

THE MINERAL INDUSTRY OF

MEXICO

By David B. Doan

In the midst of a prolonged recovery from the financial crisis and peso devaluation of late 1994 to early 1995 and in spite of minor political unrest in the rural areas of one or two southern States, Mexico's mineral industry finished 1996 in robust condition.¹ Not only did output of metals continue to show strength, but production of industrial minerals improved after being slowed in 1995 by the effects of recession. Gross domestic product grew 5% after falling nearly 7% in 1995 (International Economic Review, 1997, p. 11). Recovery was aided by an influx of hard currency for investment purposes and, specifically, exports, including mineral commodities and their derivatives. A milestone in technological progress was demonstrated when Mexico put its first satellite in orbit using a military rocket at Plesetsk Cosmodrome in Russia. The satellite will be used for geologic, oceanographic, and astronomical research (U.S. Embassy, Mexico City, 1996, p. 1).

Mexico maintained its prominent position in mineral production, once again leading the world in output of silver among the metals and strontium (celestite) among the industrial minerals. Mexico was among the world's top five producers of (white) arsenic, barite, fluorspar, graphite, and sodium sulfate; beyond these, it was one of the top 10 producers of antimony, cadmium, copper, gypsum, lead, manganese, molybdenum, salt, sulfur, and zinc. In the Western Hemisphere, only Mexico and Brazil produced manganese in significant quantities. Mexico remained in sixth place in terms of world output of petroleum crude.

In December, 1994, about a year after ratification of the North American Free Trade Agreement (NAFTA), Mexico's current economic recession began with a serious financial crisis involving collapse of the peso and, briefly, an international loss of confidence in the country's financial structure (Financial Times, 1997, p. 4). After assistance from the International Monetary Fund, the banking system began to recover with rebuilding of confidence. The mining industry performed well in supporting domestic demand and export earnings, bringing cash-flow into the mining sector amidst the sharp drop in purchasing power nationwide.

¹Much of the general and commodity information in this report was provided by Mr. Steve Ordal, Petroleum Officer, and Ing. Javier Moya R., Minerals Specialist with the Economic Section of the Embassy of the United States in Mexico City, whose joint efforts have been invaluable in providing a comprehensive, detailed, and timely report. Ing. Moya not only compiles the annual Minerals Questionnaire, but is also the author of the comprehensive annual Mexico's Minerals Outlook Report used extensively as source material for this report. Any datum, statistic, or information in the text not referenced elsewhere may be assumed to be from their current (1997) Minerals Outlook Report: Mexico—The Mineral Industry in 1996.

The notable gains in Mexico's metal mining sector versus the bleaker picture in the overall economy throughout 1995 arose from several factors, starting with a general improvement in metals prices in world markets. This alone furnished impetus to plans for new mines and expansion of existing production, but, simultaneously, the peso devaluation abruptly lowered relative operating costs, including payroll obligations, of all Mexican mines. Valuation of output continued at dollar-denominated prices set by world markets, thus enhancing peso revenues to levels higher than normal and fostering increased contributions to revenues by exports. In 1996, this general picture continued, with particular gains in the output of gold and ferrous metals. The output of industrial minerals, weakened by lack of domestic demand during 1995, improved throughout 1996 as construction picked up; this was particularly true for cement, which had dropped sharply the previous year. Production increased of barite, used in petroleum drilling operations, and sulfur recovered from crude oil.

Less conspicuously, but nonetheless significantly, the long program of privatization of mining properties inherited from two previous administrations (1982-88; 1988-94) bore fruit as newly privatized mines increased operating efficiency and expanded production at virtually the same operating costs. Furthermore, Mexico's mineral sector received infusions of hard currencies as exploration opportunities attracted more companies. At yearend, Mexico emerged as having the largest number (372) of registered international mining enterprises, almost 300 of them from Canada and the United States and at least 150 of them from Canada alone (Canadian Mines Handbook, 1997-98, p. 500). Driven by foreign and domestic companies, investment was brisk, with an estimated \$800 million expended, an increase of 10% over that of 1995. Moreover, the Mexican Mining Chamber forecast that at least \$3.7 billion more will be invested during the 1997-2000 period. All of this activity has helped reduce Mexico's inflation to 26% in 1996 from 51% in 1995, and to reduce interest rates to 33% in 1996 from 100% in 1995 (Mining Journal, 1997, p. 35).

Government Policies and Programs

Government privatization efforts that began in the last part of the 1980's and that, by 1996, had placed almost all former State-owned mines in private hands continued to be emphasized. Because minerals were considered to be part of the national patrimony under the 1917 Mexican Constitution, the Government awarded all concessions for exploration and exploitation of nonfuel minerals. In most cases, foreign

participation in the nonfuel mineral sector was limited to no more than 49% ownership. The 1961 Mining Law imposed a requirement for a majority Mexican participation, both in equity and management of mining companies, and granted a 25-year grace period for “Mexicanization” of the industry, although most companies in the mining industry were Mexican-controlled within 10 years. The 1975 Mining Law gave the Government even more control over mining activities. The law limited foreign participation to 34% in concessions on national reserves and all projects exploiting certain minerals, such as iron ore and coal; exploitation of oil and gas, phosphate rock, potassium, sulfur, and uranium was reserved for the Government. In 1990, a regulation issued by the Secretaria de Energia, Minas e Industria Paraestatal (SEMIP) allowed more flexibility in foreign ownership through exploration and production trusts undertaken according to the 1975 Mining Law.

Regulations of the most recent mining law, which became effective in September 1992, as well as the Manual de Servicios al Publico en Materia Minera (referred to hereafter as “The Mining Law”) were published on March 25, 1993, in the daily official register. This law allowed the private sector to play a much larger role in the mining industry as the Government of Mexico privatized State-owned companies, decontrolled its mining reserves, and encouraged domestic investment and foreign participation in the mining industry. The law permitted direct investment, with up to 100% ownership of equity, in exploration works and activities and allowed, through a 30-year trust mechanism, up to 100% foreign participation in mineral production. The Mining Law also provided greater legal security for holders of exploration and exploitation concessions and allowed private-sector participation in the exploitation of mineral deposits previously considered to be priority and strategic within the domain of Government ownership, such as coal, iron, phosphorus, potassium, and sulfur. The Mining Law extended the term of exploitation concessions from 25 to 50 years, renewable for a similar period, and exploration concessions were to be for a nonrenewable 6-year period. It allowed exploration and mining, through competitive bidding, for minerals on the continental shelf and underwater shelves of islands, as well as the seabed and subsoil of the Exclusive Economic Zone extending 200 miles offshore as defined by the Law of the Sea and the United Nations. The only limiting factor of these concessions was that they were nontransferable.

Exploitable substances not covered by The Mining Law included the following:

- Petroleum and solid, liquid, or gaseous hydrocarbons.
- Radioactive minerals.
- Substances contained in suspension or dissolution in subterranean waters, as long as they did not originate from a mineral deposit different from the components [sic] of the land.
- Rocks or the products of their fragmentation that could only be utilized for the fabrication of materials for construction, or ore destined for such purposes.
- Products derived from the fragmentation of the rocks, whose exploitation was performed principally by open-pit work.
- Salt that came from salt pits formed by evaporation of brines

in river basins.

The Mining Law eliminated the need for concessions for ore-preparation plants. Individuals engaged in processing minerals subject to this law would be obligated to inform the Government when their operations began, to submit the relevant reports, and to comply with the general regulations and specific technical standards in the area of environmental control.

In practical terms (Ordal and Moya, 1995, p. 6-8), The Mining Law brought greater flexibility to the management of mining affairs, eliminated excessive red tape, stimulated small- and medium-scale mining production and promoted private-sector investment in exploration and mining activities. The beneficial aspects of this law, combined with the 1989 reduction of corporate income tax to 35% and the 1991 elimination of the mineral production tax, have led to an increase in new mining projects. The number of mining claims issued has doubled from 2,000 per year to more than 4,200. The land area covered by mining concessions has increased from 2.8 million to 7.1 million hectares

Environmental Issues

Although various environmental laws and regulations have been promulgated since 1946, protection of the environment became a priority for the Government of Mexico as population increased and mining grew in size and importance. Accordingly, a key element of environmental legislation, “The General Law of Ecological Balance and Environmental Protection” (LGEEPA) was passed in 1992 (Ordal and Moya, 1996, p. 5). Environmental responsibilities residing in various Government agencies were transferred to the new Ministry of Environment, Natural Resources, and Fisheries (SEMARNAP), that was given broad powers. Enforcement of environmental regulations was to be buttressed by the newly formed Environmental Attorney’s Office.

Under the new SEMARNAP, mineral exploration and mining required a number of environmental permits and authorizations to conform to the statutes of LGEEPA, starting with a preliminary environmental impact statement for all major activities or projects. Besides an operating license, the necessary permits for any mine or plant included water well usage, water discharge, land use, explosives, and hazardous materials handling. Other regulations were concerned with noise, gas and dust emissions, dumps and tailings, storage of oil and fuel, and electrical transformers.

Water discharge regulations were specified in the “Federal Law Concerning Water Rights” (LFDMA) of January 1992 and the “National Water Law” of December, 1992. According to LFDMA, water pumped from mining works was not subject to discharge fees so long as it was not used in the “exploitation and/or metallurgical treatment of ore” or for other industrial or domestic use. In any case, however, discharge fees were required for water containing more than 2,500 milligrams per liter of total dissolved solids, unless the discharged water was able to meet the minimum quality standards set by the Consejo Nacional de Agua (CONAGUA). Although water discharged to runoffs or water basins was also exempted from payments of

discharge fee if it met CONAGUA water-quality standards, all other types of water discharge required payment of a fee according to schedules set in LFDMA.

