MEXICO

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In 1994, Mexico, one of the world's leading mineral producers, ranked first in the production of celestite (strontium mineral) and silver, and second in sodium sulfate. It was among the world's top five producers of antimony, white arsenic, bismuth, fluorspar, and graphite. Mexico was among the top 10 producers of barite, cadmium, cement, copper, diatomite, feldspar, gypsum, lead, lime, nitrogen in ammonia, sulfur, and zinc. In the Western Hemisphere, only Brazil and Mexico produced manganese in significant quantities.²

According to the Mexican Mining Chamber, the mining industry invested \$1.17 billion during the 1992-94 period.³ The Chamber forecast that the mining industry will invest \$5 billion during the 1995-2000 period.

During 1993-94, a number of important Mexican mines closed, others reopened, and several new projects began operating. Minera Santa Maria de la Paz mined only copper minerals while seeking investors and/or partners. Santa Maria de la Paz formerly produced gold, silver, lead, and zinc in addition to copper. Investment reached the \$6 million mark at Tepmin's subterranean gold mine in San Antonio, Baja California Sur.

Other new projects in 1993-94 included Minera Bismark, a zinc-silver mine in Chihuahua. Peñoles increased its participation in this project to 90% by acquiring 40% of the shares of the U.S.-based Cyprus Minerals Company for \$61 million. Peñoles invested \$70 million in La Cienega, a gold and silver mine in Durango, which started operations in 1995. Tizapa, a \$38 million silver, lead, and zinc mine in the State of México, opened in May 1994. Rey de Plata, a lead and zinc project in Guerrero, was under consideration by Peñoles. Concheno, a \$12 million underground gold, silver, and zinc project in Chihuahua, was another promising project. Grupo Frisco was studying Santa Fe, a gold and silver prospect in Chiapas, and was also evaluating San Felipe, a \$20 million gold project in Baja California Norte.

Grupo Sanluis invested \$3 million in two gold projects, one at San Martin in Querétaro and the other at Promontorio, in Durango. San Martin started operating at yearend 1994 and was responsible for the 30% gold production increase of Grupo Sanluis. La Choya, a \$2 million heap leaching operation in Sonora, owned by Hecla Mining Co. of the United States, began production in 1994. The \$2 million La Colorada gold project, near Hermosillo, Sonora, owned by the Exploraciones Eldorado S.A. de C.V. of Vancouver, Canada, also began operations in 1994. In Chihuahua, work continued on Moris, a \$17 million gold project.

In the State of México, Sanluis invested \$45 million to reopen El Oro, an old gold and silver mine that had been flooded. Sanluis also invested \$5 million for the exploration of the Metates project in Durango, a low-grade gold project with 500 million tons (Mmt) of ore reserves. Grupo Frisco invested \$30 million in Mariquita, a high-grade copper project in Sonora. Grupo Acerero del Norte reopened Cerro del Mercado, an old iron mine in Durango, which required a \$15 million investment. Echo Bay of Canada spent \$10 million exploring extensively in El Triunfo, San Antonio, and Baja California Sur.

The total investment in these projects was about \$325 million. Additionally, more than 20 new prospects, mainly gold and copper, were being explored intensively by Mexican and foreign mining enterprises.

In 1994, Mexico was in sixth place as a producer of crude oil in the world and ranked eighth in terms of oil reserves. Average production of crude oil amounted to about 2.7 million barrels per day (Mbbl/d) in 1994, almost the same as in 1993. In the Western Hemisphere, only the United States produced more oil than Mexico. Venezuela, the second leading producer of crude oil in Latin America, produced slightly less than 90% of Mexico's production. During 1993, Mexico exported 1.338 Mbbl/d of crude oil to 23 countries. In 1994, this figure dropped slightly to 1.307 Mbbl/d.

In 1994, Petroleos Mexicanos (PEMEX), the national oil company, exported 961,000 barrels per day (bbl/d) of crude oil to the United States, about 75% of its total crude oil exports. Spain was the second largest market, receiving 154,000 bbl/d, about 12% of PEMEX's crude oil exports. Japan, which used to import about 150,000 bbl/d of crude oil, imported only 81,000 bbl/d, about 6% of PEMEX crude oil exports. In 1994, the petroleum industry supplied about 28% of Mexico's export earnings, down from almost 80% of the value of total exports in 1982. In 1994, the value of crude oil, product, and petrochemical exports was \$7.52 billion, while hydrocarbon imports, mainly gasolines and natural gas, were valued at \$1.45 billion.

The historic North American Free Trade Agreement (NAFTA) was implemented on January 1, 1994. The 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 México.

Mexico has expanded trade with its Latin American neighbors through other free trade agreements, including an agreement with Colombia and Venezuela in June 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.

Mexico's gross domestic product (GDP) was estimated at \$373 billion in current prices, up from \$364.5 billion in 1993. Real GDP growth was 2.4% in 1994, compared with 0.9% in 1993. On December 20, 1994, the peso was devalued and Mexico began a turbulent economic period. The outlook for 1995 was for a drop in GDP of 2% to 4%. The peso devaluation has favored many mining companies since most of their costs were in pesos, while sales prices were set by international markets in dollars.

Government Policies and Programs

The Government privatization efforts, which began in the last part of the Miguel de la Madrid presidential term (1982-88), and continued into President Carlos Salinas' term (1988-94), have placed almost all former State-owned mines in private hands. In October 1992, the Government of Mexico sold Minera Carbonifera Rio Escondido (MICARE), the northern Mexican coal producer, for \$30 million plus the assumption of a \$100 million debt. The company was purchased by a joint venture comprised of Grupo Acerero del Norte (51%) and Mission Energy of the U.S. (49%). Minera Autlan, the manganese producer, was sold in July 1993 for \$23 million to Grupo Ferrominero, a new mining group made up of Servicios Financieros S.A. de C.V., Grupo Minero Basis, S.A. de C.V., and Regiomet. Other mining properties sold by the Government included Roca Fosforica, and the sulfur operations Azufrera Panamericana, S.A. (APSA) and Compania Exploradora del Istmo (CEDI). CEDI was owned 66% by APSA and 34% by Texasgulf. The only remaining Government mining equity was a 49% share of Exportadora de Sal.

Under the 1917 Mexican Constitution, minerals were considered to be part of the national patrimony. The Government awarded concessions for the exploration and exploitation of nonfuel minerals. In most cases, foreign participation in the nonfuel mineral sector was limited to 49% ownership. The 1961 Mining Law imposed a requirement for a majority Mexican participation, both in equity and management of mining companies. The 1961 law granted a 25-year grace period for Mexicanization of the industry, but most companies in the mining industry were Mexicanized within 10 years. The 1975 Mining Law gave the Government even more control over mining activities. The law limited foreign participation to 34% in concessions on national reserves and for the exploitation of oil and

gas, phosphate rock, potassium, sulfur, and uranium was reserved for the Government. In 1990, a new regulation issued by Secretaria de Energia, Minas e Industria Paraestatal (SEMIP) allowed more flexibility in foreign ownership through exploration and production trusts under the 1975 mining law.

Regulations of the new Mining Law, which became effective in September 1992, as well as the "Manual de Servicios al Publico en Materia Minera," were published on March 25, 1993 in the official gazette. The new Mining Law allowed the private sector to play a much larger role in the mining industry after 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 allowed direct investment, with up to 100% ownership of the capital stock, in exploration works and activities. It also allowed, through a 30-year trust mechanism, up to 100% foreign participation in mining works and activities. The new Mining Law provided greater legal security for holders of exploration and exploitation concessions. The law allowed private-sector participation in the exploitation of mineral deposits previously considered as priority and strategic within the domain of Government ownership, such as coal, iron, phosphorus, potassium, and sulfur. The law extended the term of exploitation concessions from 25 to 50 years. renewable for a similar period, while 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. The only limiting factor of these concessions was that they were nontransferable.

