THE MINERAL INDUSTRIES OF

LATIN AMERICA AND CANADA[1]

By David B. Doan, Alfredo C. Gurmendi, Ivette E. Torres, and Pablo Velasco

Mining and related activity in 40 countries, territories, and island groups of Latin America, Canada, and the Caribbean Basin during 1996 are described in this regional report. As with the United States, these other countries of the Western Hemisphere are endowed with a great diversity of mineral deposits, comprising metals, industrial, and energy minerals. For many of the countries in this study, the mining, processing, and marketing of these mineral commodities play significant roles in the foundations of their economies, in many cases earning export revenues in hard currencies. Table 1 depicts a synopsis of Latin America and Canada's production of their major mineral commodities during 1996. Table 2 shows the role of Latin America and Canada in world mineral production.

The rich and varied mineral endowment of Latin America and Canada complement the mineral resources of the United States. New interest and capital investment are attracted to many of these countries, as discussed in the ensuing country chapters.

Position in the World Mineral Economy

By itself, Latin America produced 40% of the world's silver and 30% to 36% of the world's total output of copper, tin, and bauxite.[2] It produced 15% to 22% of the world's iron ore, zinc, lead, and nickel. With Canada, it produced even greater proportions of silver (49%), copper (43%), and zinc (37%), as well as nickel (33%), iron ore (26%), lead (25%), and primary aluminum (21%). Moreover, Latin America and Canada, separately and together, were of great significance to the world economy as producers of petroleum crude, natural gas, petroleum refinery products, and coal, a large proportion of which was exported.

Brazil led the world in output of columbium and, although not the greatest producer of iron ore, was the largest exporter in recent years as well as the sixth ranking source of manganese. Canada led the world in production of uranium and zinc and was second largest producer of nickel, with a strong showing in output of silver and gold. Chile led the world in production of copper, while Cuba and the Dominican Republic were sixth and seventh, respectively, in nickel output. Jamaica was the world's third largest producer of bauxite. Mexico led in the production of silver and strontium and was seventh in output of manganese.

The inclusion of the United States in table 1 shows the position of the entire Western Hemisphere in world supply of mineral commodities. This hemisphere produced significantly more than one-half of the world's copper (60%) and silver (59%), as well as 46% of its zinc, 40% of its lead, 38% of its aluminum, 33% of its nickel, and 32% of the world's iron ore. Among the industrial minerals, the Western Hemisphere produced 48% of the world's sulfur, 40% of its salt, 38% of its phosphate rock, and 35% of its gypsum. Of the mineral fuels, this hemisphere produced 45% of the world's output of natural gas, 27% of its crude, and 23% of its coal; further in the processing stream, it produced 36% of refined petroleum products.

Production Trends

Nonfuel Minerals.—In Latin America, the most significant production, in terms of share of world output, includes, in order of importance, silver, copper, tin, bauxite, iron ore, zinc, lead, nickel, gold, and primary aluminum, in order of importance, as shown in table 2. During the past 10 years, exploration, investment, and development have taken various new discoveries to production so that copper, bauxite, nickel, tin, silver, and iron ore have all increased Latin America's world position in output of these metals.

In certain years, some of this activity seems to have been at the expense of silver, zinc, and lead, which have either declined temporarily in terms of their proportion of world production or (as with silver) fluctuated erratically in terms of world share. This is partly because of changes in output in other countries. Although Latin America's world share of output of bauxite and gold has not changed much in the past 2 or 3 years, conspicuous efforts are being exerted to find and produce these minerals. Gold has been the center of attention in the Guyana Shield of Venezuela and Guyana, as well as in virtually all of the Andean countries. The bauxite industry has weathered the unusual surge of aluminum exports from the former Soviet Union during the early 1990's and is the object of increased interest in Brazil and Venezuela for domestic aluminum production. Jamaica exports virtually all its bauxite production.