Production

Overall, the production of barite, celestite, copper, gold, graphite, gypsum, ferroalloys, fluorspar, iron, manganese, molybdenum, sand, silver, steel, sulfur, and zinc concentrates increased, compared with that of 1995, while production of antimony, arsenic, and lead concentrates declined. Output of selenium and tungsten, produced as byproducts, had been suspended in 1993 for lack of profitability; tungsten was again produced in 1995, but output declined in 1996. In the energy mineral group, the production of coal, coke, natural gas, and petroleum crude increased compared with that of 1995. Refinery products, however, declined for the second year in a row.

The total value of Mexican mining production, excluding cement and petroleum, was \$3.84 billion (rounded), or slightly less than the \$3.94 billion of 1995 and the \$4.19 billion of 1994. The overall loss was attributable, at least in part, to the drop in market price of copper, Mexico's leading mineral commodity, in terms of value of production. The \$3.84 billion total comprised the following subtotals: nonferrous metals, \$1,531 million; nonmetallic (industrial) minerals, \$1.41 billion; precious metals, \$723 million; and manganese plus iron, \$171 million. Individually, copper was the most important metal in terms of value (\$789 million), trailed by silver (\$423 million), and zinc following (\$393 million). The value of produced gold was about \$251 million.

Gray portland cement was the most valuable nonfuel mineral product in Mexico, but the total value of output was \$2.67 billion, down \$33 million from that of 1995. This reflected the continuing effect of the economic recession on domestic consumption and, in turn, the devaluation of the peso.

In the industrial mineral sector (excluding cement), sand was the most important in terms of value, at \$277 million, followed by gravel, \$206 million; limestone, excluding that for cement, \$139 million; gypsum, \$128 million; and marble, \$43 million. Among the fuels, Petroleos Mexicanos (PEMEX), the Government-owned monopoly, saw its production of petroleum crude rise about 10% above that of 1995. Production of natural gas climbed almost 12% compared with that of 1995. Output of coal rose about 8% over that of 1995. (*See table 1.*)

Trade

Total Mexican exports of goods and services amounted to an estimated \$96 billion, up about 21% from \$79.5 billion in 1995, which, in turn, was up about one-third from the \$60.9 billion of 1994, all testifying to the trade advantages of devaluation. Imports totalled \$89.5 billion, up from \$72.4 billion in 1995, probably reflecting some improvement in domestic business activity coming out of the recession. About 67% of Mexico's mineral exports went to the United States, and more than 60% of its mineral imports were from the United States. Mexico was

a major exporter of such metals as copper, lead, manganese, silver, and zinc and such industrial minerals as cement, fluorspar, graphite, gypsum, salt, sodium sulfate, and sulfur. Mexico imported bauxite and aluminum scrap for its refined aluminum industry, gold for Centenario coins, and some specific high-quality marbles, especially black marble.

PEMEX International (PMI), the trading arm of PEMEX, exported about 1.548 million barrels per day (Mbbbl/d) of crude oil, of which 1.214 Mbbbl/d went to the Americas (chiefly the United States), 96,000 barrels per day (bbl/d) went to Spain, and 87,000 bbl/d went to Japan. Average price per barrel was \$18.94. PMI's trade operations brought in about \$10.71 billion versus about \$7.48 billion in 1995.

Mexico has expanded trade with its Latin American neighbors through other free trade agreements, including an agreement with Colombia and Venezuela in 1994. Seeking to expand its economic and trade ties beyond the Americas, Mexico joined the Asia Pacific Economic Cooperation forum in November 1993 and the Organization of Economic Cooperation and Development in April 1994.

After its implementation on January 1, 1994, one impact of NAFTA on the financial sector became apparent in the second half of 1994 when the Mexican Government authorized 51 subsidiaries of U.S. and Canadian financial institutions to operate in Mexico, thus assisting in handling the flow of burgeoning trade revenues.

Structure of the Mineral Industry

The Government's participation in the mining sector continued to change as more State-owned entities were privatized. In late 1994, a reorganization of SEMIP had moved the Direccion de Minas, Comision de Fomento Minero (CFM), the Consejo de Recursos Minerales (CRM), the Fideicomiso de Fomento Minero (FMNM), and the Mining Directorate to the Secretaria de Comercio y Fomento Industrial, known as SECOFI. PEMEX and the Comision Federal de Electricidad remained part of SEMIP, which was renamed the Secretaria de Energia, known simply as SE.

CFM had been formed in 1934 to promote mining activity through financial support, technical advice, and assistance to the medium- and small-sized mines. It was also responsible for constructing and operating regional mineral-processing plants and research facilities. CRM, formed in 1975, was responsible for mineral exploration and statistics. Under The Mining Law, CRM was also given the authority to provide technical assistance, such as reserve verification, to promote further the small- and medium-sized mines. FMNM's function had been to promote the development, mining, and processing of industrial minerals. In 1990, the managements of CFM and FMNM were merged with research laboratories and assigned to CRM.

The Direccion de Minas, or Mining Directorate, gained control over mineral concessions and the national mineral register, plus the responsibility for updating and revising mining laws and regulations. Other organizations within the Mexican mining community included Camara Minera de México, widely known as CAMIMEX, which promoted the interests of the

mining industry as well as dialogue between the Government and private industry. The trade union, Sindicato Nacional de Trabajadores Mineros, Metalurgicos y Similares de la Republica Mexicana, represented nearly all the mine workers in Mexico. The cement industry union was controlled by the Confederacion de Trabajadores de Mexico, or CTM, the largest Mexican labor union. In 1995, the most recent year for which data are available, 210,000 workers were employed in the mining sector compared with 175,000 in 1994 and 165,000 in 1993.

Five large and diversified private sector companies dominated the production of nonfuel minerals, as shown in Table 2. These were Corporacion Industrial Sanluis S.A. de C.V. (Sanluis); Empresas Frisco S.A. de C.V. (Frisco); Industrias Peñoles S.A. de C.V. (Peñoles); Grupo Mexico S.A. de C.V. (Grupo Mexico), formed in August 1994 as a result of the reorganization of Grupo Industrial Minera Mexico S.A. de C.V. (IMMSA) and its subsidiary Mexico Desarrollo Industrial Minero S.A. de C.V.; and the Grupo Acerero del Norte (GAN). GAN owned Real del Monte y Pachuca, Minera el Baztan, Magistral del Oro, Barita de Sonora, Minera del Norte, Cerro del Mercado, Minera Carbonifera Rio Escondido S.A. (MICARE), Minerales Monclova, and two other corporations related to energy and chemicals. The cement industry was dominated by Cementos Mexicanos S.A. de C.V. (CEMEX), Cementos Apasco S.A. de C.V. (Apasco), and Cementos Cruz Azul S.C.L. (Azul).

Under Article 27 of the Mexican Constitution, the production of crude oil, natural gas, and basic petrochemicals was reserved for the Government through the following subsidiaries of PEMEX:

- Exploracion y Produccion was charged with the exploration and exploitation of oil and natural gas.
- Refinacion controlled the industrial refining processes, the manufacture of petroleum products, and basic petroleum derivatives and the distribution systems.
- Gas y Petroquimica Basica managed processing of natural gas, natural-gas liquids, and the production of basic petrochemicals.
- Petroquimica controlled production of secondary and tertiary petrochemicals.

Each subsidiary managed its own budget, planning, operations, and the transport, storage, and sales of its products. Private investment was not allowed in exploration, exploitation, and refining, but was allowed in secondary and tertiary petrochemical operations. In 1995, Article 27 was changed to allow private sector participation in natural gas transmission, distribution, and storage.

At yearend, PEMEX employed about 128,600 people, most of whom were represented by the Petroleum Workers Union. This figure was down from 215,000 in 1989, a peak year, and reflected the various measures undertaken by PEMEX to reduce its costs and improve its efficiency.

Inevitably, a gradual and probably long-term change in the mining industry of Mexico has been the influx of roughly 375 foreign exploration and mining enterprises. Originally, many of these set up field offices in the Hermosillo area of Sonora, but more recently, bases have been established in the States of

Chihuahua, Coahuila, Durango, and Sinaloa in the north; the States of Guerrero, Jalisco, Mexico, Queretaro, San Luis Potosi, and Zacatecas in central and southern Mexico; and the State of Baja Baja California in westernmost Mexico.

Commodity Review

Metals

Copper.—Mine production of copper increased very slightly, less than one-half of 1%, from that of 1995. Mexicana de Cobre S.A. (part of Grupo Mexico) was the leading producer with 55% of national output, all from its La Caridad mine and its new plant, which started up in midyear, that utilizes solvent extraction and electrolytic deposition (SX/EW). With a capacity of 1.08 million cubic meters (Mm³), this operation was expected to produce about 22,000 metric tons per year (t/yr) of cathodes. Mexicana de Cananea S.A.'s Cananea mine (also part of Grupo Mexico) was the second largest producer, followed by Industrial Minera Mexico.