The substances not covered by the 1992 Mining Law included the following:

• Petroleum and solid, liquid, or gaseous hydro-carbons.

• 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 of the land.

• Rocks or the products of their decomposition that could only be utilized for the fabrication of materials for construction or ore destined for such purposes.

• Products derived from the decomposition 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, submit the relevant reports, and comply with the general regulations and specific technical standards in the area of environmental control.

The 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 the 1992 Mining Law, combined with the reduction of corporate income tax to 35% in 1989 and the elimination of the mineral production tax in 1991, have led to an increase in new mining projects. The number of mining claims issued has doubled from 2,000 annually 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

The protection of the environment was a priority for the Government of Mexico. The LGEEPA (General Law of Ecological Balance and Environmental Protection), passed in 1992, was a key element of Mexican environmental legislation. In December 1994, the Ministry of Social Development (SEDESOL) transferred its environmental responsibilities to the new Environmental, Natural Resources and Fisheries Ministry (SEMARNAP). The Ministry of Agriculture and Water Resources (SARH) also had important responsibilities for the protection and preservation of the environment in Mexico. Other ministries and agencies with more limited environmental jurisdictions included: Secretaria de Salubridad y Asistencia (Health and Human Services), Secretaria de Comunicaciones y Transportes (Communications and Transportation), and Secretaria de Turismo (Tourism).

To conform with environmental protection, a number of permits and authorizations was required for mining and exploration-related activities in accordance with LGEEPA. Permits required by mining and plant operations included water discharge, operating, land use, explosives, water well usage, and hazardous materials handling. In addition, there were regulations concerning noise, gas and dust emissions, dumps and tailings, oil and fuel storage, and electrical transformers.

Water discharge regulations were covered under the "National Water Law" of December 1, 1992, and the "Federal Law Concerning Water Rights" (LFDMA) of January 1992. According to Article 224 of the LFDMA, water pumped from mining works was not subject to discharge fees, as long as it was not used in the "exploitation and/or metallurgical treatment of ore" or for other industrial or domestic use. Discharge fees were required for water containing more than 2,500 milligrams per liter of total dissolved solids, unless the discharged water met the minimum quality standards set by the Consejo Nacional de Agua (CONAGUA). Water discharged to runoffs or water basins was also exempted from payments of discharge fee if it met CONAGUA water quality standards. All other water discharges required a payment, according to schedules defined by LFDMA.

According to LGEEPA, infractions of the regulations would be sanctioned with one or more of the following penalties: a fine of at least 115 pesos up to 5,000 pesos; temporary or permanent, partial or total closure of the plant; and 36-hour imprisonment of company officials.

Production

The total value of all minerals produced, including petroleum, nonfuel minerals, and cement, in 1994 was estimated at about \$40 billion. The value of Mexican nonfuel mineral output plus coal (mining and metallurgical sectors) increased more than 14% to \$2.85 billion from the 1993 value. Individually, copper was the most important metal in terms of value (\$748 million), followed by silver (\$395 million) and zinc (\$390 million). Gray portland cement was the most valuable nonfuel mineral product in Mexico with a value of \$3.78 billion in 1994, up from \$3.41 billion in 1993. In the industrial mineral sector (excluding cement), gravel was the most important in terms of value, at \$489 million, followed by sand (\$487 million), gypsum (\$192 million), limestone (\$161 million), and marble (\$122 million).

In general, the production of antimony, bismuth, celestite, coal, coke, gold, feldspar, fluorspar, gypsum, and molybdenum increased in 1994, compared with that in 1993, while production of barite, cadmium, graphite, and manganese declined. Production of selenium and tungsten was suspended in 1993.

Output from the large mining sector, represented by Grupo Mexico, S.A. de C.V. (formerly Industrial Minera Mexico, S.A. de C.V.); Corporacion Industrial Sanluis, S.A. de C.V.; Empresas Frisco, Industrias Peñoles, S.A. de C.V.; and the Grupo Acerero del Norte, S.A. de C.V. (GAN), dominated mining production. GAN owned Real del Monte y Pachuca, Minera el Baztan, Magistral del Oro, Barita de Sonora, Minera del Norte, Cerro del Mercado, MICARE, Minerales Monclova, and two other corporations related to energy and chemicals. In 1991, GAN purchased Altos Hornos de Mexico from the Mexican Government. In 1992, GAN purchased 51% of MICARE. Grupo ICA, the large construction company, had a joint venture in concrete aggregates. The cement industry was dominated by Cemex, Apasco, and Cruz Azul. (*See table 1.*)

Trade

In 1994, total Mexican exports amounted to an estimated \$58.3 billion, up from \$51.9 billion in 1993. Total imports were \$76.6 billion, up from \$65.4 billion in 1993. In 1993, mineral exports, including coal and coke, valued at \$1.24 billion, contributed about 2.4% to export revenues. Approximately 67% of Mexico's mineral exports went to the United States, while more than 60% of its mineral imports were from the United States. In metals, Mexico was a major

exporter of copper, lead, manganese, silver, and zinc. In industrial minerals, it was a major exporter of cement, fluorspar, graphite, gypsum, salt, sodium, sulfate, and sulfur.

Structure of the Mineral Industry

The Government's participation in the minerals sector continued to change in 1994 as more State-owned entities were privatized. In late 1994, a reorganization of SEMIP moved the Direcion de Minas, Comision de Fomento Minero (CFM), Consejo de Recursos Minerales (CRM), and Fideicomiso de Fomento Minero (FFM) to the Secretariat of Commerce and Industrial Development (SECOFI). PEMEX and the Comision Federal de Electricidad (CFE) remained part of SEMIP.

The Direccion de Minas had control over mineral concessions and the mineral register, as well as responsibility for updating and revising the mining law and its regulations. CFM was founded in 1934 with the objective of promoting mining activity through financial support, technical advice, and assistance to the medium- and small-mining sector. It was also responsible for constructing and operating regional mineral beneficiation plants and minerals research facilities. CRM, formed in 1975, was given the responsibility for mineral exploration and statistics. Under the 1992 Mining Law, CRM was also given the ability to provide technical assistance, such as reserve verification, in order to promote the small- and medium-size mining sector. FFM's functions had been to promote the development, mining, and processing of the industrial minerals sector. In 1990, the managements of CFM and FFM were merged with certain operations, such as research laboratories, and assigned to CRM.

Other organizations helped shape the Mexican mining industry. One of them, Cámara Minera de México (CAMIMEX) promoted the interest of the mining community and dialogue between the Government and the private industry. Sindicato Nacional de Trabajadores Mineros, Metalurgicos y Similares de la Republica Mexicana, was the main union representing the mineral industry workers. The cement industry union was controlled by the Confederacion de Trabajadores de México (CTM), the largest Mexican labor union. In 1994, direct employment in the mining sector was 175,000 workers, compared to 165,000 in 1993.

