International Mining Co. increased in 1989 compared with 1988 output. Estalsa's tin dredging operation remained closed since September 1988.

Bolivia's tin exports increased 34.8% in 1989, with 5,103 tons exported as tin concentrates and 9,463 tons as metallic tin, including alloys.

Several small tin mines have reopened operations, and COMIBOL planned to start full operations at the Caracoles tin mines. Mill and mine tailings from COMIBOL's tin mines at Catavi, San Miguel, Porvenir, Molinos, Telamayu, and Itos were programmed for joint ventures or leasing contracts with private companies. In late 1989, the United States-Australian company MINPROC signed a 10-year lease with COMIBOL to mine the tailings of Colquiri Mine. MINPROC's

contract has a 4-month exploration stage together with metallurgical tests and an exploitation stage. COMIBOL in return will receive annual rent of $500,000 for an estimated annual tin output of 2,025 tons, 27,000 tons of zinc, and 20 kilograms of silver. However, the startup of the project had some problems with the Colquiri miners. The state-owned Vinto tin smelter in the past has had a severe ore feed shortage owing to a decrease in national tin production and the primary producers preference to export their output to foreign smelters that offered better terms. Bolivia's tin smelting charges were high at about $875 per metric ton. The smelter, which reopened in 1987 without state subsidies, improved consistently on the back of Bolivia's growing production. In 1989, 9,460 tons valued at $80.2 million was produced, enabling the smelter to record a $1.5 million profit. In 1989, the Vinto smelter purchased 10,300 tons of high-grade tin concentrates (more than 45% tin) compared with 5,600 tons purchased in 1988. In 1989, the Vinto smelter exported about 9,400 tons of metallic tin (97.4% tin content). About 40% of Bolivia's metallic tin exports went to Chile and another 40% to the United States.

Tungsten.—Bolivia's production of tungsten concentrate, heavily dependent on international prices, increased to about 1,400 tons from 1,100 tons in 1988. The mines that were closed 3 years ago because of severe ore depletion and high operating costs did not resume operations. Increased production was from those mines that remained open but had reduced their output. COMIBOL ceased production completely in 1986. Output of the medium-size mining sector increased 24% compared with that of 1988, and production by the small-size mining sector also increased 25% to 653 tons (WO_3 content). International Mining Co. (IMCO) continued to be the country's largest producer of tungsten, contributing 37% of the national total from its Chojlla Mine. IMCO's Chambilaya and Enramada Mines closed in 1986 and remained closed. Empresa Minera San José de Berque became the second largest producer of tungsten with 17% of the total produced from its Esmoraca, Pueblo Viejo, Española, and La Argentina Mines 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 with its production registered with the small-size mining sector.

TABLE 4

BOLIVIA: RESERVES OF MAJOR MINERALS

(Metric tons unless otherwise specified)

Antimony, metal content	308,000
Lead, metal content	25,965
Lithium carbonate thousand metric tons	5,500
Natural gas billion cubic meters	153
Petroleum thousand 42-gallon barrels	180,400
Silver, metal content	1,099
Tin, metal content	170,000
Tungsten, metal content	45,000
Zinc, metal content	837,000

The General Services Administration's tungsten auctions from the U.S. Government stockpile continued to be of great concern to the Bolivian Tungsten Producers Association in 1989. Available surplus material for future disposals added to the concern about the possibilities of future market disruptions.

Industrial Minerals

Cement.—Cement in Bolivia was produced by four cement plants in different regions of the country, with a total production capacity of about 700,000 tons. The largest one was Fábrica Nacional de Cementos S.A. (FANCESA) at Cal Orko (Mesa Verde) in La Paz Department and had a production capacity of 330,000 tons per year. The second largest was Sociedad Boliviana de Cementos S.A. (SOBOCE) at Viacha, La Paz Department, with a production capacity of 210,000 tons per year. The third was Compañía Boliviana de Cementos S.A. (COBOCE) at Irpa-Irpa, Cochabamba Department, with a capacity of 100,000 tons per year; and the fourth was Fábrica de Cementos El Puente at Méndez, Tarija Department, with a production capacity of 60,000 tons per year. Three plants, COBOCE, FANCESA, and El Puente were state owned. SOBOCE in La Paz Department was the only privately owned cement plant in the country.

During 1989, production of cement increased by about 12% from that of 1988. Production of clinker in 1989 was more than 400,000 tons, but the U.S. Embassy estimated the output of limestone from quarries near the cement plants at more than 600,000 tons. Another large limestone deposit was the Yacuses 60-million-ton reserve in eastern Bolivia in Santa Cruz Department, which the Regional Development Corporación of Santa Cruz (CORDECRUZ) jointly owned with private entrepreneurs (Roda Group). They plan to install a 345,000-ton-per-year cement plant and a clinker plant. The new company will be named Compañía de Cemento Camba S.A. (COSECA).

Lithium.—In 1988, the Bolivian Government, through the Ministry of Mines and Metallurgy, and officials of the Industrial Complex of the Evaporitic Resources of the Uyuni salt flats (Complejo Industrial de los Recursos Evaporíticos del Salar de Uyuni—CIRESU), started negotiations with Lithium Corp. of America (LITHCO) of North Carolina, a subsidiary company of FMC Corp., to extract lithium and other salts from the brines of the Uyuni salt flats area and to build a lithium processing plant. On November 17, 1989, LITHCO and the Ministry of Mines and Metallurgy signed a $46 million preliminary exploration and exploitation contract. The contract was valid for 40 years, or the extraction of up to 400,000 tons of metallic lithium equivalent, whichever comes first. A feasibility study was to be prepared for the construction of surface facilities to produce at least 7,000 tons per year of lithium carbonate.

For sometime, LITHCO was very interested in mining the huge lithium, potassium, and boron deposits in the salt flats known as Salar de Uyuni, 800 km south of La Paz. These flats contain the world's largest known lithium deposits, estimated at between 5.5 million tons and 9 million tons, with additional reserves of 110 million tons of potassium and 3 million tons to 6 million tons of boron in an area of 18,000 square kilometers at an elevation of 3,000 meters. The company was particularly keen to develop the area because its main competitor, Cyprus-Foote Mineral, was already exploiting lithium just across the border in Chile's Atacama salt flats. Together these two companies control 90% of the world market. LITHCO has been negotiating for years with the Argentine Government

to mine the "Hombre Muerto" salt flats, although these deposits are significantly smaller than the Bolivian and Chilean deposits.

Since November, when the preliminary deal was signed, Bolivia's national press has demanded changes to the deal; moreover, there was opposition in Congress to the contract. Outside of Congress, the Federación Sindical de Trabajadores Mineros de Bolivia-FSTMB and the regional civic committee were vociferous critics. The criticism was that taxes and royalties to be paid by LITHCO as insufficient and that the development of the Salar was not subject to public bidding, but rather the result of private negotiation between LITHCO and Bolivia's former mining minister.

Mineral Fuels

Bolivia's hydrocarbon sector participation in the worldwide energy picture remained negligible, and it appeared that a similar trend would continue for the foreseeable future. However, Bolivia continued to be self-sufficient in crude petroleum, natural gas, and refined petroleum products.

The Bolivian hydrocarbon industry continued to be the second largest export earner, and it contributed 27% of the total value of exports and 37% of the national treasury revenues. The sector also accounted for 6.4% of the gross national product. The industry continued to be controlled by the Ministerio de Energía e Hidrocarburos through its agency, Yacimientos Petrolíferos Fiscales Bolivianos (YPFB). YPFB conducted exploration, production, refining, transportation, and marketing in 1989. It was not authorized to participate in joint ventures. The hydrocarbon law allowed YPFB to conduct operational-service contracts with domestic and foreign private companies. YPFB has signed 26 operational contracts since 1973, when the Bolivian hydrocarbon law was implemented (currently this law is under revision).

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.

In March 1989, YPFB signed a contract agreement with Sol Petróleo S.A. of Argentina to explore 160,000 hectares in the Aguaragüe Block, as well as a contract for a secondary recovery of oil from the YPFB's oilfields of Camatindi, Buena Vista, Sanandita, and Caigua. In July 1989, a contract was signed with Maxus of Texas to explore 1,385,000 hectares in the Mamoré region. In August, a contract was signed with Empresa Naviera Pérez-Companc-S.A.C.F.I.C. of Argentina for a secondary oil recovery operation in the oilfields of Caranda and Colpa. The newly revised hydrocarbon law under study reportedly would allow YPFB to enter into joint-venture agreements to develop new oilfields.

Natural Gas.—Production of natural gas increased 10% from that of 1988. YPFB's Río Grande Gasfield continued to be Bolivia's largest natural gas producer, followed by Occidental Boliviana Inc.'s Porvenir Gasfield and Tesoro Boliva's La Vertiente Gasfield. Of the total production of natural gas, 69% was produced from YPFB gasfields and 31% by private contractors, Occidental, and Tesoro petroleum companies.

Bolivia's domestic consumption of natural gas continued to be minimal at 354 million cubic meters, 21.9% over that of 1988. One of the major consumers of natural gas in 1989 was the Emmpresa Nacional de Electricidad (ENDE), which consumed more than 50% of national production. Argentina continued to be Bolivia's sole foreign customer for natural gas. In 1989, exports to Argentina decreased slightly from that of 1988 to 2,209 million cubic meters and increased 1% in value to $218.5 million. In October 1989, the export price reduction agreed on was 10% lower than the former price agreed in September 1987.

Of the natural gas produced in Bolivia, 42% was exported to Argentina; 7% was consumed domestically; 37% was reinjected into the gasfields; 8% was vented, flared, or lost; 4% was consumed as fuel by YPFB; and the remainder was consumed in miscellaneous uses.

As a result of YPFB's program of substituting gas products for liquids, domestic consumption of liquefied petroleum gas (LPG), including butane and propane, has increased from about 130,000 cubic meters in 1978 to 333,000 cubic meters in 1987. In 1988 and 1989, however, several natural gas pipelines were installed, and a larger volume of natural gas was consumed domestically. LPG consumption declined to 296,000 cubic meters in 1988 and to 313,000 cubic meters in 1989. YPFB had three gas plants at Río Grande, Colpa, and Camiri Department of Santa Cruz, that produced LPG and natural gasoline.

In June 1989, YPFB started production of LPG from its fourth plant at Vuelta Grande, also in Santa Cruz Department. This plant was built with International Development Bank financing. On July 25, 1989, Bolivia and Brazil signed three agreements that established the sale-purchase of goods and services to start in September 1992. The contracts were (1) the sale of electricity generated by a 500-megawatt thermoelectrical plant (ENDE will sell electricity to Electrobrás and Electrosul of Brazil to cover the energy needs of the State of Matto Grosso), (2) the sale of 100,000 tons per year of urea for the Brazilian market, and (3) the marketing by Brazil of 100,000 tons per year of polyethylene of high density and low density.

All these projects were based on the construction of a 20-inch, 557-km-long pipeline from Santa Cruz to Puerto Suárez on the Bolivian-Brazilian border. The pipeline will be constructed by Bolivia and will carry natural gas from YPFB's and its contractors' gasfields. The cost of the three projects was estimated at $810 million. The financing for the projects was being sought from international financial institutions, private sources, and bilateral financing.

On December 13, 1989, Bolivia and Argentina signed and ratified a series of agreements aimed at integrating the economies of the two countries. These agreements included an energy integration agreement by which Argentina assures payments for Bolivian natural gas through 1992 and from then on to rework the formula for payments of natural gas sales. Both countries agreed to continue natural gas sales for 10 more years after the expiration of the contract in 1992. Under the new terms to be negotiated at that time, it features a 10% lower sale price for the natural gas and Argentine payments in 82% cash and 18% in goods and services for use in Bolivia. Argentina also agreed to pay in a timely manner for the purchase of the natural gas.

Petroleum.—Production of crude oil and condensate increased 3.6% over that of 1988 to about 7.3 million barrels. The total average daily production increased slightly to 19,929 barrels in 1989 from 19,285 barrels in 1988. Of the total crude oil produced, the YPFB share was almost

83%, and the remainder was produced by Occidental Boliviana and Tesoro Bolivia.

During 1989, YPFB and the two U.S. contractors were active in exploration drilling. YPFB drilled 23,882 meters, 9.6% higher than in the previous year. YPFB made two new oil discoveries, the Víbora and Patujá Fields, both in the Central area of Santa Cruz.

Most of the payments due to Occidental and Tesoro (about $221 million) were met in 1989. Reserves estimated by YPFB on December 31, 1989, were 180.4 million barrels of petroleum liquids and 153 billion cubic meters of natural gas.

Domestic consumption of refined petroleum products increased by 5% over that of 1988 to 23,739 barrels per day. The domestic prices for refinery products were increased twice by the Government in 1989, with the price at yearend set at $1.56 per gallon for unleaded gasoline. On July 31, 1989, Maxus Boliviana Inc., a subsidiary of Diamond Shamrock Corp. of Dallas, Texas, signed an exploration contract with YPFB (contract XXV) to explore 1.4 million hectares in the Boomerang (Mamoreé) region at the border of the Departments of Cochabamba (Chapare) and Santa Cruz. According to the contract, Maxus will receive 55% of the production when hydrocarbons are found and YPFB 45%.

After 3 years of production, the sharing rate will change to 50% each. Maxus announced plans to invest $1.6 million during the next 2 years and $2.5 million in the third year for exploration. If the company decides to continue for a fourth year, the assigned tract will be reduced to a target area and a wildcat well will be drilled.

Reserves

YPFB estimated that total Bolivian crude oil plus condensate as of December 31, 1989, was 180.4 million barrels. YPFB's share was 88% of the total, with the remaining 12% of liquid reserves divided as follows: Occidental 7.94 million barrels and Tesoro 28.69 million barrels. Bolivia's petroleum reserves at current production and consumption would last for another 22 years. YPFB estimated that of the total oil reserves, about 33% was crude oil and 67% lease condensate in natural gasfields.

According to YPFB, Bolivia's natural gas reserves, as of December 31, 1988, were 153 billion cubic meters. COMIBOL total mineral reserves for lead, silver, tin, tungsten, and zinc at the nucleus mines and at the medium-size and small-size mining sectors were revised in 1989 for the 5-year plan.

INFRASTRUCTURE

The communication and transportation systems in Bolivia have peculiar characteristics due to its rugged topography. The Andean Range constitutes a very difficult barrier to overcome for communication and transportation between the western and eastern regions of the country. The alignment of railroad lines and highways are sinuous, and, during the rainy season, mud avalanches occur, blocking them temporarily. In the eastern plains, the rivers and affluents constitute serious problems, preventing deliveries of supplies and food to the consumers because of the flooding; nevertheless, Bolivia has a relatively well-developed infrastructure. The transportation network was 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.

The railroad system consisted of 3,675 km of 1.000-meter-gauge and 32 km of 0.760-meter-gauge track, 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.

Crude oil and condensates, refined oil products, and natural gas are transported from oilfields and gasfields and refineries to domestic consumer 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. In addition, Bolivia has 14,000 km of commercially navigable waterways, which connects the eastern region of the country with the Amazon basin.

Energy.—The Ministry of Energy and Hydrocarbons formulates national policies for the electrical power sector and regulates power system 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 1,728 million kilowatt hours (kW·h) was produced in 1989, an increase of 12% over that of 1988. The average consumption was 260 kW·h per capita. Bolivia had an installed electrical generating capacity of 605 megawatts (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 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 Geological Survey (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 due to lack of financing.

OUTLOOK

Future prospects for Bolivia's mineral industry continues to be mixed. The current Government has pledged to retain the old economic policies in order to keep inflation down and continue the growth

begun under the previous Government. 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 minerals and natural gas.

Generated electrical power 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 its gold industry and the iron ore-steel prospects in Mutún bordering Brazil. Planned medium-term mining projects include continuation of COMIBOL's rehabilitation program, the lithium-potassium project, 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 the gas-thermoelectrical plant and the sale-purchase of urea and high-density polyethylene to be located 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 the Brazilian border. There also is the possibility of expansion of the current agreement concerning the export of natural gas to Argentina.

All the future Bolivian projects are included in the general program of stabilization and restructuring of the nation's economy. This includes revision of key aspects of the mining legislation, reforms of the petroleum laws, and foreign and domestic investment laws, all with emphasis on favoring the potential foreign and domestic investors.

[1]Where necessary, values have been converted from Bolivianos ($b) to U.S. dollars at the rate of $b2.7 = US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

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Publications

Ministerio de Minería y Metalurgia, La Paz City: Boletín Estadístico Minero Metalúrgico, monthly.
Asociación Nacional de Mineros Medianos, La Paz City: Minería Mediana-Memoria 1989, annual.
U.S. Embassy, La Paz, Bolivia: Industrial Outlook Report-Minerals 1989, State Dep. Airgram A-20, Sept. 20, 1990.
U.S. Embassy, La Paz, Bolivia:
Annual Petroleum and Natural Gas Questionnaire for Bolivia, 1989.
Industrial Outlook Report for the Hydrocarbons and Energy Sectors. State Dep. Airgram A-13, Mar. 28, 1990.

BRAZIL

AREA 8.5 million km² **POPULATION 151 million**

THE MINERAL INDUSTRY OF

BRAZIL

By H. Robert Ensminger

Brazil ranks as a world leader in the production and export of columbium (ferrocolumbium), gem stones (nondiamond), iron ore, lithium, tantalite, and tin. Within the Latin American region, Brazil is the 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 Brazil's dependence on oil imports. The country presently imports approximately 40% of its crude oil requirements. Brazil's economic activity began to recover in 1989. The gross domestic product (GDP) grew by approximately 4% to $288 billion (current dollars).[1] Industrial output increased by almost 4% with the minerals sector showing an estimated increase of 2% over that of 1988. The major contributors to the increase in the mineral sector were bauxite, iron ore, and petroleum. The Government continued to utilize all measures to avoid hyperinflation in 1989. Inflation reached an annualized rate of 1,765% by yearend.

It remains too early to evaluate the longer term impact of the 1988 constitutional restriction on foreign mining companies, which requires a majority Brazilian partner. The reduction in exploration and mine development since 1988 was probably more the result of general political and economic uncertainties than worry about the new mining law.

GOVERNMENT POLICIES AND PROGRAMS

Under the new Constitution, mineral taxation was transferred from the Federal Government to the State governments. The several States all approved a resolution guaranteeing that the value-added tax on mineral products will not incur greater costs than the previous singular Federal tax.

The Brazilian Government has given mining companies an additional 2 years to justify the exploration and prospecting concessions they were granted. The new Constitution stipulated that companies would have 1 year to prove they were working their concessions, rather than hoarding holdings for speculative reasons.

In midyear, the Government called off the auction of Cía. Siderúrgica do Nordeste (COSINOR), a State-owned steel mill in northeastern Pernambuco State, after the minority shareholders protested that the asking price was too low. The chief obstacle to privatization was the huge debt accumulated by the State-owned mills because of low Government-set steel prices, which forced most of the producers to sell below cost. In addition, the President of Brazil canceled the auction of Mafersa S.A., a railway equipment manufacturing company.

The Brazilian Government's mineral exploration agency, Cía. de Pesquisas de Recursos Minérais (CPRM), announced the signing of a contract with Centromín Peru S.A. (Centromín), a Peruvian Government entity, to prospect for gold in the Madre de Dios River area of Peru.

PRODUCTION

Brazil's mineral production increased by approximately 2% in 1989. The mineral commodities that were major contributors to the increase in output were bauxite, chromite, copper, ferroalloys, iron ore, kaolin, lime, petroleum, potash, steel (semimanufactures), and tin. Unofficially, gold production declined for the first time since 1979; however, the decrease was very small, being an estimated 0.2%.

In 1989, Brazil ranked first in world production of columbium, gem stones (nondiamond), tantalite, and tin; second in iron ore and lithium; third in bauxite; fourth in asbestos and vermiculite; fifth in magnesite; and sixth in manganese and steel. Brazil was also among the world leaders in the production of pig iron.

The total value of minerals produced in 1989 was approximately $9 billion. This represented approximately 3% of the GDP.

TRADE

The trade balance in the mineral sector for 1989 was heavily influenced by the value of petroleum imports. Total mineral imports were $4.9 billion while total exports were $2.6 billion. Iron ore and manganese combined accounted for 87% of Brazilian exports. Besides petroleum, other major mineral imports were copper, natural gas, potash, sulfur, and zinc.

In midyear, Brazil signed an agreement with Bolivia to purchase urea, polyethylene, and electricity produced by or from natural gas. Although billed as a natural gas accord, the natural gas portion was ruled out early in the discussions.

At yearend, Brazil and the United States reached an accord on a new Voluntary Restraint Agreement (VRA) that would boost steel shipments to the United States by up to 55% during the next 2 years. It would allow for steel exports of up to 1,556,000 tons in 1990, with an increase of 260,000 tons in 1991.

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 1989. The lone exception was the natural gas and petroleum industry, which was 100% Government-owned through Petróleo Brasileiro S.A. (PETROBRAS). In 1989, PETROBRAS was composed of six 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 Comércial Internacional S.A.; (INTERBRAS), the foreign trading company; (5) Petrobrás

BRAZIL — MINERAL PROVINCE OF CARAJÁS

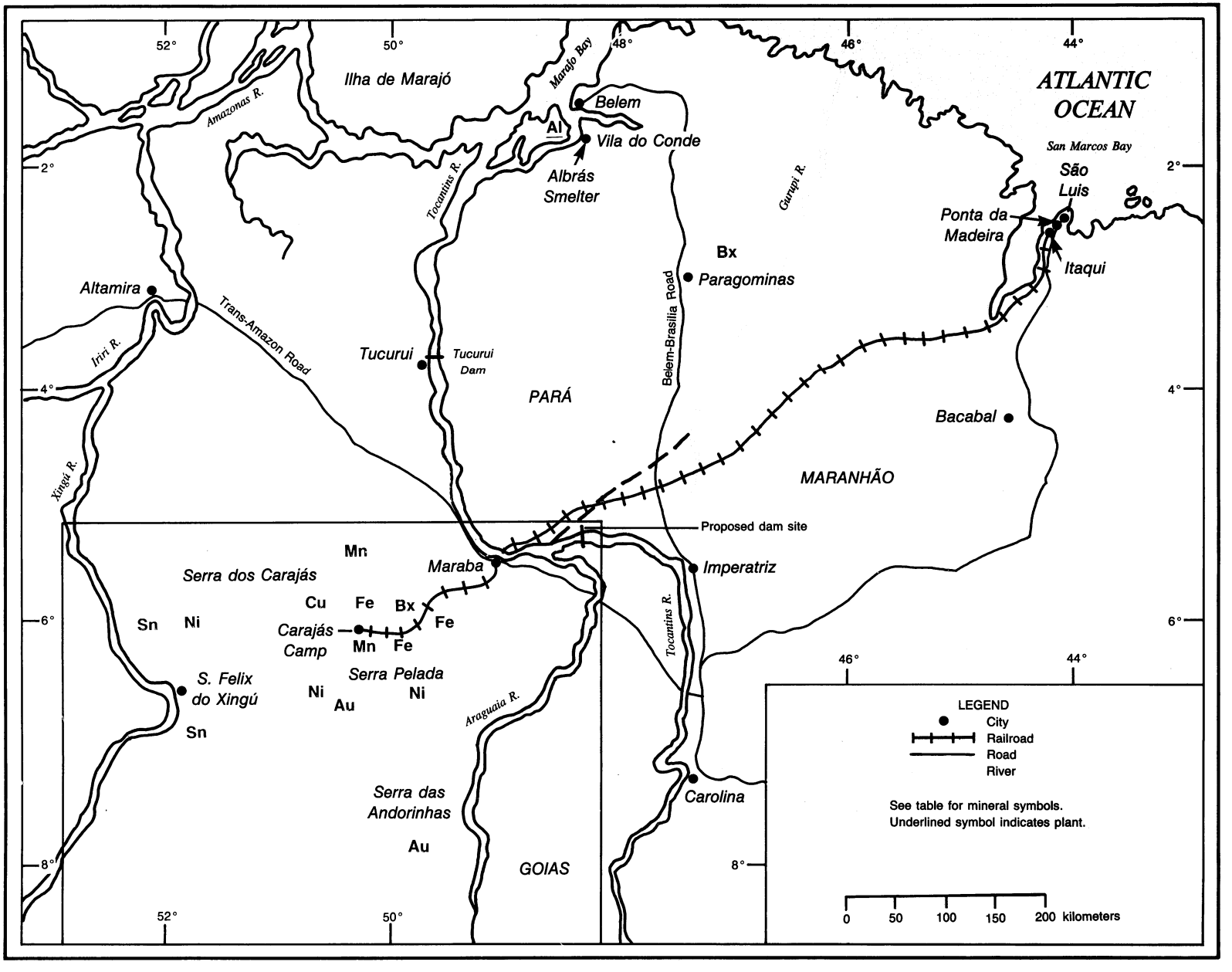


TABLE 1

BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[p]
METALS						
Aluminum:						
Bauxite, dry basis, gross weight		5,846,000	6,544,000	6,566,500	7,727,600	8,442,000
Alumina		1,095,900	1,196,800	1,396,300	1,416,700	1,624,439
Metal:						
Primary		549,167	757,375	843,500	873,500	887,900
Secondary		44,828	47,971	50,284	60,500	66,000
Beryllium: Beryl concentrate, gross weight		877	907	1,000	913	800
Cadmium: Metal, primary		224	233	214	283	283
Chromium:						
Crude ore[e]		[3]727,000	780,000	780,000	810,000	850,000
Concentrate		130,696	129,000	123,900	165,900	[3]188,000
Marketable product[4]		189,504	222,990	[e]220,000	[e]240,000	[e]250,000
Cobalt:						
Mine output, Co content by hydroxide[e]		100	150	150	150	200
Metal, electrolytic		—	—	—	—	[e]70
Columbium-tantalum ores and concentrates, gross weight:						
Columbite and tantalite		267	274	[e]300	381	426
Djalmaite concentrate		10	10	[e]10	[e]10	[e]10
Pyrochlore concentrate		29,400	28,737	26,666	20,275	21,800
Copper:						
Mine output, Cu content		41,000	40,183	40,332	44,845	44,440
Metal:						
Primary		93,900	115,990	146,969	147,880	153,376
Secondary		49,000	50,000	52,200	38,050	42,272
Gold:[e 5]						
Mine output	kilograms	22,400	23,900	31,400	30,800	[e]30,000
Garimpeiros (prospectors)	do.	49,800	43,600	52,300	69,400	[e]70,000
Total	do.	72,200	67,500	83,700	100,200	[e]100,000
Iron and steel:						
Ore and concentrate (marketable product):[4]						
Gross weight	thousand tons	128,251	132,288	134,105	145,040	153,700
Fe content	do.	87,200	89,956	91,200	98,600	[e]102,300
Metal:						
Pig iron[6]	do.	18,970	20,350	21,509	23,650	24,381
Ferroalloys, electric-furnace:						
Chromium metal		124	138	123	155	135
Ferroboron		29	35	—	—	—
Ferrocalcium silicon		22,179	23,715	25,673	31,519	33,020
Ferrochromium		127,288	109,392	105,394	130,024	113,267
Ferrochromium-silicon		8,875	9,512	8,079	9,177	8,938
Ferrocolumbium		17,676	17,391	10,880	19,106	16,378
Ferromanganese		134,835	164,093	155,252	180,588	180,668
Ferromolybdenum		509	511	422	427	332
Ferronickel		33,460	34,296	35,496	33,930	34,997
Ferrophosphorus		1,281	1,461	1,784	1,469	1,928

See footnotes at end of table.

TABLE 1—Continued

BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[p]
METALS—Continued						
Iron and steel—Continued						
Metal—Continued						
Ferroalloys, electric-furnace—Continued						
Ferrosilicon		181,784	217,715	231,159	267,538	286,994
Ferrosilicon magnesium		14,876	13,053	17,575	17,000	15,864
Ferrosilicon zirconium		421	852	398	793	1,392
Ferrotitanium		1,372	755	80	549	430
Ferrotungsten		218	173	123	133	[3]22
Ferrovanadium		905	439	88	261	302
Inoculant		1,748	3,244	3,308	7,678	12,098
Silicomanganese		180,271	177,568	188,022	193,490	208,262
Silicon metal		29,477	37,077	39,982	79,287	116,779
Total		757,328	811,420	823,838	973,124	1,031,806
Steel, crude, excluding castings	thousand tons	18,557	20,014	22,228	24,657	25,018
Semimanufactures, flat and nonflat	do.	20,457	21,234	21,213	22,243	32,537
Lead:						
Mine output, Pb content		16,997	13,614	11,633	14,314	16,050
Metal:						
Primary		29,811	32,718	29,842	29,501	32,522
Secondary		51,764	51,973	58,361	68,681	53,295
Magnesium metal:						
Primary		2,615	4,356	5,488	5,865	6,200
Secondary		2,006	1,767	1,376	[e]1,500	[e]1,500
Manganese ore and concentrate, marketable, gross weight[4]		2,523,194	2,696,799	2,067,385	1,944,596	1,904,000
Nickel:						
Mine output, Ni content		20,300	21,240	21,897	20,832	20,963
Ferronickel, Ni content		9,401	9,579	9,739	9,216	9,445
Rare-earth metals: Monazite concentrate	gross weight	1,177	1,246	1,560	[e]1,600	1,900
Silver[7]	kilograms	94,000	101,500	110,400	124,000	124,400
Tin:						
Mine output, Sn content		26,514	26,246	27,364	44,102	50,232
Metal:						
Primary		[r]24,901	[r]27,627	29,565	42,107	44,240
Secondary[e]		200	200	200	250	250
Titanium concentrates, gross weight:						
Ilmenite		76,354	75,472	111,649	134,580	144,200
Rutile		713	495	511	1,142	2,600
Tungsten, mine output, W content		1,090	875	672	739	679
Zinc:						
Concentrate and salable ore[e]		[3]673,166	650,000	675,000	675,000	675,000
Mine output, Zn content		123,811	123,902	133,375	155,531	175,998
Metal, smelter:						
Primary		116,136	130,555	138,652	139,667	155,846
Secondary		4,601	4,741	9,384	7,000	6,409
Zirconium: Zircon concentrate, gross weight[8]		21,039	15,116	18,140	28,029	32,970

See footnotes at end of table.

TABLE 1—Continued

BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[p]
INDUSTRIAL MINERALS						
Asbestos:						
Crude ore		2,254,922	2,582,500	2,500,000	e2,500,000	2,300,000
Fiber		165,446	204,460	212,807	227,653	206,195
Barite:						
Crude		83,817	101,917	99,424	68,855	63,665
Beneficiated		125,957	102,956	102,220	78,842	51,407
Marketable product[4]		142,575	103,072	102,345	85,287	e95,000
Calcite		56,798	41,554	e50,000	e50,000	e50,000
Cement, hydraulic	thousand tons	20,612	25,297	25,470	25,328	25,883
Clays:						
Bentonite		236,021	206,021	194,586	214,767	e229,000
Kaolin:						
Crude		2,156,787	2,207,600	2,259,777	2,092,635	2,200,000
Beneficiated		524,182	623,822	661,149	759,892	846,200
Marketable product[4]		655,205	706,017	e700,000	e800,000	e900,000
Other:						
Crude		(9)	(9)	(9)	(9)	—
Beneficiated		(9)	(9)	(9)	(9)	—
Diamond:						
Gem	thousand carats	233	310	e320	353	350
Industrial	do.	217	315	e325	180	150
Total[10]	do.	450	625	e645	533	500
Diatomite:						
Crude		24,387	35,000	50,000	e50,000	55,000
Beneficiated		17,463	19,601	33,189	e30,000	15,618
Marketable product[4]		18,231	20,189	35,000	e33,000	e20,000
Feldspar and related materials:						
Feldspar, marketable product[4]		110,150	120,572	e120,000	e120,000	e120,000
Leucite, marketable product[4]		2,567	10,207	10,000	e10,000	e10,000
Sodalite, crude, marketable product		1,077	1,452	1,500	e1,500	e1,500
Total		113,794	132,231	e131,500	e131,500	e131,500
Fluorspar:						
Crude		276,623	234,944	e250,000	e250,000	e250,000
Concentrates, marketable product:						
Acid-grade		42,681	53,560	58,736	54,050	56,973
Metallurgical-grade		29,714	31,015	31,212	35,310	38,558
Total		72,395	84,575	89,948	89,360	95,531
Graphite:						
Crude		191,823	462,815	e450,000	e450,000	e450,000
Marketable product:						
Direct-shipping crude ore		16,425	19,074	e20,000	e20,000	e20,000
Concentrate		27,239	28,586	31,414	34,520	31,700
Total		43,664	47,660	re51,414	re54,520	e51,700

See footnotes at end of table.

TABLE 1—Continued

BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[p]
INDUSTRIAL MINERALS—Continued						
Gypsum and anhydrite, crude		560,077	706,463	823,978	788,773	799,253
Kyanite:						
Crude		2,800	1,489	[e]1,500	[e]1,500	[e]1,500
Marketable product[4]		2,350	950	[e]1,000	[e]1,000	[e]1,000
Lime, hydrated and quicklime	thousand tons	4,767	4,909	5,300	5,500	5,730
Lithium mineral concentrates:						
Amblygonite		32	49	50	[e]50	[e]50
Lepidolite		26	30	30	[e]35	[e]35
Petalite		1,323	1,614	1,600	[e]1,700	[e]1,800
Spodumene		107	366	300	[e]400	[e]400
Total		1,488	2,059	1,980	[e]2,185	[e]2,285
Magnesite:						
Crude		623,330	648,752	778,502	810,837	1,385,565
Beneficiated		260,754	296,792	383,378	404,126	259,508
Mica, all grades		2,881	2,185	[r]2,415	[r]2,520	2,579
Nitrogen: N content of ammonia		[r]944,900	[r]881,784	957,630	935,300	979,000
Phosphate rock including apatite:						
Crude:[e]						
Mine product	thousand tons	[3]23,698	27,000	27,000	27,000	27,000
Of which, sold directly	do.	[3]23	35	35	35	35
Concentrate:						
Gross weight	do.	4,148	4,509	4,777	4,672	3,655
P_2O_5 content	do.	1,496	1,620	1,694	1,663	[e]1,300
Pigments, mineral: Other, crude		6,320	5,474	[e]6,000	[e]6,000	[e]6,000
Potash: Marketable product (K_2O)		—	17,542	37,111	54,121	96,945
Precious and semiprecious stones except diamond, crude and worked:						
Agate	kilograms	2,067,267	3,000,000	5,300,000	2,600,000	3,000,000
Amethyst	do.	472,652	500,000	1,400,000	1,500,000	1,000,000
Aquamarine	do.	17,012	9,000	34,000	197,000	20,000
Citrine	do.	63,077	15,000	400,000	160,000	100,000
Emerald	do.	5,133	16,000	60,000	100,000	90,000
Opal	do.	334	13,000	16,000	13,000	500,000
Ruby	value	$29,440	$987	[e]$10,000	[e]$10,000	[e]$10,000
Sapphire	do.	$31,767	$2,474	[e]$15,000	[e]$15,000	[e]$15,000
Topaz	kilograms	6,567	14,000	22,000	72,000	50,000
Tourmaline	do.	12,659	10,000	60,000	170,000	80,000
Other	do.	400,000	311,000	500,000	500,000	[e]500,000
Quartz crystal, all grades		7,456	4,214	3,802	3,020	3,174
Salt:						
Marine	thousand tons	1,734	1,600	3,600	3,020	2,355
Rock	do.	995	600	950	1,336	1,291
Silica (silex)		2,024	3,576	3,654	4,009	4,100
Sodium compounds:[e]						
Caustic soda		950,000	975,000	975,000	975,000	975,000
Soda ash, manufactured (barilla)		179,000	225,000	225,000	225,000	200,000

See footnotes at end of table.

TABLE 1—Continued

BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[p]
INDUSTRIAL MINERALS—Continued						
Stone, sand and gravel:						
Dimension stone:						
Marble, rough-cut	cubic meters	232,797	103,966	[e]200,000	[e]200,000	[e]200,000
Slate		45,779	119,297	115,000	[e]115,000	[e]115,000
Crushed and broken stone:						
Basalt	cubic meters	491,000	669,150	650,000	[e]650,000	[e]650,000
Calcareous shells[e]		[3]883,282	1,000,000	1,000,000	1,000,000	1,000,000
Dolomite[e]	thousand tons	[3]2,208	2,000	2,000	2,000	2,000
Gneiss	cubic meters	363,421	523,232	500,000	[e]500,000	[e]500,000
Granite	thousand cubic meters	38,817	48,091	50,000	[e]50,000	[e]50,000
Limestone[e]	thousand tons	[3]36,329	40,000	40,000	50,000	50,000
Quartz[11]		113,282	147,023	150,000	[e]150,000	[e]150,000
Quartzite:						
Crude		268,560	333,124	350,000	[e]350,000	[e]350,000
Processed		169,120	172,776	175,000	[e]175,000	[e]175,000
Sand: Industrial		2,185,183	2,730,643	2,566,220	2,613,027	[e]2,700,000
Sulfur:						
Frasch		4,277	5,642	5,742	6,039	5,721
Pyrites		91,080	91,596	76,704	102,856	71,740
Byproduct:						
Metallurgy		79,002	100,033	153,038	152,013	163,724
Petroleum		54,591	73,572	77,322	61,396	60,121
Total		228,950	270,843	312,806	322,304	301,306
Talc and related materials:						
Talc, marketable product[4]		[r]356,333	336,706	425,513	[re]425,000	433,000
Pyrophyllite, marketable product[4]		[r]81,910	[r]81,910	51,114	[re]75,000	162,000
Other: Algalmatolite, marketable product		[r]106,152	[r]131,036	104,536	[e]120,000	[e]120,000
Vermiculite:						
Crude		41,455	84,139	123,261	[re]120,000	[e]120,000
Marketable product[4]		9,291	14,150	16,825	18,849	[3]19,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous, marketable[4]	thousand tons	7,649	7,441	6,742	7,428	7,186
Coke, metallurgical, all types	do.	1,396	1,416	962	1,185	1,006
Gas, natural: Gross	million cubic meters	5,465	5,659	5,938	5,844	[e]5,890
Natural gas liquids	thousand 42-gallon barrels	6,500	4,586	9,529	[e]9,400	[e]9,500
Petroleum:						
Crude	do.	205,500	217,175	215,419	210,605	217,941
Refinery products:						
Gasoline	do.	107,675	77,015	[e]79,000	[e]75,000	68,700
Jet fuel	do.	21,900	20,075	[e]21,000	[e]20,000	19,458
Kerosene	do.	2,555	2,555	[e]5,800	[e]5,000	2,292
Distillate fuel oil	do.	128,845	142,715	[e]148,000	[e]140,000	145,752
Lubricants	do.	4,745	4,745	[e]6,500	[e]4,500	4,206
Residual fuel oil	do.	78,110	90,520	[e]106,000	[e]100,000	100,000
Other	do.	88,330	118,990	[e]74,000	[e]70,000	124,068

See footnotes at end of table.

TABLE 1—Continued

BRAZIL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Refinery products—Continued						
Refinery fuel and losses	thousand 42-gallon barrels	17,155	18,980	[e]12,700	[e]15,000	22,008
Total	do.	449,315	475,595	[e]453,000	[e]429,500	460,650

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Nov. 15, 1990.
[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: 1985 7,597; 1986 9,348; 1987 13,095; 1988 22,160; and 1989 24,900. Small mines (garimpos): 1985 21,725; 1986 31,100 (estimated); 1987 34,200 (estimated); 1988 34,260 (estimated); and 1989 56,000 (estimated).
[6]Includes sponge iron as follows, in thousand metric tons: 1985 285; 1986 295; 1987 202; 1988 195; and 1989 239.
[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: 1985 13,500 (estimated); 1986 19,900 (estimated); 1987 20,200 (estimated); 1988 20,200 (estimated)/ and 1989 22,000 (estimated).
[8]Includes baddeleyite-caldasite.
[9]Revised to zero.
[10]Figures represent officially reported output plus official Brazilian estimates of output by nonreporting miners.
[11]Apparently includes crude quartz used to produce quartz crystal (listed separately in this table) as well as additional quantities of common quartz.

Fertilizantes S.A. (PETROFERTIL), the agricultural fertilizer company; and (6) Petrobrás Mineração S.A. (PETROMIN), the mining company. PETROBRAS is the domestic operator. The Government-owned steel holding company, Siderúrgica Brasileira S.A. (SIDERBRAS), controlled the major steel plants in the country. The Government has planned to privatize a number of the State steel companies beginning in 1990. Companhía Vale do Río Doce (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 a large and vast one. In 1986, the last year for which there is information, 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 coke steelworks under SIDERBRAS produced approximately 66% of the crude steel in 1989. CVRD produced approximately 60% of the iron ore. Mineração 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 1989.

Brazil's total labor force was approximately 57 million in 1989. 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 garimpeiros active in Brazil.

COMMODITY REVIEW

Metals

Alumina, Aluminum, and Bauxite.—Aluminum production in 1989 was near the 1988 level with a slight increase of less than 2%. Alumina production increased substantially by almost 15%. Bauxite production increased by 9% over that of 1988 and by 29% over the 1987 figure.

Industrias Votorantim, Brazil's largest private-sector company, has planned to invest $750 million during the next 3 years in its Cía. Brasileira de Aluminio (CBA) plant to increase its production of aluminum from 170,000 metric tons per year (mt/yr) to 255,000 mt/yr by 1991. CVRD announced plans to construct a 1-million-mt/yr alumina refinery near Paragominas, Pará State, to process the bauxite from the 850-million-ton deposit there. It will be known as the Jabuti Project.

At yearend, CVRD announced that it was almost certain that the Japanese consortium, Nippon Amazon Aluminum Co. (NAAC), would return as a shareholder in the partially completed Alumina do Norte do Brasil S.A. (ALUNORTE) alumina refinery. Other companies that have confirmed their participation in ALUNORTE are Cía. Brasileira de Aluminio (7%), Alcan Aluminio do Brasil S.A. (9%), and Mineração 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%.

Mineração Río do Norte S.A., the world's third largest bauxite producer and exporter, announced that it has begun a $44 million expansion that will boost bauxite production to 8 million tons per year. Brazil's second largest aluminum smelter, Albras-Aluminio Brasileiro S.A. (ALBRAS), announced plans to increase its plant capacity from 160,000 mt/yr to 345,000 mt/yr by 1995 at a cost of approximately $650 million.

Columbium and Tantalum.—Cía. Brasileira de Metalurgia e Mineração (CBMM) started up its new electron beam furnace for the production of columbium metal. The furnace, produced by Leybold-Heraeus of Germany at a cost of $6.5 million, was placed in service at CBMM's site at Araxá, Minas Gerais State, in midyear. Nominal furnace capacity is 40 mt/yr with a maximum potential output of 59 mt/yr. In 1989, CBMM accounted for 85% of Brazil's production capacity and supplied approximately 65% of the world demand for ferrocolumbium.

TABLE 2

BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
(METALS)			
Aluminum	Albras-Aluminio Brasileiro S.A. (ALBRAS) (Government, 26%; private, 25%; Nippon Amazon Aluminum Co. (NAAC), 49%)	Belem, Para State (smelter)	160
Do.	Alcan Aluminio do Brasil S.A. (Alcan Aluminum Ltd., 100%)	Saramenha, Minas Gerais State (refinery)	150
Do.	Alcan Aluminio Pocos de Caldas (ALUCALDAS) (Alcan Aluminio do Brasil S.A., 100%)	Pocos de Caldas, Minas Gerais State (mine)	1,000
Do.	Alcoa Aluminio S.A. (ALUMAR)(Aluminum Co. of America, 60%; Billiton International Metals B.V., 40%)	do.	400
Do.	do.	Sao Luis, Maranhao State (refinery) (smelter)	550 174
Do.	Aluminio do Brasil Nordeste S.A. (Alcan Aluminum Ltd., 100%)	Aratu, Bahia State (smelter)	58
Do.	Billiton Metais S.A. (Billiton International Metals B.V., 100%)	Sao Luis, Maranhao State (refinery)	375
Do.	Compahnia Brasileira de Aluminio (CBA) (private, 100%)	Pocos de Caldas, Minas Gerais State (mine)	1,000
Do.	do.	Sorocaba, Sao Paulo State (refinery) (smelter)	170 170
Do.	Compahnia Geral do Minas (private, 21%; Aluminum Co. of America, 79%)	Pocos de Caldas, Minas Gerais State (refinery) (smelter)	275 90
Do.	Mineração 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
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
Chromite	Coitezeirio Mineração S.A. (COMISA) (private, 75.4%; Bayer do Brasil S.A., 24.6%)	Campo Formosa, Bahia State (mine)	50
Do.	Companhia de Ferro Ligas da Bahia (FERBASA) (private, 100%)	Campo Formoso, Bahia State (mine) (beneficiation plant)	370 292
Copper	Companhia Brasileira do Cobre (CBC) (private, 100%)	Cacapava do Sul, Rio Grande do Sul State (mine) (beneficiation plant)	1,000 1,800
Do.	Mineração Caraiba Ltda. (Government, 100%)	Jaquarari, Bahia State (mine) (beneficiation plant)	3,000 5,700
Columbium	Companhia Brasileira de Metalurgia e Mineração (CBMM) (Private, 55%; Molycorp, Inc., 45%)	Araxa, Minas Gerais State (mine) (beneficiation plant)	1,200 44
Do.	Mineração Catalao de Goias Ltda. (Private, 68.5%; Anglo American Corp. do Brasil, 31.5%)	Ouvidor, Goias State (mine)	500
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 footnote at end of table.

TABLE 2—Continued

BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
(METALS)—Continued			
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	Companhia de Mineração e Participacões (CMP) (private, 100%)	Lourenco, Amapa State (mine) Currais Novos, Rio Grande do Norte (mine)	1,080 300
Do.	Mineração 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
Do.	Sao Bento Mineração 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 Mineração 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 Mineração S.A. (Samarco) (private, 51%; Broken Hill Properties Ltd., 49%)	Mariana, Minas Gerais State (mine)	11,700
Do.	S.A. Mineração da Trindade (SAMITRI) (private, 100%)	Mariana, Rio Piracicaba, Itabira, Ouro Preto and Sabara; Minas Gerais State (five mines)	9,300
Lead	Mineração Boquira S.A. (private, 100%)	Boquira, Bahia State (mine) (beneficiation plant)	300 310
Manganese	Companhia Vale do Rio Doce (CVRD)	Corumba, Minas Gerais State (mine)	500
Do.	do.	Serra dos Carajas, Para State (beneficiation plant)	1,000
Do.	Industria e Comercio de Minerios S.A. (ICOMI) (private, 100%)	Macapa and Mazagao, Amapa State (two mines) (beneficiation plant)	1,500 800
Nickel	Companhia Niquel Tocantins (private, 100%)	Niquelandia, Goias State (mine)	150
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
Do.	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%)	Cubatão, Sao Paulo State	3,900

See footnote at end of table.

TABLE 2—Continued

BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
(METALS)—Continued			
Steel	Usinas Siderurgicas de Minas Gerais S.A. (USIMINAS) (Government, 95%; Nippon Usiminas, 5%)	Ipatinga, Minas Gerais State	4,400
Tin	Mineração Jacunda Ltda. (private, 100%)	Santa Barbara, Novo Mundo, and Potosi; Rondonia State (six mines)	108
		(three beneficiation plants)	450
Do.	Paranapanema S.A. Mineração, 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)	5,420
		(two beneficiation plants)	1,400
Do.	do.	Piraporada Bom Jesus, Sao Paulo State (refinery)	25
Titanium	Rutilo e Ilmenita do Brasil S.A. (RIB) (private, 100%)	Mataraca, Paraiba State (mine)	4,200
		(two beneficiation plants)	120
Zinc	Companhia Minera de Metais (CMM) (private, 100%)	Vazante, Minas Gerais State (mine)	800
		(beneficiation plant)	48
Do.	do.	Tres Marias, Minas Gerais State (refinery)	72
Do.	Mineração Areiense S.A.-MASA (MASA) (private, 100%)	Vazante, Minas Gerais State (mine)	400
Zirconium	Nuclemon Minero-Quimica Ltda. (Government, 100%)	Sao Joao da Barra, Rio de Janeiro State (mine)	660
Do.	do.	Itapemirim, Espirito Santo State (mine)	90
Do.	do.	Prado, Bahia State (mine)	90
		(three beneficiation plants)	123
		(three separation plants)	90
INDUSTRIAL MINERALS			
Asbestos	SAMA-Sociedade Anonima Mineração de Amianto (SAMA) (private, 100%)	Minacu, Goias State (mine)	9,000
		(beneficiation plant)	230
Cement	Cimento Santa Rita S.A. (private, 100%)	Itapevi, Sao Paulo State (plant)	1,000
		Salto de Pirapora, Sao Paulo State (plant)	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	Mineração Tejucana S.A. (private, 100%)	Diamantina, Minas Gerais State (mine)	3,000
Fluorspar	Mineração Nossa Senhora do Carmo Ltda. (private, 100%)	Morro da Fumaca and Pedras Grandes, Santa Catarina State (four mines)	180
		(two beneficiation plants)	220
Do.	Mineração Santa Catarina Ltda. (private, 100%)	Morro da Fumaca and Pedras Grandes, Santa Catarina State (four mines)	100
		(beneficiation plant)	120
Do.	Nacional de Grafite Ltda. (private, 100%)	Itapecerica and Pedra Azul, Minas Gerais State (three mines)	840
		(two beneficiation plants)	720

See footnote at end of table.

TABLE 2—Continued

BRAZIL: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
INDUSTRIAL MINERALS—Continued			
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)	720 360
Do.	Empresa de Mineração Horii Ltda. (Horii) (private, 100%)	Biritiba and Mogi das Cruzes, Sao Paulo State (two mines) (two beneficiation plants)	200 180
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)	770 820
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 Mineração (Serrana) (private, 100%)	Jacupiranga, Sao Paulo State (mine)	6,000
Salt (rock)	Mineração e Quimica do Nordeste S.A. (Dow Produtos Quimicos Ltda., 100%)	Vera Cruz, Bahia State (mine)	1,000
MINERAL FUELS			
Coal	Carbonifera Criciuma S.A. (private, 100%)	Criciuma 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	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	[1]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	[1]503,000
Do.	Refinaria de Petroleo Ipiranga S.A. (private, 100%)	Ipiranga, Rio Grande do Sul	[1]3,400
Do.	Refinaria de Petroleos de Manguinhos S.A. (private, 100%)	Manquinhos, Rio de Janeiro State	[1]3,650

[1]Thousand 42-gallon barrels per year.

In 1989, tantalum mineral concentrate production in Brazil was 700 tons compared with 622 tons in 1988 and 446 tons in 1987. Brazil was first in tantalum concentrate production in 1989, followed by Australia and Malaysia. Brazilian output was from garimpeiros (independent miners) or as a byproduct of tin operations.

Copper.—CVRD announced plans to build a $450 million, 225,000 mt/yr copper concentrate plant near its Salobo Mine. The mine is part of the Carajás mineral reserve in the State of Pará. The plant is expected to go on-line sometime in 1994. It was estimated that the plant, in addition to the copper concentrate, would recover 3 tons of gold per year and 13 tons of silver per year from the production process.

The Brazilian company Kardos Comércio, Industria e Empreendimentos Ltda. began producing oxygen-free electrolytic copper rods in July. The plant was the first of its kind in South America and used technology supplied by the Finnish company Outokumpu.

Copper-consuming companies in Brazil imported approximately 42,600 tons of copper in 1989. The increase in imports resulted from increased consumption and a production decrease by Mineração Caraiba Ltda.

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

Gold.—Official gold production in 1989 was approximately 53,000 kilograms (kg) while the unofficial figure was believed to have been approximately 100,000 kg.

Gold was a major focus of the Brazilian mining industry in 1989. The biggest incentive was a booming financial market demand for gold as an inflationary hedge. Gold for investment purposes, classed officially as a "financial asset," incurred only a 1% tax. When it was resold to jewelers, dentists, and industry as a "commodity," however, the State sales tax was raised to between 17% and 25%.

The discovery in September of a new gold deposit at the old Serra Pelada Mine in the Carajás area of the State of Pará caused garimpeiros 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, 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.

São Bento Mineração 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 Gencor's (South Africa) technology and pressure oxidation.

Iron and Steel.—**Ferroalloys.**—In 1989, ferroalloy production exceeded 1 million tons for the first time. Total production for the year exceeded that of the previous year by 6%.

Indústria e Comercio de Minerios (ICOMI) in midyear announced plans to begin production of ferrochrome in 1990 when the construction of its 20,000-mt/yr plant is completed. The plant will be operated by Cía. Ferroligas do Amapá S.A. (CFA) at Porto de Santana, Amapá State.

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/yr 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 from Carajás.

In midyear, CVRD and the Metalur Group signed an agreement with the Japanese firms Kawasaki Steel Corp. and Mitsubishi Metal Corp. to double the ferrosilicon production of their joint venture, Eletrovale S.A., at Nova Era, Minas Gerais State. The plant capacity in 1989 was 24,000 tons.

At yearend, practically every ferroalloy producer in Brazil canceled or postponed scheduled expansion projects owing to the low international prices, skyrocketing energy costs, and the economic uncertainty created by the upcoming presidential election.

Iron Ore.—Brazil's 1989 production of iron ore increased by almost 6% over that of the previous year. CVRD produced 56% of the total production or 87 million tons. The remaining major producers, in order of descending production, were Minerações Brasileiras Reunidas (MBR), Samarco Mineração S.A., Ferteco Mineração S.A., and S.A. Mineração da Trindade (SAMITRI). The total exports of iron ore achieved a record-high revenue of $2.2 billion.

In May, the first trainload of iron ore was shipped over the new "Steel Railway." It was transported from Minerações Brasileiros Reunidas' Aguas Claras Mine in Minas Gerais State to its export terminal at Sepetiba Bay in the State of Río de Janeiro.

SAMITRI announced plans to spend $15 million to set up a subsidiary to develop "heavy metals, strategic minerals, and rare-earth minerals." The move was planned to diversify into more profitable minerals. At the same time, Samarco announced plans to spend $50 million to develop a new itabirite mine in Minas Gerais State. The mine is to come on-stream in 1992 and will have a capacity of 12 million tons per year.

In July, Brazil began finalizing 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.

In August, CVRD announced the sale of 400,000 tons of iron ore to Australia. The sale was made to Broken Hill Property-Utah Minerals International through its Brazilian subsidiary Empresa Mineira Marex. Despite having been the world's fourth largest producer of iron ore in 1988, there was a need for it by the Australian steel industry. In addition, there was an effort to reduce the production of iron ore in Australia.

Pig Iron.—In 1989, pig iron production rose a modest 3% compared with a rise of almost 10% in 1988.

In May, Brazil's attorney general filed a civil suit against 22 Government-approved eastern Amazon pig iron projects. The suit was brought because the charcoal-burning units did not submit the necessary environmental impact statements and threatened to cause the destruction of 250,000 square kilometers of Amazon rain forest during the next 20

years. The 22 furnaces are along the Carajás-Ponta da Madeira railway, which runs from the Carajás iron ore mines to the port of Sao Luis in the State of Maranhao. As a result of the pig iron environmental problem, CVRD may be faced with a European Community (EC) boycott of its pig iron. There was also concern that the EC may consider boycotting CVRD's iron ore production.

In early 1989, the Korf Group companies (Germany), Ikosa and Korf Technología Siderúrgica (KTS), were considering the startup of a new charcoal-based pig iron plant in Brazil. The site chosen for the tentative plant was Campo Grande in the State of Mato Grosso.

Steel.—At yearend, Brazil and the United States reached an accord on the VRA pertaining to steel. Brazil's export quota to the United States was raised to 1.556 million tons per year. Within the quota, a 790,000-mt/yr limit was placed on semifinished products and a 766,000-mt/yr limit placed on finished products.

Usinas Siderúrgicas de Minas Gerais (USIMINAS), Brazil's largest steel producer, signed an agreement with Prensas Schuller, a subsidiary of the Brazilian Bardella Group, to purchase $133 million of equipment to set up a 360,000-mt/yr electrogalvanized steelplate mill. The Austrian-based company Maschinenfabrik Andritz was contracted to provide the technology.

Cía. Siderúgica Belgo-Mineíro in a joint venture with Trefil Arbed of Luxembourg commenced construction of a 20,000-mt/yr 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-Mineira's wire mill in Brazil.

The Gerdau Group, Brazil's largest private steelmaker, announced plans to modernize the direct-reduced iron 300,000-mt/yr Usiba plant it purchased at a Government auction in October. The upgrading options to be considered are the newer HYL-III process and the Midrex process. In the case of the Midrex option, a completely new plant would have to be constructed.

In September, the President of Brazil approved the construction of the $3 billion, 3-million-ton-per-year capacity Usimar steelmill in northern Maranhao State. Plans were to make Usimar primarily a privately owned flat-roll mill whose products will be totally for export.

Manganese.—Manganese production continued its decline that began in 1987. The 1989 figure was more than 2% below that of 1988. 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 dwindling 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 purity of the ore being mined by CVRD at its new manganese mine, the Azul Mine, in the Carajás complex. The Azul manganese ore is 45% Mn while the average grade of the ore on the international market is 48% Mn. The high content of aluminum in the ore, around 8%, may be a factor affecting the marketability of the Azul ore.

Tin.—In 1989, the garimpeiros produced approximately 59% (29,500 tons) of tin concentrate in Brazil. This was mined at the Bom Futuro site near Ariquemes in the State of Rondonia. The primary tin metal production was 44,182 tons of which 34,000 tons went for export. The Pitinga Mine in the State of Amazonas, owned and operated by Paranapanema S.A. Mineração, Industria e Construção, produced 16,500 tons of tin concentrates in 1989.

Large-scale smuggling of tin concentrates out of Brazil was believed to be one of the reasons for the decrease of tin prices on the international market. It was estimated that 9,500 tons was smuggled out of the country, most of it going to Bolivia.

British Petroleum (BP) sold its 50% interest in Cesbra Participações, Brazil's second largest tin producer, to Brascan (Canada), its partner in the tin joint venture, giving Brascan 100% ownership.

Titanium.—CVRD announced plans to invest $9 million to produce 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.

Industrial Minerals

Gem Stones.—For many years, Brazil has been an important producer of gem stones in the world. This ranking has applied in terms of volume as well as diversification. The large proportion of gem stones produced was mined by garimpeiros. For this reason gem stone reserves are unknown, but there is potential for very large reserves.

Exports of uncut gems declined in 1989 despite the removal of some export barriers. Export sales totaled $15 million, which was a decrease of 49% from that of 1988. In contrast, export sales of cut stones rose approximately 38% compared with that of 1988. In 1989, the international market saw a decrease in the volume of rough gems exported to the Federal Republic of Germany, Japan, and the United States.

Quartz.—A consortium that consisted of CVRD, Nisso Iwai (Japan), and Telequartz began production of quartz powder in 1989. 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 1989, Brazil was the largest producer of quartz in the world. It contained 53 million tons of reserves that composed 95% of the known world supply.

Other Industrial Minerals.—Potash production in 1989 increased by 74% over that of 1988; however, despite the increased production, Brazil still required imports of almost 1 million tons of K_2O.

Phosphate concentrate production decreased dramatically in 1989, decreasing by 28% from that of 1988. Imports increased from 142,000 tons in 1988 to 146,000 tons. Phosphoric acid production as well as imports decreased in 1989.

Mineral Fuels

In 1986 (the last year for which there are published data), the total amount of energy produced was 142,986,000 tons of oil equivalent. The primary sources, in order of importance, were hydraulic energy, firewood, petroleum, sugar cane bagasse, natural gas, steam coal, metallurgical coal, uranium, and others. Imported energy sources were 41,453,000 tons of oil equivalent. Total energy consumption was 145,762,000 tons of oil equivalent. Export, variations in inventory, nonutilized, and reinjected energy totaled 10,037,000 tons of oil equivalent. The transportation sector consumed 31,679,000 tons of oil equivalent the

industrial sector 60,359,000 tons of oil equivalent, and consumption, by categories, in the mineral industry, in order of importance, were pig iron and steel, 14,460,000 tons of oil equivalent; nonferrous and other metals, 7,265,000 tons of oil equivalent; cement, 2,974,000 tons of oil equivalent; mining and pelletization, 2,255,000 tons of oil equivalent; and ferroalloys, 1,720,000 tons of oil equivalent.

At yearend, the Brazilian Government began developing a plan to combat a looming alcohol shortage. The Government was expecting a shortfall of approximately 1.5 billion liters of fuel-grade alcohol by early 1990. With more than 13 million alcohol-powered vehicles on the road and with the looming alcohol shortage, the production breakdown of road vehicles was shifted to 70% gasoline-powered from almost entirely alcohol-powered.

Coal.—Brazil's total coal production in 1989 was slightly below the figure for 1988. Imports increased by more than 5% to 10,535,000 tons, which was almost entirely comprised of metallurgical coal. The United States exported an estimated 5.1 million tons of metallurgical coal, 6,000 tons of steam coal, and 25,000 tons of coke to Brazil in 1989.

Natural Gas and Petroleum.—The gas pipeline linking the Enchova platform in the offshore Campos Basin to Macaé, Río de Janeiro State, was completed in midsummer. The pipeline, 0.5 meter in diameter and 125 kilometers (km) in length, will add 5 million cubic meters per day 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. The gas was recovered from the Frederick Field, 27 km off the Louisiana coast by Petrobrás América Inc., a subsidiary of BRASPETRO.

In July, the Brazilian and Bolivian Governments signed contracts for 3.5 million cubic meters per day of natural gas in the form of electric power, urea, and polyethylene. The contracts are part of the so-called "Gas Agreement" that has been under negotiation for about 50 years.

Petroleum production increased 3.5% over that of 1988 with almost 60% coming from the Campos Basin, Río de Janeiro State. The second largest producing State was Río Grande do Norte with 14%. The Enchova platform in the Campos Basin went back into production in October, only 18 months after almost being completely destroyed by fire. The planned goal was to get daily output back up to 19,000 barrels of oil per day and 800,000 cubic meters of natural gas per day as soon as possible.

In addition to BRASPETRO's natural gas discovery in the Gulf of Mexico, the company struck oil and gas in two wells in the North Sea and struck high-grade oil in a wildcat well off the coast of Angola. In addition, several risk contract wells were drilled in Ecuador with one discovering oil. The company also signed its first risk contract with Argentina for oil exploration off the coast.

In midyear, Brazil's President inaugurated the Northeast Production Pole in the Campos Basin. Composed of seven fixed platforms built in Brazil, the system is scheduled to produce about 309 million barrels of petroleum during its expected 20-year lifetime.

Nuclear.—In October, a bill was submitted to the Brazilian Congress proposing the termination of the Brazil-Federal Republic of Germany nuclear energy accord signed in 1975. Construction was underway in 1989 on a pilot powerplant that will be capable of producing 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.

The State-owned company Uranio do Brasil signed a contract with the Andrade Gutiérrez conglomerate for the exploitation of uranium deposits near Lagoa Real, Bahía State. Andrade will expend $10 million for a feasibility study and $100 million on the proposed construction of a complex to produce uranium concentrate.

Reserves

In 1989, 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). Brazil's reserves of major minerals are included on table 3.

TABLE 3

BRAZIL: RESERVES OF MAJOR MINERALS

(Thousand metric tons unless otherwise specified)[1]

Asbestos, fiber	3,041
Bauxite, ore	2,321,000
Chromite, Cr_2O_3 content	4,850
Coal, all types	8,819,000
Columbium, pyrochlore and columbite ore	3,995
Copper, metal content	12,000
Fluorspar, ore	11,000
Gold, metal metric tons	970
Graphite, ore	38,000
Gypsum	672,379
Iron ore, 60% to 65% Fe content	18,300,000
Kaolin	1,060,000
Lead, metal content	355
Magnesite	153,000
Manganese, metal content	56,000
Natural gas[2] million cubic meters	109,000
Nickel, metal content	6,155
Petroleum[2] thousand 42-gallon barrels	2,816,000
Phosphate rock	310,000
Tin, metal content	630
Titanium, TiO_2 content	2,630
Zinc, metal content	4,200
Zirconium, ore	1,638

[1]1989 data (Sumario Mineral 1990) unless otherwise indicated.
[2]1989 (International Petroleum Encyclopedia 1990).

INFRASTRUCTURE

In 1989, Brazil had a total of 32,002 km of railroads composed of 25,268 km 1.000-meter gauge, 4,339 km 1.600-meter gauge, 74 km 1.600 to 1.000-meter gauge, 13 km 0.760-meter gauge, and 2,308 km electrified. The country contained a total of 1,448,000 km of roads, comprised of 48,000 km paved and 1,400,000 km of gravel and dirt. There were 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 1989, Brazil's installed electrical capacity was 52,865 megawatts.

Total production of electric power for the year was 202,280 gigawatt hours which translated into 1,340 kilowatt hours per capita.

In late 1989, 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-megawatt 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 found to be so great that Brazilian importers in 1988 paid nearly $300 million in penalties charged by ships that had to wait in line to be unloaded.

OUTLOOK

For the economy to improve over the longer term, the Government will need to reduce inflation to manageable levels. In addition, the public deficit will need to be reduced along with improvement in the foreign debt situation. The iron and steel industry is expected to decline somewhat over the short term, especially domestically. Another factor that may have an effect over the longer term is the environment, especially the Amazon rain forest. Much depends on what approaches are used to preserve and utilize the environment.

The role of infrastructure will have a major, direct bearing on Brazilian industry for the foreseeable future. The common denominator that is apparent is that among the many problems they have, the Brazilian companies will have to spend more money to improve and take advantage of Brazil's infrastructure. If this is not done, Brazil's ability to increase industrial production and competitiveness will be negatively affected by the country's infrastructure problems. The results may well be that the companies will pay more for the services, therefore, losing competitiveness, or they will stand in line to use these services, losing capacity. 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, probably will be most severely affected.

[1]Where necessary, values have been converted from Brazilian cruzeiros (Cz$) to U.S. dollars at the rate of Cz$4.4185 = US$1.00, the average rate for 1989.

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

Departamento Nacional de Produção 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 Mineraáo S.A. (DOCEGEO)
Avenida President Wilson 11° Andar
22030-Río de Janeiro-RJ-Brasil

Publications

American Consulate General, Río de Janeiro: Incoming telegrams.

Departamento Nacional da Producao Mineral, Brasilia: Anuario and Sumario Mineral, annual.

Fairchild Publications, New York: American Metal Market, weekly.

Instituto Latinoamericano del Fierro y el Acero, Santiago: monthly and annual reports.

Miída Ltd., London: Latin America Mining Letter, weekly.

PenWell Publishing Co., Tulsa: Oil and Gas Journal, weekly.

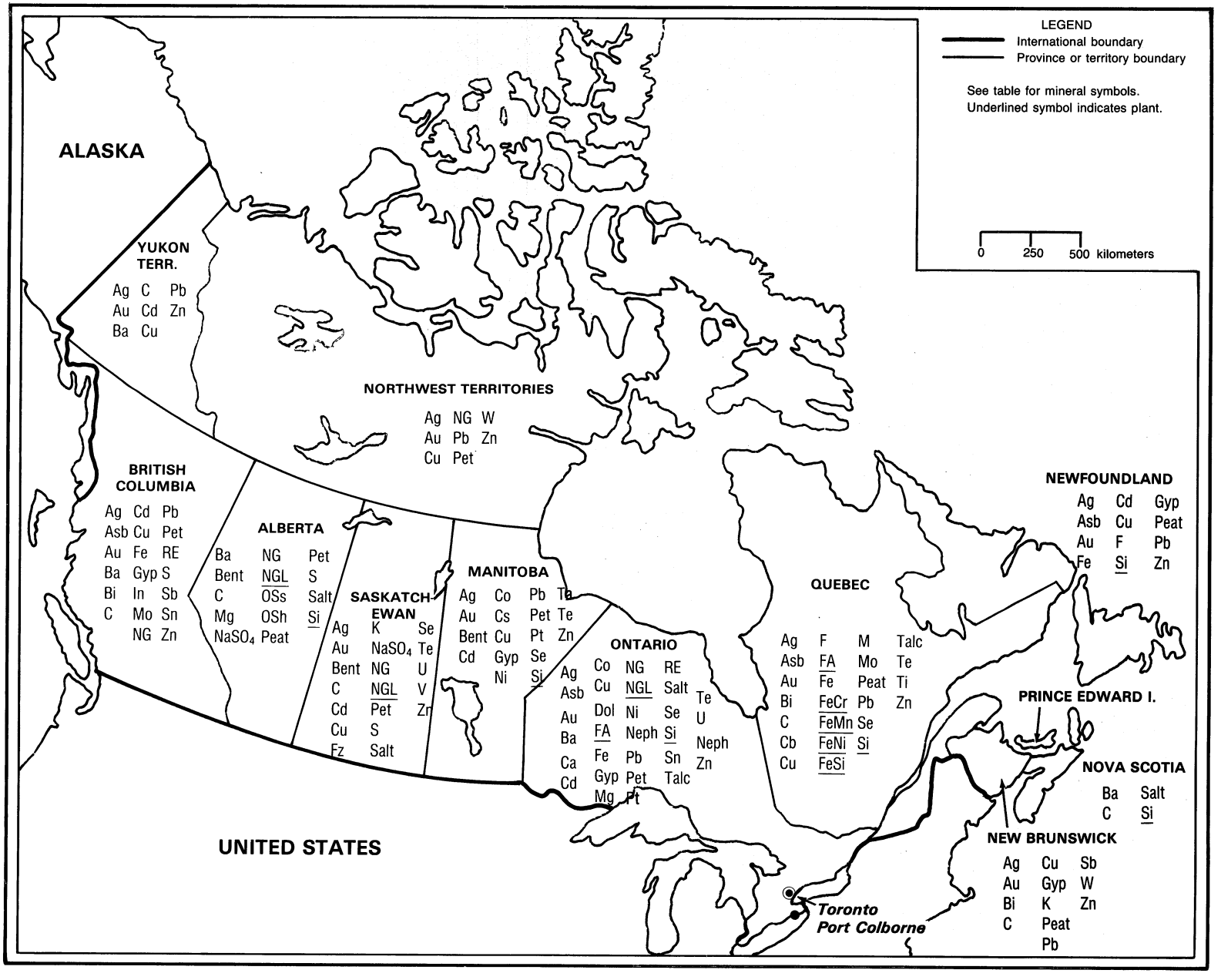
Petróleo Brasileiro S.A., Río de Janeiro: Petrobrás News, quarterly.

U.S. Central Intelligence Agency: World Factbook, annual.

CANADA

AREA 9.9 million km²

POPULATION 26 million



THE MINERAL INDUSTRY OF

CANADA[1]

By Alfredo C. Gurmendi

The value of production for the Canadian mineral industry in 1989 was $33.6 billion,[2] representating 4.5% of the economy and accounting for an impressive 23% of Canada's exports. The Canadian mineral industry was and will remain a cornerstone of its economy and will continue as a main exporter of mineral commodities in the Western Hemisphere. Canada continued to be the principal trading partner of the United States. Canada's exports of mineral commodities were valued at $26.8 billion, and imports were $13 billion. The United States accounted for 67% of these exports and 54% of Canada's imports. Japan remained the second largest market, accounting for 10% of exports, and the European Community (EC), 9.3%. Canada's mining industry continued to be profitable during the first half of the year. With improved productivity and reduced costs, the mining industry capitalized on new markets as they emerged.

The principal mineral commodities produced in Canada in terms of value of output were petroleum, natural gas, nickel, zinc, copper, gold, coal, iron ore, cement, uranium, potash, sand and gravel, and others. Canada was the second largest nickel producer in the world following the U.S.S.R. Canada followed the Republic of South Africa and the United States in gold production. The country was the fifth largest silver producer after Mexico, the United States, the U.S.S.R. and Peru. Canada followed Chile and the United States in copper production. Canada became the third largest lead producer after Australia and the United States and continued to be the world's largest producer of zinc. It was the second largest asbestos producer in the world following the U.S.S.R. producing more than one-quarter of the world's potash, and was by far the leading exporter of potash.

The gross domestic product grew at the modest rate of about 2.6% compared with 4.2% in 1988, mostly as a result of the strong Canadian dollar, inflation, high interest rates, and deteriorating trade balances. The unemployment rate averaged 7.5% in 1989 compared with 7.8% in 1988 and 8.8% in 1987. The Canadian dollar firmed to a 9-year high of more than US86c in 1989. Profits, particularly in the base metals industry, were expected to decrease because of lower prices combined with slower growth in the North American economy. The Canadian mining industry as a whole continued to meet challenges of increasingly difficult global competition, trade liberalization, and the growing importance of environmental concerns.

GOVERNMENT POLICIES AND PROGRAMS

The Free-Trade Agreement with the United States, which the Canadian mining industry actively supported, was negotiated and implemented by the Government for the benefit of Canada. Federal mineral and metal policy strongly supported the mining industry, whereby the Government provided a positive fiscal and regulatory climate to assist the industry in exploration, mining, milling, and marketing mineral and metal products.

The United States-Canada Free-Trade Agreement (FTA) had been in effect since January 1989. Businesses on both sides were responding to the many new trade and investment opportunities that the FTA had fostered. The FTA created the largest free trade area in the Western Hemisphere.

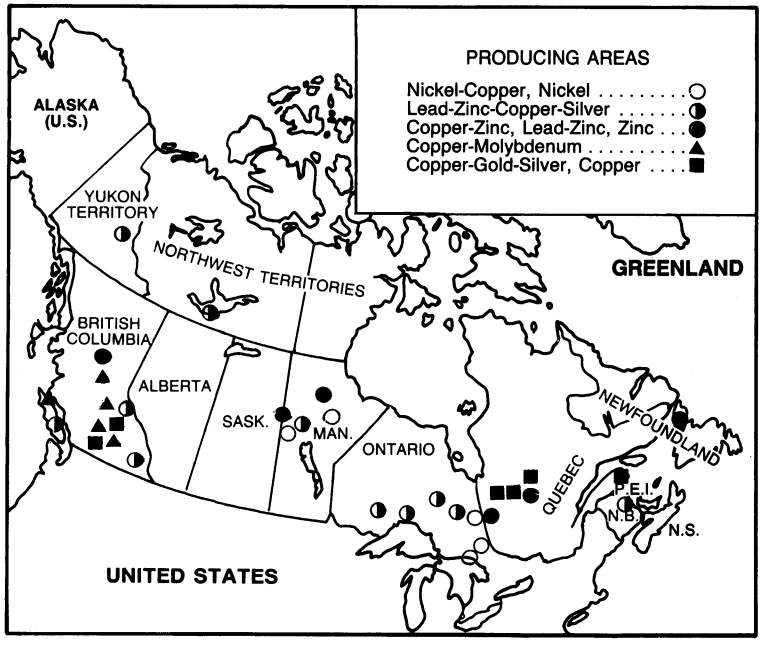
Since January 1, 1989, the bilateral relationships have been remarkable and cooperation improved, including the formation of the International Copper Association in October 1989. Trade issues were moving into a new process of consultation and resolution. Subsidy, countervail, and antidumping issues were the topics of ongoing consultations and negotiations between both Governments. There had been considerable task accomplishments in both countries concerning subsidies and practices. The Canadian concept of "net-benefit" competitive advantage from Government initiatives was on the agenda for discussion.

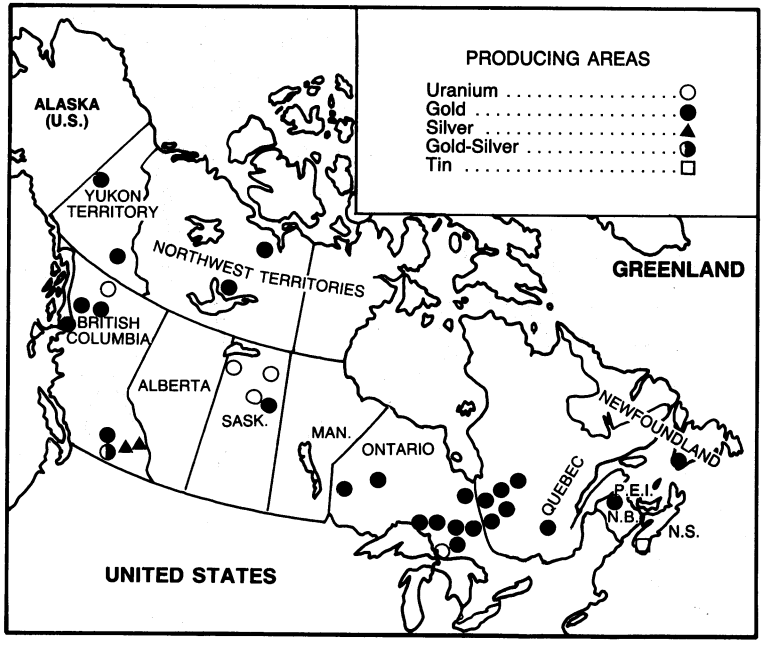
The Tariff Acceleration Agreement between the United States and Canada in 1989 was clear testimony of the FTA's success. Tariffs were accelerated on more than 400 products worth $6 billion in two-way trade. At the request of the private sector, a second round of talks on tariffs for another group of products with Canada was underway. However, United States-Canada subsidy issues continued thorny. Chapter 19 of the FTA provided for ongoing negotiations to deal with subsidies and antidumping measures in the bilateral talks. A bilateral working group had been established to pursue negotiations on subsidies, which will depend on the completion of the General Agreement on Tariffs and Trade (GATT) subsidy negotiations in the Uruguay Round by yearend 1990. The Non-Ferrous Metals Producers Committee had been active in expressing its views about public policy issues that have arisen in the negotiation of the FTA and in its implementation, particularly with issues pertaining to the Canadian subsidy practices that impact on the U.S. base metal producers. Collection of data on Federal and Provincial Canadian subsidies and advice from private business, parliament, provincial, and local officials continued.

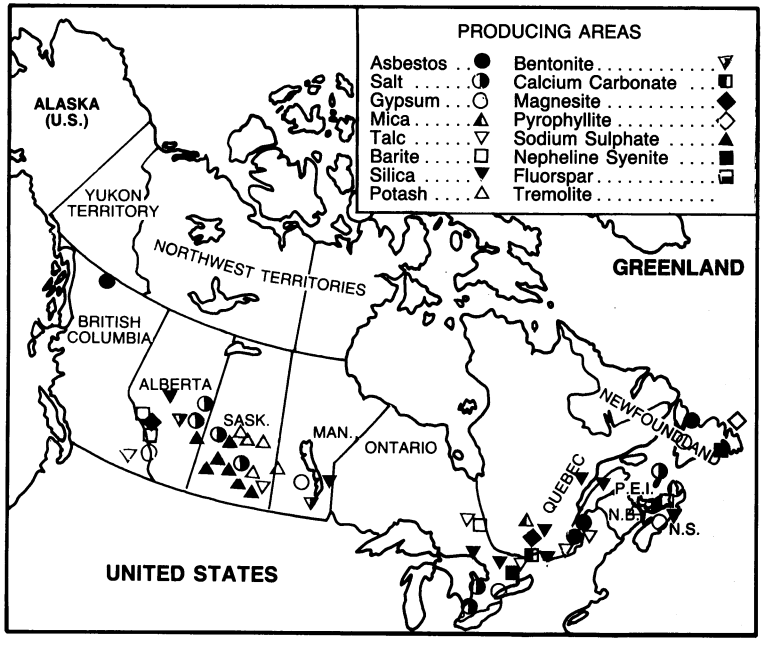
Increased interest in Newfoundland's mineral potential since the mid-1980's was a response to the definition of numerous targets for gold and base metal potential outlined by geological and geochemical surveys done under the Canada-Newfoundland Mineral Development Agreement (MDA) coupled with flow-through share financing and the opening up of new tracts of land for staking. The $22 million, 5-year MDA terminated on March 31, 1989. Terms for a renewed agreement were being finalized at yearend.

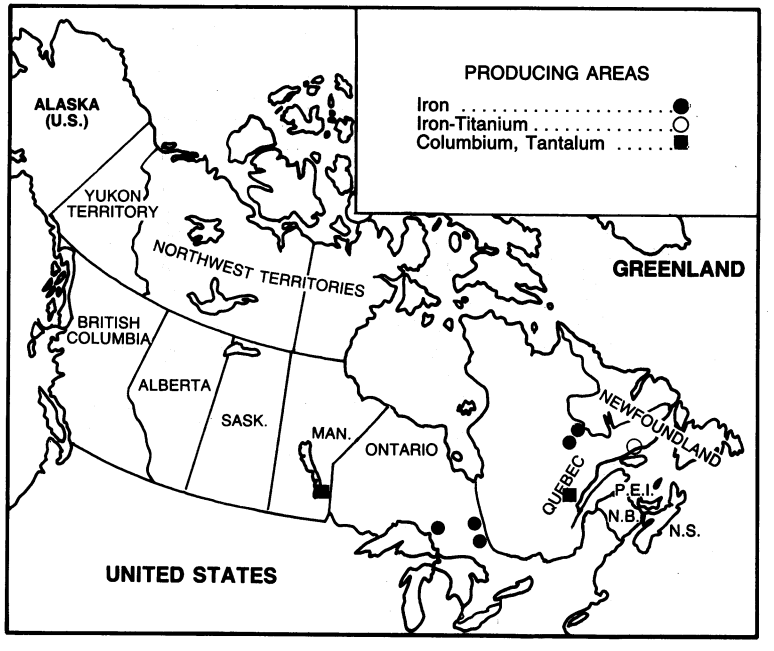
Nova Scotia spent $15 million on mineral exploration and had a total of 26 exploration companies and 16 major companies that were active in the Province. The revised flowthrough share financing and a weakened price in the gold market were contributing factors to the slowdown in investor enthusiasm in

CANADA — PRINCIPAL PRODUCING MINES



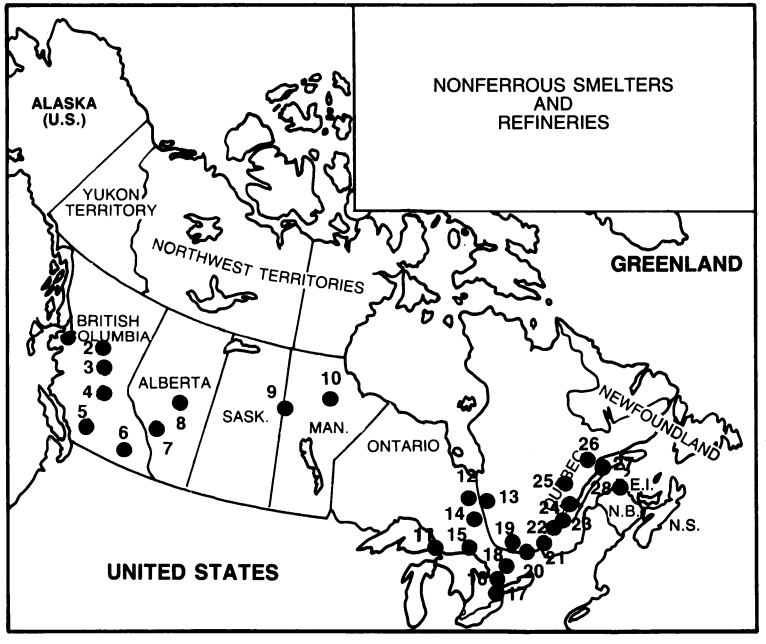


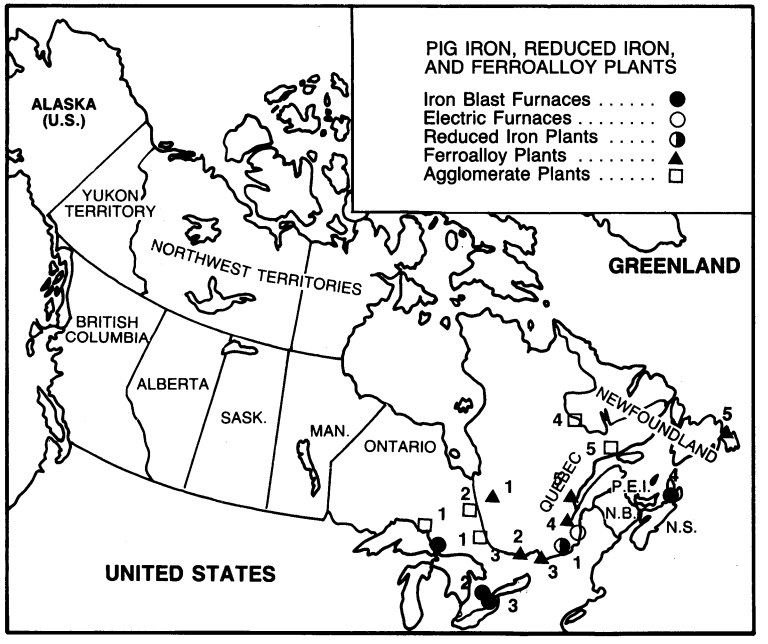




Source: Reproduced with permission from the Geological Survey of Canada (GSC 900A). Ottawa 1990.

CANADA — PRINCIPAL FERROUS & 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, Sulphuric 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 sulphide, Ammonium sulphate
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 sulphate, Copper sulphate
27. MURDOCHVILLE: Copper anodes, Sulphuric 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 sulphate, Copper (cathodes, wire bars), Gold, Silver, Selenium, Tellurium, Platinum metals (in residues), Sulphuric acid, Liquid SO_2, Sulphur
10. THOMPSON: Nickel, Copper matte, Precious metal residue, Cobalt oxide
12. TIMMINS: Zinc, Copper cathodes, Cadmium, Indium, Sulphuric acid
6. TRAIL: Zinc, Lead, Silver, Gold, Cadmium, Bismuth, Tin, Indium, Germanium, Antimonial lead, Mercuric chloride, Copper matte, Sulphuric acid, Ammonium sulphate, Sulphur, Liquid SO_2, High purity metals
21. VALLEYFIELD: Zinc, Cadmium, Sulphuric 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 Corporation

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.
5. Chicoutimi, Elkem Metal Canada Inc.
6. Long Harbour, ERCO Industries Ltd.

IRON ORE AGGLOMERATE PLANTS

1. Wawa, The Algoma Steel Corp. Ltd., (Algoma Ore Division)
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.

Nova Scotia. Negotiations for a renewed Canada-Nova Scotia MDA were ongoing during 1989.

The 5-year Canada-New Brunswick MDA agreement terminated in 1989, while negotiations for a new mineral agreement continued.

The Canada-Québec MDA agreement was in its final year. Of special interest was the addition of a technological program to provide assistance to mining companies for research projects. This program also provided financial assistance to a research center in Montreal to study automation and robotics in mining.

Mineral production in Ontario increased, namely copper, gold, nickel, uranium, and zinc, which collectively accounted for 69% of total Provincial output. Exploration was down in 1989—a lower gold price and changes in flowthrough share regulations impacted exploration activities in the Province. Two new incentive programs worth $5 million per year, to encourage exploration, were introduced by Ontario in 1989. The Ontario Prospectors Assistance Program offered grants of $10,000 to eligible individual prospectors, and the Ontario Mineral Incentive Program provided grants of 30% of exploration costs up to a maximum of $150,000 for companies not using flowthrough share funding. Geoscientific activity, mining research, and studies on industrial minerals and their markets continued under the MDA agreement, which will end on March 31, 1990.

The Canada-Manitoba MDA came to a close in 1989; however, discussions were underway between Federal and Provincial officials concerning renewal of the MDA. The 5-year Canada-Saskatchewan MDA agreement terminated in 1989; however, discussions for a renewal were being held at the end of 1989.

In 1989, the Province of British Columbia passed three legislative actions: (1) The Mines Act covered exploration, development, and production of coal and other minerals, including industrial minerals and sand and gravel. The act streamlined the mine project review process and regulation of operations from design to closure. A labor, industry, and Government committee was drafting a Health, Safety, and Reclamation Code for this act. This code will replace the mine regulation and coal mine legislation. (2) The Mining Right of Way Act will resolve disputes on the right of way and the use of existing roads. (3) The Mineral Tax Act combined mineral production tax regimes, simplified administration, and encouraged investment in new mines. The system will give short-term tax relief to coal mines. The Canada-British Columbia MDA will expire in March 1990.

Geoscience programs under the Canada-Northwest Territories MDA continued in 1989. Progress had been made toward settlement of the two land claims in the Territories. A large area of land withdrawn from staking in the Yellowknife area was expected to be resolved soon, and the Agreement in Principle for the Tungavik Federation of Nunavut (TFN) land claims was expected to be ratified by both the Federal Government and the TFN early in 1990.

Land selection for the Council for Yukon Indians (CYI) land claim was continuing, and it was expected that a final settlement of this claim would be reached in 1990. The Canada-Yukon MDA expired in March 1989 and was replaced by a 1-year Canada-Yukon Economic Development Program that funded geological mapping and geochemical surveys during the 1989 field season.

Bill 74 was the first major revision to the 1906 Mining Act. The new act received a third reading in the Ontario Legislature on December 6, 1989. In October 1989, the Minister of the Manitoba Department of Energy and Mines released a proposal for the new Mining Act for review and comments by the mineral industry. The Provincial government of Saskatchewan began privatization of the Potash Corp. of Saskatchewan (PCS) in mid-1989. Shares were issued at $18 each, which represented about 35% of PCS's share capital. Alberta began a feasibility and profitability study of its ultrasour gas wells in Bearberry. Should the wells prove to be productive, the project may then become an important producer of sulfur in Alberta. In the Yukon Territory, land selection for the Council for Yukon Indians land claim settlement was expected by yearend. In Northwest Territories, exploration decreased because of a large land withdrawal in the Yellowknife area. The land claims agreement with the Tungavik Federation of Nunavut was expected to be ratified by the Federal Government late in 1989.

The new Canadian Exploration Incentive Program (CEIP) replaced the Mining Exploration Depletion Allowance (MEDA) as of January 1, 1989. CEIP provided a Government grant equal to 30% of eligible exploration costs up to $10 million per year and per company. CEIP reduced exploration activity from $1.1 billion, with 90% financed with flowthrough shares in 1987 to $1.2 billion, 65% financed with flowthrough shares in 1988, and about $800 million, 40%, financed with flowthrough shares in 1989. In 1989, Canada had an urgent need of more exploration for base metals to replace its depleting ore reserves. Canada was committed to sustainable economic development, ensuring that sound environmental practices and polices were requisites for a productive industry and a healthy environment.

PRODUCTION

The value of Canadian mineral production in 1989, including metals, industrial minerals, and fuels, was $33.6 billion compared with $30.1 billion in 1988, an increase of about 12%. The Ministry of Energy, Mines and Resources (EMR) reported that mining had a good year, despite the fact that mineral commodity prices became somewhat weakened in the fourth quarter. Investment expenditures were less than the previous year; however, negative impact of the high Canadian dollar on the mineral industry was less severe because of strong demand for base metals. The metal sector's value reached $12 billion, an increase of almost 12%, and the value of industrial minerals was $4.3 billion, an increase of 2%. The output value of structural materials was $2.5 billion. The total nonfuel sector value increased by 8.2% over that of 1988. The value of fuels produced, excluding uranium, increased to $16.7 billion, an increase of 15.3%. The fuels sector contributed almost 50% of the total value of Canadian production. The dollar values of gold, gypsum, lead, platinum-group metals, potash, silver, sulfur, stone, and uranium were adversely affected by a combination of the decrease in market prices and by the firming of the Canadian dollar.

The 10 leading mineral commodities, based on value of output, were petroleum, natural gas, nickel, zinc, copper, gold, coal, natural gas byproducts, iron ore, and cement. The production values of the Provinces and Territories in billions of

dollars and the values of principal mineral production in millions of dollar are shown in tables 1 and 2.

The Canadian minerals industry improved its performance as a result of reduced production costs, increased productivity, and better prices for copper, mineral fuels, lead, and zinc. However, an economic slowdown occurred in the last quarter and was attributed to high interest rates, trade performance, lower base metal prices combined with increasingly global competition, trade liberalization, and increased importance of environmental concerns.

In Alberta, the value of mineral production increased to $14 billion. Included in this amount was $13.3 billion for mineral fuels, of which coal accounted for $433 million and sulfur accounted for $344 million.

Total mineral production in Ontario was $6.3 billion, an increase of 12.5% over that of the previous year. Copper, gold, nickel, uranium, and zinc accounted for 69% of total Provincial output. However, price changes for nickel enabled a 2.3% increase in output to provide a 16.5% increase in total value. Gold was the second most important mineral commodity in Ontario; a lower price, combined with an increase in volume of 29.1%, resulted in an increase in value of 8.3% or $1.0 million.

TABLE 1

CANADA: VALUES OF PROVINCIAL PRODUCTION

Province or Territory	1988	1989[p]
Alberta	12.3	14.0
Ontario	5.6	6.3
British Columbia	3.2	3.5
Saskatchewan	2.4	2.6
Québec	2.2	2.4
Manitoba	1.3	1.5
Northwest Territories	.8	.9
Newfoundland	.7	.9
New Brunswick	.7	.8
Yukon	.4	.4
Nova Scotia	.4	.3
Prince Edward Island	(1)	(1)
Total[2]	30.1	33.6

[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, 1989.

TABLE 2

CANADA: VALUES OF PRINCIPAL MINERAL PRODUCTION

Commodity	1988[r]	1989[p]
Metals:		
Nickel	2,267	2,649
Zinc	1,840	2,446
Copper	1,945	2,077
Gold	1,895	1,976
Iron ore	1,075	1,284
Uranium	828	851
Lead	289	247
Silver	314	226
Platinum-group	155	124
Molybdenum	98	105
Total[1]	10,706	11,985
Industrial minerals:		
Cement	789	858
Potash	949	814
Sand and gravel	700	721
Stone	522	544
Sulfur, elemental	361	379
Salt	201	232
Asbestos	204	223
Clay products	160	185
Lime	156	178
Sulfur in smelter gas	69	71
Gypsum	76	70
Total[1]	4,187	4,275
Mineral fuels:		
Petroleum, crude	7,449	9,175
Natural gas	4,231	4,491
Coal	1,466	1,579
Natural gas byproducts	1,295	1,406
Total[1]	14,441	16,651

[p]Preliminary. [r]Revised.
[1]Data may not add to totals shown because of independent rounding.
Source: Energy, Mines and Resources Canada, Ottawa, 1989.

In British Columbia, the value of mineral production was $3.5 billion. About 50% of the total was attributable to mineral fuels, including $840 million for coal. The other one-half was from copper production. Additional values were from antimony, cadmium, gold, lead, molybdenum, silver, and zinc. However, the value of metal production decreased 3% because of decreased prices for gold and silver and decreased production of copper and lead. Coking coal production remained constant, although the coal industry received higher prices, but the stronger Canadian dollar left the industry in about the same relative position as that of the previous year. Demand for British Columbia coking coal remained strong, while demand for steel firmed.

The value of minerals produced in Saskatchewan was $2.6 billion or about 8% higher than that of the previous year. Potash and uranium continued to account for the bulk of production.

The value of mineral production in Québec was $2.4 billion, representing an increase of 9% over that of the previous year as a result of increases in the production of copper, iron ore, and zinc. However, the value of the precious-metal production decreased by 7% when compared with previous levels. The asbestos industry in Québec is facing more difficult times, particularly because of increased environmental concerns. The phaseout and ban ruling issued by the Environmental Protection Agency (EPA) was quite unfavorable to the industry.

The value of mineral production in Manitoba was $1.5 billion, an increase of 15.4% over that of 1988, mostly because of strong base metal prices throughout most of the year. Copper, nickel, and zinc were the main commodities produced, accounting for 7% of the gross Provincial product of Manitoba.

The value of mineral production in the Northwest Territories, including fuels, was $0.9 billion or 12.5% higher than that of 1988 as a result of higher prices for lead and zinc and increased fuel production.

The value of mineral production in Newfoundland and Labrador was $825 million, an 11% increase over the previous year's value. The iron ore value of $680 million was 13% higher than that of 1988 and was the highest since 1984.

Prince Edward Island's mineral value was about $2 million, a 7.8% increase over the previous year primarily because of a slight increase in price for its sand and gravel.

In New Brunswick, the value of mineral production, including coal, increased over that of 1988 by 14% to $0.8 billion. Zinc showed an increase in value of 12.5% to $418 million, reflecting price and volume increases over those of the previous year.

In Yukon Territory, the value of mineral production was $465 million, up almost 10% from that of the previous year because of the increased value of

placer gold and zinc production. However, decreased gold prices offset the increased volume of production. There was an increased emphasis on base metal exploration in response to higher prices for these metals.

The value of mineral production in Nova Scotia, including coal, decreased by 2.7% from that of 1988 to $380 million. The industrial minerals, including coal, continued to account for the bulk of production in Nova Scotia's mineral industry. Industrial minerals accounted for $170 million, a 2.4% decrease from that of 1988, and represented 44% of the total value of mineral production. The value of coal production in Nova Scotia increased 1% to $180 million and represented 47% of the total value of mineral production.

The Canadian mineral industry operated at almost 90% of capacity; its base metal prices weakened during the last quarter; however, prices on the average remained higher than those of the previous year, providing a 16% pretax rate of return on capital investment. This was about $2.5 billion in new plants and equipment and $3.3 billion, including capital and repair expenditures, made at all Canadian mine sites. A strong Canadian dollar was a serious concern to the mining industry affecting Canada's competitiveness in the marketplace.

TRADE

In January 1989, the FTA had been in effect for 1 year. Although the FTA will not be fully implemented until 1998 (10 years duration), Canada was United States' largest export market (22% or $79 billion) comparable to U.S. exports to the

TABLE 3

CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988	1989[p]
METALS						
Aluminum:						
Alumina, gross weight	thousand tons	1,019	1,015	952	950	950
Metal:						
Primary		1,282,316	1,355,161	1,540,439	1,534,499	[e]1,550,000
Secondary		78,047	58,338	67,838	69,000	69,000
Antimony[2]		1,075	3,805	3,706	[r]3,171	2,422
Bismuth[3]		201	153	165	[r]181	164
Cadmium[4]		1,717	1,484	1,481	1,742	1,750
Calcium	kilograms	W	W	W	W	W
Cobalt:						
Mine output, Co content[5]		2,067	2,486	2,490	2,764	2,694
Metal[6]		2,023	1,990	2,318	2,398	2,337
Columbium and tantalum:						
Pyrochlore concentrate:						
Gross weight		4,944	5,216	4,304	5,230	5,443
Cb content		2,223	2,340	1,937	2,354	2,458
Tantalite concentrate:						
Gross weight		—	—	—	91	295
Ta content		—	—	—	27	73
Copper:						
Mine output, recoverable Cu content[7]		738,637	698,527	794,149	758,478	721,936
Metal, primary and secondary:						
Blister and anode		489,700	472,700	499,400	537,000	510,000
Refined		499,626	493,445	491,178	528,723	511,183
Gold	kilograms	87,561	102,899	115,818	[r]134,813	[p]158,440
Iron and steel:						
Iron ore:[8]						
Gross weight	thousand tons	39,502	36,167	37,702	38,742	40,900
Fe content	do.	24,847	22,785	23,658	24,540	26,180

See footnotes at end of table.

TABLE 3—Continued

CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988	1989[p]
METALS—Continued						
Metal:						
Pig iron	thousand tons	9,665	9,249	9,500	9,500	10,500
Ferroalloys	do.	227	260	260	250	250
Steel, crude	do.	14,600	14,100	14,700	14,500	14,500
Lead:						
Mine output, Pb content		284,600	349,281	413,685	368,444	275,018
Metal, refined:						
Primary		173,220	169,934	139,475	179,461	157,330
Secondary		68,384	87,746	91,186	89,863	87,210
Lithium: Spodumene[9]		[r]4,600	7,500	11,500	14,000	14,000
Magnesium metal, primary[e]		7,000	7,000	7,000	7,000	7,000
Molybdenum		7,852	11,251	14,771	[r]13,535	[r]13,654
Nickel:						
Mine output, Ni content[10]		169,971	163,639	189,086	[r]198,744	[r]196,177
Metal, plant production[11]		106,534	105,859	132,528	159,605	188,133
Platinum-group metals	kilograms	10,534	12,190	10,930	[r]12,541	[e]10,375
Selenium, refined[12]	do.	361,000	354,000	300,000	[r]321,000	[p]363,000
Silver	do.	1,326,720	1,197,072	1,374,946	1,443,166	1,262,163
Tellurium, refined[12]	do.	19,000	20,000	13,000	10,000	10,000
Tin, mine output, Sn content	do.	120	2,450	3,390	3,300	3,300
Titanium:						
Ilmenite, gross weight	thousand tons	2,500	2,400	2,800	2,800	2,800
Sorel slag (80% TiO_2)[13]		[r]844,000	850,000	925,000	1,025,000	1,040,000
Tungsten, mine output, W content		3,174	1,959	—	—	—
Uranium oxide (U_3O_8)		12,312	13,564	15,560	15,130	15,598
Zinc:						
Mine output, Zn content		1,172,200	1,290,765	1,481,544	1,351,664	1,214,935
Metal, refined, primary		692,418	570,981	609,909	703,206	669,677
INDUSTRIAL MINERALS						
Asbestos	thousand tons	750	662	665	705	710
Arsenic trioxide[e 14]		3,000	3,000	2,000	2,000	2,000
Barite		71,049	40,000	42,000	51,000	42,000
Cement, hydraulic[15]	thousand tons	10,192	10,602	12,590	12,036	11,832
Clays and clay products[16]	value, thousands	$138,246	$180,353	$159,000	$150,600	$218,220
Diatomite[e]		3,800	4,100	4,200	4,200	4,200
Gypsum and anhydrite	thousand tons	8,447	8,803	9,094	8,522	8,830
Lime	do.	2,212	2,243	2,330	2,535	2,569
Magnesite, dolomite, brucite		136,000	144,000	150,000	150,000	150,000
Mica, scrap and flake		11,500	12,000	13,500	12,000	12,000
Nepheline syenite		467,000	469,000	500,000	500,000	500,000
Nitrogen: N content of ammonia		3,620,286	3,540,000	3,511,719	4,010,161	4,100,000
Potash, K_2O equivalent	thousand tons	6,661	[r]6,678	[r]7,399	[r]8,337	7,090
Pyrite and pyrrhotite, gross weight[e]		6,000	6,000	5,000	5,000	5,000
Salt	thousand tons	10,085	10,332	10,129	10,690	11,140
Sand and gravel	do.	256,183	257,971	278,550	276,100	276,100

See footnotes at end of table.