One of the newest copper producers in Mexico was the Maria mine, owned by Minera Maria S.A. de C.V., a joint venture between Frisco (51%) and Cominco Resources International (49%). The high-grade underground Maria mine started up in late 1990 and achieved full production in 1991. During 1992 it produced a total of 210,000 metric tons (t) of ore with an average grade of 9% copper. The 1,000-ton-per-day (t/d) concentrator came on-stream in November 1991. Total copper production amounted to 16,600 t in 1993, 8,600 t in 1994, and 1,730 t in 1995. The Maria mine closed in 1995 and will be replaced by a new \$66 million low-grade open-pit operation named La Mariquita, which was expected to begin production in 1997, and projected to produce 22,000 t/yr of cathodic copper.

The State of Sonora accounted for 87% of Mexico's total production of copper. Other significant copper-producing States were, in descending order of output, Zacatecas, Chihuahua, San Luis Potosi, Durango, and Michoacan.

Mexico's production of refined copper was 3% more than that of 1995. The "Cobre de Mexico" refinery accounted for 52% of refined copper production, followed by the "Cobre de Pasteje" refinery (29%) and "Mexicana de Cananea" refinery (14%). Much of the anode and blister copper produced at Cananea and La Caridad was transported to Mexico City, where it was refined in Cobre de Mexico's electrolytic refinery. In response to the environmental problems of Mexico City, some of this work was transferred to the company's new facility in Celaya, Guanajuato.

Copper reserves of the two largest mines were as follows: La Caridad had 426 Mt of ore grading 0.52% copper and 0.03% molybdenum for the flotation plant, and 188 Mt of semioxidized or low-grade ore averaging 0.24% copper for SX/EW. Cananea had 1,597 Mt of ore grading 0.61% copper, plus 1,546 Mt of semioxidized or low-grade ore averaging 0.26% copper. Elsewhere, the El Arco project, in Baja California Norte, had 1,016 Mt grading 0.47% copper and 0.14 grams per ton (g/t) of gold.

Gold.—Mine production of gold rose to 24.083 t, an increase of slightly more than 13% over that of 1995, which was, in turn, 43% greater than that of 1994. Although world gold prices began to weaken late in the year, they were high enough above typical efficient mining costs that gross profits of \$3,200 to \$4,800 per kilogram (kg) were possible. In the more common language of mining companies, this translated as \$100 to \$150 per troy ounce. Much or most gold came from mines producing silver as their primary product, but the number of primary gold mines was increasing.

Interest in exploration for gold by both domestic and foreign mining companies increased in Baja California, Chihuahua, Durango, Guanajuato, Sinaloa, and Sonora. Successes in the Western United States led some companies to the southward extension of the prolific Cordillera and Basin and Range geologic provinces into Mexico. Many of the foreign companies seeking gold established investment trusts that allowed 100% foreign ownership of their exploration efforts in Mexico.

Sonora continued as the leading gold producing State, contributing about 34% of the national output. Durango was second with about 20%; Guanajuato, 12.5%; Baja California, 8.7%; Sinaloa, 6.4%; and other States, about 18.4%.

Newly opened mines accounted for most of the overall expansion of production. At yearend 1993, Minera Hecla S.A. de C.V.'s La Choya operation in northwestern Sonora began production at its open-pit operation, producing 2,494 kg in 1996. Eldorado Corp. Ltd.'s La Colorada operation began recovering gold the previous year, producing 1,247 kg in 1995 and 1,518 kg in 1996. Sanluis began operation at the San Martin project in Queretaro in early 1994, producing 488 kg in 1995 and 608 kg in 1996. During 1994, Peñoles started the Cienega, a polymetallic underground mine that yielded gold associated with other metals; a \$70 million expansion in 1996 increased its capacity to 450,000 t/yr. Other promising projects included the Empresa Minera CanMex's property at Mulatos, Sonora (owned by Placer Dome of Canada), and the Cambior Inc.-Sanluis Metates projects in Durango State. The Promontorio project of Sanluis, in the San Dimas District of Durango, involved the development of richly mineralized veins near the Tayoltita area.

Iron and Steel.—Mexico, which was the second largest steelmaker in Latin America after Brazil, produced about 25% of the Latin American output. Production of pig iron rose 2.4% compared with 1995. Production of direct-reduced iron (sponge iron) increased 2.8%, and of crude steel, up 8.4%. During 1996, 64% of crude steel was produced by electric furnace, and 36% was produced by basic oxygen converter; the open hearth process was no longer used. Mexico's steel exporters still enjoyed the benefit of the abrupt peso devaluation in the financial crisis of December 1994. They prospered throughout 1995 as the result of very competitive lower dollar-denominated prices for their export goods, whose production costs were paid for in pesos. In 1996, however, steel exports were down nearly 10%, as Mexico sold 5.8 million metric tons (Mt) of finished and semifinished products worth \$2.7 billion. Imports were steady at 1.1 Mt of finished and semifinished products but at a

cost of \$1.2 billion, an increase of about 9% of that of 1995. The latest data available show that exports of semifinished and finished products in 1995 had been 6.4 Mt valued at \$2.8 billion, and imports of semifinished and finished products in 1995 totaled 1.1 Mt valued at \$1.0 billion.

As in the United States, technological improvements were resulting in less rather than more semiskilled and unskilled labor in the industry but enhanced the net return for companies making the changes. In Durango State, GAN reopened Cerro del Mercado, an old iron mine, at a cost of \$43 million. By adding a new "heavy-medium" plant, GAN lowered the useable grade of the ore and increased reserves from 12 to 28 Mt. Hylsa de Mexico S.A. committed \$70 million to a new sponge iron facility.

The largest steel producer in 1996 was Altos Hornos de Mexico S.A. (AHMSA), with 3.39 Mt; followed by Hylsa de Mexico S.A. (HYLSA) in Monterrey, 2.72 Mt; Siderurgica Lazaro Cardenas-Las Truchas S.A. (SICARTSA) II, 2.42 Mt; SICARTSA I, 1.34 Mt; Tubos de Acero de México S.A. (TAMSA), with facilities in Veracruz and headquarters in Mexico City, was the fifth largest producer of crude steel at 0.76 Mt. TAMSA's most important domestic client was PEMEX, for tubular steel. Finally, small-mill production amounted to 2.53 Mt.

Steel industry plans were to invest at least \$1.9 billion in the next few years as follows: AHMSA, \$400 million; Grupo Villacero, \$250 million; Caribbean ISPAT, \$250 million; HYLSA, \$370 million; IMMSA (now Grupo Mexico), \$110 million; and the other companies, \$490 million.

Lead and Zinc.—Mexico continued as the sixth largest producer in the world of lead and zinc. About 6.2% of the world's output of lead and 5.2% of world output of zinc was produced. Most of this output was associated with the production of silver. The leading producers of lead and zinc were Grupo Mexico (still referred to as IMMSA), Frisco, and Peñoles. The six leading lead- and zinc-producing States were Chihuahua, Zacatecas, Hidalgo, Durango, Guerrero, and San Luis Potosi in that order.

Not only did 1996 world lead prices reflect increased demand for lead-acid vehicle batteries in many industrialized nations, but Mexico's devaluation made its lead offerings very competitive. All this resulted in enhanced financial results for the year for Mexico's principal lead producers. By 1996, 66% of lead consumption went to battery manufacture versus about 50% in the 1970's.

The largest lead producer in 1996 was the Cia. Fresnillo S.A. de C.V. mine in Naica, Chihuahua, which produced 37,881 t of lead, followed by Frisco's Minera Real de Angeles S.A. de C.V. mine in Zacatecas, which turned out 37,644 t of lead. IMMSA's Sta. Barbara Chihuahua operation produced 18,154 t of lead. Frisco's other major producer, the San Francisco del Oro mine, near Hidalgo del Parral in Chihuahua, produced 15,013 t of lead.

The Tizapa project at Zacazonapan in the State of Mexico, a joint venture between Peñoles and Dowa Mining Co. (Vancouver), mined a zinc-silver-lead deposit that initiated

production at a start-up rate of 700 t/d of ore lifted. A massive sulfide deposit, Tizapa had an estimated 4 Mt of ore grading 8% zinc, 2% lead, and 250 grams per ton (g/t) of silver. The presence of graphite and iron minerals in the ore has led to metallurgical problems causing low recovery rates in processing. Output of this mine was 19,691 t of zinc and 3,630 t of lead.

The leading zinc producer was IMMSA's Charcas mine with an output of 56,496 t, followed by IMMSA's Sombrete in Zacatecas (both owned primarily by Grupo Mexico), which turned out 46,031 t; Frisco's Noria de Angeles in the same State, 40,126 t; Bismark (Peñoles) 45,293; Frisco's San Francisco del Oro in Chihuahua, 26,680 t; and Grupo Mexico's Santa Barbara operation in Chihuahua, 29,259 t.

Mexico's largest new mining project, the Bismark zinc mine, started up in mid-1992 near the U.S. border in Ascension, Chihuahua, but its flotation plant did not reach its capacity level of 2,500 t/d in 1994. Bismark reported reserves of about 8.8 Mt of ore grading 8.5% zinc and 69 g/t silver. Minera Bismark S.A. de C.V. was originally a joint venture among Peñoles (40%), Cyprus Minerals (40%), and Promociones Industriales Banamex (20%); but Peñoles bought out Cyprus and now controls 100% of the shares. Another lead-zinc mine, El Triunfo in Baja California, underwent \$10 million worth of new exploration work by Echo Bay Mines Ltd.