In the private sector, five large and diversified companies dominated the production of nonfuel minerals. These were Corporación Industrial Sanluís S.A. de C.V. (Sanluís); Empresas Frisco S.A. de C.V. (Frisco); Industrias Peñoles S.A. de C.V. (Peñoles); Grupo México, S.A. de C.V.; and the Autrey-Ancira Group. The latter, which owned or controlled Real del Monte y Pachuca, Bastan del Cobre, Barita de Sonora, Altos Hornos, and MICARE, has recently joined the other four companies as a significant producer. Grupo México was formed in August 1994 as a result of reorganization of Grupo Industrial Minera México S.A. de C.V. (IMMSA) and its subsidiary México Desarollo Industrial Minero, S.A. de C.V. The other significant change in the industry has been the influx of more than 100 North American exploration companies in Mexico, most of which have set up offices in Hermosillo, Sonora.

The production of crude oil, natural gas, and basic petrochemicals was reserved for the Government through PEMEX, the State government-owned monopoly. PEMEX's activities were regulated by the Regulatory Law to Article 27 of the Mexican Constitution (the "Regulatory Law"), which became effective July 17, 1992. Under the Organic Law and related Regulations, PEMEX was entrusted with the central planning and the strategic management of the Mexican petroleum industry. The Organic Law reorganized the operating functions of PEMEX into four subsidiaries:

• Exploración y Producción—charged with the exploration and exploitation of oil and natural gas.

• Refinación—controlled the industrial refining processes, the manufacture of petroleum products, and basic petroleum derivatives and the distribution systems.

• Gas y Petroquímica Básica—managed processing of natural gas and natural gas liquids, and the production of basic petrochemicals.

• Petroquímica—controlled production of secondary and tertiary petrochemicals.

Each PEMEX subsidiary was in charge of its own budget and planning and was responsible for the transport, storage, and sales of its products. Each subsidiary managed its own personnel, operations, investments, and property and was held accountable for its actions and performance. Private investment was not allowed in exploration, exploitation, and refining, but was allowed in secondary and tertiary petrochemical operations. In 1995, the implementing regulation of Article 27 was changed to allow private sector participation in natural gas transmission, distribution, and storage.

At yearend 1994, PEMEX had approximately 105,000 employees (including temporary employees), most of whom were represented by the Petroleum Workers Union. This figure was down from 215,000 in 1989 and reflected the various measures undertaken by PEMEX to reduce its costs and improve its efficiency.

In February 1993, PEMEX approved the formation of an affiliate, "PEMEX Medical Services, S.A. de C.V.," for medical services for PEMEX employees, that had been managed in the former administrative subdirectorate. PEMEX Medical Services owned 21 hospitals, 9 clinics, 161 medical offices, and 562 beds, and had 12,370 employees. It was also expected to provide services to the private sector for a fee. (*See table 2.*)

Commodity Review

Metals

Copper.—Mine production decreased 2% from about 301,000 metric tons (mt) in 1993 to 295,000 mt. Mexicana de Cobre was the leading producer with 50% of national output from its La Caridad Mine, followed by Mexicana de Cananea, with about 30%. In 1994, 86% of the copper was produced in Sonora, where the three largest mines, La Caridad, Cananea, and Maria, were located. Other important copper-producing States were, in descending order of output, Zacatecas, Chihuahua, San Luis Potosi, Durango, and Michoacan.

Smelter output decreased 2.6% from 282,000 mt in 1993 to 275,000 mt in 1994. Mexicana de Cobre accounted for 67% of Mexican smelter production in 1994.

Mexico's production of 123,000 mt of refined copper in 1994 was 18% more than that of 1993. The Cobre de México refinery accounted for more than 60% of refined copper production, followed by Cobre de Pasteje refinery and Mexicana de Cananea. Much of the anode and blister copper produced by Cananea and La Caridad was transported to Mexico City, where it was refined in Cobre de México's electrolytic refinery. In response to the environmental problems of Mexico City, the refinery has transferred some of its production to its new facility in Celaya, Guanajuato.

The newest copper producer in Mexico was Minera Maria, a joint venture between Empresas Frisco (51%) and Cominco Resources of Canada (49%). The underground Maria Mine started up in late 1990 and achieved full production in 1991. The mine produced a total of 210,000 mt of ore with an average grade of 9% copper during 1992. The 1,000-metric-ton-per-day (mt/d) concentrator came on-stream in November 1991. Total copper production of the Maria Mine amounted to 16,600 mt in 1993 and 15,100 mt in 1994.

According to Grupo Mexico, copper reserves were as follows: La Caridad had 480 Mmt of ore with an average grade of 0.53% copper and 0.03% molybdenum for the flotation plant, and 173 Mmt of semioxidized or low-grade ore averaging 0.25% copper for solvent extraction and electrowinning (SX-EW). Cananea had 1,194 Mmt of ore with an average grade of 0.61% copper plus 570 Mmt of semioxidized or low-grade ore averaging 0.27% copper. The El Arco project, in Baja California Norte, had 600 Mmt with an average grade of 0.60% of copper.

Gold.—In 1993-94, a highlight of Mexican mining was the increased interest by both national and foreign mining companies in the exploration of gold in Sonora, Baja California, Chihuahua, Durango, and Sinaloa. Many of the foreign companies seeking gold have established investment trusts that allowed 100% foreign ownership of their exploration efforts in Mexico.

Mine production of gold increased from 9,770 kilograms

(kg) in 1993 to 13,900 kg in 1994. All gold mines produced silver as their primary product. Sonora was the leading gold producing State, contributing about 30% of the national production. Durango followed with 22% and Guanajuato had 19%. Gold production in the Cucurpe municipality of Sonora, which included the Santa Gertrudis Mine, owned 49% by U.S.-based Phelps Dodge, increased in 1994 to more than 1,300 kg.

At yearend 1993, Minera Hecla's La Choya operation in northwestern Sonora began production. The La Colorada property, held by Eldorado Corp. Ltd., began recovering gold in early 1994. Other promising projects included the Empresa Minera Can Mex's property at Mulatos, Sonora (owned by Placer Dome of Canada), and Cambior's Metates project in Durango. Sanluis started operations at the San Martin project in Queretaro in the last quarter of 1993. Production in 1994 was 429 kg of gold. The Promontorio Project of Sanluis, in the San Dimas District of Durango, involved development of rich veins in the southeast part of the district near the Tayoltita area.

Iron and Steel.—In 1994, production of pig iron increased to 3,500 Mmt from 3,420 Mmt in 1993. Direct-reduced iron (sponge iron) production increased 18% to 3,220 Mmt. In 1994, crude steel production was 10,250 Mmt, compared with 9,190 Mmt in 1993. Mexico was the second largest steelmaker in Latin America after Brazil, producing about 22% of the Latin American output.

The largest steel producer in 1994 was Altos Hornos de México S.A. (AHMSA), with 2.49 Mmt, followed by Hylsa de México S.A. (HYLSA) in Monterrey, 2.18 Mmt; IMEXA, previously known as SICARTSA II, 1.76 Mmt; and Siderurgica Lazaro Cardenas-Las Truchas S.A. (SICARTSA), 1.35 Mmt. 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 427,000 mt. TAMSA's most important domestic client was PEMEX.

During 1994, 62.5% of crude steel was produced by electric furnace, while 37.5% was produced by basic oxygen furnace. The open hearth process was no longer used in Mexico.

In 1994, Mexico exported about 2.53 Mmt of semifinished and finished steel products worth \$831 million, while it imported 3.35 Mmt of semifinished and finished products worth \$2.86 billion. Exports of semifinished and finished products in 1993 were 2.11 Mmt valued at \$866 million, while imports of semifinished and finished products in 1993 were 1.76 Mmt valued at \$1.61 billion.