Energy Minerals.—World share of Latin American production of petroleum crude (14%), natural gas (5%), and resultant petroleum products (8%) climbed slightly in 1996 after fluctuating unevenly since 1985. In spite of this, however, output of crude reached new highs in Argentina, Brazil, Colombia, Cuba, Guatemala, Mexico, and Venezuela. The top seven producers were Venezuela, Mexico, Brazil, Argentina, Colombia, Ecuador, and Trinidad and Tobago, representing

[1]Based on information available as of December 31, 1996.

[2]Unless otherwise noted, all listings of mineral commodities or countries for enumerative or comparative purposes are stated in order of importance based on volumes produced, exported, or imported.

97.6% of the regional total. Mexico,Venezuela, Brazil, Colombia, Bolivia, and Guatemala reached new highs in production of natural gas.

Canada also confirmed a new high in the production of crude oil; if combined with Latin America and the United States, the Western Hemisphere represents 45% of the world share of natural gas production and 27% of crude oil production, both new high values. Mexico, Brazil, and Venezuela, in order of output, led Latin American production of refinery products and, with Canada and the United States, achieved a world share of 36%, also a new high.

Coal output in Latin America was led by Colombia, followed by Mexico and Brazil, with products that were generally competitive in world markets and that increased local and regional market shares during the past 10 to 20 years. These coals range from anthracite through semianthracite, bituminous, and subbituminous, depending upon the country, plus some lignites used locally in most cases. Latin American coals are suitable for metallurgical and thermal use, as is true for Canadian and U.S. coals. Together, the Western Hemisphere coal output amounts to a 23% world share.

Trade Liberalization Developments

Canada, Mexico, and the United States ratified the North American Free Trade Agreement (NAFTA) that went into effect on the first day of 1994. This agreement created the largest and richest trading bloc in the world, including 370 million consumers and an annual output of about $7 trillion. NAFTA automatically replaced the Free Trade Agreement between the United States and Canada after 5 years of generally successful operation. The excellent infrastructure, including railroads, highways, and pipelines, connecting Canada, the United States, and Mexico, were expected to be a significant factor in the marketing of mineral commodities. Other Latin American nations, Chile in particular, viewed the possibility of joining NAFTA to enable greater freedom of mineral trade and, ultimately, greater efficiencies of production. A first step in this direction was under discussion by Canada and Chile, with the hope of negotiating a Free Trade Agreement between those two countries.

During the past 30 years or more, other Latin American countries have entered into trade agreements among themselves, such as the Southern Cone Common Market (MERCOSUR), which includes Argentina, Brazil, Paraguay, and Uruguay; Chile's bilateral Free Trade Agreement with Mexico; the Colombia and Venezuela agreement with the Central American Common Market; Venezuela's agreement with Chile to begin phasing out tariffs over a 6-year period; and a free-trade pact among Colombia, Mexico, and Venezuela to phase out tariffs.

During MERCOSUR negotiations, Brazil discussed measures to lower its average tariff to approximately 14% and to abolish the 40% ceiling on foreign investor stockholdings in privatized companies. Brazil also signed an agreement with Peru to reduce tariffs on bilateral trade by 50%. In 1993, Argentina signed a bilateral investment treaty with the United States guaranteeing U.S. investors the best of national, or most-favored-nation, treatment, free transfer of profits, and access to international arbitration. Chile signed an agreement with Colombia to eliminate tariffs entirely by 1999.

Privatization and Investment Interest

Many governments recognize that privatization of ownership and acceptance of foreign investment fosters vigorous growth, not least in the mining industry. This growth can lead to enhanced revenues and, for many countries, to expanded overall economic strength in labor and wages. During 1996, the strong trend toward privatization continued in Latin America. Significant proportions of U.S. and Canadian interest, along with mining development capital, were shifting to Latin America. Among the most popular geologic exploration targets were the Cordillera which extends southward through Mexico and Central America through the Andes of South America, virtually to Tierra del Fuego, and the Guyana Shield, which comprises parts of northern Brazil and smaller countries between Brazil and the northern coast of South America.