Silver.—Continuing as the leading producer of silver with 17% of world production, Mexico lifted ore containing 2,536 t of silver from its mines. This represented an increase of less than 2% over the output of the previous year. About 77% of Mexico's silver production came from five States—Chihuahua, Durango, Guanajuato, Hidalgo, and Zacatecas. The leading producers were Peñoles, 1,025 t; San Luis, 174 t; Frisco, 282 t, of which 224 t came from Real de Angeles Mine; and Grupo Mexico, 420 t. In addition, Mexicana de Cobre and Mexicana de Cananea produced 72 t and 28 t, respectively, of byproduct silver. The Fresnillo Mine in Fresnillo, Zacatecas, now owned entirely by Peñoles, yielded about 506,080 kg of silver, sustaining its leadership as the largest single producer of silver in the world. Peñoles has committed about \$30 million to increase capacity by 25% to 900,000 t/yr.

Most Mexican refined silver came from facilities that also refined lead and zinc. The Peñoles facility at Torreon, Coahuila, and the Grupo Mexico plant in Chihuahua refined lead concentrates and produced large quantities of silver in the process. Silver was also recovered from zinc concentrates at both of these facilities. The Cobre de Mexico refineries in Mexico City and Celaya, Guanajuato, extracted silver electrolytically from copper anodes. Real del Monte Y Pachuca mine has a precious-metal refinery that processes silver and gold from the mine's own concentrates as well as concentrates from other mines.

Mexico dramatized the country's silver production by issuing new 10-, 20-, and 50-peso silver coins in 1993 in a move to monetize and thus support the "new" peso, adopted during the Salinas Administration. In another move involving silver, Metales Peñoles, through its subsidiary Argentalli, entered a

joint venture with Italy's Calegoral to manufacture and market solid silver flatware and cutlery.

Industrial Minerals

Cement—Production increased 6% over that of 1995 and was headed strongly upward by yearend. The decrease of 18% to 24 Mt in 1995 was due, in no small part, to the effect of the financial crisis on the construction industry in Mexico. Domestic and export sales of cement were valued at \$2.7 billion in 1996. The average consumer cement price in the country was about \$106 per ton in 1995 and \$105 per ton in 1996. Owing to the devaluation of the peso, the production cost dropped from \$41 per ton in 1994 to \$29 per ton in 1995-96. In real terms, gross profit dropped from \$85 to \$77, or a net decrease of about \$8, in 1995 and another \$1 in 1996. Even this cut of about 10% was enough to force improvements in efficiency or, possibly in a few cases, suspension of output.

CEMEX was the leading producer of cement with about 75% of the national installed capacity of about 32 Mt and 61% of the domestic market. It was the world's third largest cement producer in 1996, operating 38 cement plants, 387 concrete plants, 27 maritime distribution terminals, and 76 distribution terminals in 36 nations as of 1995. Other Mexican cement producers included Azul, Apasco, and nine other independent producers. Apasco, which was partially owned by Holderbank Financiere Glaris Ltd, was Mexico's second largest cement producer, with six plants, and has undertaken an expansion program in Ramos Arizpe, Coahuila.

A workers' cooperative with two plants, Azul was Mexico's third largest cement producer. The Grupo Cementos Chihuahua S.A. built a new plant in Zamlayuca, Chihuahua, and Cementos Portland Moctezuma S.A. de C. V. was expanding its Cuernavaca plant in Morelos. Market share for Mexico's leading cement companies in 1996 were approximately as follows: CEMEX, 61%; Apasco, 21%; Azul, 14%; Cementos Chihuahua S.A. de C.V., 3%; and others, 1%.

Traditionally, Mexico has been a large exporter of cement to the United States; in 1990, however, the U.S. Government placed a countervailing duty of about 50% on Mexican cement exports into the United States. In 1992, a dispute settlement panel formed under the auspices of the General Agreement on Tariffs and Trade (GATT) declared that the compensatory duties levied by the United States on cement imported from Mexico were illegal according to the terms of the antidumping code of the GATT and recommended the rebate of deposits paid to that date. Since late 1992, the United States and Mexican Governments have negotiated to seek settlement of the dispute. In September 1996, the U.S. Department of Commerce found that the dumping margin exceeded 100% on cement imported from Mexico by CEMEX, which would invoke a charge of \$57 million for antidumping duties. A second finding by Commerce, following remand instructions from the U. S. Court of International Trade, determined the dumping margin to be 109.43% from August 1991 through July 1992, which would invoke antidumping duties of about \$32 million if this determination were upheld by the courts. Further review was

underway for the period from August 1994 through July 1995 (Southern Tier Cement Committee, 1996, p. 1).

Fluorspar.—Mexican production of fluorspar increased slightly (0.2%) to 523,971 t from 522,658 t in 1995. Of the 1996 total, 244,938 t was metallurgical-grade material, and 279,033 t was acid-grade material. Mexico exports from 75% to 95% of its fluorspar production; the United States is the principal customer. Significant quantities of Mexican fluorspar are converted into hydrofluoric acid, most of which is also imported by the United States.

Mexico's most important fluorspar deposits were in northern Coahuila, and in Villa Zaragoza municipality of San Luis Potosi. Many lead-zinc-silver veins in Mexico also contain fluorspar, recovered as a byproduct of polymetallic deposits in the Hidalgo del Parral, Santa Barbara, and the San Francisco del Oro regions of Chihuahua. Mexico's largest fluorspar producer has been Minera Las Cuevas S.A. near Zaragoza, San Luis Potosi, which produced 13% of the world's fluorspar. Installed capacity was 320,000 t/yr of acid-grade and 200,000 t/yr of metallurgical grade concentrates. Las Cuevas fluorspar has a high arsenic content that limited its use in hydrofluoric acid plants and, thus, export sales. The firm was undergoing a 4-year expansion program to achieve total production capacity of 750,000 t/yr in 1997.

Graphite.—Mexico ranked as the largest graphite producer in the world after China and India. Production climbed to 40,412 t, about 98% of which was amorphous graphite, from 34,400 t in 1995.

The center of graphite production was southeast of Hermosillo, Sonora, where amorphous graphite was mined from altered coal seams by the largest producers, Grafitera de Sonora and related companies. This group, Grafitos Mexicanos S.A., an affiliate of Cummings Moore Graphite Co. of the United States, accounted for about 78% of the graphite production of Sonora. Other companies producing amorphous graphite were Grafito Superior and Exploradora Sonorense de Grafito.

Grafito de Mexico produced flake (crystalline) graphite at Telixtlahuaca, Oaxaca. This company was privatized in 1989 when the Government sold it to Minerale No Metalicos Mexicanos, a mining company specializing in barite, bentonite, kaolin, and phosphate rock. Their plant had an annual capacity of about 2,000 t of flake graphite produced from 50,000 t of ore. Mexico exported one-half of its graphite production to the United States and has supplied about 28% of the U.S. demand for imported graphite in recent years.

Gypsum.—Output of gypsum, which was produced in 16 of Mexico's 31 states, was about 5.262 Mt, up 8.5% from that of 1995. As with other so-called construction mineral commodities, such as cement, the Mexican financial crisis and devaluation impacted the market for gypsum within the country by discouraging new construction. The Mexican gypsum industry, however, retained its export markets to continue as the third largest producer of gypsum in the Western Hemisphere, after the United States and Canada, and as the seventh largest

producer in the world.

Most of the gypsum mined was used in the production of wallboard. Other uses were the manufacture of plaster, cement additives to adjust setting time, soil enhancers, glass additives, and as fillers in pharmaceuticals.

The largest gypsum producer in Mexico was Cia. Occidental Mexicana S.A., a 49% owned affiliate of Domtar Ltd. of Canada. This operation produced about 3 million tons per year (Mt/yr) of crude gypsum at facilities on San Marcos Island, about 40 kilometers (km) southeast of Santa Rosalia, Baja California Sur, in the Gulf of California. Most of this production has been shipped to wallboard plants in the Western United States and Canada.

Other important producers included Yeso Mexicano, Yeso Panamericano, and Ciksa, affiliates of USG Inc. of the United States; Yeso Monterrey; and Yeso El Tigre. Yeso Mexicano's capacity was 280,000 t/yr of processed gypsum from its mine and plant at La Borreguita, San Luis Potosi. Yeso Monterrey had a processing capacity of 150,000 t/yr at its mine and plant in Mina, Nuevo Leon. Yeso El Tigre's capacity was 80,000 t/yr from its facilities at Lagunillas de Rayon, Puebla. Another company, Yesera Nazas S.A., had a production capacity of 60,000 t/yr from its plants in Matamoros, Coahuila, and Gomez Palacio, Durango. Elsewhere, Minera Caopas S.A. de C.V. had started production of gypsum at Santa Rosalia, Baja California Sur, in 1990.

In addition to these producers, Mexican cement companies operated dedicated mines to meet their gypsum requirements, which amounted to about 1.44 Mt in 1994, the most recent data point.

Sulfur.—PEMEX produced 921,349 t of sulfur as a byproduct of petroleum and natural gas operations. Sulfuric acid plants at Mexican base-metal smelters produced 2.01 Mt of sulfuric acid in 1996, with an estimated sulfur content of 650,000 t.

Two companies with large Government equity participation, Azufrera Panamericana S.A. (APSA) and Compania Exploradora del Istmo S.A. (CEDI), produced 102,000 t of Frasch sulfur in 1993 until October of that year when their plants were closed; this was a conspicuous decrease of 86% from 1992 production of 710,000 t. The Frasch operations were shut down as the result, and it was not clear when or if they would reopen. The Government of Mexico was expected to sell APSA, as well as its two-thirds share of CEDI.