The steel industry planned to invest a total of \$1.7 billion in the next few years as follows: AHMSA, \$400 million; Villacero, \$250 million; Ispat, \$250 million; HYLSA, \$200 million; IMMSA, \$110 million; and the other companies, \$490 million. Lead and Zinc.—Mexico was the sixth largest producer in the world of lead and zinc. In 1994, Mexico produced about 6% of the world's output of lead and 4.5% of world's output of zinc. Most of the production of lead and zinc was associated with the production of silver. The leading producers of lead and zinc were Grupo México (formerly IMMSA), Frisco, and Peñoles. The six leading lead and zinc producing States were Chihuahua, Zacatecas, San Luis Potosi, Hidalgo, Durango, and Guerrero.

The largest individual lead producer in 1994 was Compania Fresnillo in Naica, Chihuahua, which produced 34,500 mt of lead, followed by Real de Angeles in Zacatecas, which produced 29,600 mt. Frisco's other major producer, the San Francisco del Oro Mine, near Hidalgo del Parral in Chihuahua, produced 14,900 mt of lead.

The zinc-silver-lead Tizapa project in the State of México, a joint venture between Peñoles and Dowa Mining Co., began production in mid-1994 at an initial rate of 700 mt/d of ore. Tizapa was a massive sulfide deposit with an estimated 4 Mmt of ore with approximately 8% zinc, 2% lead, and 250 grams per metric ton (g/mt) of silver. Metallurgical results so far have been disappointing due to the presence of graphite and iron minerals in the ore and low recovery rates in processing.

Mexico's largest new mining project, the Bismark Mine, was a zinc mine that commenced production in mid-1992. Bismark, the country's largest individual zinc producer, near the U.S. border in Ascension, Chihuahua, produced 20,000 mt of zinc in 1992, 43,000 mt of zinc in 1993, and 37,400 mt in 1994. The flotation plant achieved its capacity level of 2,500 mt/d in 1994. Bismark reported reserves of approximately 8.8 Mmt of ore averaging 8.5% zinc and 69 g/mt silver. Minera Bismark S.A. de C.V. was originally a joint venture between Peñoles (40%), Cyprus Minerals (40%), and Promociones Industriales Banamex (20%). Peñoles has since bought out Cyprus and controlled 80% of the shares. The second zinc producer was Santa Barbara in Chihuahua, which produced 36,800 mt, followed by Noria de Angeles, which produced 32,800 mt. San Francisco del Oro and Naica, both in Chihuahua, produced 30,100 and 23,500 mt, respectively.

Silver.—Mexico was the world's leading producer of silver in 1994, with about 16% of world production. In 1994, the production of silver amounted to about 2,210,000 kg, up from 2,110,000 kg in 1993. Almost 90% of Mexico's silver production came from six States: Zacatecas, Durango, Chihuahua, Guanajuato, Sonora, and Hidalgo. The leading producers in 1993, the last year for which data were available, were Peñoles, 796,000 kg; Frisco, 214,500 kg, of which 167,500 kg was from Real de Angeles Mine; and Grupo México, 438,000 kg. In addition, byproduct silver from Mexicana de Cobre amounted to 75,800 kg of silver, and silver from Mexicana de Cananea was 12,500 kg. The Fresnillo Mine in Fresnillo, Zacatecas, a joint venture

between Peñoles (60%) and AMAX (40%), produced about 452,000 kg (14.5 million troy ounces) of silver in 1993, but lost first place as the world's largest individual silver producer to La Coipa gold-silver mine in Chile, which produced more than 500,000 kg (16.1 million troy ounces) in 1993.

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

Industrial Minerals

Cement.—Mexican cement production increased 9% in 1994 to 29.7 Mmt. Sales of cement, both domestic and foreign, amounted to \$3.74 billion in 1994. The average cement price in the country was about \$126 per mt in 1994. Mexico was a large exporter of cement to the United States, even though in 1990 the U.S. Government placed a countervailing duty of about 50% on Mexican cement exports to the United States. In July 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 exported from Mexico to the U.S. were illegal according to the terms of the antidumping code of the GATT, and recommended the rebate of deposits paid to date. Since November 1992, the U.S. and Mexican Governments have engaged in negotiations seeking a settlement of the cement case.

In 1994, Cementos Mexicanos (CEMEX) was the leading producer of cement with about 75% of the national capacity of about 32 Mmt and 68% of domestic sales. With 18 plants and 28 distribution terminals, CEMEX dominated the Mexican cement industry, and was ranked as the fourth largest cement producer in the world. In 1992, CEMEX acquired the two most important cement companies in Spain, Valenciana de Cementos and La Auxiliar de la Construccion (Sanson). In 1994, CEMEX announced the acquisition of two cement plants in the United States, one from Lafarge Coppée of France and the other from Holderbank Financière Ltd. of Switzerland.

Other Mexican cement producers included Cementos Cruz Azul S.C.L., Cementos Apasco, S.A., and nine independent producers. Apasco, which was partially owned by Holderbank, was Mexico's second largest cement producer, with six plants, the newest one in Ramos Arizpe, Coahuila. Cementos Cruz Azul, a workers' cooperative with two plants, was Mexico's third largest cement producer. The Chihuahua group built a new plant in Zamlayuca, Chihuahua. Cementos Moctezuma was expanding its Cuernavaca plant in Morelos.

In 1993, the market shares for Mexico's domestic cement production by the five leading producers were as follows: CEMEX, 68.1%; Apasco, 17.5%; Cruz Azul, 10%; Cementos Chihuahua, 3.2%; and Cementos Moctezuma, 1.2%. CEMEX, Cruz Azul, and Apasco, as well as several small producers, announced expansion plans. As a result, industry analysts expected Mexican cement capacity to increase to 45 Mmt in 1995 and to exceed 48 Mmt in 1996. The industry was investing \$700 million for expansion, including CEMEX, \$300 million; Apasco, \$200 million; Cementos Chihuahua, \$100 million; and Cruz Azul, \$50 million.

Fluorspar.—Mexican production of fluorspar increased 16% from 283,000 mt in 1993 to 327,000 mt in 1994. Mexico exports between 60% to 75% of its fluorspar production, with the United States being the most important destination. Significant quantities of Mexican fluorspar were converted into hydrofluoric acid, most of which was also exported to the United States.

Mexico's most important fluorspar deposits were in the northern portion of Coahuila; in Zaragoza, San Luis Potosí; and in the Río Verde area in Guanajuato. Fluorspar also occurred in many lead-zinc-silver veins and was recovered as a byproduct of mining operations in the Hidalgo del Parral, Santa Bárbara, and the San Francisco del Oro region of Chihuahua. Mexico's largest fluorspar producer was Minera Las Cuevas near Zaragoza, San Luis Potosí. Installed capacity was 320,000 metric tons per year (mt/a) of acidgrade concentrates and 200,000 mt/a of metallurgical grades. Las Cuevas fluorspar has a relatively high arsenic content that limited the use of the material in hydrofluoric acid plants and, thus, export sales. The firm was proceeding with a 4year expansion program to reach a total capacity of 750,000 mt/a of fluorspar production. Minera Las Cuevas was 51% owned by Mexican nationals and 49% owned by Noranda Inc. of Canada.

Graphite.—Mexico ranked as the fourth largest producer of graphite in the world. Production dropped from 43,600 mt in 1993 to 30,900 mt in 1994, approximately 98% of which was amorphous graphite. The most important center for graphite production in Mexico was southeast of Hermosillo, Sonora, where amorphous graphite was mined from altered coal seams. Grafitera de Sonora and related companies were the largest producers. This group, an affiliate of Cummings Moore Graphite Co. of the United States, accounted for about 75% of the graphite production of Sonora. Other companies that produced amorphous graphite were Grafito Superior and Exploradora Sonorense de Grafito.