TABLE 3—Continued

CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988	1989[p]
INDUSTRIAL MINERALS—Continued						
Silica (quartz)	thousand tons	2,669	2,640	2,560	2,807	2,634
Sodium compounds, n.e.s.:						
Sodium carbonate (soda ash)[e]		350,000	350,000	325,000	325,000	325,000
Sodium sulfate, natural[17]		366,000	371,000	342,000	310,000	320,000
Stone[18]	thousand tons	86,632	97,602	128,969	122,030	116,657
Sulfur:						
Elemental byproduct:						
Of smelter gases	do.	822	758	723	820	831
Of sour natural gas	do.	5,306	6,966	5,809	5,981	5,183
Of refineries[e]	do.	174	189	190	200	200
Of tar sands	do.	392	435	426	485	500
Talc, soapstone, pyrophyllite		127,000	123,000	141,000	141,000	141,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		173,022	154,418	160,000	180,697	180,000
Coal:						
Bituminous and subbituminous		[r]51,000,000	48,700,000	51,200,000	57,500,000	60,085,000
Lignite		9,672,329	8,281,312	10,000,000	12,000,000	10,915,000
Coke, high-temperature		4,683,770	4,552,600	4,636,629	4,663,441	4,665,000
Gas, natural:						
Gross	million cubic meters	91,000	89,992	98,700	109,088	114,661
Marketed	do.	79,274	75,479	79,652	88,035	92,530
Natural gas liquids:						
Gross:						
Butane	thousand 42-gallon barrels	20,068	18,733	20,130	19,044	22,194
Propane	do.	32,656	31,288	33,428	39,327	41,302
Pentanes plus	do.	36,654	36,932	38,110	40,620	43,414
Ethane	do.	34,664	32,444	37,120	38,165	42,352
Condensate	do.	1,043	828	1,210	1,521	1,871
Total	do.	125,085	120,225	129,998	138,677	151,106
Peat		643,000	738,000	662,000	736,000	695,000
Petroleum:						
Crude[19]	thousand 42-gallon barrels	538,200	538,000	560,000	584,000	583,827
Refinery products:						
Gasoline:						
Aviation	do.	1,131	2,214	2,619	2,477	1,059
Other	do.	203,793	201,115	208,415	218,635	228,298
Jet fuel	do.	27,707	30,660	32,485	32,485	26,980
Kerosene	do.	13,573	14,235	13,140	11,680	15,546
Distillate fuel oil, diesel and light	do.	140,334	143,810	150,015	160,600	166,731
Lubricants	do.	5,755	6,205	5,840	7,300	7,372
Liquefied petroleum gas, propane, and butane	do.	20,421	27,375	39,055	19,710	20,700
Petrochemical feedstocks	do.	27,595	37,836	43,327	42,330	29,080
Asphalt	do.	18,236	19,286	22,045	21,577	17,018
Petroleum coke	do.	41,244	35,929	41,144	40,196	40,072
Residual fuel oil, heavy	do.	44,240	41,975	44,530	50,735	53,903

See footnotes at end of table.

TABLE 3—Continued

CANADA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988	1989[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum—Continued						
Refinery products—Continued						
Unspecified	thousand 42-gallon barrels					
Refinery fuel and losses	do.	24,872	33,215	38,024	37,595	32,726
Total	do.	568,901	593,855	640,639	645,320	639,485

[e]Estimated. [p]Preliminary. [r]Revised. W Withheld to avoid disclosing company propriety data.
[1]Table includes data available through Dec. 1990.
[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]Refined nickel from domestic ores plus recoverable Ni content of exported matte.
[11]Includes metallic nickel, nickel oxide, Incomet, nickel powder and pellets, utility nickel, nickel carbonate, and nickel residue.
[12]From all sources, including imports and secondary sources.
[13]Refined sorel slag contained 80% TiO_2 in 1984-88.
[14]Refined arsenic (AS_2O_3) from Nerco's Con Mine in Yellow Knife, Northwest Territories.
[15]Cement shipped and/or used by producers.
[16]Includes bentonite products from common clay, fire clay, stoneware clay, and other clays.
[17]Excludes byproduct production from chemical plants.
[18]Crushed, building, ornamental, paving, and similar stone.
[19]Including synthetic crude (from oil shale and/or tar sands).

TABLE 4

CANADA: UNITED STATES-CANADA FREE-TRADE AGREEMENT TARIFFS SCHEDULE

Commodity	Existing tarrifs[1] (percent)		Phaseout
	Canada	United States	
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	10.5	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.
Minor metals:			
Beryllium, waste and scrap	10.2	8.5	Do.
Germanium, unwrought	10.2	2.7	Do.
Magnesium containing at least	3.2	7.2	10-year elimination starting Jan. 1, 1989; 10% reduction per year.

See footnote at end of table.

TABLE 4—Continued

CANADA: U.S.-CANADA FREE TRADE AGREEMENT TARIFFS SCHEDULE

Commodity	Existing tarrifs[1] (percent)		Phaseout
	Canada	United States	
METALS—Continued			
Lead:			
Refined (metal content)	8.1	2.7	10-year elimination starting Jan. 1, 1989; 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	Do.
Vanadium	10.2	3	Do.
Zinc:			
Refined	—	1.5	10-year elimination starting Jan. 1, 1989; 10% reduction per year.
INDUSTRIAL MINERALS			
Granite, cul	5.5	4.2	5-year elimination starting Jan. 1, 1989; 20% reduction per year.
Graphite, powder	6.0	—	Do.
Gypsum, wallboard	7.5	2.1	10-year elimination starting Jan. 1, 1989; 10% reduction per year.

[1]Tariff rates under the General Agreement on Tariffs and Trade (GATT).

TABLE 5

CANADA: RELATIVE IMPORTANCE OF MINERAL PRODUCTION IN 1989, BY COMMODITY

(Percent)

Commodity	Share of total value[p]
Petroleum, crude	27.3
Natural gas	13.3
Nickel	7.9
Zinc	7.3
Copper	6.2
Gold	5.9
Coal	4.7
Natural gas byproducts	4.2
Iron ore	3.8
Cement	2.6
Uranium	2.5
Potash	2.4
Sand and gravel	2.1
Others	9.8
Total	100.0

[p]Preliminary.

Source: Energy, Mines and Resources Canada, Ottawa, 1989.

EC. Seventy percent of Canada's exports reached the United States; trade between both countries in 1989 amounted to $204 billion. Canada moved from a deficit trade in 1986 to a surplus of more than $5 billion in 1989. So far, FTA implementation had been very 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 gross national product 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. The FTA specified phasing out tariffs on metals and industrial minerals trade between the two countries during a 5- to 10-year period (see the FTA tariffs schedule).

Canada's main exports were 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. Canada's coal exports of $1.7 billion went mostly to Japan. Minerals, including fuels, made up one-fourth of the total value of the 1989 Canadian exports. U.S. exports to Canada amounted to $74.6 billion, of which $3.2 billion was mineral related. U.S. imports from Canada amounted to $85.3 billion, of which $16.1 billion was composed of metals, metal products, oil, and natural gas.

STRUCTURE OF THE MINERAL INDUSTRY

The Canadian mineral industry structure was composed of 131 foreign and 2,056 domestic companies. To be considered foreign, the companies' corporate voting rights were required to be at least 50% non-Canadian. There were 33 foreign and 411 Canadian firms in the primary metals sector; 75 foreign and 1,535 Canadian concerns in the nonmetallic minerals sector; and 23 foreign and 110 Canadian corporations in the petroleum and coal sectors. Most of the mineral industry in Canada consisted of underground mines, open pits, leaching operations, concentrators, smelters, and refineries. Table 8 depicts the structure of the mineral industry by sectors of the major mineral commodities in sequence of their contribution to the Canadian economy.

COMMODITY REVIEW

Metals

Aluminum.—The Canadian aluminum

TABLE 6

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS[2]				
Alkali and alkaline-earth metals:				
Alkali metals	NA	640	640	
Alkaline-earth metals	NA	353	127	Netherlands 189; Brazil 17.
Aluminum:				
Ore and concentrate, gross weight	45,625	5,755	5,682	West Germany 38; East Germany 19.
Oxides and hydroxides	NA	139,095	121,843	United Kingdom 10,032; West Germany 4,427.
Ash and residue containing aluminum	NA	1,256	1,135	France 121.
Metal including alloys:				
Scrap	127,181	165,216	138,432	Japan 17,879; United Kingdom 3,698.
Unwrought	1,171,888	1,155,019	808,751	Japan 125,292; Netherlands 41,796.
Semimanufactures	98,448	136,008	126,610	France 2,230; United Kingdom 2,070.
Antimony:				
Ore and concentrate	NA	3,833	491	United Kingdom 2,820; Austria 174.
Oxides	NA	23	23	
Metal including alloys, all forms kilograms	NA	11,134	11,116	United Kingdom 18.
Arsenic: Metal including alloys, all forms	NA	32	29	France 2.
Beryllium: Metal including alloys, all forms	NA	23	22	Japan 1.
Bismuth: Metal including alloys, all forms	NA	103	98	Japan 5.
Cadmium: Metal including alloys, all forms	1,157	1,113	600	Japan 292; United Kingdom 178.
Chromium:				
Ore and concentrate	NA	552	552	
Oxides and hydroxides	NA	342	318	West Germany 17; Colombia 3.
Metal including alloys, all forms	NA	171	144	Hong Kong 25; Ireland 1.
Cobalt:				
Ore and concentrate	NA	98	98	
Oxides and hydroxides	440	953	534	United Kingdom 419.
Metal including alloys, all forms	1,875	3,061	1,649	Norway 962; United Kingdom 244.
Columbium and tantalum: Tantalum metal including alloys, all forms	NA	254	254	
Copper:				
Ore and concentrate, Cu content	[3]381,123	337,470	319	Japan 253,240; Brazil 19,463; Spain 19,299.
Matte and speiss including cement copper	NA	10,952	62	Norway 9,954; United Kingdom 936.
Oxides and hydroxides kilograms	NA	20,413	20,013	Chile 400.
Sulfate	NA	946	946	
Ash and residue containing copper	NA	47,064	46,925	India 139.
Metal including alloys:				
Scrap	72,102	77,107	58,134	Republic of Korea 4,390; West Germany 4,032.
Unwrought	288,811	276,288	192,843	United Kingdom 37,246; Sweden 14,517.
Semimanufactures	58,596	45,535	38,350	Venezuela 1,963; West Germany 1,404.
Germanium: Metal including alloys, all forms kilograms	NA	194	194	
Gold:				
Ore and concentrate, Au content do.	r8,604	9,831	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	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS[2]—Continued				
Gold—Continued				
Metal including alloys, unwrought and partly wrought kilograms	69,835	126,937	45,442	Japan 31,550; Hong Kong 23,827.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite, gross weight thousand tons	r29,679	30,523	10,207	United Kingdom 5,719; West Germany 3,057.
Pyrite, roasted, gross weight	16,896	NA		
Metal:				
Scrap thousand tons	1,087	1,682	1,443	Republic of Korea 87; Thailand 24.
Pig iron, cast iron, related materials	500,355	575,210	349,175	Netherlands 171,583; Italy 26,395.
Ferroalloys:				
Ferrochromium	NA	1,660	1,461	Taiwan 153; United Kingdom 42.
Ferromanganese	23,103	26,591	26,591	
Ferromolybdenum	NA	8	8	
Ferronickel	NA	190	190	
Ferrosilicochromium	NA	14	14	
Ferrosilicomanganese	NA	65	55	Brazil 10.
Ferrosilicon	28,316	30,248	17,369	Japan 10,381; Republic of Korea 1,785.
Silicon metal	NA	20,637	13,982	Japan 4,224; West Germany 1,670.
Unspecified	10,046	6,379	5,189	United Kingdom 1,083; Republic of Korea 48.
Steel, primary forms	104,756	163,483	76,741	Italy 27,664; Thailand 25,286.
Semimanufactures:[4]				
Bars, rods, angles, shapes, sections	1,053,616	1,030,050	999,774	Thailand 9,184; West Germany 5,821.
Universals, plates, sheets	1,755,533	NA		
Rails and accessories	189,457	157,907	73,363	India 55,302; Mexico 12,476.
Wire	195,376	264,253	263,088	New Zealand 308; United Kingdom 203.
Tubes, pipes, fittings	492,356	475,119	436,202	U.S.S.R. 30,259; Belgium-Luxembourg 3,406.
Castings and forgings, rough	139,142	NA		
Lead:				
Ore and concentrate	[5]207,938	169,499	4,785	Japan 57,968; Italy 30,002; Belgium-Luxembourg 27,313.
Oxides	NA	2,159	220	Brazil 1,688; Italy 250.
Ash and residue containing lead	NA	933	568	Republic of South Africa 237; Brazil 108.
Metal including alloys:				
Scrap	21,970	9,214	3,151	West Germany 3,127; Republic of Korea 1,382.
Unwrought	100,207	199,588	114,330	United Kingdom 39,859; Republic of Korea 7,603.
Semimanufactures	23,583	4,040	707	Brazil 2,807; Italy 526.
Lithium: Oxides and hydroxides	NA	14	3	United Kingdom 11.
Magnesium: Metal including alloys:				
Scrap	NA	1,907	1,888	United Kingdom 19.
Unwrought	NA	3,761	965	Japan 651; Switzerland 574.
Semimanufactures	NA	486	414	Saudi Arabia 21; Australia 19.
All forms	4,627	—		

See footnotes at end of table.

TABLE 6—Continued

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS[2]—Continued					
Manganese:					
Ore and concentrate, metallurgical-grade		NA	218	218	
Oxides		NA	1,058	1,053	Republic of Korea 5.
Metal including alloys, all forms	kilograms	NA	397,538	397,513	Republic of Korea 20; Republic of South Africa 5.
Mercury	do.	NA	48,701	28,697	United Kingdom 20,000; India 4.
Molybdenum:					
Ore and concentrate		[6]14,253	13,978	533	Belgium-Luxembourg 4,235; Japan 4,128; United Kingdom 1,161.
Oxides and hydroxides		NA	53	12	Republic of Korea 38; Italy 2.
Metal including alloys:					
Unwrought including waste and scrap		NA	32	32	
Semimanufactures		NA	92	92	
Nickel:					
Ore and concentrate including matte and oxide		[5]77,273	68,639	709	Norway 35,927; United Kingdom 31,675.
Metal including alloys:					
Scrap		7,663	7,155	5,136	Netherlands 474; United Kingdom 431.
Unwrought		96,165	2,923	1,929	Belgium-Luxembourg 568; United Kingdom 107.
Semimanufactures		14,818	11,050	7,982	Japan 1,527; Netherlands 464.
Platinum-group metals:					
Ore and concentrate[5]	kilograms	7,763	12,494	—	All to United Kingdom.
Waste and sweepings	value, thousands	$24,423	$15,735	$14,414	United Kingdom $826; West Germany $495.
Metals including alloys, unwrought and partly wrought:					
Palladium	kilograms	NA	2,548	825	United Kingdom 1,301; Singapore 239.
Platinum	do.	NA	1,787	657	Hong Kong 391; France 62.
Rhodium	do.	NA	321	—	All to United Kingdom.
Unspecified	do.	4,506	—		
Rare-earth metals including alloys, all forms		NA	52	52	
Selenium, elemental		354	428	165	United Kingdom 104; Netherlands 69.
Silicon, high-purity	kilograms	NA	227	—	All to Cuba.
Silver:					
Ore and concentrate[7]	value, thousands	$243,636	$129,228	$3,675	United Kingdom $111,052; West Germany $5,520.
Waste and sweepings[7]	do.	$95,475	$37,976	$19,341	United Kingdom $10,025; West Germany $5,511.
Metal including alloys, unwrought and partly wrought	kilograms	556,967	1,140,548	1,031,519	United Kingdom 62,934; Singapore 28,725.
Tin:					
Ore and concentrate		[6]2,783	3,593	2	United Kingdom 1,665; Malaysia 1,360; Mexico 521.
Metal including alloys:					
Scrap		NA	1,003	329	Pakistan 477; Hong Kong 98.
Unwrought		NA	400	400	
Semimanufactures		NA	1,786	1,319	Bangladesh 362; Japan 99.
Titanium:					
Ore and concentrate		NA	360,856	29,445	Japan 114,256; West Germany 112,886; Brazil 34,650.
Oxides		NA	25,854	25,602	United Kingdom 87; Hong Kong 86.

See footnotes at end of table.

TABLE 6—Continued

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS[2]—Continued				
Titanium—Continued				
Metal including alloys, all forms	495	440	341	United Kingdom 54; Japan 26.
Tungsten:				
Ore and concentrate kilograms	NA	1,306	—	Sweden 838; United Kingdom 262; Netherlands 156.
Metal including alloys:				
Unwrought including waste and scrap	NA	124	26	West Germany 98.
Semimanufactures	NA	37	14	West Germany 7; East Germany 6.
Uranium and thorium: Ore and concentrate value, thousands	$209,843	$1,258	$1,214	France $18; Japan $10.
Vanadium:				
Oxides and hydroxides	NA	105	88	Tanzania 17.
Ash and residue containing vanadium	NA	163	163	
Metal including alloys, all forms kilograms	NA	16,632	120	Republic of Korea 16,512.
Zinc:				
Ore and concentrate	[5]613,180	850,243	33,421	Belgium-Luxembourg 353,157; Japan 100,266; Republic of Korea 79,813.
Oxides	NA	34,407	32,429	U.S.S.R. 1,591; West Germany 237.
Blue powder	4,386	5,312	5,013	France 72; Venezuela 60.
Ash and residue containing zinc	NA	8,560	4,880	France 908; West Germany 813.
Metal including alloys:				
Scrap	[8]24,501	16,942	5,608	Taiwan 8,060; China 2,441.
Unwrought	441,220	556,819	418,830	United Kingdom 25,879; Taiwan 21,761.
Semimanufactures	8,909	1,360	1,328	West Germany 18; Finland 8.
Zirconium:				
Ore and concentrate	NA	1,685	1,629	France 36; India 20.
Metal including alloys, all forms	NA	68	40	Republic of Korea 14; Romania 5.
Other:				
Ores and concentrates	130,366	4,904	3,280	United Kingdom 521; Japan 302; Republic of Korea 204.
Oxides and hydroxides	NA	446	446	
Ashes and residues	59,748	17,502	12,544	Sweden 4,100; Taiwan 258.
Base metals including alloys, all forms	2,565	2,672	847	Japan 1,160; United Kingdom 603.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	1,388	12,498	11,072	United Kingdom 852; West Germany 434.
Artificial:				
Corundum	139,926	130,782	130,265	United Kingdom 245; West Germany 237.
Silicon carbide	67,704	69,537	69,505	Netherlands 17; Norway 10.
Dust and powder of precious and semiprecious stones excluding diamond kilograms	([9])	22	—	All to East Germany.
Grinding and polishing wheels and stones value, thousands	$8,363	$6,368	$3,593	Finland $477; Australia $276.
Asbestos, crude	648,843	684,905	79,173	Japan 101,198; Thailand 50,938.
Barite and witherite	6,052	9,312	9,284	Chile 231; Singapore 5.

See footnotes at end of table.

TABLE 6—Continued

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Boron materials:					
Crude natural borates		NA	120	120	
Elemental including tellurium		NA	57	44	United Kingdom 6; France 5.
Oxides and acids		NA	115	115	
Cement		2,802,965	3,638,514	3,629,250	Cameroon 5,283; St. Pierre and Miquelon 1,191.
Chalk		NA	45	39	Australia 3; St. Pierre and Miquelon 2.
Clays, crude:					
Bentonite		NA	1,120	1,082	Australia 18; New Zealand 18.
Chamotte earth		NA	133	133	
Fire clay		NA	247	174	East Germany 73.
Fuller's earth		NA	385	3	West Germany 382.
Kaolin		NA	861	534	West Germany 305; Venezuela 18.
Unspecified		6,868	1,730	879	West Germany 850; New Zealand 1.
Cryolite and chiolite		NA	1,952	1,104	United Kingdom 848.
Diamond, natural:					
Stones:					
Gem, not set or strung	carats	47,669	66,722	33,301	Israel 17,851; Belgium-Luxembourg 9,462.
Industrial stones	do.	187,413	249,981	244,221	India 4,475; United Kingdom 1,000.
Unsorted	do.	NA	1,801	—	Hong Kong 1,034; Israel 767.
Dust and powder	do.	1,748,415	2,715,039	2,709,451	Ireland 3,000; Australia 1,463.
Feldspar, fluorspar, related materials:					
Feldspar		NA	337	85	Taiwan 252.
Fluorspar		NA	38,301	38,301	
Unspecified		356,144	589,086	428,478	Australia 88,478; Netherlands 52,455.
Fertilizer materials:					
Crude, n.e.s.		NA	9,533	9,447	Bermuda 49; Netherlands 37.
Manufactured:					
Ammonia	thousand tons	1,317	1,386	1,373	Republic of Korea 12; Niger 1.
Nitrogenous	do.	1,923	2,003	1,688	Australia 74; Philippines 68.
Phosphatic		34,979	8,195	7,928	Australia 108; Greece 45.
Potassic	thousand tons	10,984	12,719	6,203	Brazil 678; Japan 658.
Unspecified and mixed	do.	243	202	171	Spain 10; Jamaica 8.
Graphite, natural		NA	6,101	6,043	Australia 44; United Kingdom 10.
Gypsum and plaster		5,723,359	5,700,793	5,664,418	Laos 35,794; Bermuda 249.
Iodine	kilograms	NA	1,394	1,387	Japan 5; Taiwan 2.
Kyanite and related materials		NA	3	3	
Lime		163,777	122,950	122,910	Republic of Korea 24; Bermuda 16.
Magnesium compounds:					
Magnesite, crude		NA	1,397	1,289	Japan 108.
Oxides and hydroxides		NA	67,845	63,559	West Germany 1,275; Austria 863.
Sulfate		NA	1,366	1,169	Saudi Arabia 160; West Germany 36.
Unspecified	value, thousands	$24,847	—		

See footnotes at end of table.

TABLE 6—Continued

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Mica:				
Crude including splittings and waste	NA	8,775	6,667	Japan 1,249; Netherlands 666.
Worked including agglomerated splittings kilograms	NA	22,165	21,997	Republic of Korea 168.
Nitrates, crude	NA	891	886	Burundi 3; France 2.
Phosphates, crude	NA	173	155	Barbados 18.
Phosphorus, elemental	NA	39,885	16,791	United Kingdom 22,746; Colombia 272.
Pigments, mineral:				
Natural, crude	NA	212	212	
Iron oxides and hydroxides, natural and processed	17,532	19,316	18,745	Japan 507; Australia 36.
Potassium salts, crude	NA	691	691	
Precious and semiprecious stones other than diamond:				
Natural value, thousands	NA	$9,955	$3,785	China $1,096; West Germany $1,028.
Synthetic do.	$9,072	$417	$167	West Germany $70; Israel $46.
Pyrite, unroasted	NA	4,585	4,585	
Quartz crystal, piezoelectric value, thousands	NA	$304	$291	Norway $4; Sweden $4.
Salt and brine thousand tons	1,960	3,038	3,035	St. Pierre and Miquelon 2.
Sodium compounds, n.e.s.:				
Soda ash, natural and manufactured	NA	115,121	115,121	
Sulfate, natural and manufactured	r168,187	166,831	149,353	Venezuela 13,052; New Zealand 4,420.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	874,273	154,212	86,816	Japan 48,719; Italy 8,513.
Worked value, thousands	$24,569	$23,000	$19,078	United Kingdom $1,456; Japan $1,115.
Dolomite, chiefly refractory-grade	506,746	676,856	676,643	United Kingdom 213.
Gravel and crushed rock	NA	1,855,854	1,715,614	Bahamas 78,131; Bermuda 31,830.
Limestone other than dimension	1,709,508	1,106,971	1,106,802	Italy 109; United Kingdom 36.
Quartz and quartzite	60,681	102,151	100,600	Sweden 776; Denmark 360.
Sand other than metal-bearing	414,849	232,896	224,360	Cuba 8,105; France 119.
Sulfur:				
Elemental:				
Crude including native and byproduct thousand tons	6,572	7,380	1,069	Morocco 1,896; Australia 528.
Colloidal, precipitated, sublimed	NA	3,256	2,256	Republic of Korea 1,000.
Dioxide	NA	52,643	52,642	United Kingdom 1.
Sulfuric acid	804,395	849,460	849,341	Romania 54; Netherlands 13.
Talc, steatite, soapstone, pyrophyllite	NA	45,937	44,522	West Germany 931; United Kingdom 292.
Other:				
Crude	NA	56,513	50,031	Netherlands 2,949; Japan 1,224.
Slag and dross, not metal-bearing value, thousands	$171,580	$178,418	$46,675	France $43,181; West Germany $35,291.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	NA	12,132	12,099	Ireland 17; France 16.

See footnotes at end of table.

TABLE 6—Continued

CANADA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Carbon black		NA	71,514	53,795	France 7,273; West Germany 1,947.
Coal:					
Anthracite		NA	9,137	9,075	Singapore 54; Malaysia 38.
Bituminous	thousand tons	NA	29,440	241	Japan 19,318; Republic of Korea 4,635; Brazil 1,559.
Briquets of anthracite and bituminous coal		75	1,768	1,768	
Lignite including briquets		NA	4,090	4,089	Trinidad and Tobago 1.
All grades excluding briquets	thousand tons	25,466	—		
Coke and semicoke		152,245	251,918	127,745	Japan 78,368; Venezuela 31,891.
Gas, natural:					
Gaseous[10]	million cubic meters	28,009	35,913	35,913	
Peat including briquets and litter		477,507	690,015	620,173	Japan 52,691; Saudi Arabia 5,593.
Petroleum:					
Crude	thousand 42-gallon barrels	224,816	257,712	252,604	Japan 1,759; Taiwan 1,720.
Refinery products:					
Liquefied petroleum gas	do.	r40,834	45,866	45,834	Belgium-Luxembourg 24; Mexico 3.
Gasoline[10]	do.	r16,261	24,004	23,205	Japan 519.
Naphtha[10]	do.	3,443	3,783	3,783	
Mineral jelly and wax	do.	NA	254	251	Singapore 1.
Kerosene and jet fuel[10]	do.	5,836	5,503	NA	NA.
Distillate fuel oil[10]	do.	r22,052	28,199	26,878	Japan 671; United Kingdom 470.
Lubricants	do.	435	NA		
Residual fuel oil[10]	do.	r9,204	14,692	14,679	Unspecified 13.
Bitumen and other residues	do.	NA	2,150	2,145	St. Pierre and Miquelon 2; France 1.
Bituminous mixtures	do.	1,753	112	112	
Petroleum coke	do.	294	269	269	

rRevised. NA Not available.
[1]Table prepared by H. D. Willis. As a result of the change to the Harmonized Tariff System of trade classification, many data entries for 1987 comparable with those of 1988 are not available.
[2]Data for ores and concentrates equal total weight of all metals contained unless otherwise indicated.
[3]Metal content of ore and concentrate and matte.
[4]As a result in changes in trade code classifications, data for 1987 amd 1988 are not completely comparable.
[5]Metal content.
[6]Metal content of ore, concentrate, and scrap.
[7]May include other precious metals.
[8]Includes dross and ashes.
[9]Unreported quantity valued at $507,000.
[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	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS[2]				
Alkali, alkaline- and rare-earth metals:				
Alkali metals	6,265	5,664	5,566	United Kingdom 76; West Germany 22.
Alkaline-earth metals	NA	61	27	Austria 29; France 2.
Unspecified	3,277	—		
Aluminum:				
Ore and concentrate, gross weight thousand tons	2,019	2,352	105	Brazil 1,336; Guinea 342; Sierra Leone 288.
Oxides and hydroxides do.	2,096	1,895	457	Australia 777; Jamaica 527.
Metal including alloys:				
Scrap	r56,959	62,201	61,612	Netherlands 202; Cuba 147.
Unwrought	53,480	59,391	53,606	Brazil 2,463; Ghana 1,401.
Semimanufactures	207,342	309,458	262,369	France 11,324; Belgium-Luxembourg 10,804.
Antimony:				
Oxides	1,526	NA		
Metal including alloys, all forms	209	130	55	China 74; Zaire 1.
Beryllium: Metal including alloys, all forms value, thousands	$375	$348	$339	Zaire $8.
Bismuth: Metal including alloys, all forms	NA	59	47	China 10; Zaire 1.
Cadmium: Metal including alloys, all forms	NA	19	18	Zaire 1.
Chromium:				
Ore and concentrate	[3]13,546	28,975	6,857	Philippines 7,481; Republic of South Africa 6,674.
Oxides and hydroxides	2,978	3,556	2,110	United Kingdom 667; West Germany 666.
Metal including alloys, all forms	NA	265	98	Japan 90; United Kingdom 33.
Cobalt:				
Ore and concentrate	NA	19	19	
Oxides and hydroxides	38	37	12	Finland 14; Belgium-Luxembourg 8.
Metal including alloys, all forms	NA	686	190	Zaire 239; Switzerland 170.
Columbium and tantalum: Tantalum metal including alloys, all forms value, thousands	$1,167	$4,883	$4,492	Zaire $132; United Kingdom $34.
Copper:				
Ore and concentrate[3]	45,153	47,795	11,333	Mexico 20,302; Chile 14,637.
Matte and speiss including cement copper[3]	1,346	190	144	France 46.
Oxides and hydroxides	622	883	NA	NA.
Sulfate	4,591	3,897	NA	NA.
Metal including alloys:				
Scrap	69,322	90,991	88,975	Portugal 997; Cuba 228.
Unwrought	16,087	7,387	5,810	India 180; West Germany 174.
Semimanufactures	r63,283	88,682	60,323	West Germany 3,329; Japan 2,647.
Germanium: Metal including alloys, all forms	NA	11	10	Zaire 1.
Gold:				
Ore and concentrate, Au content kilograms	1,060	1,588	NA	NA.
Metal including alloys, unwrought and partly wrought do.	59,936	51,495	NA	NA.

See footnotes at end of table.

TABLE 7—Continued

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
METALS[2]—Continued				
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite, gross weight thousand tons	5,213	4,796	4,352	Brazil 443.
Pyrite, roasted, gross weight	NA	60,151	27,466	Brazil 32,685.
Metal:				
Scrap	r775,830	1,151,412	1,149,121	Mexico 189; United Kingdom 171.
Pig iron, cast iron, related materials	r16,854	31,732	28,267	Brazil 2,563; West Germany 374.
Ferroalloys:				
Ferrochromium	r44,118	50,146	10,158	Republic of South Africa 34,720; Finland 3,036.
Ferromanganese	39,607	35,060	4,472	Republic of South Africa 12,793; West Germany 5,573.
Ferromolybdenum	223	345	98	Chile 126; Belgium-Luxembourg 80.
Ferronickel	NA	3,176	17	Dominican Republic 2,615; New Caledonia 541.
Ferrosilicochromium	NA	2,358	2,158	Zimbabwe 200.
Ferrosilicomanganese	13,301	17,141	5,476	Republic of South Africa 6,347; Brazil 5,009.
Ferrosilicon	12,367	20,155	15,244	Finland 4,098; U.S.S.R. 326.
Ferrotitanium	545	NA		
Ferrovanadium	r208	NA		
Silicon metal	NA	1,258	849	Brazil 178; Japan 138.
Unspecified	r15,092	13,230	7,397	France 2,718; Brazil 1,827.
Steel, primary forms	r813,610	1,341,188	40,242	Brazil 836,046; United Kingdom 137,668; Netherlands 123,604.
Semimanufactures:[4]				
Bars, rods, angles, shapes, sections	679,662	849,703	176,094	Spain 104,897; Brazil 76,209.
Universals, plates, sheets	919,406	NA		
Hoop and strip	42,121	NA		
Rails and accessories value, thousands	$33,241	$46,784	$11,504	Japan $23,245; United Kingdom $6,409.
Wire	61,683	71,344	29,511	United Kingdom 8,277; Belgium-Luxembourg 7,420.
Tubes, pipes, fittings	166,775	499,303	182,714	Japan 113,010; Republic of Korea 40,376.
Castings and forgings, rough	42,866	NA		
Lead:				
Ore and concentrate	[3]158	15,922	8,632	Peru 4,995; Australia 2,260.
Oxides	5,524	8,621	8,255	Republic of South Africa 270; Mexico 52.
Metal including alloys:				
Scrap	74,152	36,692	36,303	United Arab Emirates 190; Indonesia 86.
Unwrought	12,600	14,810	9,148	Mexico 5,205; Italy 175.
Semimanufactures	1,342	1,323	1,263	United Kingdom 31; Belgium-Luxembourg 22.
Magnesium: Metal including alloys:				
Scrap	173	67	67	
Unwrought	2,742	8,558	7,008	Norway 1,096; France 251.
Semimanufactures	4,371	2,850	2,665	France 123; United Kingdom 47.
Manganese:				
Ore and concentrate, metallurgical-grade	r[3]80,957	108,245	2,909	Republic of South Africa 31,737; Mexico 29,504; Brazil 21,787.

See footnotes at end of table.

TABLE 7—Continued

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS[2]—Continued					
Manganese—Continued					
Oxides		5,399	6,545	5,106	Japan 1,144; Brazil 248.
Metal including alloys, all forms		2,085	4,119	1,656	Republic of South Africa 2,225; United Kingdom 238.
Mercury		33	36	36	
Molybdenum:					
Ore and concentrate		[3]201	165	165	
Oxides and hydroxides		193	188	172	United Kingdom 16.
Metal including alloys:					
Unwrought including waste and scrap		NA	142	126	Zaire 11; Japan 5.
Semimanufactures		NA	19	17	Austria 2.
All forms	value, thousands	$1,023	—		
Nickel:					
Ore and concentrate		[3]3,092	12,285	1,510	Mexico 10,776.
Matte and speiss		[3]2,792	4,284	4	Australia 3,030; United Kingdom 871; U.S.S.R. 37.
Metal including alloys:					
Scrap		17,647	12,946	10,538	United Kingdom 909; Australia 758.
Unwrought		2,540	1,593	411	Norway 826; United Kingdom 120.
Semimanufactures		3,519	3,470	2,608	West Germany 713; United Kingdom 71.
Platinum-group metals:					
Waste and sweepings	value, thousands	NA	$13,235	$12,894	Costa Rica $250; Mexico $71.
Metals including alloys, unwrought and partly wrought:					
Platinum	do.	r$16,743	$47,667	$18,927	U.S.S.R. $28,085; United Kingdom $645.
Unspecified	do.	$32,350	$108,059	$25,661	U.S.S.R. $61,504; Republic of South Africa $12,610.
Silver:					
Ore and concentrate	value, thousands	[5]$40,677	$6,226	$706	Guyana $4,197; Bolivia $513.
Waste and sweepings	do.	[5]$234,748	$91,819	$76,991	Cuba $12,302; Republic of South Africa $1,663.
Metal including alloys, unwrought and partly wrought	do.	r$21,928	$26,336	$16,866	Chile $8,932; West Germany $403.
Tin:					
Ore and concentrate		—	21	NA	NA.
Metal including alloys:					
Scrap		NA	180	166	Zaire 14.
Unwrought		3,767	4,128	1,296	China 705; Brazil 509.
Semimanufactures		89	301	201	Malyasia 40; United Kingdom 21.
Titanium:					
Ore and concentrate		[3]19,311	32,054	1,462	Australia 28,461; Norway 2,013.
Oxides		10,312	10,560	4,671	West Germany 1,991; France 824.
Metal including alloys:					
Unwrought including waste and scrap		NA	437	404	Japan 30; Zaire 2.
Semimanufactures		NA	1,247	1,033	Japan 137; United Kingdom 34.
All forms		r392	—		
Tungsten:					
Ore and concentrate, W content		1	NA		

See footnotes at end of table.

TABLE 7—Continued

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS[2]—Continued					
Tungsten—Continued					
Metal including alloys:					
Unwrought including waste and scrap		NA	182	147	United Kingdom 22; Zaire 11.
Semimanufactures		NA	48	41	Denmark 2; Japan 2.
Unspecified	value, thousands	$2,236	—		
Uranium and thorium:					
Ore and concentrate	do.	$62,532	NA		
Metals including alloys, all forms	do.	$84	NA		
Vanadium:					
Oxides and hydroxides		1,410	NA		
Metal including alloys, all forms		NA	2	1	Zaire 1.
Zinc:					
Ore and concentrate		[3]26,015	38,165	38,161	Bolivia 4.
Oxides		2,229	1,295	1,089	China 40; Denmark 39.
Blue powder		668	905	904	Japan 1.
Metal including alloys:					
Scrap		466	2,474	2,473	United Kingdom 1.
Unwrought		11,031	8,026	2,897	Peru 2,221; Argentina 1,005.
Semimanufactures		2,631	2,134	1,506	Belgium-Luxembourg 200; Netherlands 154.
Zirconium:					
Ore and concentrate		NA	7,599	2,509	Australia 3,016; Republic of South Africa 1,994.
Metal including alloys:					
Unwrought including waste and scrap		NA	25	18	United Kingdom 6; Zaire 1.
Semimanufactures		NA	259	199	France 57; United Kingdom 3.
All forms		269	—		
Other:					
Ores and concentrates[3]		16,278	2,420	2,359	China 61.
Oxides and hydroxides		19,008	4,931	2,235	Republic of South Africa 1,059; United Kingdom 589.
Ashes and residues		26,019	38,281	27,830	United Kingdom 4,688; Italy 4,014.
Base metals including alloys, all forms	value, thousands	$55,537	$2,261	$2,032	Zaire $82; West Germany $16.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		28,386	19,315	17,828	Italy 474; Iceland 230.
Artificial: Corundum		NA	4,597	3,698	Austria 403; Brazil 246.
Dust and powder of precious and semiprecious stones including diamond	value, thousands	[6]$2,217	$7,113	$3,614	Ireland $2,122; U.S.S.R. $1,116.
Grinding and polishing wheels and stones	do.	$28,428	$32,381	$15,672	Italy $5,715; West Germany $2,691.
Asbestos, crude		237	384	346	United Kingdom 28; Zimbabwe 10.
Barite and witherite		4,660	4,748	2,889	Netherlands 1,446; West Germany 367.
Boron materials:					
Crude natural borates		NA	1,127	1,112	France 14.
Oxides and acids		r4,600	4,530	4,267	Italy 228; Japan 31.

See footnotes at end of table.

TABLE 7—Continued

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Cement	thousand tons	586	1,023	370	Spain 236; Greece 149.
Chalk		NA	17,466	17,204	United Kingdom 236; France 12.
Clays, crude:					
Bentonite		318,071	335,012	251,198	Greece 67,801; India 16,010.
Fire clay		30,685	NA		
Fuller's earth		10,787	NA		
Kaolin		417,405	389,650	389,129	United Kingdom 301; Italy 208.
Unspecified		213,415	227,516	226,214	United Kingdom 736; Italy 378.
Cryolite and chiolite		8,607	1,117	568	Netherlands 281; Denmark 268.
Diamond, natural:					
Stones:					
Gem, not set or strung	value, thousands	$126,178	$45,449	$9,480	Belgium-Luxembourg $19,998; Israel $8,489.
Industrial stones	do.	$9,579	$6,475	$2,655	Zaire $2,153; Ireland $1,434.
Unsorted	do.	NA	$103,471	$17,433	Belgium-Luxembourg $50,259; Israel $25,031.
Dust and powder	thousand carats	2,458	NA		
Diatomite and other infusorial earth		24,483	19,593	19,513	West Germany 80.
Feldspar, fluorspar, related materials:					
Feldspar		NA	13,213	13,213	
Fluorspar		134,567	194,074	12,417	Mexico 120,736; Morocco 34,000.
Fertilizer materials:					
Crude, n.e.s.		24,200	6,188	5,953	Brazil 155; Austria 71.
Manufactured:					
Ammonia		13,672	15,251	15,218	United Kingdom 33.
Nitrogenous		374,811	405,966	177,186	Netherlands 119,602; Trinidad and Tobago 34,085.
Phosphatic		486,047	116,678	116,678	
Potassic		64,283	59,430	56,791	France 2,002; West Germany 280.
Unspecified and mixed		r66,775	455,214	450,661	Belgium-Luxembourg 2,729; United Kingdom 788.
Graphite, natural		NA	9,311	9,129	Switzerland 68; West Germany 53.
Gypsum and plaster		243,523	940,066	731,831	Spain 115,058; Mexico 92,810.
Iodine		89	NA		
Lime		44,289	32,517	31,116	United Kingdom 1,400.
Magnesium compounds:					
Magnesite, crude		r69,047	28,831	447	China 28,372; United Kingdom 12.
Oxides and hydroxides		3,710	110,447	68,323	China 18,668; Brazil 8,800.
Mica:					
Crude including splittings and waste		r2,204	1,828	1,774	India 53.
Worked including agglomerated splittings	value, thousands	$2,620	$3,738	$2,461	France $1,034; India $243.
Nitrates, crude		r4,954	25,809	2,798	Chile 12,716; Israel 10,000.
Phosphates, crude	thousand tons	1,968	2,157	1,314	Togo 746; Morocco 83.
Pigments, mineral:					
Iron oxides and hydroxides, processed		11,886	5,710	4,925	West Germany 323; Spain 307.
Potassium salts, crude		NA	34	34	

See footnotes at end of table.

TABLE 7—Continued

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$17,455	$18,356	$5,669	Thailand $3,061; West Germany $2,321.
Synthetic	do.	$6,086	$1,544	$477	West Germany $202; Austria $154.
Pyrite, unroasted		NA	5,970	5,970	
Quartz crystal, piezoelectric	value, thousands	NA	$1,077	$549	Japan $282; United Kingdom $225.
Salt and brine	thousand tons	1,113	1,201	741	Mexico 324; Chile 74.
Sodium compounds, n.e.s.:					
Soda ash, natural and manufactured		r150,247	89,458	89,450	West Germany 8.
Sulfate, natural and manufactured		r17,194	13,037	4,252	United Kingdom 8,710; West Germany 38.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		r70,618	87,258	49,264	Republic of South Africa 12,463; Zimbabwe 9,292.
Worked	value, thousands	$42,648	$56,799	$8,343	Italy $36,249; Spain $3,502.
Dolomite, chiefly refractory-grade		29,005	29,444	15,731	United Kingdom 13,713.
Gravel and crushed rock		594,103	921,519	919,184	France 1,813; Netherlands 495.
Limestone other than dimension	thousand tons	2,695	2,639	2,639	
Quartz and quartzite		515	10,616	9,960	Brazil 286; Japan 208.
Sand other than metal-bearing	thousand tons	1,626	1,297	1,297	
Sulfur:					
Elemental:					
Crude including native and byproduct		24,711	21,826	21,637	France 189.
Colloidal, precipitated, sublimed		151	2,314	2,189	West Germany 65; France 60.
Dioxide		NA	1,495	1,495	
Sulfuric acid		44,624	40,073	29,854	Spain 10,143; Netherlands 48.
Talc, steatite, soapstone, pyrophyllite		49,711	179,692	179,336	United Kingdom 246; China 46.
Vermiculite		25,260	21,896	14,781	Republic of South Africa 7,115.
Other:					
Crude		NA	79,783	78,753	Mexico 835; Spain 62.
Slag and dross, not metal-bearing		187,904	59,960	48,715	East Germany 7,316; Italy 3,928.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		8,050	7,342	7,337	West Germany 5.
Carbon black		r12,849	18,387	17,835	West Germany 390; Uruguay 70.
Coal:					
Anthracite		277,913	406,323	406,323	
Bituminous	thousand tons	13,754	15,084	15,059	Colombia 24.
Briquets of anthracite and bituminous coal		172	6,183	6,183	
Lignite including briquets		9,388	177	177	
Unspecified excluding briquets	thousand tons	r118	130	130	
Coke and semicoke	do.	699	1,111	978	West Germany 70; Yugoslavia 41.
Gas, natural: Gaseous[7]	million cubic meters	92	384	NA	NA.
Peat including briquets and litter		NA	186	186	

See footnotes at end of table.

TABLE 7—Continued

CANADA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum:					
Crude	thousand 42-gallon barrels	134,092	145,630	5,129	United Kingdom 80,739; Nigeria 15,448; Norway 13,112.
Refinery products:					
Liquefied petroleum gas	do.	11,316	[7]5,778	5,768	West Germany 3.
Gasoline	do.	[r]9,907	[7]10,226	3,698	Netherlands 2,168; Spain 1,122.
Naphtha[7]	do.	2,108	2,066	2,066	
Mineral jelly and wax	do.	177	22	20	Unspecified 2.
Kerosene and jet fuel[7]	do.	[r]10,091	12,625	NA	NA.
Distillate fuel oil[7]	do.	[r]6,915	7,811	5,849	Italy 1,015; Venezuela 619.
Lubricants	do.	[r]1,633	NA		
Residual fuel oil[7]	do.	[r]13,753	18,222	4,096	Venezuela 10,010; Netherlands Antilles 866.
Bitumen and other residues	do.	1,193	173	126	Spain 32; Netherlands 11.
Bituminous mixtures	do.	NA	79	32	Venezuela 26; Spain 20.
Petroleum coke	do.	5,303	1,347	1,336	West Germany 6; Japan 4.

[r]Revised. NA Not available.
[1]Table prepared by H. D. Willis. As a result of the change to the Harmonized Tariff System of trade classification in 1988, some data for 1987 are not available and some are not completely comparable.
[2]Data for ores and concentrates equal total weight of all metals contained unless otherwise indicated.
[3]Metal content.
[4]As a result of changes in trade code classifications, data for 1987 and 1988 are not completely comparable.
[5]Includes other precious metals.
[6]Excludes diamond.
[7]Source: International Energy Agency, Organization for Economic Co-operation and Development.

TABLE 8

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Primary metals:			
Copper:	Brunswick Mining and Smelting Corp.	No. 12 Mine, Bathurst, New Brunswick	3,690.
Do.	BP Resources Canada Ltd. (BP, 65%; ESSO Resources Canada Ltd., 35%)	Les Mines Selbaie, Joutel, Québec	2,395.
Do.	Campbell Resources Inc.	Henderson Mines, Cedar Bay, Québec	1,045.
Do.	Dumagami Mines Ltd.	La Ronde Mine, Cadillac, Québec	505.
Do.	Minnova Inc.	Ansil Mine, Lake Dufault Div., Québec	540.
Do.	do.	Perry, Springer, Cooke Mines, and Chapais, Québec	1,010.
Do.	Noranda Inc.	Rouyn-Noranda, Home Div., Québec	1,260.
Do.	do.	Isle Dieu and Norita Mines, Matagami, Québec	1,150.
Do.	do.	Geco Div., Manitouwadge, Ontario	1,370.
Do.	Westminer Canada Ltd.	Copper Rand and Portage Mines, Chibougamau, Québec	1,120.

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Primary metals—Continued			
Copper—Continued	Falconbridge Ltd.	Sudbury Operations, Sudbury, Ontario	4,250.
Do.	do.	Strathcona and Timmins operations, Timmins, Ontario	4,860.
Do.	Giant Yellowknife Mines Ltd.	Pamour and Shumacher, Ontario	930.
Do.	Inco Ltd.	Sudbury and Shebandowan, Ontario Thompson District, Manitoba	20,250.
Do.	Mattabi Mines Ltd.	Lyon Lake Mine, Ignace, Ontario	1,010.
Do.	Hudson Bay Mining and Smelting Co., Ltd.	Flin Flon and Snow Lake, Manitoba	3,790.
Do.	do.	Ruttan Mine, Leaf Rapids, Manitoba	2,410.
Do.	Hudson Bay/Outokumpu Mines Ltd. Joint Venture	Namew Lake Mine, Flin Flon, Manitoba	690.
Do.	Brenda Mines Ltd.	Peachland, British Columbia	10,800.
Do.	Broken Hill Proprietary Co. Ltd.	Island Copper Mine, Port Hardy, British Columbia	16,740.
Do.	Cassiar Mining Corp.	Similco Mine, Princeton, British Columbia	8,180.
Do.	Gibraltar Mines Ltd.	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	43,200.
Do.	Noranda Inc.	Bell Copper Mine, Babine Lake, British Columbia	5,550.
Do.	Placer Dome Inc.	Equity Silver Mine, Houston, British Columbia	3,240.
Do.	Teck Corp.	Kamloops, Afton Operations, British Columbia	2,770.
Do.	Westmin Resources Ltd.	H.W. Lynx Mines, Buttle Lake and Premier Mine, Stewart, British Columbia	1,440.
Do.	Curragh Resources Inc.	Faro Mine, Yukon Territory	4,860.
Copper refineries:	Noranda Inc.	Division CCR, East Montreal, Québec	370.
Do.	Inco Ltd.	Copper Cliff, Ontario	180.
Do.	Falconbridge Ltd.	Timmins, Ontario	92.
Copper smelters:	do.	Falconbridge, Ontario Timmins, Ontario	570.
Do.	Hudson Bay Mining and Smelting Co., Ltd.	Flin Flon, Manitoba	400.
Do.	Inco Ltd.	Sudbury, Ontario	1,500.
Do.	Noranda Inc.	Horne, Noranda, Québec	838.
Do.	do.	Gaspe, Murdochville, Québec	215.
Gold:	Hope Brook Gold Inc.	Hope Brook Mine, Conteau Bay, Newfoundland	3,000.
Do.	Agnico-Eagle Mines Ltd.	Joutel, Québec	590.
Do.	American Barrick Resources Corp.	Camflo Div., Val-d'Or, Québec	436.
Do.	Belmoral Mines Ltd.	Ferderber Mine and Dumont Mine, Val-d'Or, Québec	490.

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Primary metals—Continued			
Gold—Continued	BP Resources Canada Ltd. (BP, 65%; Billiton Metals Canada Inc., 35%)	Les Mines Selbaie, Joutel, Québec	2,395.
Do.	Cambior Inc.	Pierre and Rouyn Mines, Val-d'Or, Québec	367.
Do.	Campbell Resources Inc.	Henderson Mines, Cedar Bay, Québec	1,045.
Do.	LAC Minerals Ltd.	Cadillac, Québec	1,125.
Do.	do.	Malartic, Québec	720.
Do.	do.	Terrains, Québec	572.
Do.	Minnova Inc.	Ansil Mine, Lake Dufault, Québec	554.
Do.	do.	Desmaraisville, Lake Shortt, Québec	414.
Do.	do.	Perry, Springer, Cooke, and Chapais Mines Opemiska, Québec	1,008.
Do.	Placer Dome Inc.	Sigma Mine, Val-d'Or, Québec Kiena Mine, Val-d'Or, Québec	465.
Do.	Westminer Canada Ltd.	Copper and Chibougamau, Québec	1,110.
Do.	Corona Corp.	Renabie Mine, Wawa, Ontario Williams Mine, Hemlo, Ontario	216.
Do.	Dickenson Mines Ltd.	Red Lake, Ontario	360.
Do.	Kidd Creek Gold	Hoyle Pond and Owl Creek Mines, Ontario	180.
Do.	Giant Yellowknife Mines Ltd.	Pamour, Ontario	945.
Do.	do.	Schumacher, Ontario	931.
Do.	Golden Shield Resources Ltd.	Kerr Addison, Virginia Town, Ontario	441.
Do.	Hemlo Gold Mines Inc.	Golden Giant Mine, Marathon, Ontario	1,080.
Do.	Inco Ltd.	Sudbury and Shabandowan, Ontario	20,250.
Do.	LAC Minerals Ltd.	Macassa, Kurkland Lake, Ontario	180.
Do.	Placer Dome Inc.	Campbell Mine, Red Lake, Ontario	384.
Do.	do.	Detour Lake Mine, northeast Ontario	828.
Do.	do.	Dome Mine, South Porcupine, Ontario	1,130.
Do.	Teck-Corona Corp.	David Bell Mine, Hemlo, Ontario	385.
Do.	Hudson Bay Mining and Smelting Co.	Flin Flon and Snow Lake, Manitoba	3,790.
Do.	do.	Rutan Mine, Leaf Rapids, Manitoba	2,412.
Do.	LynnGold Resources Inc.	MacLellan Mine, Lynn Lake, Manitoba	396.
Do.	Broken Hill Proprietary Co. Ltd.	Island Copper Mine, Port Hardy, British Columbia	16,740.
Do.	Cassiar Mining Corp.	Similco Mine, Princeton, British Columbia	8,165.
Do.	Corona Corp.	Nickel Plate Mine, Hedley, British Columbia	1,045.
Do.	Placer Dome Inc.	Equity Silver Mine, Houston, British Columbia	3,240.
Do.	Westmin Resources Ltd.	H.W. Lynx Mines, Buttle Lake and Premier Mine, Stewart, British Columbia	1,440.
Do.	Echo Bay Mines Ltd.	Lupin Mine, Contwoyto Lake; Northwest Territories	612.
Do.	Giant Yellowknife Mines Ltd.	Giant Mine, Yellowknife, Northwest Territories	407.
Do.	do.	Giant Mill-tailings, Yellowknife, Northwest Territories	3,265.

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Primary metals—Continued			
Gold—Continued	NERCO Minerals Co.	Con and Ryon Mines, Yellowknife, Northwest Territories	288.
Iron ore:	Adams Mine Ltd.	Kirkland Lake, Ontario	1,200 (fluxed pellets).
Do.	The Algoma Steel Corp. Ltd.	Wawa, Ontario	1,250.
Do.	Iron Ore Co. of Canada	Schefferville, Québec	1,400 (direct shipping).
Do.	do.	Carol Lake, Labrador	5,000 (concentrate).
Do.	do.	do.	10,000 (acid pellets).
Do.	do.	do.	2,000 (fluxed pellets).
Do.	do.	do.	500 (broken pellets).
Do.	Québec Cartier Mining Co.	Mount Wright, Québec	9,000 (concentrate).
Do.	do.	do.	8,000 (acid pellets).
Do.	do.	do.	2,000 (fluxed pellets).
Do.	Sherman Mine Ltd.	Temagami, Ontario	1,100 (fluxed pellets).
Do.	Wabush Mines Ltd.	Wabush, Labrador and Pointe Noitre, Québec	6,200 (pellets).
Lead:	Brunswick Mining and Smelting Corp. Ltd.	No. 12 Mine, Bathurst, New Brunswick	3,690.
Do.	Falconbridge Ltd.	Strathcona, Timmins, Ontario	4,860.
Do.	Mattabi Mines Ltd.	Lyon Lake Mine, Ignace, Ontario	1,080.
Do.	Noranda Inc.	Geco Div. Manitouwadge, Ontario	1,440.
Do.	Hudson Bay Mining and Smelting Co., Ltd.	Flin Flon and Snow Lake, Manitoba	3,790.
Do.	Cominco Ltd.	Sullivan Mine, Kimberley, British Columbia	3,265.
Do.	Westmin Resources	H.W. Lynx Mines, Buttle Lake, British Columbia	1,440.
Do.	Curragh Resources Inc.	Faro Mine, Yukon Territory	4,860.
Do.	Cominco Ltd.	Polaris Mine, Little Cornwallis Island, Northwest Territories	1,210.
Do.	Nanisivik Mines Ltd.	Baffin Island, Northwest Territories	720.
Do.	Pine Point Mines Ltd.	Pine Point, Northwest Territories	3,600.
Nickel (mines and mills)	Falconbridge Ltd. (Noranda Inc., 50%; Trelleborg AB, 50%)	East, Fraser, Lockerby, Onaping, Strathcona, and Craig in Sudbury, Ontario	2,600.
Do.	Timmins Nickel Inc. (BHP, 51%; Utah Mines, 49%)	Redstone, 22 kilometers southeast of Timmons, Ontario	1,000.
Do.	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	28,440.
Do.	do.	Thompson, Pipe, Birchtree mines in Manitoba	7,200.
Do.	Hudson Bay Mining and Smelting Co., Ltd. (Inspiration Resources Corp., 60%; Outokumpu Mines, 40%)	Namerw Lake, Manitoba	720.
Do.	New Québec Raglan Mines Ltd. (Falconbridge, 100%)	Northwest corner of Québec, Québec	10.

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Primary metals—Continued			
Nickel (mines and mills)—Continued	Teck Corp. (Keevil Holding Corp., 51%; Metall Mining Corp., 49%)	Moncalm Township, Ontario	5.
Do.	Great Lakes Nickel Ltd. (M.J. Boyle , 50.96%; Pacific Corp. Service, 49.04%)	Pardee Township, Thunder Bay, northwest Ontario	4.
Nickel refineries:	Inco Ltd.	Port Colborne, Ontario	64.
Do.	do.	Sudbury, Ontario	56.8.
Do.	do.	Thompson, Manitoba	45.5.
Do.	Sherritt Gordon Ltd.	Fort Saskatchewan, Alberta	27.
Nickel smelters:	Falconbridge Ltd.	Falconbridge, Ontario	600 (concentrates).
Do.	Inco Ltd.	Sudbury, Ontario	1,500 (concentrates).
Do.	do.	Thompson, Manitoba	1,270 (concentrates).
Silver:	Brunswick Mining and Smelting Corp. Ltd.	No. 12 Mine, Bathurst, New Brunswick	3,690.
Do.	BP Resources Canada Ltd.	Les Mines Selbaie, Joutel, Québec	2,395.
Do.	Campbell Resources Inc.	Henderson Mines, Ceder Bay, Québec	1,080.
Do.	Minnova Inc.	Ansil Mine, Lake Dufault, Québec	554.
Do.	do.	Perry, Springer, Cooke, and Chapais Mines, Opemiska Div., Québec	1,010.
Do.	Noranda Inc.	Isle Dieu and Norita Mines, Matagami, Québec	1,145.
Do.	Westminer Canada Ltd.	Portage Mines, Chibougamau, Québec	1,110.
Do.	Agnico-Eagle Mines Ltd.	Cobalt, Silver Div., Ontario	900.
Do.	Corona Corp.	Williams Mine, Hemlo, Ontario	2,160.
Do.	Falconbridge Ltd.	Sudbury Operations, Ontario	4,250.
Do.	do.	Timmins Operations, Ontario	4,860.
Do.	Inco Ltd.	Sudbury and Shabandowan, Ontario	20,250.
Do.	Mattabi Mines Ltd.	Lyon Lake Mine, Ignace, Ontario	1,005.
Do.	Noranda Inc.	Geco Div., Manitouwadge, Ontario	1,372.
Do.	Hudson Bay Mining and Smelting Co., Ltd.	Flin Flon and Snow Lake, Manitoba	3,790.
Do.	do.	Ruttan Mine, Leaf Rapids, Manitoba	2,410.
Do.	Inco Ltd.	Thompson Operations, Manitoba	5,050.
Do.	Lynngold Resources Inc.	MacLellan Mine, Lynn Lake, Manitoba	396.
Do.	Blackdome Mining Corp.	Blackdome Mine, Williams Lake, British Columbia	72.
Do.	Brenda Mines Ltd.	Peachland, British Columbia	10,800.
Do.	Broken Hill Proprietary Co. Ltd.	Port Hardy, British Columbia	16,740.
Do.	Cassiar Mining Corp.	Similco Mine, Princeton, British Columbia	22,680.
Do.	Corona Corp.	Nickel Plate Mine, Hedley, British Columbia	1,080.
Do.	Cominco Ltd.	Sullivan Mine, Kimberley, British Columbia	3,280.
Do.	Dickenson Mines Ltd.	Silmonac Mine, New Denver, British Columbia	72.
Do.	Highland Valley Copper	Logan Lake, British Columbia	43,200.

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Primary metals—Continued			
Silver—Continued	Noranda Inc.	Babine Lake, British Columbia	5,550.
Do.	Placer Dome Inc.	Equity Silver Mine, Houston, British Columbia	3,240.
Do.	Skylark Resources Ltd.	Greenwood, British Columbia	180.
Do.	Teck Corp.	Afton Operations, British Columbia	2,770.
Do.	Westmin Resources Ltd.	H.W. Lynx Mines, Buttle Lake, British Columbia	1,440.
Do.	Curragh Resources Inc.	Faro Mine, Yukon Territory	4,860.
Do.	United Keno Hill Mines Ltd.	Keno Mines, Elsa, Yukon Territory	180.
Do.	Echo Bay Mines Ltd.	Lupin Mine, Contwoyto Lake, Northwest Territories	720.
Do.	Navisivik Mines Ltd.	Baffin Island Mine, Northwest Territories	720.
Uranium:	Cluff Mining Co.	Cluff Lake, Saskatchewan	183.
Do.	Denison Mines Ltd.	Elliot Lake, Ontario	2,572.
Do.	Cameco-A Canadian Mining and Energy Corp.	Rabbit Lake, Saskatchewan	388.6.
Do.	Key Lake Mining Corp.	Key Lake, Saskatchewan	242.
Do.	Rio Algom Ltd.	Quirke, Elliot Lake, Ontario	1,525.
Do.	do.	Panel, Elliot Lake, Ontario	978.
Do.	do.	Stanleigh, Elliot Lake, Ontario	652.
Zinc:	Newfoundland Zinc Mines Ltd.	Daniel's Harbor, Newfoundland	522.
Do.	Brunswick Mining and Smelting Corp. Ltd.	Bathurst, New Brunswick	3,690.
Do.	East West Cariboll Mining Ltd.	Caribou Mine, Bathurst, New Brunswick	720.
Do.	BP Resources Canada Ltd. (BP, 65%; ESSO Resources Canada Ltd., 35%)	Les Mines Selbaie, Joutel, Québec	2,394.
Do.	Minnova Inc.	Ansil Mine, Lake Dufault Division, Québec	554.
Do.	do.	Desmaraisville Mine, Lake Shortt Div., Québec	414.
Do.	do.	Perry Springer, Cooke, and Chapais Mines, Opemiska Div., Québec	1,010.
Do.	do.	Zenmac Mine, Winston Lake, Ontario	360.
Do.	Falconbridge Ltd.	Timmins Operations, Ontario	4,860.
Do.	Mattabi Mines Ltd.	Lyon Lake Mine, Ignace, Ontario	1,004.
Do.	Noranda Inc.	Manitouwadge, Geco Div. Ontario	1,372.
Do.	Hudson Bay Mining and Smelting Co., Ltd.	Flin Flon and Snow Lake concentrators, Manitoba	3,790.
Do.	do.	Ruttan Mine, Leaf Rapids, Manitoba	2,410.
Do.	Cominco Ltd. (Cominco, 55%; Pine Point Mines Ltd., 45%)	Sullivan Mine, Kimberley, British Columbia	3,265.
Do.	do.	Polaris Mine, Little Cornwallis Island, Northwest Territories	1,210.
Do.	Westmin Resources Ltd.	H.W. Lynx Mines, Buttle Lake and Premier Mine, Stewart, British Columbia	1,440.
Do.	Curragh Resources Inc.	Faro Mine, Yukon Territory	4,860.

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Primary metals—Continued			
Zinc—Continued	Manisivik Mines Ltd.	Baffin Island, Northwest Territories	720.
Do.	Pine Point Mines Ltd.	Pine Point, Northwest Territories	3,600.
Zinc refineries (slab zinc):	Cominco Ltd.	Trail, British Columbia	290.
Do.	Canadian Electrolytic Zinc Ltd. (CEZ)	Valleyfield, Québec	227.
Do.	Falconbridge Ltd.	Timmins, Ontario	133.
Do.	Hudson Bay Mining and Smelting Co., Ltd.	Flin Flon, Manitoba	85.
Industrial minerals:			
Asbestos:	Baie Verte Mines Inc.	Baie Verte, Newfoundland	80 (fiber).
Do.	LAB Chrysotile Inc. (Lac d'Amiante du Québec, Ltee [LAQ], 55%; Societe National de l'Amiante [SNA], 45%)	Black Lake, Québec	160 (fiber).
Do.	British Canadian Mine (LAQ, 55%; SNA, 45%)	do.	70 (fiber).
Do.	Bell Asbestos Mines Ltd. (LAQ, 55%; SNA, 45%)	Thetford Mines, Québec	70 (fiber).
Do.	JM Asbestos Inc.	Jeffrey Mines, Asbestos, Québec	300 (fiber).
Do.	Cassiar Mining Corp.	Cassiar, British Columbia	100 (fiber).
Gypsum:	Domtar Inc.	Flat Bay, Newfoundland	1,300.
Do.	do.	McKay Settlement, Nova Scotia	40.
Do.	do.	Caledonia, Ontario	648.
Do.	do.	Gypsumville, Manitoba	173.
Do.	Fundy Gypsum Co. Ltd.	Wentworth and Miller Creek, Nova Scotia	360.
Do.	Georgia-Pacific Corp.	River Denys, Sugar Camp, Nova Scotia	1,440.
Do.	Little Narrows Gypsum Co. Ltd.	Little Narrows, Nova Scotia	1,145.
Do.	National Gypsum (Canada) Ltd.	Milford, Nova Scotia	3,240.
Do.	Lafarge Canada Inc.	Havelock, New Brunswick	641.
Do.	CGC Inc.	Hagersville, Ontario	612.
Do.	Westroc Industries Ltd.	Drumbo, Ontario	360.
Do.	do.	Amarath, Ontario	277.
Do.	do.	Windermere, British Columbia	1,150.
Oil sands:	Suncor Inc.	Mildred Lake, Alberta	160.
Do.	Syncrude Canada Ltd.	Fort McMurray, Alberta	452.
Potash (K_2O equivalent)	Potash Corp. of Saskatchewan Inc. (Private, 37%; Provincial Government, 63%)	Cory, near Saskatoon, Saskatchewan	830.
Do.	do.	Lanigan, near Lanigan Saskatchewan	2,090.
Do.	do.	Rocanville, southeast Saskatchewan	1,200.
Do.	do.	Allan (SK, 60%; Saskatchewan, 40%), near Allan, Saskatchewan	575.
Do.	do.	Esterhazy (SK, 25%; International Minerals, 75%), southeast Saskatchewan	580.
Do.	Central Canada Potash (Noranda Inc. 100%)	Colonsay, 50 miles east of Saskatcon, Saskatchewan	815.
Do.	Cominco Ltd.	Vanscoy, Saskatchewan	815.
Do.	International Minerals & Chemical Corp. (Canada) Ltd. (IMC Fertilizer Corp., 100%)	Esterhazy, (SK, 25%; INC, 75%) southeast Saskatchewan	1,745.

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Industrial minerals—Continued			
Potash (K_2O equivalent—Continued	Kalium Chemicals (Kalium Canada Ltd., 100%)	Potash Mine, 40 kilometers west of Regina, Saskatchewan	1,245.
Do.	Potash Co. of America, Inc.	Saskatoon, Saskatchewan	600.
Do.	Saskterra Fertilizers Ltd.	Allan (SK, 60%; Saskterra, 40%), near Allan, Saskatchewan	385.
Do.	Denison Mines Ltd. (Denison, 60%; Potash Co. of Canada, 40%)	Denison-Potacan Mine, near Sussex, New Brunswick	780.
Do.	Potash Co. of America, Inc.	Sussex, New Brunswick	380.
Petroleum refinery (sulfur capacities):	Consumer's Cooperative Refineries Ltd.	Regina, Saskatchewan	54.
Do.	Imperial Oil Ltd.	Dartmouth, Nova Scotia	27.
Do.	do.	Sarnia, Ontario	50.
Do.	Irving Oil Ltd.	Saint John, New Brunswick	36.
Do.	Petro-Canada Products Inc.	Edmonton, Alberta	20.
Do.	do.	Oakville-Trafalgar, Ontario	18.
Do.	Sulconam Inc.	Montreal, Québec	108.
Do.	Suncor Inc.	Sarnia, Ontario	18.
Principal SO_2 and H_2SO_4 production capacities:	Brunswick Mining and Smelting Corp. Ltd.	Belledune, New Brunswick	63 (H_2SO_4).
Do.	do.	do.	21 (sulfur).
Do.	Canadian Electro Zinc Ltd. (CEZ)	Valleyfield, Québec	155 (H_2SO_4).
Do.	do.	do.	50 (sulfur).
Do.	Falconbridge Ltd.	Sudbury, Ontario	128 (H_2SO_4).
Do.	Noranda Minerals Inc.	Rouyn, Noranda, Québec	144 (H_2SO_4).
Do.	do.	do.	47 (sulfur).
Do.	Inco Ltd.	Copper Cliff, Ontario	198 (H_2SO_4).
Do.	Falconbridge Ltd.	Kidd Creek, Ontario	202 (H_2SO_4).
Do.	do.	do.	66 (sulfur).
Do.	Border Chemical Co. Ltd.	Transcona, Manitoba	54 (H_2SO_4).
Do.	do.	do.	18 (sulfur).
Do.	Marsulex Inc.	Fort Saskatchewan, Alberta	54 (H_2SO_4).
Do.	do.	do.	18 (sulfur).
Do.	ESSO Chemical Canada	Redwater, Alberta	328 (H_2SO_4).
Do.	do.	do.	107 (sulfur).
Do.	Sherritt Gordon Ltd.	Fort Saskatchewan, Alberta	84 (H_2SO_4).
Do.	do.	do.	27 (sulfur).
Salt and brine operations:	The Canadian Salt Co.	Pugwash, Nova Scotia	1,200 (rock salt).
Do.	do.	Iles-de-la-Madeleine, Québec	1,200 (rock salt).
Do.	do.	Ojibway, Ontario	2,500 (rock salt).
Do.	do.	Windsor, Ontario	150 (brining).

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Industrial minerals—Continued			
Salt and brine operations—Continued	The Canadian Salt Co.	Belle-Plaine, Saskatchewan	170 (byproduct of potash).
Do.	do.	Lindbergh, Alberta	140 (brining).
Do.	Domtar Inc.	Nappan, Nova Scotia	100 (brining).
Do.	do.	Goderich, Ontario	2,800 (rock salt).
Do.	do.	Unity, Saskatchewan	180 (brining).
Do.	Potash Co. of America	Sussex, New Brunswick	450 (byproduct of potash).
Do.	General Chemical Canada Ltd.	Amhetstburg, Ontario	630 (brining).
Do.	Dow Chemical Canada Inc.	Sarnia, Ontario	900 (brining).
Do.	do.	Fort Saskatchewan, Alberta	1,400 (brining).
Sodium chlorate production using salt:	Albright & Wilson Americas Inc. (Tenneco, Inc. TX, USA)	Buckingham, Québec	78.
Do.	do.	Grande Prairie, Alberta	45.
Do.	do.	Thunder Bay, Ontario	53.
Do.	Alby Chlorate Canada Inc.	North Vancouver, British Columbia	78.
Do.	do.	Valleyfield, Québec	50.
Do.	Canadian Occidental Petroleum Ltd. (Occidental Petroleum Corp. Los Angeles, CA, USA, 100%)	Amherstburg, Ontario	50.
Do.	do.	Brandon, Manitoba	43.
Do.	do.	Bruderheim, Alberta	50.
Do.	do.	North Vancouver, British Columbia	155 (caustic soda).
Do.	do.	do.	141 (chlorine).
Do.	do.	Squamish, British Columbia	75 (caustic soda).
Do.	do.	do.	68 (chlorine).
Do.	C-I-L Inc. (Imperial Chemical Industries) PLC (ICI), England, 100%)	Becancour, Québec	325 (caustic soda).
Do.	do.	do.	295 (chlorine).
Do.	do.	Cornwall, Ontario	39 (caustic soda).
Do.	do.	do.	35 (chlorine).
Do.	do.	Dalhousie, New Brunswick	31 (caustic soda).
Do.	do.	do.	28 (chlorine).
Do.	Dow Chemical Canada Inc. (The Dow Chemical Co. Michigan, USA, 100%)	Fort Saskatchewan, Alberta	524 (caustic soda).
Do.	do.	do.	476 (chlorine).
Do.	do.	Sarnia, Ontario	350 (caustic soda).
Do.	do.	do.	115 (chlorine).
Do.	General Chemical Canada Ltd.	Amherstburg, Ontario	318 (calcium chloride).
Do.	do.	do.	363 (sodium carbonate).
Do.	PPG Canada Inc.	Beuharnios, Québec	40 (sodium chlorate).

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Industrial minerals—Continued			
Sodium chlorate production using salt—Continued	PPG Canada Inc.	Beuharnios, Québec	67 (caustic soda).
Do.	do.	do.	61 (chlorine).
Do.	QueNord Inc.	Magog, Québec	107 (sodium chlorate).
Sulfur:			
Main sulfur extraction plants (sour gas and oil sands)	Amoco Canada Petroleum Co., Ltd.	East Crossfield-Elkton, Alberta	650.
Do.	do.	Windfall-White Court, Alberta	480.
Do.	Canadian Occidental Petroleum, Ltd.	East Calgany-Crossfield, Alberta	610.
Do.	Chevron Standard Ltd.	Kaybob South III, Alberta	1,281.
Do.	Gulf Canada Ltd.	Hanlan Robb, Alberta	393.
Do.	Hudson's Bay Oil and Gas Co. Ltd.	Kaybob South I, Alberta	391.
Do.	do.	Kaybob South II, Alberta	391.
Do.	Husky Oil Ltd.	Ram River, Ricinus, Alberta	1,646.
Do.	Shell Canada Ltd.	Waterton, Alberta	1,120.
Do.	Westcoast Energy Inc.	Fort Nelson, British Columbia	396.
Do.	do.	Pine River, Hasler Flats, British Columbia	380.
Energy fuels:			
Principal Canadian oil and gas companies:	Aberford Resources Ltd. Grande Prairie, Alberta	Amigo, Virgo, East Peace River, Grande Praire, Alberta	2.7.
Do.	do.	do.	224.
Do.	do.	do.	224.3.
Do.	Agassiz Resources Ltd. (H.T. Cameron, 19.2%, N. Goodman, 12%; Agassiz, 68.8%)	Metiskow, Alberta	25.3.
Do.	do.	do.	1.1.
Do.	Alberta Energy Co. Ltd. (Private, 63%; Alberta Government, 37%)	Tangent Area, Suffield Area, Senex and Trout areas, Alberta	2.4.
Do.	do.	do.	1.0.
Do.	do.	do.	4.7.
Do.	American Eagle Petroleums Ltd. (CROWNX Inc., 28%; Tribel Oil & Gas, 28%; American Eagle, 44%)	Shekilie area and Tide Lake area, Alberta	0.3.
Do.	AMOCO Canada Petroleum Co. Ltd.	Wabasca, Elk Point, Soars Lake, Wapiti and Swan Hills, Alberta	8.2.
Do.	do.	do.	7.9.
Do.	B.C. Resources (British Columbia Resources Investment Corp., 100%)	Dodsland, Kerrobert, Rapdan, Plato, and Gleneoth, Saskatchewan	1.1.
Do.	do.	do.	8.3.
Do.	do.	do.	31.3.

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Industrial minerals—Continued			
Energy fuels—Continued			
Principal Canadian oil and gas companies—Continued	Bow Valley Industries Ltd.	Edgerton, Alberta; Grand Banks, Newfoundland, and Scotian shelf, Nova Scotia	1.2.
Do.	do.	do.	1.4.
Do.	BP Canada Inc. (The British Petroleum Co. PLC London, 100%)	Noel Area, North Alberta; Chauvin, Sibbald, north Pembina, Alberta	6.6.
Do.	do.	do.	1.3.
Do.	Brent Resources Group Ltd.	Whiteside, Dodsland, Gleneath, and Lucky Hills, Saskatchewan	171.
Do.	do.	do.	1.2.
Do.	Canadian Occidental Petroleum Ltd. (Occidental Petroleum Corp. USA, 100%) (Noranda, 87%; Kerr Addison Mines, 13%)	Eaglesham, Talbot, Peelho, Bilbo, Carrot Creek, Pembina, Alberta	3.3.
Do.	do.	do.	0.8.
Do.	Canadian Hunter Exploration Ltd. (Noranda, 87%; Kerr Addison Mines, 13%)	Dome Moore, Burnt Lake, Primrose, Alberta	3.2.
Do.	do.	do.	1.3.
Do.	Canterra Energy Ltd. (Canada Development Corp., 100%)	Grand Banks, Canterra, Beaufort Sea, Terra Nova, and Raimbo Lake, Ram River, Alberta	1.7.
Do.	do.	do.	1.8.
Do.	Chevron Canada Resources Ltd. (Chevron Corp., USA, 100%)	West Canada, Marrtime, Alberta	31.
Do.	do.	do.	2.0.
Do.	Dome Petroleum Ltd.	Primrose, Lindbergh, Alberta	23.8.
Do.	do.	do.	1.8.
Do.	do.	do.	6.2.
Do.	do.	do.	6.1.
Do.	Encor/Energy Corp. Ltd. (Encor, 52%; Dome Petroleum Ltd., 48%)	Lubicon, Red Earth, Rainbow, Groat, Garrington and Wembley, Alberta	3.3.
Do.	do.	do.	47.5.
Do.	do.	do.	150.
Do.	do.	do.	1.7.
Do.	Gulf Canada Corp. (Olympia & York Developments, 80%) Gulf, 20%)	Fenn-Big Valley, Swan Hills, Goose River, Peerless, and Sene, Alberta	33.1.
Do.	do.	do.	3.9.
Do.	do.	do.	8.8.
Do.	Home Oil Co. Ltd.	Red Earth, Garrington, Cherhill, Medicine River, and Swan Hills, Alberta	12.0.
Do.	do.	do.	1.7.
Do.	Husky Oil Ltd. (Nova Corp., 57%; Husky, 43%)	Lloydminster, Cold Lake, Alberta	13.9.

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Industrial minerals—Continued			
Energy fuels—Continued			
Principal Canadian oil and gas companies—Continued	Husky Oil Ltd. (Nova Corp., 57%; Husky, 43%)	Lloydminster, Cold Lake, Alberta	1.5.
Do.	Imperial Oil Ltd. (EXXON Corp., USA, 70%; others, 30%)	Judy Creek, Cold Lake, Alberta, and Mackenzie Delta, Beaufort Sea, Yukon and Northwest Territories	37.3.
Do.	do.	do.	1.5.
Do.	do.	do.	1.5.
Do.	Mobil Oil Canada Ltd. (Mobil Corp., USA, 100%)	Hibernia, Grand Banks, southeast of Newfoundland and Sable Island, Nova Scotia, and others in Alberta, Sasketchewan, and British Columbia	26.1.
Do.	do.	do.	3.0.
Do.	Murphy Oil Co. Ltd.	Onoway, Enchant, Drumheller, Buck Lake, Hilda, Three Hills Creek, Alberta	2.8.
Do.	do.	do.	0.6.
Do.	Norcen Energy Resources Ltd. (Hollinger Inc., 59%; Hees International, 41%)	Pembina, Bodo, Majorville, Alberta	12.2.
Do.	do.	do.	3.9.
Do.	Oakwood Petroleums Ltd.	Grantham, Hays, Ronalane, Peace River, Normandville, Randell, Alberta, and Grizzly Valley, British Columbia	24.6.
Do.	do.	do.	0.8.
Do.	PanCanadian Petroleum Ltd. (Canadian Pacific Enterprises, 87%; Others, 13%)	Rycroft, Wembley, Elk Point, Rio Bravo, Alberta	14.7.
Do.	do.	do.	8.4.
Do.	do.	do.	9.9.
Do.	do.	do.	1.8.
Do.	Saskatchewan Oil & Gas Corp. (Provincial Government, 81%; private 19%)	Weyburn, Raplan, Mannville, Saskatchewan, and Rainbow Lake, Wainwright, Alberta	2.9.
Do.	do.	do.	1.8.
Do.	do.	do.	20.0.
Do.	Shell Canada Ltd. (Shell Investments, 79%; Others, 21%)	Dimsdale, Little Smoky Lake, Sousa, Alberta, Midale, Benson, Sasketchewan	23.3.
Do.	do.	do.	2.3.
Do.	Suncor Inc. (Sun Co. Inc., USA, 75%; Ontario Energy Resources, 25%)	Kidney, Zama Lake, Cosway, Albersun Prevo, and Medicine River, Alberta and Leitchville, Unwin, Saskatchewan	13.7.
Do.	do.	do.	474.5.
Do.	Texaco Canada Inc. (Texaco Inc., USA, 78%; Others, 22%)	Eaglesham, Virgo, Alberta, & Desan, British Columbia	51.0.
Do.	do.	do.	1.5.

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Industrial minerals—Continued			
Energy fuels—Continued			
Principal Canadian oil and gas companies—Continued	UNOCAL Canada Ltd.	Calgary, Alberta	14.7.
Do.	do.	do.	0.5.
Coal:	Brinco Coal Corp.	Quinsam Coal Mine, Campbell River, British Columbia	14,400 (open pit underground).
Do.	Cal Graphite Corp.	Lively, Ontario	3,000 (open pit).
Do.	Cape Breton Development Corp.	Sydney, Nova Scotia	2,900 (underground).
Do.	do.	do.	22,000 (longwall).
Do.	Crows Nest Resources Ltd. (Shell Canada Resources, 100%)	Line Creek Mine, British Columbia	2.1 (open pit).[1]
Do.	Fording Coal Ltd.	Genesee Coal Mine, Warburg, Alberta	1.5 (open pit).[1]
Do.	Luscar Ltd.	Coal Valley Mine	2.2 (open pit).[1]
Do.	do.	Paintearth Mine, Forestburg, Alberta	2.0 (open pit).[1]
Do.	do.	Obed Mountain Mine, Hinton, Alberta	3.5 (open pit).[1]
Do.	Estevan Coal Corp.	Bienfait Mine, and Boundary Dam Mine, Estevan, Sasketchewan	2.3 (open pit).[1]
Do.	Manalta Coal Ltd.	Gregg River Mine, Hinton, Alberta	3,960 (open pit).
Do.	do.	Montgomery Mine, Hanna, Alberta	4,140 (open pit).
Do.	do.	Costello Mine, Estevan, Saskatchewan	3,240 (open pit).
Do.	do.	Vesta Mine, Halkirk, Alberta	2,232 (open pit).
Do.	do.	Highvale Mine, Seba Beach, Alberta	11,610 (open pit).
Do.	do.	Utilrty Mine, Estevan, Saskatchewan	3,600 (open pit).
Do.	Smoly River Coal Ltd.	Grande Cache, Alberta	3,600 (underground and open pit).
Do.	Teck Corp.	Bullmoose Mine, Tumbler Ridge, British Columbia	2.3 (open pit).[1]
Do.	Westar Mining Ltd.	Balmar Sparwood, British Columbia	9,720 (open pit and underground).
Do.	do.	Greenhills, Sparwood, British Columbia	2.4 (open pit).[1]
Do.	North Star Cement Ltd.	Corner Book, Newfoundland	160 (dry process cement).
Do.	Lafarge Canada Inc.	Brookfield, Nova Scotia	450 (dry process cement).
Do.	do.	Havebak, New Brunswick	315 (dry process cement).
Do.	do.	Montreal East, Québec	600 (grinding).
Do.	do.	St. Constant, Montreal, Québec	921 (dry process cement).
Do.	do.	Bath, Montreal, Québec	1,000 (dry process cement).
Do.	do.	Woodstock, Ontario	500 (wet process cement).

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Industrial minerals—Continued			
Coal—Continued	Lafarge Canada Inc.	Fort Whyte, Manitoba	402 (grinding cement).
Do.	do.	Steep Rock, Manitoba	906.2 (quarrying limestone).
Do.	do.	Exshaw, Alberta	1,080 (dry process cement).
Do.	do.	Kamloops, British Columbia	190 (dry process cement).
Do.	do.	Richmond, British Columbia	335 (wet process cement).
Do.	Scotia Limestone Ltd.	Iris Cove, Sydney, Nova Scotia	720 (limestone).
Do.	Ciment St. Laurent Inc. (Private, 100%)	Joliette, Québec	1,075 (dry process cement).
Do.	Indusmin Ltd. (Falconbridge Inc., 100%)	St. Canut, Ontario	648 (silica).
Do.	St. Lawrence Cement Inc.	Mississauga, Ontario Beauport, Québec	1,900 (wet and dry).
Do.	do.	do.	648 (wet process cement).
Do.	Lake Ontario Cement Ltd.	Picton, Ontario	1,260 (dry process cement).
Do.	St. Marys Cement Corp.	Bowmanville, Ontario	720 (wet process cement).
Do.	do.	St. Marys, Ontario	720 (wet-dry process cement).
Do.	Inland Cement Ltd.	Winnipeg, Manitoba	310 (wet process cement).
Do.	do.	Mafeing, Manitoba	720 (limestone).
Do.	do.	Regina, Saskatchewan	225 (dry process grinding cement).
Do.	do.	Plant Edmonton, Alberta	842 (dry process cement).
Do.	do.	Cadomin, Alberta	2,160 (quarry limestone).
Do.	Kildonan Concrete Products Ltd.	Winninpeg, Manitoba	76.6 (clay).[2]
Do.	Tilbury Cement Ltd.	Delta, British Columbia	360 (dry process cement).
Do.	Havelock Ltd. (Kickenson Mines, Ltd. 100%)	Havelock, New Brunswick	864 (limestone).
Do.	do.	do.	500/R-1/V-1 (quicklime). (hydrated-lime).
Do.	Graybec Inc. (Domlin Inc., 100%)	St. Adolphe-de-Dudwell, Québec	2,250/416/V-1 (hydrated-lime) (calcium).
Do.	do.	Joliette, Québec	6,000/783/R-3 (quicklime and calcium).
Do.	BeachviLime Ltd.	Beachville, Ontario	10,800/R-5 (high-calcium lime).
Do.	General Chemical Canada Ltd.	Amherstburg, Ontario	3,200/V-5 (high-calcium lime).

See footnotes at end of table.

TABLE 8—Continued

CANADA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Annual capacity (Thousand metric tons unless otherwise specified)
Industrial minerals—Continued			
Coal—Continued	Steetley Quarry Products Inc.	Dundas, Ontario	1,000/958/R-3 (refractory lime).
Do.	Continental Lime Ltd.	Faulkner, Manitoba	1,440/320/R-1 (crushed stone).
Do.	do.	Kananaskis, Alberta	2,070/360/R-2 (pebble).
Do.	do.	Pavilion Lake, British Columbia	1,540/635/R-2 (hydrated-lime).

[1]Million metric tons per year.
[2]Thousand cubic meters per year.

industry benefited from cheap hydroelectric power, lower operating costs, and increased productivity; however, further weakening of metal prices increased metal stocks that eased the tight supply of 1988. The stabilization of inventories, expectations of additional production from smelter projects to be completed in 1991, and labor agreements caused prices to moderate toward yearend. Production of primary aluminum decreased 1% although shipments of aluminum to the United States increased slightly to a level of 810,000 tons.

At yearend, Canadian smelters were operating at full capacity, with the exception of Alcan Aluminum Ltd.'s Arvida plant in Jonquiere, Quebec, which operated at 88% of its 432,000-ton capacity. However, as a result of a favorable climate for the aluminum industry in Canada and firm worldwide demand, Alcan reported a record-high net income of $931 million, an increase of $498 million from that of 1988.

Two important projects were undertaken to ensure Alcan's position as the lowest cost aluminum producer in the world. Construction began on a new 200,000-ton-per-year smelter at Laterriere, Québec. The new smelter was projected to cost $600 million and will replace part of the Soderbeg facility at the Arvida smelter. It will result in a 60% reduction in polycyclic aromatic hydrocarbon (PAH) emissions and appreciable savings in energy and labor. Production from the first of four 50,000-ton-per-year potlines was at 40% of available capacity due to a shortage of electric power caused by drought in Eastern Canada in 1989. Alcan also announced that expansion of the Kemano, British Columbia, hydroelectric plant will bring additional capacity of 520 megawatts at a cost of $480 million. When the plant expansion is completed in 1994, Alcan has planned to sell surplus power to BC Hydro and Power Authority, the provincially owned utility. Construction was begun on a $30 million facility at Jonquiere, Québec, for production of 12,000 tons per year of aluminum and ceramic composites, which will offer superior strength and stiffness at a low cost.

Aluminerie de Bécancour proceeded with a 120,000-ton-per-year expansion of its smelter in Québec. This expansion was projected to cost $550 million and to come on-stream in 1991. Total expenditures will amount to $1.4 billion, and the work force will increase from 775 to 1,000 employees. Initial production from the 360,000-ton-per-year expanded facility was expected to start in early 1991.

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 Finacement du Québec (SGF) (20%); Kobe Steel Ltd. (13.33%); and Marubeni Corp. of Japan (6.67%) agreed on September 1, 1989, to construct a new aluminum smelter at Sept-Iles, Québec. The first phase of 215,000-ton-per-year capacity was expected to be on-stream in 1992, and a second phase of similar capacity was planned for 1995. The entire project will cost $2 billion. The Governments of Canada and Québec signed an agreement on November 24, 1989, to pay $4.4 million each to the city of Sept-Iles for the construction of industrial infrastructure required for the Alouette project. The Canadian Government announced a $68 million program to improve facilities and transportation infrastructure at the Port of Sept-Iles to accommodate traffic caused by the new Alouette smelter.

On March 15, 1989, Reynolds Metals Co. of the United States announced a $500 million expansion of its Baie Comeau smelter, which will increase capacity by 120,000 tons per year to 400,000 tons per year. The project was expected to be completed by the end of 1991. Employment at the smelter will increase by 250 to about 2,000. It was reported in December that Wabush Alloys Inc. of the United States had agreed to purchase the business and certain assets of Metal & Alloy Co. Ltd.'s secondary aluminum facility in Toronto. Wabush Alloys, the largest secondary aluminum producer in North America, operates five secondary smelters in the United States.

In Manitoba, Alumax Inc. and the Provincial Government held discussions for the possible establishment of a new smelter. According to Alumax, Manitoba was one of several possible locations,

including sites in British Columbia, Iceland, Québec, and Venezuela.

Connecticut Metal Industries Inc. of the United States and Exalloy Metals of Canada announced the construction of a pilot plant in Toronto, Ontario, to recycle plastic-coated aluminum scrap. The facility was expected to process 90 tons per month. Environmental protection remained a high priority in the facility's current operations and planned investments.

Copper.—The price of copper on the London Metal Exchange (LME) increased in 1989 as a result of labor strikes in Peru, strong world demand, and falling inventories. The average LME price was $1.29 per pound and $1.25 on the New York Commodities Exchange (COMEX). Canadian copper producers benefited from the higher prices. Mine production was 722,000 tons.

Cominco Ltd.'s major Canadian copper-molybdenum mine was Highland Valley Copper (HVC) at Logan Lake, British Columbia, a partnership of Cominco Ltd. (50%), Rio Algom Ltd. (33.5%), Teck Corp. (11.5%), and Highmont Mining Co. (5%). In February 1989, HVC announced a $70 million expenditure to expand the Lornex milling complex and relocate the two Highmont mills to a site adjacent to the Lornex mill. HVC expected the current effective capacity of 91,000 tons to be increased to 131,000 tons per day by this expansion. The former Bethlehem Copper mill as a part of the Lornex complex produced 29,000 tons per day in 1989. It will be placed on a standby basis once the expanded Lornex mill becomes fully operational. However, the Bethlehem mill will be maintained to supplement production should market conditions warrant. Total ore processed at the Lornex mill was 44,100,000 tons. Most of the copper concentrate was sold to Japan under long-term contracts. The remaining concentrate was sold to other countries in Asia, Europe, and South America.

Noranda Inc. (60%) and BP Canada Inc. (40%) continued exploration of the Tally Pond joint venture in central Newfoundland. Exploratory drilling at yearend provided additional reserves of 4 million tons of ore at 3.5% copper, 6.6% zinc, 1.1% lead, 67.4 grams of silver per ton, and 1 gram of gold per ton; eventually, this could be an important feed source for Noranda's Murdochville, Québec, copper smelter.

Noranda Inc. committed $20 million to reopen its Murdochville Mine, which closed in April 1987 because of an underground fire. At the Horne smelter, work started on the $125 million acid plant, which was to be completed by the end of 1989. Noranda initiated a tankhouse modernization at its Montreal East copper refinery.

Minnova Inc.'s Lac Dufault Div. (Ansil Mine Project, Norbec mill) opened its Ansil Mine in Québec. Work continued with development of the upper part of the mine and the 1,460-meter level at the bottom of the mine. Full production at 450,000 tons per year was expected to commence by mid-1990.

Geddes Resources Ltd.'s Windy Craggy copper, gold, silver, and cobalt property in the extreme northwest part of British Columbia was the largest copper deposit being explored in Canada. Drilling indicated resources were in excess of 120 million tons with 1.67% copper, plus gold, silver, and cobalt values. A feasibility study was to be completed early in 1990 with a $400 million, 120,000-ton-per-year copper operation starting in 1994.

Hudson Bay Mining & Smelting Co. Ltd. (HBM&S) of Manitoba proposed a $130 million program to reduce SO_2 emissions and to modernize operations at its Flin Flon copper smelter. Copper production was planned for about 75,000 tons per year from the eight new or reopened mines.

Gold.—Gold prices trended downward from $487 per troy ounce in 1988 to slightly more than $381 per troy ounce in 1989. The 1989 average price was about $56 less than the 1988 average of $437 per troy ounce.

Production increased by more than 17%, from 135.9 tons in 1988 to 159.1 tons of gold in 1989. Canadian proven and probable gold reserves, including operating mines, mines under development, and tailings, increased by 15% to 1,700 tons of gold.

Placer Dome Inc. (PDI) was one of the world's significant gold producers and was the leading gold producer in Canada. The company operated 12 gold mines out of a total of 18; 13 PDI mines are in Canada and the United States, and the others are in Australia, Papua New Guinea, and Chile. PDI has a production capacity of about 32,000 kilograms (kg) of gold annually.

PDI's Dona Lake Mine and mill at Pickle Lake, Ontario, with a capacity of 550 tons per day, were completed on schedule at a cost of $43 million. Production commenced in April 1989 at an estimated production cost of $7,800 per kg of gold. Proven and probable reserves were 754,000 tons at 7.46 grams per ton, plus 1.17 million tons at 5.29 grams per ton at depth as a potential source of gold.

The Dome Mine in Timmins, Ontario, had a modern carbon-in-pulp recovery circuit; a 10% increase in capacity to 3,300 tons per day was achieved. The expected annual gold production will be about 4,100 kg.

Houston Metals Corp. announced the discovery of more ore at the Silver Queen Mine, which was under development near Houston, British Columbia. Currently estimated reserves were 1.73 million tons at 2.80 grams per ton of gold, 328.14 grams per ton of silver, and 6.2% zinc with associated copper and lead values.

Canamax produced its first gold from the Kremzar Mine, 32 kilometers (km) northeast of Wawa in Northern Ontario. The mine was expected to produce about 1,000 kg of gold per year at an estimated cost of $9,500 per kg.

ERG Resources Inc. opened its $78 million tailings project. The expected annual gold production will be about 3,400 kg. The new mill in Schumacher will process more than 200 million tons of tailings from the Timmins area, which can support 17 years of recovery operations.

Cambior Inc. and Lac Minerals invested $74 million to bring the Doyon Mine into production and $21 million to expand the mill. An additional $16 million expenditure was planned to boost underground production to 3,000 tons per day.

In the Northwest Territories, Neptune Resource Corp. began construction on the $155 million, 10,000-ton-per-day Colomac open pit gold mine 220 km north of Yellowknife. Its production was expected to be 6,224 kg per year of gold starting in 1990. Numerous exploration projects for gold were underway in Ontario during 1989. These included a $17 million underground exploration project at the Musselwhite site where a feasibility study was being undertaken for a $100 million, 2,200-ton-per-day mine. In Atlantic Canada, Novagold Resources Inc. opened its Murray Brook silver-gold mine near Bathurst, New Brunswick, and expected to produce 373 kg per year of gold

and 3,110 kg per year of silver over a 5-year period. The Hope Brook Mine of BP Resources Canada Ltd. in Newfoundland increased its gold production in 1989, but was unable to achieve profitability. Milling was suspended in February and March to modify its process method, and underground development was completed during the year.

Iron Ore.—About 53% of Canadian iron ore was exported to Europe and Japan. Canada shares about 4% of world production and about 8% of world trade. Six iron ore mines operated in Canada, and production was estimated at 40.6 million tons. Canadian shipments of iron ore increased 0.8 million tons to 40.9 million tons, including shipments from stockpiles, at a value of $1.5 billion. Exports exceeded 30 million tons, and Western Europe was the largest market for Canadian iron ore. The United States imported more than 9 million tons. The world price recovery during 1989 increased sales from Canadian iron ore mines attracting investors because of improved rate of return on investment.

Iron Ore Co. of Canada (IOC) shipped about 37% of Canadian iron ore production. IOC and the Canada Centre for Mineral and Energy Technology (CANMET) entered into a joint venture to use their combined technology on magnetic and flotation concentration of iron ore to improve IOC's recovery of fine iron ore particles.

Québec Cartier Mining Co. (QCM) sold about 16.1 million tons of iron ore. QCM produced products that are tailored to customer requirements. Main grades of pellets were acid, low silica, and self-fluxed. Pellet plant production exceeded 8 million tons per year.

Production from Wabush Mines at Labrador, Newfoundland, was more than 6 million tons. Wabush offered three products; namely, acid pellets with 1% and 2% manganese and fluxed pellets with 1% manganese.

Dofasco Inc.'s two iron mines, at Adams and Sherman in northern Ontario, produced more than 1 million tons of fluxed pellets each. Production at both mines was reduced because of shortage of electrical power due to the cold weather late in the year.

The Adams concentrator closed for 3 weeks in July, and the Sherman Mine stopped all operations for 5 weeks in the summer.

Lead and Zinc.—The average price of zinc reached 77.7 cents per pound. The LME High Grade (HG) price averaged 60 cents per pound. The LME lead price remained steady, and the price averaged 30.6 cents per pound in 1989.

Cominco Ltd.'s integrated smelter and refining complex at Trail, British Columbia, produced a wide range of metals, principally refined gold, lead, silver, and zinc. Annual rated capacity was 250,000 tons. More than 50% of Cominco's lead and zinc concentrates was refined at Trail. Cominco's Sullivan Mine at Kimberly, British Columbia, was the main supplier of lead and zinc concentrates to Trail. Mill feed increased by 61%, the second highest level in more than 20 years.

A joint venture between Cominco (55%) and Pine Pont Mines Ltd. (45%) operated the Polaris lead-zinc mine at Little Cornwallis Island, Northwest Territories. This mine was the Western World's most northerly base metals operation. Concentrates were shipped to European smelters during a 10-week period in the summer when shipping channels were open for navigation. The facility, which went into production in March 1982, was internationally recognized for its modern mining and milling technology under permafrost conditions. The Polaris Mill treated a record 1,016,000 tons of ore. Ore reserves at yearend amounted to 14 million tons. Exploration in the mine area recommenced in 1989.

HBM&S began development of its Callinan copper and zinc deposit in northern Manitoba in addition to the expansion of its Chisel Lake lead and zinc mine in Manitoba. The 15,000 to 18,000 tons per year of zinc concentrate will replace declining mine output in the Flin Flon area.

Nickel.—This commodity had an impressive performance in 1989. Costs were reduced from $1.97 per pound in 1984 to $1.41 in 1989. In 1989, the LME averaged $6.04 per pound of nickel. The stainless steel industry worldwide consumed 55% of the nickel produced. Major nickel consumers were Japan, the United States, and Western Europe, all accounting for 90% of the nickel demand. The demand for nickel in the Western World increased by about 13,000 tons. Noranda Inc. and Trelleborg of Sweden acquired Falconbridge for $2.2 billion. The Provincial Government announced that the Inco and Falconbridge sulfur dioxide containment programs were to be brought into compliance with Ontario's regulations, effective in 1994.