The lure of rights to private ownership in Latin American countries, such as Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Mexico, Peru, and Venezuela attracted great interest in the mineral endowment of those countries. Seeking sources of hard currency for its economy, Cuba increasingly permitted exploration efforts by foreign companies for metals and petroleum.

Venezuela courted foreign exploration for metals, particularly gold, and encouraged joint efforts in petroleum operations. The gold rush, now several years old, persisted around "Kilometre 88" on Highway 10 south of El Dorado, the site of Las Cristinas (Placer Dome Inc., 70%, Government, 30%) major gold deposit. Many other international companies acquired concessions throughout this 30- by 45-kilometer area. Although public concern over mercury pollution from old garimpeiros' (unauthorized miners) panning operations in the Las Cristinas area remained high, interest did not stop there. Many of the same companies explored for gold and diamonds toward the south and east, throughout the Guyana Shield but north of the Brazilian border, through Guyana, Suriname, and French Guinea.

The Brazilian Congress supported the Government's plan for economic stabilization, "Plano Real," based on strict control of the domestic deficit, issuance of a new currency, stable foreign-exchange rates, and reduction of tariffs. Constitutional amendments allowed the participation of the private sector via privatization, joint ventures, and deregulated investments in mining, petroleum exploration, natural gas distribution, shipping, and telecommunications. The steel industry was privatized, and the mining and petrochemicals sectors moved toward privatization. The Concessions Law created private sector opportunities in public utilities previously reserved for the state.

After adopting new mining and environmental laws in 1992, Mexico concentrated its efforts on privatization. After being hindered by the collapse of the peso at yearend 1994 and early 1995, which resulted in a serious economic recession and

temporary financial uncertainty, its economy was bolstered by strong new foreign investments in many of its basic industries. Plans for privatization of the petrochemical industry stalled, with waning enthusiasm on the part of industry officials.

Foreign investment has played an important role in the modernization and growth of the Chilean economy. Mining continued to be the most attractive target sector, absorbing about 58% of this investment in 1996. According to the Chilean Copper Commission (COCHILCO), most of the foreign capital went to 20 projects. Of particular note was the startup of El Abra, a $1.8 billion joint venture by Cyprus Amax (51%) with the National Copper Corporation of Chile (CODELCO, 49%) to form the world's largest copper heap-leach operation with production costs forecast to be just $0.35 per pound.

Since 1990, the control policies of the Peruvian Government have been replaced by a modern economic model that included the liberalization of foreign exchange transactions, deep cuts in tariffs and subsidies, unfettered interest and foreign exchange rates, and liberalized international investment rules. These have been part of a sweeping privatization process that allows price and investment decisions to be governed by open-market forces. Privatization of Empresa Minera del Centro del Peru S. A. (CENTROMIN) and Petroleous del Peru S.A. (PETROPERU) created a new and positive outlook for the mining and petroleum industries.

The Corporacion Minera de Bolivia, widely known as COMIBOL and once the leading mineral producer in the country, sought private partners to operate its existing mines under joint venture or other contracts. The Bolivian Government has undertaken significant legal and regulatory reforms, such as a single income tax rate of 25%, enactment of environmental laws to balance the need for environmental protection against the imperative of sustainable economic development, and a revised mining code ensuring equal treatment of foreign and domestic investors.

In Canada, privatization was not a concern. That country, however, has seen increasing environmental challenge to property development, mining, and closure or abandonment. The industry has striven to respond to responsible criticism by way of adopting evironmentally acceptable methods of operation. Some companies, however, have chosen to shift their interests elsewhere, particularly to Latin American countries. Groups of Canadian citizens representing all views have combined to reconcile conflicting interests between preservation and development. This effort brought together a coalition of Federal and local governments, native peoples, industry, labor unions, and nongovernmental organizations to formulate a common policy integrating public land use, resource development, and the environmental and economic concerns of the nation's people. Progress was evident as their work continued.