Wollastonite.—Production jumped to 28,365 t from 20,194 t in 1995, an increase of 40%. Nycor Minerals Inc. planned to open the Pilaes mine near Hermosillo, Sonora. Slated to begin operations in 1997 with an output of 150,000 t/yr, this \$100-million mine will export about 40% of its product to the United States and the remainder to Japan and the Republic of Korea.

Mineral Fuels

Coal.—Production (run-of-mine) of steam and metallurgical coal increased to 13.747 Mt, an increase of about 16% from that

of 1995. After losses in processing, this overall figure included 7.197 Mt of steam coal, 4.273 Mt of metallurgical coal, and 0.221 Mt of washed metallurgical coal. Recovery of washed coal from run-of-mine coal has been about 44%. Middlings commonly have been shipped to the Rio Escondido powerplant for thermal use.

The principal coal mining area of Mexico is the northern part of Coahuila, where MICARE operated. Ownership of MICARE, the principal coal producer in Mexico, was sold to a joint venture between GAN (51%) and Mission Energy (49%) for \$30 million plus the assumption of \$100 million of debt. MICARE had begun an expansion program to increase its annual production to 9 Mt to supply new coal-fired plants being installed at Rio Escondido.

Other coal deposits were in Sonora and in Oaxaca. About 4 Mt/yr of steam coal has been mined by MICARE in Coahuila from the company's two open-pit and two underground mines. About 3 Mt of metallurgical coal was mined by Minerales de Monclova S.A., and the remaining production was from about 10 small producers.

Natural Gas.—Mexico produced 43,507 Mm³ of natural gas, up 12% from the 38,879 Mm³ produced in 1995. The Government of Mexico, in the form of PEMEX, owned all production. Most of Mexico's output was associated gas, produced from oil reservoirs having either a gas cap or high saturation by lighter hydrocarbons that split off as gas at surface temperatures and pressures.

Gas production was consumed primarily within the country, but Mexico exported and imported natural gas, with imports (particularly near the Texas border) exceeding exports by about 2.64 Mm³ per day. This difference was expected to shift in favor of net exports. Domestic production went partly into the petrochemical industry and partly into a growing system of domestic distribution pipelines. In 1995, the Government approved legislative changes to permit domestic and foreign private-sector participation in natural gas storage, transport, and distribution. In mid-1966, six consortia competed for the right to distribute natural gas in Mexicali. The winner, San Diego Gas and Electric Co., became the first licensed distributor under the new legal arrangements. Plans were for the next distribution license to be for the city of Chihuahua. PEMEX had 12,763 km of transmission pipelines, not counting the gas-distribution lines that it plans to divest as distribution areas are awarded.

Petroleum Crude.—Mexican crude production climbed to 1.046 million barrels (Mbbl) from 955 Mbbl in 1995, an increase of about 10%. The 1995 total was affected negatively by Hurricanes Opal and Roxanne, which interfered with operations at PEMEX's maritime fields. Mexico produces three grades of crude oil—Olmeca, Isthmus, and Maya. Olmeca was a very light crude running 39.3° API gravity with 0.8% sulfur by weight, Isthmus was a light crude at 33.6° API gravity with 1.3% sulfur, and Maya was a heavy crude running 22° API gravity with 3.3% sulfur. During 1996, the approximate mix of total production was Maya, 48%; Isthmus, 32%; and Olmeca, 20%. PEMEX calculated its average production costs to be

\$2.52 per barrel, and its maritime production costs to be about \$1.86 per barrel, which were in the range of much of the production of the Arabian Gulf. Highest costs were in the northern part of the country where, in line with south Texas economics, crude production cost \$8.29 per barrel. Export prices of Mexican crude averaged \$18.94 per barrel.

Mexico ranked sixth in the world as a producer of crude oil and eighth in terms of reserves. In the Western Hemisphere, only the United States produced more oil than Mexico. Venezuela, the second leading producer of crude in Latin America, generated slightly less than 90% of Mexico's production. During the year, Mexico exported 1.306 million barrels per day of crude to about 23 countries; which 86% went to the Americas, 8% went to Europe, and 6% went to Asia. Exports of crude earned \$10.7 billion for the year.

Reserves

The term "reserves" is taken to mean mineral materials (ore) that can be mined, processed, and marketed to economic advantage (U.S. Bureau of Mines and U. S. Geological Survey, 1980, p.2). Yearly changes in estimation of reserves are, in simplest terms, the arithmetic result of additions to reserves, deletions of reserves, and production. For example, additions result from new discoveries, extensions to known reserves, new technical information, and commodity price increases. Deletions are caused, among other things, by increases in mining costs, decreases in market prices, and unforeseen requirements for additional capital for exploitation of otherwise favorable sites. Commonly, production is driven by a favorable balance between mining cost and return on investment, both of which may change continuously. Most mining operations aim at extracting the lowest grade that is profitable at prevailing prices for the product, thus not infrequently causing redefinition of the ore reserves. Some of the reserves in Mexican mines and deposits are contained in polymetallic deposits, necessitating close attention to market price and processing costs for two, or several, mineral commodities simultaneously to enable production as coproducts. (*See table 3.*) Between 1993 and 1995, Mexican gold output has more than doubled, and exploration turned conspicuously toward gold, but consolidated reserve estimates have not yet been promulgated so that no total value has been reported. Although a nominal estimate is listed, significant amounts of gold are associated with reserves of silver and other polymetallic deposits.

Infrastructure

Mexico had 26,725 km of railroads and 306,119 km of roads. As part of the Toll Highway Program that began in 1989, more than 5,680 km of new highways were being constructed. In addition, private companies were constructing 33 toll highways, 1,600 km of roadways, and four bridges across the U.S. border with Mexico. While financing the expansion of 2,100 km of highways to four lanes, the Government allowed the private sector to participate in such projects, including toll roads. The concessionholder was allowed to charge tolls on projects

developed until construction costs had been recovered and a reasonable profit made, at which time ownership of the highway would revert to the Government.

To streamline transportation of freight within Mexico, the Government modified regulations governing the trucking industry in 1990. After elimination of route control by private companies, Mexican carriers could move freight anywhere in the country. In addition, under NAFTA, U.S. and Canadian trucking lines, after a 3-year waiting period, would be able to avoid transshipment delays at the border by transporting freight directly across national boundaries to destinations in Chihuahua, Coahuila, Nuevo Leon, and Sonora. Mexican carriers had reciprocal rights to operate in Arizona, California, New Mexico, and Texas.

Mexico has more than 2,000 airports. Of these, 1,453 have paved runways—9 have runways longer than 3,047 m [10,000 feet (ft.)]; 25 have runways 2,438 to 3,047 m (8,000- 10,000 ft.) in length; 82 have runways 1,523-2,438 m (5,000 to 8,000 ft.) in length; 75 have runways 914 to 1,523 m (3,000- 5,000 ft.) in length; and 1,262 have runways shorter than 914 m.

The country had 21 ports and 2,900 km of navigable rivers and coastal canals. Of the 64 ships in the merchant marine, at least 44 were available for the transportation of mineral products. Within Mexico, most ore and metallurgical products were transported by truck. During the 1980's, railways declined in importance as the volume of freight and passenger transport dropped by more than 25% owing to increasingly poor and unreliable service. In 1991, railroads accounted for only 9% of Mexico's total freight traffic and were used mainly for bulk items such as coal, coke, and iron ore. Gray portland cement, for example, was transported by roads (61%), railroads (26%), and ship (13%). About 65% of the cement sold in bulk.

U.S. railroads, such as the Burlington Northern, the Santa Fe, the Southern Pacific, the Tex-Mex Railroad, and the Union Pacific, were working with the Mexican railroad, Ferrocarriles Nacionales de Mexico (FNM), to transport freight inside Mexico. Union Pacific was investing in the Huehuetoca rail distribution center and in the Port Laredo facility. Union Pacific Technologies has sold its Transportation Control System, which was designed to manage yard operations and train scheduling, to FNM. Southern Pacific and FNM offered double-stack container service to Mexico City. Southern Pacific also was investing in Ferropuertos, a series of intermodal distribution centers in Celaya, Monterrey, Torreon, and north of Los Mochis. The facilities would handle such shipments as consumer goods, grains, and minerals in bulk. Finally, FNM also was cooperating with Southern Pacific, Tex-Mex, and Union Pacific on the integration of shipping rates and the training of Mexico's railroad employees.

Hydrocarbon output continued to dominate Mexico's energy sector. Crude oil and natural gas generally represented about 90% of all energy produced. The remaining 10% of primary energy production typically was from wood and sugar cane (4.3%), hydroelectric sources (3.1%), coal (1.5%), geothermal wells (0.7%), and nuclear energy (0.5%), according to an analysis (rounded) of 1992.

Crude oil and natural gas were transported mainly through

pipelines within Mexico. Of the country's nine refineries, eight received crude oil by pipeline.

Outlook

Following a generally good showing in 1995, Mexico's production of major minerals continued to expand in 1996. Some sectors of the industry, particularly iron and steel, had demonstrated flexibility amidst the sharp decline in domestic consumption by shifting to higher output and boosting of exports in the space of one year. Other such sectors as copper, lead-zinc, and silver, are working to augment production in the belief that future markets will be able to accommodate their increased offerings. PEMEX has been and probably will be able to sell all the petroleum crude and natural gas it can produce. Market pricing in such hard currencies as the dollar, the yen, the pound, and the deutsche mark present attractive export targets for mineral commodities whose production costs are denominated in recently devalued pesos, a situation that normally will change only slowly.