Grafito de México produced flake (crystalline) graphite at Telixtlahuaca, Oaxaca. This firm was sold by the Government in 1989 to Minerales no Metálicos Mexicanos, a mining company specializing in barite, bentonite, kaolin, and phosphate rock. The plant had an annual capacity to produce about 2,000 mt of flake graphite from 50,000 mt of ore. Mexico exported about one-half of its graphite production to the United States and supplied about 30% of the U.S. demand for imported graphite during 1989-92, the latest period for which data were available.

Gypsum.—Mexico was the third largest producer of gypsum in the Western Hemisphere, after the United States and Canada, and was the seventh largest producer in the world. Mexican production of gypsum was about 5.53 Mmt in 1994, up 3.5% from that of 1993. Most of the gypsum mined was used in the production of wallboard. Other uses ranged from the manufacture of plaster, cement additives to retard setting time, soil enhancers, glass additives, and as fillers in pharmaceuticals. The largest gypsum producer was Cia. Occidental Mexicana, S.A., a 49%-owned affiliate of Domtar Ltd. of Canada. This operation produced about 2.5 million metric tons per year (Mmt/a) 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 was 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 mt/a of processed gypsum from its mine and plant at La Borreguita, San Luis Potosí. Yeso Monterrey had a processing capacity of 150,000 mt/a at its mine and plant in Mina, Nuevo León. Yeso El Tigre's capacity was 80,000 mt/a from its facilities at Lagunillas de Rayón, Puebla. Yesera Nazas S.A. had a production capacity of 60,000 mt/a from its plants in Matamoros, Coahuila, and Gómez Palacio, Durango. In 1990, Minera Caopas started production of gypsum at Santa Rosalia, Baja California Sur. In addition to these producers, Mexican cement companies operated mines to meet their gypsum requirements, which amounted to approximately 6% of the country's cement production. Gypsum was produced in 16 of Mexico's 31 States during the year.

Sulfur.—Two companies with large Government equity participation, Azufrera Panamericana S.A. (APSA) and Compania Exploradora del Istmo S.A. (CEDI), produced 102,000 mt of Frasch sulfur in 1993 (until October when their plants were closed), a decrease of 86% from 1992 production of 710,000 mt. PEMEX produced 876,879 mt as a byproduct of petroleum and natural gas operations in 1994. Sulfuric acid plants at Mexican smelters produced 2.01 Mmt of sulfuric acid in 1994, with an estimated sulfur content of 656,000 mt.

APSA was controlled by the Government through majority ownership by Comision de Fomento Minero (55.33%),

Nacional Financiera S.N.C. (40.65%), Banco Nacional de México S.N.C. (4%), Roca Fosforica Mexicana (0.01%), and Minera Carbonifera Rio Escondido (0.01%). CEDI was also majority owned by Fomento Minero (51%), Fertilizantes Mexicanos (13%), and by Texas Gulf Inc. (34%), and two private Mexican concerns (2%). CEDI's three sulfur mines closed in November 1992 following the company's liquidation. The Government of Mexico was expected to sell APSA as well as its two-thirds share of CEDI. The Fertimex fertilizer plant at Lazaro Cardenas, which had a production capacity of 1.3 Mmt/a of sulfuric acid, was sold to Fertilizantes Guadalajara in December 1992. In 1993, about 63%, or 578,000 mt, of the elemental sulfur produced in Mexico was exported.

Mineral Fuels

Hydrocarbon output continued to dominate Mexico's energy sector. Production of crude oil and natural gas in 1992 (the last year for which energy source information was available) represented about 89.9% of all energy produced. In 1992, the remaining 10.1% of primary energy produced was from firewood and sugar cane (4.3%), hydroelectric sources (3.1%), coal (1.5%), geothermal (0.7%), and nuclear energy (0.5%)

Coal.—Production (run of mine) of steam and metallurgical coal increased about 12% from that of 1993 to 11.4 Mmt. MICARE, the principal coal producer in Mexico, was privatized in 1992.

The principal coal mining area of Mexico was the northern part of Coahuila, where MICARE operated. Other coal deposits were in Sonora and in Oaxaca. About 4 Mmt/a of steam coal was mined by MICARE in Coahuila. MICARE had two open pit and two underground mines. Approximately 3 Mmt of metallurgical coal was mined by Minerales Monclova S.A., and the remaining production was from 10 small producers. MICARE was undertaking an expansion program to increase its annual production to 9 Mmt to supply new plants being installed at Rio Escondido.

Natural Gas and Petroleum.—At yearend 1994, Mexico ranked eight and sixth worldwide in the production of natural gas and oil, respectively. In terms of reserves, it ranked 8th for oil and 13th for natural gas. Internationally, PEMEX in 1994 ranked third in the production of crude and fifth in the production of natural gas. In 1994, average crude oil production was approximately 2.7 Mbbl/d, about the same as in 1993. Mexican output of natural gas averaged 103 million cubic meters per day in 1994. Total production of refined products increased 3% from that of 1993. PEMEX increased the production of its unleaded Magna Sin gasoline by 40.9% in 1994 in an effort to alleviate air pollution.

According to PEMEX, proven hydrocarbon reserves at yearend 1994 were 63.22 billion barrels of oil equivalent, a

decrease of 2% compared to 1993. About 57% of the oil, 44% of the condensate, and 17% of the gas reserves were found in the Marine Region.

In recent years, PEMEX has provided about 30% of Mexico's total export earnings and has brought in about a third of all public-sector income, via domestic and export sales, tax payments, and gas taxes. In 1994, exports of crude averaged 1.31 Mbbl/d, or 2.3% less than 1993, but the export mix improved.

To alleviate pollution in Mexico, the Government has mandated that all cars built after 1991 must use unleaded gasoline, but PEMEX did not have the refining capacity to meet demand. In February 1993, PEMEX began to address its lack of refining capacity by entering into a joint venture with U.S.-based Shell Oil Co. PEMEX purchased 50% of Shell's Deer Park oil refinery near Houston, Texas, which had a daily refining capacity of 225,000 bbl/d and assured PEMEX a secure outlet for processing its crude oil while it upgraded and expanded its refinery base in Mexico. The agreement with Shell stipulated that PEMEX export 100,000 bbl/d of crude oil to the Deer Park refinery, and reimport 45,000 bbl/d of unleaded gasoline. PEMEX planned to purchase additional refining capacity in Louisiana in the near future.

Reserves

Most of the mineral reserve data were developed by two U.S. Bureau of Mines (USBM) Divisions, Mineral Commodities and Resource Evaluation, based on the definitions by the USBM and the U.S. Geological Survey as published in the Geological Survey Circular 831, 1980. The term reserves referred to economic reserves.

Mexico ranked first in reserves of silver and third in reserves of graphite, with about 13% and 15% of total world reserves, respectively. The country was among the top five reserve holders of antimony (4%), bismuth (9%), cadmium (6.5%), fluorspar (9%), mercury (4%), selenium (4%), soda ash (0.7%), and sodium sulfate (5%). In reserves of lead and zinc, Mexico ranked seventh and sixth, respectively (4% each). It also ranked seventh for reserves of molybdenum (1.6% of world reserves) and eighth for copper and manganese (less than 0.5%), respectively. Mexico had 5% of sulfur reserves, ranking eighth in the world. Mexican reserves of antimony, bismuth, and fluorspar exceeded those of the United States. Mexico ranked in eighth place worldwide in terms of proven reserves of crude oil, after Venezuela. (*See table 3.*)

Infrastructure

Mexico had 26,445 km of railroads in 1993 and 245,433 km of roads. As part of the Toll Highway Program, which began in 1989, more than 5,000 km of new highways were being constructed in Mexico. In addition, private companies

were constructing 33 toll highways, 1,600 km of roadways and four bridges across the Mexico-U.S. border. The Government was financing the expansion of 2,100 km of highways to four lanes. The Government allowed the private sector to participate in infrastructure projects, including toll roads. The concession holder was allowed to charge tolls on projects developed until construction costs have been recovered and a reasonable profit made, at which time ownership of the highway would revert to the Government.