Inco announced plans for a $454 million capital investment program, including the $100 million development of the Thompson South open pit mine and the reactivation of the Birchtree Mine. Ore produced from these mines will replace ore from the open pit Thompson North Mine, which will be depleted in 1990. Falconbridge planned to spend $38 million on research, development, and capital requirements to increase pyrrhotite rejection and roasting capacity to minimize SO_2 emissions. In addition, Falconbridge planned to spend $33 million at its underground Lindsley project near Sudbury, the development of which was expected to be completed in 1991.

Sherritt Gordon Ltd. produced 21,000 tons of nickel in briquets and powder at its Fort Saskatchewan, Alberta, refinery. HBM&S (60%) and Outokumpu Mines Ltd. (40%), owners of the Namew Lake nickel mine, about 64 km south of Flin Flon in Manitoba, developed the $70 million project to produce 9,200 tons of nickel in concentrate annually. Known reserves were 2.6 million tons at 2.44% nickel and 0.9% copper.

Inco Ltd. announced plans to develop the McCreedy East Mine near Sudbury in Ontario at a cost of $179 million. Mining was expected to begin in 1993 and full production in 1996, which was expected to be 18,000 tons per year of nickel and 9,000 tons per year of copper. This mine will be the first major new mine developed by Inco in Sudbury in more than 20 years.

Silver.—In 1989, average silver prices decreased to $5.50 per ounce. Production of most of Canada's silver was as a by-product of base metals. In Ontario, the largest silver-producing Province, output declined by 5% to 454,100 kg because of the decline in the production of base metals.

Agnico Eagle Mines Ltd. operated three silver mines in the cobalt area of eastern Ontario. The company's refinery produced about 40,400 kg of silver. With the closure of the primary silver producers in Ontario and the Yukon Territory because of declined silver prices, production of silver was principally a by-product of base metal or gold operations.

Other Metals.—The strong performance of cadmium, at $5.00 per pound,

reflected the unprecedented growth in demand for nickel-cadmium batteries in the consumer goods market. Cominco announced the construction of a new indium plant at its British Columbia Trail facility by which the company expected to increase production capacity to more than 31,000 kg per year.

Rio Algom Ltd.'s subsidiary, Rio Kemptville Tin Corp., owned and operated the East Kemptville open pit and concentrator near Yarmouth, Nova Scotia. These facilities processed 2,000 tons per day of ore to produce 5,700 tons of tin concentrate for the year containing 55.9% tin with minor values of copper and zinc. Proven and probable tin reserves at yearend were 36.4 million tons at 0.175% tin, 0.10% copper, and 0.18% zinc.

In 1986, low tungsten prices forced the closure of Canada Tungsten Mining Corp. Ltd.'s Cantung Mine in the Northwest Territories. Continuing low prices for tungsten led to the shutdown of the mine during 1989. About 60 tungsten mines in the Western Hemisphere have closed in recent years because of excess supply and resulting very low prices. China controlled 60% of world trade in tungsten. Carbovan Inc. began building a plant in Alberta; when completed, it will recover approximately 1,000 tons per year of vanadium oxide from fly ash derived from Athabasca tar sands. Production was planned for early 1990, and the plant was reported to cost $15 million.

After a lapse of 6 years, Tantalum Mining Corp. of Canada Ltd. (Tanco) resumed production in August of tantalum at its Bernic Lake lithium-tantalum-cesium mine in Manitoba. Highwood Resources Ltd. and Hecla Mining Co. of Canada Ltd. planned to evaluate the Lake Zone deposit of the Thor Lake rare-metals project about 100 km southeast of Yellowknife, Northwest Territories. Canadian molybdenum production decreased to 12,388 tons, and production value decreased to $108 million. The five molybdenum producers were Placer Dome Inc., Brenda Mines Ltd., Highland Valley Copper, Utah Mines Ltd., and Gibraltar Mines Ltd. The Endako Mine of Placer Dome Inc., Canada's only primary molybdenum producer, has been operating at capacity since October 1988. Canada was the third largest cobalt producer in the world in 1989 and exported about 90% of its production. Cobalt from Canadian sources was recovered as a byproduct of nickel refining by Inco at Port Colborne, Ontario; Sherrit Gordon Ltd. in Fort Saskatchewan, Alberta; and Falconbridge in Norway. Canadian cobalt production was 2,337 tons valued at $45.5 million.

Industrial Minerals

Asbestos.—Canadian production of asbestos fiber, despite health concerns about asbestos, increased 13.5%. Developing countries consumed an estimated 42% of Canada's output. The balance was consumed by Japan, the United States, and Western Europe. Total sales were 691,000 tons valued at $259 million.

Cliff Resources of Toronto acquired controlling interest in Baje Verte Mines (BVM) of Newfoundland. The firm was constructing a wet-milling process, which will allow secondary recovery of short asbestos fibers from tailings. BVM ore reserves neared depletion, but this new process was expected to extend the life of BVM by about 15 years.

Cassiar Mining Corp. negotiated a $25 million development loan from the British Columbia Government to finance the $43 million development of the underground McDame asbestos deposit. Mine development started in 1988; production was planned for the middle of 1990 at 5,500 tons of ore per day.

Potash.—The value of potash output decreased to $750 million, a loss of almost 11.5%. Canada produced 7.4 million tons in 1989.

Potash Corp. of Saskatchewan (PCS) made a dramatic comeback, with a net profit of more than $85 million in 1989 after a $21 million loss in 1987 and a $104 million loss in 1986. PCS produced 4,350,000 tons of potash. PCS indicated that productivity increased by 15% to 20% at each of its five potash mines. The Saskatchewan legislature passed a bill to privatize PCS on August 14, 1989. Cominco's potash operations near Vanscoy, Saskatchewan, completed a very successful year as a result of improved productivity, record sales, and higher prices. Production increased to 963,000 tons. Noranda's Central Canada Potash subsidiary produced 1,030,000 tons of potash in 1989.

Potash Co. of America (PCA), a subsidiary of Rio Algom Ltd., was a major Canadian producer of potash for use in fertilizers. PCA operated its mining and processing facilities at Sussex Mine in Sussex, New Brunswick, and at Saskatoon Mine in Saskatoon, Saskatchewan. The Sussex facilities operated at 87% capacity to produce 608,000 tons of potash. At the Saskatoon Mine, which ceased production in 1987 because of mine flooding, work resumed in August 1988 under a $24 million program to produce potash by solution mining. It was expected that full capacity could be reached by the mid-1990's to produce more than 700,000 tons of potash.

Other Industrial Minerals.—Cominco Fertilizers produced three main nutrients for agriculture usage: nitrogen (1,455,600 tons), phosphates (140,500 tons), and potash (1,061,700 tons). The principal commercial products were anhydrous ammonia, ammonium nitrate, ammonium sulfate, potash, and urea. Cominco also produced sulfur in the form of sulfur dioxide as a byproduct of metal smelting. Most of the sulfur dioxide was converted to sulfuric acid, which was then used to process phosphate rock into fertilizer-grade phosphate compounds.

Brunswick Mining and Smelting Corp. produced about 129,200 tons of diammonium phosphate at its New Brunswick fertilizer plant from phosphate rock imported from Florida.

Silica shipments increased in Québec, Manitoba, and British Columbia and decreased in Ontario and Newfoundland. Consumption of foundry sand and silica sand used in the silicon carbide industry increased because the iron, steel, and base metal industries increased their activity. Canadian production was 2,634,500 tons.

Canada's shipments of all types of salt increased by 6% to about 11.3 million tons, of which 63% was from Ontario. Production of salt was 13% higher than that in 1988 (or 10.6 million tons) because of high operating levels, particularly in New Brunswick, Ontario, and Québec. Canadian Salt Co. Ltd. continued development of a new mining level at its Pugwash property in Nova Scotia. The development was expected to be completed in 1990. A new brine evaporator was installed to improve recovery.

Canadian cement production capacity decreased to 14.4 million tons per year. Given the strong demand in 1989, imports of both clinker and cement increased. St. Mary's Cement planned to double production capacity at Bowmanville, Ontario, by mid-1991 at a cost of $160 million. St. Lawrence Cement Inc. completed work at its Mississauga,

Ontario, facility on a $13.5 million kiln modification to reduce production costs.

Domtar Inc. continued development at its new underground gypsum mine adjacent to its Caledonia complex in Ontario at a cost of $13 million. Full production was expected to begin in early 1990.

Newfoundland Resources & Mining Co. Ltd. continued development of its limestone aggregate operation at Port Peninsula, Newfoundland.

Mineral Fuels

Coal.—Demand in the worldwide steam coal market strengthened because electricity use grew. However, low prices more than offset the favorable demand trend. Canada's record coal production was attributed to high exports to Japan and Korea. Canadian coal production increased to a record 71 million tons. Exports reached an alltime high of 33 million tons.

The dollar value of coal output increased to $1.8 billion in 1989, a 1.7% gain. Canada exported 16.5 million tons to Japan and continued to sustain a 26% share of the Japanese market. The Coal Association of Canada estimated that total coal output was composed of 65% thermal coal and 35% metallurgical coal.

Teck Corp.'s Bullmoose open pit coal and processing facilities were in northwestern British Columbia about 30 km northwest of Tumbler Ridge. More than 2 million tons of coal was processed there, resulting in the recovery of 1.7 million tons of metallurgical coal.

Gulf Canada Corp. shipped test quantities of anthracite from the Mount Klappan Mine, in the northwestern part of the Groundhog coalfield of Intermontane, British Columbia, to Korea and Western Europe with favorable results. The mine has estimated coal reserves of 6 billion tons. Relatively large-scale mining operations were being considered.

Natural Gas.—The value of natural gas produced increased to $5.3 billion. The soaring demand for natural gas created a rebound in pipeline construction activity.

Gulf Canada and partners applied for a license from the Canadian Government to export 89.6 billion cubic meters of gas over a 20-year period. Most of the gas will come from the Parsons Lake field in the Mackenzie Delta and Amauligak field in the Beaufort Sea.

Petroleum.—Improved prices of crude oil affected petroleum exploration and development activities in Canada. Despite a 3.6% decrease in crude oil production, better prices forced a 16.4% increase in the value of crude oil produced to $9.2 billion.

A consortium of Esso Resources Canada Ltd. (25%), Canadian Occidental Petroleum Ltd. (20%), Gulf Canada Resources Ltd. (20%), Petro-Canada Inc. (15%), Pan-Canadian Petroleum Ltd. (10%), and Alberta Oil Sands Equity (10%) signed a statement of principles with the Governments of Canada and Alberta to proceed with the development of a massive oil sand, called the Other Six Leases Operation (OSLO), about 130 km north of Fort McMurray in Northeast Alberta. OSLO will cost $3.5 billion, with production of 77,000 barrels of oil per day expected to start in 1996. Lease 31, among the 6 OSLO leases, covers 193 square kilometers and contains an estimated 3.5 billion barrels of bitumen. Bitumen is a tarlike substance that contains the hydrocarbons that are processed into light crude oil.

The Canadian Government also approved two other large oil projects, the $4.4 billion Hibernia Oilfield development off Canada's east coast and the $1.1 billion heavy-oil upgrader near Lloydminster on the western edges of Saskatchewan. Canada provided substantial financial aid to each of the OSLO, Hibernia, and Lloydminster projects.

The Athabasca oilsands, which includes OSLO, and the two other oil ventures, Hibernia and Lloydminster, contained an estimated 900 billion barrels of bitumen. This was equivalent to five times the proven crude oil reserves of Saudi Arabia.

Uranium.—Canada, with uranium mines in Saskatchewan and Ontario, produced about one-third of the world's supply in 1989.

The Canadian Mining and Energy Corp. (Cameco) of Saskatoon, Saskatchewan, was formed in October 1988 through the merger of provincially owned Saskatchewan Mining Development Corp. (61.5%) and federally owned Eldorado Nuclear Ltd. (38.5%). Both partners agreed to go public by selling 30% of Cameco in 1990, 30% in 1992, and 40% in 1995. Cameco's $1.26 billion of assets and almost 500 million pounds of uranium ore reserves made it the "Saudi Arabia" of the uranium industry worldwide. Cameco's largest asset was its 49% share of Cigar Lake's uranium deposit, which contained 14% of uranium oxide or 280 pounds of U_3O_8 per ton of ore. Cameco planned to go into production in 1993. The total value of uranium produced amounted to $851 million.

Reserves

Table 9 shows the levels of Canadian reserves of major mineral commodities as of the end of 1989, 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 increased about 9%. New operations and new commitments to produce gold from conventional gold mines and as a byproduct of base metal mines were the largest contributors to this increase; 76% or 1,453 tons of gold occurred in conventional mines; 19% or 359 tons as byproduct; and 5% or 102 tons were from tailings.

TABLE 9

CANADA: RESERVES OF MAJOR MINERALS

(Thousand metric tons unless otherwise specified)[1]

Asbestos, fiber		40,000
Coal, all types		6,000,000
Copper, metal content		12,693
Gold, metal	metric tons	[2]1,914
Gypsum		[3]500,000
Iron ore, iron content		10,000
Lead, metal content		6,969
Molybdenum, metal content		235
Natural gas	million cubic meters	[4]2,783,923
Nickel, metal content		6,279
Peat		[3]24,000
Petroleum	thousand cubic meters	[4]1,067,768
Potash, K_2O equivalent		4,400,000
Salt		[3]312,200
Silver, metal	metric tons	26,959
Sodium sulfate		[3]92,000
Sulfur		158,000
Zinc, metal content		21,116

[1]1989 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]1989 Canadian oil and gas handbook, The Northern Mines Press Ltd.

Canadian copper reserves decreased 2%. The largest single addition to copper reserves occurred at Teck Corp.'s Afton operations. The Ajax deposit, 13 km southwest of Kamloops, British Columbia, amounted to 23.4 million tons at 0.46% copper and 1.03 grams per ton of gold. Another significant addition to copper reserves came as a result of the discovery of a new mineralized ore horizon at Noranda Inc.'s Murdochville Mine in Quebec.

Canadian reserves of molybdenum decreased 3%. BHP-Utah's Island copper operation was the only net addition to reserves of molybdenum.

Curragh Resources Inc.'s Vangorda and Grum deposits in the Yukon Territory were largely responsible for contributing to Canadian reserves of lead. Another major contributor to lead reserves was Bathurst Base Metals Ltd.'s Caribou deposit.

Zinc reserves increased about 2%, reversing a constant decline since 1983. In addition to the Caribou Mine in New Brunswick, two new deposits of Hudson Bay Mining & Smelting Co. Ltd. in Manitoba, Chisel Lake North and Callinan, increased zinc reserves.

Silver reserves were up 5% at the beginning of 1989. Again, Vangorda and Grum deposits contributed to this increase. Three new mines were also contributors to silver reserves: the Samatosum Mine of Minnova Inc. and Rea Gold Corp.; the Premier Mine owned by Westmin Resources, Pioneer Metals Corp., and Canacord Resources Inc., both in British Columbia; and the Caribou Mine in New Brunswick.

Canadian reserves of nickel declined about 5%. Nickel reserves in Canada were still substantially larger relative to production levels than were the reserves of the other base metals.

The levels of Canadian reserves of seven major metals, in terms of metal contained in ore, were as follows: copper, 12.7 million tons; nickel, 6.3 million tons; lead, 7.0 million tons; zinc, 21.1 million tons; molybdenum, 235,000 tons; silver, 27,000 tons; and gold, excluding placer deposits, 1,914 tons.

INFRASTRUCTURE

The transportation system in Canada remained generally adequate. A total of 80,095 km of railroads was composed of 79,917 km of 1.435-meter gauge (129 km electrified) and 178 km of 0.915-meter gauge (mostly unused). Canada contained a total of 884,272 km of roads, composed of 712,936 km surfaced (250,023 km paved) and 171,336 km earth. There was 3,000 km of navigable inland waterways. The major shipping ports were Halifax, Montreal, Québec, St. John (New Brunswick), St. Johns (Newfoundland), Toronto, and Vancouver. Of the 85 ships that made up the merchant marine, 75 were available for transportation of mineral products.

OUTLOOK

Canada's economy was expected to see the slowest growth in a decade. An easing of spending by consumers, businesses, and Government; the possibility of continuing high interest rates; problems with Canada's trade performance; and a slowing U.S. economy were expected to impact negatively on Canada's economic performance. The strength of Canada's economy was intertwined with that of the United States. As a result, any softening of U.S. economic performance was expected to negatively affect the Canadian economy. Mining maintained a position of relative strength, and Canadian companies were well positioned to absorb effects of weaker prices. The United States-Canada Free-Trade Agreement should enhance the consumption of metals for both countries. New products incorporating "advanced materials," which include the specialty metals such as beryllium, gallium, and germanium, were expected to become important components of the mineral product lines. The decline in Canada's base metal reserves continued; neglect of base metal exploration remained a concern. It became necessary for Canada to find mineral deposits to replace those nearing depletion while at the same time keeping up with growth in world demand. Canada's mineral industry was well positioned to manage the future challenges and opportunities by maintaining its position as a significant contributor to the country's economy and supplier of its trading partners. The mineral industry had been a major contributor to the regional economies of Canada; as such, the Government of Canada was committed to fostering the development of the mineral and metal sectors as a foundation for regional economic development. Environmental issues were perceived as the main concern to development of the mineral economies in each of the Provinces and Territories. Companies were committed to the concept of "sustainable development," which required balancing good stewardship in the protection of human health and the natural environment with the need for economic growth.

Orex Exploration Inc. in Nova Scotia had encouraging results from its Goldboro gold deposit at Upper Seal Harbor and continued underground exploration and development. Industrial minerals and coal continued to be the mainstay of the Province's mineral industry. Increased demand was anticipated for limestone markets to counteract acid rain legislation. Abundant Nova Scotia peat reserves were being developed.

Exploration of base metals and gold, particularly in Bathurst, New Brunswick, continued. Because of deterioration of world antimony prices, Dominion Explorers Inc., operators of Canada's only antimony mine, announced plans in December for a shutdown of the Durham Mine in early 1990.

A highlight of 1989 was the discovery by Louvem Mines Inc. and Aur Resources Inc. of the world-class copper-zinc-silver-gold deposit in Louvicourt Township, 24 km east of Val-d'Or, Québec. Also of major importance was the discovery of the VSM Exploration Inc. base metal deposit on the Grevert property in Quevillon near Chibougamau. The Mazarin graphite deposit in the Fermont region constituted a major discovery made during the year. On July 6, 1989, Minnova Inc. initiated the Ansil Mine, which was a high-grade copper deposit in the Rouyn-Noranda area, and thus reduced Noranda Inc.'s dependence on imported feed. The concentrate produced by this new mine was processed through Noranda's smelting facilities in Rouyn, and the smelter output, anode copper, was shipped to Montreal East, Québec, for refining at Noranda's copper refinery.

The asbestos industry in Québec will be facing more difficult times. The phaseout and ban ruling issued by the EPA was totally unfavorable to the industry. Erosion of production was foreseen for the next several years while a decision from the U.S. Court of Appeals

concerning this ruling was not expected until late 1991.

Potash and uranium continued to contribute to mineral production in Canada even though Cameco's Cluff and Rabit Lake Mills operations in Saskatchewan were shut down for part of the year. Exploration activities decreased owing principally to a significant decline in gold activity resulting from lower gold prices. However, exploration for uranium increased even though uranium prices remained soft. The zinc-copper Hanson Lake deposit in Saskatchwan owned by Cameco and Trimin Resources Inc. underwent considerable development. The interest in diamonds intensified in 1989 following the discovery of kimberlite in mid-1988 in the Prince Albert area. Nine kimberlite occurrences had been identified, and three of them contained microdiamonds. In the future, sulfur may become the primary product from some ultrasour gas wells should the Bearberry project in Alberta prove feasible. Production of elemental sulfur was dependent on oil and gas production and prices. It was expected that increased exports of gas to the United States will help Canada maintain its leading role as sulfur supplier in the marketplace.

Four new coal mines opened in British Columbia, Canada, as a result of strong demand for Canadian coking coal. It was expected to remain strong because of higher demand for steel. Exploration for gold in the western portion of the Northwest Territories remained strong. The placer industry in the Yukon Territory had a good year, with more than 5,100,000 kg of gold produced and reported to the Department of Indian and Northern Affairs. Emphasis on base metal exploration continued. Feasibility studies of the Windy Craggy base metals project in British Columbia will be completed in 1991 to demonstrate its technical and economic potential.

[1]For more detailed information on the mineral industry, see the Canadian Mineral Surveys for 1988 and 1989, both of which were prepared by the Mineral Policy Sector and the Energy Sector, Department of Energy, Mines and Resources, Ottawa, Canada. The U.S. Department of the Interior, Bureau of Mines, has arranged to have these Canadian publications placed in libraries in each of the 50 States and Puerto Rico.

[2]Where necessary, values have been converted from Canadian dollars (CAN $) to U.S. dollars at the rate of CAN$1.1628 = US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

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Publications

Airgrams, Economic Reporting Questionnaires, Department of State, Statistics Canada, International Trade Division, AmEmbassy Ottawa, annual.

Canadian Institute of Mining and Metallurgy, monthly.

Canadian Mineral Analysts, monthly.

Canadian Mining Journal, Canada's Top Mining Companies, monthly.

Central Intelligence Agency, the World Factbook 1989, Washington, DC, annual.

Energy, Mines and Resources Canada, Canadian Minerals Yearbook, 1989 Report, annual.

Energy, Mines and Resources Canada, Canadian Mineral Industry Reports, monthly.

Energy, Mines and Resources Canada, Canadian Mines: Perspective for 1989, Production, Reserves, Development, and Exploration, annual.

Energy, Mines and Resources Canada, Mineral Policy Sector, Canadian Minerals, annual.

Energy, Mines and Resources Canada, Mining and Mineral Processing Operations in Canada 1989, Annual Mineral Bulletin.

Energy, Mines and Resources Canada, Production of Canada's Leading Minerals, monthly.

Maclean Hunter Publication, Rock Products Register, annual.

Metal Industry, Trends and Outlook, monthly.

Indian and Northern Affairs Canada, Conservation Advisory Committee on the Northern Mineral Policy, Report on IBP sites 1989, monthly.

Indian and Northern Affairs Canada, Mines and Mineral Activities 1989, annual.

Industrial Minerals of London, World of Minerals, monthly.

International Mining of London, Canadian Mining, monthly.

Latin American Newsletters, London, Latin American Economy and Business, monthly.

Latin American Newsletters, London, Latin American Weekly Report.

Mining Journal Ltd., London, Mineral Markets and Mining Finance, monthly.

Northern Miner Press Inc. Canadian Mines Handbook 1990-91, annual.

Northern Miner Press Inc., Canadian Oil & Gas Handbook, 1990-91, annual.

Penn Well Publishing Company, Worldwide Natural Gas Industry Directory, annual.

Penn Well Publication, Oil and Gas Journal, Worldwide Report, monthly.

Prospectors and Developers Association of Canada, monthly.

Québec Prospectors Association, monthly.

Répertoire, Des Etablissements Menant Des Opérations Minieres Au Québec, annual.

Statistics Canada, Coal and Coke Statistics, monthly.

Statistics Canada, Crude Petroleum and Natural Gas Production, monthly.

United Nations, 1989 Energy Statistics Yearbook, annual.

The Canadian Geoscience Council, monthly.

The Geological Association of Canada, monthly.

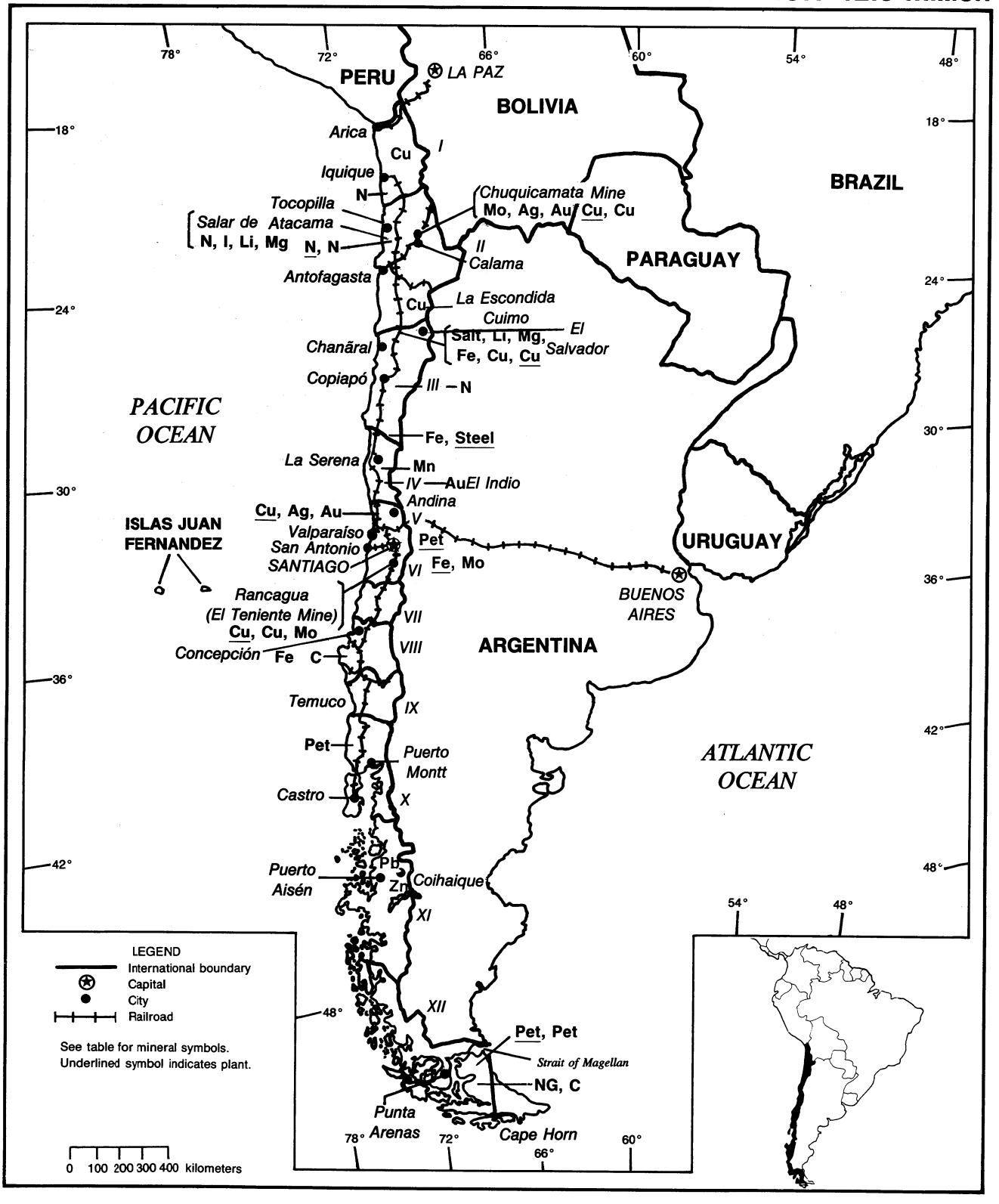
The Northern Miner, Canada's Mining Newspaper, daily.

The Wall Street Journal, newspaper, daily.

World Press Review, News and Views From Around the World, monthly.

CHILE

AREA 756,900 km² **POPULATION 12.8 million**



THE MINERAL INDUSTRY OF

CHILE

By Pablo Velasco

Chile retained its dominant position as the world's largest producer and exporter of copper, establishing another historical record in copper output in 1989 despite operational problems in some of the divisions of the Corporación Nacional del Cobre de Chile (CODELCO-Chile). Chile's copper production accounted for 22.7% of the total output of the market economy copper producing countries. Chile was also one of the world's significant producers and exporters of potassium and sodium nitrate. It ranked second in the world output of iodine, lithium, molybdenum, and rhenium, and Chile produced a record 21.4 tons of gold and 536.0 tons of silver in 1989. Based on the number of gold and silver projects currently under development, Chile's gold and silver production is expected to increase to 37.5 tons and 1,111 tons, respectively, by 1992.

The mining sector's contribution to the total export value was $4.76 billion or 58.7%. CODELCO-Chile, with its four mining divisions, contributed about 75.6% of the total copper produced. Despite the various problems confronted by CODELCO-Chile in 1988 and 1989, 1989 was another profitable year for the company. Based on pretax profits of $1.8 billion, the net profit of the company in its fifth consecutive year of growth amounted to $756.5 million, or a 22.4% increase over that of 1988.

CODELCO-Chile contributed $2.0 billion to the Chilean treasury in terms of profit sharing and taxes, or 33.6% greater than in 1988. A significant part of the higher profit was attributed to the substantial increase in the price of copper. The average copper price on the London Metal Exchange in 1989 was $1.29 per pound, almost 8.7% higher than the average price in 1988. Preliminary data released by the Ministry of Finance and the Central Bank indicated that the gross domestic product grew 10.0% to $25.5 billion[1] in 1989, the second highest annual rate in the past 30 years. After slight growth in 1988, output in the mining sector grew 8.4% in 1989, compared with 10% growth for the economy as a whole. The high-paced economic growth appeared to be because of the initiation of a number of large investment projects before the December 1989 election and the reduction of the foreign debt. The Central Bank, in 1989, continued the rapid pace of debt-swap conversions.

GOVERNMENT POLICIES AND PROGRAMS

Most of the legal provisions concerning mining activities in Chile are relatively new, having been developed since 1980. Foreign mining companies and banks used chapter 19 debt-to-equity swaps to finance a growing number of mining projects.

Chapter 19 debt-equity swaps have had a significant impact on Chile's mining sector. After the Central Bank of Chile's initial reluctance to authorize the use of debt-equity swaps in the mining sector, the first such investment was made in March 1987. This was then followed by a series of other investments by foreign mining companies and banks in a wide variety of projects. Chapter 19 debt-equity swaps have been a key mechanism for foreign investment in Chile. They permit foreign investors to purchase discounted foreign debt for conversion into equity investments in Chile. Under Central Bank regulations, these notes are redeemed at near face value (approximately 80 cents on the dollar) in Chilean pesos at the official exchange rate. These regulations also allow dividend remittance after 4 years and capital repatriation after 10 years. Chilean companies and individuals cannot carry out chapter 19 debt-equity swap operations, and each debt conversion is approved by the executive committee of the Central Bank of Chile. Since mid-1985, this and other debt reducing mechanisms have cut more than $8 billion from Chile's foreign debt. Until early 1987, foreign investment in mining operations was carried out almost exclusively under Decree law 600, Chile's main foreign investment law.

Bulk Maritime S.A. of Panama made the first chapter 19 debt-equity swap investment in Chile's mining sector in 1987. Bulk Maritime invested $2.5 million in debt papers to purchase 90% of the Cía. Minera Baritex's Juncal gold project in the Second Region. Bulk Maritime established an important precedent for foreign companies interested in using chapter 19 to invest in Chile's mining sector.

Other foreign mining companies that have received Central Bank of Chile authorization to invest in mining were LAC Minerals of Canada ($30 million) in Sociedad Contractual Minera El Toqui, The Amsterdam Pharmaceutical Co. of the Netherlands ($3 million) in Iris iodine project, The Chevron Resources Co. of the United States ($7.9 million) in mineral exploration, Pan Continental Minerals of the Cayman Islands ($11.3 million) in the development of a sulfur deposit, and Israel Chemical ($1 million) in joint venture with Sociedad Química y Minera de Chile (SOQUIMICH) to produce mixed salts. In addition to these projects, there was also an undetermined number of small mining projects that were still under consideration. Laws governing Chile's mining industry, which flourished under the military government, remain virtually intact. The country's private mining industry will not be touched, nor will Chile's

mining code that grants virtual property rights over mining concessions. Moreover, the country's lucrative foreign investment law will continue. The Government will take a hard look at CODELCO-Chile, possibly undercutting CODELCO's dominant role in the industry. The law approved by the new Government limits the power of CODELCO's president and provides the board of directors with added power.

PRODUCTION

The Chilean mining industry experienced continued growth in 1989 as a result of a combination of factors such as the implementation of the foreign investment law (Decree Law 600), the new labor code, the devaluation of the Chilean peso in 1982, the new Mining Code of 1984, chapter 19 debt-equity swaps, and the recovery of international mineral prices. As a result, Chile's mining sector became particularly attractive to domestic and foreign investors. The expansion of the Chilean mining sector was concentrated in four commodities: copper and its byproducts, precious metals, industrial minerals, and coal. Chile's copper production maintained the leadership with another record-high output. CODELCO-Chile contributed 75.6% of the world copper output. Production of copper and ferroalloys increased; pig iron, steel, and semimanufacture (hot-rolled products) declined; while industrial minerals registered 16 commodity increases, 14 showed decreases and 3 remained even. In general, coal, natural gas, and petroleum production decreased from their previous output levels.

TRADE

Mineral exports totaled $4.76 billion or 58.7% of the total exports for 1989. Copper exports were valued at $4.1 billion, a 14.3% increase over that of 1988, accounting for 52.8% of the total value of minerals exported. Increases in export values of other commodities as compared with those of the previous year were as follows: gold, 1.4%; iodine, 21.2%; iron ore, 13.2%; lithium carbonate, 14.8%; molyoxide, 4.6%; silver, 9.1%; and zinc, 82.4%. Of the total of 1.56 million tons of fine copper exported in 1989, CODELCO-Chile shipped 1.19 million tons, with the remainder sold by small and medium producers. Sales of fine copper plus byproducts by CODELCO-Chile amounted to $3.6 billion, which represents an increase of $355.2 million compared with that of 1988. Based on a pretax profit of $1.8 billion, the net profit for 1989 amounted to $756.5 million, surpassing by $169.2 million the total earnings achieved in 1988. The favorable effects of increased production on sales were largely owing to the improvement in the price of copper. The United States was Chile's principal trading partner, accounting for about 16% of Chile's total imports and 22% of Chile's total exports. According to official U.S. Department of Commerce data, in 1989, U.S. exports to Chile amounted to $1.4 billion while U.S. imports from Chile totaled $1.3 billion.

STRUCTURE OF THE MINERAL INDUSTRY

The Chilean Government exercises dominant control over the mineral industry through three large mining enterprises: CODELCO-Chile, Empresa Nacional de Minería (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 (ENAP), and SOQUIMICH. CODELCO-Chile was established in 1966 as a mining corporation and is currently the largest copper producer and exporter in Chile and in the world. The company is composed of four divisions, Chuquicamata, El Teniente, Andina, and El Salvador, with a total 1989 production of 1.24 million tons of fine copper. CODELCO-Chile was also a producer of molybdenum concentrate of which less than 50% was converted to molybdenum trioxide. CODELCO-Chile was the largest producer of silver with 47% of the total. The company was also considering the recovery of ammoniun perrhenate for export.

ENAMI, the second largest state-owned company, was created in the early 1960's to promote the development of Chile's small- and medium-size mines and the operation of two industrial smelters. ENAMI, in addition, owns eight beneficiation plants and one refinery. CORFO was created on April 29, 1939, to develop economic programs to promote manufacturing activities by exploiting natural resources. These objectives led to the birth of other major enterprises such as ENAP, CAP, and the Empresa Nacional de Electricidad S.A. (ENDESA). In time, CORFO became the state's most important corporation, exercising significant control of the national economy. This situation has gradually changed to obtain greater efficiency and decentralization of the decisionmaking process in accordance with open-economy policies based on initiatives of the private sector and the Government. During the past several years, CORFO has privatized a growing number of state mining and energy companies. They included CAP and SOQUIMICH and Chile's private electric companies. In 1989, CORFO privatized ENACAR, Carbonífera Schwagar, SCL, and ENDESA. ENAP was created in 1950. ENAP's principal activity is the exploration and production of hydrocarbons in Chile and/or abroad. These activities are closed to private enterprises except for the right to enter into "risk contracts" with private investors (including foreign investors) for the exploration and exploitation of designated areas.

CAP, the state-owned steel company, is now 100% privately owned; its primary function remains the making and marketing of steel, but it also operates a number of iron ore mines. The pelletizing is done through its subsidiaries, Cía. Minera del Pacífico S.A. (CMP); Manganesos Atacama S.A., the only manganese producer in Chile; and Cía. Siderúrgica de Huachipato S.A. (CSH).

The total labor force, including staff and office personnel, working directly in the mineral sector numbered 78,521, which represented about 1.7% of the total labor force (4,675,000) in the country. Approximately 5.3% of the total labor force was unemployed during the year. The metals sector's labor force was 57,086 (71.3% of this figure was copper workers), the industrial minerals sector was 7,218, and the mineral fuels sector was 14,217 (83.5% of this figure was coal miners). CODELCO-Chile employed about 24,000 copper workers in 1988, or about 31.1% of the total metals sector employees.

TABLE 1

CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
METALS						
Arsenic trioxide		[e]4,000	[e]4,000	3,616	3,207	3,400
Copper:						
Mine output, Cu content[3]		1,359,840	1,395,781	1,412,936	1,472,041	1,645,000
Metal:						
Smelter, primary[4]		1,088,400	1,123,900	1,106,900	1,189,400	1,266,600
Refined:[5]						
Fire, primary refined[e]		180,900	185,100	180,300	[r]188,179	199,012
Electrolytic[e]		703,400	757,200	790,000	[r]824,521	871,988
Total		884,300	942,300	970,300	1,012,700	1,071,000
Gold, mine output, Au content	kilograms	17,240	17,947	17,035	20,614	21,382
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	6,534	6,981	6,637	7,710	8,474
Fe content[e]	do.	3,967	[3]4,197	[r]4,380	[r]5,089	5,593
Metal:						
Pig iron	do.	580	591	617	776	679
Ferroalloys:						
Ferromanganese		6,330	6,277	6,613	6,394	6,500
Ferrosilicomanganese		755	1,706	1,231	683	700
Ferrosilicon		4,501	3,732	4,258	5,686	5,400
Ferromolybdenum		671	1,397	1,325	1,191	1,200
Other		—	247	872	2,312	1,700
Total		12,257	13,359	14,299	16,266	16,500
Steel, crude[6]	thousand tons	689	706	726	899	813
Semimanufactures (hot-rolled)	do.	442	481	502	678	647
Lead, mine output, Pb content		2,473	1,501	829	1,359	[7]1,241
Manganese ore and concentrate:						
Gross weight		[r]35,635	31,631	31,803	43,655	[7]43,807
Mn content		[r]11,785	10,967	10,821	14,511	14,600
Molybdenum, mine output, Mo content		18,389	16,581	16,941	15,527	16,550
Rhenium, mine output, Re content	kilograms	5,564	8,441	6,564	[e]6,940	[e]6,800
Selenium	do.	50,037	47,000	45,909	47,051	47,000
Silver	do.	517,333	500,077	499,761	506,501	535,954
Zinc, mine output, Zn content		22,288	10,504	19,618	19,182	[7]18,370
INDUSTRIAL MINERALS						
Barite		54,494	53,121	52,109	43,135	[7]59,321
Bentonite		—	—	—	529	[7]2,005
Borates, crude, natural (ulexite)		4,773	6,440	13,438	32,122	127,932
Cement, hydraulic	thousand tons	1,424	1,434	1,594	1,833	1,700
Calcite (chalk)	do.	[r]2,470	2,757	3,017	3,647	[7]3,714
Clays:						
Cimita		105	220	82	1,488	[7]810
Kaolin		48,537	42,170	44,533	54,464	[7]58,320
Other (unspecified)		9,177	14,215	15,893	18,769	[7]20,045
Diatomite		2,317	2,684	3,218	2,919	[7]3,315
Feldspar		2,565	2,275	705	4,569	[7]8,173

See footnotes at end of table.

TABLE 1—Continued

CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Gypsum:						
Crude		195,911	r192,847	235,173	315,904	275,848
Calcined		57,222	60,452	92,441	92,135	92,000
Iodine, elemental		3,020	3,076	3,181	3,967	4,845
Lapis lazuli[e]	kilograms	78,500	8,000	r8,000	r8,000	8,000
Lime, hydraulic[e]	thousand tons	800	800	750	750	750
Lithium carbonate		4,508	4,458	6,139	7,332	7,508
Nitrogen: Natural crude nitrates:						
Sodium		621,330	617,010	556,240	546,560	581,488
Potassium (KNO_3)		150,000	147,100	165,070	250,887	266,920
Total		771,330	764,110	721,310	797,447	7848,408
Phosphates:						
Guano		3,150	7,546	5,685	4,052	73,270
Rock (apatite)		7,110	6,684	10,389	9,161	713,550
Total		10,260	14,230	16,074	13,213	716,820
Pigments, mineral, natural: Iron oxide		8,224	4,404	8,145	8,542	723,653
Potash, K_2O equivalent		21,000	20,000	23,110	25,343	25,000
Pumice (includes pozzolan)		206,333	222,080	242,453	277,179	7299,874
Quartz, common		267,510	293,218	350,488	495,484	7453,322
Salt, all types		753,427	1,032,373	865,168	1,043,397	7907,485
Sodium compounds, n.e.s.: Sulfate[8]		52,700	58,700	60,406	62,879	56,245
Sand and gravel (silica sand)[e]	thousand tons	300	300	300	300	300
Stone:						
Limestone (calcium carbonate)	do.	2,470	2,757	3,017	3,647	73,714
Marble		1,300	NA	NA	2,022	71,115
Sulfur:						
Native, other than Frasch:						
Refined		14,755	13,297	14,917	16,924	16,000
Caliche		63,992	43,826	22,131	20,725	20,000
Byproduct, (from smelters and oil refining)		30,073	41,142	335,116	416,266	400,000
Total		108,820	98,265	372,164	453,915	436,000
Talc		1,299	2,257	980	1,070	7835
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous and lignite	thousand tons	r1,370	r1,441	1,736	2,470	72,399
Coke: Coke oven	do.	291	294	297	287	300
Gas, natural:						
Gross	million cubic meters	4,638	4,357	4,353	4,279	4,238
Marketed	do.	1,431	1,199	1,145	1,390	1,377
Natural gas liquids:						
Natural gasoline	thousand 42-gallon barrels	945	893	898	893	890
Liquefied petroleum gas	do.	2,916	2,716	2,761	2,657	2,600
Total	do.	3,861	3,609	3,659	3,550	3,490

See footnotes at end of table.

TABLE 1—Continued

CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum:						
Crude	thousand 42-gallon barrels	13,048	12,204	10,922	8,934	8,065
Refinery products:						
Liquefied petroleum gas	do.	4,831	5,044	2,560	2,422	2,500
Gasoline:						
Aviation	do.	25	82	69	69	70
Motor	do.	8,246	7,793	8,586	9,642	9,650
Jet fuel	do.	1,195	1,372	1,453	1,157	1,200
Kerosene	do.	755	969	1,069	1,434	1,450
Distillate fuel oil	do.	8,749	9,661	9,554	11,454	11,500
Residual fuel oil	do.	5,566	5,642	6,114	6,925	6,950
Unspecified	do.	1,554	1,566	1,679	2,743	2,680
Total	do.	30,921	32,129	31,084	35,846	36,000

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

[1] Table includes data available through July 1990.

[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 in available sources.

[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] Reported figure.

[8] Includes natural sodium sulfate and anhydrous sodium sulfate, coproducts of the nitrate industry.

COMMODITY REVIEW

Metals

Copper.—The growth in Chile's copper production in 1989 reinforced its position as the world's largest producer and exporter of copper. According to official statistical figures published by the Ministry of Mines through its agency Servicio Nacional de Geología y Minería (SERNAGEOMIN), Chile produced another historical record of 1.6 million tons of copper in 1989, an 11.7% increase over that of the previous year.

CODELCO-Chile, the largest state-owned mining corporation, also established another record in copper output in 1989 of 1.24 million tons copper, or 14% more than in 1988. CODELCO-Chile contributed about 75.6% of Chile's total copper production. Company officials indicated that this record production was achieved despite operational problems with Chuquicamata's flash smelter, an explosion at El Teniente, and a labor strike at the El Salvador division. Copper sales in 1989 exceeded $3.6 billion, an increase of $355.2 million from 1988. Earnings totaled $756.5 million, a 22.4% increase over that of the previous year. CODELCO-Chile ranked fifth in sales and fourth in earnings among the 500 largest companies in Latin America according to a Chilean business and economics publication. The company has invested almost $400 million per year to overcome the declining ore grade at its four mines. According to company officials, projects representing expenditures of $1.35 billion are on the drawing board for the period 1990–94. They will permit production increases of up to 1.32 million tons by 1993.

Chuquicamata, CODELCO's mine, has an operating life of about 40 more years if the current operating policy and production program are maintained. In 1989, Chuquícamata produced 660,000 tons of fine copper, or 53.1% of the total copper sold by CODELCO. Output of the company's three other mines was as follows: El Teniente, 329,000 tons; El Salvador, 130,000 tons; and Andina, 124,000 tons.

Future copper production in Chile is difficult to forecast because it will depend on the investment policy followed by the new Government. It was stated that the high accident rates may have been because of excessive pressure to meet overly ambitious production targets. In the future, CODELCO-Chile will devote resources to upgrading the existing facilities and will not increase 1990 copper output beyond 1,200,000 tons. The additional copper production that will be contributed by private investors over the next 5 years will be dominated by the Australian firm Broken Hill Proprietary Co. Ltd.'s (BHP) large La Escondida Project in the Region II. It is expected to be completed in mid-1991 with a planned production of at least 320,000 tons per year by 1992. Phelps Dodge Corp. of the United States was also planning to develop the La Candelaria sulfide project in the Region III with an expected production of 90,000 tons per year. Aside from these projects, there are

also a number of smaller projects under development. These include COMINCO Resources and ENAMI's Quebrada Blanca sulfide and oxide leaching project in the Region I (44,000 tons per year); Anaconda South America Inc. and Midland Bank's Los Pelambres sulfide flotation project in the Region IV (40,000 tons per year); Río Algom's Cerro Colorado bacteria leaching project in the Region I (40,000 tons per year); the Sociedad Minera Pudahuel's Cerro Zaldívar Project in the Region II (40,000 tons per year); the Empresa Minera de Mantos Blancos' Manto Verde oxide leaching project in the Region II (20,000 tons per year); Outokumpu Resources, Anaconda South America, and Midland Bank's Carolina de Michilla's Lince oxide leaching and electrowon project in the Region II (20,000 tons per year); Payrock Yellow Knife Resources' Ivan-ELZAR oxide leaching project in the Region II (15,000 tons per year); and the Compañía Minera de Tocopilla's lipesed oxide leaching project in the Region II (10,000 tons per year). If all of these projects are brought into production by the end of 1991, production would increase an additional 639,000 tons per year.

Gold and Silver.—SERNAGEOMIN, an agency under the Ministry of Mines, reported that gold production increased 3.75% to 21,387 kilograms (kg), and silver production decreased 5.82% to 535,954 kg. The small- and medium-size mines produced 67% of the total national output, followed by the large mines with 33%, primarily as a byproduct of the copper industry. Among the small and medium gold-producing companies, the biggest gold producer was Cía. Minera El Indio (El Indio and El Tambo Mines) with 32.6% of the total. Other producers were Sociedad Contractual Mineral Vilacollo (Choquelimpie Mine) with 13.6%, Homestake Mining Co. (El Hueso Mine) with 10.2%, and the remainder by ENAMI (smelter), La Coipa, and Marte Mines.

There were a number of new gold and silver projects that began during the past 2 years that were expected to raise Chile's gold and silver production in the near term (details about these projects were covered in the 1988 Mineral Yearbook chapter on Chile). CODELCO-Chile continued as the

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
1988:				
Argentina	—	—	32.4	—
Austria	—	1.2	—	—
Belgium-Luxembourg	(3)	r12.7	6.0	—
Brazil	r64.8	14.1	24.8	—
Canada	5.8	—	—	—
China	r4.2	r2.9	r16.9	—
Finland	r16.8	—	—	—
France	—	1.6	120.5	—
German Democratic Republic	—	—	6.0	—
Germany, Federal Republic of	8.3	18.7	142.7	—
Greece	—	—	9.8	—
Hungary	—	1.5	3.0	—
India	(3)	—	5.0	—
Indonesia	—	—	11.0	—
Italy	—	3.0	145.7	—
Japan	r52.5	1.0	111.5	—
Korea, Republic of	r16.6	3.0	41.1	—
Malaysia	—	—	8.9	—
Netherlands	—	3.0	12.9	r1,021
Philippines	4.2	—	—	—
Portugal	.3	—	6.6	—
Saudi Arabia	—	—	4.0	—
Spain	r30.9	—	4.3	—
Sweden	1.6	—	15.8	—
Taiwan	3.0	—	66.7	—
Thailand	—	—	1.7	—
Turkey	—	11.3	—	—
United Kingdom	r.9	10.4	50.4	r234
United States	r10.3	63.8	106.9	—
Venezuela	—	—	15.0	—
Yugoslavia	3.9	11.7	5.0	—
Other	r.1	r2.0	r.9	—
Total	r224.2	r161.9	r975.5	r1,255
1989:				
Argentina	—	—	14.6	—
Austria	—	3.2	—	—
Belgium-Luxembourg	(3)	2.0	11.9	159
Brazil	65.3	8.5	42.5	—
Canada	7.3	8.0	—	—
China	26.6	—	8.3	—
Finland	9.5	—	—	—
France	.2	13.3	115.0	—
German Democratic Republic	—	1.0	12.6	—

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
1989—Continued				
Germany, Federal Republic of	13.2	16.9	181.6	—
Greece	—	—	7.9	—
Hungary	—	2.0	—	—
India	—	—	15.0	—
Indonesia	—	—	13.1	—
Italy	([3])	.3	129.6	—
Japan	60.2	—	139.6	—
Korea, Republic of	32.9	11.1	52.4	—
Malaysia	—	—	11.1	—
Netherlands	—	—	6.4	510
Philippines	11.4	—	—	—
Portugal	—	—	9.0	—
Saudi Arabia	—	—	1.0	—
Spain	32.0	—	4.8	—
Sweden	10.5	—	20.1	—
Taiwan	24.4	1.0	96.9	—
Thailand	—	—	4.6	—
Turkey	—	10.9	—	—
United Kingdom	.1	15.2	53.8	—
United States	20.8	64.6	100.5	—
Venezuela	—	—	.8	—
Yugoslavia	—	8.6	5.0	—
Other	([3])	2.0	5.8	—
Total	314.4	168.6	1,063.9	669

[r] Revised.
[1] Table prepared by H. D. Willis.
[2] Includes cement copper and secondary copper.
[3] Less than 50 tons.

Source: Estadisticas del Cobre, Apr. 1990 edition, Comision Chilena del Cobre.

main producer of silver in the country with 46.6% of the total, followed by Mantos Blancos with 9.1% and El Indio with 7.6%. The remainder was produced by ENAMI, Procesadora de Metales Ltda. (PROMEL) Choquelimpie, and El Hueso Mines. The El Indio Mine again changed hands. Because of financial problems, Mr. Alan Bond has sold off his nearly $1 billion investment in Chile, including a 51% interest in the telephone company Telefónica of Spain, for $391 million. LAC Minerals of Canada, through its purchase of 65% interest in Bond International Gold for $373.8 million, acquired an 83% interest in Minera El Indio.

Northgate Exploration Co. and Westfield Minerals Ltd. have completed the restructuring of their jointly held interest in Northwest Holdings Inc. Under the terms of the agreement, Westfield has transferred to Northwest all of its mining and mineral exploration interest in North America and South America in exchange for a $24.5 million cash payment. Northgate also acquired a 35% interest in the Choquelimpie gold mine in Chile. The Cholquelimpie Mine (42% Shell Chile and 23% Citibank N.A.) was brought into production in the third quarter of 1988 and was expected to produce 2,600 kg of gold and about 11,000 kg of silver in 1989.

Until the beginning of this decade, Chile was a minor producer of gold and silver. Gold production increased slowly from 1,623 kg in 1970 to 3,465 kg in 1979 and to 21,387 kg in 1989. Silver production rose from 76,205 kg to 271,836 kg and 535,954 kg during the same period. However, gold production began to increase rapidly after St. Joe Minerals Corp. of the United States purchased the El Indio gold mine in the Region IV in 1975 and commenced mining operations in 1981. At the same time, Chile's increasing copper production contributed to a dramatic increase in silver output as a byproduct. Currently, there is an even larger number of projects under development that are expected to be completed during the early 1990's. According to estimates, if all of these projects come on-stream, Chile's gold production could rise to 37,500 kg in 1992 while silver production could reach 1,110,000 kg.

Iron Ore, Manganese, and Steel.— These three commodities are produced by CAP, which is now 100% privately owned. As of December 31, 1989, 68% of CAP's shares was owned by CAP employees and the remainder by private investors. In 1981, CAP was restructured as a holding company. It now owns 7 direct and 10 indirect subsidiaries with important minority interest in 3 additional companies. The seven direct subsidiaries include CMP, an iron ore and pellet producer; CSH, a fully integrated steel producer; Manganesos de Atacama S.A. (MASA), a manganese producer; Terranova S.A., a forestry and agricultural producer company; Abastecimientos CAP S.A., a supply and service company; AFP El Libertador S.A., a private pension fund; and Port Investments Ltd. N.V., a Curacao-based sales agent for CMP.

CAP is the only consistently profitable integrated steel company in Latin America, and its main business is steelmaking and marketing; it operates a number of iron ore mines, a shipping line (Naviera Santa Fe Ltda.), and Manganeso de Atacama S.A., the only manganese producer in Chile.

CAP has also diversified into forest products and a mining contracting firm that is removing overburden for the La Escondida copper deposit and is mining ore for Choquelimpie, San Cristóbal, and Marte Mines. In 1988, CAP's consolidated net income in-

TABLE 3

CHILE: STRUCTURE OF THE MINERAL INDUSTRY

(Thousand metric tons per year unless otherwise specified)

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity
Coal	Empresa Nacional del Carbón S.A. (ENACAR), CORFO's subsidiary (Government, 100%)	Moneda 1025, 6to. Piso Santiago, Chile	1,500
Do.	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%	Ahumada 174, Piso 12 Santiago, Chile	1,500
Copper	Corporación Nacional del Cobre de Chile (CODELCO-Chile) (Government, 100%)	Huérfanos 1270 Santiago, Chile	1,243
Do.	Empresa Nacional de Minería (ENAMI) (Government, 100%)	MacIver 459 Santiago, Chile	290
Do.	Cía. Minera Disputada de Las Condes, S.A., Exxon (U.S.), 87%; ENAMI—Government, 13%	Pedro de Valdivia 291 Santiago, Chile	200
Do.	Cía. Minera Mantos Blancos S.A. Anglo-American Corp., 88%; I.F.C., 12%	Pedro Valdivia 295 Santiago, Chile	100
Gold	Cía. Minera San José Ltda. El Indio Mine, owned by LAC Minerals of Canada, 83%	Las Urbinas Santiago, Chile	[1]7,000
Do.	ENAMI (Government, 100%)	MacIver 459	[1]8,000
Do.	CODELCO-Chile (byproduct from copper) (Government, 100%)	Huérfanos 1270 Santiago, Chile	[1]2,200
Iodine	SOQUIMICH, subsidiary of CORFO (Government, 35%; private 65%)	Moneda 970 Santiago, Chile	[2]4,000
Potassium nitrate	do.	do.	[2]270
Sodium nitrate	do.	do.	[2]675,00
Sodium sulfate	do.	do.	[2]60,000
Iron ore	Cía. Minera del Pacífico S.A., CAP's subsidiary (100% private)	Pedro Pablo Muñoz 675 La Serena, Chile	7,300
Iron ore pellets	Cía. Minera del Pacífico S.A., CAP's subsidiary (100% private)	do.	4,400
Lead and zinc	Soc. Contractual Minera El Toqui Ltda., (LAC Minerals of Canada, 100%)	Estado 10, Piso 16, Ofic. 1601 Santiago, Chile	5 (Pb) 15 (Zn)
Lithium carbonate	Soc. Chilena de Litio Ltda. (SCL), subsidiary of Cyprus Foot Minerals Co. of the U.S. (100% private)	Huérfanos 661 Santiago, Chile	8
Manganese	Manganesos Atacama S.A., CAP's subsidiary (100% private)	Agustinas 1022, Ofic. 920 Santiago, Chile	22
Molybdenum	CODELCO-Chile (byproduct from copper) (Government, 100%)	Huérfanos 1270 Santiago, Chile	18
Natural gas	ENAP subsidiary of CORFO (Government, 100%)	Ahumada 341 Santiago, Chile	[3]150,000
Petroleum	do.	Ahumada 341 Santiago, Chile	[4]8
Silver	CODELCO-Chile byproduct from copper.	Huérfanos 1270 Santiago, Chile	[1]235,000
Do.	Cía. Minera San José Ltda. El Indio Mine, (LAC Minerals of Canada, 83%)	Las Urbinas 53, Piso 11 Santiago, Chile	[1]57,000
Steel	Cía. Siderúrgica de Huachipato S.A., CAP subsidiary (100% private)	Huérfanos 669 Santiago, Chile	900

[1] Kilograms per year.
[2] Metric tons per year.
[3] Million cubic feet per year.
[4] Million barrels per year.

creased by 96.9% to about $61.8 million on sales of $455.3 million. In 1989, sales rose to $607.5 million and, after tax profit, increased 28% to $79 million.

CAP exports of ore and pellets in 1989 rose to $124.6 million, while steel and pig iron shipments dropped to $22.9 million. Manganesos de Atacama S.A. began diversifying and installed in the port of Guayacán a ballmill grinding media plant with a license to market grinding shapes. The plant has a production capacity of 1,000 tons per month. The Chilean market is estimated to consume 80,000 tons per year of grinding balls. The 500,000 ton coke plant in Huachipato, Talcahuano province, continued under construction in 1989 and is to be completed in late 1990. The new plant should eliminate coke imports and increase steel ingot production from 690,000 tons to 1,000,000 tons over a period of several years.

CMP is Chile's only producer of iron ore and pellets. The company operates three iron ore mines: El Romeral, near La Serena in the Region IV, El Algarrobo in the Huasco Valley in the Region III, and El Laco in the Region II.

MASA is Chile's only producer of manganese. The company operates the Corral Quemado and Los Loros manganese mines in Region IV. It also produces ferromanganese, silicomanganese, and manganese dioxide at its ferroalloy plant in Coquimbo in the same region. In February 1989, MASA completed the installation of an emission control system at its ferroalloy plant in Coquimbo. MASA also initiated studies for the installation of a second oven to increase the production of ferromanganese and silicomanganese.

Lead and Zinc.—Chile's lead and zinc production declined 8.7% and 4.2%, respectively. Chile's largest lead and zinc producer was Sociedad Contractual Minera El Toqui Ltda. (SCMT), owned by Minera LAC Chile S.A., a subsidiary of LAC Minerals of Canada. SCMT started up in 1984, went bankrupt in November 1985, restarted under CORFO in September 1986, after which an 85% equity was purchased by LAC Mineral of Canada in November for $19 million. The remaining 15% was purchased in 1988 for $5.5 million. Minera LAC Chile S.A. has expanded ore reserves at its Toqui lead and zinc mine in southern Chile. Exploration drilling has confirmed the continuity of mineralization in the Doña Rosa area, southwest of the present mine. The proven and probable reserves were increased to about 4.3 million tons grading 7.6% zinc, 1.7 grams of gold per ton, 23.7 grams of silver, 0.2% copper, and 0.4% lead. Within the present ore body, LAC has defined a high-grade ore zone comprising about 1 million tons averaging 9.4% zinc, 3.1 grams of gold per ton, and 31.1 grams of silver per ton with copper and lead values. The company intends to spend $4.4 million in exploration and development at the El Toqui Mine in 1990. An additional $40 to $60 million investment is needed to explore reserves of 12 million tons found during the most recent feasibility studies.

Industrial Minerals

Lithium and Potassium.—Cyprus Foote Mineral Co., a wholly owned subsidiary of Cyprus Minerals Co. of the United States, is the Western World's largest producer of lithium. Cyprus Foote also owns 100% interest in the lithium brine joint venture in Chile called Sociedad Chilena de Litio Ltda. (SCL). At yearend, the company announced that expansions at the Chilean operation were complete, and production capacity at the site in the Salar de Atacama was increased from 20 million pounds per year to 26 million pounds per year of lithium carbonate. Cyprus Foote anticipates growth in the world lithium market, primarily in aluminum, followed by glass, ceramics, and catalysts. The company also announced that the expansion to its lithium carbonate production plant La Negra near Antofagasta City would be completed during the fourth quarter of 1990.

Elsewhere in the Salar de Atacama, a consortium of AMAX Exploration Inc. (63.75%), Corfo (25%), and Molibdenos y Metales (Molymet) (11.25%), called Sociedad Minera Salar de Atacama Ltda. (MINSAL), was near making a final decision establishing a competing potassium chloride, potassium sulfide, boric acid, and lithium carbonate production operation in an adjacent area of the Salar de Atacama. Having completed its own technical studies, AMAX is now putting together a financial package and negotiating the use of debt-equity swaps with the Government of Chile as the last step before deciding to go ahead with the project.

Iodine and Nitrates.—SOQUIMICH, the recently privatized state nitrate company and the largest producer of iodine in Chile, increased its production capacity of iodine to 3,600 tons per year from nitrate solutions at its plants in María Elena and Pedro de Valdivia. In addition, it operated two semiportable plants that processed old waste piles at Puelma and Prat by heap leaching. The iodine is recovered as an iodine solution, which is trucked to the main plant in Pedro de Valdivia for further processing. The production of iodine from the waste material was approximately 1,000 tons. The remainder of iodine output in Chile was produced by the newly established Amsterdam Chemical Pharmaceutical Minera (APC Minera), a consortium of the Sociedad Contractual Mineral Lagunas, the Amsterdam Pharmaceutical Co. (ACF Chemical) of the Netherlands, the Cía. de Salitre y Yodo de Chile (COSAYACH), and Cía. Minera del Alba. ACF Chemical shipped its crude product to the Dutch partner for purification, and Minera del Alba sold its crude production to SOQUIMICH. SOQUIMICH operated two iodine and nitrate mines, María Elena and Pedro de Valdivia, in Antofagasta.

SOQUIMICH was the world's number one producer of sodium nitrate, potassium nitrate, iodine, and anhydrous sodium sulfate in 1989. SOQUIMICH had gross sales of $229 million, including $41 million from third party fertilizer sales, and reports a profit of $81.2 million, a 28.2% increase over that of 1988. SOQUIMICH has entered the potassium nitrate market with a plant having a supposed capacity of 250,000 tons per year. The process used is hot double decomposition of sodium nitrate with potassium chloride. In 1989, SOQUIMICH purchased 130,000 tons of potassium chloride from Canada plus 30,000 tons from Sociedad Chilena del Litio (Cyprus Foote). SOQUIMICH exported 102,000 tons of potassium nitrate to different countries. In addition, SOQUIMICH sold 24,000 tons of purified sodium nitrate to the United States

under the trade name NITEROX to replace the product traditionally supplied by Olin Corp.

Mineral Fuels

Coal.—Coal output according to the SERNAGEOMIN decreased slightly to about 2.4 million tons, of which Region VIII contributed 58.4% of the total produced. Region XII followed with 36.1%, while Region X produced the remainder. The strip coal mining operation of Cía. de Carbones de Chile S.A. (COCAR) at Pecket, near Punta Arenas, produced a sufficient supply of fuel for Chuquicamata's thermal plants in Tocopilla. The national consumption of coal was distributed as follows: electricity 1.7 million tons (71%), other entities 351,000 tons (15%), sugar refineries (4.0%), mining (4.0%, fishing industry (3.0%), cement (3.0%).

Natural Gas.—Gross output of natural gas decreased slightly, continuing the declining trend since 1982. Of the total production, 68% was reinjected, 3.3% was flared, and 32% was marketed internally.

Although Chile has been producing petroleum in Region Twelve since 1945, it has been unable to find an effective use for the associated natural gas found in the same region. One positive development in this regard was the recent completion of the $300 million Cape Horn methanol plant northeast of Punta Arenas, which will begin producing 750,000 tons of methanol per year for export. On the negative side, a similar $380 million Magellan International Nitrogen Co. (MINCO) ammonia-urea project to produce 570,000 tons of ammonia and 150,000 tons of urea per year now appears to be dead. ENAP and the Argentine officials have been negotiating the purchase of natural gas from Neuquén, and they will proceed with the construction of a pipeline crossing the Andes in southern Chile at the latitude of the town of Temuco. The gasline would then follow the Panamerican highway to Santiago, with branches to industrial centers such as Concepción.

Petroleum.—In 1989, ENAP produced 8.1 million barrels of petroleum, a decline of 10% from that of 1988, with offshore production representing 63% of the total. Production wells on Tierra del Fuego Island accounted for about 21% while mainland production accounted for only 16% of the total. In January 1989, the Government announced its plans to restructure and privatize ENAP, which continued to suffer from declining oil production and rising production costs.

In April 1989, however, the controller general ruled that the proposed division and partial privatization of ENAP was unconstitutional. As a result, all plans to restructure and/or privatize ENAP have been suspended. Decree Law 1089 of 1975 and its amendments, which were replaced by Decree Law 2 of 1987 of the Ministry of Mines, established the rules for special petroleum operating contracts regarding taxes, foreign exchange, customs tariffs, and rights of way. As a result of this change, there are now five foreign oil companies that have signed special petroleum operating contracts (SPOC's) in Chile. These companies were as follows: The Hunt Oil Co. of the United States; Pecten International of the United States, a subsidiary of the Shell Oil of the United States; Eurocan Bermuda Ltd., a subsidiary of Eurocan Ventures Ltd. of Canada; Maxus Energy Co. of the United States, the former Diamond Shamrock Co.; and Anderman-Smith Co. of the United States.

In 1988, a contract for a joint exploration project was signed with Hunt Oil Co. Similar negotiations have been initiated with Eurocan Ventures Ltd., Pecten International, and Maxus Energy.

At the beginning of the first quarter of 1989, ENAP and Hunt Oil Co. were scheduled to start a drilling operation in the Atacama salt flats in northern Chile. At yearend, the local press released the news that ENAP-Hunt Oil Co. made an oil discovery in its first exploration well in the Salar de Atacama; however, ENAP-Hunt Oil Co.'s local manager denied these reports. He indicated that the completion of this well was delayed until March 1989.

Pecten International signed a SPOC in February 1989 to explore for oil and gas in a 5,000-square-km area near San Pedro de Atacama in Region II, north and adjacent to the Hunt SPOC in the Salar de Atacama.

Eurocan Bermuda Ltd. signed two separate SPOC's in March 1989 to explore for oil and gas in a 4,900-square-kilometer area in Chiu-Chiu pampa in the Region II and a 2,920-square-kilometer area in the Salar de Pedernales and Salar de Maricunga areas in Region III.

Maxus Energy signed a SPOC in April 1989 to explore for oil in the Salar de Punta Negra in Region II with ENAP as a partner.

Anderman-Smith of the United States negotiated a special participation agreement with ENAP to jointly explore for petroleum and natural gas on the Island of Tierra del Fuego in Region XII. The objective of the agreement was to obtain additional petroleum to offset the continued decline in Chile's domestic petroleum production.

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 is divided into twelve numbered regions, beginning with the first region at the northern border with Peru and continuing in sequence to Region XII at the south, 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 located in this area. 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 comprise one-third to one-half of the middle Chile area. Near the northern end of the valley lies Santiago, Chile's capital and home of about one-third of the country's population. Industrial resources include large copper deposits, as well as coal fields 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 resources include coal, natural gas, and petroleum.

The railway system of Chile serves 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 is similar to that of its railways. The road system totals 79,025 km, of which 9,913 km are 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

As a result of the country's implementation of the Foreign Investment Law of 1974 (Decree Law 600), the new Labor Code of 1980 (amended in 1987), the new Mining Code of 1984, the chapter 19 debt-equity swaps, the improvement of international mineral prices, and the devaluation of the Chilean peso. Chile's mining sector became particularly attractive to domestic and foreign investors leading to an increase in mineral exploration in the past 5 years. This, in turn, led to an increase in project development as the same companies began to develop some of the most promising discoveries in late 1989. These projects are approaching a final decisionmaking phase and, if initiated, will contribute to an even greater expansion in mineral production in the early 1990's.

The Chilean mining activities are concentrated in four areas, copper and its byproducts, precious metals, industrial minerals, and coal. Chile's copper production is expected to grow from the current 1.6 million tons in 1989 to more than 2.0 million tons in 1991, while gold is projected to increase from 21,000 kg to 36,000 kg, and silver is predicted to increase from 535,000 kg to 850,000 kg during the same period. The production of nitrates, iodine, diatomite, bentonite, sulfuric acid, lithium carbonate, potassium chloride, potassium sulfate and boric acid are also expected to increase by significant amounts. Finally, in the energy sector, coal is expected to increase from 2.4 million tons in 1989 to more than 3.0 million tons in 1991. 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 22% in 1989. 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.

Despite the December 1989 presidential and congressional elections and the subsequent transition to democratic Government, many foreign investment projects have continued. The largest and most visible foreign investment is the $1.2 billion La Escondida copper project owned by BHP of Australia, RTZ of the United Kingdom, the Mitsubishi consortium of Japan, and the International Finance Corp. (IFC) of the World Bank. Five other large foreign investments are also expected to come to a decision between now and the formation of the next Government. 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 copper project; and Combustion Engineering's (United States) $380 to 400 million MINCO ammonia and urea project. In addition, there are Placer Dome's (United States) $140 to $160 million Ladera-Farellón gold project; Placer Dome and TVX Minings (United States) $230 million Minera Mantos de Oro-La Coipa project; COMINCO (Canada) and ENAMI (Chile) $135 million Minera Quebrada Blanca S.A. (Chile) project and Outokumpu (Finland) $100 million Outokumpu Chile Ltda.-Zaldívar project, and Midland Bank (United Kingdom) and Minera Anaconda (Chile) $66 million Minera Los Pelambres Ltda. copper project.

[1] Where necessary, values have been converted from Chilean pesos (Ch$) to U.S. dollars at the rate of Ch$267 = US$1.00, the average exchange rate for 1989.

OTHER SOURCES OF INFORMATION

Agencies

Ministerio de Minería
Teatinos 120
Santiago, 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

Sociedad Nacional de Minería (SONAMI)
Santiago, Chile

Publications

Corporación de Fomento de la Producción, New York: Chile Economic Report.

U.S. Embassy, Santiago, Chile: Industrial Outlook Report-Minerals.

Empresa Nacional de Minería, Santiago: Annual Report.

Servicio Nacional de Geología y Minería, Santiago: Anuario de la Minería de Chile.

Comisión Chilena del Cobre, Santiago: Boletín Estadístico del Cobre.

Corporación Nacional del Cobre de Chile, Santiago: Annual Report.

Compañía de Acero del Pacífico S.A. de Inversiones, Santiago: Annual Report.

COLOMBIA

AREA 1.14 million km² **POPULATION 33.1 million**

THE MINERAL INDUSTRY OF

COLOMBIA

By H. Robert Ensminger

Colombia's mineral industry has experienced an increased impetus as a result of additional petroleum and natural gas discoveries and the increased production from the El Cerrejón Norte coal mine. The output of petroleum and natural gas accounted for 80% of the total value of mineral production in 1989. Colombia produced a limited diversity of mineral commodities; it is 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—to a lesser extent—crude petroleum and natural gas.

In recent years, mining has gained a more important place in Colombia's economy, and in 1989, commanded an approximate 4% share of the gross domesic product (GDP) compared with 1% in the early 1980's. The petroleum sector was a major driving force in this respect. A number of major projects were programmed for the ensuing 3 to 4 years. Included were the construction of a new refinery, several oil and gas pipelines, several petrochemical plants, and the drilling of approximately 640 exploratory and 470 exploitation wells. The large expansion of coal output has also been a factor.

The Colombian GDP grew by an estimated 3.5% in 1989. This was among the higher annual growth rates registered for the year in Latin America. The fastest growing sectors of the economy were mining, which expanded by 8.1%, and agriculture, excluding coffee, which grew by 6%. Colombia's total mineral production had an estimated value of $2.8 billion[1] in 1989, which was about 4.5% of the GDP. The major mineral products were petroleum, natural gas, coal, gold, petroleum products, and nickel, in that order.

GOVERNMENT POLICIES AND PROGRAMS

To continue development of its mineral resources, Colombia has relied on the capital and technological knowledge of large specialized companies. They include Empresa Colombiana de Petróleos (ECOPETROL), the state petroleum enterprise, and associated foreign petroleum companies, Carbones de Colombia (CARBOCOL), the state-coal mining enterprise, and Cerro Matoso S.A., the nickel-mining company.

The new mining code, Código Minero, became law in late 1989. The new mining act, which was crafted to facilitate and encourage mineral exploration and development, contains 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 mining development fund (Fondo de Fomento Minero) went into effect when the new mining code was approved at yearend. The fund is financed by the Government and supervised by Empresa Colombiana de Minas (ECOMINAS), the state mining company. The fund provides small- and medium-sized mining enterprises with credit and technical assistance.

Mining projects were allocated a total of $427 million for disbursement for the 2-year period covering 1989 and 1990. Most of the funding was designated for the El Cerrejón coal enterprises and for petroleum projects.

PRODUCTION

The 8% increase in the value of mineral production in 1989 was principally driven by the mineral fuels coal and petroleum. Petroleum accounted for more than 80% of the total value of the mineral sector production in 1989. Colombia ranked as the third largest coal producer in the Western Hemisphere after the United States and Canada. Mineral fuels production, overall, increased approximately 12%; metals, 4%; and industrial minerals (including emeralds), 15%. Among the metals, nickel and platinum provided the major increases in production. The major contributors to the increased production in the industrial minerals sector were emerald, feldspar, kaolin, magnetite, nitrogen, and sulfur, alphabetically.

TRADE

In 1989, the annual value of petroleum exports exceeded annual coffee export earnings for the first time. The total value of mineral exports composed 38% of the total value of exports for 1989. This was an increase of about 10% over that of the previous year (table 2). In excess of 85 million barrels was exported, and it was projected that exports would increase to about 146 million barrels per year by 1992.

Coal exports, mainly steam coal, exceeded that of the preceding year by approximately 49%, with the earnings totaling $650 million compared with $425 million. Coal exports were about 14 million tons in 1989, while 1990 shipments were projected to exceed 15 million tons. In 1989, Colombia supplanted China as the fourth largest coal exporter in the world. Petroleum exports composed 23% and coal exports 10% of the country's total foreign trade in 1989.

In part, as a result of increased flexibility in foreign investment regulations adopted in 1987, the influx of foreign capital increased to nearly $500 million in 1989. In addition, $300 million en-

TABLE 1

COLOMBIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS						
Gold	kilograms	35,532	39,995	26,546	29,014	[2]29,506
Iron and steel:						
Iron ore and concentrate	thousand tons	439	[r]508	615	609	[2]530
Pig iron	do.	246	319	326	309	[2]297
Steel, crude	do.	530	631	689	754	[2]706
Semimanufactures, hot-rolled	do.	431	457	532	597	580
Lead:						
Mine output, Pb content		82	202	158	31	[2]394
Refined (secondary)[e]		3,000	4,000	4,000	4,000	4,000
Nickel:						
Mine output, Ni content		15,434	[e]22,600	[e]25,200	19,979	[2]21,425
Ferronickel, Ni content		11,800	[e]18,600	[e]20,700	16,669	17,000
Platinum-group metals	kilograms	362	447	638	815	[2]973
Silver	do.	[r]4,759	[r]5,816	4,977	6,563	[2]6,847
Zinc, mine output, Zn content		2,000	6,000	—	138	[2]394
INDUSTRIAL MINERALS						
Asbestos		12,435	[e]13,000	[e]13,000	16,819	[2]15,815
Barite		5,050	4,198	3,792	[e]4,000	[2]5,460
Cement, hydraulic	thousand tons	5,394	6,011	5,965	6,764	[2]6,643
Clays: Kaolin		1,041,151	1,155,267	1,221,000	1,306,470	[2]1,800,000
Diatomite[e]		—	—	—	—	[2]3,600
Feldspar		34,308	35,722	33,760	[e]35,000	[2]40,850
Gypsum	thousand tons	250	295	302	307	310
Lime, hydrated and quicklime[e]	do.	1,300	1,300	1,300	1,300	1,300
Magnesite[e]		1,600	[2]14,936	15,000	16,000	[2]20,425
Nitrogen: N content of ammonia		99,400	93,440	88,600	84,100	[2]91,800
Phosphate rock		24,249	28,626	[e]34,000	[e]29,800	30,000
Precious and semiprecious stones: Emerald[3]	carats	337,950	634,561	886,551	1,095,650	1,200,000
Salt:						
Rock	thousand tons	236	227	205	209	[2]190
Marine	do.	494	501	450	473	[2]470
Total	do.	730	728	655	682	[2]660
Sodium compounds, n.e.s.: Sodium carbonate		113,209	112,920	116,864	114,087	115,000
Stone and sand:						
Calcite		3,107	5,334	5,334	[e]8,736	[2]12,060
Dolomite	thousand tons	15	14	33	33	[2]45
Limestone	do.	11,756	[e]12,000	[e]12,000	11,980	12,000
Marble		16,993	19,568	17,500	[e]17,500	17,500
Sand excluding metal-bearing		511,587	516,215	602,400	654,800	700,000
Sulfur:						
Native (from ore)		41,374	36,038	41,490	42,795	[2]45,575
Byproduct, from petroleum		9,790	[e]10,000	[e]10,200	8,200	10,000
Total		51,164	[e]46,038	51,690	50,995	55,575
Talc, soapstone, pyrophyllite		8,611	9,013	11,927	12,800	[2]9,196

See footnotes at end of table.

TABLE 1—Continued

COLOMBIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]		18,000	18,000	18,000	18,000	18,000
Coal:						
Metallurgical	thousand tons	618	630	759	585	650
Steam	do.	9,088	11,540	13,835	14,315	18,252
Total	do.	9,706	12,170	14,594	14,900	18,902
Coke, all types[e]	do.	550	550	600	550	550
Gas, natural:						
Gross	million cubic meters	5,174	[e]5,240	[e]5,380	5,029	[2]5,113
Marketed	do.	([4])	([4])	([4])	4,062	4,100
Natural gas liquids	thousand 42-gallon barrels	2,297	2,216	1,717	1,384	1,400
Petroleum:						
Crude	do.	64,352	110,714	147,843	136,760	[2]147,563
Refinery products:						
Liquefied petroleum gas (propane)	do.	3,702	2,782	3,445	4,569	4,500
Gasoline:						
Aviation	do.	342	313	276	255	260
Motor	do.	21,432	24,589	28,603	27,281	28,500
Jet fuel	do.	3,651	3,829	3,888	3,685	3,800
Kerosene	do.	2,156	2,147	2,054	2,198	2,200
Distillate fuel oil	do.	11,150	11,152	14,502	14,080	14,300
Residual fuel oil	do.	19,825	21,017	23,776	23,319	23,500
Lubricants[e]	do.	657	730	750	733	750
Asphalt and bitumen	do.	926	973	1,079	1,127	1,100
Refinery fuel and losses and unspecified products	do.	1,029	1,915	[e]1,986	3,779	3,500
Total	do.	64,870	69,447	80,359	81,026	82,410

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Nov. 1990.
[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.

tered into the petroleum and natural gas sector.

STRUCTURE OF THE MINERAL INDUSTRY

Colombia is composed of three major regions of economic activity—the central, north coast, and western. The primary center of activity in the central region was Bogotá, the country's capital city. The Bogotá area produced 81% of refined petroleum products and 35% of all chemicals in 1989. In addition, cement and steel plants were major producers. The western region contains important coal deposits and has

TABLE 2

COLOMBIA: VALUE OF MINERAL EXPORTS

(Millions of U.S. dollars)

Commodity	1985	1986	1987	1988	1989[p]
Crude oil and refined products	409.0	619.0	1,341.0	952.7	1,438.0
Coal	124.8	190.4	359.6	424.5	650.0
Ferronickel	54.6	48.0	77.1	179.4	190.0
Emeralds	27.0	34.0	62.0	89.8	103.0
Cement	22.7	25.3	62.8	65.7	68.0
Total	638.1	916.7	1,902.5	1,712.1	2,449.0
Total Exports	3,782	5,434	5,638	5,805	6,364.0
Minerals as percent of total	17%	17%	34%	29%	38%

[p]Preliminary.

TABLE 3

COLOMBIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides		104	—	Peru 57; Panama 24; Venezuela 23.
Metal including alloys:				
Scrap		267	114	Japan 153.
Unwrought		185	162	Japan 18; Ecuador 5.
Semimanufactures		36	—	Ecuador 18; Peru 15; Panama 3.
Copper: Metal including alloys, semimanufactures		3	(2)	Mainly to Costa Rica.
Iron and steel: Metal:				
Pig iron, cast iron, related materials		272	—	All to Venezuela.
Ferroalloys:				
Ferromanganese		338	—	All to Japan.
Unspecified		42,432	5,006	Netherlands 24,298; France 6,896.
Steel, primary forms	value, thousands	$1	—	All to Peru.
Semimanufactures:				
Bars, rods, angles, shapes, sections	do.	$2	—	All to Nicaragua.
Universals, plates, sheets		3,497	—	Cuba 2,294; Peru 1,000; Ecuador 136.
Wire		228	89	Dominican Republic 86; Ecuador 32.
Tubes, pipes, fittings		450	141	Honduras 254; Peru 44.
Castings and forgings, rough		256	1	Venezuela 246; Panama 9.
Lead: Metal including alloys, semimanufactures		158	—	All to Venezuela.
Manganese: Oxides		71	—	Do.
Platinum-group metals: Platinum metal including alloys, unwrought and partly wrought	value, thousands	$10,671	$10,671	
Silver: Metal including alloys, unwrought and partly wrought	do.	$103	$91	Panama $12.
Other:				
Ores and concentrates of precious metals, n.e.s.		304	—	Republic of Korea 273; Japan 31.
Oxides and hydroxides		11	—	Panama 4; Venezuela 4; Peru 3.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones		9	2	Panama 4; Chile 1.
Cement	thousand tons	1,137	644	Dominican Republic 254; Netherlands Antilles 86; Haiti 62.
Chalk		53	18	Panama 35.
Clays, crude		2,099	—	Ecuador 1,300; Venezuela 799.
Fertilizer materials: Manufactured:				
Ammonia		10,405	—	All to Chile.
Nitrogenous		2	—	All to Ecuador.
Phosphatic		230	—	Do.
Unspecified and mixed		5,205	—	Panama 5,150; Ecuador 55.
Gypsum and plaster		653	—	Ecuador 560; Venezuela 93.
Precious and semiprecious stones other than diamond: Natural	value, thousands	$90,498	$12,760	Japan $75,252; Switzerland $712.
Salt and brine		23,100	23,100	

See footnotes at end of table.

TABLE 3—Continued

COLOMBIA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	Destinations, 1988	
		United States	Other (principal)
INDUSTRIAL MINERALS—Continued			
Stone, sand and gravel:			
Dimension stone: Worked	99	30	Panama 36; Netherlands Antilles 33.
Dolomite, chiefly refractory-grade	100	—	All to Ecuador.
Quartz and quartzite	11	11	
Sand other than metal-bearing	6	—	All to Peru.
Sulfur:			
Elemental: Crude including native and byproduct	2,671	—	Peru 1,413; Ecuador 586; Guatemala 463.
Sulfuric acid	3	—	All to Nicaragua.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	68	—	All to Ecuador.
Carbon black	3,059	—	Ecuador 1,742; Chile 897; Guatemala 267.
Coal, all grades excluding briquets thousand tons	10,126	1,294	Denmark 2,268; Netherlands 1,704.
Coke and semicoke	102,568	—	Venezuela 68,724; Belgium-Luxembourg 15,001; Chile 11,570.
Petroleum:			
Crude thousand 42-gallon barrels	54,920	46,983	Chile 5,826; Netherlands 822.
Refinery products:			
Mineral jelly and wax do.	1	—	All to Ecuador.
Distillate fuel oil do.	1,778	742	Peru 681; Netherlands Antilles 345.
Lubricants do.	11	—	Peru 6; Nicaragua 2; Netherlands Antilles 1.
Residual fuel oil do.	21,151	17,873	Netherlands Antilles 1,755; Mexico 894.
Bituminous mixtures 42-gallon barrels	85	6	Venezuela 30; Ecuador 16; Guatemala 12.

[1] Table prepared by H. D. Willis. Export data for 1987 were not available at time of publication.
[2] Less than 1/2 unit.

vast hydroelectric resources with an installed capacity of 3,810 megawatts. The north coast or Caribbean region contains the second largest petroleum refinery and large chemical and petrochemical production facilities. The productive Cerro Matoso nickel mine as well as the extensive El Cerrejón Norte and El Cerrejón Centro coal-mining complexes are in this region.

According to a recently completed mining census, 35 minerals were exploited on a national basis. It was determined that Colombia has 7,306 mines, more than one-half of which are associated with the mining of gold. The following mineral commodities are listed in the order of number of mines: gold, coal, industrial minerals, platinum, clay, limestone, marble, and emeralds. It was also found that 74% of the mining was on the surface with the remainder being underground. Approximately 19% of the mining was done in the traditional manner, with pick ax and shovel or washing.

The survey, Colombia's first such endeavor, was conducted by the Departamento Nacional de Estadística (DANE), CARBOCOL, Instituto Nacional de Investigaciones Geológicas y Mineras (INGEOMINAS), and ECOMINAS.

The major part of Colombia's mining industry is privately owned. This is especially true with the industrial minerals (excluding emerald), iron and steel, and the precious metals (gold, platinum, and silver). The natural gas and petroleum sector is primarily controlled and operated by the Government entity ECOPETROL, established in 1948, the 14th largest company in Latin America. 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 administer and exploit the coal, nickel, and nuclear industries.

COMMODITY REVIEW

Metals

Gold.—In Colombia, gold mining can be traced back 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 major source area, Department of Antioquía, produced about 70% of the total gold output in 1989. Most of the remaining production came from various river placers along the Pacific coastal plains.

TABLE 4

COLOMBIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	Sources, 1988	
		United States	Other (principal)
METALS			
Alkali and rare-earth metals	1	1	
Aluminum:			
Ore and concentrate including alumina	7,658	7,446	West Germany 131; Brazil 80.
Oxides and hydroxides	3,096	164	West Germany 2,591; United Kingdom 290.
Metal including alloys:			
Unwrought	8,714	574	Venezuela 4,149; Canada 3,301.
Semimanufactures	9,726	2,137	Venezuela 5,999; Ecuador 505.
Chromium: Oxides and hydroxides	93	31	West Germany 56; Spain 6.
Cobalt: Oxides and hydroxides	1	(2)	Mainly from Netherlands.
Copper:			
Matte and speiss including cement copper value, thousands	$7	$7	
Metal including alloys:			
Unwrought	359	97	Peru 258; Italy 4.
Semimanufactures	20,577	595	Chile 7,071; Peru 4,596; Belgium-Luxembourg 2,159.
Iron and steel:			
Iron ore and concentrate	217	96	Peru 97; Canada 24.
Metal:			
Scrap	157,009	85,854	Netherlands 57,561; Netherlands Antilles 7,632.
Pig iron, cast iron, related materials	7,150	128	Venezuela 5,000; Brazil 1,416; Haiti 500.
Ferroalloys:			
Ferromanganese	7,238	24	Mexico 5,523; Brazil 1,616, Republic of South Africa 76.
Ferrosilicon	3,105	1	Chile 2,409; Brazil 364; Venezuela 292.
Unspecified	5,076	102	Mexico 2,532; Brazil 1,116; Venezuela 816.
Steel, primary forms	12,473	(2)	Brazil 5,532; United Kingdom 2,749; France 1,623.
Semimanufactures:			
Bars, rods, angles, shapes, sections	57,387	2,477	United Kingdom 9,490; Spain 8,427; Venezuela 8,415.
Universals, plates, sheets	348,502	4,833	Japan 118,829; Brazil 76,379; Venezuela 51,392.
Hoop and strip	7,398	253	United Kingdom 4,632; Japan 1,520; Brazil 318.
Rails and accessories	2,802	65	Spain 1,886; Republic of Korea 344; Belgium-Luxembourg 202.
Wire	1,445	136	Belgium-Luxembourg 318; West Germany 277; Brazil 153.
Tubes, pipes, fittings	75,176	8,894	Venezuela 19,655; Argentina 11,591; Brazil 11,458.
Castings and forgings, rough	1,678	566	Peru 394; Spain 283.
Lead:			
Oxides	2,116	5	Peru 2,033; Mexico 78.
Metal including alloys:			
Unwrought	2,636	—	Peru 2,516; Mexico 75; Venezuela 45.
Semimanufactures	8	1	West Germany 6; United Kingdom 1.

See footnotes at end of table.

TABLE 4—Continued

COLOMBIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	Sources, 1988	
		United States	Other (principal)
METALS—Continued			
Magnesium: Metal including alloys:			
Unwrought	54	48	Norway 6.
Semimanufactures	34	27	Canada 7.
Manganese:			
Ore and concentrate: Metallurgical grade	9,809	1	Brazil 6,460; Mexico 3,189; Belgium-Luxembourg 159.
Oxides	592	100	Brazil 237; Belgium-Luxembourg 157.
Mercury	34	1	West Germany 16; United Kingdom 8; Spain 5.
Molybdenum: Metal including alloys:			
Unwrought	1	1	
Semimanufactures	3	2	Unspecified 1.
Nickel:			
Ore and concentrate	148	—	All from Australia.
Metal including alloys:			
Scrap	5	5	
Unwrought	170	21	Canada 109; Venezuela 35.
Semimanufactures	174	125	West Germany 22; France 14.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, unspecified value, thousands	$35	$16	West Germany $14; Japan $5.
Silver: Metal including alloys, unwrought and partly wrought do.	$56	$2	Venezuela $35; Canada $14; Spain $5.
Tin: Metal including alloys:			
Unwrought	329	(2)	Bolivia 308; Peru 21.
Semimanufactures	55	2	Bolivia 52; Brazil 1.
Titanium: Oxides	358	13	United Kingdom 143; West Germany 86; Venezuela 78.
Tungsten: Metal including alloys, semimanufactures	4	4	
Zinc:			
Oxides	67	3	Peru 36; West Germany 28.
Metal including alloys:			
Unwrought	18,946	—	Peru 18,396; Mexico 550.
Semimanufactures	387	35	Venezuela 199; Costa Rica 59; Belgium-Luxembourg 47.
Other:			
Ores and concentrates	695	195	United Kingdom 244; Australia 172.
Base metals including alloys, all forms	157	84	United Kingdom 32; Bolivia 13.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc.	4,133	90	Ecuador 3,998; Netherlands 25.
Artificial: Corundum	1,808	6	Brazil 1,774; West Germany 24.
Dust and powder of precious and semiprecious stones value, thousands	$1	$1	
Grinding and polishing wheels and stones	42	23	Italy 7; Sweden 4.
Asbestos, crude	16,614	198	Switzerland 9,260; Canada 6,682; Italy 458.
Barite and witherite	12,095	12,095	

See footnotes at end of table.

TABLE 4—Continued

COLOMBIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	Sources, 1988	
		United States	Other (principal)
INDUSTRIAL MINERALS—Continued			
Boron materials:			
Crude natural borates	6,034	—	Chile 4,000; Peru 2,034.
Oxides and acids	385	149	Peru 212; West Germany 24.
Cement	5,434	595	Cuba 4,250; France 288.
Chalk	81	28	Switzerland 52.
Clays, crude	18,431	17,832	Peru 282; Venezuela 100.
Diamond: Natural:			
Gem, not set or strung value, thousands	$32	$32	
Industrial stones do.	$5	$5	
Diatomite and other infusorial earth	1,612	1,293	Mexico 297; Chile 21.
Feldspar, fluorspar, related materials	791	—	Republic of South Africa 396; Mexico 200; United Kingdom 72.
Fertilizer materials: Manufactured:			
Ammonia	26,247	7,163	Venezuela 19,082; West Germany 2.
Nitrogenous	524,547	158,669	Mexico 142,730; Venezuela 122,493.
Phosphatic	10,345	10,345	
Potassic	257,263	100,627	East Germany 143,527; Canada 13,100.
Unspecified and mixed	226,016	174,128	Norway 51,350; Belgium-Luxembourg 292.
Graphite, natural	40	32	West Germany 6; Italy 1.
Gypsum and plaster	34,838	385	Dominican Republic 34,402; Japan 41.
Magnesium compounds: Magnesite, crude	897	346	Venezuela 163; Austria 154.
Mica:			
Crude including splittings and waste	118	92	France 22; Switzerland 1.
Worked including agglomerated splittings	19	7	Peru 6; Spain 3.
Phosphates, crude	45,696	45,696	
Pigments, mineral: Iron oxides and hydroxides, processed	1,602	179	West Germany 917; Mexico 194.
Precious and semiprecious stones other than diamond:			
Natural value, thousands	$11	$6	Brazil $5.
Synthetic	1	—	All from Japan.
Salt and brine	152	81	West Germany 71.
Sodium compounds, n.e.s.:			
Soda ash, natural and manufactured	31,817	31,809	West Germany 7.
Sulfate, natural and manufactured	3,007	—	Chile 1,951; Mexico 1,050; West Germany 6.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	11,791	3	Peru 8,319; Italy 1,299; Guatemala 1,283.
Worked	650	—	Peru 574; Ecuador 66; Belgium-Luxembourg 6.
Dolomite, chiefly refractory-grade	6,579	2,569	Belgium-Luxembourg 3,958; Spain 52.
Gravel and crushed rock	20,646	9	Venezuela 20,257; Italy 166; Brazil 80.
Quartz and quartzite	2	—	All from France.
Sand other than metal-bearing	1,086	231	Brazil 851; France 3.

See footnotes at end of table.

TABLE 4—Continued

COLOMBIA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Sulfur:				
Elemental:				
Crude including native and byproduct		25,984	25,984	
Colloidal, precipitated, sublimed		69	69	
Sulfuric acid		105	9	West Germany 95; Netherlands 1.
Talc, steatite, soapstone, pyrophyllite		2,137	870	Italy 598; North Korea 354; China 100.
Other: Crude		9,807	7,124	Mexico 2,284; United Kingdom 347.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		14	14	
Carbon black		711	292	West Germany 354; Singapore 59.
Coal: Anthracite		14	14	
Petroleum refinery products:				
Liquefied petroleum gas	thousand 42-gallon barrels	(2)	(2)	Mainly from France.
Gasoline	do.	8,208	680	Mexico 4,973; Venezuela 1,413.
Mineral jelly and wax	do.	8	3	United Kingdom 3; Netherlands 1.
Kerosene and jet fuel	do.	4	(2)	Mainly from Brazil.
Distillate fuel oil	do.	74	—	Ecuador 67; Brazil 7.
Lubricants	do.	374	96	Venezuela 273; West Germany 3.
Residual fuel oil	do.	24	—	All from Brazil.
Bitumen and other residues	do.	(2)	(2)	
Bituminous mixtures	do.	2	2	
Petroleum coke	do.	1	1	

[1] Table prepared by H. D. Willis. Import data for 1987 were not available at time of publication.
[2] Less than 1/2 unit.

A survey program was carried out in the Department of Guainía to more accurately locate and define the gold deposits in the area. During the year the Government held a series of discussions with private Colombian companies as well as foreign companies with regard to the undertaking of a large-scale mining venture in the Guainía region. Any venture agreed to most likely would involve a consortium of mining companies.

Iron and Steel.—Iron ore and steel production both decreased in 1989. Iron ore output was off by 15% and steel by approximately 7%. One of the major iron ore deposits lies approximately 248 kilometers (km) northeast of Bogotá. The mine was the major source of iron ore for Acerías Paz del Río, Colombia's only fully integrated steel mill. The mill has a crude steel capacity of 300,000 tons. Included is a 50,000-ton capacity to process scrap. The five semi-integrated steel plants utilized electric furnaces to produce steel from pig iron and scrap.

Nickel.—Colombia's nickel production in the form of ferronickel increased by more than 7% in 1989. The value of ferronickel exports increased by about 6% to $190 million. The entire production came from the Cerro Matoso Mine at Montelíbano, Department of Córdoba. The operation is a joint venture between Billiton Overseas Ltd., a subsidiary of Royal Dutch Shell (Netherlands), and Empresa Colombiana de Níquel (ECONIQUEL) (Government entity). The mine has yielded about 800,000 tons of ore per year (2.7% Ni). At the 1989 rate of extraction, the reserves are projected to last about 21 years. Surveys have determined the existence of nickel-bearing ores nearby, though of lower nickel content.

Platinum.—Platinum production increased by 19% over that of the previous year. As in prior years, the entire output came from placers adjoining the San Juan River in the Department of Chocó. The Colombian production corresponded to 1% of the world's newly mined output. Since 1984 the production has almost tripled as a result of higher world prices.

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 Antio-

TABLE 5

COLOMBIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Asbestos	Minera Las Brisas S.A. (Eternit Colombiana S.A., 70%; other, 30%)	Campamentos, Antioquia Department (mine)	9,000
Carbon black	Cabot Colombiana S.A. (private, 100%)	Cartagena, Bolívar Department	
Do.	Productos Petroquímicos S.A. (private, 100%)	Cali, Valle del Cauca Department (two plants)	12,000
Cement	Cía. de Cemento Argos S.A. (private, 100%)	Medellín, Antioquia Department (plant)	3,750,000
Do.	Cementos del Caribe S.A. (private, 100%)	Barranquilla, Atlántico Department (plant)	1,000,000
Do.	Cementos del Valle S.A. (private, 100%)	Yumbo, Valle del Cauca Department (plant)	950,000
Coal	Carbones de Colombia (CARBOCOL) (Government, 100%), and International Colombia Resources Corp. (INTERCOR) (Exxon, 100%)	El Cerrejón Norte, La Guajira Department (mine)	15,000,000
Do.	CARBOCOL (Government, 100%)	El Cerrejón Central, La Guajira Department (mine)	1,500,000
Do.	Acerías Paz del Río S.A. (private, 100%)	Paz del Río, Boyacá Department (mine)	600,000
Emerald	Empresa Colombiana de Minas (Government, 100%)	Coscuez, Muzo, and Peñas Blancas, Boyacá Department (three mines)	NA
Gold	Frontino Gold Mines Ltd. (foreign private, 100%)	Segovia, Antioquia Department (El Silencio Mine)	NA
Do.	Mineros de Antioquia S.A. (private, 100%)	Bagre and Río Nechi, Antioquia Department (two mines)	NA
Do.	Small miners (Individual prospectors and Cooperatives)	Río Nechi, Antioquia Department (mines)	NA
Iron ore	Acerías Paz del Río (private, 100%)	Paz del Río, Boyacá Department (mine)	500,000
Kaolin	Ceramicas del Valle Ltda. (private, 100%)	Yumbo, Valle del Cauca Department (mine)	NA
Natural gas	Empresa Colombiana de Petróleos (ECOPETROL) (Government, 100%)	North coast, Guajira Department (national gasfields)	[1]3,500
Do.	International Petroleum Colombia Ltd. (Exxon, 100%)	Barrancabermeja locale, Antioquia and Santander Departments (national gasfields)	[1]1,200
Nickel	Cerro Matoso S.A. (Government, 45%; foreign private, 55%)	Montelíbano, Córdoba Department (mine)	23,000
Nitrogen	Abonos de Colombia (private, 100%)	Cartagena, Bolívar Department (plant)	100,000
Do.	Monomeros Colombo-Venezolanos S.A. (private, 100%)	Barranquilla, Atlántico Department (plant)	85,000
Petroleum	ECOPETROL	16 fields in various Departments	[2]30
Do.	Houston Oil Colombiana S.A. (HOCOL) (foreign private, 100%)	14 fields in various Departments	[2]16.5
Petroleum products	ECOPETROL	Four refineries in the Departments of Bolívar, Norte de Santander, Putumayo, and Santander.	[2]101.3
Phosphate	Fosfatos de Colombia S.A.; (private, 100%)	Neiva, Huila Department	30,000
Platinum	Small miners (individual prospectors and cooperatives)	NA	NA
Salt, marine	Instituto de Fomento Industrial (IFI) (private, 100%)	Manaure Salina, La Guajira Department	1,200,000
Salt, rock	Concesión Salinas (private, 100%)	Zipaquira, Cundinamarca Department	500,000
Silver	Frontino Gold Mines Ltd.	Segovia, Antioquia Department (mine)	[3]2,500
Do.	Small miners (individual prospectors and cooperatives)	Río Nechi, Antioquia Department (mines)	[3]2,000

See footnotes at end of table.

TABLE 5—Continued

COLOMBIA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Steel, integrated plant	Acerias Paz del Río S.A. (private, 100%)	Belencito, Boyacá Department (plant)	300,000
Steel, semi-integrated plants	Hojalata y Laminados S.A. (private, 100%)	Medellín, Antioquia Department	
Do.	Siderúrgica del Boyacá S.A. (private, 100%)	Bogotá, Federal District	
Do.	Siderúrgica de Medellín S.A. (private, 100%)	Medellín, Antioquia Department	
Do.	Siderúrgica del Pacífico S.A. (private, 100%)	Cali, Valle del Cauca Department	(Total) 300,000
Sulfur	Industrias Purace S.A. (private, 100%)	El Vinagre Mine, Cauca Department	50,000

NA Not available.
[1] Million cubic meters per year.
[2] Million 42-gallon barrels per year.
[3] Kilograms per year.

quia. Gypsum has been produced in various regions for many years. In 1989, gypsum production satisfied 80% of the cement industry's requirements. Limestone is widely found in Colombia. Most of the cement plants were near limestone mine sites. Nearly one-third of the country's cement production was exported to the United States and the Caribbean region. 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.