Weaknesses in metallic mineral commodity markets of the late 1980's and early 1990's have been overcome to the extent that prices have firmed and climbed somewhat, providing a current incentive for production and expansion. World petroleum prices also have risen during the past year or so; with no warrant of permanence, they will, nonetheless, bring enhanced income to PEMEX and, hence, to Mexico.

The future seems promising for the expansion of interest in exploration, development, and mining in the gold sector, where production has increased steadily. More than 200 companies, many from the United States and Canada, have been involved in the exploration for gold, particularly in Sonora, but also Durango, and, more recently, in Baja California. A number of these companies will probably succeed and become permanently involved in Mexico, bringing new capital and technology.

The downside of Mexico's mineral industry has been the recent sharp contraction in domestic demand for construction materials, such as cement, gypsum, and steel. The outlook here, critical to a large proportion of Mexican wage-earners, will probably fluctuate as a function of the recovery of the peso. Some direct international financial support has been extended that will help stabilize the currency. The prospect of continued investment of foreign capital in Mexico's mineral industry, as well as in other industries, will help to restore confidence and solvency within the economy.

Many companies view Mexico as presenting fewer obstacles to mining and having less political risk for mining investment than some other countries of the Western Hemisphere. Depending upon the near-term experience of these companies, Mexico might expect to attract further foreign capital, thus affording a continuing increase in the significance of its mining industry. Between 1995 and 1997, total mining investment in Mexico was \$3.7 billion, according to the Mexican Mining Chamber, which estimated that another \$5 billion to \$6 billion would be invested between 1997 and 2000.

Toward the end of the century, NAFTA may well be seen to benefit the Mexican economy overall; even so, The Mining Law

and the new foreign investment law were expected to play more-immediate roles in attracting foreign capital not only from North American companies, but, increasingly, from those in Europe and Asia.

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TABLE 1
MEXICO: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity 3/	1992	1993	1994	1995	1996
METALS					
Aluminum, metal:					
Primary	24,800	25,800	--	10,413	61,458
Secondary	59,500	69,900	145,216	128,618	84,982
Antimony:					
Mine output, Sb content	1,200 e/	1,470	1,800 e/	266 r/	--
Metal 4/	1,060	1,490	1,760	1,517 r/	983
Arsenic 5/	4,290	4,450	4,440	3,620	2,942
Bismuth:					
Mine output, Bi content 6/	807	908	1,050	71 r/	113
Metal, refined	550 e/	650 e/	836	924	957
Cadmium:					
Mine output, Cd content	3,250 e/	3,320	2,580	1,385	1,455
Metal, refined	602	797	646	689	784
Copper:					
Mine output, Cu content 7/					
By concentration	251,100	277,000	279,700	300,400 r/	297,710
Leaching (electrowon)	27,900	24,100	25,800	38,900 r/	43,000
Total	279,000	301,100	305,500	339,300 r/	340,710
Metal:					
Anode and blister	227,000	94,000	277,000	298,000	300,800
Refined:					
Primary	111,000	93,800	104,300	103,100	107,200
Secondary	80,500	77,200	92,700	98,800	96,400
Total	191,500	171,000	197,000	201,900	203,600
Gold:					
Mine output, Au content	kilograms	9,890	9,770	14,642	20,292
Metal, refined	do.	5,740	6,090	6,450	8,355
Iron and steel:					
Iron ore, mine output:					
Gross weight	thousand tons	10,964	11,435	8,538	7,064 r/
Fe content	do.	7,236	7,547	5,516	5,625
Metal:					
Pig iron	thousand tons	3,400	3,420	3,401	4,142
Sponge iron	do.	2,390	2,740	3,220	3,691
Total	do.	5,790	6,160	6,621	7,833
Ferroalloys:					
Ferromanganese	do.	79	70 e/	117	109
Silicomanganese	do.	51	55 e/	72	77
Ferrosilicon	do.	5	(8/)	--	--
Ferrochromium	do.	(8)	--	--	--
Other	do.	(8)	(8)	--	--
Total	do.	135	126	189	186
Crude steel	do.	8,460	9,190	10,260	12,147 r/
Rolled products 9/	do.	6,240	6,660	7,583	8,478
Lead:					
Mine output, Pb content		170,000	149,000	170,322	164,348
Metal:					
Smelter:					
Primary		163,000	172,000	152,502	160,322
Secondary (refined) e/		10,000	10,000	10,000	10,000
Total e/		173,000	182,000	162,502 r/	170,322
Refined:					
Primary 10/		167,000	178,000	162,000	164,348
Secondary e/		10,000	10,000	10,000	10,000
Total e/		177,000	188,000	172,000	174,348
Manganese ore: 11/					
Gross weight		407,000	363,000	307,000	472,200
Mn content e/		153,000	135,000	112,000	174,200
Mercury: Mine output, Hg content		21	12	12	15 e/
Molybdenum: Mine output, Mo content		1,460	1,710	2,610	3,883 r/
Selenium: Mine output, Se content	kilograms	400	--	--	--
Silver:					
Mine output, Ag content	do.	2,100,000	2,110,000	2,214,638	2,496,000

See footnotes at end of table.

TABLE 1--Continued
MEXICO: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity 3/	1992	1993	1994	1995	1996
METALS--Continued					
Silver--Continued:					
Metallurgical products, Ag content:					
In copper bars do.	286,000	409,000	470,000	435,906	375,325
Mixed gold and silver bars do.	103,000	109,000	124,000	169,744	240,677
Metal, refined, primary do.	1,770,000	1,770,000	1,700,000	1,781,111	1,744,464
Other do.	111,000	78,100	123,000	108,762 r/	175,998
Tin:					
Mine output, Sn content	1	3	3	1	2
Metal, smelter, primary	2,590	1,640	1,640	414 r/	413
Tungsten: Mine output, W content	162	--	--	287 r/	188
Zinc:					
Mine output, Zn content	294,000	369,000	361,689	363,658	377,599
Metal, refined, primary	152,000	210,000	209,200	222,748	221,736
INDUSTRIAL MINERALS					
Abrasives, natural e/ 12/	25,000	25,000	25,000	8,234 r/ 7/	8,500
Barite	188,000	136,000	86,605	248,367	470,028
Cement, hydraulic thousand tons	26,880	27,120	29,700	24,043 r/	25,366
Clays:					
Bentonite	136,000	94,600	92,476	72,599 r/	72,600 e/
Common	4,170,000	4,420,000	4,553,635	3,697,053 r/	4,007,600 e/
Fuller's earth	41,100	36,100	21,377	15,755 r/	15,760 e/
Kaolin	144,000	216,000	193,034	221,685 r/	251,302 e/
Diatomite	46,400	46,100	52,100	50,200 r/	52,494
Feldspar	160,000	124,000	133,441	121,779	142,621
Fluorspar:					
Acid-grade thousand tons	189	187	129	270	279
Metallurgical-grade do.	95	93	103	252	245
Submetallurgical-grade e/ do.	3	3	3	--	--
Total do.	287	283	235	522	524
Graphite, natural:					
Amorphous	30,500	42,600	29,903	32,938	38,967
Crystalline	985	960	960 e/	1,450	1,445
Gypsum and anhydrite, crude (yeso)	5,160,000	5,340,000	5,530,000	4,854,339 r/	5,262,104
Lime, hydrated and quicklime e/ thousand tons	6,500	6,500	6,500	6,580 r/	6,600
Magnesium compounds:					
Magnesite	--	1,530	1,120	250 r/	250 e/
Magnesia e/ 13/	125,000 14/	110,000 r/	110,000 r/	110,000 r/	110,000
Mica, all grades	5,870	6,440	5,753	5,028 r/	5,030
Nitrogen: N content of ammonia	2,200,000	1,760,000	2,030,000	1,992,000	2,053,900
Perlite	42,600	34,600	31,918	33,529 r/	36,624
Phosphate rock 15/	515,000	237,000	546,857	622,354	682,079
Salt, all types thousand tons	7,400	7,490	7,460	7,670	8,508
Sodium compounds, n.e.s.:					
Carbonate (soda ash): e/ 16/					
Natural	160,000	160,000	160,000	160,000	160,000
Synthetic	280,000	280,000	280,000	270,000	270,000
Sulfate, natural (bloedite) 17/	534,000	500,000 e/	527,228	500,000 e/	525,000 e/
Stone, sand and gravel:					
Calcite, common	476,000	423,000	389,749	362,715 r/	362,720 e/
Dolomite	466,000	545,000	588,000	931,770 r/	929,933
Limestone 18/ thousand tons	31,800	34,000	12,260	18,976	20,000 e/
Marble	860,000	987,000	1,130,000	898,990	868,990 e/
Quartz, quartzite, glass sand (silica)	1,130,000	1,310,000	1,359,987	1,292,265	1,468,858 e/
Sand thousand cubic meters	46,300	47,600	50,982	45,086 r/	55,344
Gravel do.	42,600	43,700	44,899	37,970 r/	40,179
Strontium minerals, celestite	61,100	71,900	111,000	138,342 r/	143,892
Sulfur, elemental:					
Frasch process thousand tons	710	102	--	--	--
Byproduct:					
Of metallurgy e/ do.	817	730	2,014 14/	2,010 14/	2,010
Of petroleum and natural gas do.	775	804	877	882 r/	921
Other e/ do.	--	-- r/	-- r/	-- r/	25
Total e/ do.	2,302	1,636 r/	2,891 r/	2,892 r/	2,956

See footnotes at end of table.