To streamline transportation of freight within Mexico, the Government in 1990 modified regulations governing the trucking industry. With elimination of route control by private companies, Mexican carriers were able to 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 transloading delays at the border by directly transporting freight across national boundaries to destinations in Sonora, Chihuahua, Nuevo Leon, and Coahuila. Mexican carriers had reciprocal rights to operate in California, Texas, New Mexico, and Arizona.

The country had 21 ports and 2,900 km of navigable rivers and coastal canals. Of the country's 64 ships in the merchant marine, at least 44 were available for the transportation of mineral products.

Most ore and metallurgical products in Mexico were transported by truck. Railways declined in importance during the 1980's, as the volume of freight and passenger transport dropped by more than 25%, owing to increasingly poor and unreliable service. Railroads accounted for only 9% of Mexico's total freight traffic in 1991. Railroads were used mainly for bulk items, such as iron ore, coal, and coke. Gray portland cement was transported by railroads (26%), by roads (63%), and by ship (13%). About 65% of the cement was sold in bulk.

U.S. railroads, such as Union Pacific, Southern Pacific, Santa Fe, Burlington Northern, and Tex-Mex Railroad, were working with the Mexican railroad, Ferrocarriles Nacionales de México (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, 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 Monterrey, Celaya, Torreón, and north of Los Mochis. The facilities would handle such shipments as grains, consumer goods, and bulk minerals. FNM also was cooperating with Union Pacific, Southern Pacific, and Tex-Mex on the integration of shipping rates and training of Mexico's railroad employees.

Crude oil and natural gas were transported mainly through pipelines within Mexico. Of the mine refineries, eight receive crude oil by pipeline.

Outlook

Mexico's mining sector was expected to enjoy a strong year in 1995 as the peso devaluation would cut operating costs, while the sector's mineral production was sold in dollar or the dollar equivalent in pesos. Many operations were expected to increase production or bring new projects onstream. Gold and silver production was expected to increase by about 10%; copper by about 5%; lead by more than 10%; zinc to remain unchanged; and molybdenum by 50%. Grupo Mexico, which owned two giant copper mines, as well as lead, silver, and zinc mines, planned to invest \$1.8 billion in the next 6 years. Total mining investment in the next 6 years was forecast by the Mexican Mining Chamber to be about \$5 billion. Much of the exploration activity in Mexico was for gold and copper in Sonora, Durango, and Baja California. More than 200 companies, including many from the United States and Canada, were involved in mineral exploration.

Looking toward 1995 and beyond, NAFTA should benefit the overall economy, and the 1992 Mining Law and the new Foreign Investment law should play significant roles in attracting foreign investment from North American mining companies. Mexico was being viewed by many companies as not only presenting fewer obstacles to mining but also being less of a political risk than Canada and the United States for mining investments. As a result, Mexico was expected to attract more foreign investment, and its mining industry should continue to increase in importance.

³Where necessary, values have been converted from Mexican (new) pesos (N\$) to U.S. dollars at the rates of N\$3.1=US\$1.00 and N\$3.4=US\$1.00 for the years 1993-94 (prior to devaluation), respectively.

Major Sources of Information

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Cámara Minera de México

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²Much of the general and commodity information in this report was provided by Ing. Javier Moya R., Minerals specialist with the Economic Section of the Embassy of the United States in Mexico City. Mr. Moya's efforts have been invaluable in providing a comprehensive, detailed, and timely report. Mr. Moya not only compiles the annual Minerals Questionnaire, but he also is the author of the Comprehensive annual Mexico's Minerals Outlook Report used extensively as source material for this report. Any datum or statistic in the text not referenced elsewhere may be assumed to be from either the Minerals Outlook Report or the related series of separate, preliminary, topical reports prepared by Mr. Moya.

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Telephone: (52) 5 519-2992, 519-5690

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

(Metric tons unless otherwise specified)

Commodity 3/		1990	1991	1992	1993	1994
METALŠ						
Aluminum, metal:						
Primary		67,500	50,800	24,800 r/	25,800	
Secondary		60,300	54,200	59,500	69,900	125,000
Antimony:		1 (70)	1 470	1 200	1 450	1.000
Mine output, Sb content		1,670	1,470	1,200 e/	1,470	1,800 e/
Metal 4/		942	1,280	1,060	1,490	1,760
Arsenic 5/		4,810	4,920	4,290	4,450	4,440
Bismuth:		722	(51	907	000	1.050
Matel refined of		/ 3 3 5 4 0 7 /	500	807	908	1,030
Codmium:		549 1/	500	550	030	830 //
Mine output Cd content e/		3 400	3 100	3 250	3 320 7/	2 580 7/
Mile output, ed content e/		882	688	5,250	3,320 77 797	646
Copper:			000	002	171	0+0
Mine output Cu content 8/						
By concentration		267.000 r/	260.000 r/	263.000 r/	277 000	260,000
Leaching (electrowon)		26,900	32,100	27,900	24,000	35.000
Total		294.000 r/	293.000 r/	291.000 r/	301.000	295.000
Metal:		_, ,,	_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	_, _,	,	_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Anode and blister		175,000	183,000	228,000	282,000	275,000
Refined:				,		/
Primary 9/		122,000 r/	106,000 r/	111,000 r/	104,000 r/	123,000
Secondary		31,200 r/	53,000 r/	80,500 r/	77,200 r/	78,600
Total		153,000	159,000	191,000	181,000 r/	202,000
Gold:						
Mine output, Au content	kilograms	9,680	10,100	9,890	9,770 r/	13,900
Metal, refined	do.	5,790	5,020	5,740	6,090	6,450
Iron and steel:						
Iron ore, mine output:						
Gross weight e/	thousand tons	15,000	13,000	15,000	15,000	15,000
Fe content	do.	7,110	6,600	7,240	7,550	7,540
Metal:		0.670	0.050	2 400	2 120	2 500
Pig iron	<u>do.</u>	3,670 r/	2,960 r/	3,400	3,420	3,500
Sponge iron	<u>do.</u>	2,530	2,460	2,390	2,740	3,220
	d0.	6,200 r/	5,420 r/	5,790 r/	6,160	6,770
Ferromanganaga	do	122	08	70	70 0/	117
Silicomanganasa	<u>do.</u>	125	51	51	70 e/ 55 o/	72
Ferrosilicon	do	05	51	5	(10/)	12
Ferrochromium	<u>do.</u>	(10)	(10/)	(10)	(10/)	
Other	do.	(10/)	(10/)	(10/)	(10/)	
Total	do.	<u> </u>	155	135	<u>126 r/</u>	189
Crude steel	do.	8,730	7.960	8.460	9,190	10.200
Rolled products 11/	do.	6.710	6.250	6.240	6,660	7.410
Lead:		- ,	- ,	- , -	- ,	- , -
Mine output, Pb content		187,000	168,000	170,000	149,000 r/	170,000
Metal:				*	•	•
Smelter:						
Primary		179,000	163,000	163,000	172,000 r/	154,000
Secondary (refined) e/		65,000	10,000	10,000	10,000	10,000
Total e/		244,000	173,000	173,000	182,000 r/	164,000
Refined:				=		
Primary 12/		167,000	152,000	167,000	178,000	162,000
Secondary e/		65,000	10,000	10,000	10,000	10,000
Total e/		232,000	162,000	177,000	188,000	172,000
Manganese ore: 15/		451 000	254.000	407 000	262,000	207.000
Gross weight		451,000	254,000	407,000	363,000	307,000
Marcurat, mine output. He content		100,000	92,800	155,000	135,000	112,000
Melvedonum mine output, fig content		2 000 0/	1 720	1 460	1 710	2 610
Solonium, mine output, No content	kilograms	12,000 e/	2,800	400	1,710	2,010
Silver:	Kilografiis	12,200	2,800	400		
Mine output Ag content	do	2 420 000	2 300 000	2 100 000	2 110 000 r/	2 210 000
Metallurgical products Ag content	u0.	2,720,000	2,500,000	2,100,000	2,110,000 1/	2,210,000
In conper bars	do	225 000	210.000	286 000	409 000	470.000
Mixed gold and silver bars	do	72,800	72,600	103,000	109,000	124.000
Metal, refined, primary	do.	1.900.000	1.780.000	1.770.000	1.770.000	1.700.000
Other	do	77,500	73,200	111,000	78,100	123,000
Tin:		,000	,=00	,000	,+00	
Mine output, Sn content		5	12	1	3	3
Metal, smelter, primary		5,000	2,260	2,590	1,640	1,640
Cas footnotes at and of table	-					