In 1989, Colombia accounted for more than 90% of the world's emerald production. The preponderance of the country's production came from the Chivór, Coscuez, and Muzo Mines proximal to Bogotá. Japan was the single largest market in 1989.

Minerals Fuels

In 1986 (the last year for which there were published data), the total amount of electrical energy produced [expressed in tons of oil equivalent (toe)] was 7,073,000 toe. The primary sources were hydraulic (hydroelectric), which composed 70% of the total, and thermal with 30%. Natural gas provided 66% of the fuel for thermal plant input; coal, 30%; and petroleum, 4%. Total energy consumption, which included losses due to conversion, transportation, and distribution, was 6,918,000 toe. Households, transportation, and others consumed 3,570,000 toe, while the industrial and construction sectors consumed 1,767,000 toe. The estimated efficiency (percentage of output to input) of the thermal power and/or plant sector was 23%.

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 latest rate of extraction. About one-fifth of the country's reserves occur along the north coast, concentrated in the La Guajira Peninsula; in excess of 13 million tons of steam coal was mined from the El Cerrejón Norte Mine in 1989. The El Cerrejón Centro Mine, which was reopened in 1988, produced about 500,000 tons. 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%. The major part of the El Cerrejón Norte coal was primarily exported to Western Europe, the United States, and the Far East.

Interior coal basins provided more than 5 million tons of coal to the domestic market in 1989. It is the interior areas, mainly around Bogotá, where the preponderance of Colombia's coal reserves occur. There was also significant production near the cities of Cali and Medellín. Additional mining operations have been planned for the La Guajira region and include the new La Loma Mine development and further expansion of the El Cerrejón mines.

Natural Gas and Petroleum.—Natural gas production increased a modest 2% over that of 1988. Of the 5.1 billion cubic meters produced, 4.1 billion cubic meters was marketed domestically. There was no export of natural gas in 1989. The great majority of natural gas reserves occur both offshore and onshore of the La Guajira Peninsula.

Recoverable petroleum reserves have been conservatively estimated to be in excess of 2 billion barrels. At the rate of 1989 production, the reserves would last 15 years. The petroleum reserves are dispersed among seven basins throughout Colombia. Approximately one-half of the reserves lie in the Eastern Plains, principally in the Arauca subbasin containing the huge Caño Limón Field discovered in 1983. This structure contains estimated reserves of 300 million barrels of heavy-grade petroleum. Colombia's newest emerging petroleum basin, in the upper Magdalena Valley, contains about one-fourth of the total petroleum reserves.

In late 1989, the Government decided to proceed with construction of a new petroleum refinery in the middle Magdalena Valley. The refinery will cost $660 million and will have a capacity of 75,000 barrels per day when completed by 1995. Oleoducto de Colombia let a $350 million contract to a joint venture of Spie Batignolles of France and Techint of Argentina for construction of the second stage of a pipeline system to link oilfields in the upper Magdalena Valley with a Caribbean port. The 150,000-barrel-per-day pipeline will extend from Puerto Salgar, Department of Cundinamarca, to the Port of Coveñas, Department of Sucre.

The pipeline that extends from the Caño Limón Field to Coveñas is 787 km and cost $845 million.

Reserves

In 1989, Colombia contained the largest 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

Hydroelectric power furnished 87% of the total installed generating capacity of 9,250 megawatts in 1989. 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 potential hydroelectric plant sites that were identified as economically feasible for development.

One of the major hydroelectric plants under construction was the 1,000-megawatt Guavio River Project in the Department of Cundinamarca, which is to be completed in 1993. When completed it will be the tallest earth and gravel dam in the Western Hemisphere, rising to a height of more than 47 meters.

Colombia contained 3,563 km of single track, 0.914-meter-gauge railroad in 1989. The country had a total of 75,450 km of roads, composed of 9,350 km paved and 66,100 km having dirt and gravel surfaces. There was 14,300 km of inland waterways navigable by riverboats. The major shipping ports were Barranquilla, Buenaventura, Cartagena, Coveñas, Santa Marta, and Tumaco. Among the 34 merchant marine vessels were 23 cargo ships; 1 chemical tanker; 1 petroleum, oils, and lubricants tanker; and 9 bulk carriers. 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.

In 1989, total foreign investment in Colombia was $2.7 billion, of which approximately $285 million went to the transportation sector. This involved construction and paving of highways, access roads, and improvements in ocean ports and airports. In addition, a portion of ECOPETROL's earnings was set aside to finance basic infrastructural works in select petroleum-producing regions.

The Government decided to eliminate the country's national railroad organization, replacing it with two new entities. One, known as Ferrovías, is a state-run entity with responsibility for construction and maintenance of track, station, and related facilities. The other, Colombian Railway Transport Co., is a mixed (private and public) stock company that is responsible for rail service operations.

TABLE 6

COLOMBIA: RESERVES OF MAJOR MINERALS

(Thousand metric tons unless otherwise specified)

Asbestos, fiber	17,000
Coal, all types	19,000,000
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	2,060
Phosphate rock	450,000
Platinum, metal	1
Sulfur, 28% to 34% S	300,000

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 at a time when most of Latin America has remained mired in the morass of past economic policy errors. 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 outlooks for the mineral sector look 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 are expected to continue for the next 15 to 20 years.

[1] Where necessary, values have been converted from Colombian pesos (Col$) to U.S. dollars at the average rate of Col$394.8 = US$1.00 for 1989.

OTHER SOURCES OF INFORMATION

Agencies

Ministerio de Minas y Energía
División de Minas
Carrera 7, 7-56
Bogotá-DE-Colombia

Empresa Colombiana de Petróleos
(ECOPETROL)
Postal 808
Bogotá-DE-Colombia

Empresa Colombiana de Minas
(ECOMINAS)
Apartado Aéreo 17878
Avenida 34, 19-05
Bogotá-DE-Colombia

Empresa Colombiana de Níquel
(ECONIQUEL)
Carrera 7, 26-20
Bogotá-DE-Colombia

Instituto de Fomento Industrial (IFI)
Apartado Aéreo 874
Bogotá-DE-Colombia

Instituto Nacional de Investigaciones
Geológico-Mineras (INGEOMINAS)
Diagonal 53, 34-53
Bogotá-DE-Colombia

Carbones de Colombia S.A.
(CARBOCOL)
Carrera 7, 31-10
Bogotá-DE-Colombia

Acerías Paz del Río S.A.
Carrera 8a, 13-31 Pisos 7 a 11
Bogotá-DE-Colombia

Cerro Matoso S.A.
Carrera 7, 26-20 Piso 8
Bogotá-DE-Colombia

Publications

American Embassy, Bogotá: Incoming telegrams.

U.S. Central Intelligence Agency: World Factbook, annual.

Colombia Information Service, New York: Colombia Today, monthly.

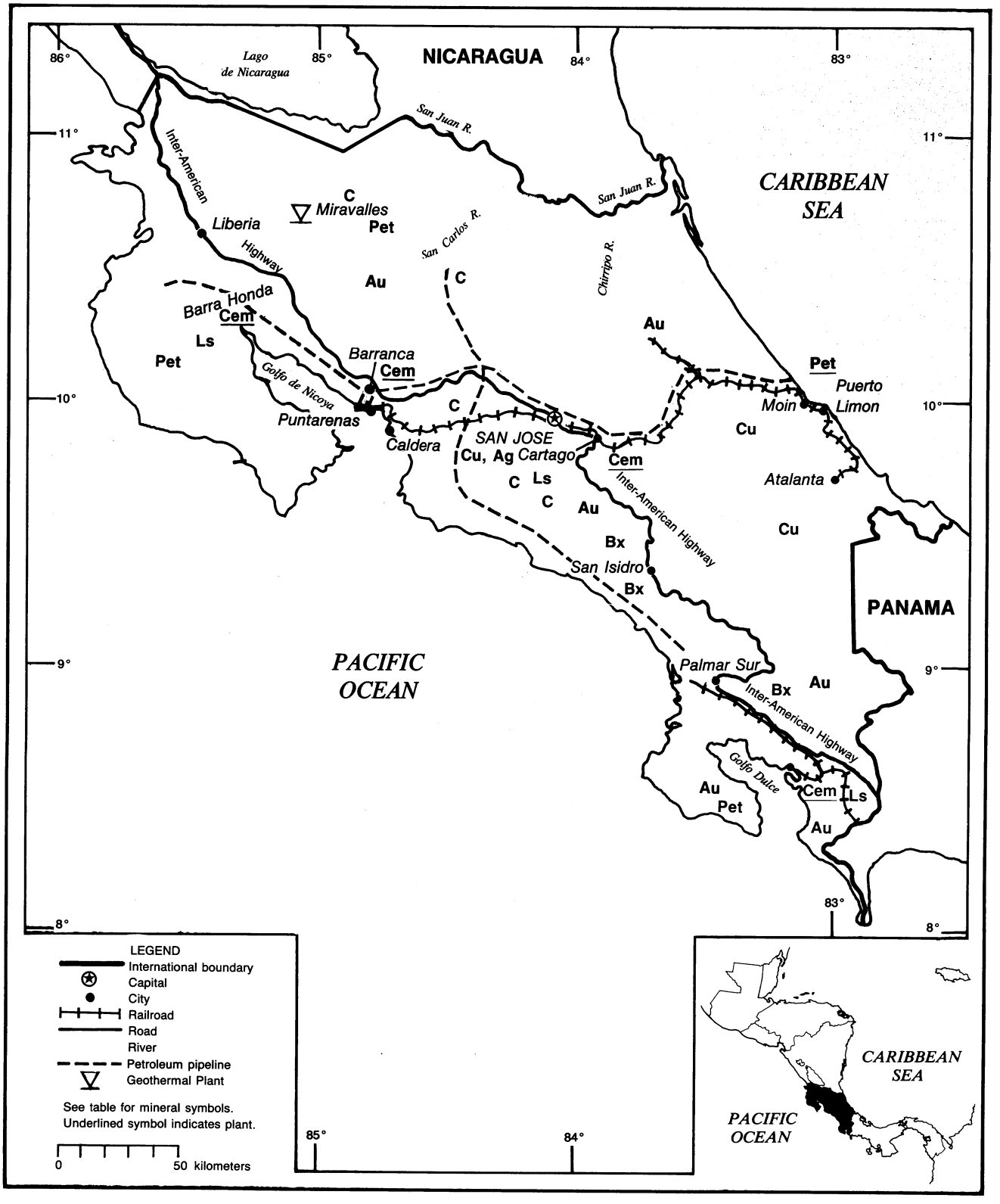
Miida Ltd., London: Latin America Mining Letter, biweekly.

PenWell Publishing Co., Tulsa: Oil and Gas Journal, monthly.

World Reports Limited, London: The Latin America Times, monthly.

COSTA RICA

AREA 51,100 km² (includes Isla del Coco) **POPULATION 2.95 million**



THE MINERAL INDUSTRY OF

COSTA RICA

By Pablo Velasco

The mineral industry of Costa Rica continues to be of small importance to the national economy. Production of industrial minerals predominates, with limestone and cement being the two major minerals. The only metallic mineral mined on a continuous basis was gold. Crude oil refinery products and iron and steel semimanufactures were also produced. Costa Rica has been for many years the most prosperous of the Central American countries, a position the country enjoys mainly through its political stability, with an economy dominated by the production of agricultural products for export. Early in 1989, the Costa Rican Government negotiated new loans from the International Monetary Fund (IMF) to secure support for the balance of payments, to reduce the rate of inflation, and to stabilize the conditions deemed necessary for sustained growth. The inflation rate decreased to 10% in 1989.

During 1989, the gross domestic product (GDP) was $5.2 billion[1] in current dollars, compared with $4.7 billion for 1988. In 1989, the mining sector played a minor role in Costa Rica's economic development. It produced limited amounts of common clays, diatomite, gold, iron and steel semimanufactures, marine salt, petroleum products, silver, and various industrial materials, notably limestone, pumice, sand and gravel, and stone. The Costa Rican Government continues to place emphasis on the development of the country's gold potential; however, other mineral deposits such as bauxite, coal, copper, iron ore, manganese, mercury, sulfur, and others have also been identified but thus far have not been developed.

GOVERNMENT POLICIES AND PROGRAMS

Costa Rica continues to offer a favorable investment climate to foreign investors. The principal legislation governing mining is the new mining code that was enacted as Law 6797 on October 4, 1982. El Ministerio de Recursos Naturales, Energía y Minas (MIRENEM) (The Ministry of Natural Resources, Energy and Mines) is responsible for the control and development of Costa Rica's mineral resources. The Dirección de Geología, Minas e Hidrocarburos (DGMH), and the agencies Minera Nacional, S.A. (MINASA) and the National Environmental Commission, which were created in 1984 and 1985, respectively, to provide technical assistance and expertise in mining and environmental issues. Under MIRENEM, MINASA acts as the Government mining company, with legislative authority to develop and exploit mineral resources independently.

In addition to MIRENEM responsibilities in controling the mineral sector, the Ministry of Planning, the Central Bank through its office of precious metals, and Refinadora Costarricense de Petróleo S.A. (RECOPE) also regulate this sector in some way. RECOPE currently is in the process of developing regulations to control hydrocarbon exploration that could include environmental protection aspects. The new regulations would permit foreign companies to establish joint ventures with RECOPE and would require a minimum state participation and share of the mineral resources extracted.

The 1982 mining code states that no exploitation can occur in national parks or biological reserves in areas protected by the state (forest reserves, archeological sites, or wildlife refuges). Only MINASA may carry out mining activity with the approval of the legislative assembly. At present, mining is the only industry that is required by legislation to prepare environmental impact studies (EIS). In the future, the code established that the EIS would be approved by the pertinent National Environmental Commission agency. In 1989, new reforms to the mining code have been proposed to the legislative assembly for approval. Among the reforms were the following:

1. Establishment of regional mine offices, with two inspectors, a geologist,and a mining engineer, in addition to an assistant to provide on-site control, to be located in Juntas de Abangares, San Ramón, Puerto Jiménez, and Corredores.
2. A census to count the existing mines in the country.
3. Monthly reports by mining concessionaires to the Office of DGMH; annual and semiannual visits to the mine site by the Office of DGMH, to be paid by the concessionaire.
4. A requirement that no less than 50% of the gold or other extracted material be offered first to the Central Bank for purchase.
5. The Office of DGMH would review precious minerals extraction and report to the Banco Central.
6. Prison terms of 6 months to 3 years for those who traffic or export precious metals without first approaching the Banco Central. (Permit would be canceled and any property seized).
7. Development of a minerals resource register for the country.
8. Strengthening of the National Environmental Commission, which should be made up of additional outside experts in the disciplines that are most important to protection and conservation (health experts and engineers, for example).

PRODUCTION

Mineral production in Costa Rica continues to be limited to the extraction of gold and silver, the production of iron and steel semimanufactures, petroleum refinery products, and to a lesser degree some industrial minerals, notably sand and gravel, crushed rock, rough stone, limestone and other calcareous materials, cement, common clay, and pumice stone. According to official figures released by the Ministry of Natural Resources, Energy and Mines, the output of nonfuel minerals, including iron and steel

semimanufactures and petroleum products, increased slightly in 1989 compared with those of the previous year. The total value of minerals produced in 1989 was estimated to be about $40 million, a relatively insignificant contribution in terms of the GDP.

TRADE

Despite the existence of the Central American Common Market the passing of the Caribbean Basin Economic Recovery Act by the U.S. Government, which has eliminated tariff barriers on a wide range of goods and services exported to the United States, and the fact that Costa Rica has substantial nonmetallic mineral resources, their potential is relatively undeveloped. The country imports about 25 times as much as it exports. However, there are good opportunities to reduce this imbalance.

The value of nonmetallic (industrial minerals), raw material imports during the years 1980–89 ranged from $4.3 to $7.8 million with an average of $5.8 million. Volumetrically, the principal imports since 1980 have been ceramic clays, feldspar, fertilizer raw materials, gypsum, salt, and silica sand. In addition, other commodities imported regularly in smaller quantities included bentonite, diatomite, dimension stone, and talc.

In 1989, Costa Rica imported 4.8 million barrels of crude oil and refinery products from Colombia, Ecuador, Mexico, and Venezuela. Costa Rican exports of nonmetallics were by comparison very small, composing less than 5% of the value of imports. The principal export was limestone from the Barra Honda Formation, which was trucked to Panama. The very high purity of the Barra Honda limestone, and its outcrop near the coast are instrumental factors in

TABLE 1

COSTA RICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS						
Gold	kilograms	498	361	300	313	[2]387
Iron and steel: Semimanufactures:						
Concrete reinforcing bar		32,276	29,686	45,435	39,214	40,000
Wire		6,246	9,644	8,178	10,414	10,500
Galvanized sheet		13,700	13,573	45,000	22,000	22,000
Silver[e]	kilograms	62	62	62	62	[2]194
INDUSTRIAL MINERALS						
Cement		[r]458,000	[r]533,766	581,740	556,360	800,000
Clays, common[e]		200,000	200,000	200,000	200,000	[2]506,685
Diatomite[e]		[r]4,500	[r]4,500	[r]4,500	[2]4,500	4,500
Lime[e]		10,000	10,000	10,000	10,150	23,000
Pumice		[r]10,000	[r]10,000	[r]12,000	[r]14,000	14,000
Salt, marine		29,484	30,000	[r]30,000	[2]30,000	30,000
Stone:						
Crushed rock and rough stone[e]		[e]1,100,000	1,200,000	1,300,000	[2]1,500,000	1,500,000
Limestone and other calcareous materials[e]		1,000,000	1,000,000	1,000,000	[2]1,015,000	[2]2,300,000
Sand and gravel[e]		625,000	1,000,000	1,000,000	[2]1,350,000	1,400,000
Sandstone[e]		1,000	1,000	1,000	[2]1,000	1,000
MINERAL FUELS AND RELATED MATERIALS						
Refinery products:						
Gasoline	thousand 42-gallon barrels	570	969	901	905	950
Kerosene	do.	124	78	124	120	130
Jet fuel	do.	128	160	264	260	270
Destillate fuel oil	do.	656	1,291	1,179	1,170	1,300
Residual fuel oil	do.	1,252	1,798	1,578	1,600	1,650
Asphalt	do.	133	67	85	80	90
Other	do.	124	296	382	380	385
Refinery fuel and losses	do.	58	81	81	42	46
Total	do.	3,045	4,740	4,594	4,557	4,821

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Sept. 1990.
[2]Reported figure.

making Barra Honda limestone well placed for export. Costa Rica exports to the United States in 1989 amounted to $578.5 million, an increase of 17.1% over that of 1988. Imports from the United States reached $705 million, an increase of 29.5% compared with that of the previous year. The U.S. share of Costa Rican exports represented 39.7% of the total, with the United States share of Costa Rican imports about 40.4%.

STRUCTURE OF THE MINERAL INDUSTRY

All active exploration and mining operations are owned by foreign companies, most of them from Canada and to a lesser extent by other countries. Control of the mineral sector, including energy fuel minerals, is administered by the DGMH of MIRENEM. Within the MIRENEM, other agencies were created to assist and provide technical expertise to potential investors, foreign and domestic. These agencies are: MINASA, RECOPE, and the National Environmental Commission.

COMMODITY REVIEW

Metals

Gold and Silver.—Reliable figures and grades worked by different companies are very difficult to obtain, and declared records of gold and silver production by individual operators or from the Osa Peninsula as a whole are generally understated and must be treated with caution.

The "Coligalleros," a local name for a team comprised of two men helped by women and children, can recover an average of 1 to 3 grams (g) of gold per day. It was estimated that 500 of these teams working 200 days a year can produce about 200 kilograms (kg) of gold.

The Banco Central of Costa Rica has been purchasing gold since July 1981 and has an agency in Puerto Jiménez that buys gold at a slight premium over the prevailing world price, paying in local currency at the official exchange rate on the basis of 22.1 karat (92%) gold. However, producers can avoid paying taxes if they sell privately, and they can sell nuggets for appreciably more than the world price as well as being paid in U.S. dollars. Thus a large proportion of the gold produced is sold privately with a resulting loss of income to the Government.

Gold and silver production in Costa Rica increased 23.6%, and 213% respectively, in 1989 with respect to that of 1988. Ariel Resources Ltd., the largest underground gold producer in Costa Rica, is to sell a 5% net smelter royalty in its Tres Hermanos Mine to Lion Mining Finance Ltd. of Canada for $1.5 million. The intention of this sale is to use the money to fund an expansion of the mine and mill from its current 55 tons per day to 200 tons per day. Ariel anticipated that this increased capacity would enable gold production to increase from 93 kg per year to over 370 kg per year. Exploration at the company's Esperanza Mine in Guanacaste Province continued in a mineralized zone in previous workings containing three veins and five collapsed tunnels. The Esperanza Mine reportedly has been producing about 6 kg of gold per month from quartz veins aproximately 1 to 3 meters (m) wide.

Minera Macona Ltda. from Canada has been operating an open pit mine within the Tilarán-Aguacate gold province since 1981. The company previously

TABLE 2

COSTA RICA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	Industria Nacional de Cemento S.A. (INCS (Private, 100%)	Aguas Calientes, Cartago, Cartago Province	350.
Do.	Cementos del Pacifico S.A., (CEMPASA), subsidiary of CODESA (Government, 100%)	Abangares, Guanacaste Province	300.
Do.	Cementos del Valle, S.A., subsidiary of CODESA (Government, 100%)	Guatuso de Patarra, Heredia Province	170.
Limestone	Cementos del Pacifico S.A. (Government, 100%)	Cerro Pena Blanca, Barra Honda Mine, Guanacaste Province	400.
Gold	Ariel Resources Ltd. (Canadian, 100%)	Tres Hermanos and Esperanza Mines, Guancaste Province	93 gold.[1]
Do.	Minera Macona Ltda. (Owned 100% by Equinox Resources Ltd.) [Previously jointly owned by United Hearne Resources (60%) and Barranca Corp. Ltd (40%) (all Canadian)]	Santa Clara Mine, Modongo Zone, Puntarenas Province	160 gold.[1]
Gold and silver	Greenstone Resources Ltd. (Toronto, Canada)	El Recio Mine, Abangares, Guanacaste Province	100 gold.[1] 100 silver.[1]
Do.	Mallon Resources Corp. (Denver, United States)	Rio Chiquito Mine, Guanacaste Province	100 gold.[1] 90 silver.[1]
Petroleum products	Refinadora Costarricense de Petroleo S.A. (RECOPE) (Government, 100%)	Moin Refinery, Limon Province	16.[2]

[1]Kilogram per year.
[2]Thousand 42-gallon barrels per day.

owned jointly by United Hearne Resources (60%) and Barranca Corp. Ltd. (40%) of Canada, was acquired by Equinox Resources Ltd. also of Canada in February 1989. Surface sampling has shown gold mineralization to extend over a distance of more than 7 kilometers (km), with resources amounting from 2 to 3 million tons of potential sulfide ore. Southern Era Resources Ltd., also of Canada, has replaced Consolidated Silver Standard Mines Ltd. as the partner in the mining venture. The mine, which was developed in one of the Santa Clara's epithermal deposits 65 km west-northwest of San José, has produced approximately 160 kg of gold per year. Proven reserves were placed at about 5 million tons of ore averaging 1 to 6 g of gold per ton.

It was reported in August 1989 that Maalon Resources Corp. of Denver, CO (United States), was to suspend and reassess its gold-silver mining and recovery operation at Río Chiquito Mine. Exploration was to be intensified during the shutdown, and additional financing will be sought. Greenstone Resources Ltd. of Canada had announced the discovery of high-grade deposits at the Santa Ana section of its Recio gold-silver deposit in Guanacaste Province. Greenstone planned to begin production from its open pit mine. Rayrock Yellow Knife Resources Inc. (Canada), the operator of the joint venture between the Canadian companies, Midland Energy Corp. and Westlake Industries Ltd., has announced that 27 additional holes totaling 5,000 m have been drilled at the Bellavista, Montezuma, property. This exploration reportedly indicated a significant northerly extension of the ore body. Preliminary estimates of reserves were 14 million tons grading 1.6 g of gold per ton.

A deposit of gold-bearing sulfides in the Las Juntas region has been explored by Minas de Sierra Alta S.A., a subsidiary of Nor-Quest Resources Ltd. of Canada. Reserves at the San Martín deposit were estimated at 650,000 tons of ore averaging 3.8 g of gold per ton.

In 1989, MINASA, acting as the Government mining company with legislative authority to exploit mineral reserves, signed its first joint-venture agreement with the Canadian company NOVA-CO Exploration Ltd. for the exploration of gold reserves in Guanacaste Province.

Iron and Steel.—Costa Rican production of iron and steel products (hot-rolled) maintained the same level as that of 1988. In 1988, production of concrete reinforcing bars declined 1.7%, production of wire increased 27.3%, and production of galvanized sheets fell 51.1% with respect to that of 1987. Imports and exports of semimanufacture steel products declined 52.2% and increased 10.7%, respectively.

Industrial Minerals

The results of a recent project funded jointly by the British Government's Overseas Development Administration, MIRENEM and RECOPE, have been released in the report "Proyecto Anglo-Costarricense de Minerales Industriales." This is an ongoing bilateral technical cooperation project to make a systematic survey of the nonmetallic industrial minerals and rocks of Costa Rica. According to this report four classes of industrial minerals in Costa Rica were recognized:

1. Those that are actually being exploited, namely clays, diatomite, limestones, sand and gravel, sandstones, solar salt, and volcanic rocks.
2. Those for which there are claimed to be proven reserves sufficient to sustain a profitable mining operation, e.g., volcanigenic sulfur.
3. Those for which there is sufficient geological knowledge to consider the commodity a potentially exploitable resource, e.g., granite.
4. Those that are either known to occur in noneconomic deposits or for which there are some favorable geological indications suggesting that economic deposits may be found. Included in this more speculative category are barite, feldspar, gypsum, perlite, phosphate rock, ultramafic nonmetallics, wollastonite, and zeolites.

Limestone and Cement.—Costa Rican production of limestone in 1989 was reported to be 2.3 million tons, an increase of 126.7% with respect to that of 1988. The principal use was in the manufacture of cement, which accounted for 81% of the limestone extracted. Limestone is also used as a soil conditioner, as an aggregate, in glassmaking, for producing lime, and as dimension stone. Costa Rica has plentiful resources of limestone.

At present, there are about a dozen working quarries in the Barra Honda limestone deposit, all located close to the mouth of the Tempisque River. The largest operation is by Cementos del Pacífico S.A. (CEMPSA), which commenced in 1980 at Cerro Peña Blanca in Guanacaste Province and now is producing more than 350,000 tons per year of limestone. CEMPSA blends the limestone in their on-site factory with locally extracted shales of the Brito Formation to make cement. CEMPSA produces about 300,000 tons per year of cement, and by law they are guaranteed 50% of the domestic market. The company's quarry has an estimated 76 million tons of limestone reserves, sufficient for 177 years at the present rate of consumption.

Industria Nacional de Cemento's (INCSA) major extraction is at their La Chilena quarry operation where they extract 350,000 tons per year of limestone from the upper and lower parts of the deposit and 200,000 tons per year from interbedded limestone and shale, called "50-50" from the middle of the deposit. All of this material is used to manufacture cement products in INCSA's nearby factory. Production was on the order of 350,000 tons, of which portland cement No. 1 accounted for about 90%. NICSA supplied about 57% of the national demand for cement.

Sulfur.—In spite of the emphasis placed on gold, efforts were being made by the Government of Costa Rica to assess the country's resources of other minerals, including bauxite, coal, copper, iron ore, manganese, mercury, and sulfur. Total native sulfur resources in Costa Rica have been estimated at 11 million tons. It was reported by Costa Rican officials that Rich Coast Sulphur Ltd. of Vancouver, Canada, through its subsidiary Corporación de Azufre de Costa Rica S.A. had reevaluated the Volcán Cacao (Río Góngora) sulfur deposit known also as "Quebrada Grande," a small town 5 km to the south-southwest in Guanacaste Province. It is alongside Río Góngora on the flanks of Volcán Cacao, 6 km south-southwest of its summit. During 1986 and 1987, by drilling another 30 holes totaling some 2,233 m, the company delineated an irregular-shaped deposit covering an area of about 500 by 200 m with an average thickness of about 20 m. The southern and western margins of the deposit were not delineated, and further drilling could considerably

increase reserves. The company has estimated that there are measured and proven reserves of 4.69 million tons of ore containing 14.1% native sulfur and 16.4% pyrite.

Rich Coast Sulphur has reached agreements on an equal partnership venture with Daeboo Battery Ltd. of South Korea for the development of the Góngora sulfur deposit. The project aims at constructing a 125,000-ton-per-year mine to operate for more than 5 to 6 years based on most recent proven reserves. Under the terms of the agreement, Daeboo Battery is to transport the mine's entire output to South Korea.

Mineral Fuels

Coal.—Coal exploration by RECOPE began in 1983 with the cooperation of the U.S. Agency for International Development (AID). In 1987, the Canadian Government, through its agency Petro Canada International Assistance Corp. (PCIAC), decided to cooperate with RECOPE donating approximately $169 million[2] for exploration of removable resources and protection of the environment. Three exploration holes, Matina I, Pataste I, and Tonjibe I, were drilled to delineate the Uatzi and Zent coal reserves in Limon Province. In 1988, the first pilot plant for the extraction and commercialization of coal from Zent by RECOPE and the private sector was initiated, and production was planned for 1989–90.

Petroleum and Natural Gas.—RECOPE continued to play a key role in Costa Rica's energy sector. It is responsible for the importation, refining, and distribution of petroleum and petroleum products. Costa Rica remained heavily dependent on imported crude oil to meet its commercial energy requirements. Total annual energy consumption in 1988 and 1989 was believed to have been quite close to the 1987 level of 1,391,000 tons of standard coal equivalent. Distribution by source was believed to have approximated the 1987 pattern, when liquid fuels, all imported, provided 74% of total energy consumed, domestic hydroelectric plants provided 25%, and the remaining 1% was imported electric power.

The liquid fuel supply situation apparently closely paralleled that of 1987, when Costa Rican refinery output, based entirely on imported crude oil, provided about 71% of the available supply of products, and direct imports of products constituted 29% of the supply. Of the total supply, 90% was consumed in Costa Rica, and 10% was exported. Costa Rica's refinery apparently operated at about 90% of capacity.

RECOPE has confirmed that it signed a cooperative and technical assistance contract with Nicaragua and Norway to begin an oil exploration program off the Pacific coast. The focus of the program will be geophysical surveying of more than 1,500 square kilometers of the Pacific coast of Costa Rica and Nicaragua and the training of personnel. The estimated cost of the project was approximately $1.5 million and will be paid by Norway's technical development assistance agency. Statoil, Norway's state petroleum company, is managing the project and has awarded a subcontract to Western Atlas International (WaII).

Energy.—As for the electricity supply for the country, an estimated 2,875 million kilowatt hours (kW·h) was provided by hydroelectric plants, the primary electrical energy source. An estimated 53 million kW·h was produced by thermal plants using liquid fuels. There was a small exchange of electric power with neighboring countries, with imports exceeding exports. Available data indicated that electric power production in 1987–89 has been considerably below rated capacity.

Despite Costa Rica's dependency on imported oil for three-quarters of its energy, development of the country's hydroelectric and geothermal energy resources has proceeded slowly. Among other projects in energy for the 1990's, is a 42-megawatt (MW) hydroelectric plant at Sandillal, for which the Inter-American Development Bank (IDB) has granted a loan of $94.6 million, in addition to two hydroelectric plants to produce 90 MW on the Toro River. A longstanding Japanese-funded project is the 55-MW geothermal powerplant due to be completed in 1992. It is in the District of Bagaces, Guanacaste Province, on the southwest slope of the Miravalles volcano.

Reserves

Costa Rica's mineral reserves are not considered large in comparison to other countries. The metallic mineral reserves are always unpublished. All the industrial mineral reserve figures are unpublished except for limestone, where the reserves are considered plentiful. Minerals with unpublished reserves are clays, diatomite, intrusive igneous rocks, salt, sand and gravel, sandstone, sulfur, and volcanic rock. Other possible industrial minerals are barite, feldspar, gypsum, perlite, ultramafic nonmetallic, wollastonite, and zeolites.

INFRASTRUCTURE

Costa Rica is one of the most prosperous of the Central American republics; it has a relatively well-developed infrastructure. The transportation network was composed of a total of 15,400 km of highways: 7,030 km was paved, 7,010 km was gravel, and 1,360 km was unimproved earth. The primary road is the Inter-American Highway that extends the length of the country. Branch roads extend from this main artery to almost all population and industrial centers.

The railroad system consisted of 950 km of 1,067-m gauge, of which 243 km is electrified. The railroad system extends from Puntarenas on the Pacific coast to Puerto Limón on the Caribbean coast. About 730 km of river is seasonally navigable. There are five important ports in Costa Rica: Puerto Limón, Caldera, Golfito, Moín, and Puntarenas.

RECOPE's distribution of petroleum refined products in the country is accomplished by a net of 348 km of pipeline that has the capacity to transport 550 barrels per hour of refined products from Moin on the Caribbean coast to Barranca on the Pacific coast.

About 89% of Costa Rica's 914-MW electrical capacity is from hydroelectric plants. The country produced a total of 2,928 million kW·h in 1989, which translated into 993 kW·h per capita. Geothermal power potential is under development near the Miravalles Volcano in northwestern Costa Rica. Successful completion of this project would add 55 MW of electrical capacity.

OUTLOOK

For the short term, the outlook for nonfuel minerals and hydrocarbon minerals operations does not expect much improvement. However, conditions could improve significantly in the longer term

when the new mining code and other regulations recently introduced are adopted and implemented.

The Anglo-Costarricense Industrial Minerals Project Phase 1, implemented by the British Geological Survey, the DGMH, and RECOPE in 1989 have demonstrated that there is considerable potential for development of industrial minerals in Costa Rica, both for domestic consumption and export. Phase 2 of this project will involve more detailed investigation of selected mineral commodities. Other major factors that could affect the long-term outlook are the exploration and exploitation of metallic minerals with emphasis on the development of the country's gold potential.

The development of the country's hydroelectric and geothermal power as well as the extraction and commercialization of bituminous coal from the Zent (Limón Province) would boost the industrial sector, particularly the cement plants.

[1]Where necessary, values have been converted from Costa Rican colones (c) to U.S. dollars at the rate of c84.9 = 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

Refinadora Costarricense de Petróleo S.A.
Apartado 4351, Zona 1000
San José, Costa Rica

Minera Nacional S.A.
Apartado 10104, Zona 1000
San José, Costa Rica

Publications

Proyecto Anglo-Costarricense de Minerales Industriales.

The Nonmetallic Industrial Minerals and Rocks of Costa Rica, Phase I Report.

Planificación Corporativa, Refinadora Costarricence de Petróleo S.A., report.

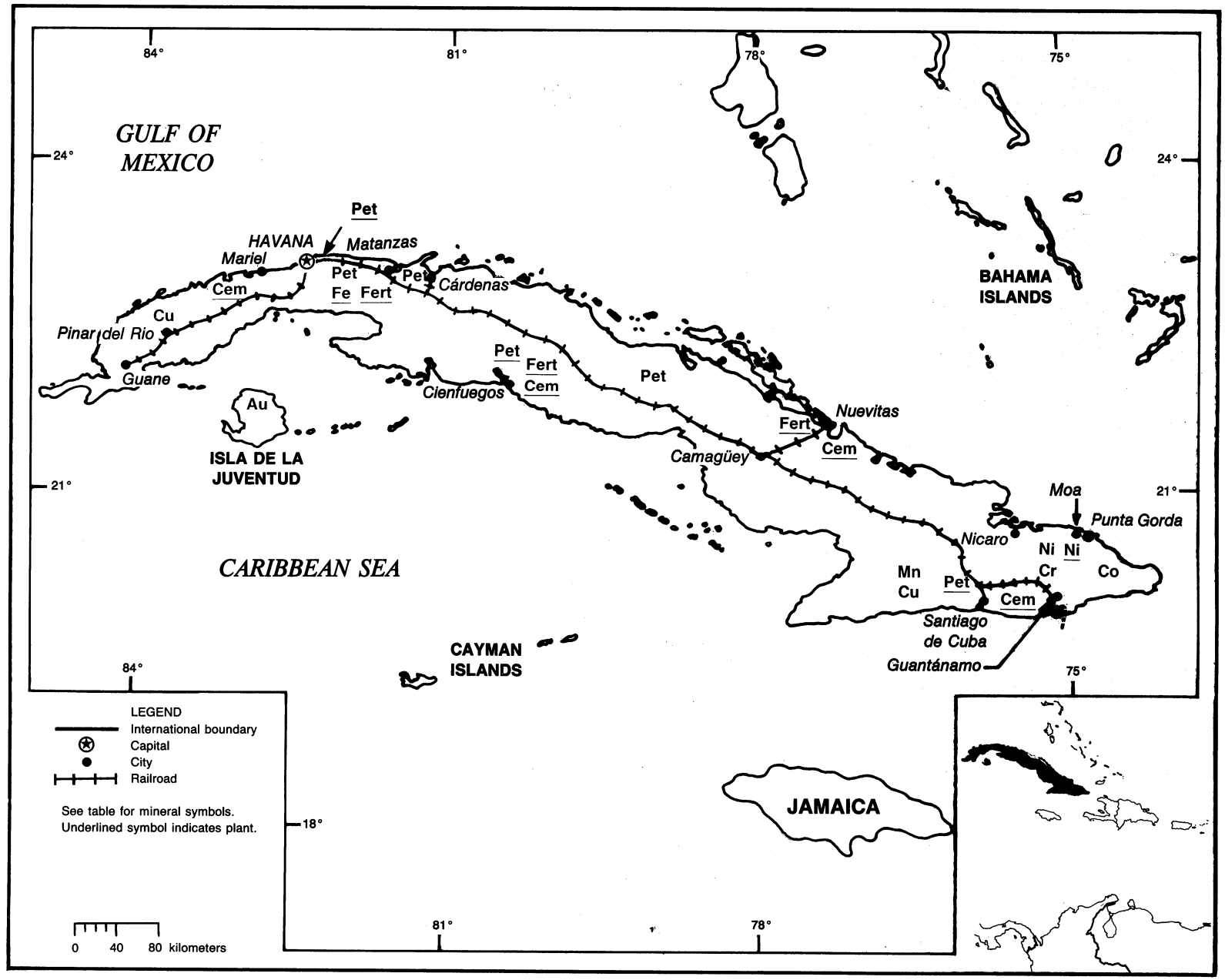
Petróleo, Carbón, Turba, Refinadora Costarricence de Petróleo S.A., report.

Miravalles Geothermal Project, Instituto Costarricense de Electricidad (ICE), report.

Energy and Mineral Potential of the Central American Caribbean Region, Ministerio de Recursos Naturales Energía y Minas, Refinadora Costarricence de Petróleo, report.

CUBA

AREA 110,860 km² **POPULATION 10.6 million**



THE MINERAL INDUSTRY OF

CUBA

By Philip M. Mobbs and Ivette E. Torres

Mining and processing of laterite nickel deposits in northeastern Cuba dominated minerals industry activity in 1989. Cuba ranked sixth, accounting for 5% of the total world nickel production. Other important mineral products included cement, chromite, gypsum, salt, and steel. Domestic and imported crude oil formed the country's primary source of energy, as well as the feedstock for the country's petroleum products.

GOVERNMENT POLICIES AND PROGRAMS

Cuba's global social product increased by 1% in 1989 to approximately $21 billion,[1] compared with a 2.3% increase in 1988 and an 8.3% annual increase at the beginning of the decade. The global social product differs from the gross domestic product in that it represents the value of all goods and services generated in the country in the course of the year. It is equal to the sum of the values of gross production in all productive sectors and does not include the value of services that are defined as nonproductive. The global social product is determined in accord with the material product system adopted by the United Nations Statistics Office.

In 1982, Cuba enacted the Joint-Venture Law, Legislative Decree 50, which authorized the Government to enter into commercial ventures with foreign investors. U.S.-based companies were prohibited from participating because of U.S. Government restrictions. Additionally, constraints were placed on third party use of U.S. origin equipment in joint ventures with the Cuban Government.

The Government continued to encourage small mining operations, especially of raw materials related to the construction industry. New mineral projects were focused toward the reduction of raw material imports, enhancement of regional development, and increased exports.

Cuba entered into numerous technical and trade agreements with foreign governments. The U.S.S.R. agreed to provide safety supervision equipment and training for the nuclear powerplant under construction at Cienfuegos. Scientific and technical co-operation agreements were signed with North Korea, Romania, the U.S.S.R., and Vietnam. Cuba normalized diplomatic relations with Venezuela after a 9-year hiatus.

Cuba rejected Soviet style social and economic reforms, especially *perestroika* and *glasnost*. Later in the year, the Government expressed apprehension that crucial imports from the Council for Mutual Economic Assistance (CMEA or Comecon) countries could be disrupted by the Eastern bloc reforms.

PRODUCTION

Cuba's primary metal output consisted of chromite, cobalt, nickel, and steel. Nickel production continued its upward trend. Most industrial mineral production was for domestic use, although cement and marble were important exports. Cement output continued its 3% to 4% annual growth. Crude petroleum production hovered at about 1989 levels.

TRADE

Nickel and petroleum products were Cuba's leading mineral exports and significant sources of hard currency. The nation's trade deficit grew in 1989. Exports dropped by more than 9% and imports increased by almost 5%. Lack of hard currency checked overall industrial growth. Cuba's Soviet and CMEA trade was based on rubles, which were not convertible to hard currency. Increased production and export of sugar, nickel, medical supplies, and petroleum products to Western markets, as well as an expanded tourist industry, were intended to boost the nation's hard currency income.

Cuba signed a 3-year trade agreement with Venezuela promoting the economic integration of the Caribbean basin. Cuba was to receive tariff preferences on exported nickel oxide, whereas Venezuela would receive tariff preferences on petroleum and processed aluminum products. Petroleum represented nearly 35% of Cuba's total import costs in 1989.

Cuba and China agreed to increase bilateral trade to $500 million in 1990, a 15% increase over that of 1989. Ghana agreed to barter aluminum, cocoa, and wood for Cuban sugar, sports equipment, and medicine. Albania and Cuba agreed to a 14% trade increase over the 1989 volume, and, in November, Cuba and Romania concurred on a 3% trade increase pact for 1990 valued at $300 million. Also in November, a Bulgarian-Cuban Agreement was signed, which specified that Cuba would export nickel to Bulgaria in 1990 and import Bulgarian metals.

Cubaniquel, the international marketing company associated with the Union de Empresas del Níquel, continued to export all of the nickel-cobalt sulfide slurry produced at the Pedro Soto Alba plant to the U.S.S.R. In 1989, Cuba exported approximately 40% of its granular nickel oxide, nickel oxide powder, and sintered nickel oxide to CMEA countries. An estimated 14,000 tons of nickel powder and nickel sinter was sold on the Western markets, a 16% increase over that of 1988. Nickel-cobalt oxides and sulfides represent about 6% of the value of total Cuban exports.

The United States imposed economic sanctions against Cuba in 1962. The U.S. trade embargo was augmented in 1983 when a ban was imposed on all imported third country products that contained Cuban nickel. The U.S. Government's position shifted slightly in 1989 when the U.S. Postal Service began to ship mail directly to Cuba instead of relaying it via Mexico.

STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry, like the overall economy, was controlled by the Government. Mining and petroleum enterprises

TABLE 1

CUBA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
Cement, hydraulic	thousand tons	3,182	3,305	3,535	3,566	3,700
Chromite	do.	38	50	52	55	50
Cobalt[3]		1,490	r1,553	1,566	1,752	2,000
Copper, mine output, Cu content		3,076	3,257	3,461	2,951	2,750
Gas, natural:						
Gross[e]	thousand cubic meters	67,960	56,634	65,129	r21,900	34,000
Marketed	do.	6,911	5,691	e6,796	1,524	4,000
Gypsum[e]	thousand tons	130	130	130	130	130
Iron and steel: Steel, crude	do.	401	412	402	321	310
Lime	do.	170	r174	185	179	180
Nickel:						
Mine output, Ni-Co content of oxide and sulfide		33,577	r35,102	35,860	43,928	4[4]5,500
Metallurgical products, Ni content:[3]						
Granular oxide and powder		r8,830	8,382	5,905	12,620	13,000
Oxide sinter		r7,055	r8,289	11,319	11,211	12,000
Sulfide		r15,900	r16,547	16,600	17,927	18,000
Total		r31,785	r33,218	33,824	41,758	43,000
Nitrogen: N content of anhydrous ammonia	thousand tons	163	163	148	135	150
Petroleum:						
Crude[5]	thousand 42-gallon barrels	5,771	6,240	5,950	4,768	4,800
Refinery products	do.	r50,144	r50,213	52,103	50,839	53,000
Salt	thousand tons	221	266	231	201	200
Sulfur, byproduct of petroleum[e]	do.	5	5	5	5	5

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

[1]Table includes data available through Dec. 1990.

[2]In addition to commodities listed, crude construction materials (marble, sand and gravel, stone, etc.) were produced, but data on such production are not always available, and information is inadequate to make reliable estimates of output levels.

[3]Anuario Estadistico de Cuba provided 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]Includes 500 tons of ammonium sulfide.

[5]Cuba reports crude oil production in metric tons. A conversion to barrels was made using a factor of 6.652.

TABLE 2

CUBA: APPARENT EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988[p]	Principal destinations, 1988
METALS			
Aluminum:			
Ore and concentrate	120	NA	
Ash and residue containing aluminum	551	NA	
Metal including alloys:			
Scrap	4,288	3,122	Netherlands 2,498; Spain 311; Canada 147.
Unwrought	507	811	Spain 763; Japan 48.
Semimanufactures	263	52	All to Netherlands.
Chromium: Ore and concentrate	7,137	31,405	Sweden 9,548; Mexico 6,815; Austria 5,291.

See footnotes at end of table.

TABLE 2—Continued

CUBA: APPARENT EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988[p]	Principal destinations, 1988
METALS—Continued			
Copper:			
Ore and concentrate	[2]3,333	NA	
Ash and residue containing copper	142	NA	
Metal including alloys:			
Scrap	8,029	4,476	Netherlands 4,229; Canada 228; Spain 19.
Semimanufactures	1	10	All to Mexico.
Iron and steel: Metal:			
Scrap	161,364	60,788	Italy 57,069; Mexico 2,271; Netherlands 1,348.
Pig iron, cast iron, related materials	6,402	NA	
Steel, primary forms	17,441	10,264	Italy 10,228; West Gemany 36.
Semimanufactures	[2]104,816	61,044	Egypt 47,760; Canada 9,887; Italy 3,170.
Lead:			
Ash and residue containing lead	150	NA	
Metal including alloys:			
Scrap	657	5,021	Netherlands 4,967; Canada 54.
Unwrought	501	188	All to Netherlands.
Nickel:			
Ore and concentrate	NA	15	All to Mexico.
Matte and speiss	1,448	1,838	Italy 1,222; Japan 512; Mexico 63.
Oxides and hydroxides, Ni content[2 3]	6,113	NA	
Sinter, Ni content[2 3]	11,618	NA	
Sulfide, Ni content[2 3]	18,399	NA	
Metal including alloys:			
Unwrought	—	46	All to Yugoslavia.
Semimanufactures	6	NA	
Platinum-group metals: Metals including alloys, all forms value, thousands	$6	NA	
Tin:			
Ash and residue containing tin	12	NA	
Metal including alloys, scrap	68	8	All to Netherlands.
Vanadium: Ash and residue containing vanadium	186	NA	
Zinc:			
Ash and residue containing zinc	794	NA	
Metal including alloys:			
Scrap	155	296	All to Netherlands.
Semimanufactures	NA	2	Do.
Other:			
Ores and concentrates	3,298	9,565	Sweden 9,548; Mexico 17.
Oxides and hydroxides	NA	42	Argentina 28; Spain 14.
Ashes and residues	30	2,034	All to Netherlands.
INDUSTRIAL MINERALS			
Asbestos, crude	161	NA	
Cement	[2]86,987	55,000	Colombia 4,250; unspecified 50,750.
Clays, crude	8	NA	

See footnotes at end of table.

TABLE 2—Continued

CUBA: APPARENT EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988[p]	Principal destinations, 1988
INDUSTRIAL MINERALS—Continued				
Precious and semiprecious stones other than diamond: Natural	value, thousands	$14	NA	
Salt and brine		92	NA	
Stone, sand and gravel: Dimension stone:				
Crude and partly worked		1,235	1,522	Italy 1,365; Mexico 157.
Worked		159	249	Netherlands 194; Spain 45; Japan 10.
Other: Crude		NA	449	France 407; Spain 42.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum:				
Crude	thousand 42-gallon barrels	1,009	639	Spain 433; West Germany 206.
Refinery products:				
Gasoline	do.	1,126	3,308	United Kingdom 2,339; West Germany 745; Netherlands 115.
Lubricants	do.	NA	(4)	All to Netherlands.

[p]Preliminary. NA Not available.
[1]Table prepared by H. D. Willis. Owing to a lack of official trade data published by Cuba, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries. The United States reported no mineral commodity imports from Cuba in 1987.
[2]Anuario Estadistico de Cuba, 1987.
[3]Includes contained cobalt.
[4]Less than 1/2 unit.

TABLE 3.

CUBA: APPARENT IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988[p]	Principal sources, 1988
METALS				
Aluminum:				
Oxides and hydroxides		1,973	441	Japan 439; West Germany 1; Mexico 1.
Metal including alloys:				
Unwrought		NA	99	All from Argentina.
Semimanufactures		13,200	18,500	Mexico 1,152; Spain 803; West Germany 20.
Chromium:				
Oxides and hydroxides		132	2	All from Japan.
Metal including alloys, all forms	value, thousands	NA	$4	All from West Germany.
Cobalt:				
Oxides and hydroxides	kilograms	10	NA	
Metal including alloys, all forms		NA	1	All from West Germany.
Copper:				
Ore and concentrate		NA	2	All from Mexico.
Sulfate		129	5	All from United Kingdom.
Metal including alloys:				
Scrap		1	2	All from Mexico.
Unwrought		(2)	33	Spain 32; Japan 1.
Semimanufactures		[3]1,537	1,775	Mexico 1,292; Japan 393; Spain 40.
Gold: Metal including alloys, unwrought and partly wrought	value, thousands	$147	NA	

See footnotes at end of table.

TABLE 3.—Continued

CUBA: APPARENT IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988[p]	Principal sources, 1988
METALS—Continued				
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite		194	334	Netherlands 281; United Kingdom 53.
Metal:				
Scrap		NA	53	All from Mexico.
Pig iron, cast iron, related materials		93	236	West Germany 194; Yugoslavia 30; Italy 10.
Ferroalloys:				
Ferrochromium		NA	329	All from Mexico.
Ferromanganese		794	980	Do.
Ferrosilicomanganese		985	806	Do.
Ferrosilicon		2	91	Do.
Silicon metal		NA	112	Do.
Unspecified		2	144	Do.
Steel, primary forms		222	616	Mexico 578; United Kingdom 38.
Semimanufactures:				
Bars, rods, angles, shapes, sections		2,398	1,441	Spain 744; West Germany 273; United Kingdom 213.
Universals, plates, sheets		[3]731,362	3,949	Colombia 2,294; Mexico 1,655.
Hoop and strip		78	86	All from Mexico.
Rails and accessories		NA	130	Spain 106; Portugal 23; United Kingdom 1.
Wire		[3]16,789	8,792	China 5,320; Mexico 1,674; Spain 864.
Tubes, pipes, fittings		[3]83,282	7,691	Mexico 5,067; Spain 1,196; West Germany 624.
Castings and forgings, rough		[3]271,774	NA	
Lead:				
Oxides		792	170	All from Mexico.
Metal including alloys:				
Scrap		NA	14	All from Netherlands.
Unwrought		2,180	2,153	Mexico 2,078; West Germany 75.
Semimanufactures		([2])	15	All from Spain.
Magnesium: Metal including alloys, unwrought		NA	28	All from Mexico.
Manganese:				
Ore and concentrate: Battery-grade		30	NA	
Metal including alloys, all forms		1	1,055	All from Mexico.
Mercury	kilograms	4,000	NA	
Nickel: Metal including alloys:				
Unwrought		1	1	All from West Germany.
Semimanufactures		3	7	West Germany 5; Japan 2.
All forms	value, thousands	NA	$9	All from United Kingdom.
Platinum-group metals: Metals including alloys, unwrought and partly wrought	do.	$51	$30	All from West Germany.
Silicon, high-purity	kilograms	506	227	All from Canada.
Silver: Metal including alloys, unwrought and partly wrought	value, thousands	$38	$56	Spain $48; West Germany $8.
Tin: Metal including alloys: Semimanufactures		5	138	Mexico 137; Japan 1.
Titanium:				
Oxides		109	110	West Germany 72; Spain 32; Mexico 4.
Metal including alloys, all forms		2	NA	

See footnotes at end of table.

TABLE 3.—Continued

CUBA: APPARENT IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988[p]	Principal sources, 1988
METALS—Continued			
Vanadium: Ash and residue containing vanadium	NA	15	All from Netherlands.
Zinc:			
Oxides	95	245	United Kingdom 237; Belgium-Luxembourg 4; Japan 4.
Blue powder	47	NA	
Metal including alloys:			
Unwrought	311	1,290	Mexico 1,188; Canada 102.
Semimanufactures	1,008	351	Mexico 322; Spain 25; West Germany 3.
Other:			
Ores and concentrates	NA	203	All from Mexico.
Oxides and hydroxides	948	1,900	All from China.
Base metals including alloys, all forms	3	NA	
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc.	11	70	Italy 68; Japan 1; Spain 1.
Artificial:			
Corundum	12	2	All from Japan.
Silicon carbide	72	NA	
Grinding and polishing wheels and stones	33	159	Spain 96; Italy 47; Mexico 12.
Asbestos, crude	1,412	1,224	Canada 1,024; China 200.
Boron materials: Oxides and acids	(2)	121	Argentina 120; West Germany 1.
Cement	19,000	24,800	Belgium-Luxembourg 3,000; Mexico 2,529; China 100.
Chalk value, thousands	$331	NA	
Clays, crude:			
Bentonite	24	27	France 17; Spain 10.
Fire clay	NA	118	Mexico 100; West Germany 18.
Kaolin	3,063	2,366	Spain 2,303; United Kingdom 50; Belgium-Luxembourg 13.
Unspecified	250	362	United Kingdom 344; West Germany 18.
Diamond: Natural: Gem, not set or strung value, thousands	NA	$1	All from Spain.
Diatomite and other infusorial earth	74	72	All from Mexico.
Feldspar, fluorspar, related materials	177	2	Do.
Fertilizer materials: Manufactured:			
Ammonia	[3]39,000	10,274	Mexico 10,270; West Germany 3; Japan 1.
Nitrogenous	[3]501,000	40	West Germany 24; United Kingdom 16.
Phosphatic:			
Superphosphate, simple	[3]324,000	NA	
Superphosphate, triple	[3]37,000	NA	
Unspecified	NA	15,535	Morocco 10,500; Mexico 5,035.
Potassic:			
Potassium chloride	[3]352,000	NA	
Potassium sulfate	[3]22,000	NA	
Unspecified and mixed	NA	24	United Kingdom 22; West Germany 2.
Graphite, natural	158	15	All from Japan.
Gypsum and plaster	381	517	West Germany 515; United Kingdom 2.
Iodine	2	2	All from West Germany.

See footnotes at end of table.

TABLE 3.—Continued

CUBA: APPARENT IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988[p]	Principal sources, 1988
INDUSTRIAL MINERALS—Continued			
Lime	NA	16	All from Japan.
Magnesium compounds:			
Magnesite, crude	7	NA	
Oxides and hydroxides	8	231	Mexico 210; Japan 21.
Magnesium sulfate	NA	10	All from West Germany.
Mica:			
Crude including splittings and waste kilograms	NA	2,048	West Germany 2,000; Mexico 48.
Worked including agglomerated splittings	56	124	Mexico 122; Japan 2.
Phosphates, crude	14,700	NA	
Pigments, mineral: Iron oxides and hydroxides, processed	440	82	All from Mexico.
Precious and semiprecious stones other than diamond, synthetic value, thousands	NA	$7	All from Japan.
Salt and brine	83	117	West Germany 116; United Kingdom 1.
Sodium compounds, n.e.s.:			
Soda ash, natural and manufactured	2,579	4	All from West Germany.
Sulfate, natural and manufactured	31	NA	
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	10,675	22	All from Italy.
Worked	4	29	Italy 21; Spain 5; Japan 3.
Gravel and crushed rock	6	3,711	Canada 3,649; France 59; West Germany 3.
Sand other than metal-bearing	22,232	8,120	Canada 8,105; Spain 15.
Sulfur:			
Elemental, all forms	[3]156,873	166,000	Canada 19,664; West Germany 5; unspecified 146,331.
Sulfuric acid	12	75	Mexico 66; West Germany 9.
Talc, steatite, soapstone, pyrophyllite	NA	9	All from France.
Other:			
Crude	2,209	4,655	China 4,352; Mexico 183; Italy 70.
Slag and dross, not metal-bearing value, thousands	$317	NA	
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	NA	22	All from United Kingdom.
Carbon:			
Carbon black	4,789	3,184	Mexico 3,124; Japan 41; West Germany 19.
Gas carbon	11	NA	
Coal:			
Anthracite	[3]58,814	NA	
Lignite including briquets	NA	228	All from Mexico.
Coke and semicoke	[3]83,723	53,000	China 20,228; Colombia 1,749; Mexico 53.
Peat including briquets and litter	107	NA	
Petroleum:			
Crude thousand 42-gallon barrels	57,626	234	All from Colombia.
Refinery products:			
Liquefied petroleum gas do.	148	97	All from Mexico.
Gasoline do.	2,406	101	Mainly from Netherlands.

See footnotes at end of table.

TABLE 3.—Continued

CUBA: APPARENT IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988[p]	Principal sources, 1988
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum—Continued				
Refinery products—Continued				
Mineral jelly and wax	thousand 42-gallon barrels	9	6	China 5; West Germany 1.
Kerosene and jet fuel	do.	92	46	All from Italy.
Distillate fuel oil	do.	10,481	(2)	Mainly from Mexico.
Lubricants	do.	670	303	Italy 163; Spain 104; West Germany 35.
Residual fuel oil	do.	24,396	NA	
Bitumen and other residues	do.	(2)	(2)	All from United Kingdom.
Bituminous mixtures	do.	1	(2)	All from Spain.
Petroleum coke	do.	NA	(2)	All from West Germany.

[p]Preliminary. NA Not available.
[1]Table prepared by H. D. Willis. Owing to a lack of official trade data published by Cuba, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries. The United States reported no trade in mineral commodities with Cuba in 1987.
[2]Less than 1/22 unit.
[3]Anuario Estadistico de Cuba, 1987.

TABLE 4

CUBA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	Empresa del Cemento (Government, 100%)	Mariel, Pinar del Río Province, Cienfuegos, Cienfuegos Province	3,500
Chromite	Ministerio de Industria Básica (Government, 100%)	Mercedita Mine and plant, Holquín Province	40
Copper	Empresa Minera de Occidente (Government, 100%)	Mantúa, Matahambre, and Jucard Mines, Pinar del Río Province; Mina Grande, Santiago de Cuba Province	3
Nickel	Empresa Niquelífera Comandante René Ramos Latour (Government, 100%)	Nicaro, Holquín Province	23
Do.	Empresa Niquelífera Comandante Pedro Soto Alba (Government, 100%)	Moa, Holquín Province	24
Do.	Empresa Niquelífera Comandante Ernesto Ché Guevara (Government, 100%)	Punta Gorda, Holquín Province	30
Petroleum:			
Crude	Empresa de Perforación y Extracción de Petrolero (Government, 100%)	Northern coast area between Havana and Cárdenas	[1]16
Products	Instituto Cubano del Petróleo (Government, 100%)	Refineries at Cienfuegos, Havana and Santiago de Cuba	[1]160
Steel	Empresa Metalúrgica Jose Martí (Government, 100%)	Cotorro, Havana Province	400

[1]Thousand 42-gallon barrels per day.

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.

COMMODITY REVIEW

Metals

During 1989, a Swedish team began a $500,000 study to evaluate the gold deposits in Camagüey Province and on the Isla de la Juventud.

Iron and Steel.—Limonitic ore was extracted from the nickel-cobalt laterite residues. This ore contained a relatively high iron content, ranging between 48% and 52%. Cuba forecast production of 10 million tons of pig iron during the next 5-year planning period, provided that the appropriate advanced technology and energy sources were obtained to work the ore.

The Antillana de Acero steelworks was enlarged as part of the continued economic development of the Havana region.

Nickel.—The Comandante Ernesto Ché Guevara processing plant, the newest of the country's three nickel-processing plants, was projected to reach full capacity of 30,000 tons per year of nickel and cobalt by 1991. The plant increased its annual production 42% to 10,000 tons in 1989 and has overcome numerous technical problems since opening in 1986.

The country's fourth nickel plant was under construction at Las Camariocas, near Moa. Estimated startup of the proposed 30,000-ton-per-year nickel and cobalt plant was projected to be during 1993, despite uncertainty about contracts signed with members of the CMEA. The addition of the Las Camariocas plant could allow Cuba to boost nickel production to 100,000 tons per year by 1996.

The Government announced that a sulfur unit, under construction at the Empresa Niquelífera Comandante René Ramos Latour metallurgical complex in Nicaro, would increase the plant's capacity by 4,000 tons per year by 1991.

Industrial Minerals

The construction-related mineral industry strained to supply the country's massive construction upswing. Approximately 10,000 residential units were scheduled for construction in Havana alone. When quarries and pits near Havana were exhausted during the year, exurban deposits, including the 1.2-million-cubic-meter sand and gravel quarry at El Purio and the 600,000-cubic-meter La Molina-1 pit west of Havana, were exploited. Concrete block production was reported to be 25 million for 1989, up from 11 million in 1987.

Cement.—A new cement factory was opened in Sancti Spiritus Province with an estimated capacity of 100,000 tons per year.

Marble.—Marble was cut from 11 quarries scattered across the main island and on the Isla de la Juventud. After being processed in one of the country's seven marble plants, 70% of the production was bartered or sold overseas, primarily to Italy, Mexico, and Spain. The country planned to increase marble exports during the next 5 years.

Salt.—Salt output hovered about the middle of the 1980's range of 160 to 260 tons per year. Salt was produced from solar evaporation of seawater from numerous small producers dotted along the northeast and south coasts.

Mineral Fuels

Energy.—The country had an installed generating capacity of 3,853 megawatts (MW). Cuba relied heavily on oil-fired plants owing to the highly limited hydroelectric potential and lack of major coal deposits in the country. Cuba was the third largest user of bagasse for energy production, after Brazil and India, utilizing approximately 9% of the world's production. This renewable energy source accounted for almost 30% of the fuel consumed in Cuban sugar mills.

During 1989, a second 100-MW generating unit was completed at the thermoelectric center in Este del Habana. Work continued on the Juraguá nuclear plant, across the bay from Cienfuegos. The first of its four reactors was projected to start up in 1993. This plant represented more than 1,600-MW generating capacity and was designed to save up to 15.4 million barrels of oil annually.

Petroleum and Natural Gas.—Cuba moved offshore in its drive to increase petroleum production. An exploration well was successfully drilled from an artificial island at the end of a causeway built into the shallow waters of Cárdenas Bay, north of Cárdenas. Additional wells were planned for 1990. A 22.5-kilometer (km) causeway was under construction across the Majaguillar Swamp to access additional offshore sites.

Oil production barely reached 1988 levels, and petroleum was imported from the U.S.S.R. to satisfy Cuban domestic oil requirements. The Ñico López refinery in Regla, on the eastern shore of Havana Harbor, was enlarged during 1989, and a sulfur plant was under construction at the Hermanos Díaz refinery in Santiago de Cuba to extract sulfur from domestically produced sour crude. The 19-million-barrel-per-year Cienfuegos refinery was scheduled for startup in 1989. The facility was designed for eventual expansion to 38-million-barrel-per-year throughput.

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, 140 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-deadweight-ton tanker and a 70,000-deadweight-ton tanker simultaneously, took 4 years to complete. A 187-km 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

Prospects for the Cuban economy

remain unfavorable given the increasing foreign exchange constraints and the economic and political reforms of its primary trading partners toward market economies. The Cuban Government plans to increase its hard currency earnings with increased exports to the West, but the newly semiautonomous Eastern European enterprises are demanding hard currency in lieu of the traditional nonconvertible currency transactions. New Cuban mineral development projects appear to emphasize import substitution, export potential and, with the exception of nickel projects, low startup costs.

Cuba plans to continue its nickel production expansion, with a projected 1996 output of 100,000 tons. However, the industry is highly energy dependent, and the Eastern European counterrevolution may affect the availability of crude oil supplies as well as the construction of the Las Camariocas plant, thus making the 1996 target difficult to achieve. Questionable crude oil supplies could also adversely impact Cuba's factories as well as the country's growing petroleum product export business.

[1]Where necessary, values have been converted from Cuban pesos (CP) to U.S. dollars at the rate of CP0.8 = US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Unión de Empresas del Níquel
Avenida del Puerto
Rolo Monterrey
Moa, Holguín, Cuba

Ministerio de Industria Básica
Havana, Cuba

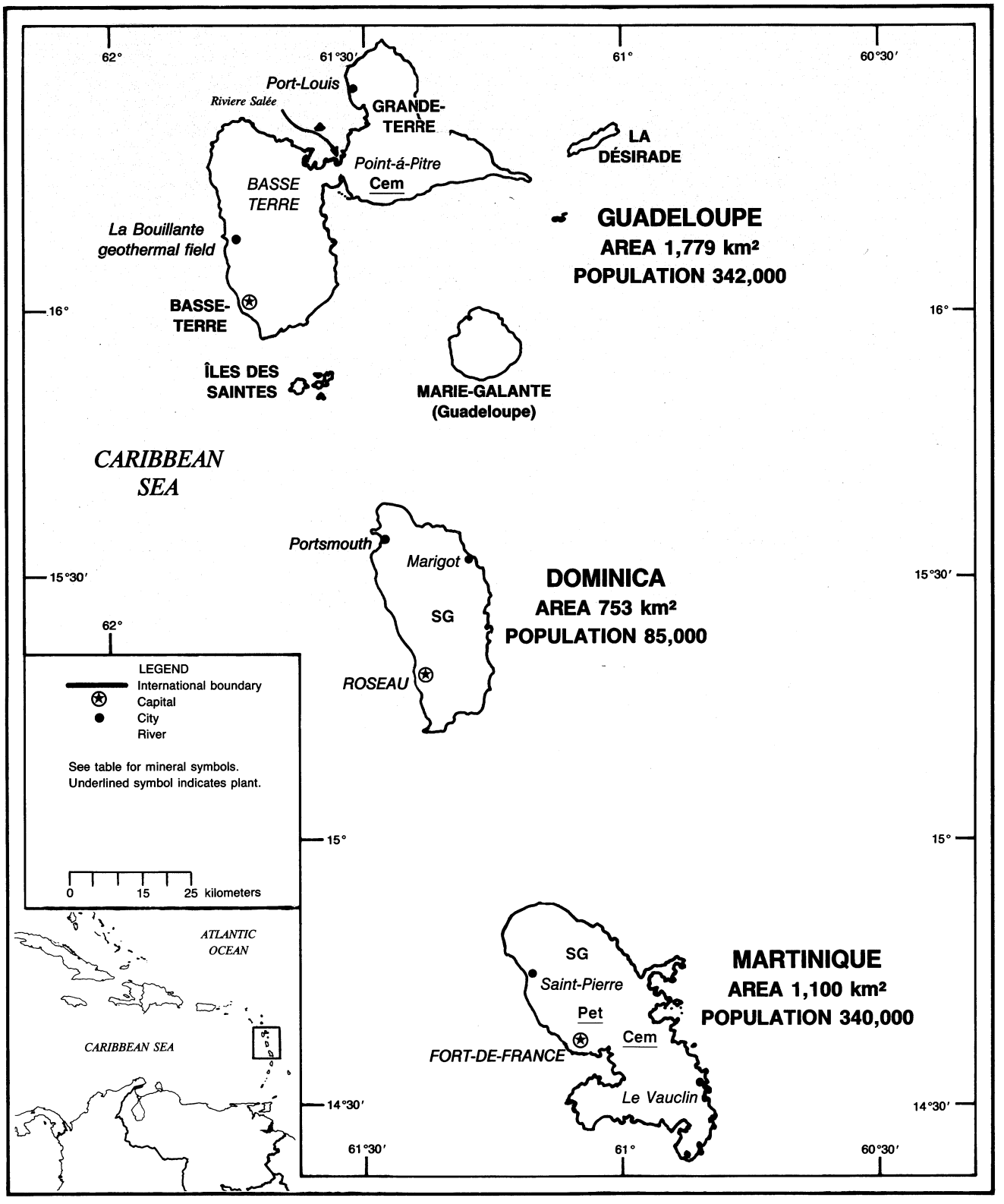
Publications

Granma Weekly Review, La Habana, Cuba: Granma Weekly Review, international edition, weekly.

Organización Latinoamericana de Energía (OLADE), Quito, Ecuador: Energía en Cifras, 1989, annual.

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

DOMINICA, GUADELOUPE, AND MARTINIQUE



THE MINERAL INDUSTRY OF

DOMINICA, GUADELOUPE, AND MARTINIQUE

By H. Robert Ensminger

DOMINICA

Dominica, an independent state within the British Commonwealth, is primarily an agricultural country. In 1988, the last year for which there is information, mining and quarrying activities accounted for less than 1% of the $132.5 million gross domestic product (in current dollars).

In 1989, the Government gave a 10-year tax holiday to sizable investors. In addition, a plan to increase the tax holiday to 15 years was discussed by Government officials. Goods needed for capital improvements were allowed to enter the country tariff free.

Production

Production in 1989 consisted of pumice, volcanic ash, and quantities of sand and gravel for construction purposes. No company has expressed an interest in petroleum exploration, and no future expansion or diversification of the mining sector was likely.

Trade

In 1988, Dominica's total exports were valued at $56 million, of which the United States received 5%. The total value of imports was $88 million, of which the U.S. share was 25%. Chemical imports composed 14% of the total imports, while fuels and lubricants made up about 6%.

Infrastructure

The country had a total of 750 kilometers (km) of roads, composed of 370 km paved and 380 km having dirt and gravel surfaces. The major shipping ports were Portsmouth on the northwest coast and Roseau on the southwest coast.

In 1989, Dominica had a rated electrical capacity of 7,000 kilowatts with approximately 60% derived from hydroelectric generation plants. Total production of electrical power was 16 million kilowatt hours, which translated into 190 kilowatt hours per capita. Total commercial energy consumption was 90% derived from liquid fuels and 10% from hydroelectric power.

The mining and quarrying activities accounted for a very minor portion of the estimated total work force of 25,000.

GUADELOUPE

Guadeloupe, an Overseas Department of France, is composed of seven islands, including the main islands of Basse-Terre and Grande-Terre, Marie-Galante, La Désirade, Iles des Saintes, and the French side of St. Martin and St. Barthelemy (shown on map of Netherlands Antilles).

The mineral sector made a negligible contribution to the gross departmental product, which was estimated at more than $1 billion in 1989. The mineral policy was the same as that of other French Overseas Departments. Mineral deposits are classified as mines and quarries, with quarries including all building materials and fertilizers (excluding nitrates, associated salts, or phosphates). Direct French involvement is encouraged in mineral development; however, foreign involvement is not discouraged. Foreign control of zones with petroleum potential is not permitted, but foreign minority interest is permissible.

Production

The country produced a small amount of pumice in 1989. One clinker-grinding cement plant, majority owned by Ciments La Farge of France, was in operation during the year. Lime, salt, sand and gravel, and stone were also produced, but no production data were available for 1989.

Trade

Principal mineral commodity exports in 1988 were cement and plaster. A small

TABLE 1

GUADELOUPE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
Abrasives, natural: Pumice[e]	thousand tons	215	221	220	220	220
Cement	do.	173	181	[e]190	[e]200	200

[e]Estimated. [p]Preliminary.

[1]Table includes data available through Dec. 31, 1990.

[2]In addition to commodities listed, crude construction materials (lime, salt, 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.

TABLE 2

GUADELOUPE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Principal destinations, 1988
METALS				
Aluminum: Metal including alloys:				
Scrap		75	113	France 101; Belgium-Luxembourg 12.
Unwrought		—	1	All to Martinique.
Semimanufactures		(2)	19	Martinique 15; French Guiana 3; France 1.
Copper: Metal including alloys:				
Scrap		209	545	France 426; Belgium-Luxembourg 98; Spain 21.
Semimanufactures		—	(3)	All to Martinique.
Iron and steel: Metal:				
Scrap		—	25	All to Dominica.
Steel, primary forms		—	1	Mainly to Dominica.
Semimanufactures:[4]				
Bars, rods, angles, shapes, sections		—	30	Dominica 18; France 8; Martinique 4.
Universals, plates, sheets		11	NA	
Wire		16	40	Martinique 29; Antigua and Barbuda 3; Dominica 3.
Tubes, pipes, fittings		1	3	All to Martinique.
Lead: Metal including alloys, scrap		—	2	All to Belgium-Luxembourg.
Silver: Waste and sweepings	value, thousands	$1	—	
Other: Ashes and residues		—	66	All to France.
INDUSTRIAL MINERALS				
Cement		11,984	7,877	French Guiana 6,499; Dominica 948; St. Lucia 230.
Fertilizer materials: Manufactured:				
Ammonia		53	87	Martinique 82; French Guiana 5.
Phosphatic		—	40	All to Martinique.
Potassic		—	20	Do.
Unspecified and mixed		—	15	All to French Guiana.
Gypsum and plaster		1,093	1,020	Venezuela 1,000; Netherlands Antilles 20.
Stone, sand and gravel: Dimension stone, worked		4	1	All to Martinique.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Liquefied petroleum gas	42-gallon barrels	—	128	Martinique 70; France 58.
Gasoline, motor	do.	9	NA	
Kerosene and jet fuel	do.	6,812	NA	
Lubricants	do.	126	NA	

NA Not available.
[1]Table prepared by H. D. Willis. Guadeloupe did not report any exports of mineral commodities to the United States during 1987 and 1988.
[2]Quantity not available, valued at $2,198,000.
[3]Quantity not available, valued at $1,000.
[4]As a result of changes in trade code classifications, data for 1987 and 1988 are not completely comparable.

amount of scrap metal was also exported. None of the material was imported by the United States.

Principal mineral commodity imports by Guadeloupe in 1988 were cement, fertilizers, gypsum and plaster, petroleum refinery products, salt, and steel semimanufactures. The United States exported small amounts of aluminum, fertilizers, and liquefied petroleum gas to Guadeloupe. The majority of petroleum refinery products was imported from Martinique.

Infrastructure

Guadeloupe had a total of 1,940 km of roads in 1989. The total was composed of 1,600 km paved and 340 km gravel and dirt. The railroads were privately owned, narrow-gauge plantation lines. The major shipping ports were Pointe-a-Pitre on Grande-Terre, and Basse-Terre on Basse-Terre. The country's electrical energy generation capacity was 103

TABLE 3

GUADELOUPE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS					
Aluminum:					
Oxides and hydroxides	value, thousands	$5	$6	—	France $3; Italy $3.
Metal including alloys, semimanufactures		430	654	223	France 365; Austria 19.
Chromium: Oxides and hydroxides		5	2	—	France 1; West Germany 1.
Copper: Metal including alloys:					
Unwrought	value, thousands	$2	$2	—	All from France.
Semimanufactures		167	212	1	France 203; Italy 7.
Iron and steel: Metal:					
Pig iron, cast iron, related materials		6	155	—	All from France.
Steel, primary forms		1	10	—	Do.
Semimanufactures:[2]					
Bars, rods, angles, shapes, sections		16,560	21,303	—	Spain 7,053; France 6,500; Trinidad and Tobago 2,556.
Universals, plates, sheets		8,409	NA		
Hoop and strip		11	NA		
Rails and accessories		26	27	—	All from France.
Wire		1,597	1,373	—	Belgium-Luxembourg 918; Trinidad and Tobago 298; France 157.
Tubes, pipes, fittings		10,323	4,805	10	France 3,190; Spain 1,047; Belgium-Luxembourg 467.
Castings and forgings, rough		146	NA		
Lead:					
Oxides		1	1	—	All from France.
Metal including alloys, semimanufactures		11	9	—	Do.
Mercury	value, thousands	$3	$1	—	Do.
Nickel: Metal including alloys, semimanufactures	do.	$32	$10	—	France $8; West Germany $2.
Platinum-group metals: Platinum metal including alloys, unwrought and partly wrought	do.	$8	$3	—	All from France.
Silver: Metal including alloys, unwrought and partly wrought	do.	$3	$2	—	Do.
Tin: Metal including alloys, semimanufactures		1	1	—	Do.
Titanium: Oxides		12	32	—	Do.
Tungsten: Metal including alloys, unwrought	value, thousands	—	$1	—	All from Martinique.
Uranium and thorium: Metal including alloys, all forms	do.	$1	—		
Zinc: Metal including alloys, semimanufactures		1	(3)	—	All from France.
Other: Ashes and residues		22	106	—	Do.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		3	1	—	All from Italy.
Grinding and polishing wheels and stones		20	37	—	France 29; Switzerland 6; Italy 1.
Asbestos, crude		98	116	—	France 101; Italy 15.
Barite and witherite		13	6	—	All from France.
Boron materials: Crude natural borates		—	1	—	Do.

See footnotes at end of table.

TABLE 3—Continued

GUADELOUPE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Cement	168,457	217,917	—	Tunisia 99,915; France 49,158; Venezuela 38,255.
Chalk	622	781	—	Mainly from France.
Clays, crude:				
Kaolin	—	82	—	All from United Kingdom.
Unspecified	51	16	—	All from France.
Diamond: Gem, not set or strung value, thousands	$8	$6	—	Do.
Diatomite and other infusorial earth	55	40	—	Do.
Fertilizer materials:				
Crude, n.e.s.	86	41	—	Do.
Manufactured:				
Ammonia	89	109	—	France 108; Belgium-Luxembourg 1.
Nitrogenous	2,696	2,147	160	Netherlands 1,539; France 212; Belgium-Luxembourg 199.
Phosphatic	253	452	50	France 294; Belgium-Luxembourg 108.
Potassic	337	461	185	Belgium-Luxembourg 183; Guyana 60.
Unspecified and mixed	20,297	22,752	20	Martinique 9,180; Netherlands 6,220; France 4,644.
Gypsum and plaster	10,918	17,651	7	Spain 11,180; Jamaica 6,040; France 424.
Lime	755	1,691	—	Martinique 850; France 841.
Magnesium compounds:				
Magnesite, crude	183	—		
Oxides and hydroxides	—	180	—	All from Netherlands.
Mica:				
Crude including splittings and waste	43	11	—	All from France.
Worked including agglomerated splittings	11	—		
Pigments, mineral: Iron oxides and hydroxides, processed	40	45	—	France 28; West Germany 17.
Precious and semiprecious stones other than diamond, natural value, thousands	$16	$4	—	All from Brazil.
Pyrite, unroasted	—	6	—	All from France.
Salt and brine	2,410	2,481	—	France 1,030; West Germany 660; Netherlands 547.
Sodium compounds, n.e.s.:				
Soda ash, manufactured	2	—		
Sulfate, manufactured value, thousands	(4)	$1	—	All from France.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	22	—		
Worked	293	332	—	Italy 181; France 85; West Germany 41.
Dolomite, chiefly refractory-grade	470	344	—	All from France.
Gravel and crushed rock	32	122	—	France 120; Netherlands 2.
Quartz and quartzite	15	11	—	All from France.
Sand other than metal-bearing	315	2,547	—	Dominica 2,000; France 541; West Germany 6.
Sulfur:				
Elemental:				
Crude including native and byproduct	1	(5)	—	All from France.

See footnotes at end of table.

TABLE 3—Continued

GUADELOUPE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sulfur—Continued					
Elemental—Continued					
Colloidal, precipitated, sublimed	value, thousands	$1	$1	—	All from France.
Sulfuric acid		179	191	—	Do.
Talc, steatite, soapstone, pyrophyllite		57	109	—	Do.
Other:					
Crude		186	143	9	France 116; West Germany 17.
Slag and dross, not metal-bearing		42	—		
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		1	24	—	All from France.
Carbon black		8	—		
Coal:					
Briquets of anthracite and bituminous coal		1	—		
All grades excluding briquets		2	—		
Peat including briquets and litter		50	14	—	All from France.
Petroleum refinery products:					
Liquefied petroleum gas	42-gallon barrels	156,403	129,943	15,579	Netherlands Antilles 63,023; Venezuela 34,197; Trinidad and Tobago 15,730.
Gasoline, motor	do.	487,577	NA		
Mineral jelly and wax	do.	1,685	1,267	—	All from France.
Kerosene and jet fuel	do.	306,567	NA		
Distillate fuel oil	do.	95,369	NA		
Lubricants	do.	45,850	NA		
Residual fuel oil	do.	627,885	NA		
Bitumen and other residues	do.	49,983	333	—	All from France.
Bituminous mixtures	do.	473	485	—	France 473; Belgium-Luxembourg 12.

NA Not available.
[1]Table prepared by H. D. Willis.
[2]As a result of changes in trade code classifications, data for 1987 and 1988 are not completely comparable.
[3]Less than 1/2 unit.
[4]Revised to zero.
[5]Quantity not available, valued at $1,000.

megawatts, all of it thermal based on fuel oil. In 1989, a total of 315 gigawatt-hours of electric power was generated, which translated into 920 kilowatt hours per capita. A 4.2-megawatt geothermal plant was under development near La Bouillante. Guadeloupe's total available labor force was estimated at approximately 125,000, but the number of workers engaged in the mineral sector was probably less than 1% of the total.

MARTINIQUE

The country's mineral sector was a small contributor to the gross departmental product, which was estimated at more than $1 billion in 1989.

The mineral policy of Martinique is the same as that of other Latin American Overseas Departments of France. Mineral deposits are classified as mines and quarries. All building materials, fertilizers, and similar substances except for nitrates, salts, and phosphates are considered to be quarries. Foreign individuals and companies residing in Martinique may acquire mining rights, but preferably with direct French involvement. Mining concessions are obtained from the Minister of Mines, who also rules on disputes that may arise from conflicting concessions.

A French Government-owned company held a majority ownership of the local petroleum refinery with minority interests held by the Royal Dutch-Shell Group (Netherlands), Texas Corp. (United States), and Esso Inter-America Inc., a subsidiary of the Exxon Corp. of the United States. The clinker-grinding cement plant was majority owned by Ciments La Farge of France.

Production

Martinique's mineral industry included the production of cement, clay, petroleum refinery products, pumice, sand and gravel, and stone in 1989. The petroleum refinery produced fuel for domestic consumption and for export to Guadeloupe.

Trade

Principal mineral commodity exports in 1988 were cement, fertilizers, and petroleum refinery products. Small amounts of aluminum metal, copper metal, and steel semimanufactures were also exported. A small amount of aluminum scrap was exported to the United States.

The major mineral commodity imports were cement, crude petroleum, fertilizers, gypsum and plaster, petroleum refinery products, salt, and steel semimanufactures. There were no imports from the United States.

Infrastructure

There was a total of 1,680 km of roads in Martinique in 1989. The total was composed of 1,300 km paved and 380 km gravel and dirt. The major shipping port was Fort-de-France on the west coast.

The country's electrical energy generation capacity was 108 megawatts, all of it thermal based on fuel oil. There was a total of 330 gigawatt hours of electric power generated in 1989, which translated into 990 kilowatt hours per capita.

It was estimated that less than 1% of the total available work force of about 100,000 was employed in the mineral industry.

TABLE 4

MARTINIQUE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
Cement, hydraulic[e]	thousand tons	200	200	200	200	200
Lime[e]		5,000	5,000	5,000	5,000	5,000
Petroleum refinery products[e]	thousand 42-gallon barrels	4,300	[3]4,938	4,800	4,800	4,800
Pumice, converted from cubic meters[e]	thousand tons	150	140	130	130	140

[e]Estimated. [p]Preliminary.
[1]Table includes data available through Dec. 31, 1990.
[2]In addition to commodities listed, crude construction materials (lime, salt, 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]Reported figure.

TABLE 5

MARTINIQUE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Principal destinations, 1988
METALS			
Aluminum: Metal including alloys:			
Scrap	101	57	France 32; United States 25.
Semimanufactures	2	9	Mainly to Guadeloupe.
Copper: Metal including alloys, scrap	480	407	All to France.
Iron and steel: Metal: Semimanufactures:[2]			
Bars, rods, angles, shapes, sections	1,403	1,668	Guadeloupe 820; French Guiana 751; France 91.
Universals, plates, sheets	1,313	NA	
Tubes, pipes, fittings	6	([3])	All to Guadeloupe.
INDUSTRIAL MINERALS			
Cement	10,392	8,302	All to French Guiana.
Clays, crude	14	—	
Fertilizer materials: Manufactured:			
Nitrogenous	710	660	Guadeloupe 287; St. Lucia 245; French Guiana 108.
Phosphatic	—	50	All to Guadeloupe.
Potassic	590	—	

See footnotes at end of table.

TABLE 5—Continued

MARTINIQUE: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Principal destinations, 1988
INDUSTRIAL MINERALS—Continued				
Fertilizer materials: Manufactured—Continued				
Unspecified and mixed		14,819	16,237	Guadeloupe 7,475; St. Lucia 6,591; Barbados 820.
Gypsum and plaster		20	—	
Lime		300	330	Guadeloupe 300; French Guiana 20; St. Vincent and the Grenadines 10.
Magnesium compounds: Magnesite, crude		26	—	
Salt and brine		31	—	
Stone, sand and gravel:				
Dimension stone, worked		—	26	Guadeloupe 24; St. Vincent and the Grenadines 2.
Sand other than metal-bearing		196	—	
Sulfur:				
Elemental: Crude including native				
Crude including native and byproduct		1	—	
Colloidal, precipitated, sublimed		—	1	All to Guadeloupe.
Sulfuric acid		—	1	Do.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Liquefied petroleum gas	42-gallon barrels	31,877	23,536	Do.
Gasoline, motor	do.	127,976	NA	
Kerosene and jet fuel	do.	63,984	NA	
Distillate fuel oil	do.	283,458	NA	
Lubricants	do.	217	NA	
Residual fuel oil	do.	494,445	NA	
Bituminous mixtures	do.	6	NA	

NA Not available.
[1]Table prepared by H. D. Willis.
[2]As a result of changes in trade code classifications, data for 1987 and 1988 are not completely comparable.
[3]Quantity not available, valued at $5,000.

TABLE 6

MARTINIQUE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS					
Alkali and rare-earth metals	value, thousands	$3	—		
Aluminum:					
Oxides and hydroxides	do.	—	$2	—	All from France.
Metal including alloys:					
Scrap		—	1	—	Do.
Semimanufactures		228	374	42	France 278; Belgium-Luxembourg 34.

See footnotes at end of table.

TABLE 6—Continued

MARTINIQUE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Chromium:					
Oxides and hydroxides		—	7	—	All from West Germany.
Metal including alloys, all forms	value, thousands	—	$3	$3	
Cobalt:					
Ore and concentrate		—	6	—	Mainly from France.
Oxides and hydroxides	value, thousands	$1	$1	—	All from France.
Copper: Metal including alloys:					
Scrap		—	10	—	Do.
Unwrought	value, thousands	—	$3	—	Do.
Semimanufactures		169	253	3	France 248; West Germany 1.
Iron and steel: Metal:					
Scrap	value, thousands	—	$1	—	All from France.
Pig iron, cast iron, related materials		13	1	—	Mainly from West Germany.
Steel, primary forms		(2)	68	—	All from France.
Semimanufactures:[3]					
Bars, rods, angles, shapes, sections		20,098	23,835	(4)	Trinidad and Tobago 14,411; France 3,685; Spain 2,176.
Universals, plates, sheets		6,870	NA		
Hoop and strip		1	NA		
Rails and accessories		13	115	—	All from France.
Wire		171	127	—	France 100; Belgium-Luxembourg 26.
Tubes, pipes, fittings		3,931	5,702	1	France 3,451; Spain 1,591; Italy 630.
Castings and forgings, rough		228	NA		
Lead:					
Oxides		6	5	—	All from France.
Metal including alloys:					
Unwrought		—	1	—	Do.
Semimanufactures		8	6	—	Do.
Mercury	value, thousands	$1	—		
Molybdenum: Metal including alloys, all forms	do.	$1	—		
Nickel: Metal including alloys, semimanufactures	do.	$3	$1	—	All from Ireland.
Tin: Metal including alloys:					
Scrap		—	19	—	All from Spain.
Semimanufactures		1	1	—	All from France.
Titanium: Oxides		173	226	—	United Kingdom 126; France 80; Belgium-Luxembourg 20.
Zinc:					
Oxides		24	36	—	All from France.
Metal including alloys, semimanufactures		—	7	—	Do.
Other: Ashes and residues		260	3	—	Do.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.	value, thousands	$3	$2	—	Do.

See footnotes at end of table.

TABLE 6—Continued

MARTINIQUE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Abrasives, n.e.s.—Continued					
Artificial: Corundum	value, thousands	$1	$1	—	All from France.
Grinding and polishing wheels and stones		34	44	([4])	France 37; Italy 4; Netherlands 2.
Asbestos, crude		61	77	—	All from Italy.
Barite and witherite		1	4	—	All from France.
Boron materials: Crude natural borates		2	6	—	Do.
Cement		216,631	177,794	—	Tunisia 74,382; France 37,418; Venezuela 32,537.
Chalk		712	654	—	All from France.
Clays, crude:					
Bentonite		—	5	—	Do.
Kaolin		—	120	—	French Guiana 91; France 14; United Kingdom 14.
Unspecified		104	13	—	France 10; United Kingdom 3.
Diamond: Gem, not set or strung	value, thousands	$1	$7	—	All from France.
Diatomite and other infusorial earth		48	20	—	Do.
Fertilizer materials:					
Crude, n.e.s.		7	100	—	Do.
Manufactured:					
Ammonia		84	88	—	Guadeloupe 73; France 14; Belgium-Luxembourg 1.
Nitrogenous		5,954	5,711	402	Netherlands 4,000; France 938.
Phosphatic		202	203	40	France 151; Guyana 10.
Potassic		4,561	10,008	4,900	East Germany 4,500; France 390.
Unspecified and mixed		30,021	26,384	300	France 25,187; Belgium-Luxembourg 891.
Graphite, natural		1	([4])	—	All from France.
Gypsum and plaster		12,459	17,833	—	Spain 11,180; Jamaica 5,915; France 738.
Lime		300	208	—	France 190; Spain 18.
Magnesium compounds:					
Magnesite, crude		711	—		
Oxides and hydroxides		—	308	—	All from France.
Mica: Crude including splittings and waste		1	2	—	Do.
Nitrates, crude		7	—		
Phosphates, crude		496	40	—	All from France.
Pigments, mineral: Iron oxides and hydroxides, processed		25	25	—	France 14; West Germany 11.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$10	$1	—	All from West Germany.
Synthetic	do.	—	$2	—	All from France.
Salt and brine		2,380	2,376	—	West Germany 1,432; France 650; United Kingdom 173.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		16	—		
Sulfate, manufactured		([5])	2	—	All from France.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		—	12	—	Do.
Worked		149	1,589	—	Italy 712; Belgium-Luxembourg 632; France 189.

See footnotes at end of table.

TABLE 6—Continued

MARTINIQUE: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued					
Dolomite, chiefly refractory-grade		1,193	1,309	—	France 1,289; Belgium-Luxembourg 20.
Gravel and crushed rock		25	58	—	France 38; Switzerland 20.
Sand other than metal-bearing		252	229	—	France 202; Belgium-Luxembourg 20; Spain 7.
Sulfur:					
Elemental:					
Crude including native and byproduct		5	1	—	All from France.
Colloidal, precipitated, sublimed		17	—		
Sulfuric acid		263	194	—	France 147; Netherlands 41; Guadeloupe 5.
Talc, steatite, soapstone, pyrophyllite		48	65	—	France 52; Italy 13.
Other:					
Crude		410	335	—	France 258; Belgium-Luxembourg 70; Italy 7.
Slag and dross, not metal-bearing		103	164	—	France 144; Belgium-Luxembourg 20.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		21	3	—	All from France.
Peat including briquets and litter		4	167	—	West Germany 91; Belgium-Luxembourg 74; France 3.
Petroleum:					
Crude	thousand 42-gallon barrels	4,055	3,657	—	United Arab Emirates 1,759; United Kingdom 1,274; Nigeria 624.
Refinery products:					
Liquefied petroleum gas	42-gallon barrels	20,288	44,370	15,184	Netherlands Antilles 20,776; Venezuela 8,178.
Gasoline, motor	do.	69,046	NA		
Mineral jelly and wax	do.	2,330	2,762	—	All from France.
Kerosene and jet fuel	do.	32,837	NA		
Distillate fuel oil	do.	22	NA		
Lubricants	do.	31,031	NA		
Residual fuel oil	do.	120,280	NA		
Bitumen and other residues	do.	31,851	49,334	—	Trinidad and Tobago 26,773; Netherlands Antilles 22,228; France 333.
Bituminous mixtures	do.	739	303	24	France 279.

NA Not available.
[1]Table prepared by H. D. Willis.
[2]Quantity not available, valued at $3,000.
[3]As a result of changes in trade code classifications, data for 1987 and 1988 are not completely comparable.
[4]Less than 1/2 unit.
[5]Revised to zero.

OTHER SOURCES OF INFORMATION

Agencies

Service des Mines et de l'Industrie
B.P. 448
97110-Pointe-a-Pitre
Guadeloupe, French West Indies

Service des Mines et de l'Industrie
B.P. 458
97200-Fort-de-France
Martinique, French West Indies

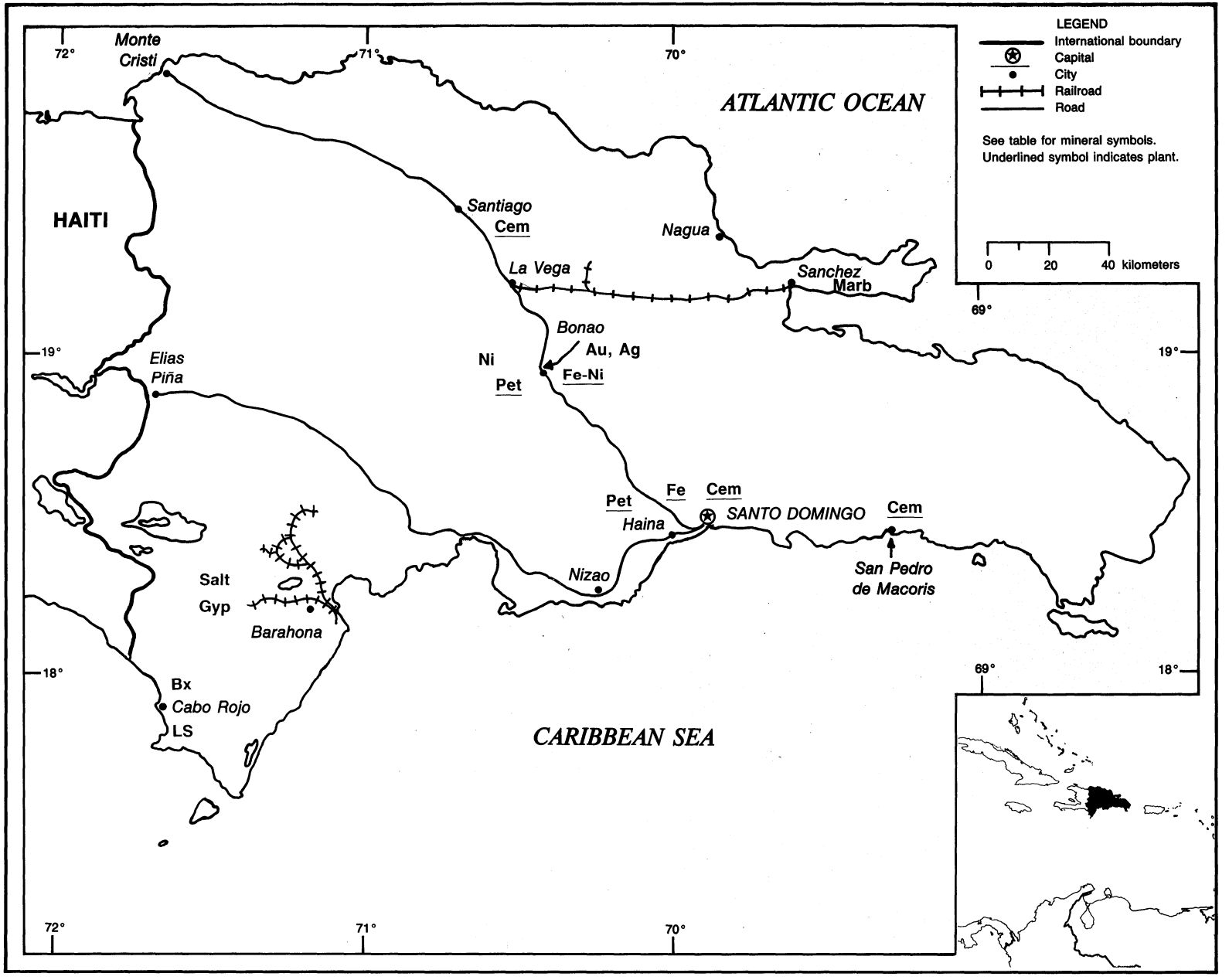
Publications

U.S. Central Intelligence Agency. The World Factbook, annual.

U.S. Department of the Interior, Bureau of Mines. Mineral Industries of Latin America. BuMines Mineral Perspectives, annual.

DOMINICAN REPUBLIC

AREA 48,700 km² **POPULATION 7.2 million**



THE MINERAL INDUSTRY OF

THE DOMINICAN REPUBLIC

By Ivette E. Torres

The Dominican Republic was the third leading world producer of ferronickel, after Japan and New Caledonia, and ranked eighth in nickel mine output. It produced 15% of the world ferronickel in 1989. Although not of world significance, in Latin America the Dominican Republic was among the leading five producers of gold, and it ranked sixth in the production of both gypsum and silver.

During the year, ferronickel was the country's leading export earner contributing to about 40% of total export value, a significant increase from 1985 when the ferronickel value represented only 16% of the total. Doré on the other hand represented about 10% of total exports, a significant reduction when compared with that of 1985 when it provided about 16% of the total export value.

According to statistics from the Central Bank, the gross domestic product (GDP) of the Dominican Republic increased 4.2% in real terms from that of 1988 when the GDP was $6.4 billion.[1] The bank's rate of inflation estimate was about 45%, a figure lower than estimated by other sources. Unemployment remained very high at about 29%, while the public deficit decreased by about 11%.

The Government continued with its public investment program, with the result that the construction sector increased by 13%. Agriculture, mining, tourism, and the free trade zone were the four sectors targeted for development under the Government's development policy. However, severe energy shortages continued throughout the year.

Total imports increased 22% to $1.98 billion while exports increased only by 4% to $927.7 million. The United States continued to be the Dominican Republic's main trading partner. It received 67% of the Dominican Republic's exports and contributed to 48% of total imports.

GOVERNMENT POLICIES AND PROGRAMS

With Decree No. 13-87 of January 1987, most fiscal reserves (areas known to contain gold, silver, base metals, and other types of deposits that were limited to be evaluated by the Government or by special contract with the Government) in the Dominican Republic were released for exploration by the private sector. Out of 21 areas, only 4—Neita, Sabaneta, La Cuaba, and Pueblo Viejo Extension—were retained as fiscal reserves to be evaluated by the state-owned company Rosario Dominicana S.A. With this change, the majority of the national territory is regulated by Mining Law 146 of 1971, which allows exploration by private domestic and foreign mining companies.

International cooperation agreements with the Government through the Dirección General de Minería were completed, in progress, or discussed throughout 1989. The Organización Latinoamericana de Energía was discussing the possibility of a technical cooperation agreement that would concentrate on the lignite deposits in the Sánchez-Samaná area. Sweden and the Dominican Republic began a technical cooperation agreement that includes geochemical analysis and computer training of Dominican personnel. Other agreements were being considered with France, Italy, and Japan.

PRODUCTION

In 1989, the mining activity of the Dominican Republic continued to be centered around the production of gold, nickel, and silver. On a world scale, the Dominican Republic ranked eighth in nickel mine production and third in ferronickel production. Production of gold and silver continued to decrease, mainly because of Pueblo Viejo's oxide ore depletion. Production of nickel in ferronickel, the industry's principal source of foreign exchange, increased about 7% to the second highest output level since production began in 1972. Other minerals and mineral-related commodities produced in the country included amber, bauxite, cement, gypsum, lime, limestone, marble, mercury, petroleum refinery products, salt, and steel.