TABLE 1--Continued
MEXICO: PRODUCTION OF MINERAL COMMODITIES 1/2/

(Metric tons unless otherwise specified)

Commodity 3/	1992	1993	1994	1995	1996	
INDUSTRIAL MINERALS--Continued						
Talc	19,600	14,400	14,900	11,134 r/	11,130 e/	
Vermiculite	125	134	300	225 r/	225 e/	
Wollastonite	27,400	35,800	29,000 r/	20,194 r/	28,365	
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Run-of-mine:						
Metallurgical	thousand tons	3,640	4,500	4,632	4,036	4,273
Steam	do.	5,060	5,720	6,311	7,197	7,836
Total	do.	8,700	10,220	10,943	11,233	12,109
Washed metallurgical coal e/	do.	1,610	1,710 e/	1,800 e/	213 r/	221
Coke: 19/						
Metallurgical	do.	1,890	1,890	1,933	2,097	2,141
Imperial	do.	2	3	3	--	--
Breeze	do.	144	49	49	51	43
Total	do.	2,036	1,942	1,985	2,148	2,184
Gas, natural:						
Gross	million cubic meters	37,100	37,000	37,492	38,879	43,507
Marketed	do.	32,700	35,700	36,000 e/	36,000 e/	41,000 e/
Petroleum:						
Crude	thousand 42-gallon barrels	974,000	976,000	980,025	955,205	1,046,028
Condensate e/	do.	1,640 14/	1,500	1,500	1,500	1,560
Total	do.	975,640	977,500	981,525	956,705	1,047,588 e/
Refinery products:						
Liquefied petroleum gas	do.	20,100	21,500	24,100	22,265	22,692
Motor gasoline	do.	148,000	152,000	157,000	154,395	152,256
Jet fuel	do.	23,700	26,300	27,000	25,550	22,692
Kerosene	do.	4,020	3,650	3,290	1,825	2,562
Distillate fuel oil (diesel)	thousand 42-gallon barrels	101,000	97,500	104,000	92,710	98,820
Lubricants	do.	2,920	2,560	2,560	2,555	2,562
Residual fuel oil	do.	157,000	162,000	156,000	151,840	152,622
Asphalt	do.	8,400	8,760	11,700	10,950	8,418
Other, refinery fuel, and losses	do.	19,900	20,700	24,400	24,090	2,562
Total	do.	485,040	494,970	510,050	486,180	465,186

e/ Estimated. r/ Revised.

1/ Data previously published for 1992 through 1994 were rounded by the U.S. Bureau of Mines to three significant digits. With very few exceptions, data in the present table have been unrounded to their original state.

2/ Table includes data available through Aug. 31, 1997.

3/ In addition to the commodities listed, additional types of crude construction materials are produced, but output is not reported; available information is inadequate to make estimates of output levels.

4/ Sb content of antimonial lead and impure bars plus refined metals.

5/ Arsenic content of white and black (impure) arsenic trioxide.

6/ Refined metal plus Bi content of impure smelter products.

7/ Series reported by Camara Minera de Mexico (CAMIMEX). Tonnages reflect a 2.5% metal loss in smelter.

8/ Less than 1/2 unit.

9/ Includes flat, nonflat, and seamless pipe steel products.

10/ Pb content of antimonial lead and impure bars plus primary refined metals.

11/ Mostly oxide nodules; includes smaller quantities of direct-shipping carbonates and oxide ores for metallurgical and battery applications.

12/ Based on exports comprising mostly pumice stone and emery (a granular, impure variety of corundum).

13/ Reported by Industrias Penoles S.A. de C.V. as the only major producer.

14/ Reported figure.

15/ Includes only output used to manufacture fertilizers.

16/ Total sodium carbonate reported by Asociación Nacional de la Industria Química.

17/ Series reflects output reported by Industrias Peñoles plus an additional 22,000 tons estimated production by Sulfato de Viesca.

18/ Excludes limestone for cement production.

19/ Includes coke made from imported metallurgical coal.

TABLE 2
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities 1/	Annual capacity
Aluminum	Aluminio S.A. (Nacobre, 77.8%; Carso Group, 20%)	Smelter at Veracruz, Ver.	94.
Antimony	Cia. Minera y Refinadora Mexicana S.A. (private Mexican, 51%; Cookson Ltd., 49%)	San Jose Mine, Catorce, S.L.P.	365.
Barite	Barita de Sonora S.A. (Grupo Acerero del Norte S.A. de C.V., 100%)	Mazatan, Son.	264.
Do.	Minera Capela S.A. (Penoles, 100%)	La Minita Mine, Coalcoman, Mich.	150. 2/
Do.	Minerales y Arcillas S.A. de C.V. (private Mexican, 100%)	Galeana, N.L.	108.
Do.		Apodaca, N.L.	60.
Do.	Barita de Santa Rosa S.A. de C.V. (private Mexican, 100%)	Muzquiz, Coah.	256.
Cement	Cementos Mexicanos S.A. de C.V. (private Mexican, 100%)	Monterrey, N.L.; Torreon, Coah.; Huichiapam, Hgo.; Valles, S.L.P.	8,970 (Monterrey group).
Do.	Cementos Anahuac S.A. (Cementos Mexicanos, 100%)	Leon, Gto.; Merida, Yuc.; Tlanepantla, Mex.; Tamuin, S.L.P.	6,970 (Maya group).
Do.	Cementos Tolteca S.A. (Cementos Mexicanos, 100%)	Atotonilco, Hgo.; Zapotiltic, Jal.; Tula, Hgo.; Hornillos, Sin.; Hermosillo, Son	7,150 (Tolteca group).
Do.	Cementos Guadalajara S.A. (Cementos Mexicanos, 100%)	Ensenada, B.C.N.; Guadalajara, Jal.; Hermosillo, Son.; Hidalgo, N.L.	4,445 (Cegusa group).
Do.	Cementos Apasco S.A. de C.V. (Holderbank, 49%)	Apasco, Hgo.; Ramos Arizpe, Coah.; Macuspana, Tab.; Caleras, Col.; Orizaba, Ver.; Acapulco, Gro.	9,500.
Do.	Sociedad Cooperativa La Cruz Azul (private Mexican, 100%)	Jasso, Hgo.; La Cruz Azul, Oax.	4,600.
Do.	Cementos de Chihuahua S.A. de C.V. (private Mexicanos, 100%)	Chihuahua and Ciudad Juarez, Chih.	1,160.
Coal	Minerales de Monclova S.A. (Altos Hornos de Mexico, S.A., 100%)	Mimosa, Palau mines, Muzquiz washing plant at Palau, Coah., and Coking plant at Monclova, Coah.	3,000.
Do.	Carbonifera de San Patricio S.A. de C.V. (private Mexicanos, 100%)	Progreso, Coah.	1,314.
Do.	Industrial Minera Mexico S.A. de C.V. C.V. 3/ (Grupo Mexico, 74%; Asarco Inc. of U.S. and others, 26%)	Nueva Rosita, Coah.	1,500.
Do.	Minera Carbonifera Rio Escondido S.A. (MICARE) (Grupo Acerero del Norte, 51%; Mission Energy, 49%)	Mina I, Mina II, and Tajo I at Nava and Piedras Negras, Coah.	4,000.
Copper	Mexicana de Cobre S.A. de C.V. (Mexico Desarrollo Industrial Minero S.A. de C.V., 96.4%) 3/	La Caridad mine and smelter at Nacozari de Garcia, Son.	180 smelter, 16 leaching.
Do.	Mexicana de Cananea S.A. (Mexicana de Cobre, S.A., 76.1%; ACEC Union Miniere, S.A. of Belgium, 21.2%; workers union, 2.7%)	Mine and smelter at Cananea, Son.	170 smelter, 20 leaching.
Do.	Minera Maria S.A. de C.V. (Empresas Frisco, S.A. de C.V., 51%; Cominco Resources International, 49%)	Cananea District, Son.	18.
Ferroalloys	Cia. Minera Autlan S.A. (Grupo Ferrominero, 54%; Minas de Basis S.A. de C.V., 32%; Broken Hill Property Co. Ltd. of Australia, 14%)	Plant in Tamos, Ver. Plant in Teziutlan, Pue.	140. 38.
Fluorspar	Cia. Minera Las Cuevas S.A. de C.V. (Grupo Industrial Camesa S.A. de C.V.) 4/	Salitera (Zaragoza), S.L.P.	520.
Do.	Fluorita de Mexico S.A. (private Mexican, 51%; AIMCOR, 49%)	Mines at La Encantada district and plant at Muzquiz, Coah.	500.
Gold	kilograms Cia. Fresnillo S.A. (Industrias Penoles S.A. de C.V., 60%; AMAX, 40%)	Fresnillo Mine, Zac.	1,866.
Do.	do. Minas de San Luis S.A. (Industrias Luismin, 100%)	Tayoltita, Dgo.	1,400.
Do.	do. Cia. Minera de Santa Gertrudis (Grupo Ariztegui, 51%; Phelps Dodge, 49%)	Santa Gertrudis Mine, Son.	1,600.
Do.	kilograms Exploraciones El Dorado S.A. de C.V. (70%), Minerales Sotula (70%)	La Colorada Mine, Son.	800.
Do.	do. Minera Hecla (Hecla Mining Co. of U.S., 100%)	La Choya Mine, Son.	2,000.
Do.	do. Walhalla Mining Co. NL (private foreign, 100%)	Amelia Mine, Son.	1,300.