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

(Metric tons unless otherwise specified)

Commodity 3/	1990	1991	1992	1993	1994
METALSContinued	1770			1770	
Tungsten, mine output, W content	183	194	162		
Zinc:	205.000	215 000	201000	2 co o o o (000.000
Mine output, Zn content	307,000	317,000	294,000	369,000 r/	382,000
INDUSTRIAL MINERALS	199,000	189,000	152,000	210,000	209,000
Abrasives, natural e/ 14/	25,000	25,000	25,000	25,000	25,000
Barite	306,000	192,000	188,000	136,000	86,600
Cement, hydraulic thousand tons	23,800	25,100	26,900	27,100	29,700
Clays:					
Bentonite	145,000	145,000	136,000	94,600	94,600
Common	3,830,000	3,920,000	4,170,000	4,420,000	4,310,000
Fuller's earth Kaolin	29,900	41,100	41,100	216,000	216,000
Diatomite	51 100	46 000	46 400	46 100	46 100
Feldspar	163,000	152,000	160,000	124,000	133,000
Fluorspar:				,	
Acid-grade thousand tons	428	277	189	187 r/	221
Ceramic-grade do.	11			(
Metallurgical-grade do.	192	90	95	93 r/	103
Submetallurgical-grade e/ do.	634	370	<u> </u>	283	327
Graphite, patural:	054	570	201	203	521
Amorphous	22,600	35.300	30.500	42.600	29.900
Crystalline	2,370	1,940	985	960	960 e/
Gypsum and anhydrite, crude (yeso)	5,430,000	4,770,000	5,160,000	5,340,000	5,530,000
Lime, hydrated and quicklime e/ thousand tons	6,000	6,500	6,500	6,500	6,500
Magnesium compounds:	570	c00 /		1 520	1 100
Magnesite Magnesis 15/	579	600 e/	125.000	1,530	1,120
Mice all grades	5 860	5 590	5 870	125,000 e/	7 060
Nitrogen: N content of ammonia	2 160 000	2 220 000	2 200 000	1.760.000 r/	2,030,000
Perlite	42,400	48,900	42,600	34.600	34.600
Phosphate rock 16/	623,000	596,000	515,000 r/	237,000 r/	556,000
Salt, all types thousand tons	7,140	7,530	7,400	7,490	7,460
Sodium compounds, n.e.s.:					
Carbonate (soda ash): e/ 17/	100.000	100.000	1 <0.000	1 < 0 0 0 0	1 (0,000
Natural Symthetic	190,000	190,000	160,000	160,000	160,000
Sulfate natural (bloedite) 18/	239,000	239,000	280,000	280,000 500,000 e/	280,000
Stone, sand and gravel:	545,000	510,000	554,000	500,000 0/	527,000
Calcite, common	445,000	458,000	476,000	423,000	423,000
Dolomite	482,000	471,000	466,000	545,000	588,000
Limestone 19/ thousand tons	27,400	29,500	31,800	34,000	36,400
Marble	681,000	750,000	860,000	987,000	1,130,000
Quartz, quartzite, glass sand (silica)	1,170,000	1,200,000	1,130,000	1,310,000	1,360,000
Gravel do	44,700	39,700	40,500	47,000	48,900
Strontium minerals, celestite	66,300	62,200	61,100	71,900	111,000
Sulfur, elemental:		02,200	01,100	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	111,000
Frasch process thousand tons	1,440	1,040	710	102	
Byproduct:					
Of metallurgy e/ do.	290	280	817	730	2,010 7/
Of petroleum and natural gas do.	682	/54	115	804	8//
Total e/	2 4 10	20	2 300	1 670	2 920
Talc	13,500	11,900	19,600	14.400	14,400
Vermiculite	132	117	125	134	300
Wollastonite	11,400	13,900	27,400	35,800	35,800
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Kun-of-mine:	5 700	1 5 10	2640	4.500/	1 620
Steam do	3,790 1 220	4,540 1 870	3,040 ľ/ 5 060 r/	4,300 ľ/ 5 720 r/	4,030
Total do.	10 000	9 400	<u> </u>	10 200	11 400
Washed metallurgical coal do.	2.850	2.210	1.610	1.710 e/	1.800 e/
Coke: 20/		_,	-,010	_,, 10 0/	-,
Metallurgical do.	2,320	2,010	1,890	1,890	1,930
Imperial do.	6	3	2	3	3
Breeze do.	16	98	144	49	49
lotal do.	2.340	2.110	2,030	1,940	1,980

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

(Metric tons unless otherwise specified)

Commodity 3/		1990	1991	1992	1993	1994
MINERAL FUELS AND RELATED MA	TERIALSContinued					
Gas, natural:						
Gross	million cubic meters	37,700	37,600	37,100	37,000	37,500
Marketed	do.	34,100	33,700	32,700	35,700	36,000 e/
Natural gas liquids	thousand 42-gallon barrels	156,000	165,000	165,000	170,000 e/	170,000 e/
Petroleum:						
Crude	do.	930,000	977,000	974,000 r/	976,000 r/	980,000
Lease (field) condensate	do.	1,830	1,440	1,640	1,500 e/	1,500 e/
Total	do.	932,000	978,000	976,000 r/	978,000	982,000
Refinery products:						
Liquefied petroleum gas	do.	20,000 r/ e/	25,200 r/	20,100 r/	21,500 r/	24,100
Motor gasoline	do.	154,000	153,000	148,000 r/	152,000 r/	157,000
Jet fuel	do.	18,600	22,600 r/	23,700 r/	26,300 r/	27,000
Kerosene	do.	5,780	3,650 r/	4,020 r/	3,650 r/	3,290
Distillate fuel oil (diesel)	do.	94,400	101,000	101,000 r/	97,500 r/	104,000
Lubricants	do.	2,680	2,920 r/	2,920 r/	2,560 r/	2,560
Residual fuel oil	do.	159,000	152,000	157,000	162,000 r/	156,000
Asphalt	do.	5,770	7,670 r/	8,400 r/	8,760 r/	11,700
Unspecified and refinery fuel and losses	do.	20,000 r/ e/	19,000 r/	19,900 r/	20,700 r/	24,400
Total	do.	480,000 r/ e/	487,000 r/	485,000 r/	495,000 r/	510,000

e/Estimated. r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Table includes data available through Aug. 31, 1995.