Major Sources of 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 Documentation Miniere, Paris: Annales des Mines, monthly.
Bureau de Recherches Geologiques et Minieres, Paris: Chronique de la Recherche Miniere, quarterly.
Business International Corporation, New York: The New Latin America Market Atlas, 1992.
EMEP—Editorial Ltda. Sao Paulo, Brazil: Minerios Extracão and Processamento, monthly.
G & T International (Chile): Latinominería, quarterly.
Institute of the Americas, La Jolla, California: HEMISFILE, News & Events, and summary reports on all major conferences.
Instituto Latinoamericano del Fierro y el Acero (ILAFA), Santiago: Anuario Estadístico de la Siderurgia y Mineria 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.
International Bauxite Association (IBA), Kingston, Jamaica: Review, quarterly.
International Lead and Zinc Study Group, London.
International Monetary Fund, Washington, DC: International Financial Statistics, monthly.
Annual Yearbook.
International Nickel Study Group, The Hague, the Netherlands: Occasional reports.
Kal Wagenheim, Maplewood, NJ: Caribbean Update, monthly.
Latin American Energy Organization (OLADE): Energy Statistics, annual.
Energy Magazine, issued every 4 months.
Latin American Mining Institute, Washington, DC: The South American Investment and Mining Guide, annual.
Mexico and Central America Investment and Mining Guide, annual.
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.
Metals Economics Group, Halifax, Nova Scotia, Canada: Latin America Gold—Transactions and Opportunities.
MllDa Limited, London: Latin American Mining Letter, biweekly.
Miller Freeman Publications, San Francisco: World Mining, yearbook.
Mining Journal Ltd., London: Mining Magazine, monthly.
Mining Journal, weekly.
Mining Annual Review, July issue.
Metallgesellschaft Aktiengesellschaft, Frankfurt: Metal Statistics, annual.
National Mining 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, Oklahoma: International Petroleum Encyclopedia.
Robertson, Andrew, ed. Atlas of the Latin American and Caribbean Mineral Industry. Mining Journal Books. Kent, England, 162 p.
Samim, Rome: Metalli Non Ferrosi, annual report.
United Nations, New York, NY: Chronicle of the United Nations Mineral Resources Exploration in Developing Countries 1988-93. Yearly updates.
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. Agency for International Development: Latin America and the Caribbean—Selected Economic and Social Data, April 1992.
U.S. Central Intelligence Agency: World Factbook, annual.
U.S. Department of Commerce: Bureau of the Census, trade statistics.
Intenational Trade Administration: Foreign Economic Trade and Their Implications for the United States, semiannual by country.
International Marketing Information Series.
Business America, v. 113, No. 21, Oct. 19, 1992: U.S. Department of Commerce, Feature article on NAFTA.
U.S. Department of Energy, Office of International Energy Analysis: International Energy Annual, DOE/EIA-0219.
Petroleum Supply Annual v. 1 and 2. DOW/E1A-0340.
U.S. Department of the Interior, U.S. Geological Survey: Mineral Commodity Summaries, annual.
Minerals Yearbook, Annual Commodity Reports.
U.S. Department of the Interior, U.S. Bureau of Mines, Mineral Perspectives Series: The Mineral Economy of Mexico, 1992.
U.S. Joint Publications Research Service, Arlington, VA: Foreign Broadcast Information Service Regional Publications, weekly.
University of Miami, North-South Center for Latin American Studies: North-South, the Magazine of the Americas, bimonthly.
Weaver, Jean N. Coal in Latin America: 1992. U.S. Geological Survey Open-File Report 93-239. 60 p.
World Bank, Washington, DC: Bank news releases.
World Bureau of Metals Statistics, London: World Metal Statistics, monthly.
World Reports Limited, New York: The Latin American Times, monthly.