See footnotes at end of table.

TABLE 2--Continued
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities 1/	Annual capacity
Gold--Continued	kilograms	Cia. Minera las Torres S.A. de C.V. (100% Industrias Penoles)	Guanajuato, Gto.	730.
Do.	do.	Cia. Minera El Cubo S.A. de C.V. (private Mexican, 100%)	do.	128.
Do.	do.	Sociedad Cooperativa Minero Metalurgica Santa Fe de Guanajuato (private Mexican, 100%)	do.	438.
Graphite		Grafitos Mexicanos S.A. (Cummings Moore Graphite Co. of U.S., 25%; private Mexican, 75%)	Lourdes and San Francisco Mines, Son.	60.
Gypsum		Cia. Occidental Mexicana S.A. (private Canada, 49%)	Santa Rosalia on San Marcos Island, B.C.S.	2,500.
Iron ore		Consortio Minero Benito Juarez Pena Colorado S.A. de C.V. (Grupo Acerero del Norte, 29%; Caribbean ISPAT, 29%; Hylsa de Mexico S.A., 42%)	Pena Colorada Mine and pellet plant near Manzanillo, Col.	3,000.
Do.		Siderurgica Lazaro Cardenas-Las Truchas, S.A. (SICARTSA) (Grupo Villacero, 80%; Government, 20%)	Ferrotepec, Volcan, and Mango deposits in Las Truchas project area and pellet plant, Mich.	1,900.
Lead and zinc		Mexico Desarrollo Industrial Minero S.A. (Grupo Mexico, 74%; Asarco Inc. of U.S. and others, 26%)	Charcas, S.L.P.; San Martin, 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 Penoles S.A. de C.V. (private Mexican, 97%; private U.S., 3%)	Mines at La Encantada, Coah.; Fresnillo, Zac.; Naica, Chih.; Bismark, Son. Rey de Plata, Gro. (Penoles, 60%; Outokump, 40%); Metallurgical complex at Torreon, Coah., with silver, lead, and zinc smelter and/or refineries operated by Met-MexPenoles (Penoles, 100%)	50 (lead), 60 (zinc).
Do.		Minera San Francisco del Oro S.A. de C.V. (Empresas Frisco, S.A. de C.V., 100%)	San Francisco del Oro, near Hidalgo del Parral, Chih.	15 (lead), 21 (zinc).
Do.		Minera Real de Angeles S.A. de C.V. (Empresas Frisco, S.A. de C.V., 100%)	Noria de Angeles, Zac.	45 (lead), 47 (zinc).
Manganese		Cia. Minera Autllan S.A. (Grupo Ferrominero, 54%; Minas de Basis, S.A. de C.V., 32%; Broken Hill Property Co. Ltd. of Australia, 14%)	Molango Mine, Hgo. Nonoalco Mine, Hgo. Gomez Palacio, Hgo.	460. 26. 35.
Molybdenum		Mexicana de Cobre S.A. (Mexico Desarrollo Industrial Minero S.A. de C.V., 96.4%)	La Caridad Mine, Molybdenum plant, Son.	6.
Petroleum	thousand 42-gallon barrels per day	Petroleos Mexicanos (PEMEX) (Government, 100%)	Comalcalco, Poza Rica, Ver., and Gulf of Campeche, Cam. districts	3,500. 5/
Salt		Exportadora de Sal S.A. (ESSA) (Fideicomiso de Fomento Minero, 51%; Mitsubishi Corp., 49%)	Solar salt complex at Guerrero Negro, B.C.S.	6,000.
Silver	kilograms	Industrias Penoles S.A. de C.V. (private Mexican, 97%; private U.S., 3%) 6/	Naica, Chih.; Fresnillo, Zac.; Las Torres, Gto.; Cuale, Jal.; La Negra, Qro.; La Encantada, Coah.; La Minita, Mich.	654,000.
Do.	do.	Mexico Desarrollo Industrial Minero S.A. (Grupo Mexico, 74%; Asarco Inc. of U.S. and others, 26%)	San Martin Mine, Sombretete, Zac.; Taxco, Gro.; Charcas, S.L.P.; Santa Eulalia, Chih.; Refinery at Monterrey, N.L.	467,000.
Do.	do.	Minera Real de Angeles S.A. de C.V. (Empresas Frisco S.A. de C.V., 100%)	Open pit mine and concentrator at Noria de Angeles, Zac.	924,000.
Sodium carbonate		Sosa Texcoco S.A. (private Mexican, 100%)	Lake Texcoco, Mex., from subsurface brines	200.
Sodium sulfate		Quimica Magna, S.A. de C.V. (Industria Penoles S.A. de C.V., 100%)	Subsurface brines at Laguna del Rey, Coah.	350.
Steel		Altos Hornos de Mexico S.A. (AHMSA), Grupo Acerero de Norte (GAN)	Steelworks at Monclova, Coah. (Iron ore from Pena Colorada Mine in Col.)	3,900.
Do.		Hylsa de Mexico S.A. (Grupo Industrial ALFA, 100%)	Direct-reduction units at Monterrey, N.L., and Puebla, Pue., (Iron ore from Cerro Nahuatl Mine in Col.)	1,800.

See footnotes at end of table.

TABLE 2--Continued
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1996

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities 1/	Annual capacity
Steel--Continued	Siderurgica Lazaro Cardenas-Las Truchas S.A. S.A. (SICARTSA) (Grupo Villacero, 80%; Government, 20%)	Port of Lazaro Cardenas, Mich.	1,300.
Do.	Siderurgica del Balsas S.A. (SIBALSA) (Caribbean ISPAT, 100%)	SICARTSA II Plant Facilities at Lazaro Cardenas, Mich., plus 29% share in the Pena Colorada Mine, Col.	2,000 (steel), 1,500 (steel plate).
Strontium (celestite)	Cia. Minera La Valenciana (private Mexican, 100%)	San Agustin Mine in Coah.	50.
Sulfur	Petroleos Mexicanos (PEMEX)	Nationwide petroleum operations	890,000.
	Azufretera Panamericana S.A. (APSA) (Fideicomiso de Fomento Minero, 96%; private, 4%)	Coachapa, Patapa, Jaltipan, Ver.	1,230. 7/
Do.	Cia. Exploradora del Istmo S.A. (Government, 64%; Texasgulf, Inc., 34%; private, 2%)	Texistepec, Ver.	750. 7/
Tin 8/	Metales Potosi S.A. (private Mexican, 100%)	San Luis Potosi, S.L.P.	6.4.
Do.	Estano Electro S.A. (private Mexican, 100%)	Tlalnepantla, Mexico, D.F.	1.3.
Do.	Fundidora de Estano S.A. (private Mexican, 100%)	San Luis Potosi, S.L.P.	1.2.

1/ State abbreviations: Baja California Norte (B.C.N.), Baja California Sur (B.C.S.), Campeche (Cam.), Chiapas (Chia.), Chihuahua (Chih.), Coahuila (Coah.), Colima (Col.), Distrito Federal (D.F.), Durango (Dgo.), Guanajuato (Gto.), Guerrero (Gro.), Hidalgo (Hgo.), Jalisco (Jal.), Mexico (Mex.), Michoacan Mich.), Nuevo Leon (N.L.) Oaxaca (Oax.), Puebla (Pue.), Queretaro (Qro.), San Luis Potosi (S.L.P.), Sinaloa (Sin.), Sonora (Son.), Tabasco (Tab.), Veracruz (Ver.), Yucatan (Yuc.), and Zacatecas (Zac.).

2/ Operation was shut down in 1989.

3/ In Aug. 1994, Grupo Industrial Minera Mexico S.A. de C.V. and its subsidiary Mexico Desarrollo Industrial Minero S.A. de C.V. were reorganized to form Grupo Mexico S.A. de C.V.

4/ Grupo Industrial Camesa S.A. de C.V. is owned by private Mexican (51%) and Noranda Inc. of Canada (49%).

5/ PEMEX operates nine refineries with an installed capacity of 1.68 million barrels per day.

6/ Includes capacity from Cia. Fresnillo S.A. de C.V.

7/ Operation was shut down in 1993.

8/ Smelter output from mostly imported concentrates.

TABLE 3
MEXICO: RESERVES OF SELECTED MINERAL
COMMODITIES FOR 1996

(Thousand metric tons unless otherwise specified)

Commodity 1/	Reserves
Antimony	180
Barite	7,000
Bismuth	metric tons 10,000
Cadmium	do. 35,000
Copper	14,000
Fluorspar 2/	19,000
Gold	metric tons 450
Gas, natural 3/	billion cubic meters 10,160
Graphite, natural	3,100
Iron ore	million metric tons 690
Lead	1,000
Manganese	4,000
Mercury	metric tons 5,000
Molybdenum	do. 90
Petroleum, crude 3/	million 42-gallon barrels 48,475
Selenium	metric tons 4,000
Silver	do. 37,000
Sodium carbonate, natural	200,000
Sodium sulfate, natural	170,000
Sulfur 4/	75,000
Zinc	6,000

1/ All metals expressed in metal content.

2/ Measured as 100% calcium fluoride.

3/ Yearend 1996. Source: Petroleos Mexicanos 1997.

4/ Sulfur in all forms.