TRADE

Minerals contributing significantly to the Dominican Republic's exports continued to be nickel in ferronickel and gold and silver in doré. Together, ferronickel and doré represented about 50% of total exports in 1989.

The United States received 6,857 tons of nickel in ferronickel from the Dominican Republic, a 16% decrease from that of 1988. The 1989 figure represents about 24% of total nickel in ferronickel shipped for the year. All doré was shipped to the United States for refining.

The Dominican Republic imports all of its oil requirements from Mexico and Venezuela under the concessionary terms of the San José Accord. In 1989, about 46% of the refinery products requirements were imported also. Refinery products have been generally imported from Venezuela and Curaçao, but at times, fuel oil has been imported from Puerto Rico.

STRUCTURE OF THE MINERAL INDUSTRY

The Dirección General de Minería, under the Secretaría de Estado de Industria y Comercio, is the Government agency responsible for promoting mining and metallurgical development. Its functions cover technical, administrative, and legal matters. The Corporación Dominicana de Empresas Estatales, a Government holding company, controls some of the mining entities owned by the Government.

Ownership of the mineral industry of the Dominican Republic is mixed. Rosario Dominicana S.A. in Pueblo Viejo is fully owned by the Government. The Government has majority ownership in Fábrica Dominicana de Cemento in

TABLE 1

DOMINICAN REPUBLIC: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
Aluminum: Bauxite, dry equivalent, gross weight	thousand tons	—	—	187	168	[3]151
Cement, hydraulic	do.	1,007	1,066	1,100	1,495	1,600
Coal, subbituminous[e]		600	600	600	600	600
Gold	kilograms	10,202	8,833	7,651	5,785	[3]5,238
Gypsum	thousand tons	310	132	59	153	[3]171
Iron and steel:						
Ferroalloys, ferronickel		64,542	55,954	81,303	73,363	78,170
Steel, crude		59,850	100,043	87,800	75,327	[3]54,855
Lime[e]		34,000	34,000	36,000	36,000	36,000
Limestone		[e]150,000	[e]150,000	254,251	525,946	[3]1,127,397
Mercury	kilograms	689	448	69	207	35
Nickel:						
Mine output, Ni content		25,394	21,878	32,521	[e]29,300	32,000
Metal:						
Smelter, Ni content of ferronickel		25,365	21,878	32,521	29,345	[3]31,264
Shipments, Ni content of ferronickel		25,809	21,989	29,051	32,377	[3]28,944
Petroleum refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	441	278	197	237	378
Gasoline, motor	do.	2,474	2,924	3,068	2,900	3,035
Kerosene and jet fuel	do.	718	989	1,113	1,038	1,042
Distillate fuel oil	do.	2,566	3,066	3,267	2,486	2,162
Residual fuel oil	do.	3,410	3,516	2,817	2,617	2,619
Total	do.	[r]9,609	10,773	10,462	9,278	9,236
Salt		47,159	[e]54,000	[e]55,000	[4]37,532	[3 4]30,258
Silver	kilograms	50,077	40,994	35,707	39,595	22,614

[e]Estimated. [p]Preliminary.
[1]Table includes data available through Aug. 31, 1990.
[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]Reported figure.
[4]Rock salt only.

Santo Domingo. 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 Shell Internationale Petroleum Maatschappij B.V. (50%) and the Government (50%).

COMMODITY REVIEW

Metals

Bauxite.—Ideal Dominicana S.A., a privately owned company, has been producing bauxite from the Cabo Rojo area since 1987. Production by Ideal has been only at the request of the Dirección General de Minería. In 1987, most of the shipments originated from stockpiled material. Current production capacity is 200,000 tons per year. Before Aluminum Company of America (Alcoa) closed its operation in 1983, annual capacity was 1.25 million tons. Since Ideal began producing, only Alcoa has purchased the bauxite for its Suriname refinery. Production in 1989 was about 150,000 dry tons.

Gold and Silver.—In December, Rosario Resources S.A., a subsidiary of AMAX Inc., ceased to manage Rosario Dominicana. Gold and silver production continued to decrease, and oxide ores were basically exhausted. Production from the transition ore (about 13 million tons with 2.8 grams of gold per ton and 13 grams of silver per ton) was behind schedule and was not expected to begin until 1991. Development of the sulfide ore reserves, which could total almost 100 million tons, remained uncertain.

Nickel.—Falcondo shipped 28,944 tons of nickel in ferronickel in 1989, a small decrease from that of 1988. At the average price received by the company in 1989 this represents about $371 million. All nickel produced by Falcondo was purchased and marketed by Falconbridge Ltd.

Mineral Fuels

Plans for expansion of the oil refinery from 30,000 to 45,000 barrels per day were announced by the president of Shell Internationale. In October, in an effort to control the rapid increase in demand for

TABLE 2

DOMINICAN REPUBLIC: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Bauxite	Ideal Dominicana S.A. (Holnam Inc., 100%)	Sierra de Bahoruco, Pedernales Province	200
Cement	Fábrica Dominicana de Cemento C. por A. (Corp. Dominicana de Empresas Estatales, 86%; other 14%)	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
Doré (gold and silver)	Rosario Dominicana S.A. (Government, 100%)	Pueblo Viejo Mine, Cotuí, Sánchez Ramírez Province	[1]30,000
Gypsum	Sal y Yeso C. por A. (Government, 100%)	Barahona Province	NA
Nickel	Falconbridge Dominicana C. por A. (Falconbridge Ltd., 84.6%; Government, 8.1%; other private, 7.3%)	Mine and plant at Bonao, La Vega Province	30
Petroleum products	Refinería Dominicana de Petróleo S.A. (Shell International, 50%; Government, 50%)	Haina, Distrito Nacional	[2]30
	Falconbridge Dominicana C. por A.	La Peguera, La Vega Province	[2]3
Salt	Sal y Yeso C. por A.	Barahona Province	NA
Steel	Metaldom	Santo Domingo, Distrito Nacional	100

NA Not available.
[1]Kilograms.
[2]Thousand 42-gallon barrels per day.

gasoline, the Government increased the retail price of gasoline by 66% to 57 cents per gallon. This was the first price increase since 1987. Prices for other oil products were not increased.

Reserves

Falcondo's nickel reserves at yearend 1989 were 37.8 million dry tons grading 1.72% nickel. In 1988, the figure had been 23.9 million dry tons grading 1.88% nickel. The new figure reflects a lower cutoff grade based on the economic feasibility of lower grade feed under more favorable market conditions.[2]

Rosario Dominicana's reserves at Pueblo Viejo in the sulfide ore zone were estimated at 70 million tons with gold and silver contents of 4.0 and 19 grams per ton, respectively, with a cutoff grade of 3 grams per ton. Reserves in the transition ore zone were estimated at 13 million tons with 2.8 and 13 grams per ton of gold and silver, respectively.

INFRASTRUCTURE

The Dominican Republic had 1,655 kilometers of railroad. A short railroad line was used to transport gypsum and salt in Barahona. Otherwise, mineral production was trucked through the 12,000-kilometer road system. Bauxite and limestone were exported from the port in Cabo Rojo, and ferronickel was shipped from Haina port. Doré bullion was shipped to the United States by air. Crude oil was received by a buoy at Nizao and pipelined to the refinery near Santo Domingo to be processed. Since 1988, some refinery products have been received at a buoy near the refinery. Petroleum products were distributed by truck, but some fuel oil was pipelined to thermal energy generating plants throughout the country.

OUTLOOK

Recent exploration activity and international cooperative programs in the Dominican Republic have stimulated interest by the mining community. However, little changes are expected in the future. Limited Government financial resources and high inflation are preventing necessary capacity expansion of Government-owned properties and infrastructure development.

[1]Where necessary, values have been converted from Dominican Republic pesos (RD$) to U.S. dollars at the rate of RD$6.35 = US$1.00.
[2]Falconbridge Dominicana C. por A. 1989 annual report.

OTHER SOURCES OF INFORMATION

Agencies

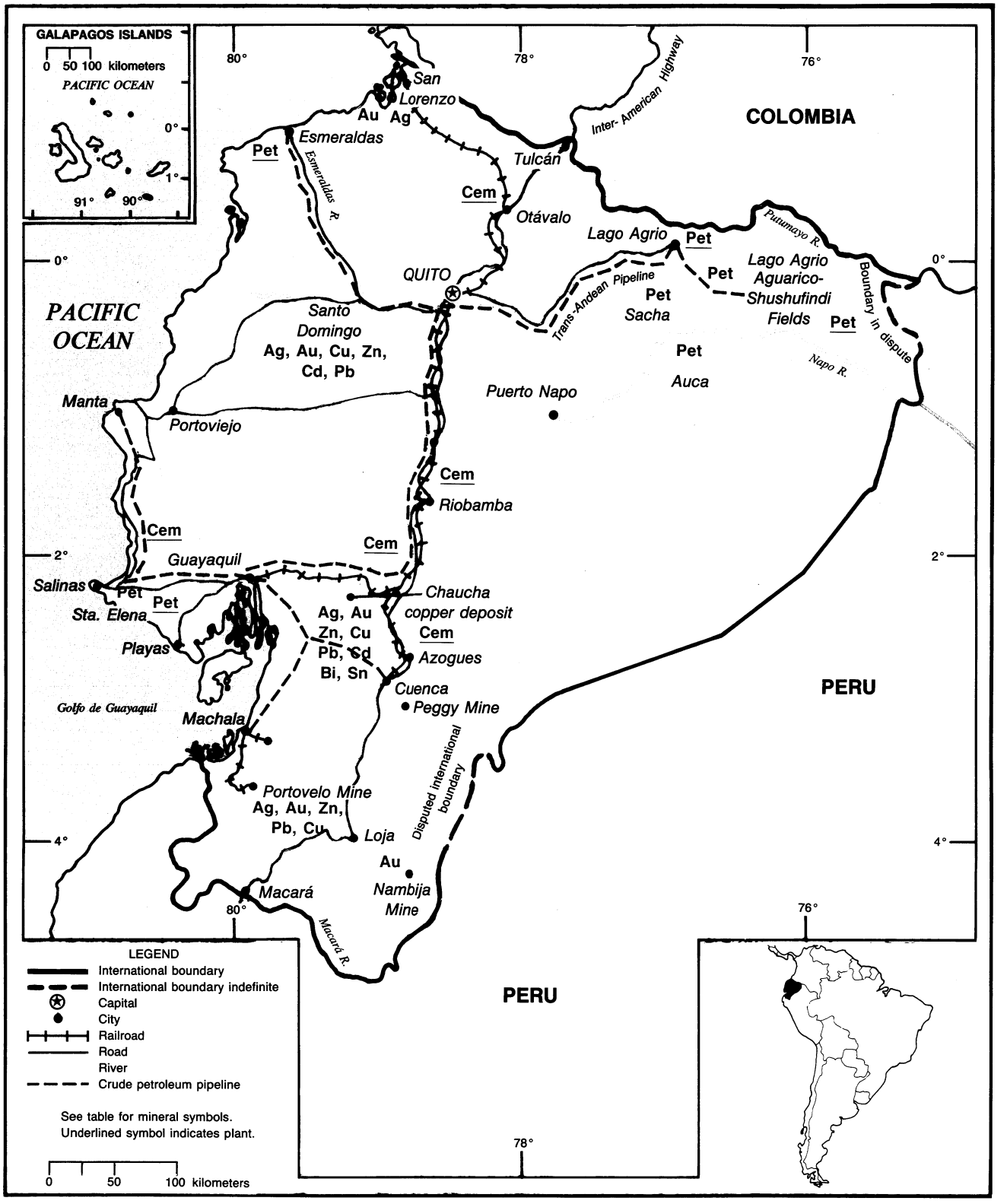
Dirección General de Minería
Edificio Gubernamental
Avenida México
Santo Domingo, República Dominicana
Corporación Dominicana de Empresas Estatales
Ave. Gral. Antonio Duvergé
Esq. José Contreras
Santo Domingo, República Dominicana

Publications

U.S. Department of State Economic Trends Report, Airgram A-6, Aug. 15, 1990. 12 pp.
U.S. Central Intelligence Agency. World Factbook, annual.
Ellis, G. The Hispaniola Report. Gold in the Dominican Republic and Haiti. 1988.
De León, R. O. Museo Nacional de Historia Natural. Geología de la Sierra de Bahoruco. 1989. 112 pp.
International Monetary Fund Washington, DC: International Financial Statistics, monthly and annual yearbook.

ECUADOR

AREA 283,560 km² (including Galapagos Islands) **POPULATION 10.5 million**



THE MINERAL INDUSTRY OF

ECUADOR

By Pablo Velasco

The mineral sector of Ecuador continued to be dominated by petroleum. This industry was the major contributor to Ecuador's economy. Exports of crude oil and its products accounted for 47% of the country's export earnings in 1989. Other major export products were bananas (16%), shrimp (15%), coffee (8%), cocoa (5%), fish (4%), and other minor exports (5%). Based on a recovery in oil production following the 1987 earthquake, the Central Bank estimated that the gross domestic product (GDP) increased by 8% in 1988. During 1989, the GDP growth slowed dramatically to 0.5%, reaching $9.8 billion.[1] This sharp reduction in the growth rate was attributed to the Government's tight credit policies and import restrictions. The annual inflation rate decreased to 54% from that of 1988, when it reached 86%.

Mining continued to be considered a priority development sector by the Government. In 1989, this sector registered an estimated 86% growth, mainly in the areas of industrial minerals and, to a lesser extent, metallic minerals, mainly gold. Crude oil production, which had been increased to 300,000 barrels per day (bbl/d) in 1988 to compensate for the 5-month production loss brought about by the earthquake in March 1987, was reduced to 280,000 bbl/d in 1989. This was far above the limits of 230,000 bbl/d and, more recently, 242,000 bbl/d stipulated by the Organization of Petroleum Exporting Countries (OPEC). On October 1, the newly established state-owned Petróleos Ecuador (Petroecuador) oil-holding corporation took control of the Trans-Andean pipeline, previously operated by Texaco Inc., United States, following the expiry of an agreement. Of the other activities in this sector, only gold was of any importance, with production in 1989 of about 13 tons.

GOVERNMENT POLICIES AND PROGRAMS

Ecuador continued to offer a favorable investment climate to foreign and domestic investors in mining activities and exploration for precious metals throughout the country. These activities had been stimulated by both the country's mineral potential and by the favorable mining law implemented in August 1985. The new reforms proposal to Ecuadorian mining law expected to be approved by the Government emphasized rapid active exploration and development of mineral resources, encouraged investment both domestic and foreign, imposed moderate fees and royalties, and barred public officials from holding mining concessions. It would impose restrictions on foreign currency transactions and create a potentially cumbersome bureaucracy. It would take effect after congressional review and approval and upon its publication in the official register. Its tax provisions would become effective January 1, 1990. In addition to the above changes, all investment agreements would be negotiated by the Committee for Mining Contracts composed of Ministers of Energy and Mines, Finance, Industry and Commerce, the Director General of the Central Bank, the Attorney General, and the President of the Mining and Metallurgical Development Corp. Investors would be protected from expropriation of their mines, except "for reasons of public usefulness or national necessity," when declared by executive decree. Investors would be assured the right to import, duty free, equipment, materials, and supplies necessary to their enterprise. The following environmental provisions would be included in the new mining code:

- Surface water must be returned, uncontaminated, to its source,
- Earth moving must be done so as to avoid erosion and decertification,
- Land must be reforested after use,
- Slag must be disposed of in a manner so as not to contaminate soil,
- Flora and fauna of economic or scientific value must be conserved,
- Processing plants must be equipped with environmental protection systems, and
- The use of mercury and other contaminants is only permitted when the process used includes recovery of same.

Small-scale gold mining for individual subsistence level activity using rudimentary tools may be practiced freely except in areas where rights have been assigned. The Ministry of Energy and Mines was authorized to provide financial and technical assistance to small-scale gold miners. The National Directorate of Mines would investigate and rule on allegations of claim jumping within 12 days of receipt of a complaint. Claim jumpers would be subject to provisions of the penal code, and "public forces" would be used to dislodge violators if they do not vacate within 3 days of an order from the National Directorate of Mines. However, the complaint must be made within 90 days of the infraction to receive administrative consideration from the Directorate.

PRODUCTION

Production of nonfuel minerals showed modest growth in 1989 and contributed 0.9% to the GDP. Mineral production was limited to a few commodities: gold from placer operations; lead, silver, and zinc from polymetallic mines; and to a lesser degree industrial minerals, clays, kaolin, limestone, marble, and sulfur. The total value and volume of mineral production increased in 1989 compared with those of 1988 and are expected to become increasingly important in the future. The total value of mineral output was estimated at $1.03 billion in 1989 compared with $875 million in 1988. The mineral fuels and their derivatives accounted for 75% of the total value, and the nonfuel minerals, including gold, accounted for the remaining 25%. Production of crude oil was temporarily suspended on May 22, 1989, and shipments partially rerouted via Colombia owing to damage sustained by the pipeline linking the Amazon region to La Esmeralds refinery. Heavy rains caused

TABLE 1

ECUADOR: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS						
Cadmium, mine output, Cd content[e]	kilograms	300	300	300	300	300
Copper, mine output, Cu content[e]		100	100	100	100	100
Gold, mine output, Au content	kilograms	9,331	9,870	9,500	8,050	[2]13,000
Iron and steel:						
Steel, crude		17,874	17,084	25,200	23,500	23,400
Semimanufactures		133,182	181,850	170,400	170,538	178,000
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]		[2]100	100	100	100	100
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	[r]1,966	[r]2,015	2,145	2,200	2,250
Clays:						
Bentonite		[e]50	[e]100	155	100	[2]250
Common:						
For cement	thousand metric tons	—	[r]2,907	255	500	[2]520
Other		—	[r]26,472	29,200	50,000	[2]150,250
Kaolin		[r]7,271	3,867	11,017	[e]16,700	[2]22,576
Coal, lignite		[e]1,000	[e]1,200	1,541	3,000	[2]5,000
Feldspar		3,389	2,298	1,558	5,000	[2]21,814
Gypsum (for cement)		316,468	290,680	29,200	50,000	[2]48,368
Sand:						
Silica (glass sand)		22,441	36,649	14,675	50,000	[2]102,345
Ferruginous		[e]5,000	[e]5,500	6,000	6,000	[2]15,334
Stone, sand and gravel:						
Limestone (for cement manufacture)	thousand metric tons	3,762	6,500	2,773	5,000	[2]5,617
Marble		11,435	15,195	15,210	20,000	[2]47,771
Pumice		[e]80,000	[e]85,000	—	[2]90,000	[2]144,836
Sulfur:[e]						
Native		4,000	4,000	4,500	4,500	4,300
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		14,000	14,000	14,500	14,500	14,300
MINERAL FUELS AND RELATED MATERIALS						
Gas, natural:						
Gross	million cubic meters	609	[e]623	[e]348	177	180
Marketable	do.	130	146	92	99	100
Natural gas, liquids:						
Natural gasoline	thousand 42-gallon barrels	229	232	186	232	240
Liquefied petroleum gas	do.	591	789	278	533	550
Total	do.	820	1,021	464	765	790
Petroleum:						
Crude		[r]102,415	106,580	63,510	110,157	105,000

See footnotes at end of table.

TABLE 1—Continued

ECUADOR: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1985	1986	1987	1988[p]	1989[e]
MINERAL FUELS AND RELATED MATERIALS—Continued					
Petroleum—Continued					
Refinery products:					
Liquefied petroleum gas	[r]703	1,635	770	2,040	2,000
Gasoline	[r]7,630	8,788	6,904	10,772	11,000
Jet fuel	[r]1,124	1,170	1,288	1,332	1,400
Kerosene	[r]2,127	2,187	1,581	1,497	1,500
Distillate fuel oil	[r]13,646	6,281	6,371	7,207	7,300
Lubricants	291	287	294	300	300
Residual fuel oil	[r]4,111	13,667	11,769	12,783	16,500
Unspecified	718	730	620	1,000	1,300
Refinery fuel and losses	1,089	840	[e]812	—	1,800
Total	[r]31,439	35,585	30,409	36,931	43,100

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes data available through Aug. 1990.
[2]Reported figure.

a landslide that buried approximately 100 meters of pipeline, spilling 5,000 barrels of crude.

TRADE

The merchandise trade balance recovered by a significant amount to $669 million in 1989 compared with $589 million in 1988. The Ecuadorian imported market for mining equipment increased from $3.1 million in 1988 to $4.6 million in 1989. Almost all mining machinery and equipment were imported from different countries. Ecuador's total exports were valued at $2.4 billion, while total imports were $1.7 billion. The United States was Ecuador's major supplier of mining equipment with a market share of 54.3%, followed by the United Kingdom with 11.9% and other countries with the remaining 33.8%. The value of imported mining equipment from the United States increased 5.2% to $2.5 million compared with that of 1988. Fifty-six percent of Ecuador's total exports were sold to the United States, and the U.S. supplied 31% of Ecuador's total imports. The volume of petroleum exports recovered, but was partially offset by declining prices.

Ecuador was granted an International Monetary Fund standby agreement worth $135 million in 1989, and the Government would seek to reschedule its foreign commercial debt in 1990, which would further facilitate the adjustment program for the balance of payments.

STRUCTURE OF THE MINERAL INDUSTRY

Two Government agencies, the Dirección Nacional de Hidrocarburos and the Instituto Ecuatoriano de Minería (INEMIN), formerly Dirección General de Geología y Minas, both 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. Oil and gas were produced by companies with production-sharing agreements with the Government, Corporación Estatal Petrolera Ecuatoriana (CEPE), and CEPE-Texaco. CEPE-Texaco were also joint owners of the trans-Ecuadorian 800-kilometer-long crude oil pipeline with a 300,000-bbl/d capacity. The pipeline installation was completed in 1972 and crosses the Andes near the capital of Quito. It transports crude oil from the Lago Agrio Oilfields to the Balao terminal on the Pacific coast near Esmeraldas.

In October 1, 1989, the Government of Ecuador, exercising a contractual agreement with Texaco Inc., took over the operation of the trans-Ecuadorean pipeline, and CEPE assumed full operational control. In late September 1989, a law was enacted reorganizing CEPE, and the name was changed to Petróleos Ecuador (Petroecuador) as of January 1, 1990. The Government of Ecuador continued plans to assume operation control of the oilfields currently operated by Texaco in July 1990 and the Repetrol refinery by yearend.

In 1989, the total national work force was 2.8 million workers distributed as follows: 52% in the agricultural sector; less than 28% in the industrial, construction, and commerce sectors; with the remainder employed in other services and 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 15% of the total.

Despite the existence of several base metal prospects with relative good mineral potential, the exploration for this type of mining had been stagnant during the past 4 years because gold production had captured most of the attention of the private investors. INEMIN was carrying out an agreement with Japan for a detailed exploration followup program to ascertain base metal prospects outlined by the British Geological Mission during the

TABLE 2

ECUADOR: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	Destinations, 1988	
			United States	Other (principal)
Abrasives, n.e.s.: Natural: Corundum, emery, pumice, etc.		30,549	28,509	Colombia 622; Venezuela 500.
Aluminum: Metal including alloys, semimanufactures		428	—	Colombia 412; Dominican Republic 10; Peru 6.
Copper: Metal including alloys, semimanufactures		16	—	All to Argentina.
Fertilizer materials: Manufactured:				
Unspecified and mixed	value, thousands	$975,714	$228,346	Netherlands Antilles $143,803; Peru $116,850.
Iron and steel: Metal: Semimanufactures:				
Universals, plates, sheets		748	—	Chile 490; Peru 203; Switzerland 54.
Tubes, pipes, fittings		317	—	Mainly to Chile.
Petroleum:				
Crude	thousand 42-gallon barrels	45,951	NA	NA.
Refinery products:				
Gasoline	42-gallon barrels	305,837	NA	NA.
Distillate fuel oil	do.	563,193	NA	NA.
Residual fuel oil	do.	8,772,279	NA	NA.
Bituminous mixtures	do.	121	—	All to Costa Rica.
Stone, sand and gravel:				
Dimension stone, crude and partly worked		16	16	
Quartz and quartzite		18	18	

NA Not available.
[1]Table prepared by H. D. Willis. Export data for 1987 were not available at time of publication.

TABLE 3

ECUADOR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	Sources, 1988	
		United States	Other (principal)
METALS			
Alkali and rare-earth metals	3	3	
Aluminum:			
Oxides and hydroxides	1,636	1,443	Romania 60; United Kingdom 60.
Metal including alloys:			
Scrap	2	2	
Unwrought	4,947	151	Canada 2,886; Argentina 845; Brazil 710.
Semimanufactures	14,357	280	Brazil 12,610; West Germany 525.
Chromium:			
Ore and concentrate	20	20	
Oxides and hydroxides	17	(2)	West Germany 11; Canada 3; Italy 3.
Cobalt: Oxides and hydroxides	2	2	
Copper: Metal including alloys:			
Unwrought	4	1	Canada 2; Senegal 1.
Semimanufactures	6,288	144	Colombia 3,807; Peru 1,074; Chile 628.

See footnotes at end of table.

TABLE 3—Continued

ECUADOR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	Sources, 1988	
			United States	Other (principal)
METALS—Continued				
Iron and steel:				
Iron ore and concentrate: Pyrite, roasted		2	—	All from Switzerland.
Metal:				
Pig iron, cast iron, related materials		257	30	Brazil 143; Switzerland 35; Colombia 33.
Ferroalloys:				
Ferromanganese		392	—	Chile 360; West Germany 31; Sweden 1.
Ferrosilicon		115	—	Chile 110; Switzerland 5.
Unspecified		2	1	West Germany 1.
Steel, primary forms		183,207	5,050	Turkey 87,731; Brazil 37,424; Chile 19,056.
Semimanufactures:				
Bars, rods, angles, shapes, sections		45,898	314	Venezuela 7,564; Chile 6,721; Republic of South Africa 6,607.
Universals, plates, sheets		123,153	1,245	Brazil 76,950; Japan 12,542; West Germany 11,311.
Hoop and strip		2,626	225	Japan 1,156; Belgium-Luxembourg 478; Brazil 369.
Rails and accessories		36	1	Italy 28; Canada 5; Belgium-Luxembourg 2.
Wire		348	11	Republic of Korea 113; United Kingdom 81; Italy 35.
Tubes, pipes, fittings		31,550	1,735	Argentina 7,147; Mexico 6,817; Brazil 6,360.
Castings and forgings, rough		418	397	Brazil 20.
Lead:				
Oxides		1,569	(2)	Mexico 653; Peru 531; Panama 380.
Metal including alloys:				
Unwrought		1,079	53	Peru 520; Panama 361; Canada 106.
Semimanufactures		203	1	Republic of South Africa 198; Belgium-Luxembourg 3.
Magnesium: Metal including alloys:				
Unwrought	value, thousands	$1	—	All from Argentina.
Semimanufactures		5	5	
Manganese: Oxides		683	12	Brazil 623; Mexico 20.
Mercury	kilograms	2,000	2,000	
Molybdenum: Metal including alloys, semimanufactures	value, thousands	$6	$4	United Kingdom $2.
Nickel: Metal including alloys:				
Unwrought		2	—	All from Canada.
Semimanufactures		12	4	West Germany 5; Canada 3.
Silver: Metal including alloys, unwrought and partly wrought	value, thousands	$76	$5	Chile $61; Spain $10.
Tin: Metal including alloys:				
Unwrought		7	3	Bolivia 4.
Semimanufactures		25	2	Bolivia 14; West Germany 3.
Titanium: Oxides		359	67	West Germany 161; Austria 60.
Tungsten: Metal including alloys:				
Semimanufactures	value, thousands	$5	—	All from Japan.
All forms	do.	$2	$2	
Zinc:				
Oxides		19	10	West Germany 7; Mexico 1.
Blue powder		17	7	Denmark 5; Peru 5.

See footnotes at end of table.

TABLE 3—Continued

ECUADOR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1988	Sources, 1988	
		United States	Other (principal)
METALS—Continued			
Zinc—Continued			
Metal including alloys:			
Unwrought	53,692	50	Canada 51,800; Peru 1,836.
Semimanufactures	15	6	Republic of South Africa 9.
Other:			
Ores and concentrates	116	112	Italy 2; France 1.
Oxides and hydroxides	92	84	West Germany 6; France 2.
Ashes and residues	143	18	Mexico 125.
Base metals including alloys, all forms	8	8	
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc.	17	4	Italy 6; West Germany 2.
Artificial: Corundum	79	(2)	Austria 50; Brazil 27; Italy 2.
Grinding and polishing wheels and stones	290	14	Brazil 81; Belgium-Luxembourg 50; Italy 47.
Asbestos, crude	7,036	2	Canada 5,970; Republic of South Africa 1,063.
Barite and witherite	91	47	Peru 25; Brazil 10.
Boron materials:			
Crude natural borates	6	—	Belgium-Luxembourg 4; Italy 2.
Oxides and acids	207	—	Peru 205; West Germany 2.
Cement	8,330	1,124	Peru 3,531; Colombia 3,513.
Chalk	855	18	Belgium-Luxembourg 340; United Kingdom 340; Chile 84.
Clays, crude	2,564	2,127	Colombia 315; United Kingdom 61.
Diamond: Gem, not set or strung value, thousands	$238	$2	Belgium-Luxembourg $224; Thailand $11.
Diatomite and other infusorial earth	355	337	Mexico 16; Canada 2.
Feldspar, fluorspar, related materials	144	(2)	Peru 70; Mexico 27; Argentina 20.
Fertilizer materials:			
Crude, n.e.s.	2	2	
Manufactured:			
Ammonia	39	(2)	Netherlands 28; West Germany 10.
Nitrogenous	65,081	15,941	Venezuela 15,769; U.S.S.R. 10,500.
Phosphatic	872	1	Republic of South Africa 400; Belgium-Luxembourg 210; Colombia 200.
Potassic	27,150	21,261	West Germany 5,603; Belgium-Luxembourg 250.
Unspecified and mixed	21,187	19,820	Belgium-Luxembourg 800; West Germany 469.
Graphite, natural	16	1	Brazil 10; West Germany 5.
Gypsum and plaster	65,820	5,407	Mexico 56,042; Peru 4,000.
Magnesium compounds: Magnesite, crude	1	—	Mainly from Switzerland.
Mica:			
Crude including splittings and waste	36	10	France 13; Peru 13.
Worked including agglomerated splittings value, thousands	$2	—	All from West Germany.
Phosphates, crude	2	—	All from United Kingdom.
Pigments, mineral: Iron oxides and hydroxides, processed	265	11	Spain 111; West Germany 80; Mexico 37.
Potassium salts, crude	5,077	5,077	

See footnotes at end of table.

TABLE 3—Continued

ECUADOR: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Precious and semiprecious stones other than diamond: Synthetic	value, thousands	$42	NA	NA.
Salt and brine		162	4	United Kingdom 126; West Germany 21; Colombia 10.
Sodium compounds, n.e.s.:				
Soda ash, natural and manufactured		6,954	4,757	France 1,646; Poland 400.
Sulfate, natural and manufactured		3,506	161	Mexico 2,765; Chile 480.
Stone, sand and gravel:				
Dimension stone: Crude and partly worked		22	(2)	Mainly from Italy.
Dolomite, chiefly refractory-grade		302	—	Peru 200; Spain 66; Switzerland 27.
Quartz and quartzite		6	6	
Sand other than metal-bearing		5,302	5,267	Colombia 25; Italy 8.
Sulfur:				
Elemental:				
Crude including native and byproduct		1,367	—	Colombia 1,360; West Germany 7.
Colloidal, precipitated, sublimed		24	24	
Sulfuric acid		2,316	2,162	Peru 154.
Talc, steatite, soapstone, pyrophyllite		676	346	Italy 23; Brazil 21.
Other:				
Crude		459	264	Mexico 85; Italy 76.
Slag and dross, not metal-bearing		4	4	
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		60	14	Colombia 46.
Carbon:				
Carbon black		2,402	11	Venezuela 1,279; Colombia 956; Malaysia 120.
Gas carbon		381	—	All from Colombia.
Coal:				
Anthracite		168	—	Colombia 150; Belgium-Luxembourg 15; United Kingdom 3.
Lignite excluding briquets		1	1	
All grades excluding briquets		27	—	Colombia 15; West Germany 12.
Petroleum refinery products:				
Liquefied petroleum gas	42-gallon barrels	1,837,813	NA	NA.
Gasoline:				
Aviation	do.	39,782	NA	NA.
Motor	do.	50,014	NA	NA.
Mineral jelly and wax	do.	27,057	4,431	West Germany 13,119; Japan 4,336.
Lubricants	do.	258,545	148,127	Netherlands 54,495; France 35,147.
Residual fuel oil	value, thousands	$2,644	$2,261	Panama $383.
Bitumen and other residues	42-gallon barrels	721	418	West Germany 303.
Bituminous mixtures	do.	764	576	Colombia 127; Costa Rica 42.
Petroleum coke	do.	6	—	All from Spain.

NA Not available.
[1]Table prepared by H. D. Willis. Import data for 1987 were not available at time of publication.
[2]Less than 1/2 unit.

1970's in the Western Central Cordillera. The Government had encouraged the formation of mixed enterprises, such as mining centers, MINACEN, to install processing plants to treat minerals in the mining districts of Nambija in the Province of Zamora, Ponce Enríquez in the Azuay Province, and Portovelo in the Province of El Oro. The Government had also given the Ecuadorian Army's Industry Div. (DINE) joint responsibility with INEMIN for the administration of certain regions, including parts of the Provinces of Zamora and Morona-Santiago.

There were more than 100 small mining companies operating 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 1989, there were 20 foreign companies prospecting and exploring for copper, gold, and silver in Ecuador. The countries of origin were Australia, Canada, China, Finland, France, Panama, Spain, the United Kingdom, and the United States. There were four foreign companies actively engaged in the mining of gold and silver; they were Australian, Canadian, French, and Panamanian.

Major industrial mineral operations included: marble-Industria Marmolera Ecuatoriana S.A., Mármoles Andinos Cia. Ltda., Mármoles Santa Rosa Cia Ltda., and Marmolera Chimborazo.; calcium carbonate—Cecal. S.A.; bentonite—Mineral M.D.K. Mineral Bentonite Charasol; barite—Mineral Bomboiza; and cement—La Cementa Nacional C.A., Cementos Selva Alegre S.A., Cementos Chimborazo C.A., Empresa Industrias Guapan S.A., and Cemento Cotopaxi C.A.

In addition, there was production of clays, limestone, pumice stone, and silica sands.

COMMODITY REVIEW

Metals

Gold.—Gold production in Ecuador was reported to have increased 61% to 13,000 kilograms (kg) in 1989 compared with that of 1988. Most of the gold came from the Nambija, Ponce Enríquez, and the Zaruma-Portovelo Districts. The gold was produced by underground methods and recovered by the gravimetric process followed by amalgamation or cyanidation methods. Gold was also extracted from alluvial deposits and placers. The material extracted from these works was processed on a toll basis in plants treating 5 tons per day. At present, most of the metallic mines were in the southern part of the country and approximately 200 rivers containing gold, outlined in five main districts formed by the following rivers: Esmeralda-Santiago; Daule-Quevedo; Puyango-Balao, Chinchipe-Zamora-Upano, and Napo-Pastaza-Aguarico. The Government was encouraging joint ventures, mainly to install larger processing plants capable of treating 40 to 200 tons of gold bearing gravel per day.

Three gravimetric plants had been installed in the Catamayo, Bonanza, Vivar, Jubones, and Casacay Rivers. In 1988, Greevor PLC of the United Kingdom began to build a 100-ton-per-day plant, which would use an acid leaching circuit in the Zaruma-Portovelo District. The plant, which would initially reprocess old tailings dumps and treat low-grade ore from small gold mines, was still under test and should be in full production by the end of 1990.

Within the past 2 years, several foreign companies had embarked on the task of exploration for primary gold deposits in various regions of the country. These included RTZ (United Kingdom), Cogema (France), Rayrock Yellownife Resources (Canada), BRGM (France), and others. Alluvial gold mining was also very active in the country; most of the operations were small-scale. One example was the Los Lilenes operation where 60,000 cubic meters per month was dredged. Mineral Gowanda S.A., a U.S. company established in 1973, mined gold placer deposits in the Esmeraldas area, northwest of Ecuador.

Other Metals.—Armeno Resources Inc. of Vancouver, Canada, through its branch office in Ecuador, had indicated that the exploration and development work carried out during 1989 contributed to an increase in ore reserves from 120,000 tons to 2.2 million tons (proven and probable) grading 0.65% lead, 1.9% zinc, 465 grams (g) silver per ton, and 0.55 g of gold per ton. Armeno Resources had formed a joint venture with Nissho Iwaí Corp. of Japan to finance the development and exploitation of the San Bartolomé Mine and three other exploration prospects in Ecuador in return for a $1.25 million investment and a loan of $1.25 million to construct the production facilities in the mine and bring it into production by the end of 1990. Nissho Iwaí had agreed to acquire a 50% stake in Armeno's San Bartomé property and other prospects. The completion of the deal, however, was subject to various approvals by Canadian and Ecuadorian regulatory authorities.

INEMIN, the official regulatory mining institution, maintained under subsidized operating conditions a low-production level (20 tons per day) at the Portovelo Mine.

According to the latest evaluation performed by INEMIN's technical staff, reserves of 130,000 tons (proven and probable) had been estimated at Portovelo, grading 1% copper, 1.7% zinc, 63 g of silver per ton, and 1.2 g of gold per ton. La Plata and Molleturo were other relatively important prospects. Both mines were in production for several years during the late 1970's and early 1980's, but at present are closed. Intensive exploration, development, and rehabilitation programs would be required to bring them into production. According to official sources, the La Plata deposit contained reserves of approximately 300,000 tons (proven and probable) with grades of 3.5% copper, 2.3% zinc, 43 g of silver per ton, and 2.5 g of gold per ton. Similarly, at the Molleturo deposit, based on the limited exploration work carried out by the property holders, there was approximately 100,000 tons (proven and probable) grading 1.3% copper, 5.2% lead, 6.9% zinc, 560 g of silver per ton, and 1.5 g of gold per ton.

Industrial Minerals

The industrial minerals sector of Ecuador played a significant role in the nonfuel mineral sector. The most important operations were in the cement and cement-related industries, notably large limestone and clay quarries.

Cement.—Production of cement increased 2.3% from that of 1988 to an estimated 2.25 million tons. Domestic sales in 1989 totaled 2.2 million tons. Most of the cement production capacity was under Government control and owned and managed by regional development corporations.

TABLE 4

ECUADOR: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	Cementos Selva Alegre S.A. (Government, 100%)	Near Otavalo, Pichincha Province	350
Do.	Cementos Chimborazo C.A. (Government, 100%)	Near San Juan Chico, Riobamba Province	250
Do.	La Cemento Nacional C.A. (Corporacion 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 Guaya Province	1,500
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)	Cia. Armeno Resources Inc. of Vancouver, British Columbia, Canada (Jointly owned by Armenco Resources Inc. of Canada, 50%; Nissho Iwai Corp. of Japan, 50%)	San Bartolome Mine, Azuay Province, 30 km south east from Cuenca	36
Polimetallic (Au, Ag, Cu, Pb, Zn)	Minera Toachi, S.A. (Owned by Outokumpu Oy of Finland, 33%; Cia 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 El Oro Province	6
Gold	Coperativa Gordillera Nambija (Government, 40%; private, 60%)	Cordillera Tunantza, southeast of Ecuador, 25 kilometers north of Zamora Chinchipe	[1]10
Do.	Coperativa Orquidea de Los Andes & Cia. Minera Cumbinamasa S.A.	Cordillera Las Brisas, Villa 4, Machala	[1]10
Do.	Cia. Minera Los Lilenes S.A. (Osborne & Chapel, 50%; Government, 50%)	Machala River gold placer, El Oro Province	[2]120
Petroleum, crude	Petroecuador (Former CEPE-Texaco, Inc.) (Government, 100%)	Lago Agrio, Sacha, Auca, Shushufindi-Aguarico Oilfields, Oriente region	[3]243
Do.	Petroecuador (Former CEPE-Oriente) (Government, 100%)	Shushuqui, Shuara, Secoya, Cuyabeno and other oilfields in the northeastern sector	[3]45
Refinery products	Petroecuador (Former CEPE) (Government, 100%)	Esmeralda refinery at Esmeralda city and Shushufindi refinery in the Oriente region	[3]90
Do.	Anglo-Ecuadorian & Repetrol (privately owned)	Santa Elena Peninsula, Guayas Province	[3]44

[1]Grams of gold per ton.
[2]Kilograms of gold per year.
[3]Thousand 42-gallon barrels per day.

La Cemento Nacional C.A. (LCN), the largest manufacturer of cement in Ecuador, produced about 67% of the total output in the country. LCN 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 had since operated the two cement plants of the company, including the implementation of the two major expansions of LCN's production facilities. LCN was an established and well organized cement company serving the entire Ecuadorian market. 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%).

In 1988, IFC, after 10 years since its original involvement, had decided to sell its entire shareholding for an undisclosed amount to Compañia de Inversiones Albacerrada S.A. (CIASA). CIASA was an Ecuadorian investment corporation owned by private Ecuadorians. The most important cement companies after LCN were Cementos Selva Alegre S.A., Cementos Chimborazo C.A., Industrias Guapán S.A., and Cemento Cotopaxi C.A.

Kaolin.—In recent years, the ceramic industry of Ecuador was concentrated in the southern part of the country; it had become a significant factor in Ecuador's economy. Fine ceramic goods, namely earthenware and crockery, were the main products. The location of the ceramic industry around Azogues, Cuenca, and Loja in southern Ecuador was determined

by the deposits of primary kaolin. The initial systematic investigation was made as part of a United Nation Development Program (UNDP) project in the 1960's. In 1966, a technical co-operation project between Ecuador and the Federal Republic of Germany began in the industrial mineral sector. The project was implemented by the counterpart INEMIN and Bundesanstalt fur Geowissenschaften and Rohstoffe (BGR).

The kaolin deposits within reach of the ceramic industry at Azogues, Cuenca, and Loja were investigated in a joint project. Most of the kaolin mined in the area under investigation was used in the ceramic industry for the manufacture of earthenware. The earthenware industry in Cuenca, Azogues, and Loja used roughly 700 tons of raw material per month, approximately 200 to 300 tons of which was raw kaolin mined in the deposits of Las Mercedes, Tinajillas, Belén, Lucero-El Valle, and Samael. Reserves of raw kaolin amounted to more than 2 million tons and were adequate to meet the long-term needs of the ceramic industry. According to preliminary figures from INEMIN, the production of kaolin in 1989 had increased 35% to 22,576 tons compared with that of the previous year.

Pumice.—Production of pumice stone increased 61% in 1989 to a reported 144,836 tons compared with that of 1988. Reportedly, a steadily increasing volume of this stone was coming to the United States via the port of New Orleans from Ecuador, Turkey, and Mexico. Increased U.S. use of the floating stone, better known as pumice, was a type of volcanic glass attributed to the textile industry where it was used in producing so-called stonewashed blue jeans. The commodity, however, was utilized virtually worldwide in a variety of applications, including as cleansers in the cosmetic industry, in concrete blocks to lighten them, as railroad ballast to hold ties in place, as insulation, in plaster, and in acoustic tile. Thus far, at least three companies were handling the increasing flow of pumice through the Port of New Orleans.

Mineral Fuels

Gas.—During 1989, Ecuador produced 180 million cubic meters of natural gas. Most of the domestically produced gas was processed at the gas plant in Shushufindi. To meet domestic demand, an additional 100 million cubic meters of natural gas was imported from Colombia. Liquified petroleum gas was bottled and distributed by four private firms as well as by CEPE.

Petroleum.—Crude oil production in 1989 totaled 105.0 million barrels, a decrease of 4.7% from the previous year. Ecuador exported 62 million barrels of crude and 9.5 million barrels of refinery products in 1989. The decline appeared principally due in response to an OPEC move to cut output to reduce the glut in the world oil market and thereby raise the price of oil. Petroleum exploration activities had continued apace during the first 9 months of 1989 with new wells drilled by Belco (United States), Elf (France), Petrobras (Brazil), Petrocanada (Canada), and Tenneco (United States). Oil shows were encountered in some of the wells, but it was not clear whether any of these would be considered commercial. Conoco (U.S.) made a large find during 1988, and it is negotiating a development plan with the Government. Exploration contracts with Esso-Hispanoil (Spain), Texaco-Pecten, Belco, and Occidental (United States) had expired, although Belco received an extension for one of its two blocks.

The Government had announced that seven additional blocks (200,000 hectares or about 500 acres each) would be available for exploration bids beginning January 10, 1990. On October 1, 1989, CEPE assumed operation of the Trans-Andean pipeline, previously operated by Texaco. On December 1, the Anglo refinery also reverted to CEPE, and the Government continued its plan to assume operation of the oilfields now operated by Texaco in July 1990 and the privately owned Repetrol refinery later in the year. In late September 1989, a law was enacted reorganizing the state petroleum company and changing its name from CEPE to Petroecuador (effective January 1, 1990). From the total of crude oil production, the CEPE-Texaco consortium accounted for 83 million barrels, CEPE directly produced 19.7 million, and City-Ecuadorian (CEPCO) produced 23 million. More than 99% of Ecuador's petroleum output, however, comes from the Oriente. Texaco's main base-camp in the Oriente was in the town of Lago Agrio, and the main oilfields operated by the U.S. (Texaco) firm included Shushufindi, Sacha, Lago Agrio, Aguarico, and Auca. Most of CEPE's production came from fields north of the Texaco concession near the Colombian border. As of June 1988, proven reserves were estimated at 1.14 billion barrels, and probable reserves added 700 million barrels. With an output of 285,000 barrels per day, proven reserves would last 11 years based on present production; probable reserves add about 6.5 years.

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 remains unexploited.

Ore reserves of metallic minerals and industrial minerals were small but considered significant in Latin America. Crude oil proven reserves were estimated at 1.14 billion barrels and probable reserves at 700 million barrels.

INFRASTRUCTURE

Ecuador had a relatively well developed infrastructure. The transportation network was composed of a total of 28,000 kilometers (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-meter-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 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 Bolivar, and Manta.

For international air transportation, there were two airports, one in Quito and the other in Guayaquil. Ecuatoriana de Aviación was the major airline that covered several routes throughout Latin America and the United States; its routes connected with other foreign airlines. Ecuador had an installed electrical

generating capacity of 1,953 megawatts, of which 53% came from thermal stations and 47% came from hydroelectric sources. Early in 1991, however, this ratio was expected to change in favor of hydroelectric power.

OUTLOOK

For a long time the potential to develop mining in Ecuador had been seen as promising. The current mining law enacted in 1985 motivated foreign investment to flow into the country, but even so, this had not been sufficient to reactivate the mining sector to any great degree owing mainly to certain inconsistencies in the law, not to mention bureaucratic obstacles that delay the implementation of sound projects.

The current authorities concerned with the mineral sector are working eagerly to overcome these pitfalls. A new mining law has been drawn up to amend the former law and create major incentives to encourage mining activity. Should this law be enacted during 1990 and properly applied and enforced, it may be possible to say that the mining sector would contribute properly to the income of the country, in the best national interest.

The new state petroleum company Petroecuador is expanding its productive capacity, most notably the construction of a liquefied petroleum gas terminal and of petroleum-product pipelines. In addition, 10 foreign consortia are carrying out exploration activities, and 7 more blocks are being offered for exploration. Development of two of the exploration blocks may begin during 1990.

[1]Where necessary, values have been converted from Ecuadorian Sucres (S/) to U.S. dollars at the rate of S/526 = US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

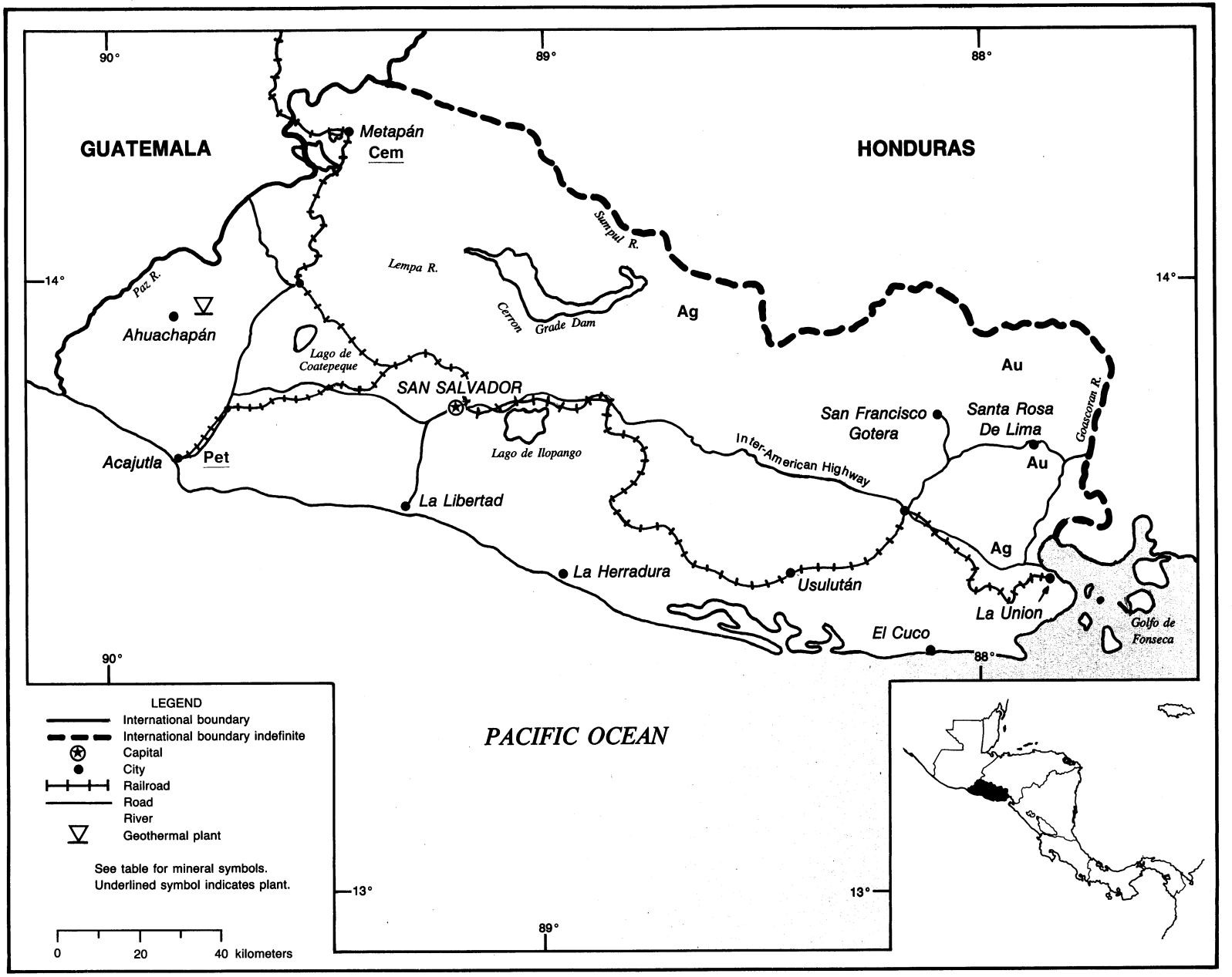
Ministry of Energy and Mines
Santa Prisca 223
Quito, Ecuador
Petróleos del Ecuador
(Petroecuador)
Alpallana y 6 de Diciembre
Edif. Alpallana P.O. Box 5007-8
Quito, Ecuador
Instituto Ecuatoriano de Minería
(INEMIN)
Casilla 23-A, Av. 10 de Agosto y
Villalengua Esq.
Quito, Ecuador
Cámara de Minería del Ecuador
Ave. 6 de Diciembre 134 y Sodiro
Edif. Capitolio, Ofic. 505
Quito, Ecuador

Publications

Banco Central del Ecuador—Memoria Anual 1987.
ENEMIN, Mining in Ecuador 1986, annual report.

EL SALVADOR

AREA 21,040 km² **POPULATION 5.1 million**



THE MINERAL INDUSTRY OF

EL SALVADOR

By H. Robert Ensminger

The country continued to be affected by insurgent activities during 1989. These activities had a detrimental effect on El Salvador's economy. The gross domestic product (GDP) was estimated to have risen about 1% to $4.82 billion[1] (current dollars). The mining industry contributed an estimated share of 0.4% to the GDP. The Government's economic targets were not met, and El Salvador continued to rely heavily on foreign aid from the Federal Republic of Germany, Italy, and the United States.

GOVERNMENT POLICIES AND PROGRAMS

The Minister of Economy announced the finalizing of a new draft mining code by a national advisory commission composed of representatives of the Ministries of Economy, Foreign Trade, Justice, and the Central Bank. The proposal would modernize the current code, which dates from 1922. It would clarify the rules and regulations and provide incentives for foreign investment in the mining sector.

In June, the President of El Salvador released a list of economic reforms to receive the highest priority. Among them were (1) a decrease in maximum tariff rates, (2) an expansion of the foreign exchange market, (3) a hike in interests rates, (4) privatization of state enterprises, and (5) a modification of the tax code.

PRODUCTION

Mineral production in 1989 was confined to gold, gypsum, limestone, marine salt, and silver; however, there was no reported figure for the amount of gold produced. Even the limited mining operations were affected by civilian disturbances, labor problems, and the difficulty in acquiring political risk insurance and refinancing for mine rehabilitation. Other mineral occurrences reported in 1989 were copper, iron ore, lead, mercury, perlite, sulfur, and zinc.

Gold has been produced by Minas San Cristóbal S.A., a subsidiary of Javelin International Ltd. of Canada, at its mine near San Cristóbal, Department of Morazán; however, there was no information available in regard to mine status and production.

TRADE

The United States was El Salvador's major trade partner in 1989 with an estimated 49% share of total exports and an estimated 40% share of imports. In addition, the United States provided foreign economic assistance.

STRUCTURE OF THE MINERAL INDUSTRY

El Salvador continued to rely entirely on imported crude petroleum to meet the requirements of the Acajutla refinery at Acajutla, Department of Aharachapán. An unreported amount of gold was produced by Javelin International Ltd. at its San Cristóbal Mine. The major silver mining operation was the El Dorado Mine in the Department of San Salvador. Cement was produced by two companies, Cemento Maya S.A. and Cemento de El Salvador S.A., both near Metapán, Department of San Salvador. El Salvador's only major steel producer was Siderúrgica Centro Americana del Pacífico S.A. near San Salvador.

TABLE 1

EL SALVADOR: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988	1989[p]
Aluminum metal, including alloys, semimanufactures		1,266	1,295	1,526	1,681	1,795
Cement		450,026	442,625	606,462	623,224	632,651
Gypsum[e]		4,000	4,000	4,500	4,500	4,500
Iron and steel: Metal:						
Steel, crude		11,845	9,263	13,106	11,269	15,200
Semimanufactures		23,472	35,460	32,654	32,934	37,804
Limestone		890,000	[e]900,000	1,450,000	1,450,000	1,600,000
Petroleum refinery products	thousand 42-gallon barrels	4,831	[e]4,800	[e]4,800	5,113	5,000
Salt, marine		[e]2,700	2,950	3,100	3,200	5,000

[e]Estimated. [p]Preliminary.

[1]Table includes data available through July 27, 1990.

[2]In addition to commodities listed, gold and silver ore presumably were produced during the period covered by this table, but available information is inadequate to make reliable estimates of output levels.

TABLE 2

EL SALVADOR: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	Cemento Maya S.A. (private investors, 100%)	Metapán, Department of San Salvador	240
	Cemento de El Salvador S.A. (private investors, 100%)	do.	684
Gold	Minas San Cristóbal S.A. (Javelin International Ltd., 100%)	San Cristóbal Mine, Department of Morazán	[1]85
Petroleum products	Refinería Petrolera Acajutla S.A. (Exxon Corp., 60%; Shell Oil Co., 40%)	Acajutla, Department of San Salvador	[2]16,300
Silver	Bruneau Mining Corp. (Amax Inc., 66%)	El Dorado Mine, Department of Cabanas	[1]780
Steel	Siderúrgica Centro Americana del Pacífico S.A. (Borgonovo Group, 100%)	San Salvador, Department of San Salvador	100

[1]Kilograms.
[2]Barrels per day.

INFRASTRUCTURE

El Salvador's transportation network is composed of a total of 10,000 kilometers (km) of highways; 1,500 km paved, 4,100 km gravel, and 4,400 km improved and unimproved dirt. The railroad system consists of 602 km of 0.914-gauge single track. The two major ports, Acajutla on the west side and La Unión on the east, are connected by both road and rail.

The thermal electric, hydroelectric, and geothermal electric capacity (1988) was 669 megawatts. The country produced a total of 1,813 million kilowatt hours in 1988, which translated into 350 kilowatt hours per capita.

OUTLOOK

For the short-term outlook, mineral and mining operations do not expect much improvement. Conditions could improve significantly in the longer term if the new mining code was adopted and acted on. Other major factors that would affect the long-term outlook are the elimination of most civilian disturbances and labor problems and the easing of the difficulty in securing political risk insurance and financing for mine rehabilitation. Other positive factors would be a decrease in maximum tariff rates, privatization of state enterprises, and tax code modifications.

[1]Where necessary, values have been converted from the Salvadoran colon (c) to U.S. dollars at the rate of c5.0=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

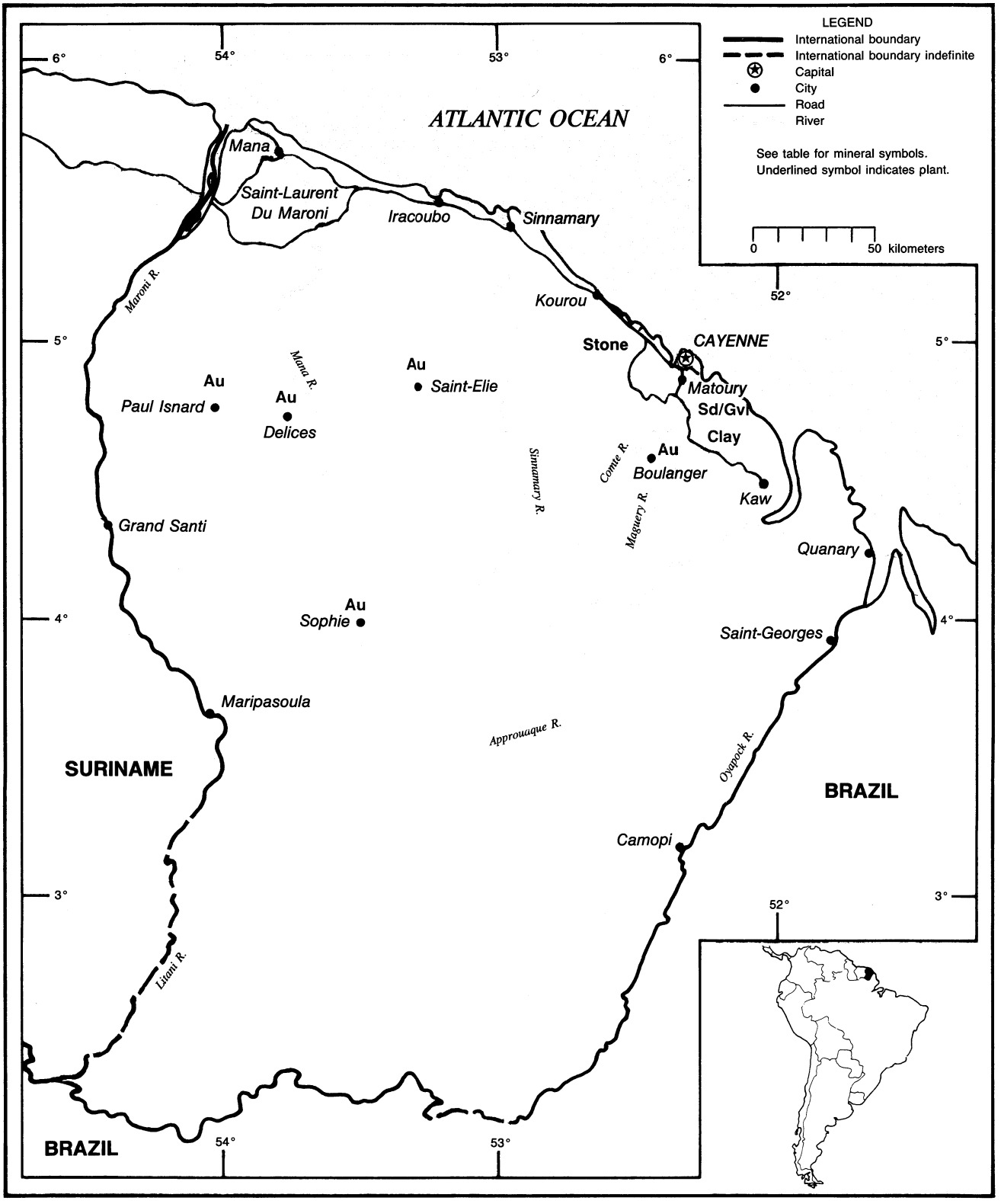
Centro de Investigaciones Geotécnicas
Ministerio de Obras Públicas
San Salvador, El Salvador
División de Recursos Mineros
Ministerio de Economía
San Salvador, El Salvador

Publication

Central Intelligence Agency: The World Factbook 1989, annual.

FRENCH GUIANA

AREA 90,909 km² **POPULATION 94,700**



THE MINERAL INDUSTRY OF

FRENCH GUIANA

By H. Robert Ensminger

The mineral industry of French Guiana (an Overseas Department of France) comprised a small segment of the overall industry in 1989. The area's major industries were construction, forestry products, shrimp, and sugar cane (rum). The mineral industry did not affect the department's economy; as an overseas department, French Guiana was almost totally supported by the French Government.

GOVERNMENT POLICIES AND PROGRAMS

The mining laws of France continued to prevail in French Guiana in 1989. Under these laws, mineral deposits were classified as mines and quarries, with quarries including all building materials and fertilizers (excluding nitrates, associated salts, or phosphates). Direct French involvement was encouraged in mineral development; however, foreign involvement was not discouraged. Foreign control of zones with petroleum potential was not permitted, but foreign minority interest was permissible.

PRODUCTION

The few minerals produced in 1989 consisted of columbite and tantalite, gold, gravel, sand, and stone. The gold was mined at a number of placer sites in the interior. Stone was quarried in the central coastal region solely for domestic use. The principal sources for sand and gravel were sites by the major rivers and along the coastline.

TRADE

The gravel, sand, and stone were used locally. In 1988 (the last year for which there was information), all of the produced columbite and tantalite (566 kilograms) was exported to the United States, and 83% (422 kilograms) of the gold produced was exported to France.

STRUCTURE OF THE MINERAL INDUSTRY

Specific ownership information is unavailable. The existing companies are small, construction-oriented, and locally owned. Placer gold mining is principally done by small independent operators, some financed by foreign investors.

INFRASTRUCTURE

French Guiana had no railroad. Therefore, all minerals produced were transported over the 700-kilometer road system or the 460-kilometer navigable inland waterway system. The capital of Cayenne was the sole ocean access port.

French Guiana had a total electrical generating capacity of 92 megawatts in 1989, all in thermolelectric plants. Total electric energy produced was 185 million kilowatt hours, which translated to 1,950 kilowatt hours per capita.

OUTLOOK

Gold mining should be a growing industry. Other potential mineral resources are bauxite, copper, iron, manganese, mercury, molybdenum, and

TABLE 1

FRENCH GUIANA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity		1985	1986	1987	1988[P]	1989[e]
Columbite and tantalite	kilograms	2,360	700	—	566	600
Gold, mine output, Au content	do.	[r]407	326	514	522	550
Stone, sand and gravel[e]	metric tons	400,000	400,000	400,000	400,000	400,000

[e] Estimated. [P] Preliminary. [r] Revised.
[1] Includes data available through June 15, 1990.

TABLE 2

FRENCH GUIANA: EXPORTS AND REEXPORTS OF SELECTED MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
Clays, crude: Kaolin		—	91	—	All to Martinique.
Copper: Metal including alloys, scrap		—	18	—	All to France.
Iron and steel: Metal:					
Scrap		6	—		
Semimanufactures:					
Bars, rods, angles, shapes, sections		10	—		
Tubes, pipes, fittings		—	1	—	Mainly to Netherlands.
Molybdenum: Metal including alloys, all forms		2	—		
Petroleum refinery products:					
Liquefied petroleum gas	42-gallon barrels	—	35	35	
Distillate fuel oil	do.	358	—		
Salt and brine		1	—		
Stone, sand and gravel: Gravel and crushed rock		2	4	—	All to France.

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

nickel; all will probably remain uneconomic for the foreseeable future. Stone and sand and gravel should continue to be produced at present levels in the future.

OTHER SOURCES OF INFORMATION

Agency

Bureau de Recherches Géologiques et Minieres
191 Rue de Vauqirard
75737 Paris, France

Publications

Observatorie des Matieres Premieres, Paris: Réalités Industrielles des Annales des Mines.

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

TABLE 3

FRENCH GUIANA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS					
Aluminum:					
Oxides and hydroxides		2	—		
Metal including alloys, semimanufactures		81	114	3	France 77; Italy 27.
Chromium: Oxides and hydroxides	value, thousands	$1	$3	—	All from France.
Cobalt:					
Oxides and hydroxides	do.	$3	—		
Metal including alloys, scrap	do.	—	$3	—	West Germany $1; unspecified $2.
Copper: Metal including alloys:					
Unwrought	value, thousands	—	$2	—	All from France.
Semimanufactures		64	5	—	Do.
Iron and steel: Metal:					
Pig iron, cast iron, related materials		—	1	—	Do.
Steel, primary forms		8	NA		
Semimanufactures:					
Bars, rods, angles, shapes, sections		3,708	5,689	—	France 3,157; Spain 531; United Kingdom 466.
Universals, plates, sheets		2,918	NA		
Hoop and strip		4	NA		
Rails and accessories		NA	92	—	All from France.
Wire		43	122	—	Belgium-Luxembourg 67; France 32; Italy 21.
Tubes, pipes, fittings		950	1,307	(2)	France 1,057; Spain 219; Belgium-Luxembourg 21.
Castings and forgings, rough		43	NA		
Lead:					
Oxides	value, thousands	$1	$1	—	All from France.
Metal including alloys:					
Unwrought		—	1	—	Do.
Semimanufactures		2	(2)	—	Do.
Mercury	value, thousands	$8	$18	—	Do.
Nickel: Metal including alloys, semimanufactures		1	—		
Platinum-group metals: Platinum metal including alloys, unwrought and partly wrought	value, thousands	—	$5	—	France $3; West Germany $2.
Tin: Metal including alloys, semimanufactures		NA	8	—	Netherlands 7; France 1.
Titanium: Oxides	value, thousands	$3	$2	—	All from France.
Other:					
Ashes and residues		202	15	—	Do.
Base metals including alloys, all forms	value, thousands	$2	—		
INDUSTRIAL MINERALS					
Abrasives, n.e.s.: Grinding and polishing wheels and stones		9	10	—	France 5; Italy 4; Netherlands 1.
Cement		47,950	69,498	—	France 35,472; Martinique 9,310; Barbados 8,949.
Clays, crude		20	(2)	(2)	

See footnotes at end of table.

TABLE 3—Continued

FRENCH GUIANA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Sources, 1988	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Diamond:				
Gem, not set or strung value, thousands	$13	$12	—	France $11; Brazil $1.
Industrial stones do.	$4	—		
Diatomite and other infusorial earth	1	7	—	All from France.
Fertilizer materials:				
Crude, n.e.s.	1	—		
Manufactured:				
Ammonia	5	14	—	France 12; Guadeloupe 1; Martinique 1.
Nitrogenous	882	884	—	Netherlands 701; Guyana 108; France 75.
Phosphatic	228	459	—	Netherlands 301; France 138; Belgium-Luxembourg 20.
Potassic	68	31	—	All from France.
Unspecified and mixed	994	788	—	France 687; Netherlands 100; West Germany 1.
Gypsum and plaster	108	11	—	All from France.
Lime	238	179	—	France 103; Martinique 76.
Magnesium compounds: Magnesite, crude	—	3	—	All from France.
Pigments, mineral: Iron oxides and hydroxides, processed value, thousands	$1	$17	—	Do.
Precious and semiprecious stones other than diamond:				
Natural do.	$39	$45	—	Brazil $28; France $16; Ecuador $1.
Synthetic do.	$1	$2	—	All from France.
Pyrite, unroasted	—	2	—	Do.
Salt and brine	429	—		
Sodium compounds, n.e.s.:				
Carbonate, manufactured	(2)	—		
Sulfate, manufactured	203	—		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	21	40	—	All from Brazil.
Worked	49	127	—	Brazil 77; France 29; Italy 21.
Dolomite, chiefly refractory-grade	124	53	—	France 32; Belgium-Luxembourg 21.
Quartz and quartzite	2	1	—	All from France.
Sand other than metal-bearing	114	214	18	France 196.
Sulfur:				
Elemental:				
Crude including native and byproduct	18	1	—	All from France.
Colloidal, precipitated, sublimed	—	1	—	Do.
Sulfuric acid	15	34	—	France 20; Guadeloupe 13; West Germany 1.
Other:				
Crude	98	61	—	France 57; West Germany 4.
Slag and dross, not metal-bearing	42	217	—	All from France.

See footnotes at end of table.

TABLE 3—Continued

FRENCH GUIANA: IMPORTS OF MINERAL COMMODITIES[1]

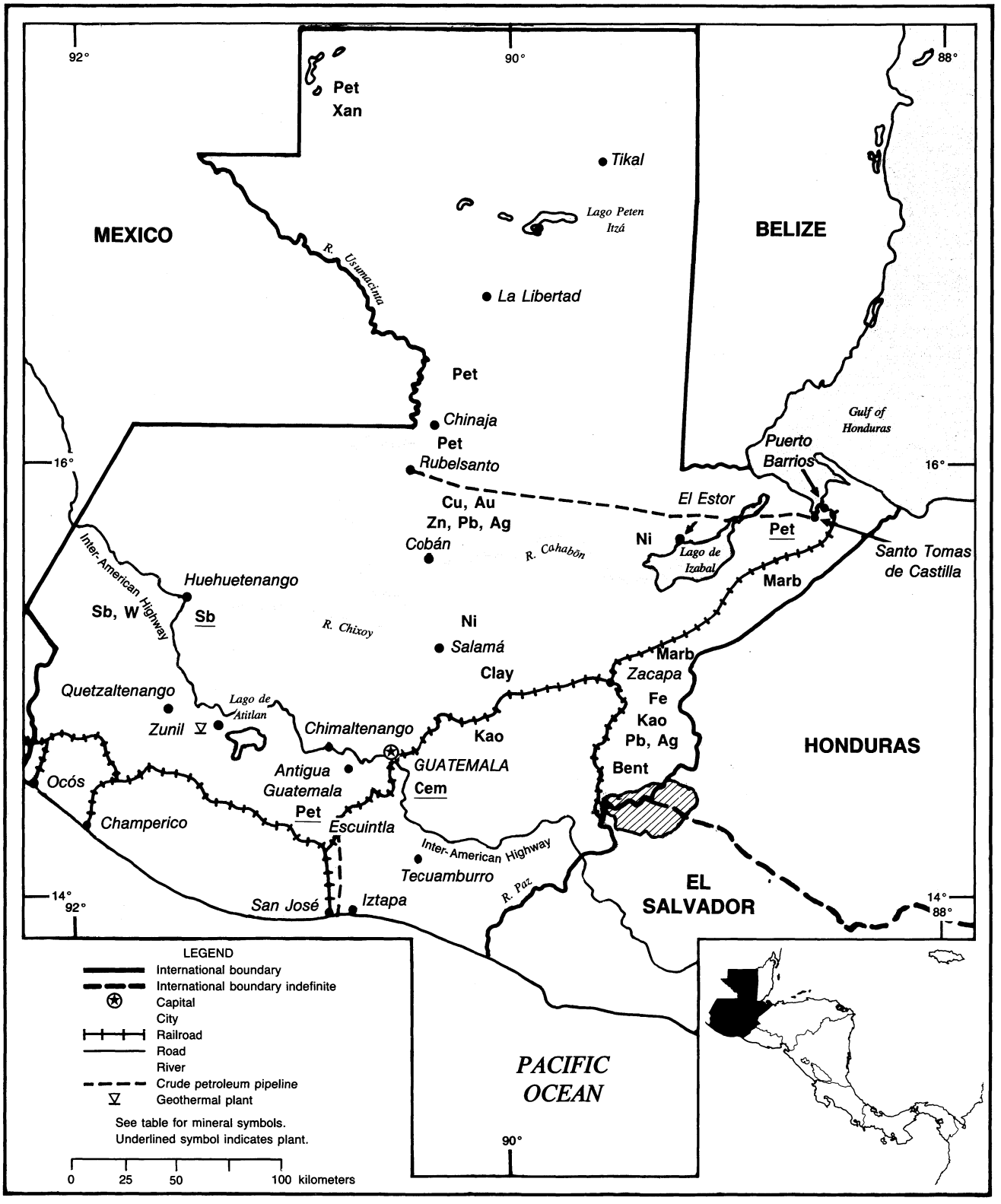
(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		—	1,339	—	Trinidad and Tobago 838; Netherlands Antilles 495; France 5.
Coke and semicoke	value, thousands	$1	—		
Peat including briquets and litter		9	20	—	West Germany 15; France 5.
Petroleum refinery products:					
Liquefied petroleum gas	42-gallon barrels	32,062	16,750	12	Netherlands Antilles 6,832; Venezuela 5,139; Panama 2,448.
Gasoline, motor	do.	229,475	NA		
Mineral jelly and wax	do.	346	8	—	Mainly from France.
Kerosene and jet fuel	do.	106,772	NA		
Distillate fuel oil	do.	315,305	NA		
Lubricants	do.	13,489	NA		
Residual fuel oil	do.	232,414	NA		
Bitumen and other residues	do.	11,399	12,102	—	All from Trinidad and Tobago.
Bituminous mixtures	do.	36	67	—	All from France.

NA Not available.
[1] Table prepared by H. D. Willis.
[2] Less than 1/2 unit.

GUATEMALA

AREA 108,900 km² **POPULATION 9.1 million**



THE MINERAL INDUSTRY OF

GUATEMALA

By Philip M. Mobbs

Mineral development was sluggish in Guatemala. In the past, the country produced limited quantities of antimony, copper, iron, lead, nickel, silver, zinc, and industrial minerals. Annual mineral production accounted for less than 1% of the country's gross domestic product (GDP), estimated at 10.8 billion.[1] The country's most significant mineral deposit, the lateritic nickel deposit near El Estor, was worked from 1977 until 1980, when operations were terminated due to unfavorable economic conditions. Guatemala was Central America's only crude oil producer. Oil production did not change significantly in 1989; however, exploration activities were severely affected by the threat of insurgent operations.

GOVERNMENT POLICIES AND PROGRAMS

The Government focused on economic policies that encouraged financial stability and attracted new private investment, both domestic and foreign. Economic growth was fueled by increased nontraditional exports. The administration freed both the interest rate and the exchange rate during the year.

Laws passed in 1989 that obliquely affected the mineral industry included a law promoting investments in nontraditional export industries and a law providing fiscal incentives for the private development of free trade and industrial zones.

The controlling legislation for mining was Decree Law 69-85 of July 12, 1985. This law was aimed at attracting new investment by allowing foreign investors to directly obtain exploration rights. Petroleum activity was covered by the Hydrocarbon Law, Decree Law 109-83, and associated regulations, especially Government Edicts 1034-83 and 203-84.

The Guatemalan Government announced that the El Pato-El Poxte area would be the first to be explored under the Trifinio Agreement. The United Nations Revolving Fund for Natural Resources Exploration set up the plan to identify natural resources, especially mineral potential, of a 7,584-square-kilometer area along the borders of El Salvador, Guatemala, and Honduras.

PRODUCTION

Guatemala's metal output consisted of small amounts of antimony, iron ore, and lead. Production of copper, nickel, and zinc ceased in 1980. Tungsten, derived from the exported antimony concentrates, was last reported in 1985.

Industrial mineral production was primarily for domestic use with the notable exception of marble, which along with antimony, was one of the nation's most important minerals in terms of export value. Marble production surged in response to market demand from an average of 1,280 cubic meters for most of the decade to 2,500 cubic meters in 1988 and 6,625 cubic meters in 1989.

TRADE

Agricultural products, such as bananas, coffee, and sugar, dominated the economy, accounting for more than 60% of exports, 60% of employment, and about 25% of the GDP. Mineral production contributed less than 1% of the GDP. Preliminary data indicated the United States remained the primary country of destination for 29% of the $1,155 million Guatemalan export market. Other principal trading partners included Costa Rica, El Salvador, Mexico, and West Germany. There was an 8.4% increase in the value of exported goods from the prior year, while imports increased 6.2% over 1988 levels. The United States originated 37% of the $1,695 million Guatemalan imports, followed by Venezuela, Japan, West Germany, and Mexico.

Guatemala imported 4.105 million barrels (MMbbl) of crude oil, 85% from Venezuela and the remainder from Mexico. Twenty percent of the Mexican oil was secured under the San José Agreement. The country exported 1.086 MMbbl of sour crude oil to the United States.

STRUCTURE OF THE MINERAL INDUSTRY

The mineral industry, like the overall economy, was dominated by the private sector. The Government's involvement in the mineral industry was limited to regulation and several mineral research projects.

Laws and regulations affecting the minerals sector were administered by the Ministerio de Energía y Minas and the Comisión Nacional Petrolera. The Dirección General de Minería was responsible for metallic, nonmetallic, and radioactive minerals. Petroleum laws were managed by the Direccíon General de Hidrocarburos.

COMMODITY REVIEW

Metals

Antimony.—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 and Los Ligos Mines at Ixtahuacan, near the western border. Output was exported mainly to France, Japan, and the United States. An antimony trioxide plant was completed in Huehuetenango. Plant operations were expected to start up in 1990, with a projected 3,000-ton yearly output.

Iron and Steel.—Iron ore represented more than 80% of the tonnage of Guatemalan metallic ores reported in 1989. More than 85% of the iron was exported. Because the country's iron ore was not considered suitable for steel production, ingots, sheets, coils, and wire

TABLE 1

GUATEMALA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988	1989[p]
Antimony, mine output, Sb content		1,638	1,530	1,575	1,335	1,348
Barite		3,703	750	—	2,415	3,995
Cement	thousand tons	526	644	1,324	1,506	1,613
Clays:						
Bentonite		2,727	3,836	5,600	4,100	8,236
Kaolin		1,042	2,017	1,880	3,459	2,573
Unspecified		494	636	1,319	3,667	3,200
Dolomite		3,865	6,876	—	9,199	10,946
Feldspar		5,582	5,446	7,669	7,200	7,000
Gas, natural, gross	thousand cubic meters	28,317	31,150	16,990	[e]16,990	[e]9,282
Gypsum, crude: For cement manufacture		16,888	30,608	51,495	34,448	27,980
Iron and steel:						
Iron ore, gross weight		2,334	7,186	10,706	8,092	6,641
Steel, crude		(2)	(2)	(2)	(2)	—
Steel, semimanufactures[e]		[r 3]29,477	[r]35,800	[r]39,700	[r]42,400	31,540
Lead, metal including secondary		70	78	92	100	150
Lime		61,761	36,798	79,418	71,306	79,359
Petroleum:						
Crude	thousand 42-gallon barrels	1,068	1,802	1,327	1,248	1,328
Refinery products	do.	5,017	3,819	4,480	4,504	4,249
Pumice and related materials:						
Pumice		16,038	11,442	15,191	[e]15,000	[e]100
Volcanic ash		—	[r]1,789	2,446	2,500	2,400
Salt		[e]17,300	[e]39,400	37,088	42,184	63,063
Stone, sand and gravel:						
Crushed stone	thousand tons	797	895	1,014	1,236	1,414
Limestone	do.	990	1,938	467	407	844
Marble	cubic meters	380	1,332	1,330	2,500	6,625
Sand and gravel	do.	317,389	252,573	378,157	375,000	345,969
Sand, silica		22,355	22,859	30,665	32,000	31,000
Sand, volcanic		—	50,862	73,435	75,000	137,000
Talc		—	—	—	616	650
Tungsten, mine output, W content of concentrate		18	—	—	—	—

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Dec. 10, 1990.
[2]Revised to zero.
[3]Reported figure.

were imported and further processed into sheets, rods, bars, and other products, much of which went into the local construction industry. Most of the imported steel came from Mexico, South Korea, Venezuela, and West Germany.

Nickel.—Guatemala was the fifth leading Latin American nickel producer until September 1980, when the El Estor Mine was shut down. The closure was due to deteriorating economic conditions, chiefly relating to the cost of energy. The cost of fuel oil for the mine rose from $11 in 1978 to more than $40 in 1980. Additionally, the demand for nickel was down at the time. Inco Ltd., the majority owner of the mine, was forced to discount its nickel prices by 6% during September 1980. The mine had reached 57% of capacity in 1980, when 6,744 tons of nickel was produced in 8 months. Remaining reserves were estimated to be 900,000 tons.

Industrial Minerals

Output of industrial minerals propelled the growth of the Guatemalan mining

TABLE 2

GUATEMALA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Antimony	Minas de Guatemala S.A. (private, 100%)	Los Lirios and Annabella Mines, Ixtahuacan, Huehuetenango Department	1
Cement	Cementos Progreso S.A. (Lambert Freres et Cie., 69.8%; others, 30.2%)	San Miguel Plant, Sanarate, El Progreso Department; La Pedrera Plant, Guatemala City	1,000
Lead	Cía. Minas de Oriente S.A. (Minorsa) (Lacana Mining Corp., 60%; Japanese interests, 40%)	Ballena, Montenegro and Peñasco Mines, Chiquimula Department	10
Nickel	Exploraciones y Explotaciones Mineras Izabal S.A. (EXIMBAL) (Inco Ltd., 80% and Hanna Mining 20%)	El Estor,[1] Alta Verapaz Department	18
Petroleum:			
Crude	Repsol Exploración S.A., (Spanish Government, 100%)	Chinajá, Caribe, Tierra Blanca and Rubelsanto Fields, Petén Department	[2]6
Do.	Basic Resources International S.A. (private, 100%)	Xan Field, Petén Department	[2]1
Products	Texas Petroleum Co. (Texaco, Inc. 100%)	Refinery at Escuintla, Escuintla Department	[2]17

[1]Mine shut down during Sept. 1980.
[2]Thousand 42-gallon barrels per day.

sector. Glass, cement, ceramics, and construction 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.

Clays.—The Guatemalan Mineral Resources Inventory Project, run by the Dirección General de Minería, located significant clay deposits suitable for brick and tile manufacturing in the Baja Verapaz Department during 1988. New bentonite deposits were also discovered in the Chiquimula Department in east-central Guatemala.

Marble.—Marble was produced as both blocks and fragments from numerous pits and quarries in the southern part of the country. Most of the output of white, black, green, and merendon (a blend of brown, white, and red) marble block was processed into flooring and furniture products. Marble was one of the more important export minerals in terms of value.

Mineral Fuels

Energy—Fuel wood, used predominately for residential purposes, provided 64% of Guatemala's energy consumption. Electrical power accounted for 4% of the nation's energy usage. The country had an installed generating capacity of 729 megawatts, of which 60% was available from hydroelectric facilities. The industrial sector utilized 4% of the nation's energy, which was produced from vegetation byproducts such as bagasse. The remaining 28% of the country's energy consumption was supplied by petroleum products, more than 60% of which was used in the transportation sector.

The Director General of New Sources and Renewable Energy investigated alternative energy programs that would provide low-cost energy for the urban and rural poor and simultaneously, slow deforestation of the countryside. Ongoing projects included the examination of potential hydroelectric facility sites; alcohol production from sugarcane byproducts; and tree farming, a project that was started in 1983. Another study focused on the biodigestion of vegetative wastes to produce gas.

A geothermal pilot plant was constructed in Zunil, approximately 30 kilometers northwest of Lake Atitlán, with the cooperation of the Instituto Nacional de Electrificación (INDE) and Los Alamos National Laboratory. The heat from the plant was used to dehydrate fruits and vegetables. Steep slopes in the area contributed to fatal landslides, which precluded the area from being considered for further development. The Tecuamburro and Amatitlan geothermal sites were being evaluated as alternative sites for the next geothermal plant. UNOCAL Corp. (formerly Union Oil of California) was negotiating with the Ministerio de Energía y Minas and INDE to develop a small geothermal plant with a proposed generating capacity of 15 to 20 megawatts.

Petroleum and Natural Gas.—Oil production in Guatemala reached 1.328 MMbbl, of which 1.086 MMbbl was exported through the Port of Santo Tomas de Castilla. The Xan Field in northern Petén Department produced approximately one-quarter of the country's crude from its two wells. Because the Texas Petroleum Co.'s refinery at Esquintla could not handle the high-sulfur crude produced in the country, Basic Resources International S.A., a Bahamian company, sought to build a minirefinery near La Libertad. The proposed refinery would be capable of dealing with domestic sour crude, as well as being projected to make up the shortfall between national consumption and refinery capacity. The country used 26,000 barrels per day in 1989, while the Esquintla refinery had a 17,000-barrel-per-day capacity.

TABLE 3

GUATEMALA: RESERVES OF MAJOR MINERALS

(Metric tons unless otherwise specified)

Commodity	Reserves
Antimony	NA
Barite	NA
Cement	XX
Lead	13,000
Nickel	900,000
Petroleum, crude	[1]25,454
Salt	XX
Stone, sand and gravel:	
Marble	NA
Sand, silica	NA

NA Not available. XX Not applicable.
[1]Thousand 42-gallon barrels.

Basic Resources, Repsol Exploración, and Petén Petroleum were the only companies with continuing operations. Esso Exploration Guatemala abandoned its first wildcat, Machaquilá I, as unproductive. The company canceled its second wildcat, El Ceibal I, in central Guatemala, sited near Mayan ruins, owing to concerns of Ministry of Culture archaeologists. Esso subsequently shut down Guatemalan operations.

Repeated attacks by insurgents forced Amoco Guatemala Petroleum to abandon operations in the El Quiché and Huehuetenango Departments of northwest Guatemala. The company sought to be released from its 4-85 contract obligations.

INFRASTRUCTURE

There were 870 km of narrow-gauge (0.914-meter) 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. There were 2,868 km of paved roads, 11,421 km was gravel surfaced, with the remainder unimproved. Ground transportation facilities in the north (Petén Department) consisted primarily of unsurfaced roads and tracks. The country had 260 km of inland waterways available for year-round traffic.

A 12,000-barrel-per-day capacity crude oil pipeline ran from the Rubelsanto Field to Santo Tomás de Castilla, a distance of 235 km. A second pipeline covered the 48 km between San José and the Texaco refinery at Esquintla.

Puerto Barrios on the Caribbean side of the country was the country's major port. Santo Tomás de Castilla, 5 km southwest of Puerto Barrios, also handled mineral exports. San José was the country's major Pacific port.

OUTLOOK

Guatemala's economic recovery increased domestic demand for raw materials and capital goods. Import demand was expected to remain high, despite the declining performance of traditional exports.

Mining activity should continue to be limited. However, industrial minerals production is anticipated to increase slightly. Physical security problems and lack of infrastructure in the north part of the country will continue to plague petroleum exploration and production.

The country has 23 documented geothermal sites and a hydroelectric potential of about 10,500 megawatts. The current electric generating capacity will have to be increased to satisfy the projected surge in energy demand.

[1]Where necessary, values have been converted from Guatemalan Quetzals (Q) to U.S. dollars, using the exchange rate of 2.8Q=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

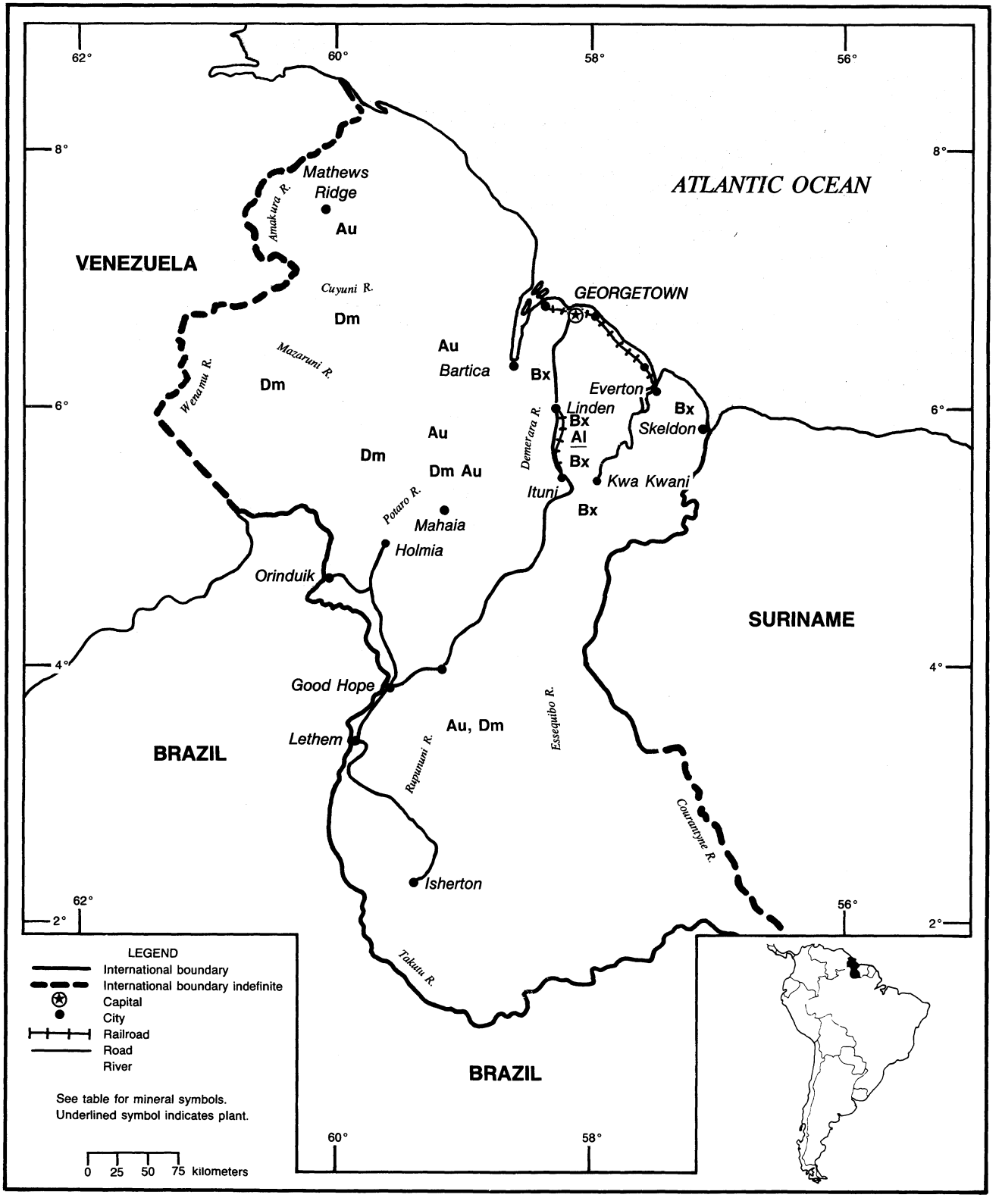
Ministerio de Energía y Minas
Diagonal 17, entre 20 y 30 Calles
Zona 11
Guatemala City, Guatemala
Dirección General de Minería
(includes Departmento de Investigación Minera)
Diagonal 17, 29-78, Zona 11
Guatemala City, Guatemala
Dirección General de Hidrocarburos
Diagonal 17, 29-78, Zona 11
Guatemala City, Guatemala

Publications

Cunningham, C. G., et al. Earth and Water Resources and Hazards in Central America. U.S. Geol. Surv. Circ. 925, 1984, 40 pp.
Ministerio de Energía y Minas, Guatemala: Informe Estadístico de Energía y Minas, annual.
Memoria de Labores, annual.
Organización Latinoamericana de Energía (OLADE), Quito, Ecuador: Energía en Cifras, 1989, annual.
U.S. Central Intelligence Agency: The World Factbook, 1990, annual.
U.S. Department of Commerce, International Trade Administration: Foreign Economic Trends and Their Implications for the United States, annual by country.

GUYANA

AREA 214,970 km² **POPULATION 765,500**



THE MINERAL INDUSTRY OF

GUYANA

By H. Robert Ensminger

Guyana has recorded negative gross domestic products every year since 1986. The country's economic problems continued into 1989 owing to low production levels in a number of sectors. Bauxite, for example, suffered a 7-week strike. Despite the labor problems, bauxite continued to be the dominant constituent of the mineral industry and produced 40% of Guyana's foreign exchange earnings in 1989. Gold and diamond, once again, ranked second and third, respectively.

GOVERNMENT POLICIES AND PROGRAMS

In March, the Government began its Economic Recovery Program. It was based on a structural adjustment program monitored by the International Monetary Fund. The program included budget austerity, devaluation of the Guyana dollar from G$0.10 per U.S. dollar to G$0.03 per U.S. dollar, debt rescheduling by the country's principal creditors, and the repayment of Guyanese arrears to the International Monetary Fund, the Caribbean Development Bank, and the World Bank.

In recent years, the Government has welcomed foreign investment and has been willing to negotiate with potential investors over tax holidays, repatriation of profits, and natural resource concessions. As of midyear, nine foreign firms were exploring for gold, and two groups were exploring for petroleum in Guyana.

In September, the Government of Guyana announced its approval of Overseas Private Investment Corp. insurance coverage for Reynolds International Inc. of the United States. Reynolds had agreed to invest in a new bauxite mine at Aroima, District of Berbice.

PRODUCTION

Except for 1987, bauxite production in Guyana had showed a steady decline during the past 5 years. Since 1985, bauxite production had decreased 31%. Most of the gold mined in Guyana was smuggled across the Venezuelan or Brazilian borders and sold for U.S. dollars that were then converted to Guyanese dollars at the parallel market rate (50:1) as opposed to the official rate (33:1).

TRADE

In 1989, Guyana's major export commodities, in order of value, were bauxite, sugar, rice, shrimp, gold, molasses, timber, and rum. Bauxite exports comprised 40% of all foreign trade earnings in value. Primary imports, in order of value, were manufactured goods, machinery, foodstuffs, and petroleum.

STRUCTURE OF THE MINERAL INDUSTRY

The entire bauxite industry was overseen by the Bauxite Industry Development Co. Ltd. (BIDCO), the state holding company. The bauxite mining and processing was done by or through Guyana Mining Enterprise Ltd. (GUYMINE), the state mining company. Several foreign companies became actively involved in the bauxite industry. They were Alcan Aluminium Ltd. of Canada and Green Mining Inc. and Reynolds Metals Co. of the United States.

In the diamond and gold sector, a number of foreign companies were active. The most prominent among these were Golden Star Resources Ltd. (gold mine development and exploration) and Placer Dome Ltd. (exploration), both of Canada.

Minerals and Technology Ltd., a company formed by Minerals and Chemicals of Texas Inc. of the United States and Guyanese investors, established an operation to quarry silica sand on the left bank of the Demerara River in the District of West Demerara.

TABLE 1

GUYANA: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity		1985	1986	1987	1988[p]	1989[e]
Aluminum: Bauxite, dry equivalent, gross weight	thousand metric tons	1,675	1,466	2,200	1,339	[3]1,281
Diamond:[e]						
Gem	thousand carats	4	3	2	[r]1	3
Industrial stones	do.	7	6	5	[r]3	5
Total	do.	11	[3]9	7	[r]4	[3]8
Gold, mine output, Au content	kilograms	321	437	1,568	[e]2,000	[3]3,200

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes data available through July 13, 1990.
[2]In addition to the commodities listed, a variety of crude construction materials (common clays sand and gravel, and stone) undoubtedly were also produced, but output was not reported and available information was inadequate to make reliable estimates of output levels.
[3]Reported figure.

TABLE 2

GUYANA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Rated capacity (thousand metric tons per year unless otherwise specified)
Bauxite	Guyana Mining Enterprise Ltd. (GUYMINE) (Government, 100%)	Kwakwani, East Berbice District (mine)	[1]3,000,000
Do.	do.	Linden, West Demerara District (mine)	[1]3,000,000
Do.	Green Mining, Inc. (Green Construction Co. U.S., 100%) (GUYMINE Contract)	Dacoura Mine, Linden, West Demerara District	NA
Gold	Golden Star Resources Ltd. (Canada, 100%) (Gold mine development)	Omai, Mazaruni - Potaro District	[2]1,900
Silica sand	Minerals and Technology Ltd. (Guyanese private investors, 50%; Minerals and Chemicals of Texas Inc., U.S., 50%)	Demerara River, West Demerara District	NA

NA Not available.
[1]Metric tons per year.
[2]Kilograms per year.

COMMODITY REVIEW

Metals

Gold.—In December, Golden Star Resources announced it would begin production of gold mined near Mahdia, District of Mazaruni-Potaro. The company will install an initial production unit by the end of June 1990 with production to begin in October. Ultimately, three additional production units will be added, which will bring total capacity to approximately 1,900 kilograms per year.

Placer Dome, under an exploration option agreement with Golden Star Resources, has identified anomalous gold mineralization along most of the margin of Wenot Lake, District of Mazaruni-Potaro.

Industrial Minerals

Bauxite.—At yearend, Reynolds and the Government of Guyana (BIDCO) signed an agreement creating two equal partnership companies, Aroima Bauxite Co. and Aroima Mining Co. The $25 million joint venture was financed by Reynolds. BIDCO will provide mining and mineral rights at the new bauxite mine near Aroima on the Berbice River, District of Berbice.

Alcan agreed to assist the Government of Guyana in the marketing of bauxite as well as the rehabilitation of the alumina refinery at Linden, District of West Demerara.

Green Mining, under an 18-month contract, delivered its first shipment of bauxite from the Dacoura Mine near Linden to GUYMINE in September.

Other Minerals.—Golden Star Resources was granted an option to explore three properties for alluvial diamonds and gold and one property for columbite-tantalite. The option areas were in the Kurupung-Enachu region of the Mazaruni-Potaro District, which was well known for the alluvial diamond and gold deposits along the larger tributaries of the Mazaruni River.

INFRASTRUCTURE

Guyana had a total of 7,665 kilometers (km) of highways, comprised of 550 km paved, 5,000 km gravel, 1,525 km dirt, and 590 km unimproved dirt. The railroad system consisted of 187 km of 0.914-meter gauge, single track. The navigable waterways were the Berbice, Demerara, and Essequibo Rivers, which were navigable by ocean-going vessels for 150 km, 100 km, and 80 km, respectively.

Guyana had a total electrical generating capacity of 221 megawatts in 1989. Total electric energy produced was 583 million kilowatt hours, which translated to 760 kilowatt hours per capita.

OUTLOOK

Apart from bauxite, Guyana contains a wide range of mineral resources, including base metals, columbite and tantalite, diamond, gem stones, gold, industrial minerals, laterite, magnesite, magnetite, manganese, rare earths, and tungsten. The Guyana Geology and Mines Commission (GGMC) has built up a substantial reference base of the country's mineral resources, including comprehensive 1:1,000,000 scale geologic map coverage. Recently the main effort by the GGMC has been directed at the exploration potential for diamond and gold.