TABLE 1
PRODUCTION OF SELECTED MINERALS IN LATIN AMERICA AND CANADA, 1996

(Thousand metric tons unless otherwise specified)

	Metals										
	Aluminum primary metal	Bauxite	Copper mine output	Gold (tons)	Iron ore, gross weight	Lead mine output	Nickel mine output	Silver (tons)	Steel, crude	Tin mine output	Zinc, mine output
Argentina	186	--	--	1	--	11	--	50	3,650	--	31
Belize	--	--	--	(1/)	--	--	--	--	--	--	--
Bolivia	--	--	(1/)	13	--	17	--	384	--	15	145
Brazil	1,180	10,760	46	42	182,700	13	26	55	25,076	20	150
Chile	--	--	3,116	53	9,082	1	--	1,047	1,135	--	36
Colombia	--	2	11	22	606	(1/)	28	10	677	--	(1/)
Costa Rica	--	--	--	1	--	--	--	(1/)	--	--	--
Cuba	--	--	2	--	--	--	54	--	231	--	--
Dominican Republic	--	--	--	4	--	--	51	17	--	--	--
Ecuador	--	--	(1/)	18	--	(1/)	--	(1/)	33	--	(1/)
El Salvador	--	--	--	--	--	--	--	--	12	--	--
Guatemala	--	--	--	(1/)	3	(1/)	--	--	18	--	--
Guyana	--	2,100	--	12	--	--	--	--	--	--	--
Honduras	--	--	--	(1/)	--	3	--	29	--	--	25
Jamaica	--	11,829	--	--	--	--	--	--	25	--	--
Mexico	61	--	341	24	7,794	174	--	2,528	13,169	(1/)	378
Nicaragua	--	--	--	2	--	--	--	3	--	--	--
Panama	--	--	--	1	--	--	--	(1/)	--	--	--
Paraguay	--	--	--	--	--	--	--	--	95	--	--
Peru	--	--	484	65	4,304	249	--	1,970	27	27	761
Suriname	32	4,000	--	(1/)	--	--	--	--	--	--	--
Trinidad and Tobago	--	--	--	--	--	--	--	--	695	--	--
Uruguay	--	--	--	1	5	--	--	--	40	--	--
Venezuela	635	5,600	--	12	20,842	--	--	--	3,725	--	--
Others 2/	--	--	--	3	--	--	--	--	--	--	--
Total Latin America	2,094	34,291	4,000	274	225,336	468	159	6,093	48,608	62	1,526
Share of world total (percent)	10	30	36	12	22	16	15	40	6	32	21
Canada	2,282	--	686	165	36,030	257	193	1,308	14,500	--	1,235
Total Latin America and Canada	4,376	34,291	4,686	439	261,366	725	352	7,401	63,108	62	2,761
Share of world total (percent)	21	30	43	20	26	25	33	49	8	32	37
United States	3,577	W	1,920	318	62,073	436	1	1,570	94,700	--	628
Total Western Hemisphere 3/	7,953	34,291	6,606	757	323,439	1,161	353	8,971	157,808	62	3,389
Share of world total (percent)	38	30	60	34	32	40	33	59	21	32	46
Total world	20,700	114,000	11,000	2,250	1,020,000	2,920	1,080	15,200	758,000	196	7,440

See footnotes at end of table.

TABLE 1--Continued
PRODUCTION OF SELECTED MINERALS IN LATIN AMERICA AND CANADA, 1996

(Thousand metric tons unless otherwise specified)