OTHER SOURCES OF INFORMATION

Agencies

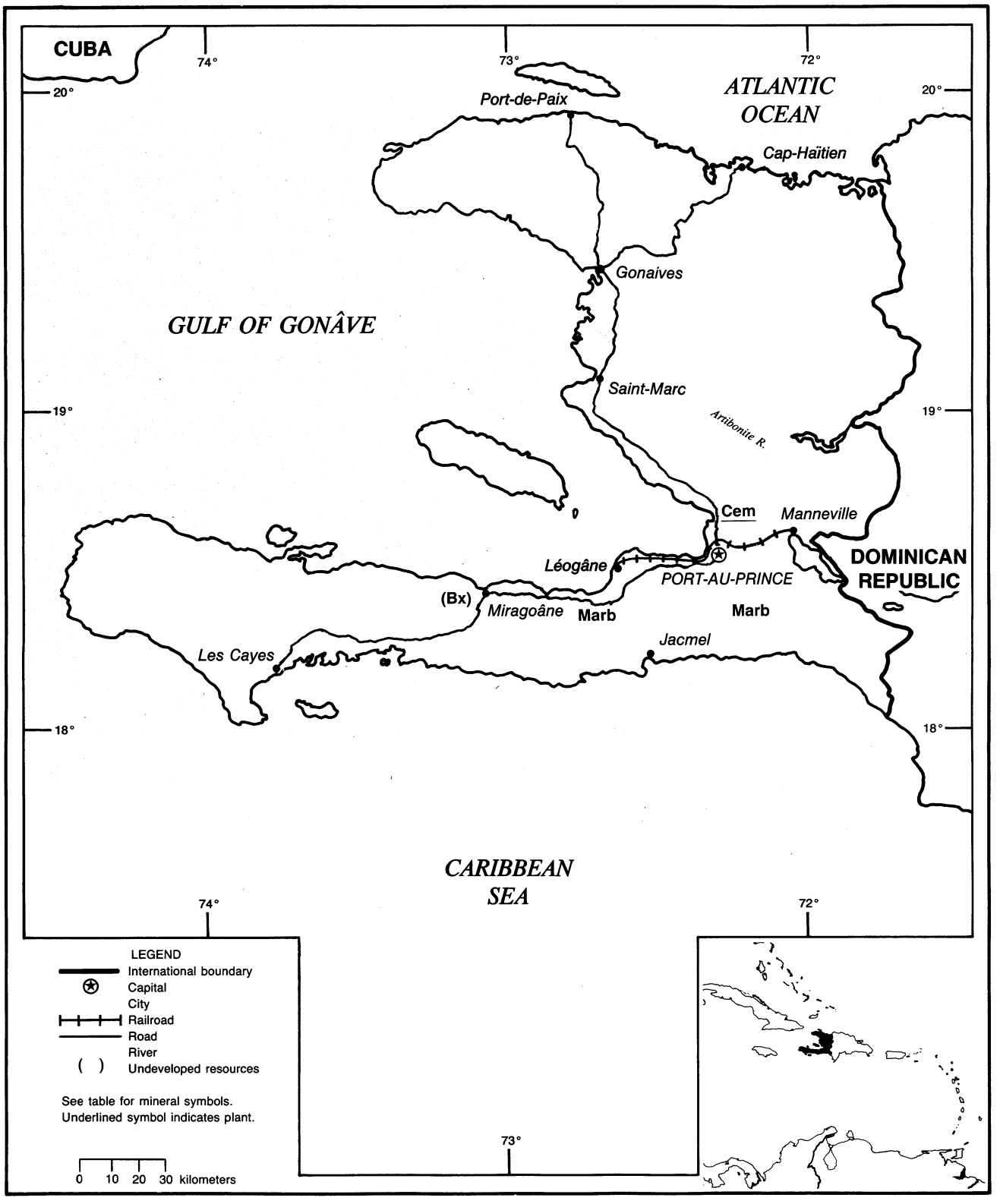
Ministry of Energy and Natural Resources
Geological Survey and Mines
P.O. Box 1028
Georgetown, Guyana

Publications

The World Factbook 1989, Central Intelligence Agency, (Annual).

HAITI

AREA 27,750 km² **POPULATION 6.3 million**



THE MINERAL INDUSTRY OF

HAITI

By Ivette E. Torres

Haiti's small mineral industry centered around the production of cement and marble and other materials for local construction. Since 1986, Haiti has been in a state of political and economic instability. In the past 4 years, the growth of gross domestic product has been less than 1% per year. The contribution of the mineral industry to the mostly agrarian economy was insignificant.

GOVERNMENT POLICIES AND PROGRAMS

The Mining Law of 1976 and the creation of the Ministère des Mines et des Resources Energetiques in 1978 established a framework for an orderly relationship between the Government and private investment. Mining companies may be privately owned, and there were no restrictions on the repatriation of capital or profits. A 1985 investment code ended the distinction between foreign and domestic investment.

PRODUCTION

Mineral production continued to be small and its contribution to the economy negligible. Output was limited to cement, related construction materials, and marble. Bauxite production ceased in 1982.

TRADE

The United States continued to be Haiti's main trading partner. The value of all exports (f.o.b.) in 1988 was estimated at $220 million. In 1986, the last year for which detailed information is available, Haiti's total exports were valued at $201 million, 77% of which was directed to the United States. For the same year, Haitian imports from the United States were $205 million or 65% of Haiti's imports. Petroleum products represented 11% of the total import value. Since 1984, Haiti has had duty-free access to the United States on certain products and assembled goods under the Caribbean Basin Initiative (CBI). The CBI, however, has excluded petroleum products and some minerals. Other trading partners included Canada, France, the Federal Republic of Germany, Italy, Japan, and the Netherlands Antilles.

STRUCTURE OF THE MINERAL INDUSTRY

Mineral and mineral-related industries were primarily owned by private capital. The Government had a minority interest in the cement plant and may retain an interest in future projects.

COMMODITY REVIEW

Metals

Bauxite.—Bauxite mining in Haiti was terminated in 1982 because of low aluminum prices and the poor commercial quality of the ore. The sole producer, Reynolds Haitian Mines Inc., had operated in the Miragoâne area for 26 years, in which time output averaged 510,000 tons per year. Since 1979, production had

TABLE 1

HAITI: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
Cement, hydraulic		264,000	252,000	252,000	250,000	215,000
Clays (for cement)		43,804	40,537	35,726	27,083	27,000
Sand and gravel:						
Gravel	cubic meters	2,391,021	2,335,369	2,255,686	2,405,646	2,400,000
Sand	do.	1,195,511	1,167,685	1,127,843	1,368,328	1,300,000
Stone:						
Limestone (for cement)		230,422	221,663	246,387	208,118	200,000
Marble	cubic meters	595	339	179	595	500

[e]Estimated. [p]Preliminary.
[1]Table includes data available through June 1, 1990.
[2]In addition to commodities listed, 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.

TABLE 2

HAITI: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand tons per year)
Cement	Le Ciment D'Haiti S.A. (Lambert Freres et Cie., 70%; Government, 17%; other 13%)	Fond-Mobin, Quest Department	350
Marble	Several private operators	South of Port-au-Prince	NA

NA Not available.

been decreasing, and, in 1982, it was only 377,000 tons.

Gold.—In 1989, the Government of Haiti was seeking foreign partners to form joint ventures for gold exploration. Reportedly, the Government approached companies in Australia, Brazil, Canada, and the United States with its development plans. However, it appeared that investors had little interest. Concern about political instability of the country in recent years was the main reason for the lack of interest. Exploration has been concentrated in the northern part of the country around Terrier Rouge, Cap-Haïtien, Grand Bois, Limbe, Milot, and Mount Organizé, where several deposits have been found.

Mineral Fuels

All energy requirements continued to be met through imports, and these were almost exclusively petroleum products. Électricité d' Haiti, the Government electric company, generated power from thermal and hydroelectric plants. Power for industrial use was considered to be expensive. In 1988, installed electric capacity was 230 megawatts. In 1986, the latest year for which detailed information is available, thermal energy accounted for 52% of the generating capacity and hydroelectric the remainder. The thermal plants were operated on imported diesel or fuel oil.

In Haiti, more than 75% of the household energy requirement was met by firewood and charcoal. This has caused deforestation that could result in serious energy supply problems in the future. Since 1982, with the assistance from the U.S. Agency for International Development and the Pan American Development Foundation, small Haitian farmers have been planting trees as cash crops through the Agroforestry Outreach Program. In 1989, farmers participating in the program planted 6.9 million fast-growing, multipurpose trees on small holdings throughout the country.

INFRASTRUCTURE

Haiti had 4,000 kilometers of road, 950 of which was paved. The 40-kilometer industrial railroad from Manneville to Léogane was privately owned. There were two significant ports: the capital, Port-au-Prince, and Cap-Haïtien.

OUTLOOK

The poorest country in the Caribbean, Haiti has not had the financial resources to develop its natural resources. The political instability of recent years may prevent Haiti from obtaining the needed technical and economic support from foreign investors. Without it, Haiti may not be able to develop its gold resources in the Massif du Nord in the near future.

OTHER SOURCES OF INFORMATION

Agency

Bureau des Mines et des Resources Énergétiques
Port-au-Prince Haiti
West Indies

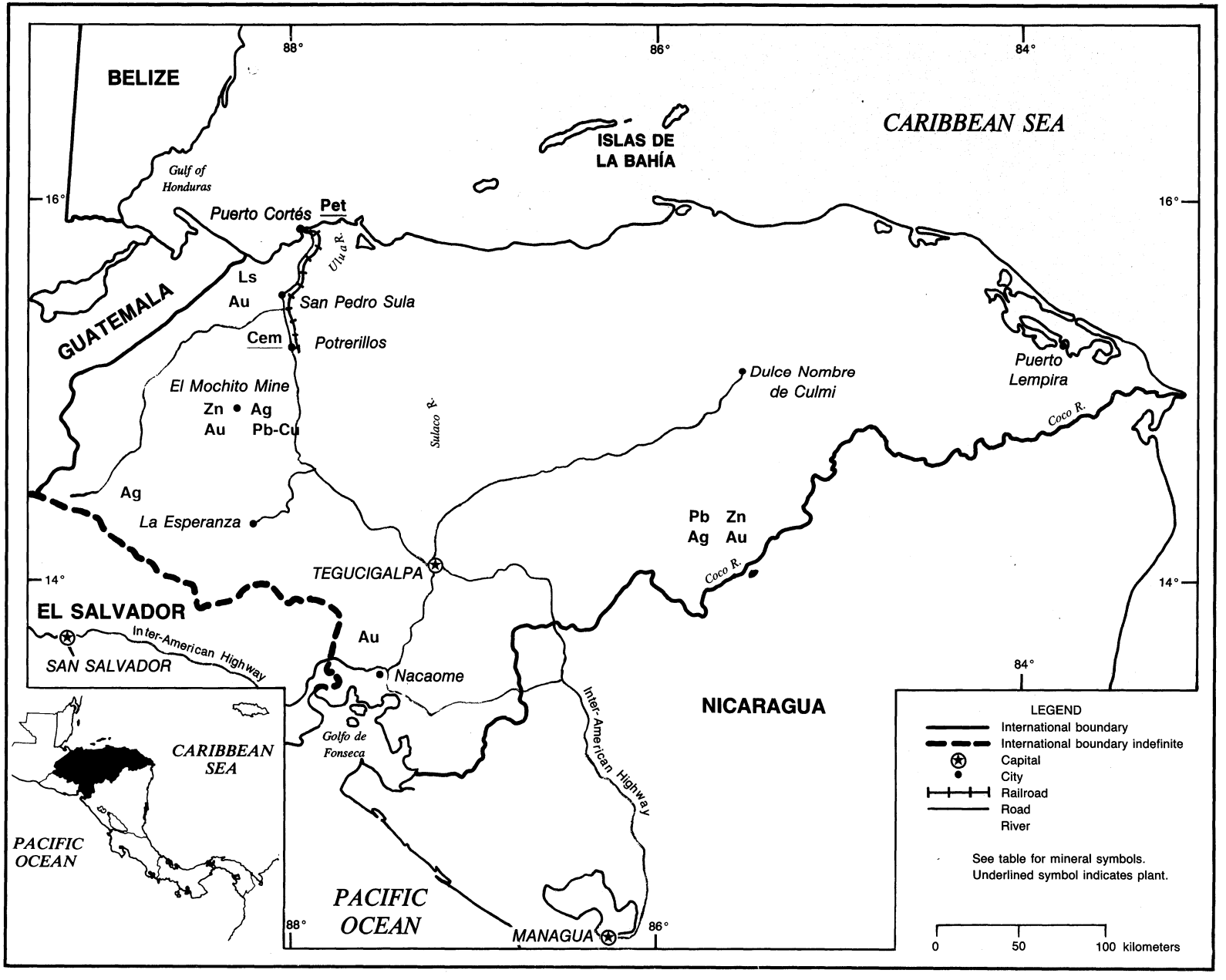
Publications

Inter-American Development Bank, Washington, DC: Economic and Social Progress in Latin America, 1989 report.

United Nations Development Organization, Vienna, Austria: Stone in Haiti, 1980, 63 pp.

HONDURAS

AREA 112,100 km² **POPULATION 5.1 million**



THE MINERAL INDUSTRY OF

HONDURAS

By Alfredo C. Gurmendi

Honduras's mineral industry was limited to the production of antimony, cadmium, cement, gold, gypsum, iron and steel, lead, limestone, silver, and zinc. The country has no significant known petroleum resources. The gross domestic product (GDP) grew by 2% to $4 billion.[1] In 1989, inflation reached 20%, foreign debt rose to $3.4 billion, and unemployment decreased to 15%. The economy consisted of predominantly agricultural and agribusiness, which represented about 25% of the GDP. Agriculture employed about 50% of the labor force and provided the bulk of exports. Bananas, beef, coffee, lumber, minerals, and seafood composed more than 95% of total Honduran exports. Mining accounted for about 2% of the GDP and employed less than 20,000 of the total 1.5 million labor force of the country.

Honduras's mineral resources continued partially unexplored because of inadequate infrastructure and negative impact of the conflict in Nicaragua that contributed to the fiscal and trade deficits, worsening of foreign exchange, and inadequate investment. U.S. capital investments of $250 million were made mainly in food processing, 50%; mining, 5%; and petroleum refining and distribution, 10%. The U.S. Overseas Private Investment Corp. (OPIC) provided investment insurance and financing to eight separate U.S. investments. Since 1955, OPIC has not paid a claim under its insurance program in Honduras. In 1989, business opportunities existed in the areas of gold, hydropower, limestone, lumber, and silver.

GOVERNMENT POLICIES AND PROGRAMS

Honduras has begun to open up its economy by making it more attractive to investors. There were no legal restrictions on transfers of dividends, interests royalties, or capital out of Honduras. Tariffs had been lowered from an average of 95% to 40% and were expected to average 20% by 1992. Investment regulations, both for foreign and national investors, were being streamlined. The Foundation for Investment and Export Development (FIDE) was established with U.S. Agency for International Development assistance to promote investment oriented toward exports. Cooperatives, corporations, and joint ventures must be at least 51% Honduran-owned. All investment agencies had been centralized into one. Four special export processing zones had no taxes and few regulations. Decree 79 of 1982 substantially reduced the tax burden on mining and provided for tax and royalty credits to help offset operating losses. The Dirección de Minas e Hidrocarburos (DMH) had undertaken geophysical petroleum exploration with results to be made available to the private sector. Honduras, to find fuel credits, had raised diesel fuel prices from $1.25 per gallon to $2.10 per gallon. The country was planning to reorient its economy toward the free market by dismantling the import substitution policy and its complex foreign exchange controls, tariffs, and quotas. Operations that qualify for a Government mine concession were required to post a bond with the Honduran DMH equivalent to 10% of its estimated value to guarantee mineral exploration in an orderly and timely manner.

PRODUCTION

Honduras had some internationally significant base metals and gold resources. DMH of the Ministerio de Recursos Naturales has provided the statistics of minerals production in Honduras for 1989. Production of silver and gold was 49,892 kilograms (kg) and 1,244 kg, respectively. Base metals were produced in the following amounts: zinc, 37,184 tons; lead, 9,610, tons; and copper, 2,419 tons. A small volume of cadmium was produced as a byproduct of zinc. Industrial minerals, gypsum, lime, limestone, and steel were produced mostly for local consumption.

TRADE

Since November 1987, the El Mochito Mine, closed in April 1987 because of economic reasons, had resumed production of base metal concentrates containing cadmium, gold, silver, copper, lead, and zinc, which were exported to the United States and Europe. Marble and salt were also exported. Mining exports represented about 5% of the total trade valued at $869 million. Imports of petroleum and refined oil in 1989 were valued at $118 million. A number of metals and industrial minerals and compounds were exported to various Asian, Central American, and European countries as well as Mexico and the United States.

STRUCTURE OF THE MINERAL INDUSTRY

In Honduras, two American companies, American Pacific Honduras Inc. and J. C. Newman Co. and Associates, and Compañía Minerales de Copán control the mining industry; however, the Government owns two cement plants with a small, private minority participation. The El Mochito mining operation consisted of an underground mine and a mill producing lead and zinc concentrates. It was in Santa Bárbara, about 130 kilometers (km) northwest of the capital Tegucigalpa. The mine was owned and operated by American Pacific Honduras Inc. (AmPac), a subsidiary of American Pacific Mining Co. of the United States. After renegotiating royalty payments, taxes, power costs, and employment levels with the Government, the mine was reopened in October 1987. Efforts were underway to increase ore reserves in order to double the actual rate of mining to 1,800 tons of ore per day.

TABLE 1

HONDURAS: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
Antimony, mine output, Sb content		87	50	28	19	30
Cadmium, mine output, Cd content		598	[e]350	124	276	350
Cement		[r]347,523	359,975	451,180	560,065	[2]648,763
Copper, Cu content of lead and zinc concentrates		5,051	[e]5,000	582	538	[2]2,419
Gold	kilograms	156	63	131	127	[2]1,244
Gypsum[e]		22,000	22,000	22,000	22,000	22,000
Iron and steel:						
Steel, crude[e]		19,200	7,200	7,200	7,200	7,200
Semimanufactures[e]		[2]11,850	12,000	12,000	12,000	14,000
Lead, mine output, Pb content		21,250	12,558	5,041	16,906	[2]9,610
Petroleum refinery products	thousand 42-gallon barrels	2,386	1,472	[e]1,500	[e]1,500	5,000
Salt[e]		30,000	30,000	30,000	30,000	30,000
Silver	kilograms	86,001	54,276	23,234	58,447	[2]49,892
Stone:						
Limestone[e]		500,000	500,000	[2]448,820	450,000	450,000
Marble		[e]40,000	6,726	962	3,175	3,200
Zinc, mine output, Zn content		44,026	25,443	15,417	23,475	[2]37,184

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes date available through July 31, 1990.
[2]Reported figure.

Compañía Minerales de Copán expanded its San Andrés heap-leach operation in Copán Department from a rate of 230 to 450 tons per day of gold and silver ore. Newman Mining Co. and Ability Inc. of Longview, Texas, were forming a joint venture to provide financing and management to exploit the placer gravels of the confluence of the Río Jalán and Guayape River in central Honduras, about 10 km north of Tegucigalpa. Industria Nacional del Acero (INA), a Government-owned operation, produced 14,000 tons per year of rolled steel products. INA's plant was in Choloma, Cortés Department. Industria Cementera Hondureña S.A. and Cementos de Honduras S.A. were Government-owned corporations that had a combined producing capacity of 700,000 tons per year. Honduras continued its dependency on imports of petroleum and natural gas to meet its fossil fuel energy requirements. During 1989, Refinería Texaco de Honduras S.A. (RTHSA) produced 14,000 barrels per day of petroleum products for local consumption. This refinery in Puerto Cortés Department was 100% privately owned by Texaco Inc. of the United States.

COMMODITY REVIEW

Metals

Honduras produced base and precious metals. AmPac operated the El Mochito Mine producing by conventional mill techniques separate lead and zinc concentrates containing cadmium, copper, gold, and silver; it processes about 936,000 tons of ore per year. Assays of the Río Jalán gold placer deposit, owned by Newman Mining Co. and Ability Inc., showed gold values of approximately $27 per ton, not including microscopic gold fines. This indicated 10 years of mining at an anticipated rate of 1 million cubic yards per year. The Compañía Minerales de Copán, owned 25.5% by Madeleine Mines and 25.5% by Milner Consolidated Silver Mines, both from the United States, and 49% by the Honduran Government, had expanded its heap-leach operation to 450 tons per day at its San Andrés property to recover about 4,000 kg of gold. During the past 2 years, greater Honduran Government interest and incentives in mining had prompted the Ministry of Natural Resources to undertake a mineral inventory, including teledetection and geophysical surveys to produce geological maps.

There are considerable interests in lead-zinc, gold-silver, and antimony deposits in Honduras, especially in the Departments of Santa Bárbara, Comayahua, Ocotepeque, and El Paraíso, where the Ministerio de Recursos Naturales was preparing a mineral inventory program. Other known but unexploited gold-placer deposits included Vueltas del Río in the northern Department of Santa Bárbara and Guajiniquil in the Southern Department of Choluteca.

Industrial Minerals

Honduras produced cement, gypsum, limestone, marble, and salt, which were primarily consumed by the industrial sector; however, nontraditional exports such as cement and marble were growing at a slow rate. Honduras exported cement to Puerto Rico valued at $2 million. The Government operated two cement plants at Piedras Azules in Comayagua Department and San Pedro in Cortés Department; both produced at full capacity or 700,000 tons per year.

TABLE 2

HONDURAS: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	Industria Cementera Hondurena S.A. (Government, 100%)	Piedras Azules, Comayagua Department	340
Do.	Cementos de Honduras S.A. (Government, 95%; private, 5%)	Rio Bijao, San Pedro, Cortés Department	360
Gold	American Pacific Honduras Inc. (private, 100%—U.S.)	El Mochito Mine, Santa Bárbara Department[2]	[1]1,244
Gold (placer)	J.C. Newman Mining Co. and Associates (private, 100%—U.S.)	Rio Jalan, 10 kilometers northwest from Tegucigalpa	[3]765
Gold-silver	Compania Minerales de Copan (private, 51%; Government, 49%)	San Andrés, Copan Department	165
Lead-copper	American Pacific Honduras, Inc.	El Mochito Mine[2]	12
Petroleum products	Refinería Texaco de Honduras S.A. (Texaco Inc., 100%—U.S.)	Puerto Cortés, Cortés Department	[4]14
Silver	American Pacific Honduras Inc.	El Mochito Mine[2]	[2]50,000
Steel	Industria Nacional del Acero (Government, 100%)	Choloma, Cortes Department	14
Zinc	American Pacific Honduras, Inc.	El Monchito Mine[2]	50

[1]Thousand kilograms.
[2]Reopned in Oct. 1987.
[3]Thousand cubic meters per year.
[4]Thousand 42-gallon barrels per year.

Mineral Fuels and Energy

Honduras had no domestic fossil fuel resources, and the country continued to be dependent on imports for its petroleum requirements. RTHSA imported about $120 million of petroleum and derivatives from Mexico, the United States, and Venezuela. RTHSA was active in oil refining and marketing in Honduras.

The 292-megawatt El Cajón hydroelectric powerplant on the Ulua River in northwestern Honduras, near San Pedro Sula, supplied the balance of the nation's electrical needs. Total energy consumed in Honduras was derived 43% from petroleum, 52% from hydropower, and 5% from thermal.

Reserves

Honduran mineral reserves were significant compared with other countries in the region. Honduras had a potential for further development of its mineral resources, including gold, silver, and base metal deposits. At the end of the year, reserves of base metals with silver content on the El Mochito Mine 55 km south of San Pedro Sula were estimated at 5.1 million tons grading at 8% zinc, 4% lead, 0.7% copper, and 78 grams of silver per ton. The San Andrés heap-leach operation on the northwest region near Copán had estimated reserves of less than 4,000 kg of gold. Placer gravels of the Río Jalán and Guayape River, approximately 7 km north of the village of Sara, containing material of about 20 million tons with gold values of approximately $27 per ton, excluding values in microscopic gold. Available information on the mineral potential of the country was increasing. The United Nations Fund for Natural Resources had decided to undertake additional drilling in the Yuscarán area of southern Honduras following favorable results obtained previously. So far, holes drilled have intersected gold mineralization zones to a depth of 240 meters. The program began in 1986 and had attracted additional funding from Italy and Japan.

INFRASTRUCTURE

The transportation system in Honduras improved in 1989, but remained generally inadequate. The country had about 9,000 km of roads, about 20% of which is paved, 55% improved, and 25% unimproved earth. The railroad system totaled 545 km, and the inland waterways totaled 465 km navigable by small craft. There were 182 airports, of which 141 were usable; 8 had permanent surface runways, 4 had runways ranging from 2,440 to 3,659 meters, and 11 had runways of 1,220 to 2,439 meters. The main ports of Honduras were Puerto Castilla, Puerto Cortés, Puerto Lemmpire, and San Lorenzo. The Government was committed to expand and upgrade road, rail, and air transport routes, particularly to remote areas of the territory.

OUTLOOK

Honduras encourages free market policies to activate its economy in addition to policies of gradual reduction in import tariffs and private investment taxation; also, joint ventures are welcomed.

The country's much needed mineral inventory is being undertaken by the French Bureau de Recherches Géologique et Minieres (BRGM) under an agreement signed with the Ministerio de Recursos Naturales. This project will

prepare geological maps and is being funded by the Inter-American Development Bank and the French Government. Honduras is also a member of the international mineral exploration program, the Trifino Plan, which covers the border regions of El Salvador, Guatemala, and Honduras, totaling 7,584 square kilometers.

Mining explorations in the eastern part of Honduras, sponsored by the United Nations Development Program and the Italian Government, are encouraging, and, as a result, enhancing the country as a potential and competitive exporter of gold and silver. The creation of gold-mining cooperatives (joint ventures) with promising results in Olancho Department in the central region of Honduras has given the placer mining activity new impetus in the region.

Despite this relatively favorable situation, the Honduran economy faces a severe financial crisis caused by large fiscal and balance of payments deficits and distortions created by an overvalued currency. The new debt conversion law allows the mixed public- and private-sectors commission to negotiate with the investor on the terms of national currency bonds issued to finance the swap for equity. However, the investor must sell these bonds in the secondary market to obtain the lempiras for his investment. There are currently about 30 applications as potential new investors. Specific project reviews by the commission await the issuance of regulations being prepared by the Ministry of Finance.

[1]Where necessary, values have been converted from Honduran Lémpiras (L) to U.S. dollars at the average official rate of L2.0=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Ministry of Economy and Commerce
Department of Export and Investment Promotion
Salamé Building, 4th Floor
Tegucigalpa, Honduras

Honduras Information Service
501 Fifth Avenue, Suite 1611
New York, NY 10017

Dirección General de Minas e Hidrocarburos
Ministerio de Recursos Naturales
Bulevard Miraflores
Tegucigalpa, D.C. Honduras

Metalúrgica de Mayap. S.A.
Colonia Nueva Suyapa
Tegucigalpa, Honduras

Industria Cementera Hondureña S.A. (INCEHSA)
Salida a la Libertad
Comayagua, Honduras

Aceros Industriales S.A. de C.V.
Carretera a Puerto Cortés
Puerto Cortés, Honduras

Industrias Corona S.A. de C.V.
Kilómetro 13. Carretera a Puerto Cortés
Puerto Cortés, Honduras

Fundación de Desarrollo de Inversiones y Exportaciones (FIDE)
P.O. Box 2029
Tegucigalpa, Honduras

Publications

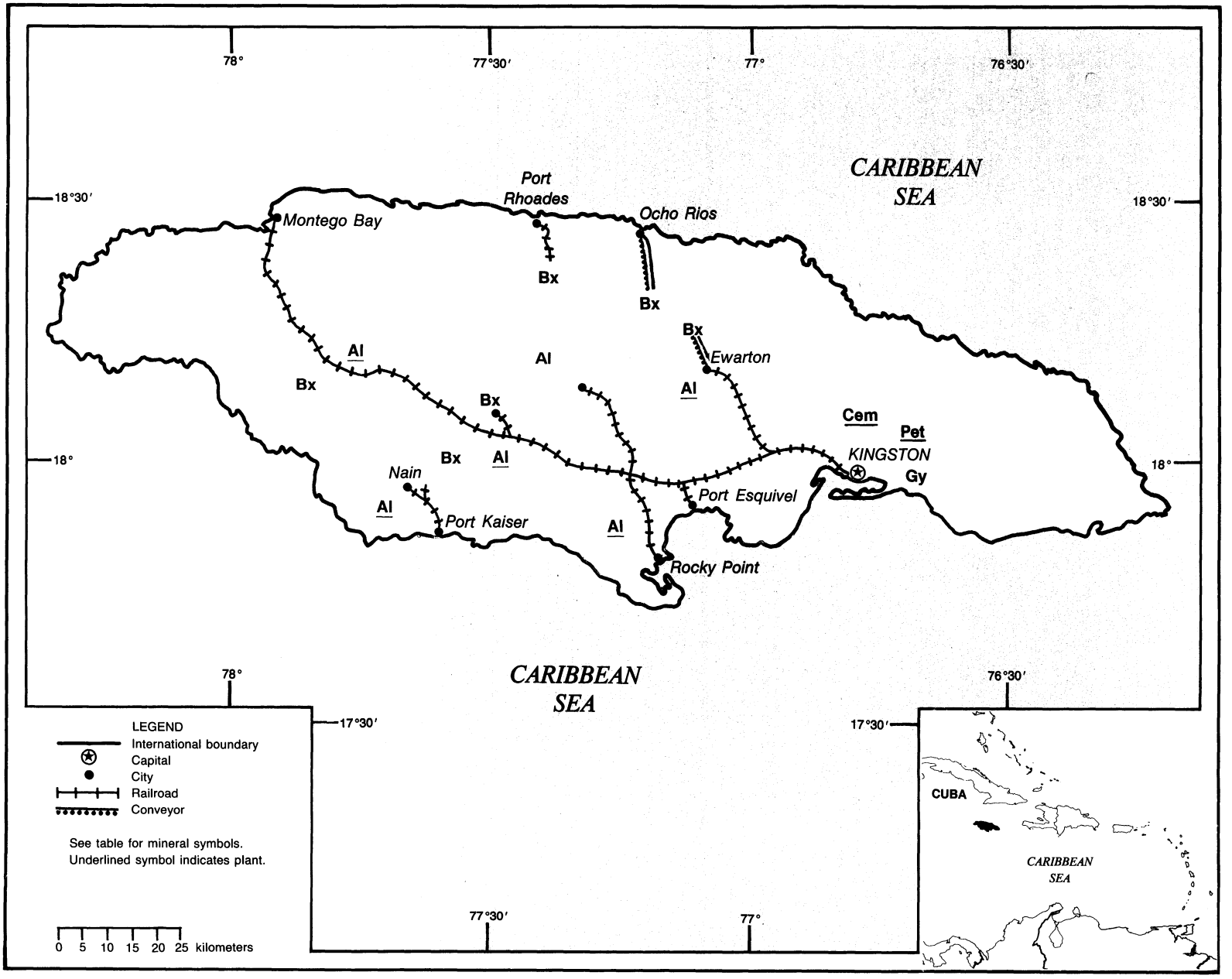
Pincock, Allen & Holt, Inc. El Mochito Mine Operations report, Apr. 1989.

Inter-American Development Bank, Washington, DC: Economic and Social Progress in Latin America, 1989 Report.

Instituto Latinoamericano del Fierro y el Acero (ILAFA), Santiago: Anuario Estadístico de la Siderúrgica y Minería del Hierro de América Latina, annual. Siderurgia Latinoamericana, monthly.

JAMAICA

AREA 11,000 km² **POPULATION 2.4 million**



THE MINERAL INDUSTRY OF

JAMAICA

By Ivette E. Torres

Bauxite and alumina were not only the two dominant mineral commodities in the Jamaican economy, but were also the only two significant mineral commodities in terms of world production. Jamaica ranked third and fourth worldwide in the production of bauxite and alumina, respectively. In addition, Jamaica produced small amounts of cement, gypsum, construction materials, and oil refinery products, mainly for domestic consumption. Efforts by the Government to develop and diversify the industrial mineral sector were oriented toward marble and other high-value commodities. The Jamaican gross domestic product (GDP), in real terms, increased 4.6% from that of 1988 to $3.88 billion.[1] Mining and quarrying represented 6.6% of total GDP, 97% of which was from bauxite and alumina.

GOVERNMENT POLICIES AND PROGRAMS

The Government's Five Year Development Plan (1991–95) calls for an increase in total bauxite production from about 9.7 million tons to almost 12.5 million tons by the end of the 5-year term. This plan excludes any planned additional capacity; it considers only the installed capacity. The Government's hopes are directed toward the increase of bauxite and alumina output by capturing new markets and by encouraging more private investment in the industry.

Interest by the Government to expand the mining sector continued, in particular, industrial minerals. Jamaica Promotion Ltd. and the Ministry of Mines and Energy have been two agencies actively trying to develop this mineral group. The Government development plans give emphasis to commodities with high unit value, such as marble and dimension stone. To facilitate investment, the Government, among other things, plans to provide or facilitate construction of at least one bulk shipment port or barge facilities, as determined by feasibility studies. It also plans to provide duty-free or concessionary duty rates on imported capital equipment and other appropriate incentives. During the year, its second symposium on Caribbean industrial minerals was held by the Geological Society of Jamaica. The first symposium was held in 1981.

PRODUCTION

In 1989, Jamaica was the third leading world producer of bauxite, after Australia and Guinea. It produced about 9% of the world's bauxite. The country was also the fourth leading producer of alumina, after Australia, the United States, and the U.S.S.R. It produced almost 6% of the world's alumina. Production of these two commodities continued to dominate the mining industry of Jamaica. Other mineral commodities produced in Jamaica represent a very small portion of the economy and are insignificant by world standards. Most of these commodities, which include cement, gypsum, limestone, marble, sand and gravel, steel, and other construction materials, were produced for domestic consumption. Because of the increase in construction activity in 1989, production of cement and steel increased significantly, reaching record-high levels.

TRADE

The United States continued to be Jamaica's main trading partner, contributing almost 47% of imports from countries outside of the Caribbean Common Market (CARICOM) and receiving about 40% of Jamaica's exports to non-CARICOM countries. Jamaica's main European and CARICOM trading partners were the United Kingdom and Trinidad and Tobago, respectively.

In 1989, exports of alumina and crude bauxite totaled 2.1 and 4.2 million tons, respectively. Alumina was the major component of traditional exports, contributing 44.5% to the value of total exports of $970.3 million. Exports of crude bauxite were valued at $125.7 million or about 13% of total export value.

During the year, alumina was exported to Europe (38.4%), Canada (27.9%), the United States (26.6%), Ghana (4.7%), and Brazil (2.4%). It was the first time that Jamaica exported alumina to France and Yugoslavia.

In addition to alumina and bauxite, Jamaica exported small amounts of cement, gypsum, and limestone. Exports of cement represented only about 6% of total sales of 375,000 tons, but was a 39% increase from that of 1988. About 43,000 tons of gypsum was exported, a sharp decrease from that of 1988. About 60% of the gypsum (in terms of value) was exported to countries within CARICOM. Exports of limestone totaled 20,164 tons, 52% of which was exported to the United States.

Jamaica imported all its crude oil requirements from Mexico and Venezuela. It also imported oil refinery products. Of the 15.8 million barrels of crude and refinery products imported in 1989, 4.9 million barrels was imported by the bauxite industrial sector. Imports of fuel represented 15.2% of total import value, an increase from that of 1988 because of increased volume and price.

STRUCTURE OF THE MINERAL INDUSTRY

The Government of Jamaica is directly involved in the production, trade, and technical developments of bauxite and alumina through Jamaican Bauxite Mining Ltd., Clarendon Alumina Production Ltd., Bauxite and Alumina Trading Co. of Jamaica Ltd., and the Jamaican Bauxite Institute Ltd. Other Government organizations involved in the mineral sector are the Ministry of Mining and Energy's Division of Mines and Quarries and the Geological Survey.

TABLE 1

JAMAICA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988	1989[p]
Aluminum:						
Bauxite, dry equivalent, gross weight	thousand tons	[r]5,967	[r]6,930	7,802	7,305	9,601
Alumina	do.	[r]1,511	[r]1,575	1,609	1,514	2,221
Cement, hydraulic	do.	240	241	306	371	412
Gypsum		179,000	117,000	176,300	145,500	78,010
Iron and steel: Steel, crude		11,734	11,095	18,950	25,334	33,743
Lead, refined (secondary)[e]		1,000	1,000	1,000	1,000	1,000
Lime	thousand tons	86	92	90	80	[e]90
Petroleum refinery products	thousand 42-gallon barrels	8,726	9,597	9,108	9,801	5,928
Salt		15,706	13,090	15,665	15,466	9,920
Silica sand		16,000	13,100	19,930	13,000	15,200
Stone:						
Limestone		5,304	5,331	5,848	5,984	6,800
Marble		50	200	500	2,700	5,000
Marl and fill	thousand tons	6,210	7,020	7,560	7,020	7,560
Sand and gravel	do.	1,375	1,525	1,700	2,025	2,250

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Sept. 30, 1990.

TABLE 2

JAMAICA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Destinations, 1988	
				United States	Other (principal)
METALS					
Aluminum:					
Ore and concentrate	thousand tons	3,711	3,494	2,498	U.S.S.R. 996.
Oxides and hydroxides	do.	1,557	1,561	286	Canada 540; Netherlands 435.
Metal including alloys:					
Scrap		1,797	3,502	923	Japan 2,338; Switzerland 139.
Semimanufactures		288	822	354	Trinidad and Tobago 401; Belize 34.
Copper: Metal including alloys:					
Scrap		265	639	161	United Kingdom 116; West Germany 43; unspecified 200.
Unwrought		—	6	—	All to United Kingdom.
Semimanufactures	value	$10	$2,000	—	All to Trinidad and Tobago.
Iron and steel: Metal:					
Scrap		203	270	224	United Kingdom 27; Netherlands 19.
Semimanufactures:					
Bars, rods, angles, shapes, sections		6	—		
Universals, plates, sheets		8,625	1,628	176	Trinidad and Tobago 806; St. Lucia 503.
Tubes, pipes, fittings		222	205	—	Trinidad and Tobago 203; St. Lucia 2.
Castings and forgings, rough		50	—		
Unspecified	value	$297	—		

See footnote at end of table.

TABLE 2—Continued

JAMAICA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Lead: Metal including alloys:				
Unwrought	36	—		
Semimanufactures	—	18	18	
Silver: Metal including alloys, unwrought and partly wrought value	$131	—		
Tin: Metal including alloys:				
Scrap	569	508	508	
Semimanufactures	19	19	19	
Other:				
Oxides and hydroxides	23	—		
Ashes and residues	55	32	32	
Base metals including alloys, all forms	1	—		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	(2)	(2)	NA	NA.
Cement	11,232	9,324	5,985	Haiti 1,843; Turks and Caicos Islands 1,496.
Chalk	(2)	—		
Clays, crude	—	2	—	All to Trinidad and Tobago.
Fertilizer materials:				
Crude, n.e.s.	37	12	10	NA.
Manufactured:				
Nitrogenous	—	50	—	All to Trinidad and Tobago.
Unspecified and mixed	1	—		
Gypsum and plaster	117,577	89,497	—	Venezuela 41,615; Guadeloupe 12,079; Haiti 11,750.
Salt and brine	2,347	3,376	592	Trinidad and Tobago 1,946; Barbados 290.
Sodium compounds, n.e.s.: Soda ash, manufactured kilograms	1	—		
Stone, sand and gravel:				
Dimension stone, crude and partly worked	11	—		
Gravel and crushed rock	18	—		
Limestone other than dimension	94,996	36,953	22,246	Trinidad and Tobago 11,103; Bermuda 3,333.
Sulfuric acid	487	360	17	Trinidad and Tobago 186; Haiti 99; Barbados 29.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	726	—		
Gasoline do.	51,463	765	314	Bahamas 451.
Mineral jelly and wax do.	6	—		
Kerosene and jet fuel do.	9,611	21,034	13,531	Bahamas 2,992; unspecified 4,510.
Distillate fuel oil do.	226,559	341,183	170,938	Belize 133,922; Panama 21,955.
Lubricants do.	107,070	110,964	392	Guatemala 25,291; Guyana 22,449; Suriname 13,055.
Residual fuel oil do.	75,943	150,423	115,125	United Kingdom 35,052.

NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

TABLE 3

JAMAICA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS					
Aluminum:					
Ore and concentrate	value	$874	—		
Oxides and hydroxides		3	9	1	Canada 8.
Metal including alloys:					
Unwrought		951	1,745	—	All from Canada.
Semimanufactures		1,860	3,637	2,175	Canada 551; United Kingdom 382.
Copper:					
Sulfate		16	—		
Metal including alloys:					
Unwrought		7	—		
Semimanufactures		2,459	795	524	Hong Kong 156; United Kingdom 94.
Gold:					
Waste and sweepings	value	$1,330	—		
Metal including alloys, unwrought and partly wrought	kilograms	69	—		
Iron and steel:					
Iron ore and concentrate including roasted pyrite		—	14	14	
Metal:					
Scrap		—	173	—	
Pig iron, cast iron, related materials		31	7	7	
Ferroalloys:					
Ferromanganese	value	$53	—		
Ferrosilicon		(2)	6	6	
Unspecified	value	—	$2,000	$1,000	United Kingdom $1,000.
Steel, primary forms		56,413	29,431	4,803	Trinidad and Tobago 18,127; Netherlands 3,950.
Semimanufactures:					
Bars, rods, angles, shapes, sections		19,394	28,404	2,855	Trinidad and Tobago 15,425; Japan 2,294.
Universals, plates, sheets		463,869	34,209	7,010	United Kingdom 9,687; Japan 4,235.
Hoop and strip		224	389	67	United Kingdom 247; Barbados 24.
Rails and accessories		8	47	33	United Kingdom 8; France 4.
Wire		23,317	4,623	504	United Kingdom 1,476; Venezuela 1,295.
Tubes, pipes, fittings		5,663	9,763	5,984	Italy 2,824; United Kingdom 419.
Castings and forgings, rough		13	44	17	Japan 14; Canada 12.
Unspecified		354	—		
Lead:					
Oxides		405	205	167	United Kingdom 11; Canada 7.
Metal including alloys:					
Unwrought		44	24	4	United Kingdom 20.
Semimanufactures		2,920	55	52	United Kingdom 2; Switzerland 1.
Magnesium: Metal including alloys, semimanufactures	value	$1,988	$4,000	$2,000	United Kingdom $2,000.
Manganese: Ore and concentrate		104	197	36	Gabon 72; Belgium-Luxembourg 53; Mexico 36.
Molybdenum: Metal including alloys, semimanufactures	value	$4,871	$4,000	—	NA.

See footnotes at end of table.

TABLE 3—Continued

JAMAICA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Nickel:					
Ore and concentrate	value	$309	—		
Metal including alloys, semimanufactures		4	4	1	West Germany 2; Canada 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought	value	$5,660	$1,000	$1,000	
Silver: Metal including alloys, unwrought and partly wrought	do.	$259,095	$194,000	—	Canada $148,000; West Germany $46,000.
Tin: Metal including alloys:					
Scrap	do.	$2,628	—		
Unwrought		2	2	(2)	Sweden 1; United Kingdom 1.
Semimanufactures		3,372	5,717	1	Netherlands 4,098; United Kingdom 1,420; Japan 198.
Titanium: Oxides		903	858	636	United Kingdom 12; Syria 10.
Tungsten: Metal including alloys, semimanufactures	value	$365	$17,000	$17,000	
Uranium and thorium: Metal including alloys, all forms	do.	$647	$2,000	$2,000	
Zinc:					
Ore and concentrate		2	—		
Oxides		136	178	79	Japan 33; Netherlands 33.
Blue powder	kilograms	23	—		
Metal including alloys:					
Unwrought		981	815	170	Mexico 525; Canada 99.
Semimanufactures		1	1,054	576	United Kingdom 433; Venezuela 25.
Other:					
Ores and concentrates		—	15	5	— All from United Kingdom.
Oxides and hydroxides		147	95	66	Japan 20; West Germany 7.
Base metals including alloys, all forms	kilograms	118	—		
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc		18	41	37	United Kingdom 4.
Grinding and polishing wheels and stones		24	39	7	Italy 20; West Germany 5.
Asbestos, crude		—	29	23	United Kingdom 5; Canada 1.
Barite and witherite		4	18	14	United Kingdom 4.
Boron materials: Crude natural borates		(3)	4	4	
Cement		19,104	5,216	4,113	United Kingdom 372; Denmark 371.
Chalk		40	63	—	France 36; United Kingdom 27.
Clays, crude		636	591	493	Mexico 92; United Kingdom 6.
Diamond: Natural:					
Gem, not set or strung	value	$14,398	$24,000	$9,000	Belgium-Luxembourg $10,000; Israel $5,000.
Industrial stones	do.	—	$2,000	—	All from United Kingdom.
Diatomite and other infusorial earth		23	40	40	
Feldspar, fluorspar, related materials		13	22	22	
Fertilizer materials: Manufactured:					
Ammonia		107	112	93	Trinidad and Tobago 18; United Kingdom 1.
Nitrogenous		882	60,172	279	Canada 59,756; Dominican Republic 133.

See footnotes at end of table.

TABLE 3—Continued

JAMAICA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Fertilizer materials: Manufactured—Continued					
Phosphatic		108	101	56	Dominican Republic 45.
Potassic		391	11,472	29	Canada 11,083; Israel 360.
Unspecified and mixed		5,057	17,334	60	Canada 16,575; Dominican Republic 698.
Graphite, natural	value	$1,221	$3,000	$3,000	
Gypsum and plaster		65	114	94	West Germany 20.
Lime		10	4	4	
Magnesium compounds: Unspecified		49	1	1	
Mica:					
Crude including splittings and waste		162	108	(2)	Mainly from Norway.
Worked including agglomerated splittings		(2)	11	1	United Kingdom 10.
Phosphates, crude		94	25	NA	NA.
Pigments, mineral:					
Natural, crude		15	—		
Iron oxides and hydroxides, processed		154	99	3	West Germany 72; United Kingdom 10; Spain 9.
Potassium salts, crude		2	—		
Precious and semiprecious stones other than diamond:					
Natural	value	$1,157	—		
Synthetic	do.	$9,246	—		
Salt and brine		23,667	18,225	17,937	Canada 247; Trinidad and Tobago 40.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		4,502	6,494	5,962	France 328; West Germany 198.
Sulfate, manufactured		1,656	2,380	27	West Germany 1,282; Mexico 1,050.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		116	66	(2)	Italy 61; Barbados 5.
Worked		15	4	4	
Gravel and crushed rock		32,772	51	25	Barbados 26.
Limestone other than dimension	value	$43	—		
Quartz and quartzite		—	3	6	6
Sand other than metal-bearing		294	63	63	
Sulfur:					
Elemental:					
Crude including native and byproduct		57	31	—	All from Belgium-Luxembourg.
Colloidal, precipitated, sublimed		3,005	3	2	Saudi Arabia 1.
Dioxide	kilograms	375	—		
Sulfuric acid		8	16	13	United Kingdom 3.
Talc, steatite, soapstone, pyrophyllite		449	636	496	Norway 135; United Kingdom 3.
Other: Crude		12	35	4	West Germany 31.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		21	29	17	United Kingdom 12.
Carbon including carbon black		773	1,607	536	Venezuela 659; Belgium-Luxembourg 276.
Coal: All grades including briquets		—	19	19	
Coke and semicoke		114	81	62	West Germany 10; United Kingdom 9.

See footnotes at end of table.

TABLE 3—Continued

JAMAICA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Peat including briquets and litter		55	[2]	[2]	
Petroleum:					
Crude	42-gallon barrels	44	[4]		
Refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	565	729	523	Venezuela 175; Panama 31.
Gasoline	do.	876	804	757	Mexico 42; Netherlands Antilles 5.
Mineral jelly and wax	do.	16	14	5	United Kingdom 7; Japan 2.
Kerosene and jet fuel	do.	1,154	1,937	735	Venezuela 691; Mexico 331.
Distillate fuel oil	do.	641	1,177	933	Venezuela 107; Netherlands Antilles 78.
Lubricants	do.	36	56	23	Netherlands Antilles 22; United Kingdom 6.
Residual fuel oil	do.	9,850	7,329	2,253	Mexico 2,793; Venezuela 2,283.
Bitumen and other residues	do.	69	63	25	Venezuela 22; Netherlands Antilles 15.
Bituminous mixtures	do.	1	2	2	

NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.
[3]Quantity not available, valued at $1,283,000.
[4]Quantity not available, valued at $18,000.

State-owned Petroleum Corp. of Jamaica (PCJ) is responsible for conducting oil and gas exploration studies. A subsidiary of PCJ, Petrojam Ltd., operates the oil refinery in Kingston.

In 1989, employment in the mining, quarrying, and refining sector averaged 6,400 people, up from 5,800 in 1988. This represents less than 1% of the total work force of 871,800.

COMMODITY REVIEW

Metals

The Jamaican bauxite and alumina industry in 1989 reported production levels close to the ones achieved early in the decade, after which production levels decreased and reached a low point in 1985 when two of the alumina plants closed because of soft prices. The large increase in production in 1989 of bauxite and alumina from that of 1988 was mainly owing to the April reopening of the Aluminum Partners of Jamaica (Alpart) facilities.

All the operating companies in Jamaica had plans for expansion. Jamalco, a 50-50 joint venture between the Government of Jamaica and Alcoa Minerals of Jamaica, was planning to expand its alumina production capacity from 750,000 tons per year to 1 million tons in 1990. JAMALCAN, a joint venture between Alcan Aluminium Ltd. (97%) and the Government of Jamaica (3%), planned to increase its combined Ewarton and Kirvine alumina production levels as part of the new operating agreement signed between the company and the Government in 1988. Alpart, which reopened as a result of a new partnership between Kaiser Aluminum & Chemical Corp. (65%) and Hydro Aluminium Jamaica a/s (35%), was planning the largest alumina capacity increase from about 1.1 million tons per year to 1.5 million tons per year. In October, Alcan Aluminium began a prefeasibility study for the construction of a new 1-million-ton alumina refinery in Trelawny Parish.

In July, a 2-week strike by workers at Alcoa's refinery was settled when employees ratified a new labor contract retroactive to January and received a 20% increase in salary. The strike, however, had little effect on forecast output levels.

During the year, JAMALCAN's Ewarton refinery opened a new plant for red mud disposal. The plant consists of a 240-acre mud stacking and drying area that will allow the company to increase production at Ewarton. The new stacking method was developed and patented by Alcan Jamaica Co., the refinery's operator. Reportedly, Alcoa and other companies have shown interest in this new development on waste disposal.

Plans to build an aluminum smelter were revitalized in 1989 when the Minister of Mines and Energy announced that Jamaica was considering plans for a regional smelter using Jamaican alumina and natural gas from Trinidad and Tobago as the energy source. Earlier plans called for Government participation only; the new plans include private participation as well. The viability of the project was being evaluated at yearend.

At yearend, the Governments of Jamaica and the U.S.S.R. agreed to extend the bauxite contract scheduled to expire in 1990. The new contract would cover shipments of 1 million tons per year from 1991 to 1995.

Industrial Minerals

In October 1989, the Canadian company Commonwealth Limestone Corp. began shipping high-purity, filler-grade

TABLE 4

JAMAICA: STRUCTURE OF THE MINERAL INDUSTRY[1]

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Alumina	Jamalco (Alcoa Minerals of Jamaica, 50%; Government, 50%)	Clarendon, Clarendon Parish	750
Do.	Aluminum Partners of Jamaica (Kaiser Aluminum & Chemical Corp., 65%; Hydro Aluminum Jamaica a/s, 35%)	Nain, St. Elizabeth Parish	1,200
Do.	JAMALCAN (Alcan Aluminium Ltd., 93%; Government, 7%)	Kirkvine, Manchester Parish; Ewarton, St. Catherine Parish	547.5 547.5
Bauxite	Jamaica Bauxite Mining Ltd. Lydford Mines Government, 100%)[1]	Lydford, St. Ann Parish	2,500
Do.	Kaiser Jamaica Bauxite Co., Ltd., (Government, 51%; Kaiser Aluminum & Chemical Corp., 49%)	Water Valley, St. Ann Parish	4,500
Cement	Caribbean Cement Co. Ltd.	Rockfort, St. Andrew Parish	830
Petroleum products	Petroleum Corp. of Jamaica (Government, 100%)	Kingston	[2]35,500

[1]Formerly Jamaica Reynolds Bauxite Partners.
[2]Forty-two gallon barrels per day.

limestone from Jamaica to the United States. The first shipment totaled 10,500 tons, but the company planned to export 75,000 tons to the United States in 1990. To develop a market in Trinidad and Tobago, the company also exported an initial shipment to that country.

Mineral Fuels

Imported petroleum and refinery products supplied almost 89% of total energy consumption. The remainder was supplied by bagasse, 8.5%; coal; 1.5%; and hydroelectric power, 1.3%. In 1989, Jamaica's electric generating capacity was 1,437 megawatts. Because Jamaica's industry is energy intensive, Government policies have centered around energy source diversification and petroleum product substitution to reduce dependence on imported energy. Areas of energy investigation include hydroelectric, coal, solar, and biogas alternatives.

Reserves

Reserves of bauxite have been estimated at 2 billion tons.

INFRASTRUCTURE

Jamaica had more than 18,000 kilometers of highways, 70% of which was paved. There were two major ports, Kingston and Montego Bay, and 370 kilometers of railroad. Jamaica's mining sector used railroads, highways, and conveyor belts to transport production to processing facilities, local consumers, and shipping ports. Bauxite was exported from Port Rhoades and Rocky Point. Alumina was shipped from Port Kaiser and Port Esquivel.

OUTLOOK

The Government of Jamaica and the private companies are working together to increase output of bauxite and alumina. Because of firm demand and strong prices, prospects for the Jamaican industry look promising. Recent increases in oil prices, however, may have a limiting effect on the actual industry growth.

[1]Where necessary, values have been converted from Jamaican dollars (J$) to U.S. dollars at the rate of JD$5.75 = US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Geological Survey Division
Ministry Of Mining and Energy
P.O. Box 141
Hope Gardens
Kingston 6, Jamaica

Mines and Quarries Division
Ministry of Mines and Energy
P.O. Box 189
Hope Gardens
Kingston 6, Jamaica

The Jamaican Bauxite Institute
P.O.Box 355
Hope Gardens
Kingston 6, Jamaica

Petroleum Corporation of Jamaica
12 Ocean Boulevard
Kingston 6, Jamaica

Publications

U.S. Central Intelligence Agency: World Factbook.

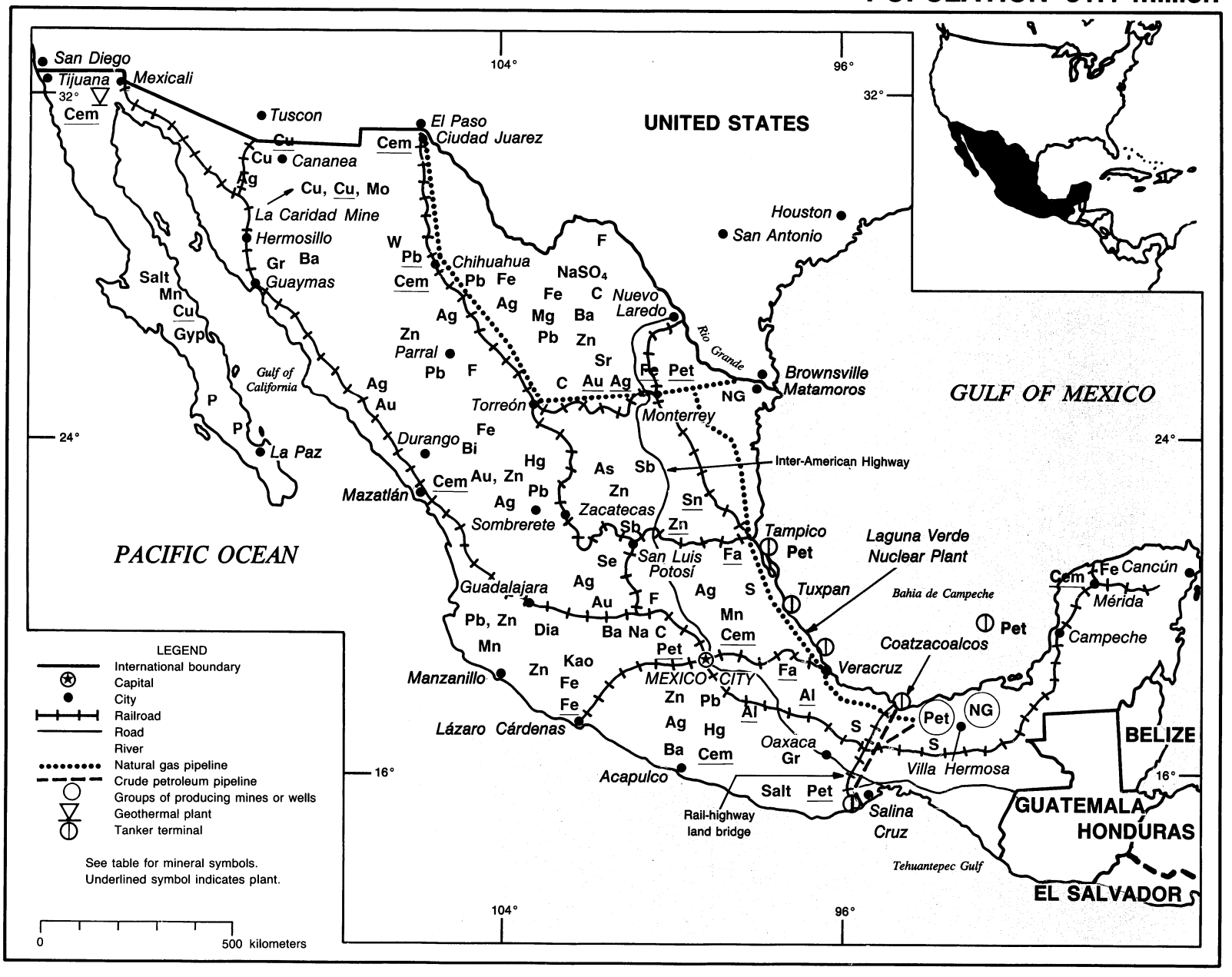
Planning Institute of Jamaica: Economic and Social Survey Jamaica 1989, annual report.

The Jamaican Bauxite Institute: The JBI Journal, annual report.

Davis, C. E. Jamaica in the World Aluminium Industry 1938–1973. Jamaica Bauxite Institute, Kingston, 1989, 412 pp.

MEXICO

AREA 1.97 million km² **POPULATION 81.1 million**



THE MINERAL INDUSTRY OF

MEXICO

By Ivette E. Torres

Mexico, one of the world's leading mineral producers, ranked first in the production of bismuth and silver in 1989. It was among the top five producers of antimony, white arsenic, barite, cadmium, celestite, fluorspar, natural graphite, mercury, molybdenum, nitrogen, and sodium sulfate. The production of diatomite, feldspar, gypsum, lead, lime, manganese, selenium, sulfur, and zinc was of world significance also. In those commodities, Mexico was among the top 10 producers.

Mexico was the seventh leading producer of crude oil in the world and ranked eighth in terms of oil reserves. In the Western Hemisphere, only the United States produced more oil than Mexico. Venezuela, the second leading producer of crude oil in Latin America, produced only about two-thirds of that produced by Mexico. A significant portion of the Mexican crude oil was exported to the United States. 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 1980 to approximately 35% in 1989. More than 90% of the value of petroleum exports was from crude oil.

The Mexican gross domestic product was estimated at $201.4 billion.[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. In 1989, inflation was 19.7%, the lowest since 1979. In 1987 and 1988, inflation had been 150% and 57%, respectively. In May 1989, Mexico signed a loan agreement with the Bank for Reconstruction and Development (the World Bank) and one on debt restructuring with the Paris Club. In addition, Mexico was able to renegotiate its public-sector debt with a series of agreements with bilateral creditors, the World Bank, the International Monetary Fund, and foreign commercial banks. The external debt was reduced from $100.4 billion in 1988 to $95.1 billion in 1989.

GOVERNMENT POLICIES AND PROGRAMS

In May 1989, in an effort to modernize the economy and attract foreign capital, the Government issued new investment regulations pertaining to the 1973 Foreign Investment Law, which limited foreign investment participation to 49%. The 1973 law allowed exceptions only in the national interest. Although since the early 1980's the Government has moved toward more flexibility on this and other investment issues, the new regulations have opened many sectors of the Mexican economy to foreign investment. It also has facilitated administrative procedures of foreign investment approval and has provided the means by which foreign investors could obtain majority ownership by establishing a trust.

The Mexican investment law classifies industries in terms of share of foreign participation allowed. The extraction of oil and natural gas, oil refining, the manufacturing of basic petrochemical products, and uranium and nuclear fuels fall under the category of activities exclusively reserved to the Mexican Government. Most other mining activities, including the production and refining of copper, gold, lead, silver, and zinc, allow 49% foreign participation.

At yearend, Mexico was preparing a new mining modernization plan and a new mining regulation that, among other things, would facilitate Mexican and foreign private participation in the mining industry, exploration and development, and simplification of the administrative procedures within the Secretaría de Energía, Minas e Industria Paraestatal (SEMIP). The draft of the new regulation was reviewed by the Cámara Minera de México (CAMIMEX) in 1989.

The privatization program continued in 1989, but efforts to sell the Cía. Minera Cananea S.A., one of the major copper producers, were unsuccessful.

In August, the list of basic petrochemicals—those reserved for Petróleos Mexicanos (PEMEX) under Mexican law—was reduced to 20 products. Fourteen products were placed in the list of secondary petrochemicals. Foreign ownership in corporations producing secondary petrochemicals was limited to 40%. Petrochemicals not listed as basic or secondary had no foreign participation limits.

PRODUCTION

The value of Mexican nonfuel mineral output in 1989, plus coal, was $2.5 billion, a slight increase from that of 1988, when it was $2.4 billion. Nonferrous and precious metals accounted for almost 56% and 21% of the total, respectively. Individually, copper was the most important in terms of value ($706.5 million), followed by zinc ($492.7 million) and silver ($408.9 million). In the industrial mineral sector, sulfur, which accounted for 23% of the total value, was the most important in terms of value, followed by salt and fluorspar. In 1988, the last year for which information was available, sales of gray portland cement totaled more than $995 million.

Output from the large mining sector was about 90% of total production: 60% originated from the private sector and 30% from the parastatal industry. The remaining 10% was produced by the medium and small mining sector.

TRADE

In 1989, total Mexican exports (f.o.b.), which excludes exports from maquiladoras, totaled about $22.8 billion. Nonfuel minerals plus coal and coke contributed about 7.5% of export revenues, valued at $1.7 billion. Relative to total trade, the United States was Mexico's

TABLE 1

MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988	1989[p]
METALS						
Aluminum:						
Primary		42,743	37,016	60,200	68,337	71,691
Secondary		22,305	16,432	8,765	4,474	13,172
Antimony:						
Mine output, Sb content[3]		4,266	3,337	2,839	2,185	1,906
Metal (in mixed bars and refined)		2,715	1,955	1,602	1,207	1,192
Arsenic, white[4]		4,782	5,315	5,304	5,164	5,551
Bismuth[5]		925	749	1,012	958	883
Cadmium:						
Mine output, Cd content		1,140	1,183	1,249	1,726	1,439
Metal, refined		734	r719	935	1,117	976
Copper:						
Mine output, Cu content[6]		r175,462	r189,478	r249,985	280,266	254,038
Metal:						
Blister (primary only)		r67,192	r73,714	r126,310	150,334	174,294
Refined:						
Primary[e 7]		104,156	75,811	r114,576	r119,097	124,058
Secondary[e 8]		19,409	13,686	r21,185	r21,750	22,971
Total		123,565	89,497	r135,761	140,847	147,029
Gold:						
Mine output, Au content	kilograms	7,524	7,795	7,988	9,098	8,613
Metal, refined	do.	6,181	5,885	6,392	6,369	5,919
Iron and steel:						
Iron ore, mine output:						
Gross weight[9]	thousand tons	7,820	7,298	7,523	8,431	8,141
Fe content	do.	5,161	4,817	4,965	5,564	5,373
Metal:						
Pig iron	do.	3,595	3,737	3,712	3,678	3,247
Sponge iron	do.	1,500	1,420	1,551	1,686	2,225
Total	do.	5,095	5,157	5,263	5,364	5,472
Ferroalloys:						
Ferromanganese	do.	154	156	161	165	168
Silicomanganese	do.	39	61	80	80	99
Ferrosilicon	do.	28	18	18	17	9
Ferrochromium	do.	6	3	6	9	3
Other	do.	3	1	1	1	([10])
Total	do.	230	239	266	272	279
Steel, crude	do.	7,399	7,225	7,642	7,779	7,920
Rolled products	do.	r6,016	5,589	5,954	6,207	6,299
Forgings and castings	do.	r28	r24	r42	88	100
Lead:						
Mine output, Pb content		206,732	182,672	177,161	171,337	163,017
Metal:						
Smelter:						
Primary		203,036	182,021	176,986	171,087	162,478

See footnotes at end of table.

TABLE 1—Continued

MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988	1989[p]
METALS—Continued						
Lead—Continued						
Metal—Continued						
Smelter—Continued						
Secondary (refined)[e]		31,000	33,000	35,000	35,000	35,000
Total[e]		234,036	215,021	211,986	206,087	197,478
Refined:						
Primary (including lead content of antimonial lead)		193,525	178,860	173,830	168,093	160,035
Secondary[e]		31,000	33,000	35,000	35,000	35,000
Total		224,525	211,860	208,830	203,093	195,035
Manganese ore:						
Gross weight						
Metallurgical, run-of-mine[e 11]		630,000	660,400	581,700	680,300	635,000
Oxide nodules		337,400	394,300	336,000	394,100	352,000
Battery grade[e]		30,300	38,700	41,300	40,000	17,900
Mn content		150,647	174,416	146,407	168,573	149,875
Mercury, mine output, Hg content		394	184	124	345	[e]345
Molybdenum, mine output, Mo content		3,761	3,350	4,400	4,456	4,189
Selenium, mine output, Se content		42	23	29	13	20
Silver:						
Mine output, Ag content	kilograms	[r]2,152,959	[r]2,303,142	[r]2,414,954	2,358,907	2,306,091
Metallurgical products:						
Impure bars	do.	76,989	224,670	156,463	247,619	241,211
Mixed bars	do.	57,064	66,880	45,257	76,423	83,801
Metal, refined, primary	do.	[r]1,917,559	[r]1,936,518	[r]2,142,280	1,975,996	1,904,286
Other	do.	3,092	1,088	9,006	16,585	28,251
Tin:						
Mine output, Sn content		380	385	369	274	159
Metal, smelter, primary		1,533	1,488	1,730	1,423	771
Tungsten, mine output, W content		282	294	213	206	170
Zinc:						
Mine output, Zn content		275,412	271,351	271,480	262,228	284,058
Metal:						
Smelter, primary		175,353	173,700	—	—	—
Refined, primary		171,388	172,489	184,755	192,529	193,279
INDUSTRIAL MINERALS						
Abrasives, natural[12]		248	1,458	12,390	15,248	[e]15,000
Barite		467,693	321,186	401,336	534,954	324,739
Cement, hydraulic	thousand tons	20,680	19,751	22,347	22,872	[e]23,500
Clays:						
Bentonite		267,695	136,478	129,596	163,916	123,927
Common		254,606	248,351	178,347	158,153	168,000
Fuller's earth		58,000	52,200	49,112	37,226	24,603
Kaolin		282,337	276,427	151,104	162,415	141,519
Diatomite		45,781	36,022	34,708	36,524	44,920
Feldspar		432,031	85,019	106,490	83,170	121,988

See footnotes at end of table.

TABLE 1—Continued

MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988	1989[p]
INDUSTRIAL MINERALS—Continued						
Fluorspar:[13]						
Acid-grade	thousand tons	379	424	291	338	359
Ceramic-grade	do.	27	14	—	27	27
Metallurgical-grade	do.	270	263	244	253	225
Submetallurgical-grade	do.	53	66	189	138	168
Total	do.	729	767	724	756	779
Graphite, natural:						
Amorphous		33,468	36,018	36,674	47,871	38,304
Crystalline		1,910	1,838	1,787	1,735	1,942
Gypsum and anhydrite, crude (yeso)		4,602,796	4,232,805	4,575,416	4,779,827	5,390,391
Lime, hydrated and quicklime	thousand tons	5,093	5,545	[e]6,250	3,738	[e]6,000
Magnesium compounds:						
Magnesia[14]		121,698	99,965	118,332	141,014	125,210
Magnesite		19,299	7,530	7,351	5,384	4,229
Mica, all grades		1,446	1,748	3,419	6,228	4,510
Nitrogen: N content of ammonia[15]		[r]1,904,542	[r]1,651,078	[r]1,793,462	2,129,330	2,195,210
Perlite		37,261	46,170	39,428	39,169	37,354
Phosphate rock[16]		786,500	746,863	688,973	835,093	655,477
Salt, all types	thousand tons	6,467	6,205	6,199	6,788	6,703
Sodium compounds, n.e.s.:						
Carbonate (soda ash):						
Natural[e]		[17]200,185	200,000	180,000	180,000	180,000
Synthetic[e]		[17]257,223	250,000	250,000	250,000	250,000
Sulfate, natural (bloedite)[18]		394,074	455,360	488,642	[e]430,000	486,000
Stone, sand and gravel:						
Calcite, common		400,516	437,118	486,740	436,183	444,000
Dolomite		330,711	453,861	411,601	340,671	469,564
Limestone[19]	thousand tons	30,840	28,919	23,735	24,741	25,800
Marble		263,100	258,000	261,000	468,000	473,100
Quartz, quartzite, glass sand (silica)		1,479,100	886,411	965,921	926,166	1,031,100
Sand and gravel:						
Sand	thousand cubic meters	54,350	50,064	52,513	51,904	51,646
Gravel[e]	do.	35,196	32,420	34,007	33,477	34,583
Strontium minerals: Celestite		32,320	24,042	47,739	51,626	51,755
Sulfur, elemental:						
Frasch process	thousand tons	1,551	1,588	1,806	1,628	1,528
Byproduct:						
Of metallurgy[e]	do.	120	134	154	240	286
Of petroleum and natural gas	do.	469	462	498	510	555
Total[e]	do.	2,140	2,184	2,458	2,378	2,369
Talc		29,900	24,301	17,469	13,645	13,908
Vermiculite		350	220	161	191	300
Wollastonite		13,512	9,356	10,993	10,506	10,618
MINERAL FUELS AND RELATED MATERIALS						
Carbon black (materia prima negro de humo)		264,317	543,693	748,124	943,987	1,049,829

See footnotes at end of table.

TABLE 1—Continued

MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988	1989[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Coal:						
Run-of-mine:						
Metallurgical	thousand tons	7,331	7,108	7,014	6,439	5,847
Steam	do.	2,440	3,050	4,122	4,147	4,136
Total	do.	9,771	10,158	11,136	10,586	9,983
Washed metallurgical coal	do.	3,442	3,027	3,026	2,340	2,761
Coke:[20]						
Metallurgical	do.	2,890	2,594	2,330	2,322	2,260
Imperial	do.	6	6	6	5	6
Breeze	do.	5	4	4	5	4
Total	do.	2,901	2,604	2,340	2,332	2,270
Gas, natural:						
Gross	million cubic meters	r37,250	r35,462	r36,154	36,046	36,919
Marketable	do.	33,899	33,278	33,816	34,512	30,414
Natural gas plant liquids	thousand 42-gallon barrels	26,583	26,547	27,657	27,925	28,312
Petroleum:						
Crude	do.	960,114	886,092	927,333	917,431	917,355
Lease (field) condensate	do.	NA	2,647	2,563	1,857	2,355
Total	do.	NA	888,739	929,896	919,288	919,710
Refinery products:						
Gasoline:						
Aviation	do.	406	419	418	430	409
Motor, leaded and unleaded	do.	130,084	129,296	134,291	137,044	140,988
Liquefied petroleum gas	do.	60,981	66,912	70,306	75,704	79,530
Jet fuel	do.	12,379	12,625	15,141	16,495	15,886
Kerosene	do.	11,286	9,798	11,009	9,961	9,075
Distillate fuel oil (diesel)	do.	89,726	88,521	84,817	75,465	85,518
Lubricants	do.	2,504	2,386	2,602	2,842	2,780
Residual fuel oil	do.	145,253	147,974	154,939	154,003	155,832
Asphalt	do.	8,360	6,054	6,655	5,463	5,484
Unfinished crude oil[21]	do.	16,954	950	660	—	—
Unspecified	do.	26,208	28,736	31,283	36,150	37,468
Refinery fuel and losses	do.	14,763	10,903	7,560	8,517	6,932
Total	do.	518,904	504,574	519,681	522,074	539,902

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through Dec. 1, 1990.
[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]Mine output is estimated based upon reported concentrate production plus reported smelter output adjusted for 2.5% metal loss to slag.
[7]Includes cathode copper from the Cía. Minera de Cananea S.A. electrowinning plant in metric tons as follows: 1985—8,034; 1986—8,033; 1987—9,662; 1988—11,380 and 1989—10,299.
[8]Secondary refined copper production is estimated to be 16.8% of the total refined copper produced by Cobre de México 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 reported production of Mn carbonate ore and oxide nodules by Cía. Minera Autlán S.A. and reported Mn content of mine production.
[12]Based on exports, composed mostly of pumice stone and emery (a granular, impure variety of corundum).
[13]Both the data series and breakdown by grade are as reported by Instituto Mexicano de la Fluorita for 1985–87 and Consejo de Recursos Minerales for 1988–89 showing run-of-mine production. Data on processed and beneficiated material, as reported by Mexican industry sources for 1988 and 1989 and as presented in the fluorspar chapter of volume I of the Minerals Yearbook, are as follows: Acid grade: 1988—577,000; and 1989—595,000. Metallurgical grade: 1988—251,000; and 1989—266,000.
[14]Reported by Industrias Peñoles S.A. de C.V. as the only major producer.
[15]Nitrogen content of ammonia produced by PEMEX plus liquid nitrogen.
[16]Includes only output used to manufacture fertilizers.
[17]Reported figure.
[18]Series reflects output reported by Industrias Peñoles plus an additional 30,000 tons estimated production by smaller producers.
[19]Excludes that for cement production.
[20]Includes coke made from imported metallurgical coal.
[21]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	1987[r]	1988	Destinations, 1988	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	(2)	—		
Aluminum:				
Oxides and hydroxides	313	459	14	Japan 360; Hong Kong 36; Ecuador 27.
Metal including alloys:				
Scrap	6,727	8,642	8,598	Netherlands 44.
Unwrought	3,058	10,482	9,501	El Salvador 232; Guatemala 200.
Semimanufactures	5,231	7,391	4,185	Cuba 1,152; Costa Rica 619.
Antimony:				
Ore and concentrate	3,108	3,980	3,980	
Oxides	—	60	—	United Kingdom 42; Japan 18.
Ash and residue containing antimony	1,340	—		
Metal including alloys, all forms	63	110	84	Uruguay 13; El Salvador 11.
Arsenic: Oxides and acids	4,559	1,717	1,717	
Beryllium: Metal including alloys, all forms kilograms	—	269	269	
Bismuth:				
Ore and concentrate	(2)	—		
Oxides and hydroxides	2	1	—	All to Brazil.
Metal including alloys, all forms	1,402	1,515	529	U.S.S.R. 500; Belgium-Luxembourg 280.
Cadmium: Metal including alloys, all forms	800	1,373	785	Netherlands 380; Republic of Korea 139.
Chromium:				
Ore and concentrate	—	137	137	
Oxides and hydroxides	2	171	51	Netherlands 78; West Germany 20.
Cobalt: Oxides and hydroxides	18	30	30	
Columbium and tantalum:				
Ore and concentrate including vanadium	—	207	—	Ecuador 102; Cuba 74; Colombia 31.
Metal including alloys, all forms, tantalum	8	1	1	
Copper:				
Ore and concentrate	367,403	346,684	29,082	Japan 88,600; North Korea 58,350; Canada 57,650.
Matte and speiss including cement copper	3	9	9	
Oxides and hydroxides	258	650	625	West Germany 18; China 6.
Sulfate	2,523	2,787	2,787	
Ash and residue containing copper	3,868	(2)	—	All to Guatemala.
Metal including alloys:				
Scrap	14,754	14,062	13,951	United Kingdom 109; Cuba 2.
Unwrought	18,233	38,839	35,843	Venezuela 2,327.
Semimanufactures	34,458	48,717	44,268	Colombia 1,326; Cuba 1,292.
Gold:				
Waste and sweepings value, thousands	$2	—		
Metal including alloys, unwrought and partly wrought kilograms	—	10,645	10,645	
Iron and steel:				
Iron ore and concentrate including roasted pyrite	1,304	12,386	1,822	Spain 10,000; Belgium-Luxembourg 536.

See footnotes at end of table.

TABLE 2—Continued

MEXICO: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987[r]	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued				
Metal:				
Scrap	44,052	21,123	19,624	Japan 1,301.
Pig iron, cast iron, related materials	1,306	162	159	Cuba 2.
Ferroalloys:				
Ferrochromium	—	4,157	3,128	Cyprus 700; Cuba 329.
Ferromanganese	37,451	43,025	32,116	Colombia 6,037; Canada 2,000.
Ferromolybdenum	—	1	1	
Ferrosilicomanganese	2,000	773	773	
Ferrosilicon	52	625	—	Japan 300; Cyprus 201; Cuba 91.
Ferrovanadium	—	3	3	
Silicon metal	—	112	—	All to Cuba.
Unspecified	147	199	43	Cuba 144; Venezuela 7.
Steel, primary forms	193,569	153,483	83,966	Canada 11,329; Argentina 10,340.
Semimanufactures:				
Bars, rods, angles, shapes, sections	392,349	NA		
Universals, plates, sheets	357,783	NA		
Hoop and strip	5,312	NA		
Rails and accessories	36	1,000	472	Venezuela 523; El Salvador 5.
Wire	18,374	NA		
Tubes, pipes, fittings	334,948	359,997	152,462	U.S.S.R. 50,221; Caiman Islands 43,998.
Castings and forgings, rough	70,075	NA		
Lead:				
Ore and concentrate	15,770	12,567	343	Spain 12,224.
Oxides	30,375	27,326	14,546	Japan 8,843; Venezuela 1,051.
Metal including alloys:				
Scrap	3,099	2,291	2,140	Dominican Republic 150.
Unwrought	86,603	105,228	31,713	Japan 22,415; Republic of Korea 18,356.
Semimanufactures	406	840	186	Italy 300; United Kingdom 184.
Lithium: Oxides and hydroxides	—	20	20	
Magnesium: Metal including alloys:				
Unwrought	284	265	238	Cuba 27.
Semimanufactures	3	57	43	Sweden 13; Venezuela 1.
Manganese:				
Ore and concentrate:				
Battery-grade	30,543	5,852	85	Japan 2,000; Colombia 1,622.
Metallurgical-grade	134,762	163,275	70,301	Venezuela 31,661; Canada 26,058.
Oxides	118	129	21	Venezuela 102; Ecuador 6.
Metal including alloys, all forms	—	25,215	15,938	Japan 5,500; Colombia 2,702.
Mercury	121	142	5	Argentina 68; Brazil 64.
Molybdenum:				
Ore and concentrate	4,238	4,542	1,539	Netherlands 1,647; United Kingdom 562.
Metal including alloys, semimanufactures kilograms	681	1,013	268	Brazil 741; Colombia 4.

See footnotes at end of table.

TABLE 2—Continued

MEXICO: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987[r]	1988	Destinations, 1988	
				United States	Other (principal)
METALS—Continued					
Nickel:					
Oxides and hydroxides	kilograms	—	5,444	5,334	Colombia 110.
Metal including alloys:					
Scrap		(2)	14	—	Mainly to Netherlands.
Unwrought		—	120		
Semimanufactures		6	7	6	Japan 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:					
Platinum	kilograms	NA	4,379	4,379	
Rhodium	do.	NA	379	—	All to France.
Iridium, osmium, ruthenium	do.	NA	7	7	
Unspecified	do.	17,920	32,874	32,874	
Selenium, elemental	do.	—	214	—	All to Argentina.
Silicon, high-purity		—	13	—	Do.
Silver:					
Ore and concentrate	value, thousands	$637	$562	$412	Belgium-Luxembourg $150.
Waste and sweepings[3]	do.	$23	—		
Metal including alloys, unwrought and partly wrought	kilograms	1,622,640	1,565,234	966,618	Japan 385,507; United Kingdom 130,482.
Tin:					
Ore and concentrate		10,089	2,861	—	All to Belgium-Luxembourg.
Ash and residue containing tin		—	78	78	
Metal including alloys:					
Scrap		19	6	6	
Unwrought		910	96	96	
Semimanufactures		26	355	209	Cuba 137; West Germany 4.
Titanium:					
Oxides		841	1,650	628	El Salvador 427; Guatemala 298.
Metal including alloys:					
Unwrought		—	(2)	(2)	
Semimanufactures		—	29	26	Hong Kong 2.
Tungsten:					
Ore and concentrate		633	465	464	Brazil 1.
Metal including alloys:					
Unwrought		6	41	20	Sweden 18; West Germany 3.
Semimanufactures		39	25	(2)	West Germany 24; Brazil 1.
Vanadium:					
Ore and concentrate		40	NA		
Ash and residue containing vanadium		1,070	1,193	1,193	
Zinc:					
Ore and concentrate		157,516	142,328	24,764	Belgium-Luxembourg 63,972; Grenada 14,463.
Oxides		24,107	31,313	31,027	Costa Rica 142.
Blue powder		65	291	185	Venezuela 104; Costa Rica 2.

See footnotes at end of table.

TABLE 2—Continued

MEXICO: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1987[r]	1988	Destinations, 1988	
			United States	Other (principal)
METALS—Continued				
Zinc—Continued				
Ash and residue containing zinc	2,599	2,198	1,720	Uruguay 478.
Metal including alloys:				
Scrap	—	457	357	Ecuador 100.
Unwrought	72,044	80,953	59,505	Costa Rica 4,086; Argentina 2,618.
Semimanufactures	20,671	5,519	2,417	Guatemala 603; El Salvador 600.
Zirconium:				
Ore and concentrate	—	10	—	All to Chile.
Metal including alloys, semimanufactures	—	59	59	
Other:				
Ores and concentrates	21	218	89	Cuba 129.
Oxides and hydroxides	974	340	127	France 99; Japan 55.
Ashes and residues	164	496	495	West Germany 1.
Base metals including alloys, all forms	4	4	3	Do.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	12,390	14,904	14,697	El Salvador 95; Dominican Republic 73.
Artificial: Silicon carbide	4,045	3,779	2,430	Japan 1,182; Belgium-Luxembourg 166.
Dust and powder of precious and semiprecious stones including diamond kilograms	187	2	2	
Grinding and polishing wheels and stones	172	163	144	Cuba 12.
Asbestos, crude	40	—		
Barite and witherite	65,794	44,633	44,633	
Boron materials:				
Crude natural borates	3	65	65	
Oxides and acids	(2)	1	—	All to El Salvador.
Cement thousand tons	4,371	4,463	4,100	Caiman Islands 180; Belize 63.
Chalk	2,250	1,483	1,483	
Clays, crude:				
Bentonite	11,846	3,074	1,554	Venezuela 1,306; Colombia 200.
Chamotte earth	NA	31	31	
Fuller's earth	22	720	474	Brazil 245; Nicaragua 1.
Fire clay	NA	111	4	Cuba 100; Guatemala 5.
Kaolin	87	53	—	Colombia 26; Guatemala 16; Ecuador 10.
Unspecified	113	111	11	Brazil 52; Peru 14.
Cryolite and chiolite	51	400	400	
Diamond, natural: Gem, not set or strung carats	—	20,000	20,000	
Diatomite and other infusorial earth	5,905	6,145	844	Belgium-Luxembourg 1,593; Brazil 1,270; Argentina 1,146.
Feldspar, fluorspar, related materials:				
Feldspar	3,845	5,592	5,588	Canada 4.
Fluorspar	474,781	509,443	303,612	Canada 122,404; Netherlands 44,210.
Unspecified	—	131	131	

See footnotes at end of table.

TABLE 2—Continued

MEXICO: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987[r]	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Fertilizer materials:					
Crude, n.e.s.		113	104	104	
Manufactured:					
Ammonia		144,886	434,075	333,282	Mozambique 20,806; Morocco 20,704.
Nitrogenous		175,907	130,889	29,902	Colombia 61,939; Peru 25,961.
Phosphatic		723	5,921	33	Cuba 5,035; Belize 750.
Potassic		23	31	31	
Unspecified and mixed		633	2,853	2,533	West Germany 252; China 25.
Graphite, natural		19,599	22,844	22,684	Spain 150; Panama 10.
Gypsum and plaster	thousand tons	2,184	2,241	1,850	Canada 172; Japan 144.
Iodine		(2)	—		
Lime		53,662	28,458	27,060	Belize 612; Guatemala 610.
Magnesium compounds:					
Magnesite, crude		31	104	86	Argentina 18.
Oxides and hydroxides		39,430	59,076	27,975	Argentina 10,890; Belgium-Luxembourg 7,778.
Meerschaum, amber, jet		20	—		
Mica:					
Crude including splittings and waste		22	(2)	—	All to Cuba.
Worked including agglomerated splittings		58	133	10	Cuba 122; Venezuela 1.
Phosphates, crude		3	15	15	
Phosphorus, elemental		NA	60	60	
Pigments, mineral: Iron oxides and hydroxides, processed		4,890	4,701	3,666	Colombia 234; Canada 140.
Potassium salts, crude		—	1	1	
Precious and semiprecious stones other than diamond:					
Natural	kilograms	43,299	9,775	5,415	Japan 2,323; Spain 1,998.
Synthetic	do.	55	1,818	168	Italy 1,053; West Germany 520.
Quartz crystal, piezoelectric	do.	NA	108	—	All to Switzerland.
Salt and brine	thousand tons	4,841	5,098	1,414	Japan 3,265; Canada 179.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		3,955	45	45	
Sulfate, manufactured		137,901	88,456	65,371	Brazil 11,513; Ecuador 2,179.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		1,930	4,285	904	China 2,227; Spain 337.
Worked		16,957	25,186	24,154	China 244; Panama 93.
Dolomite, chiefly refractory-grade		2,165	2,031	1,601	Panama 310; El Salvador 120.
Gravel and crushed rock		60,680	20,390	20,365	El Salvador 18; Guatemala 4.
Limestone other than dimension		6	—		
Quartz and quartzite		19	2	2	
Sand other than metal-bearing		10,691	59,409	59,345	Guatemala 51; Costa Rica 5.
Strontium minerals: Celestite		39,324	[4]42,159	41,822	Canada 205; Cuba 183.

See footnotes at end of table.

TABLE 2—Continued

MEXICO: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987[r]	1988	Destinations, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sulfur:					
Elemental: Crude including elemental and byproduct	thousand tons	1,435	1,739	1,030	Morocco 490; Tunisia 92.
Dioxide		107	11	—	All to Guatemala.
Sulfuric acid		845	52,758	38,692	Chile 12,800; Panama 1,099.
Talc, steatite, soapstone, pyrophyllite		116	298	272	El Salvador 20; Costa Rica 6.
Vermiculite, perlite, chlorite		295	419	310	Venezuela 61; Colombia 48.
Other:					
Crude		279	NA		
Slag and dross, not metal-bearing		12,220	2,490	2,311	Venezuela 170.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		200,292	39,422	39,304	Guatemala 47; Spain 39.
Carbon black		63,468	69,712	23,497	West Germany 5,766; Bahamas 4,250.
Coal: All grades including briquets		46,643	75,863	75,634	Cuba 228; Guatemala 1.
Coke and semicoke		183	68,366	68,207	Nicaragua 80; Cuba 53.
Peat including briquets and litter		26	15	13	Belize 2.
Petroleum:					
Crude	thousand 42-gallon barrels	490,339	478,263	251,502	Spain 74,921; Japan 63,826.
Refinery products:					
Liquefied petroleum gas	do.	6,094	11,307	9,200	Ecuador 1,112; Panama 339.
Gasoline	do.	3,649	6,119	1,339	Colombia 4,720; Jamaica 42.
Mineral jelly and wax	do.	82	49	49	
Kerosene and jet fuel	do.	4,616	6,467	5,785	Jamaica 682.
Distillate fuel oil	do.	7,409	21,289	3,257	Panama 8,695; Singapore 4,358.
Lubricants	do.	5	2	1	Panama 1.
Residual fuel oil	do.	13,652	16,813	6,145	Bahamas 9,170.
Bitumen and other residues	do.	90	241	241	
Bituminous mixtures	do.	408	58	56	Guatemala 1.
Petroleum coke	do.	442	—		
Unfinished crude oil	do.	1,266	—		
Unspecified	do.	2,026	1,809	1,807	Guatemala 1.

[r]Revised. NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]May include other crude minerals.

leading trading partner. Other important partners were France, Japan, and Spain. About 70% of Mexico's total exports was to the United States, and about 65% of its total imports was from the United States. The mineral trade between the United States and Mexico was just as important to Mexico. In 1988, the last year for which information was available, 60% of Mexico's mineral exports went to the United Sates, and 63% of its mineral imports was from the United States.

Earnings from hydrocarbons exports, including refinery products, accounted for about 35% of total export earnings in 1989. Mexico exported about 57% of its crude oil to the United States. Crude oil exports to Spain and Japan were 15% and 13%, respectively. In addition, 3.5% of the crude oil was exported 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,

TABLE 3

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987[r]	1988	Sources, 1988	
				United States	Other (principal)
METALS					
Alkali and alkaline-earth metals:					
Alkali metals		4,091	4,210	4,186	Netherlands 13; United Kingdom 10.
Alkaline-earth metals		194	232	231	
Aluminum:					
Ore and concentrate		40,225	53,040	44,180	Guyana 8,784; Brazil 76.
Oxides and hydroxides		165,698	194,620	190,185	Brazil 858; West Germany 505.
Ash and residue containing aluminum		773	339	339	
Metal including alloys:					
Scrap		8,890	31,304	31,142	West Germany 106; Austria 20; Cyprus 20.
Unwrought		11,017	16,850	12,322	Canada 3,031; Venezuela 1,430.
Semimanufactures		22,263	31,751	28,326	Brazil 707; West Germany 654.
Antimony:					
Ore and concentrate		—	21	21	
Oxides		28	34	6	West Germany 27; Japan 1.
Metal including alloys, all forms		—	60	55	West Germany 5.
Arsenic:					
Oxides and acids	kilograms	60	20,467	20,421	Switzerland 25; West Germany 20.
Metal including alloys, all forms		86	23	23	
Beryllium: Metal including alloys, all forms		(2)	22	22	
Bismuth: Metal including alloys, all forms	kilograms	27	45	35	NA.
Cadmium: Metal including alloys, all forms		132	121	57	Netherlands 43; Belgium-Luxembourg 21.
Chromium:					
Ore and concentrate		45,016	39,019	8,714	Turkey 23,450; Cuba 6,815.
Oxides and hydroxides		194	638	636	Italy 2.
Metal including alloys, all forms		—	28	19	Italy 8; United Kingdom 1.
Cobalt:					
Oxides and hydroxides		158	136	63	Belgium-Luxembourg 66; United Kingdom 6.
Metal including alloys, all forms		63	111	61	Belgium-Luxembourg 21; Canada 10.
Columbium and tantalum: Tantalum metal including alloys, all forms	kilograms	986	2,481	2,442	Italy 39.
Copper:					
Ore and concentrate		—	6,328	1,976	Chile 4,352.
Oxides and hydroxides		17	53	32	Peru 20; Brazil 1.
Sulfate		10	50	7	Peru 43.
Metal including alloys:					
Scrap		22,105	25,417	25,360	Guatemala 37; West Germany 20.
Unwrought		18,602	20,474	17,450	United Kingdom 1,002; Chile 1,001.
Semimanufactures		6,993	17,886	16,921	France 260; West Germany 166.
Germanium: Metal including alloys, all forms	kilograms	—	1	1	
Gold: Metal including alloys, unwrought and partly wrought	grams	—	7,805	7,768	Italy 35; Japan 2.
Iron and steel:					
Iron ore and concentrate		44,803	484,450	279,950	Brazil 179,914; Venezuela 24,504.

See footnotes at end of table.

TABLE 3—Continued

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987[r]	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Iron and steel—Continued					
Metal:					
Scrap		464,111	834,539	801,183	U.S.S.R. 19,999.
Pig iron, cast iron, related materials		11,442	33,399	30,696	Canada 1,635; Brazil 844.
Ferroalloys:					
Ferrochromium		766	3,528	2,801	United Kingdom 411; Switzerland 138.
Ferrocolumbium		—	180	32	Brazil 148.
Ferromanganese		42	796	795	West Germany 1.
Ferromolybdenum		43	139	101	Netherlands 37; Switzerland 1.
Ferronickel		64	40	30	Canada 10.
Ferrosilicochromium		—	38	38	
Ferrosilicomanganese		65	387	387	
Ferrosilicon		767	4,031	3,771	West Germany 203.
Ferrovanadium		26	48	46	West Germany 2.
Silicon metal		2,406	2,033	1,792	Brazil 181; Netherlands 60.
Unspecified		1,033	1,133	982	Brazil 57; Italy 43.
Steel, primary forms		30,615	87,277	61,752	West Germany 7,659.
Semimanufactures:					
Bars, rods, angles, shapes, sections		23,847	NA		
Universals, plates, sheets		163,491	NA		
Hoop and strip		4,230	NA		
Rails and accessories		86,124	168,103	126,618	Canada 12,373; Argentina 12,159.
Wire		3,152	NA		
Tubes, pipes, fittings		25,287	84,458	47,111	West Germany 16,435; Japan 7,109.
Unspecified		16,664	NA		
Lead:					
Ore and concentrate		—	22,846	15,859	Peru 6,987.
Oxides		19	17	16	West Germany 1.
Ash and residue containing lead		—	107	107	
Metal including alloys:					
Scrap		2,300	4,337	4,337	
Unwrought		44	193	193	
Semimanufactures		292	328	322	West Germany 6.
Lithium: Oxides and hydroxides		217	225	225	
Magnesium: Metal including alloys:					
Scrap		10	8	8	
Unwrought		693	921	820	Norway 100; Canada 1.
Semimanufactures		128	133	129	West Germany 2; Belgium-Luxembourg 1.
Manganese:					
Ore and concentrate		44,670	140,333	46,494	Panama 73,168; Switzerland 16,157.
Oxides		1,722	1,962	1,154	Japan 493; Brazil 147.
Metal including alloys, all forms		—	130	129	Switzerland 1.
Mercury	kilograms	69	353	327	West Germany 25; Japan 1.

See footnotes at end of table.

TABLE 3—Continued

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987[r]	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Molybdenum:					
Ore and concentrate		19	10	10	
Oxides and hydroxides		38	19	19	
Metal including alloys:					
Unwrought		31	89	79	Austria 10.
Semimanufactures		13	21	16	Netherlands 4.
Nickel:					
Ore and concentrate		—	15	—	All from Cuba.
Matte and speiss		2,233	982	287	Canada 369; West Germany 177.
Oxides and hydroxides		81	32	11	Canada 21.
Ash and residue containing nickel		111	1,180	1,180	
Metal including alloys:					
Unwrought		4	998	204	Belgium-Luxembourg 453; Canada 341.
Semimanufactures		873	1,240	778	Canada 144; Netherlands 136.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:					
Palladium	grams	10,265	12,367	6,252	Switzerland 6,115.
Platinum	do.	11,119	56,841	56,811	Switzerland 22; Italy 8.
Rhodium	value, thousands	$24	$45	$45	
Iridium, osmium, ruthenium	grams	25	1,037	1,037	
Rare-earth metals including alloys, all forms	kilograms	3,317	63	63	
Selenium, elemental		66	8	8	
Silicon, high-purity		NA	560	392	West Germany 108; Brazil 60.
Silver:					
Waste and sweepings[3]	value, thousands	(2)	$165	$164	Panama $1.
Metal including alloys, unwrought and partly wrought	kilograms	126,797	878	779	Switzerland 69; France 16.
Tellurium, elemental	do.	634	10	10	
Tin:					
Ore and concentrate		3,687	3,416	2,602	Chile 496; Hong Kong 266.
Oxides		11	528	523	Italy 3; United Kingdom 2.
Ash and residue containing tin		3,574	2,586	2,586	
Metal including alloys:					
Scrap		140	467	390	Brazil 77.
Unwrought		44	200	200	
Semimanufactures	kilograms	6,000	29,767	28,815	Argentina 470; United Kingdom 199.
Titanium:					
Ore and concentrate		44,562	29,102	15,993	Australia 13,109.
Oxides		1,197	1,719	573	West Germany 665; Belgium-Luxembourg 272.
Metal including alloys:					
Unwrought including scrap		—	27	27	
Semimanufactures		3	110	88	Italy 19.

See footnotes at end of table.

TABLE 3—Continued

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987[r]	1988	Sources, 1988	
				United States	Other (principal)
METALS—Continued					
Tungsten:					
Ore and concentrate	kilograms	155	13	13	
Metal including alloys:					
Unwrought		28	46	33	Austria 12.
Semimanufactures		47	28	25	Brazil 1; Netherlands 1.
Uranium and thorium:					
Ore and concentrate		—	9	9	
Oxides and other compounds	kilograms	—	294	294	
Vanadium:					
Oxides and hydroxides		346	163	163	
Metal including alloys, all forms	kilograms	—	24	24	
Zinc:					
Ore and concentrate		—	8,067	67	Honduras 8,000.
Oxides		100	4,074	2,260	Netherlands 1,774.
Blue powder		272	177	177	
Ash and residue containing zinc		NA	10,849	10,849	
Metal including alloys:					
Scrap		1,205	1,030	1,030	
Unwrought		2	104	40	West Germany 53; Italy 11.
Semimanufactures		211	785	741	Japan 31; Brazil 9.
Zirconium:					
Ore and concentrate		771	69	69	
Metal including alloys, all forms	kilograms	—	478	456	China 22.
Other:					
Ores and concentrates		296	19,963	2,352	Peru 14,920; Honduras 2,500.
Oxides and hydroxides		366	347	291	West Germany 22; France 20.
Ashes and residues		4,991	9,797	9,715	Ghana 50; Canada 31.
Base metals including alloys, all forms		315	327	275	Australia 43.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		925	754	707	West Germany 45.
Artificial:					
Corundum		353	3,260	688	Austria 907; Brazil 804.
Silicon carbide		138	464	257	Norway 154; West Germany 41.
Dust and powder of precious and semiprecious stones excluding diamond	kilograms	827	114	12	China 102.
Grinding and polishing wheels and stones		387	1,993	1,820	West Germany 46; Canada 22.
Asbestos, crude		38,377	14,209	3,920	Canada 6,609; Brazil 1,658.
Barite and witherite		88	81	63	West Germany 17.
Boron materials:					
Crude natural borates		762	815	810	Peru 5.
Oxides and acids		2,733	2,806	2,538	Italy 213; Chile 54.
Bromine		146	192	186	Israel 5; Netherlands 1.

See footnotes at end of table.

TABLE 3—Continued

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987[r]	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Cement		9,978	11,472	10,136	France 551.
Chalk		3	66	66	
Clays, crude:					
Bentonite		2,162	2,950	2,943	West Germany 4; United Kingdom 3.
Chamotte earth	kilograms	—	3,070	2,996	Ecuador 74.
Fuller's earth		—	1	1	
Fire clay		145,541	167,503	166,845	Canada 506.
Kaolin		98,546	110,688	110,315	Spain 203.
Unspecified		1,162	2,503	2,497	Japan 6.
Cryolite and chiolite		653	104	41	Denmark 62; Switzerland 1.
Diamond, natural:					
Gem, not set or strung	carats	110	7,485	7,230	Belgium-Luxembourg 255.
Industrial stones	do.	4,280,000	1,300,000	1,130,000	Japan 50,000; West Germany 40,000.
Dust and powder	kilograms	7,760	681	654	Belgium-Luxembourg 25; Italy 1.
Diatomite and other infusorial earth		422	595	584	United Kingdom 10.
Feldspar, fluorspar, related materials:					
Feldspar		581	522	504	Switzerland 11; West Germany 7.
Fluorspar		19,612	46,400	45,934	Kenya 466.
Unspecified		10,325	14,635	14,331	Canada 302; West Germany 2.
Fertilizer materials:					
Crude, n.e.s.		298	378	378	
Manufactured:					
Ammonia		102,428	30,064	30,064	
Nitrogenous		138,986	42,120	4,489	U.S.S.R. 27,100; Israel 6,020.
Phosphatic		24,301	6,031	6,031	
Potassic		81,807	155,723	62,501	Canada 34,393; West Germany 31,329.
Unspecified and mixed		60,991	41,347	9,026	Spain 15,790; Denmark 15,750.
Graphite, natural		399	1,181	977	West Germany 85; Brazil 78.
Gypsum and plaster		5,660	34,322	34,308	Italy 14.
Iodine		207	174	127	Japan 18; West Germany 15.
Kyanite and related materials:					
Andalusite, kyanite, sillimanite		—	293	253	West Germany 40.
Mullite		1,529	2,055	1,956	Brazil 99.
Lime		1,771	27,393	27,392	France 1.
Magnesium compounds:					
Magnesite, crude		637	136	130	West Germany 5.
Oxides and hydroxides		222	14,861	11,719	Brazil 3,000.
Sulfate		47	NA		
Mica:					
Crude including splittings and waste		58	153	137	West Germany 13; Switzerland 3.
Worked including agglomerated splittings		43	77	71	Spain 3; Switzerland 1.
Nitrates, crude		NA	2,845	2,700	Chile 145.
Phosphates, crude	thousand tons	1,345	1,490	482	Morocco 1,008.

See footnotes at end of table.

TABLE 3—Continued

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987[r]	1988	Sources, 1988	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Phosphorus, elemental		4,797	3,493	3,065	Belgium-Luxembourg 380.
Pigments, mineral:					
Natural, crude		154	247	10	Spain 236.
Iron oxides and hydroxides, processed		358	1,299	1,259	West Germany 22.
Potassium salts, crude		77,437	80	80	
Precious and semiprecious stones other than diamond:					
Natural	kilograms	902	4,583	3,337	Thailand 750; Brazil 490.
Synthetic	grams	643	39,771	22,965	Thailand 13,979; Switzerland 2,769.
Pyrite, unroasted		98	182	64	West Germany 118.
Quartz crystal, piezoelectric	kilograms	16	1,965	1,921	West Germany 44.
Salt and brine		538	1,061	980	West Germany 81.
Sodium compounds, n.e.s.:					
Soda ash, manufactured		85,287	80,317	80,317	
Sulfate, manufactured		14	12,464	12,064	East Germany 400.
Stone, sand and gravel:					
Calcite, common		1339	—		
Dimension stone:					
Crude and partly worked		1,851	3,912	1,342	Italy 1,421; Guatemala 690.
Worked		8,789	13,173	12,331	Italy 440; Guatemala 156.
Dolomite, chiefly refractory-grade		1,369	5,376	5,354	Guatemala 22.
Gravel and crushed rock		3,099	3,619	3,165	France 210; United Kingdom 193.
Quartz and quartzite		630	5,223	174	Canada 5,027.
Sand other than metal-bearing		64,426	70,468	70,345	Venezuela 50.
Sulfur:					
Elemental:					
Crude including native and byproduct		448,566	604,145	313,323	Canada 290,822.
Colloidal, precipitated, sublimed		75	1,133	1,127	West Germany 5.
Dioxide		—	8	8	
Sulfuric acid		13,850	69,616	69,335	Guatemala 281.
Talc, steatite, soapstone, pyrophyllite		93,404	107,588	107,014	France 192; Italy 141.
Vermiculite, perlite, chlorite		942	507	507	
Other:					
Crude		10,800	18,598	11,636	West Germany 6,633.
Slag and dross, not metal-bearing		36,967	50,809	44,962	Bahamas 5,847.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		927	1,914	1,914	
Carbon:					
Carbon black		2,342	3,530	3,008	West Germany 420.
Gas carbon		—	1	1	
Coal:					
Lignite including briquets		3,200	4,233	4,233	
All grades including briquets		20,163	76,242	76,187	Canada 55.
Coke and semicoke		88,601	149,470	79,075	Panama 63,415; Belgium-Luxembourg 4,335.

See footnotes at end of table.

TABLE 3—Continued

MEXICO: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1987[r]	1988	Sources, 1988	
				United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS—Continued					
Gas, natural, gaseous	thousand cubic meters	60,721	67,940	67,940	
Peat including briquets and litter		40	107	107	
Petroleum refinery products:					
Liquefied petroleum gas	thousand 42-gallon barrels	5,866	6,021	6,021	
Gasoline	do.	1,872	621	621	
Mineral jelly and wax	do.	273	315	256	Brazil 46.
Kerosene and jet fuel	do.	557	(2)	(2)	
Distillate fuel oil	do.	—	(2)	(2)	
Lubricants	do.	1,911	1,657	1,616	Netherlands 31.
Residual fuel oil	do.	17,200	20,720	14,772	Peru 2,644; Ecuador 1,262.
Bitumen and other residues	do.	11	12	12	
Bituminous mixtures	do.	1,930	1	1	
Petroleum coke	do.	424	729	728	West Germany 1.

[r]Revised. NA Not available.
[1]Table prepared by P. J. Roetzel.
[2]Less than 1/2 unit.
[3]May include other precious metals.

graphite, gypsum, salt, sodium sulfate, and sulfur.

STRUCTURE OF THE MINERAL INDUSTRY

Under the 1917 Mexican Constitution, minerals are 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 limited foreign participation in the mining of iron ore, phosphate rock, potassium, and sulfur to 34%. The 1975 Mining Law gave the Government more control over mining activities. It also gave exclusive rights in the exploration and the production of iron ore, phosphate rock, potassium, sulfur, and uranium to the Government.

In 1989, the nonfuel mineral sector in Mexico was formed by 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 participation.

The Government's participation in the mineral sector continued to be strong under the policy guidance and coordination of SEMIP. Three SEMIP autonomous agencies, Comisión de Fomento Minero (CFM), Consejo de Recursos Minerales (CRM), and 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. CRM, formed in 1976, was given the responsibility for mineral exploration and statistics. FMNM's functions were to promote the development, mining, and processing of the industrial mineral (nonmetal) sector. Both CFM and FMNM participated in the production of minerals through majority or minority ownership of mineral companies. At yearend 1989, SEMIP was planning to merge those two agencies.

The Dirección de Minas, as part of SEMIP's Subsecretaría de Minas e Industria Básica, was given control of the 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, 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 companies and the Government 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 terms of private companies, four large companies dominated the production of nonfuel minerals. These were Corporación Industrial San Luis S.A. de C.V. (San Luis), Empresas Frisco S.A. de C.V. (Frisco), Grupo Industrial Minera México S.A. de C.V. (IMMSA), and Industrias Peoles S.A. de C.V. (Peñoles).

Direct employment in the mining sector in 1989 increased to 242,000 persons,

TABLE 4

MEXICO: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities[1]	Capacity (thousand metric tons per year unless otherwise specified)
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. (Fideicomiso de Fomento Minero[2])	Mazatán, Son.	165.
Do.	Minera Capela S.A. (Peñoles, 100%)	La Minita Mine, Mich.	150.
Cement	Cementos Mexicanos S.A. (Private Mexican, 100%)	Monterrey, N.L., Torreón, Coah., Huichapan, Hgo.; Valles, S.L.P.; Antotonilco, Hgo.; Zapotiltic, Jal.; Tolteca, Hgo.; and Mixcoac, Mex.	19,800.[3]
Do.	Cementos Anahuac S.A. (Cementos Mexicanos, 100%)	México, D.F., and Tamuín, S.L.P.	4,500.
Do.	Cementos Cruz Azul S.C.L. (Private Mexican, 100%)	Cruz Azul, Hgo. and Laganeas, Oax.	3,900.
Do.	Cementos Apasco S.A. (Holderbank, 49%)	Mexico, Tabasco	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.[5] (Medimsa, 85%; Grupo IMMSA, 9.8%; Other and Workers Union, 5.2%)	La Caridad Mine and smelter Nacozari de García, Son.	150.
Do.	Mexicana de Cananea S.A. (Mexicana de Cobre, 76%; ACEC Union Miniere S.A. [Belgium], 21%; Other, principally the Workers Union, 3%)	Mine/smelter at Cananea, Son.	170.
Ferroalloys and manganese	Cía. Minera Autlán S.A.[6]	Mines at Molango and Nonoalco, Hgo.	500 (manganese).
Do.	do.	Plants in Puebla and Tamos, Ver.	185 (ferroalloys).
Fluorspar	Cía. Minera Las Cuevas S.A. (Grupo Industrial Camesa S.A.)[7]	Salitrera (Zaragoza), S.L.P.	520.
Do.	Fluorita del Río Verde S.A. (Industrias Peñoles S.A., 60%, International Minerals, 40%)	Río Colorado and Rio Verde Mines, S.L.P.	160.
Gold	Cía. Fresnillo S.A. (Peñoles, 60%; AMAX, 40%)	Fresnillo Mine, Zac.	1,866.[8]
Do.	Minas de San Luis S.A. (Industrias Luismín, 100%)	Tayoltita, Durango	1,400.[8]
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.
Lead and zinc	México Desarollo Industrial Minero S.A. de C.V. (Grupo IMMSA, 66%; ASARCO Incorporated (United States), 34%)	Charcas, S.L.P.; San Martín, Zac.; Santa Eulalia, Chih.; Taxco, Gro.; Rosario, Sin.; Lead smelter at Chih., lead refinery at Monterrey, N.L., zinc refinery 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. Metallurgical complex at Torreón with silver, lead, and zinc smelters and/or refineries operated by Met-Mex Peñoles (Peñoles, 100%)	50 (lead). 60 (zinc).

See footnotes at end of table.

TABLE 4—Continued

MEXICO: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities[1]	Capacity (thousand metric tons per year unless otherwise specified)
Molybdenum	Mexicana de Cobre S.A. (Medimsa, 85%; Grupo IMMSA, 9.8%; Other and Workers Union, 5.2%)	La Caridad Mine, Molybdenum Plant, Son.	6.
Do.	Minera Cumobabi S.A. de C.V. (Empresas Frisco S.A., 100%)	Cumpas, Son.	2.
Petroleum[9]	Petróleos Mexicanos (PEMEX) (Government, 100%)	Comalcalco, Poza Rica, and Golfo de Campeche districts	3,500.[10]
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	Industrias Peñoles S.A. C.V.[11]	Naica, Chih.; Fresnillo, Zac.; Las Torres, Gto., Cuale, Jal. La Negra, Qro; La Encantada, Coah.; La Minita, Mich. Refinery at Torreón, Coah.	654,000.[8]
Do.	Desarrollo Industrial Minero S.A. (Grupo IMMSA, 66%, ASARCO Incorporated [United States], 34%)	San Martín Mine, Sombrerete, Zac.; Taxco, Gro.; Charcas, S.L.P.; Santa Eulalia, Chih. Refinery at Monterrey, N.L.	467,000.[8]
Do.	Minera Real de Angeles S.A. de C.V. (Frisco, 51%; Placer Development Ltd. of Canada, 49%)	Open pit mine and concentrator at Noria de Angeles, Zac.	373,000.[8]
Sodium carbonate	Sosa Texcoco S.A. (Private Mexican, 100%)	Lake Texcoco, Mex. from subsurface brines	200.
Sodium sulfate	Química Magna S.A. de (Grupo Penoles, 100%)	Subsurface brines at Laguna del Rey, Coah.	350.
Steel	Altos Hornos de México S.A. (AHMSA), (Subsidiary of Siderúrgica 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 Col.	1,800.
Do.	Siderúrgica Lázaro Cárdenas—Las Truchas S.A. (SICARTSA) (SIDERMEX Unit) (Government, 100%)	Port of Lázaro Cárdenas, Mich.	1,300.
Iron ore	Consorcio Minero Benito Juárez-Peña Colorada (Federal Government, Comision de Fomento Minero and SIDERMEX, 55%; HYLSA, 28.5%; TAMSA, 16.5%)	Peña Colorada Mine, and pellet plant near Manzanillo, Col.	3,000.
Do.	Siderúrgica Lázaro Cárdenas-Las Truchas S.A. (SICARTSA) (Grupo SIDERMEX, 100%)	Ferrotepec, Volcán, and Mango deposits in Las Truchas project area, and pellet plant, Mich.	1,900.
Strontium (celestite)	Cía. Minera La Valenciana (Private Mexican, 100%)	San Agustín Mine, Coah.	50.
Sulfur	Azufrera Panamericana S.A. (APSA)[12] (Government-Fomento Minero, 96%)	Coachapa, Patapa, Jáltipan, Ver.	1,230.
Do.	Cía. Exploradora del Istmo S.A. [Fomento Minero, 66%; Texasgulf Inc. (France), 34%].	Texistepec, Ver.	750.
Tin[13]	Metales Potosí S.A.	San Luis Potosí, S.L.P.	6.4.
Do.	Estaño Electro S.A.	Tlalnepantla, Mexico, D.F.	1.3.
Do.	Fundidora de Estaño S.A.	San Luis Potosí, 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.), Michoacán (Mich.), Nuevo León (N.L.), Oaxaca (Oax.), Querétaro (Qro.), San Luis Potosí (S.L.P.), Sinaloa (Sin.), Sonora (Son.), Veracruz (Ver.), and Zacatecas (Zac.).
[2]Formerly Fideicomiso de Minerales No-Metálicos Mexicanos.
[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, Comisión Federal de Electricidad, Nacional Financiera, and AMSHA. Private equity is by Grupo IMMSA.
[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]Camesa S.A. de C.V. is owned by Private Mexican (59.4%) and Noranda Inc. of Canada (40.6%).
[8]Kilograms.
[9]Thousand 42-gallon barrels per day.
[10]PEMEX operates nine refineries with an installed capacity of 1.68 million barrels per day.
[11]Includes capacity from Cía Fresnillo S.A. de C.V.
[12]Handles all exports of sulfur including sulfur recovered by PEMEX.
[13]Smelter output from mostly imported concentrated.

a 5% increase from that of the previous year, representing slightly less than 1% of the 26,000,000 estimated work force.

The production of crude oil, natural gas, and basic petrochemicals was reserved for the Government operating through PEMEX, the Government-owned monopoly. PEMEX also operated nine refineries throughout the country. Direct employment in PEMEX at year-end was about 170,000.

COMMODITY REVIEW

Metals

Copper.—In 1989, mine production of copper decreased about 9% from that of 1988. Production from Mexicana de Cobre S.A.'s La Caridad, Mexico's largest copper mine, increased about 15% and represented about 56% of the total copper output. In 1988, Mexicana de Cobre's share was only 45% of the total. Production from Cananea, Mexico's second largest mine, decreased about 35% and represented 33% of the total. In terms of output share, this represents a 12% decrease for Cananea from that of 1988. Cananea's decreased output was due to an 89-day mine shutdown after the Government, in August, declared the mine bankrupt and a subsequent strike by the union. The mine reopened on November 8 under conditions that included a work force reduction by 710 to 2,200, a 33% wage increase for union members, and the restructuring of the labor contract. Originally, the workers had demanded a 60% salary increase.

Iron and Steel.—Mexico was the second largest producer of steel in Latin America after Brazil. Together, Brazil and Mexico produced 77% of the Latin American output. Mexico's share of the Latin American output was 18.5%. Mexico's production of crude steel increased slightly (less than 2%) from that of 1988 to 7.9 million tons, but did not achieve the planned level of 8.1 million tons because of work stoppages resulting from labor disputes at some facilities. About 53% of the steel production was from Altos Hornos de México S.A. (AHMSA) and Siderúrgica Lázaro Cárdenas-Las Truchas S.A. (SICARTSA), both controlled by the Government-owned parastatal Siderúrgica Mexicana (SIDERMEX). Those two companies, however, controlled their own marketing and administration. In the private sector, the leading producer was Hylsa de México S.A. (HYLSA) in Monterrey, with an output of 1.8 million tons, second only to AHMSA, which produced about 2.9 million tons. 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 468,000 tons. TAMSA's most important domestic client was PEMEX.

Mexico exported 1.5 million tons of semifinished and finished steel products with a value of $849 million, while it imported 779,000 tons of semifinished and finished products with a value of $796 million.

During the year, the Voluntary Restraint Agreement (VRA) between Mexico and the United States was extended. Under the VRA renewal, Mexico's export limits to the United States were adjusted upward for the initial VRA period of October 1989 through December 1990 to 0.95% of the U.S. apparent consumption, from 0.03% for the 5-year period ending in September 1989. After December 1990, a further adjustment upward to 1.1% of apparent consumption was to be applied for the duration of the agreement through March 1992. Because of the VRA, Mexican steel exports to the United States have decreased significantly. In 1983, the year preceding the VRA, Mexico's exports of steel products to the United States were about 74% of the total steel product exports. In 1988, the last year for which information was available, exports of steel products to the United States represented only 28% of the total.

Lead and Zinc.—Mine production of lead continued to decrease, while the production of zinc increased about 8% from that of 1988. Both metals continued to be important to the Mexican mining industry. Mine production of zinc ranked second in terms of value, ahead of silver. Mine production of lead ranked fifth in terms of value, ahead of gold. Mexico produced 4% of the world mine output of lead and 5% of the zinc, ranking seventh in the production of both metals. 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 Peoles. Exports of lead were mainly destined to the United States, Japan, the Republic of Korea, and Spain. The three leading recipients of Mexican zinc were the United States, Belgium-Luxembourg, and Greece.

Silver.—Mexico was the world's leading producer of silver in 1989. Mine production was 2.3 million kilograms, about 16% of the total world output. However, production decreased for the second consecutive year. The top producers were Peoles (739 tons, 326 of which was from Cía. Fresnillo S.A. de C.V.), IMMSA (394 tons), and Frisco (385 tons, 268 of which was from Real de Angeles S.A. de C.V.).

Industrial Minerals

Celestite.—Mexico was the second largest producer of celestite in 1989 after Turkey (production data from the U.S.S.R. were not available, so it was not included in the world total). Mexico produced about 25% of the world's celestite, and there were plans for capacity expansion. Mexico's leading producer was Minera la Valenciana S.A., with an underground mine in Martí, Coahuila, and a strontium carbonate plant in Torreón, also in Coahuila. The second leading producer of celestite in Mexico was Sales y Oxidos S.A. in Monterrey.

Cement.—Mexico was the 12th largest producer of cement in 1989. With 29 plants, it produced 2% of the world's cement. In July, the largest company, Cementos de México S.A. de C.V. (CEMEX), purchased Cementos Tolteca S.A.'s four plants, two in Hidalgo, one in Jalisco, and one in Sonora. With this purchase, CEMEX (which previously owned 12 plants with about 51% of the 34-million-ton capacity) increased its national capacity share to 68%. Cementos Apascos S.A., 49% owned by Holderbank of Switzerland, and Cementos Cruz Azul S.C.L., a cooperative, followed in importance in terms of capacity in the Mexican cement industry. In addition, nine independent companies had the remaining 12.5% of the cement capacity. Mexico was the second largest exporter of cement worldwide after Greece. It exported about 4 million tons of cement to the United States in 1989, a slight decrease from that of 1988. Mexico has replaced Canada as the leading cement supplier to the United States.

With the purchase of Cementos Tolteca, CEMEX acquired the U.S.-based company Blue Circle Western Inc. in Phoenix, Arizona. CEMEX also purchased the four

TABLE 5

MEXICO: PRODUCTION OF CRUDE STEEL, BY COMPANY

(Thousand metric tons)

Group and company	1987	1988	1989[p]
Government-owned companies:			
Siderúrgica Mexicana (SIDERMEX) Group Altos Hornos de México S.A. (AHMSA)	3,086	3,083	2,862
Siderúrgica Lázaro Cárdenas-Las Truchas S.A. (SICARTSA)	1,190	1,131	1,336
Total	4,276	4,214	4,198
Private companies:			
Tubos de Acero de México S.A. (TAMSA)	485	540	468
Hylsa de México S.A. (HYLSA)	1,662	1,710	1,810
Others	1,219	1,315	1,444
Total	3,366	3,565	3,722
Grand total	7,642	7,779	7,920

[p]Preliminary.

Source: Cámara Nacional de la Industria del Hierro y del Acero, Informe Anual 1989, México, D.F.

TABLE 6

MEXICO: PRODUCTION OF FINISHED STEEL, BY PRODUCT TYPE

(Thousand metric tons)

Product type	1987	1988	1989[p]
Castings and forgings	42	88	100
Rolled products:			
Flat-rolled	2,362	2,531	2,669
Nonflat products	3,310	3,335	3,285
Seamless tubes	282	341	345
Total	5,996	6,295	6,399

[p]Preliminary.

Source: Cámara Nacional de la Industria del Hierro y del Acero, Informe Anual 1989. México, D.F.

companies that form Sunstar Cement in Houston, Texas. CEMEX also became the sole owner of Southwestern Sunbelt Cement, of which it already owned 50%, and purchased Pacific Coast Cement Corp. in Los Angeles, California.

Fluorspar.—Mexico ranked third in the production of fluorspar after China and Mongolia. A leading producer since 1956, in 1989, Mexico produced about 14% of the world's total. About two-thirds of the fluorspar produced by Mexico was destined for export. The United States was the leading importer of Mexican fluorspar. Mexican fluorspar was also imported by Canada, Europe, and Japan.

The leading Mexican producer of fluorspar was Cía. Minera Las Cuevas in San Luis Potosí State, a subsidiary of Grupo Industrial Camesa S.A. de C.V. (40.6% owned by Noranda Inc.). The company's capacity, in 1989, was 320,000 tons of acid-grade fluorspar and 200,000 tons of metallurgical-grade. However, the company was working on an expansion program to increase the production capacity to 750,000 tons. The second leading producer of fluorspar in Mexico was Fluorita Río Verde, also in San Luis Potosí, owned by Peoles.

Graphite.—The Government entity Fideicomiso de Minerales No-Metálicos Mexicanos sold the mine Grafito de México to the private sector. The mine, in Telixtlahuaca, Oaxaca State, and in operation since 1980, produces about 1,800 tons of flake graphite per year. About 66% of the production is exported to the United States and Spain. Reportedly, the mine was sold for $5.7 million. The new owner, Minerales Mexicanos No-Metálicos S.A., has specialized in the production of barite, bentonite, kaolin, and phosphate rock.

Mineral Fuels

Hydrocarbons continued to dominate Mexico's energy sector. Production of crude oil and natural gas in 1988 (the last year for which 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 sugar cane (4.9%), geothermal (0.6%), and hydroelectric (2.6%).

Coal.—Production (run of mine) of steam and metallurgical coal decreased about 5% from that of 1988 to 9.98 million tons. About 38% of the total was from Minera Carbonífera Río Escondido, which was owned mainly by the Government, and 33% of the production was from Minerales Monclova, a subsidiary of Altos Hornos de México S.A.

Natural Gas and Petroleum.—The extraction of oil and natural gas, the refining of oil, the manufacturing of basic petrochemical products, and the distribution of petroleum and petroleum products are activities reserved for the Mexican Government through PEMEX.

Worldwide, Mexico, in 1989, ranked eighth and seventh in the production of natural gas and oil, respectively. In terms of reserves, it ranked 8th for oil and 14th for natural gas. Internationally, PEMEX (as a company) ranked third in the production of crude and fourth in the production of natural gas. The company, in terms of sales, was 15th worldwide, with a total of $13 billion. In 1989, Mexican production of oil, including lease (field) condensate, increased slightly. Production of gross natural gas increased about 2%. However, production of marketable natural gas decreased about 12% from that of 1988. Total production of refinery products increased slightly.

For administrative purposes and reporting simplification, Mexico's national territory has been geographically divided into five zones, North, Central,

TABLE 7

MEXICO: PROVEN HYDROCARBON RESERVES

(Million 42-gallon barrels unless otherwise specified)

Zone	Dry natural gas (billion cubic meters)	Liquid hydrocarbons				
		Crude oil	Condensate	Dry natural gas-liquid equivalent	1988 total	1989 total
1988 total	2,077	46,191	6,321	14,588	67,600	XX
1989:						
Marine (Bay of Campeche)	320	25,494	2,929	2,254	31,509	30,677
Chicontepec	756	10,898	1,320	5,337	17,560	17,555
Southeast	640	6,695	1,918	4,490	13,289	13,103
South	28	669	59	198	1,039	956
Central	97	1,060	248	639	1,969	1,947
North[1]	220	434	259	1,549	2,225	2,242
Total[2]	2,060	45,250	6,733	14,467	XX	66,450

XX Not applicable.
[1]Includes Northeastern Frontier.
[2]Data may not add to totals shown because of independent rounding.

Source: Petróleos Mexicanos S.A., Statistical Yearbook 1990, México, D.F.

TABLE 8

MEXICO: PETROLEUM AND NATURAL GAS PRODUCTION

Zone and District	Natural gas (million cubic meters)			Crude oil[1] (thousand 42-gallon barrels)		
	1987	1988	1989	1987	1988	1989
Marine Zone:						
Bay of Campeche	10,015	10,385	11,152	615,475	617,413	635,757
Southeastern Zone:						
Villahermosa[2]	18,201	18,261	18,005	238,243	230,724	217,102
Comalcalco District	165	135	145	5,003	4,596	4,490
Ciudad Pemex	1,685	1,700	1,809	24	64	36
Total[3]	20,051	20,096	19,958	243,270	235,384	221,628
South Zone:						
Agua Dulce District	692	736	692	14,825	15,305	14,929
El Plan District	568	497	465	10,416	9,772	7,629
Nanchital District	21	31	21	1,300	1,359	1,314
Total[3]	1,282	1,264	1,178	26,542	26,435	23,871
Central Zone:						
Poza Rica	702	549	506	23,966	20,933	19,382
Papaloapan Basin	589	591	1,044	2,364	1,749	1,679
Nueva Faja de Oro	—	—	—	—	—	—
Total[3]	1,292	1,140	1,550	26,330	22,682	21,061
North Zone:						
Northern District	486	466	424	9,006	8,875	8,505
Southern District	227	218	196	6,635	6,586	6,424
Northeastern Frontier District	2,801	2,477	2,460	76	56	110
Total[3]	3,514	3,161	3,080	15,717	15,517	15,038
Grand total	36,154	36,046	36,919	927,333	917,431	917,355

[1]Does not include condensate.
[2]Referred to as Mesozoic.
[3]Data may not add to totals shown because of independent rounding.

Sources: Petróleos Mexicanos, Memoria de Labores, 1987 and 1988, and Statistical Yearbook 1990, México, D.F.

South, Southeast, and Marine. Oil- and gas-producing fields are found in each of the five zones. The most important producing zones in 1989, the Marine and Southeast Zones, produced 69% and 24% of the total Mexican crude oil, respectively. Those two zones also dominated the production of natural gas. The Southeast Zone, mostly the Villahermosa Field, produced 49% of the natural gas output in 1989. The Marine Zone (Bay of Campeche) accounted for 30% of total natural gas output for the year.

During the year, Petróleos Mexicanos Internacional (PMI) was created to market crude oil and refinery products for PEMEX in international markets. Although PMI planned to enter the spot market, its participation in this market would be limited. Mexico planned to continue to concentrate its marketing efforts on long-term contracts.

In 1989, PEMEX renewed its contract to supply Isthmus and Maya crude to Japan. The new contract specifies the supply of 120,000 barrels per day of Isthmus and 30,000 barrels per day of Maya, a slight decrease from Isthmus levels specified in the old contract. The company also signed various agreements with Spain's largest petroleum company, Repsol S.A., to supply 150,000 barrels per day of Maya (heavy crude) to the Spanish market.

A 48-inch, 265-kilometer (km) pipeline to carry light crude across the Isthmus of Tehuantepec from the Nuevo Teapa pumping station to the Salina Cruz refinery on the Pacific coast was near completion in 1989. Construction of the pipeline began in 1987, with the financial support of $500 million from Japan's Export-Import Bank. The existing 30-inch pipeline will be used to transport heavier Maya oil (22°API) to the refinery, which uses a blend of heavy and light oil grades.

Reserves

The minerals 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, with about 15% and 13% of total world reserves, respectively. The country was among the top five reserve holders of antimony (4%), bismuth (6%), cadmium (7%), fluorspar (8%), mercury (4%), and selenium (5%). In reserves of lead and zinc, Mexico ranked sixth (4% each), and seventh (4%) and eighth (1%) for copper and manganese, respectively.

INFRASTRUCTURE

Mexico had 20,680 km of railroads, 19,950 km of which was 1.435-meter gauge and 730 km of 0.914-meter 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 country had 11 ports and 2,900 km of navigable rivers and coastal canals. Of the country's 68 ships in the merchant marine, 49 were available for the transportation of mineral products.

Most ore and metallurgical products in Mexico were transported by truck. 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 1989, PEMEX owned and operated almost 60,000 km of pipelines. About 30,031 km of the pipelines was for the collection of hydrocarbons at the wellhead. Of the 403 specialized pipelines 102 (13,166 km) were used for gas, 57 (5,142 km) for crude oil, 118 (9,652 km) for refinery products, 68 (1,414 km) for petrochemicals, 28 (222 km) for fuel oil and 34 (224 km) for other purposes.

TABLE 9

MEXICO: RESERVES OF SELECTED MINERALS—YEAREND 1990

(Thousand metric tons unless otherwise specified)

Mineral[1]		Reserves
Antimony		181
Barite		7,000
Bismuth	metric tons	5,000
Cadmium	do.	35,000
Copper		14,000
Fluorspar[2]		19,000
Gas, natural[3 4]		14,467
Graphite, natural		3,100
Lead		3,000
Manganese		3,600
Mercury	metric tons	5,000
Molybdenum	do.	100,000
Petroleum, crude[3]	million 42-gallon barrels	45,250
Salt		Large
Selenium	metric tons	4,000
Silver	do.	37,000
Sodium carbonate, natural		181,000
Sodium sulfate, natural		165,000
Sulfur[5]		75,000
Zinc		6,000

[1]All metals expressed in metal content.
[2]Measured as 100% calcium fluoride.
[3]Yearend 1989.
[4]Crude oil equivalent.
[5]Sulfur in all forms.

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 mining sector. Among the programs introduced in 1989 was the new investment law with the purpose of increasing private domestic and foreign investment. In general, this law created a trust (fideicomiso) that allowed full foreign participation in some of the Mexican industries for a limited period of time.

Another significant step taken by the Government in recent years has been the privatization of Government-held corporations. Some of the mineral-producing companies have been privatized recently or were on the block waiting privatization, and this process was expected to continue. With the new changes, foreign ownership was allowed in the cement and steel industries.

To support its economic policies, Mexico was planning to establish a new 5-year mining modernization program and to issue a new mining regulation consistent with the new investment law. The Government wanted to stimulate investment

and development of the mining sector, a sector that historically has been one of the strongest of the Mexican economy.

[1]Where necessary, values have been converted from Mexican Pesos (Mex$) to U.S. dollars at the rates of Mex$2,260 = US$1.00 and Mex$2,453 = US$1.00 for the years 1988 and 1989, respectively.

OTHER SOURCES OF INFORMATION

Agencies

Secretaría de Energía, Minas e Industria Paraestatal
Ave. Insurgentes Sur 552
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Publications

Petróleos Mexicanos (PEMEX), México City: Memoria de Labores, Annual Report.

PEMEX, Statistical Yearbook, Annual Report.

Consejo de Recursos Minerales, México City: Anuario Estadístico de la Minería Mexicana, Annual Report.

Comisión de Fomento Minero, México City: Informe de labores, Annual Report.

Cámara Minera de México (CAMIMEX), México City: Asamblea General Ordinaria, Annual Report.

Cámara Nacional de la Industria del Hierro y del Acero (CANACERO), México City, Annual Report.

Asociación de Ingenieros de Minas, Metalurgistas y Geólogos de México, A.C., México City: GEOMIMET, bimonthly magazine.

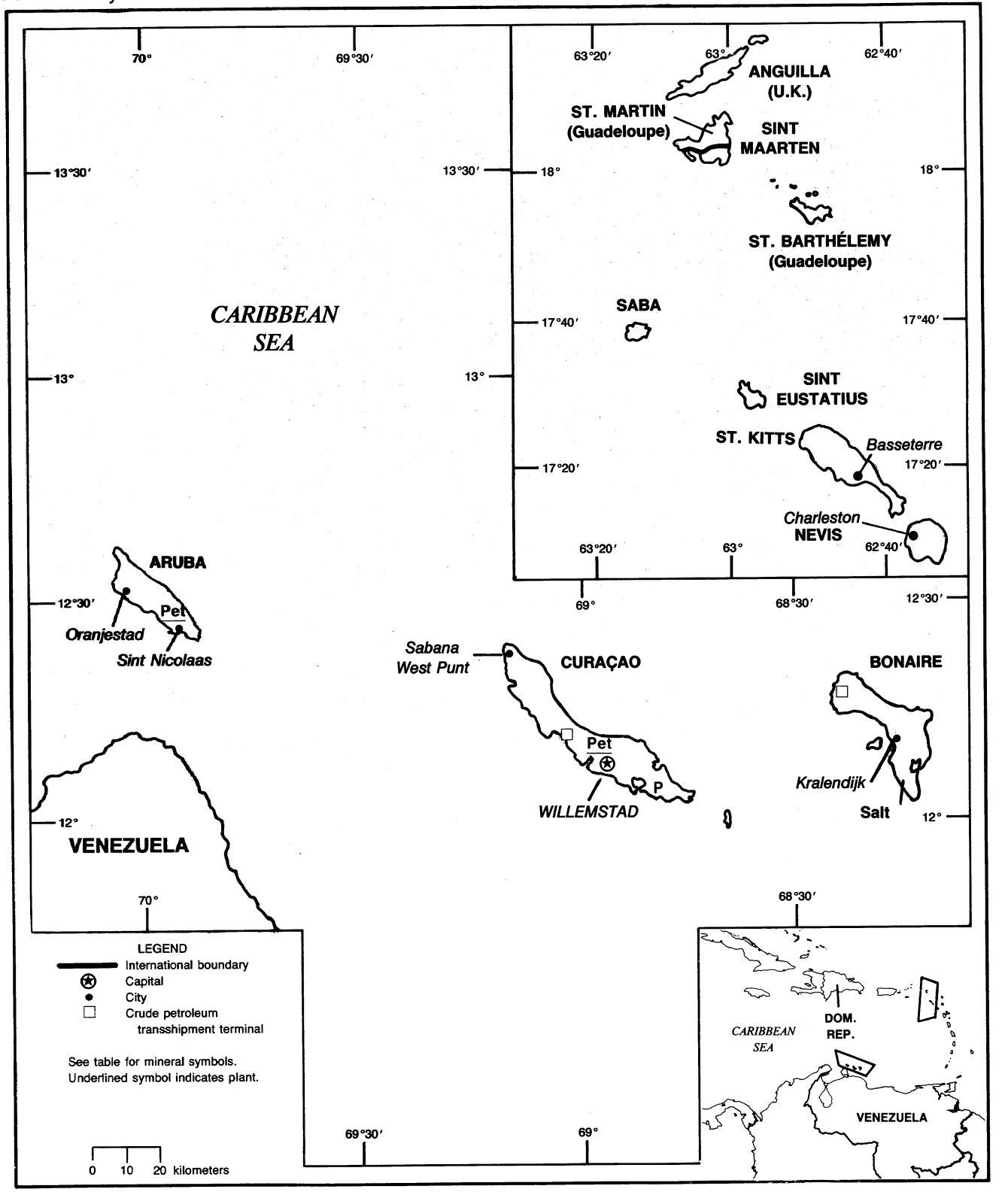
Banco de México, México City: Informe Anual.

Mining and mineral-related companies: Annual operations reports.

U.S. Embassy, México City: Minerals Questionnaire, Minerals Outlook Report, and Petroleum Report, annual.

NETHERLANDS ANTILLES AND ARUBA

AREA 1,153 km² **POPULATION 245,500**



THE MINERAL INDUSTRIES OF

THE NETHERLANDS ANTILLES AND ARUBA

By Ivette E. Torres

The economy of the Netherlands Antilles continued to depend primarily on the export of oil refinery products as a source of foreign exchange and employment in 1989. Tourism and offshore financing composed the remaining large sectors of the economy.

The economy of Aruba, separated from the Netherlands Antilles since January 1986, was lead by tourism. Oil refining on the Island stopped with the closure of Exxon's facility in 1985.

PRODUCTION AND TRADE

The mineral production of the Netherlands Antilles has been limited to salt in Bonaire and phosphate rock and petroleum products in Curaçao. The Lago refinery in Aruba, closed in 1985, remained closed in 1989. However, plans called for the refinery's reopening in 1990.

The Netherlands Antilles and Aruba's main trading partners are the European Community (EC) and the United States. As associate members of the EC and participants in the Caribbean Basin Initiative, goods from the Netherlands Antilles and Aruba have preferential access to the EC and the United States. Salt from Bonaire is exported to the Caribbean, New Zealand, and the United States.

The Netherlands Antilles had an electrical generating capacity of 125 megawatts in 1988. Total electrical energy produced in the Netherlands Antilles in 1988 was 365 million kilowatt hours.

Aruba's electrical generating capacity in 1988 was 310 megawatts. Total electrical energy produced in Aruba in 1988 was 945 kilowatt hours.

COMMODITY REVIEW

Industrial Minerals

In 1989, the Antilles International Salt Co. N.V., a subsidiary of AKZO Salt Inc. (formerly International Salt Co.), changed its name to AKZO Salt Antilles N.V. The company, with a rated capacity of 360,000 tons per year, has been producing solar salt in Bonaire, the Netherlands Antilles, since the early 1970's.

TABLE 1

NETHERLANDS ANTILLES AND ARUBA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1985	1986	1987	1988[p]	1989[e]
Petroleum refinery products	thousand 42-gallon barrels	73,000	67,160	63,510	69,350	[3]65,335
Phosphate rock[e]	thousand tons	20	20	16	16	15
Salt[e]	do.	350	350	350	350	350
Sulfur, byproduct of petroleum[e]	do.	25	40	60	60	60

[e]Estimated. [p]Preliminary.
[1]Table includes data available through Aug. 31, 1990.
[2]In addition to commodities listed, crude construction materials (lime, salt, 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]Reported figure.

Mineral Fuels

After years of inactivity in Aruba's oil refinery sector, on October 19, 1989, Coastal Corp. of Houston, TX (United States), signed an agreement with the Government of Aruba for the reactivation of the Lago refinery. Coastal planned to begin refining approximately 150,000 barrels of crude oil per day in November 1990, about 30% of the rated capacity. Planned production includes, in barrels per day, 34,000 of jet fuel, 32,000 of low-sulfur diesel fuel, 30,000 of naphtha, 17,000 of residual fuel oil, 8,000 of asphalt, and 25,000 of low-sulfur catalytic cracker feedstock. The company planned to employ 300 to 400 people (about 1.3% to 1.7% of the total work force of yearend 1988) and to export low-sulfur fuel to the United States. In 1989, the Government of the Netherlands Antilles continued to lease its oil refinery in Willemstad, Curaçao, to Petróleos de Venezuela S.A.

INFRASTRUCTURE

There are no railroads in the Netherlands Antilles and Aruba. The Netherlands Antilles has 950 kilometers of roads, 300 of which is paved.

Salt is loaded directly from a AKZO Salt Antilles conveyor belt onto the ship for exports.

OUTLOOK

The minerals industry will most likely remain at present low levels because of the limited resources found in the Netherlands Antilles and Aruba. However, the reopening of the Lago refinery in Aruba in the fall of 1990 will represent a tremendous boost to the island's economy and employment.

TABLE 2

NETHERLANDS ANTILLES AND ARUBA: STRUCTURE OF THE MINERAL INDUSTRY

Country and commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year)
Netherlands Antilles:			
Petroleum products	Refinería Isla de Curacao S.A. (Petróleos Venezuela S.A., leased from the Government)	Willemstad, Curaçao	[1]310,000
Salt	AKZO Salt Antilles N.V. (AKZO Salt Inc., 100%)	Bonaire	360
Aruba:			
Petroleum products	Lago Refinery (Coastal Corp., leased from the Government)[2]	St. Nicolaas	[1]480,000

[1] Barrels per day.
[2] Scheduled to reopen in Nov. 1990.

OTHER SOURCES OF INFORMATION

Agencies

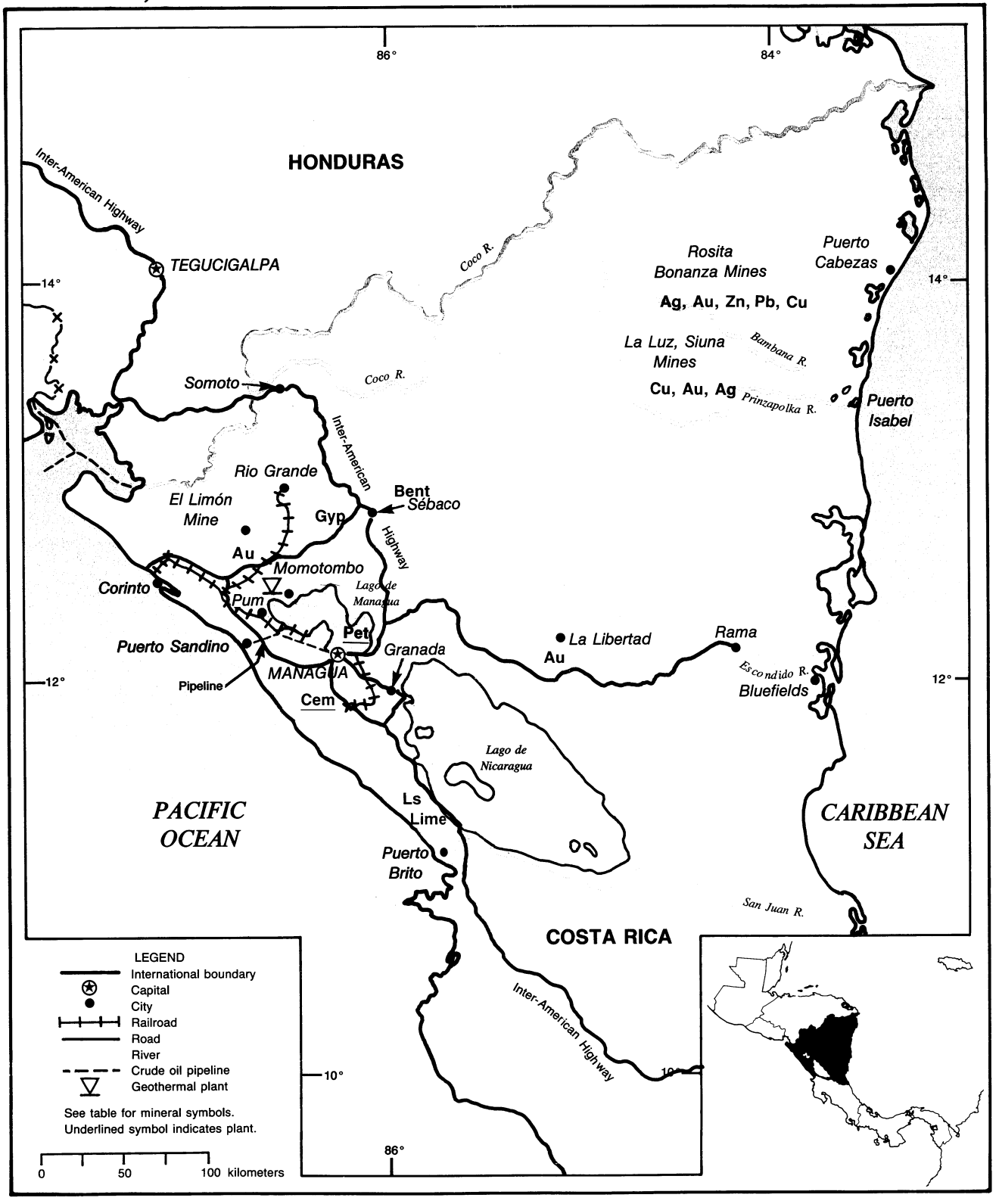
Central Bureau Voor de Statistiek
Willemstad, Curaçao
Centraal Bureau Voor de Statistiek
Windstraat 21
Oranjestad, Aruba

Publications

Central Intelligence Agency:
The World Factbook 1989, annual.
U.S. Department of Commerce:
Foreign Economic Trends and Their Implications for the United States, FET 90-60, Feb. 1990.
Foreign Economic Trends and Their Implications for the United States, FET 90-23, Feb. 1990.

NICARAGUA

AREA 129,500 km² **POPULATION 3.5 million**



THE MINERAL INDUSTRY OF

NICARAGUA

By Alfredo C. Gurmendi

Nicaragua is a country of limited mineral resources. Its main mining and quarrying activities were in producing gold, silver, and some industrial minerals, such as cement, gypsum, lime, salt, and sand and gravel. Nicaragua is totally dependent on imports for its oil supply, which provides the bulk of its energy needs. The gross domestic product contracted by 3.0% to $2.6 billion[1] in 1989. The rate of inflation was officially reported at 6,000%. The foreign debt increased $7.5 billion while unemployment exceeded 26%. Nicaragua's economy is based on commodity exports, mainly bananas, beef, coffee, cotton, forest products, sesame, shellfish, some gold and silver, and sugar. It imports consumer goods, crude oil, and machinery. The mineral sector employed less than 0.2% of the total labor force of 1.1 million.

GOVERNMENT POLICIES AND PROGRAMS

The Government of Nicaragua is attempting to revitalize its mining industry, especially gold and silver production. With assistance from the U.S.S.R. and other foreign countries, Nicaragua plans to increase gold production to almost 2 tons per year by 1992. The Corporación Nicaragüense de Minas (INMINE) plans to open several areas for precious-metals exploitation in León, Zelaya, and Chontales Departments, and with Swedish assistance the Government plans to conduct general geological studies to help increase overall mining in Nicaragua. In addition, INMINE established severe penalties for any illegal movement of gold from the country.

Petroleum exploration concessions were nationalized whereby the resulting political uncertainties halted foreign investment.

PRODUCTION

Nicaragua has no internationally significant mineral resources. Most of its industrial minerals, such as cement, sand and gravel, and salt, were produced for local consumption. Nicaragua is heavily dependent on imported crude oil. INMINE reported production of gold (1,232 kilograms) and silver (1,113 kilograms) for exports to bolster its declining hard currency earnings.

TRADE

Nicaragua, because of its financial difficulties, could not import sufficient crude oil for domestic needs, and the U.S.S.R. was reported to be supplying most of Nicaragua's crude oil needs. Minerals and mineral compounds for domestic use were imported at reduced volumes too. Exports, traditionally a major source of revenues, decreased by 18.2% to about $180 million while imports fell 12% to $710 million. The country faced the worst trade deficit and economic performance in the past decade in 1989. The United States, beginning on May 1, 1985, imposed economic sanctions, including a total embargo on trade with Nicaragua.

STRUCTURE OF THE MINERAL INDUSTRY

All mineral exploration and production operations were under the control of INMINE. The nationalization of private mining companies appeared to be limited to those of foreign ownership; however, it

TABLE 1

NICARAGUA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
Cement[e]		100,000	100,000	100,000	100,000	[2]131,011
Gold, mine output, Au content	kilograms	762	892	948	878	[2]1,232
Gypsum and anhydrite, crude		8,310	[e]8,000	7,299	[e]7,000	[2]11,570
Lime[e]		[2]3,702	3,500	3,500	3,500	3,500
Petroleum refinery products[e]	thousand 42-gallon barrels	[2]3,715	3,560	3,620	3,500	3,500
Salt, marine[e]		15,000	15,000	15,000	15,000	15,000
Sand and gravel[e]	cubic meters	450,000	450,000	450,000	450,000	450,000
Silver, mine output, Ag content	kilograms	923	[e]778	888	776	[2]1,113

[e]Estimated. [p]Preliminary.

[1]Includes data available through Aug. 31, 1990. In addition to the commodities listed, Nicaragua presumably continues to produce a variety of clay and stone to meet indigenous needs, but output of these materials is not reported, and there is insufficient general information for fomulation of estimates.

[2]Reported figure.

TABLE 2

NICARAGUA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	Cía. Nacional Productora de Cemento (Government, 100%)	San Rafael del Sur, Managua Department	330
Gold	Corporación Nicaragüenese de Minas (INMINE) (Government, 100%)	El Limón mining complex, León Department Bonanza Siuna, Rosita, and La Luza mining complexes, Zelaya Department	[1]1,000
Petroleum products	do.	Managua, Managua Department	[2]15
Silver	do.	Bonanza, Siuna, Rosita, and La Luz mining complexes, Zelaya Department	[1]850

[1]Kilograms.
[2]Thousand 42-gallon barrels per day.

is not clear as to who owns the quarries and mines producing industrial minerals.

COMMODITY REVIEW

Metals

Nicaragua was attempting to revitalize its mining industry, particularly its gold and silver production. The Government planned to open a new gold mine in León Department and expand La Talavera Mine in Chinandega Department by 1992. Soviet advisors were working with the Government of Nicaragua to reopen La India Mine in León Department, which has been shut down since 1956. Nicaragua planned to use Swedish and Soviet assistance to conduct geological studies to increase its mining activities and boost gold and silver production in León, Zelaya, and Chontales Departments.

Industrial Minerals

Nicaragua's main quarrying activities were dedicated to the production of construction materials such as, gypsum, limestone, salt, and sand and gravel; most of the production was for local consumption.

Mineral Fuels

Nicaragua has no known commercial hydrocarbon deposits, and primary electric power (hydroelectric and geothermal) of domestic origin provided only about 7% of the country's total energy consumption in 1987, the latest year for which comprehensive energy data are available. The remaining 93% of energy requirements in that year were met through imports, with 91% of the total consumption of 1,037,000 tons of standard coal equivalent being provided by liquid fuels and 2% by imported electric power. Of the 1987 liquid fuel consumption, about 75% was provided by products refined in Nicaragua from imported crude oil, and 25% was from imported refinery products. Although more recent figures on imports of crude oil and refinery products are not available, it is believed that there was but a little change from the 1987 levels.

With regard to electric power, there has been a 26% increase in total electricity generation between 1987 and 1989, with output reaching 1,340 million kilowatt hours (kW·h) in 1989, compared with 1,258 million kW·h in 1988 and 1,063 million kW·h in 1987. However, the distribution of the increase by plant type is unreported. In 1987, production of primary electricity included 268 million kW·h from hydroelectric plants, 300 million kW·h from geothermal plants, and 495 million kW·h from liquid-fuel-fired thermal plants. Installed capacity in that year included 103 megawatts (MW) in hydroelectric plants, 35 MW in geothermal plants, and 257 MW in thermal plants, for a total of 395 MW; this total has apparently increased to 415 MW in 1989, but the distribution of the total by plant type is not reported. INMINE was planning to bring on-stream an additional 140 MW of hydroelectric and geothermal capacity to make possible a reduction in liquid fuel requirements.

Reserves

Nicaragua's mineral reserves are not significant and are not comparable with some other producing countries in the region. The gold and silver reserves were estimated at about 10 tons of gold and 8 tons of silver. El Limón, Bonanza, La Libertad, and Siuna Mines in León, Zelaya, and Chontales Departments each have a projected production life of about 10 years.

INFRASTRUCTURE

Improvements of the infrastructure were a high priority to the Government of Nicaragua, with road construction and maintenance mainly for agricultural and defense purposes. There were about 25,000 kilometers (km) of road, 4,000 km of which were paved; 2,170 km were of gravel or crushed stone, 5,425 km were of earth or graded earth, and 14,335 km were unimproved. The 368.5 km Pan-American Highway was paved. The major ports were Corinto on the Pacific coast and Cabezas and Isabel on the Caribbean coast. There were 7 secondary and 10 minor ports. Inland waterways totaled 2,220 km, including two large lakes. There were 265 airports, of which 178 were usable; 9 with permanent surface runways, 2 with runways ranging from 2,440 to 3,700 meters, and 12 with runways of 1,220 to 2,440 meters.

OUTLOOK

Nicaragua has been implementing its mineral inventory with the assistance of the U.S.S.R. and Swedish Governments. The carbonate rocks of the Nicaragua Rise offshore and adjoining inshore areas of the Caribbean coast seem to offer the most promising hydrocarbon possibilities. Exploration for gold and silver appear to be of prime importance to obtain much needed foreign currency to reconstruct Nicaragua. The U.S.S.R. has become the main crude oil supplier to Nicaragua and has remained active in petroleum exploration, an activity that private foreign firms ceased in 1979. Brazil, Bulgaria, Canada, Cuba, France, and Norway provided financial and technical assistance to the mineral and energy sectors and engaged in assessments of the country's hydrocarbon potential. Despite these efforts, the Nicaraguan economy faces a severe financial crisis caused by large fiscal and balance of payments deficits, fueled by hyperinflation, high unemployment, and disruptions by counterrevolutionaries.

In July 1989, the Japanese Committee for Development of a Grand Canal in Central America presented to the Nicaraguan Government a plan for the maritime transport of freight to benefit international trade. The proposed canal would cross the Central American isthmus for 220 km, from Puerto Brito on the Pacific coast, passing south of the city of Rivas to the shore of Lake Nicaragua, cross the southern end of the lake to the port of San Carlos, then follow the course of the San Juan River east to the Caribbean Sea.

[1]Where necessary, values have been converted from Nicaragua Córdoba (C$) to U.S. dollars at the average official rate of C$32,950 = US$1.00.

OTHER SOURCES OF INFORMATION

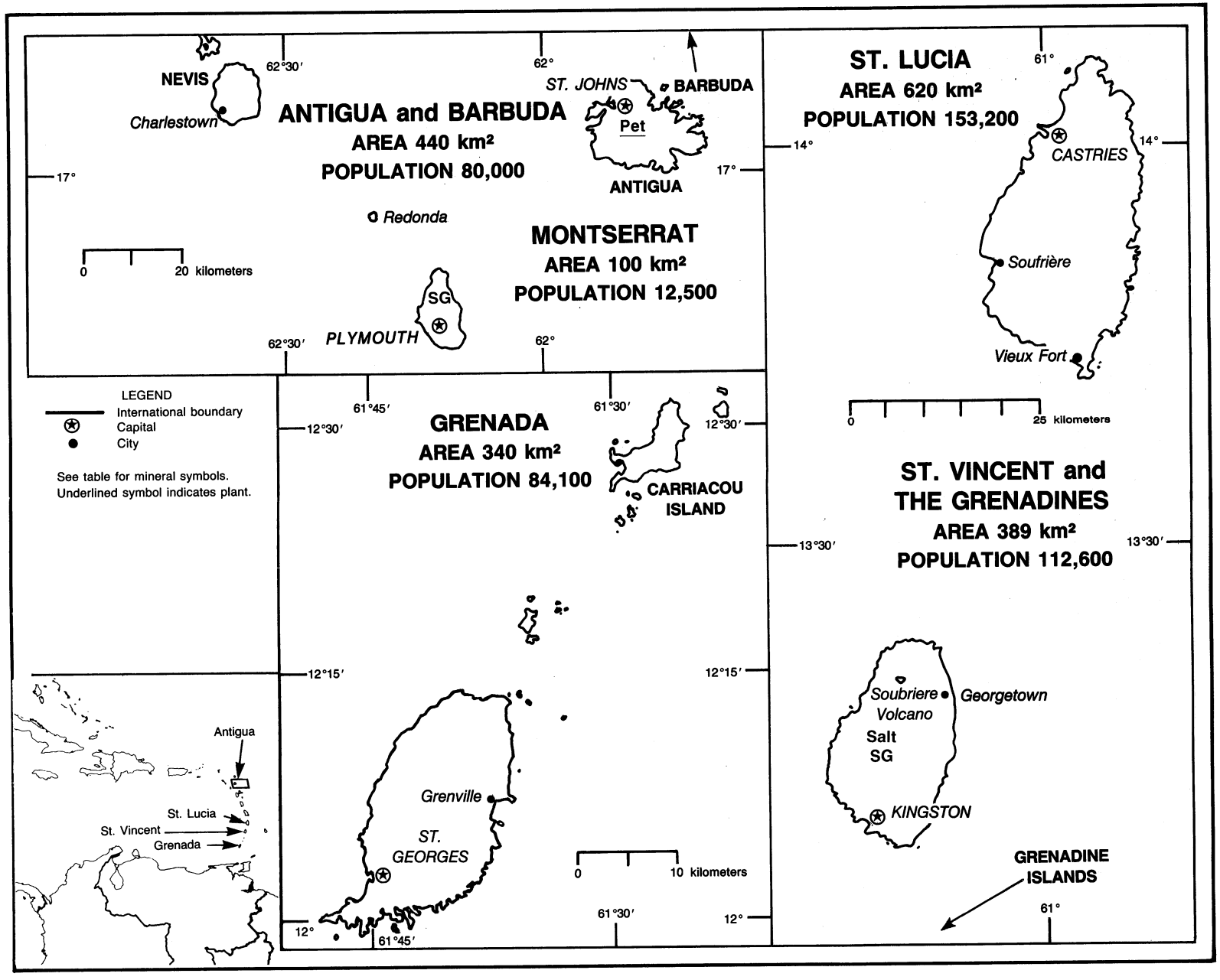
Agency

Corporación Nicaragüense de Minas
del Instituto Nicaragüense de Minas
(INMINE)
Apartado 195
Managua, Nicaragua

Publications

Annuario Estadístico de Nicaragua, monthly.
Instituto Nacional de Estadísticas y Censos, Managua, Nicaragua, monthly.
Instituto Nicaragüense de Energía (INE), Managua, Nicaragua.
Compañía Nacional Productora de Cemento San Rafael del Sur, Managua, Nicaragua.

OTHER LESSER ANTILLES



THE MINERAL INDUSTRIES OF

THE OTHER LESSER ANTILLES

By Pablo Velasco

ANTIGUA AND BARBUDA

The island nation of Antigua, Barbuda, and Redonda became independent on November 1, 1981, after 350 years of being a dependency of the United Kingdom. This three-island nation remains within the Commonwealth. Antigua, one of the first Caribbean islands to promote tourism in the early 1960's, is the wealthiest. Barbuda seeks to balance rapid resort development with protection of its varied wildlife. The tiny Redonda island is uninhabited. Mineral production is limited to small quantities of sand and gravel and crushed stone and represents about 2% of the $345 million gross domestic product (GDP) at current prices. Real GDP, fueled by growth in tourism and construction, increased at an estimated growth rate of 6.2% to $354 million.[1]

Antigua and Barbuda is one of the few areas in the Caribbean that experienced a labor shortage in some sectors of its economy.

Imports were valued at $302 million, mainly composed of food and live animals, machinery and transport equipment, manufactures, chemicals, and crude oil. Trading partners were the United States, 27%; United Kingdom, 14%; Caribbean Community and Common Market (CARICOM), 7%; Canada, 4%; and others, 48%. Exports amounted to $30.4 million and were composed mainly of petroleum products, 46%, and manufactures, 29%; partners were Trinidad and Tobago, 40%, and Barbados, 8%.

Electric power capacity was 49 megawatts (MW), all from thermal plants. In 1989, about 50% of imported petroleum was used for aviation bunkers, and 43% was consumed domestically.

Antigua and Barbuda has a labor force of 30,000, of which 82% is in commerce and services, 11% in agriculture, and 7% in the industry (including mining and quarrying). Antigua and Barbuda has a relatively well-developed infrastructure. The transportation network was composed of a total of 240 kilometers (km) of highways, 64 km of railroads of 0.760-meter-gauge single track and 13 km of 0.610-meter-gauge track used almost exclusively for handling sugarcane. The port at St. John's on Antigua Island serves the country on the Caribbean Sea coast. There are three usable airports.

MONTSERRAT

This small volcanic island 400 km southeast of Puerto Rico in the Caribbean Sea remains a colony of the United Kingdom. The economy of Montserrat is small and open with economic activity centered on tourism and construction. Real GDP growth was about 12% to about $45.4 million. Tourism is the most important sector and accounted for 20% of the GDP. Agriculture accounted for 4% of the GDP and industry 9%. The economy is heavily dependent on imports, consequently vulnerable to fluctuations in world prices. Small quantities of sand and gravel and other quarry products compose the mineral industries of Montserrat. Mining and quarrying contribute about 1% of the GDP. Exports amounted to $3.0 million and imports to $25.3 million, mainly machinery and transportation equipment, foodstuffs, manufactured goods, fuels, and lubricants and related materials. Petroleum products compose about 8% of total import expenditures. The Government is interested in developing alternative energy sources to supplement petroleum imports. Geothermal energy potential is one alternative the Government plans to investigate. Installed electric capacity in 1989 was 5 MW, all from oil-fired thermal generators operated by the public utility company. The communication network was composed of a total of 280 km of highways, of which 200 km was paved, and 80 km was improved earth. The port at Plymouth serves the island on the Caribbean coast. There is one permanent-surface runway airport.

ST. LUCIA

The state of Santa Lucia became independent from the United Kingdom on February 22, 1979. That same year, this member of the Windward Islands became a member of the Organization of American States (OAS). It has a legal system based on the English Common Law. Mineral production is not regularly reported, although some quarry operation and production of sand and gravel contributed about $1.0 million or 0.6% to the GDP.

Real GDP has shown an impressive average annual growth rate of almost 7% to $172 million because of strong agricultural output, tourism, and oil transshipments. Despite this economic performance, the country unemployment rate remains high at about 19%. Exports amounted to $77 million and was 67%, composed mainly of agricultural products, bananas, and coconuts. Imports were valued at $178 million, which consisted mainly of manufactured goods, 22%; machinery and transportation equipment, 21%; food and live animals, 20%; mineral fuels, food stuffs, machinery and equipment, fertilizers, and petroleum products, 37%.

In 1989, installed electrical power capacity was 20 MW, all from thermal plants. As of early 1989 and based on data from UNOCAL, Geothermal Div., positive geothermal assessment has been made for the area of boiling volcanic sulfur springs near the town of Soufriere on

the southern coast where 10 MW of electrical power is programmed to be generated from this geothermal source.

The communication network was composed of 760 km of highways, of which 500 km was paved, and 260 km was improved earth. Castries's port, one of the most sheltered anchorages in the world, serves the nation on the Caribbean coast, and there are two usable airports. St. Lucia is laced with many small rivers. The town of Vieux Fort, with an international airport, is being developed along the concept of a free zone area.

GRENADA

The most southern of the Windward Islands, Grenada Island (including the southernmost Grenadines) became independent from the United Kingdom in 1974 and assumed self-rule as one of the Caribbean's smaller nations. The southern Grenadines, which are slightly to the northeast of Grenada, include Ronde, Frigate, Carriacou, and little Martinique. These little islands of the Grenadines group are divided politically between Grenada and with St. Vincent and the Granadines.

As a popular stopover for cruise ships, Grenada is a British Commonwealth dominion with a parliamentary system and a governor-general representing the queen. The Grenada economy is essentially agricultural and centers on the traditional production of spices and tropical plants. Agriculture accounts for about 20% of the GDP, 90% of exports, and employs 24% of the labor force. Tourism is the leading foreign exchange earner, followed by agricultural exports. Despite an impressive average annual growth rate of about 6% during 1984–88, unemployment remains high at about 26%. Real GDP growth rate was 5% in 1988 to $130 million. Exports amounted to $32 million, mainly nutmeg, 35%; cocoa beans, 15%; bananas, 13%; mace, 7%; and textiles.

Imports were valued at $93 million, mainly composed of machinery, 24%; food, 22%; manufactured goods, 19%; and petroleum, 8%. There are no reported mineral industries in Grenada, although some construction material is probably produced. In 1989, installed electrical power capacity was 11.4 MW, all from thermal plants.

The transportation network was composed of a total of 1,000 km of highways, of which 600 km is paved, 300 km is improved earth, and 100 km is unimproved. St. George's port serves the country on the Caribbean coast. There are three usable airports. A Development Incentives Ordinance is directed toward attracting capital investment.

ST. VINCENT AND THE GRENADINES

St. Vincent and the Grenadines (including the northern Grenadines) among the Windward Islands is an independent state within the Commonwealth of Nations, having received independence October 27, 1979. The northern Grenadines are composed of the islands of Bequia, Mustique, Canouan, Mayrean, Union, Prime (Palm) Petit, St. Vincent, and numerous islets. St. Vincent (shown on the map) is by far the largest island.

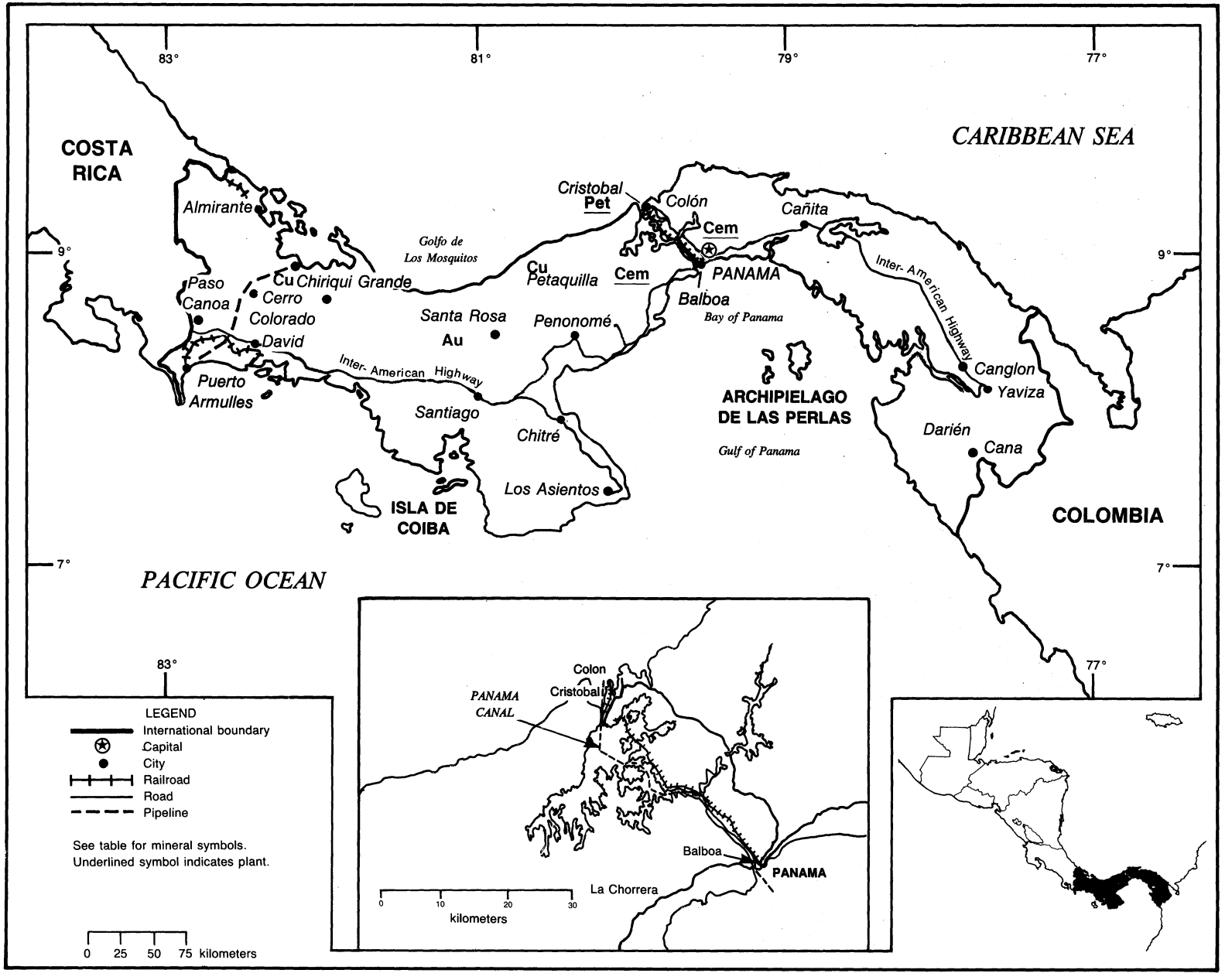
The country has been a member of the OAS since 1981, forms part of CARICOM, and is also a member of the Caribbean Free Trade Association (CARIFTA). The mineral industry of these islands consists of industrial materials such as sand and gravel, crushed rock from quarry operations, and salt. Mining and quarrying contributed to about 0.3% of the GDP. Real GDP growth rate was about 8% to $136 million. Agriculture, dominated by banana production, is the most important sector of the economy, providing employment for more than 60% of the labor force and contributing about 20% to the GDP. The services sector is next in importance, based mostly on a growing tourist industry. The economy continues to have a high unemployment rate of about 30%.

Exports of mostly bananas, coconuts, and arrowroot amounted to $64 million; partners were CARICOM, 60%; the United Kingdom, 27%; and the United States, 10%. Imports were valued at $87 million, mainly composed of food stuffs, machinery and equipment, chemicals, fertilizers, minerals, and fuels. Trading partners were the United States, 37%; CARICOM, 18%; and the United Kingdom, 13%. Installed electric capacity in 1989 was 16 MW, 80% of which was from oil-fired thermal generators and the remaining 20% from a new hydroelectric facility, all operated by the public utility company. The communication network was composed of about 1,000 km of highways, of which 300 km was paved, 400 km was improved, and 300 km was unimproved. Kingstown's port serves the island on the Caribbean coast. There are six usable airports, four with permanent-surface runways.

[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.

PANAMA

AREA 75,990 km² **POPULATION 2.4 million**



THE MINERAL INDUSTRY OF

PANAMA

By Philip M. Mobbs

Construction-related minerals and petroleum products continued to dominate Panama's mineral sector. Because the country's mineral output was limited to clay, limestone, salt, and sand and gravel produced for local use, Panama was forced to import almost all mineral requirements for its limited industrial base. Mineral exports consisted mainly of providing petroleum products to ships and aircraft in transit. Transportation of mineral products, shipped through the canal or sent through the oil pipeline, represented the largest facet of the minerals industry in Panama.

Mining and mineral transportation contributed less than 5% to the country's economy. This percentage has slowly declined during the past 2 years, owing in part to fewer canal transits, a result of economic slowdowns in Japan and the United States.

GOVERNMENT POLICIES AND PROGRAMS

Panama's Government was subject to numerous political crises during 1989, culminating with "Operation Just Cause" in December. U.S. economic sanctions, initiated in December 1987 and supplemented in March and April 1988, remained in place until after the U.S. military action. This combination of political and economic instability severely affected mineral exploration and production activities. Even the 1988 mining legislation, designed to encourage mining, was unable to stimulate growth in the mineral sector.

PRODUCTION

The mineral industry continued the decline that began in 1988. Construction-related material production dropped with the collapse of Panama's construction industry. Transisthmian oil pipeline shipments were reduced owing to declining Alaskan crude oil production and increased U.S. west coast refinery demand. Production was cut back at the country's petroleum refinery.

TRADE

Canal coal shipments from the United States to the Far East continued the decline first noticed in 1983. Dwindling mineral shipments reflected the impact of shifting world trade patterns. The Canal Commission, in response to this degeneration of traffic, increased the toll rate by 9.8% in October, the first increase in 6 years.

A new free zone was authorized near Paso Canoa in Chiriqui Province. The new zone should compete with the Colon Free Zone for Central American exports.

STRUCTURE OF THE MINERAL INDUSTRY

Most of the mineral industry ownership is private. The Government had a 50% interest in Bayano's cement plant and 40% interest in Petroterminal de Panamá, S.A., a crude oil transshipment and pipeline activity.

COMMODITY REVIEW

Metals

Copper.—Panama Resource Development Co. and partners proposed to begin mining operations on the Petaquilla copper deposits during 1990. Ore reserves were estimated to be 200 million tons.

Gold.—Production from the Remance gold mine, a joint venture of Transworld Exploration of Panama and Minera Remance of Peru, northwest of Santiago, was delayed until 1990. Startup investment exceeded $3.5 million.[1] Production was projected to be 1.9 tons of gold per year. The mine reserves were estimated to be 8 tons of gold. Freeport Exploration continued to evaluate data from its gold prospects at Cana in Darién Province and Santa Rosa in Veraguas Province.

Industrial Minerals

During 1989, industrial minerals production lagged far behind prior year's output owing to the country's sagging economy. Cement, clays, and crushed limestone productions were approximately one-half of the levels reached in 1986 and 1987.

The $950,000 Inter-American Development Bank grant of 1987 for geologic mapping and minerals inventory in three areas covering more than 15,000 square kilometers was suspended owing to the Government's economic problems.

Mineral Fuels

Panama's public electric power capacity was rated at 848 megawatts, of which 65% was hydroelectric based. Private capacity and the Canal Commission generators added another 265 megawatts to the country's total capacity. Some energy was obtained from the use of biomass residues and fuel wood. A geothermal energy region in western Chiriqui Province had an estimated potential of 400 megawatts.

Coal deposits in the Bocas del Toro region near the northwestern border were identified by a team from the Los Alamos National Laboratory. Panama had several known lignite deposits in the western provinces and substantial peat reserves in the Darién area.

INFRASTRUCTURE

Oceangoing ships with beams up to 32.3 meters can transit the 82-kilometer (km) Panama Canal. An additional 800 km of navigable waterways was available to shallow draft vessels.

In January, the Panama Railroad was authorized by the Government to invest

TABLE 1

PANAMA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
Cement		305,200	336,000	[e]350,000	[r e]200,000	[2]168,500
Clays and clay products:						
Crude		98,382	111,335	78,000	56,000	[2]43,047
Products	cubic meters	37,343	29,598	33,105	20,647	15,000
Manganese ore		—	6,000	[e]6,000	—	—
Petroleum refinery products[e]	thousand 42-gallon barrels	[2]8,864	9,000	9,000	9,000	[2]6,552
Salt, marine[3]		16,024	9,816	[e]10,000	[e]9,000	8,000
Stone, sand and gravel:						
Limestone[4]		293,726	462,414	[e]450,000	[e]400,000	[2]199,818
Sand and gravel	thousand cubic meters	674	669	792	566	400
Sand, silica		13,882	16,290	[e]17,000	[e]15,000	12,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes data available through Nov. 1, 1990.
[2]Reported figure.
[3]Represents sales.
[4]Excludes approximately 8,000 cubic meters per year, apparently dimension stone.

TABLE 2

PANAMA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
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
Petroleum products	Refinería Panamá S.A. (Texaco Panamá Inc., 100%)	Las Minas, Colón Province	[1]100

[1]Thousand 42-gallon barrels per day.

$18 million in renovation of its railway system. There was 238 km of track in the country. Paved highways account for 2,745 km of the approximately 8,500 km of roads. The remainder consisted of gravel or earthen surfaces. Forty two airports had all-weather surface runways.

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.

OUTLOOK

The industrial mineral industry of Panama is posed to participate in the rebuilding of urban areas damaged during the 1989 military intervention. Public expectations, political stability, elimination of U.S. sanctions, and increasing availability of credit are expected to boost Panama's economy and mineral utilization.

[1]Where necessary, values have been converted from Panamanian balboas (B) to U.S. dollars at the rate of B1.00 = US$1.00.

OTHER SOURCES OF INFORMATION

Agency

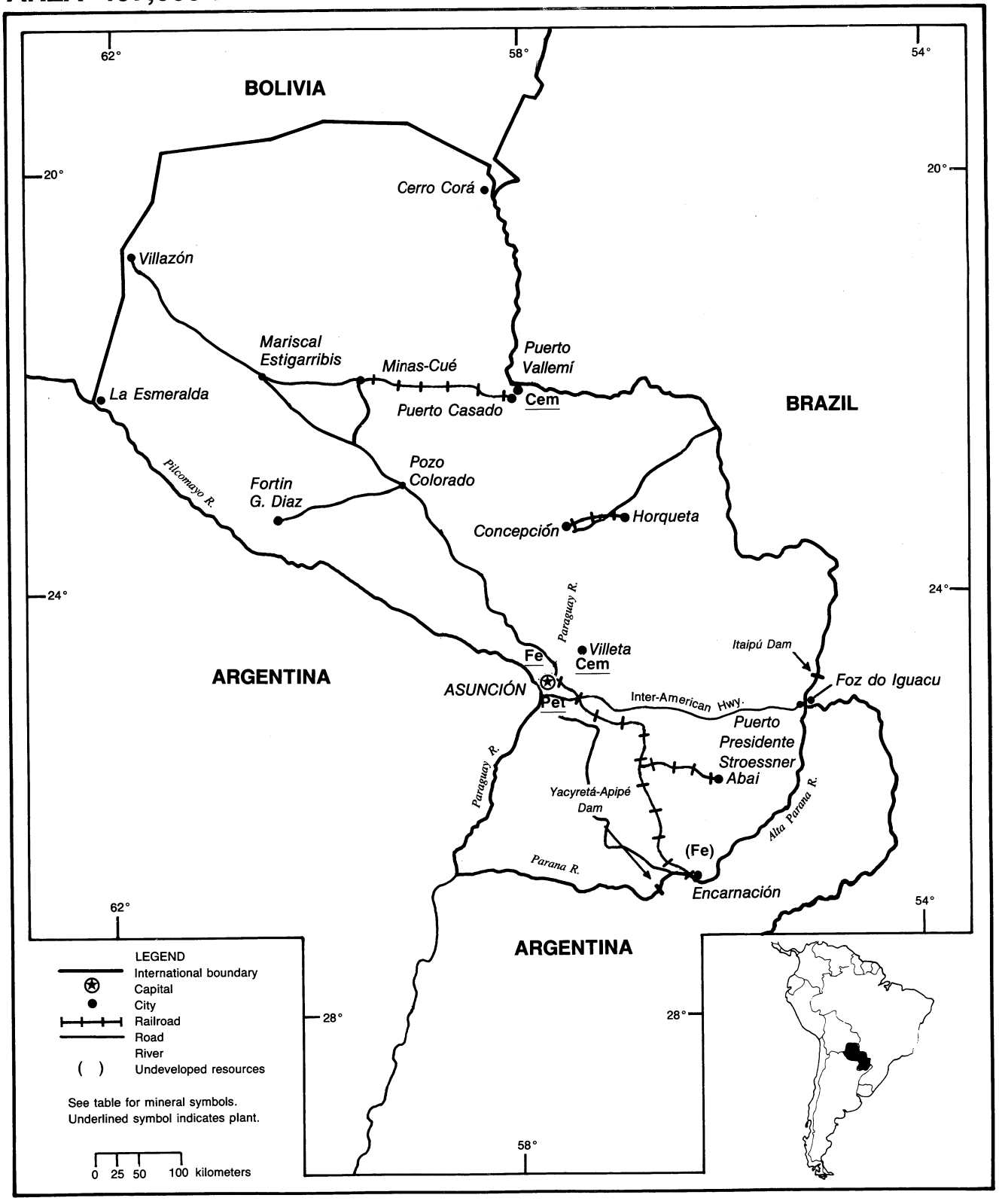
Dirección General de Recursos Minerales
Ministerio de Comercio e Industrias
Apartado 8515
Panamá 5, Panamá

Publications

Dirección de Estadstica y Censo, Panama: Panamá en Cifras, annual.
Cunningham, Charles G., et al.: Earth and Water Resources and Hazards in Central America, U.S. Geol. Surv. Circ. 925, 1984, 40 pp.

PARAGUAY

AREA 407,000 km² **POPULATION 4.5 million**



THE MINERAL INDUSTRY OF

PARAGUAY

By Alfredo C. Gurmendi

Paraguay's mining and quarrying industry was limited to the production of clays, crushed rock, dimension stone, gravel, limestone, sand, and small amounts of gypsum, iron oxide pigments, and talc. Mineral processing activities included manufacture of cement and lime from indigeneous raw materials and pig iron, steel, and refined petroleum from imported raw materials. Paraguay has no significant petroleum resources, but does have a large hydropower potential. The gross domestic product (GDP) grew by 6% to $6.3 billion,[1] inflation reached 30%, foreign debt rose to $2.1 billion, unemployment decreased to 11%, and the country's international reserves doubled to $285 million. The economy is predominantly agricultural; that sector accounted for 25% of the GDP, employed almost 50% of the labor force, and provided the bulk of exports.

The Paraguayan work force in 1989 reached 1.3 million. Employment was distributed as follows: 49% in agriculture, 32% in industry (minerals, cement, and petroleum refining are included here) and commerce, 16% in services, and 3% in Government. The labor market for skilled workers is relatively tight because of the limited number of Paraguayan professionals. The mineral sector's labor force is estimated to be less than 1% of the total work force in the country.

Paraguay's mineral resources continued partially explored because of inadequate infrastructure, large fiscal and trade deficits, scarcity of foreign exchange, and limited private investment. Business opportunities appeared to exist for developing natural resources such as iron ore, manganese, limestone, hydropower, and timber.

GOVERNMENT POLICIES AND PROGRAMS

Paraguay promulgated a new investment code under Decree Law No. 19/89 of February 1, 1989, with the intent of promoting investment and reinvestment of domestic and foreign capital by granting tax exemptions for investment projects. The Government's economic policy encourages economic activities oriented toward expansion and diversification of exports. Since February, the fluctuating free exchange system has been in force for trade of goods, services, and investment; however, the import of crude petroleum, aviation and motor gasoline, diesel oil, fuel oil, kerosene, and liquefied petroleum gas may only be made by Petróleos Paraguayos S.A. (Petropar) for reasons of "public order and national security" as established by Decree No. 1663/88, Article 12 of December 28, 1988.

The Dirección General de Recursos Minerales (DGRM) under the Ministry of Public Works and Communications handles matters concerning petroleum exploration and mineral resources. The main duties of DGRM with respect to the petroleum industry are to (1) prepare documents related to concessions and permits, (2) audit companies that are involved in petroleum programs in Paraguay, and (3) receive, file, and safeguard the information that companies are obligated to report to the Government by virtue of the petroleum law. The basic law governing petroleum and other hydrocarbons is contained in law 675 of September 9, 1960, as amended by Decree Law 397 of March 31, 1965. Labor activities in Paraguay are governed by laws 729 and 743, both dated August 31, 1981.

Since 1980, Paraguay has been a member of the Latin America Integration Association, which recognizes the need of balanced growth of the region. The country has resumed negotiations with the General Agreement on Tariffs and Trade (GATT) regarding membership, and GATT has set up a "working party" to examine Paraguay's application in March 6, 1989.

PRODUCTION

Paraguay has no internationally significant mineral or petroleum resources, but has a large hydropower potential. Output of petroleum refinery products for local consumption was estimated at about 69% of apparent refinery capacity. Rolled steel output for 1989 was 54,700 tons and for pig iron was 61,400 tons. The value added for industrial minerals, such as sand for glass, kaolin, construction stone, cement, and others, was estimated at $30 million. Most of these industrial minerals were consumed internally.

TRADE

The value of Paraguayan mineral industry product exports in 1989 was negligible. Imports of crude oil and petroleum products were valued at $118 million or nearly 19% of total imports. Argentina and Brazil were the primary sources for refinery products and Algeria for crude oil. The total value of Paraguayan imports was almost double its exports.

STRUCTURE OF THE MINERAL INDUSTRY

Paraguay's mineral industry continued to be limited. The main mineral industry activities were the Government-owned cement plants and petroleum refinery. In 1989, the Paraguayan Government was studying the relative benefits of converting the Industria Nacional del Cemento (INC) to a joint venture or complete privatization.

Paraguay continued to be dependent on imports of petroleum and natural gas to meet its fuel energy requirements. During 1989, 43% of the 12,000 barrels per day of petroleum products consumed in the country was refined locally by the state-owned Petropar at its Santa Elisa plant in Asunción.

Aceros del Paraguay S.A. (ACEPAR) apparently continued producing considerably below its installed capacity of 150,000 tons per year of rolled steel

TABLE 1

PARAGUAY: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity[2]		1985	1986	1987	1988	1989[p]
Cement, hydraulic	thousand metric tons	46	179	261	321	326
Clays:						
Kaolin	metric tons	60,000	r55,000	72,000	76,000	74,000
Other	thousand metric tons	1,750	1,650	1,898	1,910	1,860
Gypsum	metric tons	2,500	2,800	3,100	3,600	4,500
Iron and steel:						
Pig iron	do.	—	—	50,278	62,724	63,000
Steel, crude	do.	—	—	13,167	62,273	62,500
Lime	do.	80,270	88,290	92,500	96,000	103,000
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	506	r382	494	512	e560
Liquefied petroleum gas	do.	47	40	91	96	e100
Jet fuel	do.	115	162	152	146	e160
Kerosene	do.	58	21	33	38	e40
Distillate fuel oil	do.	623	640	821	675	e740
Residual fuel oil	do.	223	254	350	323	e350
Lubricants:						
Oil	do.	—	—	14	19	e20
Grease	do.	—	—	2	5	e5
Refinery fuel and losses	do.	229	r89	NA	21	e25
Total	do.	1,801	1,588	1,957	1,835	e2,000
Pigments, mineral: Natural, ocher-metric tons		260	250	285	310	320
Sand, including glass sand	thousand metric tons	1,741	1,659	1,893	1,926	1,939
Stone:						
Dimension	do.	65	r58	65	73	65
Crushed and broken:						
Limestone (for cement and lime)	do.	180	387	507	550	566
Other	do.	1,850	1,720	1,990	2,070	1,960
Marble	metric tons	400	450	600	750	730
Talc, soapstone, pyrophyllite	do.	120	130	180	210	200

eEstimated. pPreliminary. rRevised. NA Not available.
[1]Includes data available through mid-June 1990.
[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.

products because of shortages of raw materials. ACEPAR's plant is about 20 kilometers (km) north of Asunción at Villa Hayes.

COMMODITY REVIEW

Metals

The small demand for nonferrous metals by Paraguay's limited industry was met wholly by imports, and the country's single small steel plant was only able to supply reinforcing bars and some wire, lacking mill facilities to produce structurals, flat products, and pipe. Imports of rolled steel totaled more than 41,000 tons in 1989. Shortages of raw materials to produce rolled steel products forced ACEPAR to operate under capacity. Discussions continued with the Bolivian Government regarding imports of 500,000 tons per year of iron ore from the Mutún Mine near the Paraguayan border.

Industrial Minerals

Paraguay's production of limestone, gypsum, sand, kaolin, cement, and others were primarily to meet the needs of its domestic construction industry. INC operated its cement plants at Puerto Vallemí in Concepción Department and Villeta in Central Department; they produced at 65% capacity or 326,000 tons per year.

Mineral Fuels and Energy

Paraguay was dependent upon foreign sources of petroleum. Petropar imported more than 2 million barrels of crude oil from Algeria. Oil exploration efforts were

TABLE 2

PARAGUAY: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Cement	Industria Nacional del Cemento (Government, 100%)	Puerto Vallemí, (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	Petróleos Paraguayos S.A. (PETROPAR) (Government, 60%; Refinería Paraguaya S.A., 40%)	Santa Elisa, Asunción (near Asunción)	[1]2,738

[1]Thousand barrels per year rated capacity; effective capacity is reportedly only 2,190,000 barrels per year.

limited. Two U.S. petroleum firms were active. Occidental Petroleum Co. identified a potential oil and natural gas-bearing structure in western Paraguay near the Bolivian border, and Texaco Co. continued with geophysical surveys in southern Paraguay close to the border with Argentina.

The 12,600-megawatt (MW) Itaipú Dam complex, a joint Paraguayan-Brazilian hydroelectric powerplant on the Paraná River estimated to cost $19 billion, is considered to be the world's largest electrical generating plant and is expected to generate revenues of more than $200 million per year. The facility, which began power generation in late 1984, will be at full-scale operation in 1992, when the last 2 of 18 units operating at 700 MW each are completed. The Yacyretá-Apipé Dam, a joint Paraguayan-Argentinean hydroelectric project 320 km downstream from Itaipú, is being constructed. This hydroelectric project is expected to be operational in mid-1993 at a capacity of 2,760 MW and is estimated to cost more than $9 billion.

Reserves

Available information on mineral potential of the country is limited, but Paraguay's mineral reserves are not regarded as significant compared with those of other countries in Latin America. At the end of the year, reserves of lateritic iron ore on the Paraná River near Encarnación were estimated at less than 3 billion tons grading at 35% iron.

INFRASTRUCTURE

The transportation system in Paraguay improved somewhat in 1989, 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 meters. Other transportation modes comprised inland waterways, 3,100 km; railways, 970 km; and highways, 21,960 km. The most important commercial transportation connections 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

Since February 1989, a free exchange system has been in force for trade of goods, services, and investment. This measure is expected to foster Paraguay's economic growth. The new mining and investment codes should provide further incentives to attract national and foreign investments and stimulate exploration and development work.

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 and Argentina remained committed to the multibillion-dollar Yacyretá hydroelectric project. It should help to improve the Paraguayan economy when completed.

Paraguay's accession to GATT would provide an opportunity to expand its trade position worldwide.

[1]Where necessary, values have been converted from Paraguayan Guaranies (G) to U.S. dollars at the average market rate of G1,210=US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

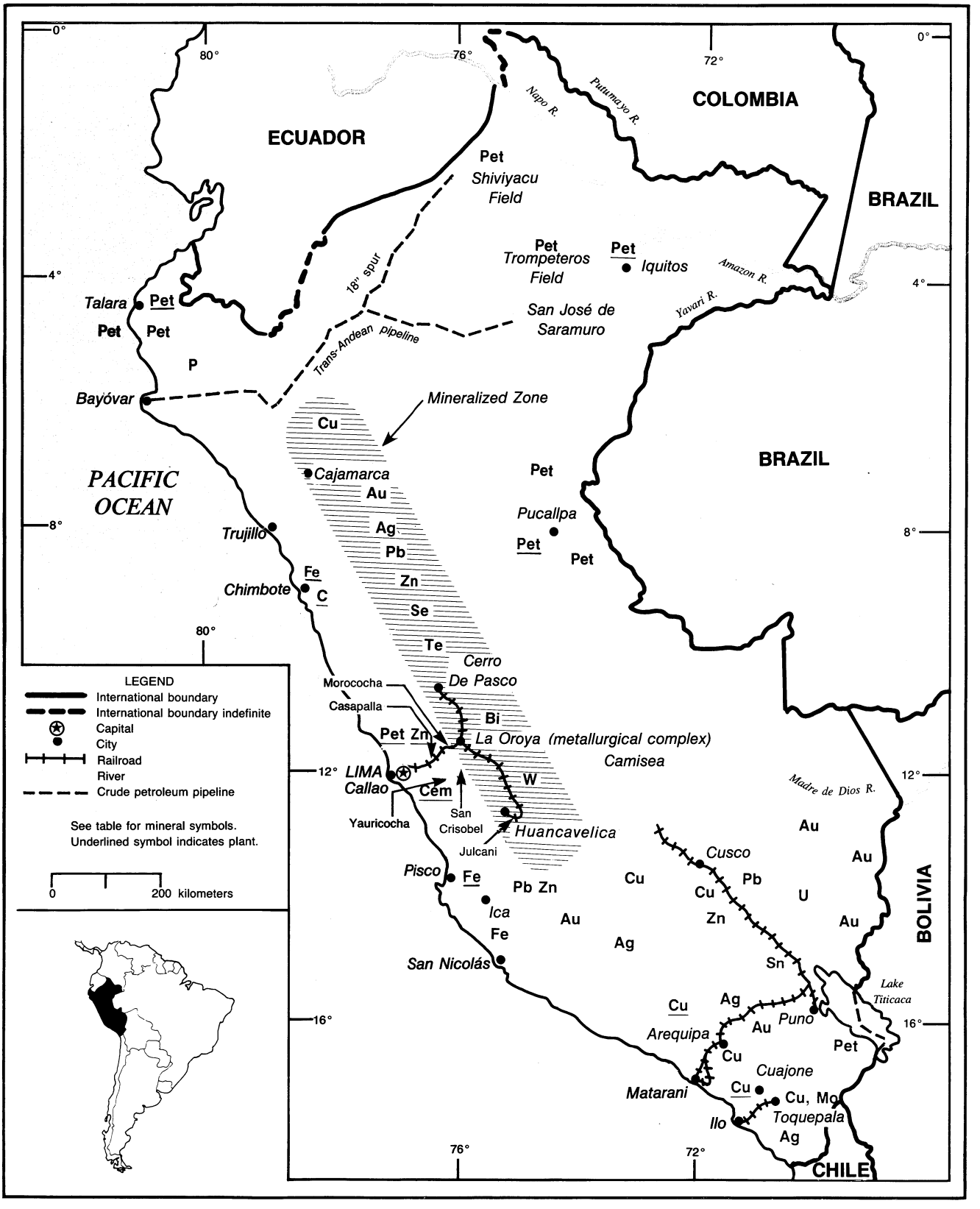
Aceros del Paraguay S.A. (ACEPAR)
Azara 179, Asunción
Administración Nacional de Combustibles, Alcohol y Portland
Asunción, Paraguay
Palma 1084 y Hernanderías, Asunción
Administración Nacional de Navegación y Puertos (ANNP)
Plazoleta Isabel La Católica y Colón
Asunción, Paraguay
Dirección General de 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 America 4to Piso
Oliva 299
Asunción, Paraguay

Publications

Administración Nacional de Combustibles, Alcohol y Portland, Asunción, Paraguay: Memoria y Balance, annual.
Banco Central del Paraguay, Asunción, Paraguay: Boletín Estadístico, annual.
Inter-American Development Bank, Washington, DC: Economic and Social Progress in Latin America, 1989 Report.
Instituto Latinoamericano del Fierro y el Acero (ILAFA), Santiago: Anuario Estadístico de la Siderúrgica y Minería del Hierro de América Latina, annual.
Siderurgia Latinoamericana, monthly.

PERU

AREA 1,285,200 km² **POPULATION 21.9 million**



THE MINERAL INDUSTRY OF

PERU

By Philip M. Mobbs

Peru was one of the more important mining countries of the world in 1989. At least 19 metallic and 23 industrial minerals were produced or processed within the country. Peru was a major world source for arsenic, copper, lead, molybdenum, silver, tellurium, and zinc. The country was South America's sixth largest petroleum producer. Mine output surpassed the depressed levels of 1988, but almost all mineral commodities lagged behind posted 1987 volumes. Mineral export income reached $1.62 billion, which was 46% of the country's export earnings.[1]

Despite the adverse effects of galloping hyperinflation, deep recession, and continued international financial problems, the value of mineral exports helped to drive the country's general economic growth during 1989. Peru achieved a positive trade balance for the first time since 1985. This surplus was attributed to falling domestic demand for imports during the first part of the year and parallel exchange financed imports not included in the Central Bank's balance of payments statistics. The almost $1.2 billion surplus in 1989 compared favorably with the $57 million loss incurred during 1988.

GOVERNMENT POLICIES AND PROGRAMS

During 1989, the Government proclaimed a number of mines to be in a state of emergency, which allowed the distressed companies to order spare parts and equipment without the international tender procedures normally required by law. A new minimum mining wage was announced, effective August 1st. The mining wage was scheduled to be at least 125% of the country's legal minimum wage. Fourteen diseases were added to the official list of compensable diseases that affected the mining sector, and December 5th was declared to be "Mine Workers' Day," a holiday for the mining community. The Government also appointed a commission to design a national mining development plan to promote Peruvian mining.

The Peruvian minerals industry was adversely affected by many of the Government's economic policies. The Government continued its policy of multitiered exchange rates. Export companies received a mix of dollars and two types of foreign exchange certificates, which resulted in the exporter suffering an effective loss of between 25% and 50% of the exported material's value.

In June, the Government began daily minidevaluations of the inti, the national currency. This gradual depreciation approach was initiated with the hopes of buffering the hardships of larger adjustments. Cumulative inflation for the year exceeded 2,775%.

Consistently late debt service payments prompted the Inter-American Development Bank to suspended credit to Peru. The reduction of credit severely distressed the mining sector. Subsequently, the Government discussed loan repayments and credit restoration with the International Monetary Fund, World Bank, and Inter-American Development Bank. Late in the year, debt service payments were resumed to the International Monetary Fund, which had suspended credit in 1986.

The state-owned Banco Minero del Perú was originally chartered to provide financial and technical assistance to small-sized and medium-sized mining companies. The bank's activity was severely limited in 1989 by financial problems highlighted by a shrinking deposit base and lack of liquidity when deteriorating metal prices, terrorism, and the unfavorable export exchange rates took their toll on the bank's clients, the small and medium mining sectors. The Instituto Geológico Minero Metalúrgico (Ingemment) maintained basic geological, mining, and metallurgical research, and training programs.

Most mining activity falls under Legislative Degree No. 109, the General Mining Law signed on June 12, 1981, and the subsequent decrees and regulations passed to revise and adjust articles of the law. Legislative Decree No. 296 of July 1984 involved tax incentives for the small mining sector, including heavy-mineral and gold miners. Supreme Decree No. 027-84-EM/VM of August 1984 modified sections of the General Mining Law concerning the obligations of mining companies with regard to tax payments and credits and capital investments. Legislative Decree No. 362 modified the general income tax law to promote investment in the mining industry. Supreme Decree No. 014-85-EM/DGM of May 1985 altered the Gold Mining Law, Decree Law No. 22178 of May 1978, to attract investors to gold mining. Legislative Decree No. 400 of December 1986 discharged tax liabilities for new small-sized and medium-sized mining companies operating outside the Lima metropolitan region. Supreme Decree No. 008-87-EM/DGM of August 1987 allowed Empresa Comercializadora de Productos Mineros (Minpeco) to purchase mineral products tenders offered by the mining companies. Law No. 24762 changed the 1980 Petroleum Law, Decree No. 23231, to provide time periods for oil and natural gas contracts, as well as specifying block sizes. Decree Law No. 23112 regulated uranium exploration and exploitation.

PRODUCTION

Production rebounded in mid-1989, eventually surpassing 1988 output, a year noted for the lowest production of the decade. Continued lack of foreign exchange to fund projects, discouraging exchange rates for exported minerals, high interest rates, and increased terrorist attacks on both operational sites and electrical distribution grids helped to frustrate mineral production. There was, however, a noticeable reduction in labor disputes. The Peruvian Miners' Federation's only major strike occurred in mid-August. Although the strike lasted 18 days and incapacitated major copper and zinc mines, and the Ilo smelter, the action did not

significantly affect the country's annual mineral output.

Terrorist groups continued to disrupt Peru's mining facilities. More than 70 small and medium mines were ravaged by terrorist activity; many others operated substantially below capacity. Equipment damage compounded the mining community's chronic lack of spare parts, one of the consequences of Peru's foreign exchange crisis. Because of loss of life, personnel injuries, and equipment destruction, most companies installed paramilitary security groups at their operational sites, isolated in remote regions of the Andes Mountains.

TRADE

Minpeco was the state agency in charge of minerals marketing. Mineral commodities dominated the country's exports. Copper accounted for 22% and zinc garnered 11% of export activity. Lead and petroleum each secured 6% of the export market, while silver picked up 2%. Other major components of the export mix included: fishmeal (12%), textiles (10%), and agricultural products (3%). The United States remained a significant export destination (21% of exports),

TABLE 1

PERU: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS						
Antimony:						
Mine output, Sb content		594	[e]670	590	[e]420	[2]519
Metal		377	356	318	246	[2]304
Arsenic, white[3]		1,257	1,273	1,757	828	[2]563
Bismuth:						
Mine output, Bi content		785	605	412	363	[2]687
Metal		738	569	387	341	[2]646
Cadmium:						
Mine output, Cd content		579	463	461	368	[2]472
Metal		420	387	351	303	[2]352
Chromium, mine output, Cr content		—	—	461	368	430
Copper:						
Mine output, Cu content		[r]389,286	[r]370,899	391,050	301,723	[2]353,134
Sulfate, Cu content		[r]6,379	[r]5,612	5,218	3,185	[2]3,511
Metal:						
Smelter		[r]320,088	[r]327,198	323,009	246,879	[2]241,424
Refined		[r]230,465	[r]226,716	225,910	179,592	[2]219,958
Electrowon		[r]30,934	[r]28,976	26,520	21,126	[2]19,652
Gold:						
Mine output, Au content	kilograms	6,621	[r]8,846	8,486	9,164	8,700
Metal	do.	2,633	2,615	2,021	2,392	[2]2,300
Indium	do.	3,863	3,333	3,890	2,120	3,200
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	4,892	5,036	5,019	4,171	4,300
Fe content	do.	3,290	3,356	3,305	2,839	[2]2,923
Metal:						
Pig iron[4]	do.	163	216	185	202	[2]227
Ferroalloys		—	739	2,362	1,621	1,600
Steel ingots and castings	thousand tons	397	487	503	481	[2]401
Semimanufactures	do.	304	377	396	390	[2]222
Lead:						
Mine output, Pb content		201,460	194,378	203,950	149,037	[2]192,213
Metal		81,895	66,417	71,333	56,523	[2]73,402

See footnotes at end of table.

TABLE 1—Continued

PERU: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS—Continued						
Manganese, mine output, Mn content		334	119	[e]200	[e]146	150
Molybdenum, mine output, Mo content		3,807	3,484	3,353	2,444	[2]3,177
Selenium metal, refined	kilograms	14,506	12,035	11,430	4,937	5,000
Silver:						
Mine output, Ag content	do.	1,811,000	1,926,000	2,054,000	1,552,000	[2]1,840,000
Metal, refined	do.	751,000	667,000	662,000	510,000	[2]663,000
Tellurium metal	do.	15,007	9,836	7,457	4,078	5,000
Tin, mine output, Sn content		3,807	4,817	5,263	4,378	[2]5,053
Tungsten, mine output, W content		771	742	205	432	[2]880
Zinc:						
Mine output, Zn content		523,434	597,576	612,477	485,429	[2]597,413
Metal		162,725	155,811	144,169	123,125	[2]137,800
INDUSTRIAL MINERALS						
Barite		21,661	9,945	8,354	[e]8,500	8,400
Boron materials, crude (borates)		[e]10,000	22,557	22,710	[e]15,000	18,000
Cement, hydraulic	thousand tons	[r]1,757	2,207	2,584	[e]2,500	2,100
Chalk[e]		470,000	470,000	470,000	470,000	470,000
Clays:						
Bentonite		2,017	33,080	16,194	[e]20,000	20,000
Fire clay		4,305	[e]5,000	50	[e]100	100
Kaolin		210	6,328	626	[e]200	200
Common clay		115,588	406,587	1,083,528	[e]600,000	500,000
Diatomite		14,854	8,905	20,916	[e]15,000	15,000
Feldspar		—	19,467	64,749	[e]20,000	20,000
Gypsum, crude		28,640	171,347	228,845	[e]150,000	160,000
Lime[e]		35,000	35,000	12,500	13,000	13,000
Mica[e]		550	550	550	550	500
Nitrogen: N content of ammonia[e]		85,000	100,000	80,000	95,000	91,000
Phosphates, crude		12,216	5,167	60,713	13,465	13,000
Salt, all types		204,992	399,387	444,894	[re]350,000	350,000
Stone, sand and gravel:						
Stone:						
Dolomite		1,635	[e]2,000	60	[e]100	100
Flagstone		—	467,766	[e]400,000	[e]300,000	300,000
Granite		—	—	64,296	[e]60,000	60,000
Limestone	thousand tons	2,031	2,935	1,657	[e]1,600	1,600
Marble		1,550	7,258	9,926	[e]8,000	8,000
Onyx		—	143	577	[e]500	500
Quartz and quartzite (crushed)		2,150	[e]2,200	848	[e]1,000	1,000
Shell, marl		—	5,437	[e]5,000	[e]4,000	4,000
Slate[e]		18,000	18,000	18,000	18,000	18,000
Travertine		550	4,082	6,524	[e]5,000	5,000
Sand and gravel:						
Construction	thousand tons	1,902	4,847	8,013	[e]5,000	5,000
Silica sand	do.	2	99	76	[e]75	75

See footnotes at end of table.