	Industrial minerals						Fuels			
	Barite crude	Cement, hydraulic	Gypsum crude	Phosphate rock (P_2O_5)	Salt, all forms	Sulfur, all forms	Coal, all grades	Natural gas, gross (million cubic meters)	Petroleum (million 42-gallon barrels) Crude	Petroleum (million 42-gallon barrels) Products
Argentina	14	5,117	633	--	1,096	--	200	27,000	286	139
Bolivia	5	934	(1/)	--	(1/)	--	--	5,500	10	11
Brazil	45	34,597	1,197	1,000	6,014	254	4,648	9,182	296	458
Chile	3	3,400	520	17	4,043	350	1,446	3,632	3	48
Colombia	20	8,590	450	50	576	81	30,065	8,000	229	102
Costa Rica	--	990	--	--	37	--	--	--	--	8
Cuba	--	1,453	130	--	180	5	--	37	11	60
Dominican Republic	--	1,500	86	--	10	--	1	--	--	12
Ecuador	--	2,400	--	--	--	14	--	190	140	55
El Salvador	--	880	5	--	31	--	--	--	--	6
Guatemala	1	1,200	90	--	48	--	--	20	6	6
Guyana	--	--	--	--	--	--	--	--	--	--
Honduras	--	1,150	26	--	25	--	--	--	--	2
Jamaica	--	555	339	--	18	--	--	--	--	6
Mexico	470	25,366	5,262	682 4/	8,508	2,956	12,109	43,507	1,046	465
Nicaragua	--	350	13	--	15	--	--	--	--	5
Panama	--	350	--	--	22	--	--	--	--	10
Paraguay	--	600	5	--	--	--	--	--	--	7
Peru	37	3,200	35	103	235	60	62	1,200	44	54
Suriname	--	50	--	--	--	--	--	--	2	--
Trinidad and Tobago	--	617	--	--	--	5	--	9,033	47	41
Uruguay	(1/)	1,000	145	--	--	2	--	--	--	11
Venezuela	--	7,556	30	203	350	250	4,342	38,470	1,086	372
Others 5/	--	607	--	--	1,466	71	--	35	(1/)	140
Total Latin America	595	102,462	8,966	2,055	22,674	4,048	52,873	145,806	3,206	2,018
Share of world total (percent)	13	7	9	5	12	8	1	5	14	8
Canada	61	11,050	8,333	--	12,126	9,153	75,860	198,107	675 6/	663
Total Latin America and Canada	656	113,512	17,299	2,055	34,800	13,201	128,733	343,913	3,881	2,681
Share of world total (percent)	15	8	17	5	18	25	3	12	17	10
United States	662	80,818	17,500	13,300	42,300	11,800	965,130	905,000	2,362	6,701
Total Western Hemisphere 3/	1,318	194,330	34,799	15,355	77,100	25,001	1,093,863	1,248,913	6,243	9,382
Share of world total (percent)	30	13	35	38	40	48	23	45	27	36
Total world	4,460	1,484,564	99,700	40,200	192,000	52,200	4,784,000	2,800,000	23,380	26,000

W Withheld to avoid disclosing company proprietary data.
1/ Less than 1/2 unit.
2/ Includes French Guiana.
3/ Excludes Greenland.
4/ Includes only output used to manufacture fertilizers.
5/ Includes Aruba, The Bahamas, Barbados, French Guiana, Guadeloupe, Haiti, Martinique, the Netherlands Antilles, and St. Kitts and Nevis.
6/ Includes synthetic crude (from oil shale and/or tar sands).

TABLE 2
THE ROLE OF LATIN AMERICA IN WORLD MINERAL PRODUCTION

(Percentage of world output) 1/

Commodity	1985	1990	1993	1994	1995	1996
Silver	35	35	31	39	33	40
Copper	26	26	30	31	33	36
Tin	25	28	32	32	31	32
Bauxite	20	24	28	28	30	30
Iron ore	17	21	20	22	22	22
Zinc	17	17	13	19	20	21
Lead	15	13	10	16	16	16
Nickel	6 e/	11	12	15	14	15
Crude oil	12	11	9	15	12	14
Gold	10	9	9	9	10	12
Aluminum	8	10	10	10	10	10
Petroleum products	7	9	9	8	7	8
Cement	7	7	7	7	6	7
Steel	5	5	6	6	6	6
Coal	1	1	1	1	1	1

e/ Estimated.
1/ By volume.