TABLE 1—Continued

PERU: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
INDUSTRIAL MINERALS—Continued						
Sulfur:						
Elemental:						
Native[e]		100	100	100	100	100
Byproduct of metallurgy		64,145	66,300	[e]66,000	[e]66,000	66,000
Sulfuric acid, gross weight		[r]210,754	[r]207,462	181,054	173,722	180,000
Talc and related materials:						
Talc		500	1,754	1,447	[e]1,500	1,250
Pyrophyllite		—	7,354	705	[e]1,000	750
Total		500	9,108	2,152	[e]2,500	2,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		5,949	5,439	5,877	7,081	[2]5,028
Coal:						
Anthracite, run-of-mine[e]		92,750	90,000	90,000	90,000	90,000
Bituminous, run-of-mine		32,691	61,077	107,501	[e]67,000	70,000
Total		125,441	151,077	197,501	[e]157,000	160,000
Coke, all types[e]		10,000	10,000	10,000	10,000	10,000
Gas, natural:						
Gross	million cubic meters	1,338	1,416	1,395	1,359	1,125
Marketed	do.	623	626	493	435	283
Natural gas liquids:						
Natural gasoline and other[5]	thousand 42-gallon barrels	249	240	335	368	240
Propane	do.	81	69	29	24	20
Butane	do.	6	6	9	5	5
Total	do.	336	315	373	397	265
Petroleum:						
Crude	do.	68,620	65,262	59,730	51,717	[2]47,597
Refinery products:						
Gasoline, motor	do.	11,627	11,702	11,425	11,694	[2]10,916
Jet fuel	do.	2,377	2,551	2,260	1,991	[2]1,970
Kerosene	do.	6,353	6,940	6,464	7,404	[2]6,484
Distillate fuel oil	do.	12,389	10,577	10,444	9,503	[2]8,547
Residual fuel oil	do.	25,652	27,441	28,829	27,306	[2]24,751
Lubricants	do.	58	61	63	54	[2]48
Liquefied petroleum gas	do.	1,407	1,577	1,620	1,649	[2]1,685
Asphalt	do.	271	333	446	1,009	[2]871
Refinery fuel and losses	do.	537	1	2	138	[2]167
Other	do.	1,536	1,131	397	153	[2]131
Total	do.	62,207	62,314	61,950	60,901	[2]55,570

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

[1]Table includes data available through Sept. 1990. Production figures for 1986–89 do not necessarily reflect recoverable metal content as do those for prior years.

[2]Reported figure.

[3]Output reported by Empresa Minera del Centro del Perú S.A.

[4]Excludes sponge iron production as follows, in tons: 1985—49,300; 1986—55,500; 1987—50,891 (revised); 1988—51,000; and 1989—49,200.

[5]Includes hexane.

especially for silver, crude petroleum and petroleum products, and coffee. Europe and the U.S.S.R. had been increasing their share of Peru's exports in recent years as U.S. intake waned. Peruvian products were increasingly the objects of debt-for-product swaps with the international banks.

Imports recovered after a slow beginning of the year, reaching $2.3 billion. Imports from the United States accounted for 30% of Peru's official purchases. Petroleum products accounted for 6% of this $690 million market, trailing machine parts and equipment (22%) and agricultural products (12%).

STRUCTURE OF THE MINERAL INDUSTRY

In Peru, the major mining companies were state-owned, with the exceptions of Southern Perú Copper Corp. (SPCC) and Compañía (Cía.) Minera Milpo S.A. Private companies dominated the medium and small mining sectors. Petroleum activities were the responsibility of the Ministry of Energy and Mines and were administered by Petróleos del Perú S.A. (Petroperú), the state petroleum company.

Because of the chronic lack of financing, state-owned companies were unable to work on undeveloped concessions, nationalized by Peru's military regimes of the 1970's. State mining companies continued to offer these unexploited resource concessions to both national and international concerns. Petroperú also contracted out acreage previously reserved for its own development.

COMMODITY REVIEW

Metals

The Government announced that it would sell its 18.5% stake in Cía. de Minas Buenaventura S.A., a medium-sized silver producer. The action had originally been proposed in 1982. Privatization of the state's holdings in Cía. Minería Condestable, a copper producer in the medium mining sector, was also proposed.

Tenders were requested by Empresa Minera del Perú S.A. (Minero Perú) to develop the copper deposits at Cerro Verde II, Berengeula, Michiquillay, Quellaveco, and Las Bambas. The San Antonio de Poto gold deposit, and the polymetallic prospects at Iscaycruz, and Antamina were also made available to bidders. Tenders were canceled at yearend, owing to the lack of qualified bidders.

Copper.—Most copper was produced by the private SPCC, and state-owned Empresa Minera del Centro del Perú S.A. (Centromín), Empresa Minera Especial Tintaya S.A. (Tintaya), and Minero Perú, all large-scale mining concerns. The privately owned medium-scale mining

TABLE 2

PERU: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Antimony	Empresa Minero del Centro del Perú (Centromín) (Government, 100%)	Smelter at La Oroya, Junín Department	[1]300
Barite	Barmine S.A. (private, 100%)	Santa Cruz de Cocachacra, Huarochiri Department	NA
Bentonite	Minerales Andinos S.A. (NL Industries, 90%)	Vichayal Mine, Piura Department	9
Bismuth	Centromín	Refinery at La Oroya	[1]515
Copper	Southern Perú Copper Corp. (SPCC) (ASARCO Incorporated, 52.3%; Phelps Dodge Overseas Capital Corp., 16.3%; The Marmon Group Inc., 20.7%; Newmont Mining Corp., 10.7%)	Cuajone, Moquegua Dept., and Toquepala, Tacna Department Smelter at Ilo, Moquegua Department	300 300
Do.	Centromín	Cobriza, Huancavélica Department; Casapalca and Yauricocha, Lima Department; Morococha and San Cristóbal, Junín Department Smelter at at La Oroya Refinery at La Oroya	60 62 58
Do.	Empresa Minera Especial Tintaya S.A. (Government, 100%)	Tintaya Mine, Cuzco Department	60
Do.	Empresa Minera del Perú S.A. (Minero Peru) (Government, 100%)	Cerro Verde, Arequipa Department Refinery at Ilo, Moquegua Department Electrowon at Cerro Verde.	33 175 33
Dolomite	Minera Baribent S.A. (private, 100%)	Esperanza, Ancash Department	25
Gold	Cía. Minera Ponderosa S.A. (private, 100%)	Ponderosa, La Libertad Department	[2]1,300

See footnotes at end of table.

TABLE 2—Continued

PERU: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Gold	Cía de Minas Orcopampa S.A. (Buenaventura, 100%)	Orcopampa, Arequipa Department	[2]1,050
Do.	Asesoría Contable Minera S.A. (private, 100%)	Ocona, Santa Clarita, Explatoro, and Molino de Oro, Arequipa Department	[2]1,000
Do.	Cía. Aurífera Río Inambari S.A. (Cía. Minera del Sur S.A., 84%, Aurífera Claudia, 16%)	Río Caichive, Madre de Dios Department	[2]200
Iron ore	Empresa Minero del Hierro del Perú (Hierro Peru) (Government, 100%)	Marcona, Ica Department	13,000
Lead	Centromín	Cerro de Pasco, Casapalca, San Cristobal, Morococha, and Yauricocha Mines	85
		Smelter at La Oroya	93
		Refinery at La Oroya	95
Do.	Cía. Minera Milpo S.A. (private, 100%)	El Porvenir Mine, Pasco Department	20
Molybdenum	SPCC	Cuajone, Moquegua Department, and Toquepala, Tacna Department	NA
Petroleum, crude	Petróleos del Perú (Petroperu) (Government, 100%)	Onshore Piura Department; northeast and central jungle areas, Loreto Department	[3]68,000
Do.	Petróleos del Mar S.A. (Petroperú, 100%)	Pacific coast, offshore Piura Department	[3]28,000
Do.	Occidental Petroleum Corp. del Perú (private, 100%)	Northeastern jungle, Loreto Department	[3]90,000
Petroleum products	Petroperú	Refineries at Talara, Lima, Iquitos, Marsella, and Pucallpa	[3]185,500
Silica sand	Minera Baribent S.A. (private, 100%)	María G. and Martín I., Junín Department	27
Silver	Centromín	Cerro de Pasco, Cobriza, Monterrosas, Morococha, San Cristóbal, and Yauricocha Mines	[2]466,000
		Refinery at La Oroya	[2]809,000
Do.	Cía. de Minas Buenaventura S.A. (Buenaventura)(private, 83%; Centomín 17%)	Julcani and Huachocolpa Mines Huancavélica Department, Uchucchacua Mine, Lima Department	[2]187,000
Do.	Cía. de Minas Orcopampa S.A. (Buenaventura, 100%)	Orcopampa Mine, Arequipa Department	[2]161,000
Steel	Empresa Siderúrgica del Perú (Government, 100%)	Chimbote, Ancash Department	550
Do.	Empresa Laminadora del Pacífico S.A. (private, 100%)	Pisco, Ica Department	180
Tellurium	Centromín	Refinery at La Oroya	[1]12
Tungsten	Minera Regina S.A. (private, 100%)	Palca XI, Puno Department	[1]1,400
Do.	Fermín Málaga Santolalla (private, 100%)	Pasto Bueno, Ancash Department	[1]1,000
Zinc	Centromín	Casapalca, Cerro de Pasco Morococha San Cristóbal, and Yauricocha mine units	235
		Refinery at La Oroya	70
Do.	Minero Perú	Refinery at Cajamarquilla	102
Do	San Ignacio de Morococha S.A. (private, 100%)	San Vicente Mine, Junín Department	70

NA Not available.
[1]Metric tons per year.
[2]Kilograms per year.
[3]Forty-two gallon barrels per day.

sector accounted for less than 8% of Peru's copper output.

Minero Perú increased the refinery capacity of its Ilo plant from 150,000 to 175,000 tons per year. The company also upgraded the capacity of its copper concentrates pilot plant at Cerro Verde from 1,300 tons per day to 1,500 tons per day.

Centromín planned the installation of an oxygen plant for the copper line at the La Oroya metallurgical complex. The plant was projected to increase the line output by 20% and decrease fuel requirements by 50%. The La Oroya complex produced 48,522 tons of refined copper in 1989.

Tintaya generated $105 million in sales during 1989. The company invested $20 million in spare parts and equipment to upgrade its concentrator and spent an additional $3.5 million on mine vehicles. Financial problems had limited the mine's production since it opened in 1985. Tintaya diverted 55,000 tons of copper concentrates to SPCC instead of exporting all of its production through Minpeco.

Gold.—Peru produced gold from both vein and placer deposits. Vein type production was observed along the Río Marañón, southeast of Cajamarca and in the area between Ica and Arequipa. Additionally, gold was obtained as a byproduct from the beneficiation of polymetallic ores. Most placer mining occurred in the Department of Madre de Dios, where up to 30,000 miners were estimated to be working the riverbanks, washing alluvial deposits for gold. Operations ranged from single person sluices to bucket dredges.

Statistical information on placer gold production was based on gold purchases by Banco Minero and the Central Reserve Bank, the only legal sales channels. Although miners were paid a premium (world price plus 5%) until early December, gold was treated as an export and subject to the multitier exchange rates. Because of the effectively lower prices paid by the banks, they were apparently bypassed. Up to 40% of the placer production was estimated to be smuggled out of the country.

Cía. Aurífera Río Inambari S.A. (Carisa) operated its bucket dredge on the Caichive River near the border between the Madre de Dios and Cusco Departments. Carisa produced 10 to 15 kilograms (kg) of gold per month. The company was 84% owned by Bolivia's Cía. Minera del Sur S.A. and 16% by Cía. Aurífera Claudia, a private Peruvian company. The Cía. Aurífera el Sol S.A. and Aurífera Los Incas joint venture transported a bucket dredge through the mountains toward their placer concession on the Madre de Dios. It was expected to be assembled and in operation during 1990.

Three suction dredges actively worked the Madre de Dios area. Minpeco, the state-owned minerals marketing company, made another two dredges available for lease. A sixth suction dredge was reported to be tied up and not operating. All six suction dredges were imported from Brazil. In November, Centromín committed to the local manufacture of a dredge. Cía. Minera Aurífera Ana María produced more than 8 kg of placer gold next to a vein mine in the Department of Puno.

Cía. Minera Ponderosa S.A. recovered 1,300 kg of gold from the Ponderosa lode gold mine. This was a 63% increase over its 1988 production. Power for mine operations was upgraded when a 1,500-kilowatt hydroelectric plant was installed during 1989. Cía. de Minas Orcopampa S.A., a Buenaventura subsidiary, produced 13,150 tons of concentrates containing 0.08 kg gold per ton, 11 kg silver per ton, and 3.86% copper. Orcopampa was the country's leading producer of gold in concentrates and the second largest silver producer.

Lead and Zinc.—Lead output exceeded 192,000 tons, with Centromín contributing 37.4% and medium-sized companies producing 53.8% of the total. The remaining 8.8% was contributed by the small-scale mining companies. More than one-third of the almost 600,000 tons of zinc production was also attributable to Centromín.

Prominent private sector lead-zinc producers included: Cía. Minera Milpo S.A., Cía. Minera Atacocha S.A., Cía. Minera Santa Luisa S.A., Cía. Minera San Ignacio de Morococha S.A., and Perubar S.A. Other producers included: Cía. Minera Huarón S.A., Cía. Minera Raura S.A., Corporación Minera Nor Perú S.A., and Volcan Cía. Minera S.A.

Milpo produced 31,955 tons of lead concentrates containing 69.4% lead and 2.1 kg silver per ton and 49,582 tons of zinc concentrates with 56.6% zinc and 130 grams (g) silver per ton.

Santa Luisa shipped lead-silver and zinc concentrates from the 1,300 tons per day concentrator at its Huanzala mine to Japan. The company is owned by the Japanese with Mitsui Mining and Smelting Co. maintaining a majority interest. The company increased mechanization of the mine and upgraded employee housing at the mine during the year.

San Ignacio continued as Peru's leading private zinc producer, producing 130,862 tons of zinc concentrates with a 61.15% zinc and 0.65% lead average composition. Its San Vicente Mine in the central jungle also produced 6,398 tons of lead concentrates containing 67.74% lead and 2.03% zinc. The company reported drastically reduced income on exports of 106,516 tons of zinc concentrates worth more than $55 million and 1,953 tons of refined zinc worth $2.7 million despite high 1989 zinc prices, primarily owing to exchange rate problems.

Nor Perú's 1989 output included: 9,222 tons of lead concentrates with 52.86% lead, 5.84% zinc, 4.00% copper, and 4.17 kg silver per ton; 28,184 tons of zinc concentrates with 55.20% zinc, 0.70% copper, 0.67% lead, and 242 g silver per ton; and 5,431 tons of copper concentrates with 10.94% zinc, 7.94% lead, 7.34% copper, and 4.68 kg silver per ton. The company, which deepened its satellite mine shaft and improved the hydraulic system at the Quiruvilca polymetallic deposit 100 kilometers east of Trujillo, is 80% owned by ASARCO Incorporated, a U.S. company.

Minero Perú's Cajamarquilla zinc refinery was forced to reduce operations during 1989 owing to repeated electric powerline sabotage. The refinery started up a flotation unit projected to produce up to 700,000 kg of silver concentrates per year from lead-silver tailings.

Silver.—In 1989, most Peruvian silver was produced as a byproduct from lead-zinc-copper concentrates. Medium-scale and small-scale companies mined most of the 1,840,000 kg of silver produced. Silver producers attempted to overcome the problem of lower income associated with low commodity prices with increased production. Silver output was up compared with that of 1988.

Centromín was the country's largest silver producer with mine operations at Casapalca, Cerro de Pasco, Morococha, San Cristóbal, and Yauricocha. Cía. de Minas Buenaventura S.A., the parent of Orcopampa, was the third largest silver producer with operations at Julcani and Uchucchacua. Additional major silver producers included: Minas de Arcata

S.A., Cía. Minera Milpo S.A., Corporación Minera Nor Perú S.A., Cía. Minera Huarón S.A., Cía. Minera de Caylloma S.A., and Minera Pachapaqui S.A.

Tin.—The San Rafael and Santa Bárbara deposits worked by Minsur S.A. were the only sources of Peruvian tin. San Rafael output consisted of 9,305 tons of tin concentrates with 44.56% tin and 3,710 tons of tin concentrates with 22.45% tin, in addition to 899 tons of copper concentrates with 25.6% copper. Santa Bárbara output was 2,384 tons of concentrates with 33.9% copper, 6.6% lead, 3.3 kg silver per ton, and 26 g gold per ton and 96 tons of concentrates with 3.24 kg silver per ton and 85 g gold per ton.

Tungsten.—The more than 200% increase in tungsten was owing to the substantial production increase by Minera Regina S.A. and the reopening of the Pasto Bueno Mine by Minera Fermín Málaga Santolalla, formerly the country's leading tungsten producer. Minera Regina's Palca XI Mine produced concentrates containing 700 tons of tungsten, 85% of which was exported to the United States.

Uranium.—Bids were solicited by the Peruvian Nuclear Energy Institute for the development of the uranium resources in the Chapi-Manusani deposit north of Puno. A commission was appointed to negotiate the contract.

Industrial Minerals

Marble.—Minera Baribent S.A. opened a new marble quarry in Puno Department during 1988. The company has an annual capacity of 2,500 cubic meters of marble.

Phosphate Rock.—The Empresa Promotora de Bayóvar S.A. (Probayóvar) obtained bids on Area II of the Bayóvar phosphate deposit in the Sechura Desert of Piura Department. Two Peruvian consortia and the British Wimpey International Ltd. bid on the estimated 350-million-ton reserves of the 48-square-km area. Output was projected to be 1.5 million tons of phosphate rock per year.

Minpeco arranged a contract that called for two shipments of 20,000 tons of phosphate rock from Minero Perú's pilot plant in Area I at Bayóvar to a New Zealand company. The first shipment of 21,000 tons got under way in November.

Mineral Fuels

About 4% of Peru's total estimated 74,000-megawatt hydroelectric potential was utilized. The country has an installed electrical generating capacity of 4,106 megawatts. Peru's substantial unexploited hydroelectric potential has not been exploited owing to the high initial investment associated with harnessing isolated mountain rivers and interconnecting with the main power distribution grid.

Liquid fuel's share of energy consumption increased owing in part to the Government's decision to keep fuel prices low, augmented by frequent power outages resulting from transmission line damage by insurgent groups. To maintain production, mining operations often relied on independent local power sources, both hydroelectric and thermoelectric.

Coal.—In an effort to reduce the country's dependence on imported petroleum products, Empresa Promotora del Carbón S.A. (Procarbón), the state coal promotion company, in cooperation with other state enterprises and South Korea, opened an 80-ton-per-day coal briquetting plant near Chimbote. The briquettes were intended to be used for domestic cooking as a substitute for kerosene.

Petroleum and Natural Gas.—Petroleum production averaged 130,421 barrels per day, about 8% below 1988 levels. Government price controls resulted in Petroperú selling domestic products at prices that left the company unable to satisfy exploration and production funding requirements. The lack of foreign exchange sorely affected equipment, supplies, and spare parts availability. The lack of refinery investment during the 1980's forced Petroperú to export the lower priced heavy crude produced in the country and import higher priced petroleum products and lighter crude oil, which the refineries were able to handle.

Petroperú discovered the Chambira East field in western part of Block 8 with the Chambira Este 123 X, which was spudded in March. The Cretaceous test in the northeast jungle flowed up to 2,084 barrels per day of 26.7 API gravity crude. An offset well also successfully tested oil. Petroperú also drilled two exploratory wells in the Talara area. Occidental Petroleum Corp. del Perú (Oxy) abandoned both the 2,926 meter La Colpa 1 and the 3,505 meter Platanal 1 wildcats on Block 36 in the central eastern jungle.

Oxy ceased maintenance operations on its northern jungle fields during April in response to Petroperú's failure to maintain contract payments. Oxy's production dropped by 15,000 barrels per day to 50,000 barrels per day during the period. In December, Oxy stopped pumping its northern jungle wells for 3 weeks to protest Petroperú's continued delay in payments for production.

Mobil Exploration and Producing Perú Inc. contracted to explore blocks 28, 29, and 30, with an option on block 53 in the eastern jungle. Petroperú initialed an exploration contract with Vera Gutiérrez Exploración Producción S.A. for block S-2 in southeastern Peru, along the shore of Lake Titicaca. This was the first petroleum exploration contract signed with a privately owned Peruvian company.

Enron was compensated by the American Insurance Group of New York (AIG) for the loss of its Belco assets, nationalized by the Peruvian Government in 1985. Negotiations between AIG and the Government to resolve the matter continued through the year.

INFRASTRUCTURE

Peru had 8,600 km of navigable waterways associated with the Amazón River and Lake Titicaca. Important mineral industry ports included Iquitos on the Amazón and Callao, Ilo, Matarani, and Talara on the Pacific Ocean. There was also a petroleum depot at Bayóvar, the terminus of the 800-km Trans-Andean crude oil pipeline. The country had 1,876 km of railroads and 56,645 km of roads. Of these roads, 6,030 km were hard surfaced, 11,865 km had gravel surfaces, and the remainder were earthen. The roads and railroads in the mountains were subject to damage by landslides and terrorist actions. The BR-364 highway project linking the Trans-Amazonian and the Trans-Andean highways was dropped by Japan. Many international interests opposed the project, which would have encouraged development in the area between Río Branca in Brazil and Pucallpa in Peru at the cost of severely damaging the rain forest.

OUTLOOK

The overall situation in Peru remains uncertain. Although numerous investment opportunities exist, the existence of hyperinflation and recession, exchange rate problems, labor dissatisfaction, frequent power shortages, and increasing terrorist activities all adversely affect the short-term prospects of the minerals industry. Many of the small and medium mining companies are in difficult financial condition, as are Petroperú and Banco Minero, and the situation is not expected to improve in the near future.

The Ministry of Energy and Mines is actively promoting minerals development. Additional oil exploration contracts with both local and international companies are expected to be signed. Interest in undeveloped Peruvian mineral resources is increasing in the international mining community. However, some investment decisions are being delayed until after the 1990 elections.

[1]Where necessary, values have been converted from Peruvian intis to U.S. dollars using the average exchange rate for 1989 of 3,483 intis = US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Dirección General de Minería
Ministerio de Energía y Minas
Avenida de Las Artes
Urbanización San Borja, San Isidro
Lima, Peru

Dirección General de Hidrocarburos
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Publications

Ministerio de Energía y Minas, Lima: Anuario de la Minería del Perú, annual.

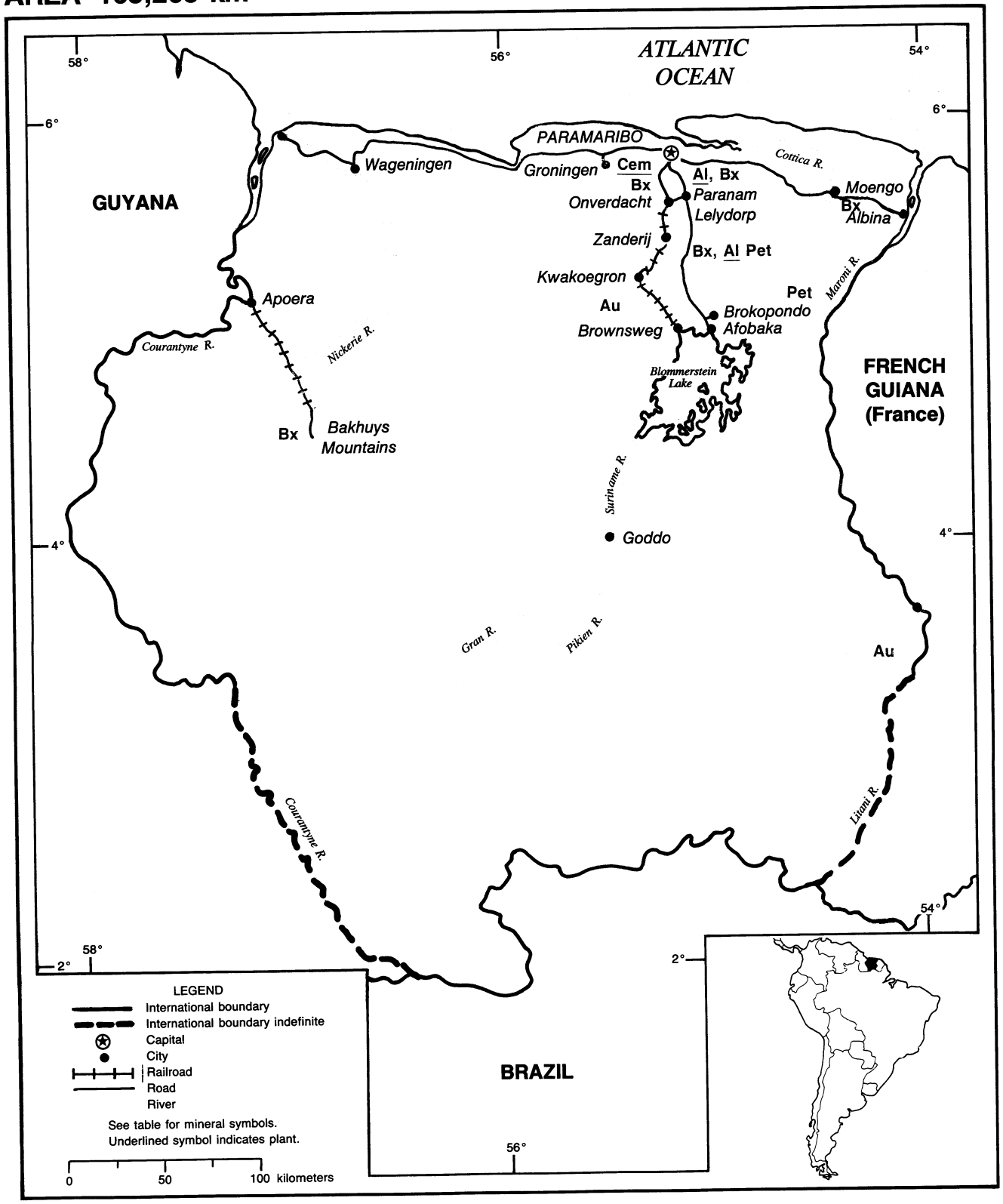
Andean Air Mail & Peruvian Times S.A., Lima: Carta Minera y Panorama Petrolero, weekly.

Organización Latinoamericana de Energía (OLADE), Quito, Ecuador: Energía en Cifras, 1989, annual.

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

SURINAME

AREA 163,265 km² **POPULATION 401,500**



THE MINERAL INDUSTRY OF

SURINAME

By H. Robert Ensminger

Suriname's economy has been in decline since 1982. The principal reasons for the downward trend were lower commodity prices, political unrest, and the suspension of foreign aid, especially from the Netherlands. The estimated gross domestic product in 1989 was $1.2 billion[1] (current dollars). The major mineral commodities produced were alumina, bauxite, cement, common clays, petroleum, sand and gravel, and stone (crushed). Guerilla activity since 1986 has had an adverse affect on the country's economy. In midyear, a formal ceasefire signing was called the Kourou Agreement; however, sabotage activities by the military and Amerindian groups, who disagreed with the pact, resumed in September.

GOVERNMENT POLICIES AND PROGRAMS

The civilian Government of Suriname held back from any decisive action on the economic front and continued to resist the devaluation favored by the International Monetary Fund. In July, the Government of the Netherlands signed an agreement with the Government of Suriname for the resumption of long-term aid; however, some of the Netherlands ministers became very unhappy with the agreement after guerilla violence erupted around the Moengo bauxite mine later in the year.

Investment inducements available in 1989 were tax holidays, assistance with site locations, provision of low-cost or no-cost factory shells, and assistance in processing the necessary paperwork. For the future, Suriname can offer only limited prospects for exporters or investors; however, opportunities do exist for mining, petroleum, and consumer goods.

PRODUCTION

Bauxite production increased over that of the previous year while alumina production showed a slight decrease. Crude petroleum production showed an increase over that of 1988. Aluminum metal output remained at about the same level. Although Suriname is a minor producer of gold, its production increased an estimated 40% in 1989.

TRADE

In 1989, Suriname's bauxite companies exported more than 1.6 million tons of alumina valued in excess of $320 million. The Suriname Aluminum Co. (SURALCO), a wholly owned subsidiary of the Aluminum Co. of America of the United States, exported in excess of 1.6 million tons of aluminum. A small amount of bauxite was also exported. In 1989, the preponderance of alumina exports went to Canada, the Netherlands, Norway, and the United States, in descending order of tonnage. The major portion of aluminum exports went to the Netherlands.

STRUCTURE OF THE MINERAL INDUSTRY

Bauxite was mined solely by two companies, SURALCO and N.V. Billiton Maatschappij Suriname (BMS), which was 100% owned by Royal Dutch Shell of the Netherlands. SURALCO wholly owned and operated the alumina refinery and the aluminum smelter at Paranam, District of Para. N.V. Staatsolie Maatschappij Suriname, the state petroleum company, owned and operated the entire production from the Borneo and Tambaredjo Fields east of Paramaribo. The 60,000-ton-per-year cement plant, Vensur N.V. near Paramaribo, was 100% privately owned.

COMMODITY REVIEW

Metals

Production of alumina, aluminum ingot, and bauxite continued to be the country's primary industrial activity,

TABLE 1

SURINAME: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
Aluminum:						
Bauxite, gross weight		3,000	3,847	2,522	3,434	[2]3,530
Alumina		1,000	1,471	1,363	1,632	[2]1,567
Metal, primary[3]		29	[r]29	2	10	10
Cement, hydraulic[e]		50	50	50	50	50
Clays: Common[e]	metric tons	[r]15,000	[r]15,000	[r]16,000	[r]16,000	16,000
Gold, mine output, Au content	kilograms	16	19	[e]22	[e]22	[2]31
Petroleum, crude	thousand 42-gallon barrels	NA	NA	956	1,400	1,442
Sand and gravel:[e]						
Sand, common		155	160	[2]156	160	160
Gravel		25	25	[2]19	[2]35	35
Stone, crushed and broken[e]		50	[2]50	50	50	50

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Includes data available through July 31, 1990.
[2]Reported figure.
[3]Data represents exports.

TABLE 2

SURINAME: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Alumina	Suriname Aluminum Co. (SURALCO) and N.V. Billiton Maatschappij Suriname (BMS) (SURALCO, 55%; BMS, 45%)	Paranam (refinery), District of Para	1,500
Aluminum	SURALCO (private, 100%)	Paranam (smelter), District of Para	66
Bauxite	do.	Moengo (mine), District of Marowijne	1,500
Do.	BMS (Royal Dutch Shell, 100%)	Onverdacht (mine), District of Para	4,000
Cement	Vensur N.V. (private, 100%)	Paramaribo, District of Para	60
Petroleum	N.V. Staatsolie Maatschappij Suriname (Government, 100%)	Fields in District of Commewijne	[1]1,500

[1]Thousand 42-gallon barrels per year.

accounting for 9% of Government revenues. These commodities also contributed about 60% to the financing of imports of goods and services by other sectors of the economy. Approximately 4% of the total work force was employed in the bauxite sector.

SURALCO's Moengo Mines will be exhausted by 1991 based on present production. Billitons Onverdacht Mine was in a similar condition. As a consequence, SURALCO and Billiton's demand for a more favorable fiscal climate with respect to their operations in Suriname in exchange for renewed investment in new mines and operations was largely met by the Government. In 1989, proven reserves of bauxite were approximately 280 million tons.

Mineral Fuels

Suriname petroleum production had risen rapidly from 4,000 barrels in 1982 to almost 1.5 million barrels in 1989. Staatsolie developed a new exploration and production expansion program for the onshore basin, to be carried out between 1989 and 1992. The program calls for the drilling and testing of a minimum of 30 wells. The expanded production was intended to increase crude petroleum production to 6,300 barrels per day by 1992 compared with 1,442 barrels per day in 1989. In addition, Staatsolie hopes to have its own refinery operational by yearend 1992.

Reserves

The International Bauxite Association had reported that Suriname contained 284 million tons of proven reserves and 189 million tons of indicated and probable reserves. Most of the reserves were low-grade bauxite.

INFRASTRUCTURE

Suriname contained a total of 8,300 kilometers (km) of highways composed of 500 km paved; 5,400 km bauxite gravel, crushed stone, or improved earth; and 2,400 km sand or clay. The railroad system consisted of 86 km of 1.0-meter-gauge single track and 80 km of 1.435-meter-gauge single track. The country had 1,200 km of inland waterways, its most important means of transport. Oceangoing vessels with drafts of 4.2 meters to 7 meters could navigate many of the principal waterways. Paramaribo, the capital, and Moengo were the principal seaports.

Suriname's power sector was closely linked to the bauxite industry and had an installed capacity of about 450 megawatts divided equally between thermal and hydroelectric generation; the often deferred Kabalebo Dam Project, originally scheduled for completion by 1980, was intended to develop large bauxite reserves in the Balchuis Mountains, District of Nickerie. The plan was scaled down in 1989 and will be aimed at electricity generation of 300 megawatts for use by the public.

OUTLOOK

A cessation in the political unrest that has racked Suriname since 1986 in conjunction with the new mining code adopted by the Government in 1988 would greatly improve the mineral industry sector for the long term. SURALCO and Billitons' efforts to expand and improve the bauxite industry bodes well for the future of the country's economy as well as the minerals industry. In addition, Staatsolie's activities in the petroleum sector, the planned quadrupling of production by 1992, and the commencement of refinery operations by yearend 1991 brighten the future.

[1]Where necessary, values have been converted from Surinamese guilders (Gs) to U.S. dollars at the rate of Gs1.7850=US$1.00.

OTHER SOURCES OF INFORMATION

Agency

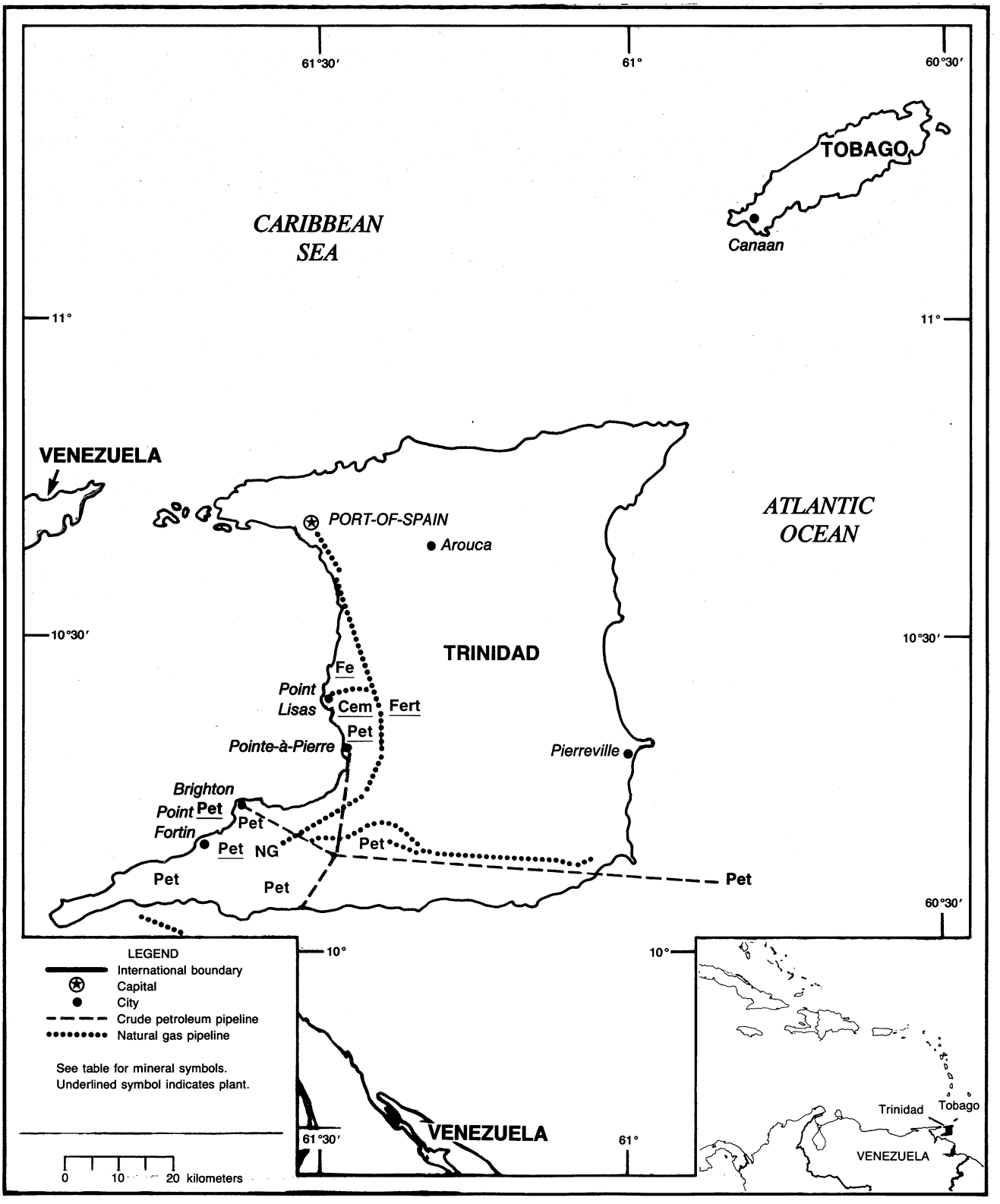
Ministry of Development
Geological and Mining Service
Paramaribo, Suriname

Publication

International Bauxite Association, Kingston, Jamaica: IBA Quarterly Review.

TRINIDAD AND TOBAGO

AREA 5,130 km² **POPULATION 1.2 million**



THE MINERAL INDUSTRY OF

TRINIDAD AND TOBAGO

By Ivette E. Torres

The economy of Trinidad and Tobago continued to depend heavily on oil and refinery products. Trinidad and Tobago was the second leading exporter of anhydrous ammonia after the U.S.S.R. Other mineral-related commodities produced in the country included natural gas, cement, and steel. Mining was limited to construction materials and rock products.

Efforts by the Government to diversify its economy continued, and foreign investment was encouraged. The economy remained in recession, but there were signs of stability. However, inflation and high unemployment persisted.

GOVERNMENT POLICIES AND PROGRAMS

The Government continued to promote private investment, and efforts were underway to stimulate activity in the oil sector. Simultaneously, the development of the country's vast natural gas resources to reduce oil dependency remained a top priority.

At yearend, the Government reportedly was considering a proposal to restructure the public energy sector. Under the proposal, the Government companies would be consolidated by establishing four operational divisions: (1) exploration and production, (2) refining and marketing, (3) petrochemicals, and (4) natural gas.

PRODUCTION

In addition to oil and refinery products, the main source of export revenues, Trinidad and Tobago produces natural gas, anhydrous ammonia, steel, and construction materials. In general, mineral activity in 1989 remained at about the same level as that of 1988 with a small variation in output levels in cement, sponge iron, and crude oil and refinery products. The notable exceptions were the output of anhydrous ammonia (which increased about 12%) and crude steel (which decreased about 19%).

TRADE

The United States continued to be Trinidad and Tobago's main trading partner. Import value from the United States in 1988, the last year for which information is available, was estimated at $377 million. Exports to the United States for the same period were valued at $782 million. Major products exported to the United States included oil and refinery products and anhydrous ammonia. In 1989, U.S. imports of oil and refinery products from Trinidad and Tobago represented only about 1% of the total received. However, to Trinidad and Tobago, the figures represent about 50% of the country's production of crude oil and 25% of refinery products output. Trinidad and Tobago imported about 1 million barrels of crude oil from Nigeria and Suriname.

In 1989, exports of ammonia represented about 85% of domestic production. The United States received from 45% to 55% of Trinidad and Tobago's anhydrous ammonia total exports.

STRUCTURE OF THE MINERAL INDUSTRY

Ownership of the mineral industry is by the Government and by private entities. For example, W.R. Grace & Co., through its subsidiary Federation Chemicals (FEDCHEM), owns an anhydrous ammonia plant in Point Lisas. In addition, the company is a minority partner (49%) with the Government in two other ammonia plants, Tringen I and Tringen II. The steel corporation, the Iron and Steel Corp. of Trinidad and Tobago (ISCOTT), is fully owned by the Government. However, in 1988, ISCOTT was leased to the Ispat Group (India) for 10 years. From 1976 to 1988, the cement company, Trinidad Cement Ltd. (TCL), was fully owned by the Government. In 1989, only 35% of the company was owned by the Government.

The largest producer of natural gas and crude oil is Amoco Trinidad Oil Co. Ltd., a subsidiary of Amoco International Oil Co. Ltd. About one-half of the crude oil is produced by the Government companies Trinidad and Tobago Oil Co. Ltd. (TRINTOC) and Trinidad and Tobago Petroleum Co. Ltd. (TRINTOPEC). A very small portion of the total is produced by the private company Premier Consolidated Oil Co. Refinery products are produced by TRINTOC. In general, most foreign investment in the mineral-related industry is in the form of joint ventures with the Government.

COMMODITY REVIEW

Metals

After years of financial difficulties, the Government of Trinidad and Tobago leased the steel complex to the Ispat Group (India) with an option to buy at the midpoint of the lease arrangement. The agreement, negotiated since 1988, reportedly became effective in May 1989. A subsidiary, Caribbean Ispat Ltd. (CIL), was created to manage and operate the complex. Iron ore pellets for the operation were purchased from Brazil and Venezuela. The agreement with Venezuela included the sale of direct-reduced-iron pellets to the State steelmaker in that country.

CIL exported wire rod to Canada, the Caribbean, Central America, Japan, Taiwan, South America, and the United States. In 1989, the company was reportedly negotiating sales with the European Community.

In 1987, after complaints from U.S. producers of unfair market prices and dumping, Trinidad and Tobago agreed, under the Voluntary Restraint Agreement (VRA), to limit its imports to the United States. In 1989, the new company

TABLE 1

TRINIDAD AND TOBAGO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
Asphalt, natural		33,000	27,000	[e]26,000	21,000	[2]27,231
Cement, hydraulic		328,000	327,000	327,000	360,000	380,000
Gas, natural:						
Gross	million cubic meters	9,032	6,427	7,646	[r e]7,700	[2]7,146
Marketed[e 3]	do.	[2]3,517	3,750	3,820	[r]4,000	[2]3,833
Iron and steel:						
Iron, sponge		205,000	208,000	475,000	593,000	[2]612,000
Steel, crude		172,000	326,000	361,000	361,000	[2]294,000
Semimanufactures (wire rod)		103,000	217,000	291,000	251,000	250,000
Lead, refined (secondary)[e]		2,000	2,000	1,800	1,800	1,800
Natural gas liquids[e]	thousand 42-gallon barrels	40	40	40	40	40
Nitrogen: N content of ammonia	thousand tons	1,080	1,141	1,127	1,388	1,550
Petroleum:						
Crude	thousand 42-gallon barrels	64,259	61,435	56,621	56,476	[2]56,189
Refinery products	do.	29,678	[e]30,860	31,392	31,123	[2]28,225
Stone: Limestone		663,000	580,000	[e]600,000	[e]600,000	600,000
Sulfur, byproduct of petroleum[e 4]		5,000	5,000	5,000	5,000	5,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 15, 1990.
[2]Reported figure.
[3]Excludes natural gas used in field operations. In 1989, 2,344 million cubic meters 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.

management, CIL, was trying to renegotiate the VRA limits, which total less than 10% of Trinidad and Tobago's production capacity.

Industrial Minerals

Ammonia.—Ammonia production increased about 12% from that of 1988 and exceeded rated capacity by about 7%. The new 450,000-ton plant, Tringen II, on-stream since mid-1988, operated near capacity during 1989.[1] Tringen I, in operation since 1977, has a design capacity of 370,000 tons.

Cement.—Cement production in 1989 from TCL, the sole producer of cement in Trinidad and Tobago, was estimated at 380,000 tons. The company, formerly a subsidiary of Rugby Portland Cement Ltd., began production in 1954 with a capacity of 130,000 tons per year. In 1976, the company was purchased by the Government and, in 1988, in agreement with its divestment program, the Government offered shares to the public. As a result, in 1989, 65% of the company was privately owned. Full Government divestment of the company was expected by 1990. The wet-process plant has a cement production capacity of 540,000 tons per year and a clinker capacity of 600,000 per year. The facility has three gas-fired kilns, three rotary ball mills, and a silo storage capacity of 16,000 tons. Trinidad and Tobago exported clinker for the first time in 1987 (18,600 tons). Exports of cement began in 1986 with a little more than 10,000 tons. In 1987, cement exports were about 45,000 tons.

Mineral Fuels

Liquefied Petroleum Gas.—In January 1989, the Government-owned National Gas Co. of Trinidad and Tobago and two U.S. companies, Conoco and Panwest Engineers and Construction Inc., signed an agreement to construct a liquid gas recovery plant. Construction of the $100 million plant (Phoenix Park) began in 1989, and completion was scheduled for mid-1991. The plant will initially produce liquid petroleum gas and gasoline, but plans include an expansion of the plant in the future to include production of ethane.

Natural Gas.—Production of natural gas remained at about the same level as that of 1988. The main consumer of natural gas in the industrial sector continued to be the anhydrous ammonia producers. The portion of the industrial consumption utilized by the steel company was only about 5%. All natural gas output is consumed domestically.

Petroleum.—In September, as part of the Government program to stimulate the oil industry, Mobil and TRINTOPEC signed a 4-year exploration agreement. Mobil holds 70% equity of the joint-venture program and agreed to spend no less than $28 million[2] for seismic studies and for drilling of four wells. On November 1, the Government, through TRINTOC and TRINTOPEC, also signed a joint-venture exploration agreement with Exxon Corp., Chevron Corp., and the U.S. division of Shell Oil Co., Pecten. Reportedly, with the agreements, Chevron, Exxon, Mobil, and Pecten and their partners committed themselves to drill 10 exploration wells in 5 years and to spend $117 million. Also in November, the Government signed an agreement

TABLE 2

TRINIDAD AND TOBAGO: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
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., 49%; Government, 51%)	do.	710.
Do.	Federation Chemicals (W.R. Grace & Co., 100%)	do.	230.
Asphalt	Lake Asphalt of Trinidad & Tobago (1978) Ltd. (Government, 100%)	Brighton, St. Patrick Co.	60.
Cement	Trinidad Cement Ltd. (Government, 35%; private, 65%)	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	95,000.[2]
Do.	Trinidad and Tobago Oil Co. Ltd. (Government, 100%)	Point Fortin, Ortoire, Penal Forest Fields, offshore, east of Guayaguayare	20,000.[2]
Do.	Trinidad Northern Areas Ltd. (Texaco Trinidad Inc., Trinidad and Tobago Oil Co. Ltd., and Trinidad and Tobago Petroleum Co. Ltd., 33% each)	Soldado Fields, offshore in Gulf of Paria	40,000.[2]
Do.	Trinidad and Tobago Petroleum Co. Ltd. (Government, 100%)[3]	Soldado Field onshore, Galeota Field offshore (exported)	24,000.[2]
Products	Trinidad and Tobago Oil Co. Ltd. (Government, 100%)	Point Fortin, St. Patrick Co. Pointe-à-Pierre, Victoria Co.[4]	80,000.[2] 220,000.[2]

[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.

with TOTAL, the U.S. division of Compagnie Francaise de Petroles, to explore deep formations of the southern half of Trinidad.

Reserves

Proven natural gas reserves as of January 1988 were 247 billion cubic meters. According to the Oil and Gas Journal, oil reserves were 500 million barrels.

INFRASTRUCTURE

There is 8,000 kilometers of roads, 4,000 of which is paved. Crude oil is transported through a 1,032-kilometer pipeline, and a 904-kilometer natural gas pipeline distributes natural gas to residential, commercial, and industrial consumers. Trinidad has three major ports: Port-of-Spain, Point Lisas, and Pointe-a-Pierre.

OUTLOOK

Production of oil and refinery products will continue to dominate the economy of Trinidad and Tobago. With incentives to broaden the economic base of the country through private participation and foreign investment, other industries will increase their contribution to the economy. This is especially true for the ones that use inexpensive natural gas as fuel for feedstock, such as petrochemicals, methanol, plastics, and fertilizers.

[1]In the 1988 chapter, design capacities for the two Tringen plants were inadvertedly exchanged. Capacities are calculated on 340 operating days per year.
[2]Where necessary, values have been converted from Trinidad and Tobago's dollar (TT$) to U.S. dollar at the rate of TT$4.25 = US$1.00.

OTHER SOURCES OF INFORMATION

Agency

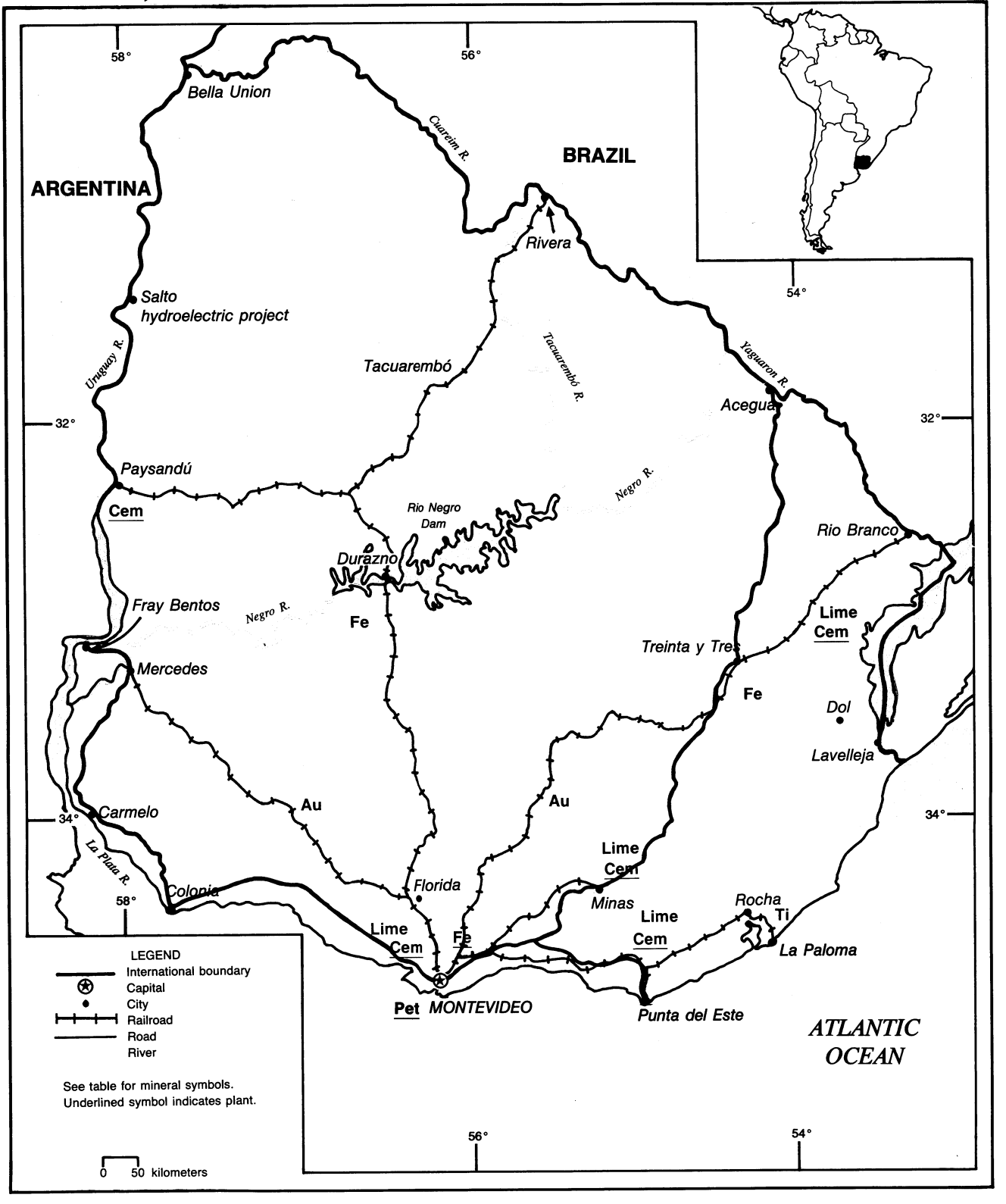
Ministry of Energy
Level 11
Riverside Plaza
Besson Street
Trinidad

Publication

Ministry of Energy, Petroleum Industry, monthly bulletin.

URUGUAY

AREA 176,000 km² **POPULATION 3.1 million**



THE MINERAL INDUSTRY OF

URUGUAY

By Alfredo C. Gurmendi

Uruguay is a country of limited mineral resources. The country's main quarrying and mining activities were confined to the production of dimension stone, limestone, dolomite, gypsum, granite, quartz, sand and gravel, clays, and marble, the latter considered of reputable quality. Uruguay has no known oilfields and continued heavily dependent on imported crude oil. The gross domestic product (GDP) grew by 0.5% to $14.2 billion,[1] while the rate of inflation approached 85%. The foreign debt rose to $6 billion, while unemployment reached 13.1%. The economy, largely agrarian, only recently saw limited exploration activity. The mineral sector employed less than 1% of the total 1.4 million labor force of the country in 1989.

Quarrying of construction materials expanded in an important growth area where the Uruguayan Government is seeking to increase exports. Lime, talc, feldspars, clays, glassmaking sands, and semiprecious stones like amethysts and agates were considered to be mineral growth areas.

GOVERNMENT POLICIES AND PROGRAMS

Planned investment in prospecting and mining amounted to $200 million for the next 5 years, following the introduction of fiscal and other incentives during the year. Dozens of mineral rights requests were lodged after the introduction of a flexible law granting equal mining rights to international and local investors. Other new incentives to foreign prospectors included exemption from import duties on necessary equipment, exemption from all capital taxes, right to repatriate profits and capital, and free marketing of production. Investors responded positively to Uruguay's debt-swap program, whereby mining rights are granted to foreign companies in exchange for foreign debt bonds and a large proportion of costs can be financed by debt conversions. Foreign investment in the following areas require Government authorization: electricity, hydrocarbons, basic petrochemicals, atomic energy, exploitation of strategic minerals, and those activities reserved by law to state enterprises. Foreign investment is actively encouraged in industrial and mining ventures.

According to the National Mining and Geology Institute (INMG), Uruguay has at least fourteen areas of precious or base metals potential with several companies actively engaged in gold exploration. The Government granted Bond International Gold (BIG) exclusive rights in 1989 to develop its Mahoma exploration leases, 130 kilometers (km) from Montevideo. The Government signed a Foreign Investment Agreement with BIG, and the project was declared to be in the national interest, thus qualifying for certain tax incentives; the mine will be funded up to 80% through the Uruguayan debt conversion scheme.

Uruguay is a founding member of the Asociación Latinoamericana de Integración (ALADI), which promotes economic cooperation and the gradual abolition of tariff barriers in 11 of the region's countries. Montevideo has also hosted meetings of the Cartagena Group of Latin American debtors, and Uruguay is a member of the Contadora "support group." The country is represented in the Sistema Económico Latinoamericano (SELA), whose goals include safeguarding Latin American interests in international organizations, and is also a member of the River Plate Basin group set up to identify and promote potential hydroelectric and mineral projects. Uruguay, Paraguay, and Bolivia formed URUPABOL, which encourages trade, transport, and communications in the area.

Uruguay's economy is becoming increasingly dependent on conditions in Brazil and is serving as a capital refuge for Brazilian and Argentinean investors, lured by a free-floating exchange rate, absence of capital controls, and traditional banking secrecy. Despite the absence of official gold production in Uruguay at present, much of the gold from Brazil's Amazon region finds its way across the border into Uruguay to avoid local Brazilian taxes and lower prices paid by the Brazilian Government.

PRODUCTION

Uruguay has no internationally significant mineral resources, but has significant hydropower potential. Rolled steel production for 1989 was 53,300 tons and was 47,300 tons for castings. Most of the industrial minerals, such as cement, 465,000 tons, and lime, 12,000 tons, were produced for local consumption. Uruguay is heavily dependent on imported crude oil. Output of petroleum refinery products, mostly for local consumption, was nearly 9.6 million barrels for the year.

TRADE

During 1989, Uruguayan exports of industrial sand for glass, ceramics, and precious stones amounted to almost $10 million. Imports of crude oil, petroleum products, and lubricants were estimated at $270 million. Import of an additional $6 million of fuel oil was required for thermal electricity generation in substitution for reduced hydroelectric generation capacity because of severe drought. The Administración Nacional de Combustibles, Alcohol y Portland (ANCAP) imported crude oil and refined petroleum mainly from Argentina, Brazil, Mexico, and Nigeria.

Imports from the United States amounted to $115 million. Ammonium phosphate for fertilizer was valued at $15 million. Mineral products, sulfur, lubricants and petroleum byproducts, and chemicals were valued at $60 million.

STRUCTURE OF THE MINERAL INDUSTRY

Uruguay's mineral industry continued to be limited; however, large resources of dolomite include a potentially viable

TABLE 1

URUGUAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
Aluminum, secondary		20	51	56	65	42
Barite		15	15	[e]15	[e]15	15
Cement, hydraulic		314,000	340,000	401,000	434,000	560,000
Clays, unspecified[e]		[2]150,000	150,000	150,000	150,000	150,000
Coke, gashouse[e]		8,000	8,000	8,000	8,000	8,000
Corundum[e]		40	40	40	40	40
Feldspar[e]		1,000	1,000	1,000	1,000	1,000
Gem stones, semiprecious:[e]						
Agate		[2]90	90	90	90	90
Amethyst		[2]20	20	20	20	20
Gypsum[e]		100,000	100,000	100,000	100,000	100,000
Iron and steel:						
Ferroalloys: Electric-furnace ferrosilicon crust[e]		[2]250	250	250	250	250
Steel, crude		38,964	30,987	30,200	28,700	47,285
Semimanufactures		31,773	34,348	43,500	18,000	18,000
Lime		9,000	10,000	13,000	10,000	12,000
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	1,649	1,660	1,540	[e]1,550	1,550
Jet fuel	do.	184	182	264	[e]300	300
Kerosene	do.	452	415	457	[e]500	500
Distillate fuel oil	do.	2,992	2,324	3,290	[e]3,300	3,300
Residual fuel oil	do.	2,301	2,434	2,418	[e]2,500	2,500
Lubricants	do.	49	49	56	[e]60	60
Liquefied petroleum gas	do.	498	459	580	[e]600	600
Unspecified	do.	189	225	826	[e]800	800
Refinery fuel and losses	do.	-386	22	[e]20	[e]20	20
Total	do.	7,928	7,700	9,451	[e]9,630	9,630
Sand and gravel:[e]						
Sand, common	thousand metric tons	[2]1,500	1,500	1,500	1,500	1,500
Gravel	do.	[2]500	500	500	500	500
Stone:[e]						
Dimension		[2]8,000	8,000	10,000	10,000	10,000
Crushed and broken:						
Alum schist		[2]8,000	8,000	8,000	8,000	8,000
Dolomite		[2]3,000	3,000	3,000	3,000	
Limestone		[2]700,000	700,000	700,000	700,000	700,000
Marble		[2]4,000	4,000	5,000	5,000	5,000
Marl		[2]7,000	7,000	7,000	7,000	7,000
Quartz		[2]300	300	300	300	300
Other, including ballast	thousand metric tons	[2]1,900	1,900	2,000	2,000	2,000
Sulfur, elemental, byproduct[e]		2,000	2,000	2,000	2,000	2,000
Talc, soapstone, pyrophyllite[e]		[2]1,500	1,500	1,500	1,500	1,500
Tuff: Tufa[e]		[2]3,500	3,500	3,500	3,500	3,500

[e]Estimated. [p]Preliminary.
[1]Includes data available through June 15, 1990.
[2]Reported figure.

TABLE 2

URUGUAY: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Gold	Bond International Gold (BIG) (private, 100%)	Mahoma, 130 kilometers from Montevideo	[1]930
Cement	Administracion Nacional de Combustibles, Alcohol y Portland (ANCAP) (Government, 100%)	Minas and Paysandú Plants, Montevideo	1,000
Dolomite	do.	Lavalleja, 250 kilometers east of Montevideo	30
Petroleum products	do.	Refineria de la Teja, Montevideo	[2]13,400
Steel	Industria Nacional Laminadora, S.A. (INLASA) (private, 57%; Government, 43%)	Planta Pandos and Barros Arana near Montevideo	60

[1]Kilograms per year.
[2]Thousand barrels per year.

30,000-ton-per-year deposit at Lavalleja, 250 km east of Montevideo. The principal activities were the Government-owned cement and steel plants and petroleum refinery. In 1989, the Uruguayan Government was considering the complete or partial privatization of all state-owned companies.

ANCAP operated its cement plants at 91% capacity or 912,000 tons per year. Uruguay continued its dependency on imports of petroleum and natural gas. During 1989, 72% of its fuel energy requirements was refined by ANCAP at its Teja plant in Montevideo. Industria Nacional Laminadora, S.A. (INLASA), 43% Government-owned, produced at 89% of its installed capacity of 60,000 metric tons per year of rolled steel products. INLASA's plant is near Montevideo.

COMMODITY REVIEW

Metals

Currently, Uruguay does not produce gold; much of it is produced in Brazil. During the past 2 years, greater Uruguayan Government interest and incentives in mining have prompted the initiation of exploration and evaluation surveys for gold, silver, and base metals. INMG reported that Uruguay has 14 areas of precious or base metals potential, and several companies have actively engaged in gold exploration. BIG obtained exclusive rights to develop a gold mine on its Mahoma exploration leases. Feasibility studies completed in midyear pojected a cost of $18 million for development of the Mahoma deposit. Operations will begin with a series of open pits, which will be followed in later years by an underground mine. The ore will be processed in a conventional mill using gravity separation and carbon-in-pulp or carbon-in-leach recovery at an initial rate of 300 tons per day of ore.

Both Compañía Minera San José, a wholly owned subsidiary of BIG and Shell S.A., a subsidiary of Brazil's Mineracao e Participacoe, plan to invest $18 million in base and precious metals assessment in Uruguay. Gold Standard Inc. of Salt Lake City, UT, continued exploration at its San Juan Hills gold prospect in the southwest of the country, following its joint-venture agreement signed in 1988 with Compañía Minera San José. Big Pony Gold Inc. of Salt Lake City, 50% owned by Gold Standard, reported during the year that preliminary exploration over a large tract of Archaen greenstone terrain had located several gold occurrences. In the North Palacio area of its Paso de Lugo property, mineralization was encountered, grading about 12 grams of gold per ton. Systematic channel sampling and trenching began in midyear. Through its wholly owned Uruguayan subsidiary, Tormin S.A., Big Pony holds a number of prospecting leases. The analysis of samples have revealed a number of gold anomalies near Montevideo.

There was also considerable interest in iron ore deposits in the country, especially in the southeastern Departments of Florida and Treinta y Tres, where proven reserves of ore prompted talk of siting a $140 million iron and steel complex. Other known but unexploited deposits include Zapucay in the northern Department of Durazno, where iron ore deposits occur.

Industrial Minerals

At present, Uruguay's main quarrying and mining activities are dedicated to the production of construction materials such as clays, dimension stone, dolomite, granite, gypsum, limestone, quartz, and sand and gravel. The country is noted for the excellent quality of its marble. Despite austerity measures, the construction sector was relatively dynamic in 1989. Large resources of dolomite include a potentially viable deposit at Lavalleja, 250 km east of Montevideo. Titanium-bearing sands suitable for the extraction of ilmenite and monazite were surveyed a few years ago for a development feasibility study in the Department of Rocha. Corundum is produced in Uruguay for natural abrasive applications, although demand in the optical lens grinding field is small.

Mineral Fuels and Energy

Uruguay is not well endowed with hydrocarbon deposits. No oilfields are known, the coal that does occur is of poor quality, and natural gas reserves in the northwest of the country are still under study. In an effort to reduce its heavy dependence on oil imports, Uruguay has a well-developed hydroelectric power system, as well as the potential for alternative energy resources and small uranium deposits.

In 1989, total installed electric power capacity was about 1,400 megawatts (MW), of which 41% was generated by thermal plants and 59% by hydroelectric plants. It was estimated by the IDB that Uruguay's energy requirements by 1990 will increase to 1,700 MW, of which 32% will be thermal and 68% hydropower.

The energy industry has eased the country's balance of trade problem with the opening of the 1,890-MW-capacity Salto Grande hydroelectric plant, a binational project with Argentina, on the Uruguayan River. The project, partly financed by the IDB, has helped bring about a major reduction in Uruguay's reliance on imported crude oil. There are three hydroelectric powerplants in Uruguay, of which the El Palmar powerplant is the largest with 34% share of the total production, with the Salto Grande's share about 32% of the total.

Reserves

There is available information on certain mineral deposits in the country, but Uruguay's mineral reserves are not regarded as important compared with some mining countries in Latin America.

Mahoma project's gold reserves were estimated at 330,000 tons grading about 9 grams of gold per ton of ore. Large resources of dolomite included a viable 30,000-ton-per-year deposit in Lavalleja Department. There are iron ore deposits in the country, such as proven reserves of 45 million tons of 40% iron in Florida and Treinta y Tres Departments and the Zapucay deposit in the Durazno Department with 400 million tons of iron ore containing 40% iron.

INFRASTRUCTURE

The mineral production, including mineral fuels, is transported primarily by road and rail systems. In 1989, 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 meters) 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 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 of alternative energy resources could be provided by small uranium deposits for nuclear power. 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$550 = US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Administración Nacional de Combustibles, Alcohol y Portland
Montevideo, Uruguay

Ministerio de Industria y Energía
Montevideo, Uruguay

Instituto Geológico del Uruguay
Montevideo, Uruguay

Publications

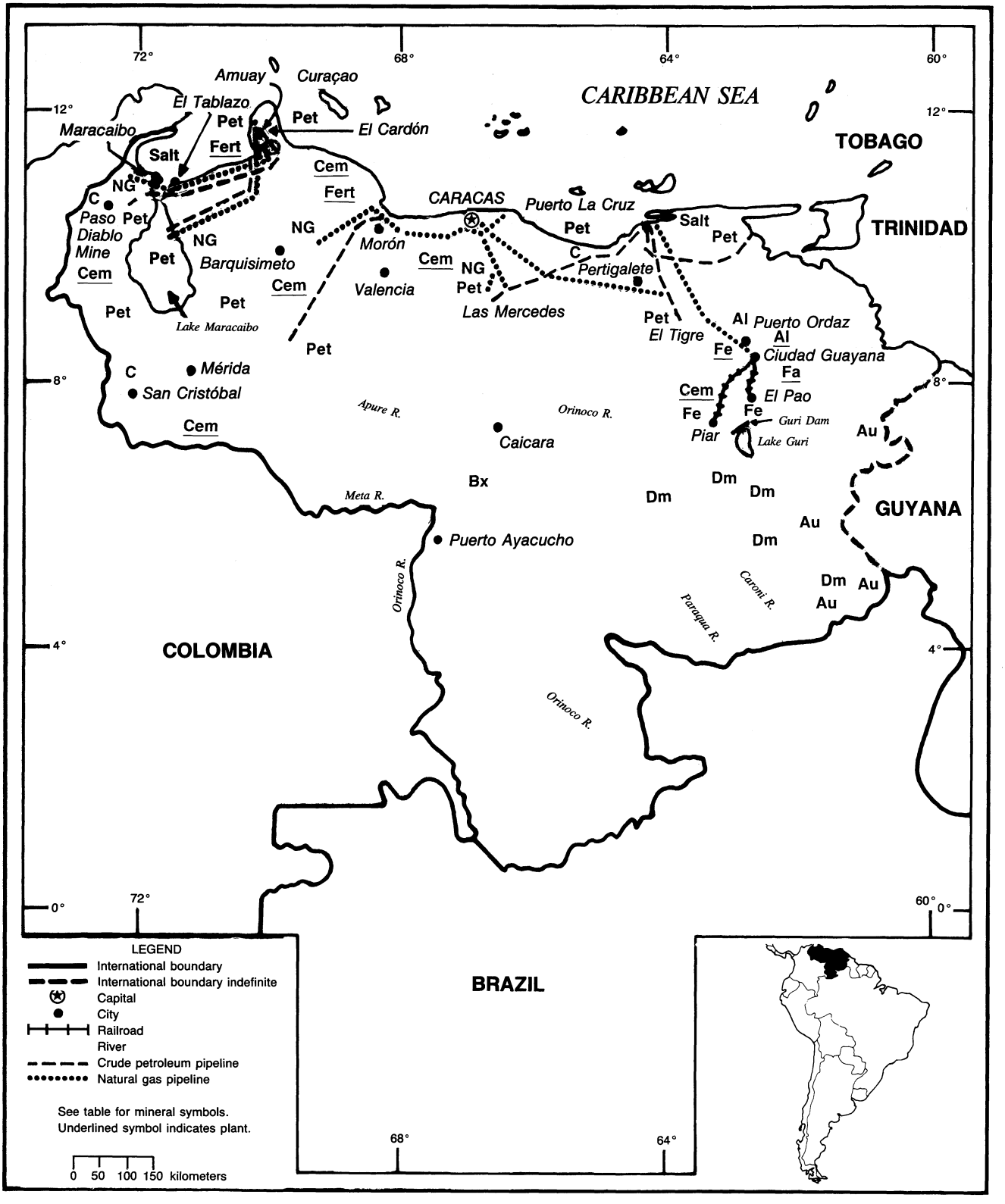
Banco Central del Uruguay, Montevideo, Uruguay: Boletín Estadístico, annual report

Inter-American Development Bank, Washington, DC: Economic and Social Progress in Latin America, 1989 Report.

Instituto Latinoamericano del Fierro y el Acero (ILAFA), Santiago: Anuario Estadístico de la Siderúrgica y Minería del Hierro de América Latina, annual. Siderurgia Latinoamericana, monthly.

VENEZUELA

AREA 911,700 km² **POPULATION 19.3 million**



THE MINERAL INDUSTRY OF

VENEZUELA

By H. Robert Ensminger

The petroleum industry dominated the Venezuelan mineral industry in 1989 as it has for many years. The revenue from petroleum accounted for almost 15% of the gross domestic product (GDP). Because of the effects of a severe recession in 1989, the GDP declined 8.1% to $45.5 billion at current prices.[1] The year saw an increased emphasis placed on the expansion of production and export of aluminum, gold, iron ore, and iron and steel in an effort to create a more diversified mineral industry that is less dependent on petroleum. Venezuela ranked among the leaders in Latin America in the production of aluminum, cement, ferroalloys, gold, iron ore, iron and steel, petroleum and natural gas, and petroleum products.

GOVERNMENT POLICIES AND PROGRAMS

In February, the new Government signaled its intention to restructure the petroleum-driven economy fundamentally in order to create a more outward-looking, diversified, and market-oriented economy. To support the restructuring, the Government negotiated a 3-year, $5 billion extended loan with the International Monetary Fund (IMF) and began a multibillion dollar sectorial loan program with the International Bank for Reconstruction and Development (World Bank). Important economic changes included elimination of the multiple exchange rate system, liberalization of the trade regime, lifting of price controls on most private-sector goods and services, steep increases in domestic interest rates, and reduction of subsidies.

In June, the President of Venezuela signed a decree prohibiting all mining in the Federal Territory of Amazonas. The decree mandated an immediate suspension of all mining activity in the Territory. The principal thrust of the decree was to force out the Brazilian garimpeiros (independent miners), who were illegally in the area mining gold and, in the process, were deforesting the land and polluting the streams with mercury.

PRODUCTION

The Venezuelan mineral industry showed little growth overall in 1989. The manufacturing sector was a major contributor to the negative growth of the GDP. Coal, natural gas, petroleum, and petroleum products showed strong positive growth while most of the remaining major mineral commodities such as aluminum, bauxite, cement, iron ore, and iron and steel stayed near 1988 output levels or declined.

TRADE

Venezuela's trade balance for 1989 showed a surplus of $4.1 billion that was principally the result of petroleum and petroleum product exports of $9.8 billion. The trade balance increased by $4.615 billion over the negative figure of $515 million for 1988. The petroleum exports showed an increase of 17% while exports of aluminum, iron ore, and steel totaled $824 million for a combined increase of 36%.

In midyear, Venezuela signed two historic agreements to export metal and mineral output to fellow Organization of Petroleum Exporting Countries (OPEC) members Iran and Kuwait. The agreements marked the first time Venezuela has exported mining output to a fellow OPEC member.

STRUCTURE OF THE MINERAL INDUSTRY

In Venezuela, the major mineral producing companies are predominantly State owned. In the past, unprofitable State-owned enterprises often were retained for economic, employment, and political reasons. However, the new Government that came to power in January set about to privatize many of the companies. A special commission was set up to speed up the privatization of the more than 450 companies under State ownership. Private participation in basic sectors (aluminum, coal, and petrochemicals) may be increased. In addition, steel and petroleum may be opened up to investors.

In 1989, the total Venezuelan labor force was approximately 6 million with the industrial sector comprising 1.68 million. The minerals industry comprised approximately 6% of the industrial total. The minerals industry labor force was composed of 46,000 in petroleum, 28,000 in iron and steel, and 26,000 in mining and quarrying.

COMMODITY REVIEW

Metals

Alumina, Aluminum, and Bauxite.—Alumina and aluminum production in 1989 was at approximately the same levels as those of the previous year. In both cases, production was at or near installed capacity. At the Los Pijiguaos Mine in the State of Bolívar, Corporación Venezolana de Guayana Bauxita Venezolana C.A. (BAUXIVEN) increased its production of bauxite by approximately 38% over that of 1988.

The State-controlled bauxite mining company, BAUXIVEN, invested $195

TABLE 1

VENEZUELA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherw ise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
METALS						
Aluminum:						
Alumina		1,085,000	1,296,000	[2]1,360,000	[2]1,284,000	1,350,000
Bauxite		—	—	217,000	550,000	800,000
Metal, unalloyed ingot		395,894	424,000	439,600	455,000	[2]546,014
Gold, mine output, Au content	kilograms	2,214	2,511	3,417	3,502	[2]3,867
Iron and steel:						
Iron ore and concentrate	thousand tons	14,754	17,396	17,780	18,789	[2]18,053
Metal:						
Pig iron	do.	441	491	473	484	[2]489
Direct reduced iron	do.	2,635	[r]2,938	3,151	2,710	[2]2,773
Total	do.	3,076	[r]3,429	3,624	3,194	[2]3,262
Ferroalloys:						
Ferromanganese	do.	2	—	—	—	—
Ferrosilicomanganese	do.	22	29	28	34	30
Ferrosilicon[3]	do.	61	51	52	51	55
Total	do.	85	80	80	85	85
Steel, crude	do.	3,055	3,467	3,722	3,677	[2]3,390
Semimanufactures, hot-rolled	do.	2,060	2,315	3,081	2,994	[2]2,734
Lead, secondary, smelter[e]		18,000	16,000	17,000	18,000	17,000
INDUSTRIAL MINERALS						
Amphibolite		183,296	315,833	241,000	179,200	200,000
Cement, hydraulic		5,294,000	5,747,000	6,110,000	6,199,000	[2]4,509,500
Clays:						
Kaolin		13,906	14,906	25,598	24,800	[2]15,000
Other	thousand tons	1,928	1,648	1,794	1,967	2,000
Diamond:						
Gem	carats	47,400	45,000	[e]35,000	55,200	55,000
Industrial	do.	167,900	188,500	[e]63,000	52,500	[2]254,570
Total	do.	215,300	233,500	[e]98,000	107,700	309,570
Feldspar		42,440	34,900	43,546	96,500	[2]97,000
Gypsum		188,754	250,230	246,324	250,900	[2]332,000
Nitrogen, N content of ammonia		452,000	530,000	577,000	481,000	[2]532,000
Phosphate rock		8,567	194,221	212,779	[e]100,000	[2]237,000
Pyrophyllite		18,700	25,000	[e]32,000	[e]32,000	32,000
Salt, evaporated		338,889	511,421	[e]500,000	[e]500,000	500,000
Serpentinite, crushed		517,117	553,550	[e]580,000	[e]580,000	550,000
Stone, sand, and gravel:						
Stone:						
Dolomite	thousand tons	274	271	257	276	[2]383
Granite		655,587	568,300	[e]287,000	561,400	[2]440,000
Limestone	thousand tons	13,906	14,907	15,458	17,999	[2]15,371
Marble	cubic meters	272	549	671	675	675
Sand and gravel	thousand tons	6,879	7,030	7,645	7,565	[2]5,789
Sand, glass	do.	297	335	548	441	440
Sulfur, byproduct of petroleum and natural gas[e]		35,100	99,380	125,000	125,000	125,000

See footnotes at end of table.

TABLE 1—Continued

VENEZUELA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherw ise specified)

Commodity		1985	1986	1987	1988[p]	1989[e]
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]	thousand tons	51	41	61	60	60
Coal, bituminous		41,427	67,641	117,000	1,000,000	1,500,000
Gas, natural:						
Gross	million cubic feet	1,165,088	1,280,870	1,292,486	[e]1,000,000	1,200,000
Marketable	do.	498,159	576,390	[e]465,300	[e]450,000	500,000
Natural gas liquids:[4]						
Natural gasoline	thousand 42-gallon barrels	6,885	6,687	[e]6,500	[e]6,500	6,500
Liquefied petroleum gas	do.	15,849	15,007	[e]15,000	[e]15,000	15,000
Total	do.	22,734	21,694	[e]21,500	[e]21,500	21,500
Petroleum: Crude[5]	do.	613,583	664,125	664,125	[r]575,970	[2]638,020
Refinery products:						
Liquefied petroleum gas	do.	15,848	2,824	2,768	[e]3,000	3,000
Gasoline:						
Aviation	do.	373	277	286	[e]260	275
Motor	do.	59,994	88,470	76,884	[e]85,000	85,000
Naphtha	do.	21,249	15,750	18,760	[e]15,000	15,000
Jet fuel	do.	18,263	20,770	21,229	[e]20,000	20,000
Kerosene	do.	21,648	32,060	32,640	[e]30,000	32,000
Distillate fuel oil	do.	92,870	87,470	76,884	[e]85,000	85,000
Lubricantsd	do.	2,343	2,453	2,566	[e]2,000	2,300
Residual fuel oil	do.	107,987	96,620	89,760	[e]90,000	95,000
Asphalt and bitumen	do.	10,215	11,980	11,983	[e]10,000	11,500
Refinery gas[6]	do.	7,844	9,862	7,400	[e]8,000	9,000
Unspecified	do.	20,754	22,330	22,640	[e]20,000	22,000
Total	do.	379,388	390,866	363,800	[e]368,260	380,075

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

[1] Table includes data available through May 25, 1990.

[2] Reported figure.

[3] Figures represent combined 45% silicon content and 75% silicon content production.

[4] From nonassociated natural gas only.

[5] Includes associated natural gas lease condensate and natural gasoline. Lease condensate is included as follows, in thousand 42-gallon barrels: 1985—43,435; 1986—51,830; 1987—60,225; 1988—61,000 (estimated); and 1989—61,000 (estimated). Natural gasoline is included as follows, in thousand 42-gallon barrels: 1985—22,995; 1986—35,405; 1987—34,310; 1988—35,000 (estimated); and 1989—35,000 (estimated).

[6] Liquid equivalent.

million for expansion at the Los Pijiguaos Mine in 1989. The expansion plans called for the production of 3 million tons of bauxite beginning in 1990.

A team of Técnicos Mineros, the mineral exploration subsidiary of Corporación Venezolana de Guayana (CVG), discovered three bauxite deposits between the Los Pijiguaos Mine and Puerto Ayacucho on the Orinoco River in the Territory of Amazonas. Officials estimated that there were up to 200 bauxite deposits in the mineral-rich Guayana region, but only about 2% have been discovered.

Interamericana de Alúmina C.A., the State alumina company, received an $80 million loan from the West German bank, Der Kreditanstalt fur Wiederaufbau, for the modification and expansion of its facility to an annual output capacity of 2 million tons by 1992. In addition, a $237 million loan with the Export-Import Bank of Japan was agreed to for the same purpose.

About 60% of the nation's primary aluminum production is sold domestically on an annual basis. In May, a representative from Austria Metall (Austria) visited Venezuela to discuss investment in a new aluminum smelter as part of a joint venture with CVG, the State holding company, and Pechiney (France). Austria Metall will invest 40% of the $700 million, and the remainder will be divided evenly between CVG and Pechiney. In midyear, it was announced that two new Venezuelan aluminum companies, Aleaciones Ligeras S.A. (ALISA) and Vexxal Aluminio S.A., were to receive a $730,000 grant from the U.S. Department of Commerce Trade and Development Program for feasibility studies. ALISA

was a joint venture between private Venezuelan investors and CVG; Vexxal was a joint venture between Switzerland's Asea Brown Boveri and CVG. Both plants will be primary aluminum smelters. Two French banks, Banque Indosuez and Banque Francaise du Commerce Exterieur, have agreed to aid Venezuela in the financing of a new 180,000-ton-per-year potline that will upgrade Aluminio del Caroni S.A.'s installed capacity to 300,000 tons per year.

Gold.—The Monarch Resources Ltd. (United Kingdom) and CVG joint venture began trial operations at CVG's gold tailings facility in El Callao, State of Bolívar. The gold-processing venture known as Revermin II C.A. was 50% owned by CVG, 49% by Monarch, and 1% by private Venezuelan investors. The facility, when in full operation, will process 600,000 tons of tailings annually. The tailings dump at Mocupia Gorge is estimated to contain 4.6 million tons of tailings grading more than 1.34 grams per ton of gold.

In April, the Chamber of Deputies opened an investigation into reported corruption in the assignment of concessions in the Guayana Region. The Chamber also looked into ways of reforming the Government's gold industry policies.

Greenwich Resources Ltd. (United Kingdom) began exploration of two private concessions and two joint ventures with CVG in the Guayana region. Greenwich began gold-mining operations in Venezuela in 1985.

***Iron and Steel*—Ferroalloys.**—CVG Ferrosilicio de Venezuela C.A. (FESILVEN), the State ferroalloy company, announced plans to modernize and enlarge its facilities. It will modernize two older ovens and install two new ovens that are designed to produce 25,000 tons per year of ferrosilicon and 13,500 tons per year of silicon metal. When all four ovens are working at full capacity, FESILVEN will have a maximum production capacity of 90,000 tons per year. Annually, FESILVEN has exported approximately 90% of its output.

Iron Ore.—In midyear, CVG Ferromínera Orinoco C.A. (FERROMINERA) unveiled an expansion project that included a new iron pellet plant and a briquette plant. The pellet plant will have a capacity of 3 million tons per year. The investors will be composed of Japan's Kobe Steel and private Venezuelan investors.

CVG and the Davy Corp. (United Kingdom) signed an agreement to form a new company for the promotion and licensing of Davy McKee's Fluidized Iron Ore Reduction (FIOR) process for the direct reduction of iron ore. Also included in the agreement was the construction of a 1-million-ton-per-year FIOR plant to be built by Davy Dravo, a

TABLE 2

VENEZUELA: STRUCTURE OF THE MINERAL INDUSTRY

Commodity	Major operating companies (ownership)	Location of main facilities	Capacity (thousand metric tons per year unless otherwise specified)
Alumina	Interamericana de Alumina C.A. (Government, 88.7%; Aluminio Suizo S.A., 11.3%)	Ciudad Guayana, Bolívar State	1,300
Aluminum	Aluminio del Caroni S.A. (Government, 72%; Reynolds International, Inc., 28%)	do.	210
Do.	Industria Venezolana de Aluminio C.A. (Government, 80%; and 6 Japanese Companies, 20%)	do.	330
Bauxite	C.V.G. Bauxita Venezolana C.A. (Government, 100%)	Los Pijiguaos, Bolívar State	1,000
Cement	C.A. Venezolana de Cementos (private, 100%)	Barquisimeto, Lara State; Maracaibo, Zulia State; Pertigalete, Anzoatequi	2,750
Coal	Carbones del Guasare S.A. (Government, 49%, Atlantic Richfield (U.S.) and Ente Nazionale Idrocarburi (Italy), 43%; and Venezuelan Investors, 8%)	Paso Diablo, Zulia State	1,500
Iron ore	C.V.G. Ferrominera del Orinoco C.A. (Government, 100%)	Cerro Bolívar, El Pao, and San Isidro Mines, Bolivar State	20,000
Petrochemical	Petroquímica de Venezuela S.A. (PDVSA) (Government, 100%)	El Tablazo, Zulia State; Moron, Carabobo State	2,350
Petroleum	Petróleos de Venezuela S.A. (PDVSA) (Government, 100%)	Fields in Anzoatequi, Apara, Falcón, Guarico, Monagas, and Zulia States	[1] 1,822,000
Petroleum products	do.	Major refineries at Amuay Bay, and Cardon, both in Falcón State	[1] 1,588,000
Steel	C.V.G. Siderúrgica del Orinoco C.A. (Government, 100%)	Ciudad Guayana, Bolívar State	4,300

[1] Barrels per day.

subsidiary of the Davy Corp., at an estimated cost of $200 million. When completed, the plant will be the largest single-stream direct-reduction iron plant in the world.

Siderurgia Venezolana S.A., Venezuela's largest private steel producer, jointly set up Siderúrgica del Caroni with Voest-Alpine AG (Austria) and the Midrex Corp. (United States) to produce iron briquettes using Midrex direct-reduction technology. Production was scheduled to start in 1990.

Iron and Steel.—Cía. Siderúrgica del Guayana, a joint venture between Kobe Steel and CVG, was established in 1989 to set up an integrated steelworks in the Puerto Ordaz area to produce 1 million tons per year of hot briquetted direct-reduced iron and 950,000 tons per year of steel slabs for export. Investment for the project was estimated at $1 billion with groundbreaking projected to take place in early 1991.

In June, public- and private-sector officials met in Ottawa, Canada, and negotiated a steel quota under which Venezuela reduced exports of steel products (sheets, tubes, wire and rods, and semifinished products) to approximately 40,000 tons for the remainder of the year. This agreement was to allay Canadian fears of the flooding of its markets with inexpensive Venezuelan steel products.

Industrial Minerals

Cement production declined by more than 27% from that of the previous year. The reduction in output apparently resulted from the austere economic climate that dominated Venezuela in 1989.

At yearend, the French cement group Lafarge Coppée announced it had purchased 20% of the Venezolana de Cementos C.A. plant at Pertigalete in Anzoátegui State for $27 million. The new capital will be used for plant expansion, aimed at raising output to 2.6 million tons per year, which would make it one of the largest plants in the Western Hemisphere. The plant should be ready for full production by late 1991.

Mineral Fuels

In 1988, Venezuela produced 51,920 million kilowatt hours of electricity from a total capacity of 18,200,000 kilowatts. Of the total electrical energy produced, thermal electric accounted for 56% and hydroelectric the remainder. The thermal electric powerplant input was 59% natural gas, 34% residual fuel oil, and 7% gas-diesel oil. Consumption by sector in 1986 was energy, 9%; industry and construction, 47%; and households and other consumers, 44%.

Coal.—Coal production at the Paso Diablo Mine, in the Guasare Basin in the State of Zulia, was approximately 1.5 million tons in 1989 and was primarily used for the generation of thermal electric energy. The mine was operated by Carbones del Guasare S.A., a joint venture between Carbones del Zulia C.A., a subsidiary of Petróleos de Venezuela S.A. (PDVSA) and AA Antilles Coal NV (itself a joint venture of the Atlantic-Richfield Co. of the United States) and AgipCoal SpA, an affiliate of the Italian ENI group. The long-term plan was to increase production to 6.5 million tons per year during the 1990's; principally for export. The expansion project would require a large investment of between $400 million and $500 million. The partners hoped that Venezuela's newly approved debt equity swap rules and devaluation of the bolívar would entice foreign investment.

Natural Gas and Petroleum.—The Venezuelan State oil company, PDVSA, announced in November that it had reached an agreement with the Southland Corp. of the United States to purchase the remaining 50% of Citgo Petroleum Corp. In 1986, PDVSA paid $290 million for 50% interest in the Tulsa, Oklahoma-based company, which included a 320,000-barrel-per-day refinery at Lake Charles, Louisiana. With the purchase of Citgo, PDVSA has positioned itself to become one of the primary marketers of gasoline in the United States. PDVSA also was the 100% owner of the Champlin Refining Co. (Corpus Christi, Texas) and had refining interests in the Federal Republic of Germany and Sweden. In 1989, Venezuela committed 690,000 barrels per day of its approximately 1.7-million-barrels-per-day petroleum exports to overseas refineries in which it had ownership.

The Minister of Energy and Mines announced in November that the Government was considering allowing foreign participation in exploration and refining operations in Venezuela for the first time since the petroleum sector was nationalized 14 years ago. Service contracts for exploration projects were being studied. Under this type of contract, the investing partner would take the risks and recover the investment in kind when oil or natural gas was discovered. In addition, the Government was seeking foreign financing to increase refining capacity.

The Minister of Energy and Mines announced plans to build a $1.3 billion refinery in association with foreign and private Venezuelan investors. The refinery, with its planned capacity of 180,000 barrels per day of crude petroleum, would meet demand for nonleaded gasoline, especially on the United States east coast.

A number of discoveries in eastern Venezuela were leading to a reassessment of the country's petroleum reserves, according to PDVSA. The reserves at yearend stood at 58.5 billion barrels, but the new finds of light and medium crude could increase the figure by as much as 40% by 1994.

Reserves

Venezuela has large reserves of bauxite, coal, gold, iron ore, natural gas, and petroleum. PDVSA increased its estimate of the effective recovery rate of Orinoco heavy and superheavy crude petroleum to 40% from 22%. The resultant estimate of this petroleum type in place was 1.25 trillion barrels. Venezuela's reserves of major minerals are included in table 5.

TABLE 3

VENEZUELA: RESERVES OF MAJOR MINERALS

(Thousand metric tons unless otherwise specified)

Bauxite	270,000
Coal	9,000,000
Gold	[1] 8,000
Iron ore	2,000,000
Natural gas	[2] 2,900,000
Petroleum	
Light and medium grades	[3] 58,500
Heavy and superheavy grades	[3] 1,250,000

[1] Thousand kilograms.
[2] Million cubic meters.
[3] Million barrels.

INFRASTRUCTURE

Corpoven S.A., an operating subsidiary of PDVSA, commissioned a $228 million petroleum products transportation system in eastern Venezuela. The system will consist of 600 kilometers (km) of pipeline, storage, and distribution facilities linking the Puerto La Cruz refinery on the Caribbean to Puerto Ayacucho, Territory of Amazonas, in southeastern Venezuela.

The new floating iron ore transshipment station for the mouth of the Orinoco River that arrived in Venezuela in late 1988 began operation in 1989. The system, consisting of two ships, was built in Japan and was refitted by NKK Corp. on arrival. The station enabled FERROMINERA to reduce transport costs by using larger ships, which before had been unable to load at the Ciudad Guayana terminal because of the seasonally variable water depth of the river.

Venezuela had a total of 439 km of railroads of 1.435-meter gauge. It contained a total of 77,785 km of roads, of which 22,780 km was paved, 24,720 km was gravel, 14,450 km was dirt, and 15,835 km was unimproved dirt. The country had 7,100 km of waterways navigable by oceangoing vessels provided through Lake Maracaibo and the Orinoco River. The pipeline system was constituted of 6,370 km for crude petroleum, 480 km for refined products, and 4010 km for natural gas. Of the total of 72 ships making up the merchant marine, 33 were available for the transportation of mineral products.

OUTLOOK

The new Government, through the introduction of a series of austerity measures, removed the majority of the worst imbalances from the economy and consequently laid a solid base for a sustained recovery. Additionally, the Government of Venezuela has begun to create a more conducive environment for foreign investment. Several of the more important changes were (1) allowing foreigners to invest in gold mining without being forced into joint ventures, (2) allowing almost unlimited repatriation of profits and dividends, and (3) permitting foreign-owned companies to obtain financing on the local stock market.

Central to the Government's long-range minerals program was the diversification and expansion of the production and exportation of its major nonpetroleum minerals in order to cushion the vagaries of a petroleum driven economy. Considerable expansion has been projected for aluminum, bauxite, coal, and gold as well as substantial increases in iron, iron ore, and steel over the next 10 years. The aluminum industry should become totally integrated over the next 10 years.

Construction material demand has contributed to expansion plans in the cement industry; however, despite the projected expansion, it appeared that Venezuela may revert from a cement exporter to an importer by 1993.

[1] Where necessary, values have been converted from Venezuelan bolivars (Bs) to U.S. dollars at the rate of Bs43.08 = US$1.00.

OTHER SOURCES OF INFORMATION

Agencies

Dirección General Sectorial de Hidrocarburos
Ministerio de Energía y Minas
Caracas, Venezuela

Dirección General Sectorial de Minas
Ministerio de Energía y Minas
Caracas, Venezuela

Publications

Ministerio de Energía y Minas, Caracas:
Carta Semanal.
Memoria y Cuenta.
Petróleo y Otros Datos Estadísticos.

Presidencia de la República, Oficina Central de Estadística e Informática, Caracas, Anuario Estadístico de Venezuela.

TABLE 4

U.S. DEPENDENCY ON IMPORTS OF PETROLEUM FROM LATIN AMERICA, 1988

(Thousand 42-gallon barrels)

Country	Crude oil	Petroleum products[1]	Total petroleum	Percent share (crude oil)	Percent share (products)	Percent share (total petroleum)
Venezuela	160,747	129,891	290,638	32.9	50.2	38.9
Mexico	246,525	28,825	273,370	50.5	11.1	36.6
Colombia	38,640	[2]10,537	49,177	7.9	4.1	6.6
Brazil	—	35,947	35,947	—	13.9	4.8
Trinidad and Tobago	26,119	9,515	35,634	5.3	3.7	4.8
Ecuador	12,240	[2]5,074	17,314	2.5	2.0	2.3
Netherlands Antilles	—	13,079	13,079	—	5.1	1.8
Peru	1,849	[2]10,336	12,185	.4	4.0	1.6
Bahamas	—	[2]11,690	11,690	—	4.5	1.6
Argentina	1,277	3,884	5,161	.3	1.5	.7
Guatemala	1,083	—	1,083	.2	—	.1
Panama	—	[2]11	11	—	—	—
Total	488,480	258,789	746,289	100.0	100.0	100.0
Total U.S. imports	1,869,005	840,135	2,709,140	100.0	100.0	100.0
from Latin America	488,480	258,789	746,289	26.1	29.4	27.1
from Canada	249,077	116,693	365,770	13.3	13.9	13.5
from Western Hemisphere	737,557	375,482	1,112,059	39.5	44.7	41.0

[1]Composed of LPG, motor gasoline, jet fuel, residual fuel oil, kerosene, asphalt, and other products.
[2]Mostly residual fuel oils.

Source: U.S. Department of Energy, Energy Information Administration, Petroleum Supply Annual 1988, DOE/EIA-0340(88)/1, May 1989.

TABLE 5

U.S. DEPENDENCY ON IMPORTS OF PETROLEUM FROM LATIN AMERICA, 1989

(Thousand 42-gallon barrels)

Country	Crude Oil	Petroleum Products[1]	Total Petroleum	Percent share (crude oil)	Percent share (total products)	Percent share (total petroleum)
Venezuela	180,598	137,947	318,545	32.7	54.0	39.5
Mexico	261,244	18,724	279,968	47.3	7.3	34.7
Colombia	49,615	[2]13,018	62,633	9.0	5.1	7.8
Trinidad and Tobago	26,815	7,667	34,482	4.9	3.0	4.3
Ecuador	29,208	[2]3,425	32,633	5.3	1.3	4.0
Brazil	—	29,862	29,862	—	11.7	3.7
Netherlands Antilles	—	15,316	15,316	—	6.0	1.9
Bahamas	—	[2]12,235	12,235	—	4.8	1.5
Peru	359	[2]10,590	10,949	.1	4.1	1.4
Argentina	3,257	5,808	9,065	.6	2.3	1.1
Panama	—	[2]673	673	—	.3	.1
Guatemala	655	—	655	.1	—	.1
Total	551,751	255,265	807,016	100.0	100.0	100.0
Total U.S. imports	2,132,761	809,338	2,942,099	100.0	100.0	100.0
from Latin America	551,751	243,030	794,781	25.9	30.0	27.0
from Canada	230,043	109,906	339,949	10.8	13.6	11.6
from Western Hemisphere	781,794	365,171	1,146,965	36.7	45.1	39.0

[1]Composed of LPG, motor gasoline, jet fuel, residual fuel oil, kerosene, asphalt, and other products.
[2]Mostly residual fuel oils.

Source: U.S. Department of Energy, Energy Information Administration, Petroleum Supply Annual 1988, DOE/EIA-0340(88)/1, May 1989.

TABLE 6

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
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	L.A. 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

Map Symbols

Commodity	Symbol
Alunite	Alu
Alumina	Al
Aluminum	AL
Andalusite	And
Antimony	Sb
Arsenic	As
Asbestos	Asb
Asphalt	Asp
Barite	Ba
Bauxite	Bx
Bentonite	Bent
Beryllium	Be
Bismuth	Bi
Bitumen (Natural)	Bit
Boron	B
Bromine	Br
Cadmium	Cd
Calcium	Ca
Carbon Black	CBl
Cement	Cem
Cesium	Cs
Chromite	Cr
Clays	Clay
Coal	C
Cobalt	Co
Columbium	Cb
Copper	Cu
Corundum	Cn
Cryolite	Cry
Diamond	Dm
Diatomite	Dia
Dolomite	Dol
Emerald	Em
Feldspar	Feld
Ferroalloys	FA
Ferrochrome	FeCr
Ferromanganese	FeMn
Ferronickel	FeNi
Ferrosilicon	FeSi
Fertilizer	Fert
Fluorspar	F
Gallium	Ga
Germanium	Ge
Gold	Au
Graphite	Gr
Gypsum	Gyp
Ilmenite	Il
Indium	In
Iron and Steel	Fe
Iron Ore	Fe
Kaolin	Kao
Kyanite	Ky
Lapis Lazuli	Laz
Lead	Pb
Lignite	Lig
Lime	Lime
Limestone	Ls
Liquefied Natural Gas	LNG
Liquefied Petroleum Gas	LPG
Lithium	Li
Magnesite	Mag
Magnesium	Mg
Manganese	Mn
Marble and Alabaster	Marb
Mercury	Hg
Mica	M
Molybdenum	Mo
Natural Gas	NG
Natural Gas Liquids	NGL
Nepheline Syenite	Neph
Nickel	Ni
Nitrates	Nit
Nitrogen (Ammonia Plants)	N
Oil Sands	OSs
Oil Shale	OSh
Olivine	Ol
Opal	Opal
Peat	Peat
Perlite	Per
Petroleum, Crude	Pet
Petroleum Refinery Products	Pet
Phosphate	P
Pig Iron	Pig
Pigments, Iron	Pigm
Platinum-Group Metals	PGM
Potash	K
Precious and Semiprecious Stones	Gem
Pumice	Pum
Pyrite	Py
Pyrophyllite	Pyrp
Quartz or Quartzite	Qtz
Rare Earths	REE
Rhenium	Re
Rutile	Ru
Salt	Salt
Sand and Gravel	Sd/Gvl
Sandstone	Ss
Selenium	Se
Sepiolite, Meerschaum	Sep
Serpentine	Serp
Shale	Sh
Silicon	Si
Sillimanite	Slm
Silver	Ag
Soapstone	Soap
Soda Ash, Trona	NaAsh
Sodium Sulfate	$NaSO_4$
Stone	Stone
Strontium	Sr
Sulfur	S
Talc	Talc
Tantalum	Ta
Tellurium	Te
Thorium	Th
Tin	Sn
Titanium	Ti
Titanium Dioxide	TiO_2
Tungsten	W
Uranium	U
Vanadium	V
Vermiculite	Verm
Wollastonite	Wo
Wonderstone	Ws
Yttrium	Y
Zinc	Zn
Zirconium	Zr

MAP LEGEND

Symbol	=	Mine, including beneficiation plants, well
Circled Symbol	=	Group of producing mines or wells
Underlined Symbol	=	Processing plant or oil refinery, including smelters and metal refineries
(Symbol)	=	Undeveloped resource