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

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

5/ As content of white and black (impure) arsenic troioxide.

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

7/ Reported figure.
8/ Series reported by CAMIMEX. Tonnages reflect a 2.5% metal loss in smelter.

9/ Includes cathode copper from the Cía. Mexicana de Cananea, S.A. de C.V. electrowinning plant, in metric tons, as follows: 1990--26,900; 1991--32,000; 1992--27,900; 1993--30,000 (revised); and 1994--26,900.

10/ Less than 1/2 unit.

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

12/Pb content of antimonial lead and input bars plus primary refined metals. 13/Mostly oxide nodules; includes smaller quantities of direct-shipping carbonates and oxide ores for metallurgical and battery applications.

14/ Based on exports, comprised mostly of pumice stone and emery (a granular, impure variety of corundum).
 15/ Reported by Industrias Peñoles, S.A. de C.V. as the only major producer.

16/ Includes only output used to manufacture fertilizers.

17/ Total sodium carbonate reported by Asociación Nacional de la Industria Química. 18/ Series reflects output reported by Industrias Peñoles plus an additional 22,000 tons estimated production by Sulfato de Viesca.

19/ Excludes that for cement production.

20/ Includes coke made from imported metallurgical coal.

TABLE 2 MEXICO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

	Major operating companies		Annual
Commodity	and major equity owners	Location of main facilities 1/	capacity
Aluminum	Aluminio S.A. (Nacobre, 77.8%; Carso	Smelter at Veracruz, Ver	94.
	Group, 20%)		
Antimony	Cia. Minera y Refinadora Mexicana, S.A. (private Mexian, 51%;	San Jose Mine, Catorce, S.L.P.	365.
	Cookson Ltd., 49%)		
Barite	Barita de Sonora, S.A. (Grupo Acerero	Mazatan, Son	264.
	del Norte, S.A. de C.V., 100%)		
Do.	Minera Capela, S.A. (Penoles, 100%)	La Minita Mine, Coalcoman, Mich.	150. 2/
Do.	Minerales y Arcillas, S.A. de C.V. (private	Galeana, N.L.	108.
	Mexican, 100%)		
Do.	do.	Apodaca, N.L.	60.
Do.	Barita de Santa Rosa, S.A. de C.V. (private	Muzquiz, Coah	256.
	Mexican, 100%)		
Cement	Cementos Mexicanos, S.A. de C.V. (private	Monterrey, N.L.; Torreon, Coah.;	8,970 (Monterrey
	Mexican, 100%	Huichiapan, Hg.; Valles, S.L.P.	group).
Do.	Cementos Anahuac, S.A. (Cementos	Leon, Gto.; Merida, Yuc.; Tlanepantla,	6,970 (Maya group
	Mexicanos, 100%)	Mex.; Tamuin, S.L.P.	
Do.	Cementos Tolteca, S.A. (Cementos	Atotonilco, Hgo.; Zapotiltic, Jal.; Tula,	7,150 (Tolteca grou
	Mexicanos, 100%)	Hgo.; Hornillos, Sin.; Hermosillo, Son	
Do.	Cementos Guadalajara, S.A. (Cementos	Ensenada, B.C.N.; Guadalajara, Jal.;	4,445 (Cegusa grou
	Mexicanos, 100%)	Hermosillo, Son.; Hidalgo, N.L.	

TABLE 2--Continued MEXICO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

		Major operating companies		Annual
Commodity	7	and major equity owners	Location of main facilities 1/	capacity
CementContinued		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 Chihuahua, S.A. de C.V. (private Mexicanos 100%)	Chihuahua, Chih.; Cuidad 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	2,500.
Do.		Carbonifera de San Patricio, S.A. de C.V. (private Mexicanos, 100%)	Progresso, Coah	1,314.
Do.		Industrial Minera Mexico, S.A. de C.V. C.V. 3/ (Grupo Mexico, 74%; Asarco Lnc. of U.S. and others. 26%)	Nueva Rosita, Coah	1,500
Do.		Minera Carbonifera Rio Escondido, S.A. (MICARE) (Grupo Acerero del Norte, Ell'(, Mission Escone), 40%)	MinaI, Mina II, and Tajo I at Nava and Piedras Negras, Coah	4,000.
Copper		Mexicana de Cobre, S.A. (Mexico Desarollo Industrial Minero, 96.4%), 3/	La Caridad Mine and smelter at Nacozari de Garcia Son	180 smelter,
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, 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. (Grupo Industrial Camesa S.A. de C.V.) 4/	Salitera (Zaragoza), S.L.P.	520.
Do.		Fluorita de Mexico, S.A. de C.V. (private Mexican, 51%: AIMCOR, 49%)	Mines at La Encantada range and plant at Muzguiz, 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. (Industriales 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.	do.	Exploraciones El Dorado, S.A. de C.V., 70%; Minerales Sotula, 30%)	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.
Do.	do.	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 (Mayican 100%)	do.	438.
Graphite		Grafitos Mexicanos S.A. (Cummings Moore Graphite Co. of the U.S., 25%; private Mexican, 75%)	Lourdes and San Francisco Mines, Son	60.
Gypsum		Cia. Occidental Mexciana, S.A. (private Mexican, 51%; Domtar, Ltd. of Canada, 49%)	Santa Rosalia on San Marcos Island, B.C.S.	1,500.
Iron ore		(Grupo Acerero del Norte, 29%; Caribbean ISPAT, 29%; Hylsa de Mexic, 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 Desarollo 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%; U.S. private, 3%)	Mines at La Encantada, Coah.; Fresnillo, Zac.; Naica, Chih.; Bismark, Son. Rey de Plata, Gro. (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 ro, S.A. de C.V. (Frisco, S.A. de C.V., 100%)	San Francisco del Oro, Chih.	14 (lead), 30 (zinc).
Do.		Minera Keal de Angeles, S.A. de C.V. (Frisco, S.A. de C.V., 100%)	Noria de Angeles, Zac.	39 (lead), 41 (zinc).

TABLE 2--Continued MEXICO: STRUCTURE OF THE MINERAL INDUSTRY FOR 1994

(Thousand metric tons unless otherwise specified)

	Major operating companies		Annual
Commodity	and major equity owners	Location of main facilities 1/	capacity
Manganese	Cia. Minera Autllan, S.A. (Grupo Ferrominero,	Molango Mine, Hgo.	460.
	54%; Minas de Basis, S.A. de C.V., 32%;	Nonoalco Mine, Hgo.	26.
	Broken Hill Property Co. Ltd. of	Gomez Palacio, Hgo.	35.
	Australia, 14%)	-	
Molybdenum	Mexicana de Cobre, S.A. (Mexico Desarollo	La Caridad Mine, Molybdenum plant, Son	6.
	Industrial Minero, 96.4%)		
Petroleum thousand 42-gallor	n Petroleos Mexicanos (PEMEX)	Comalcalco, Poza Rica, Ver.,	3,500. 5/
barrels per da	y (Government, 100%)	and Gulf of Campeche, Cam. districts	
Salt	Exportadora de Sal, S.A. (ESSA) (Fideicomiso	Solar salt complex at Guerrero Negro,	6,000.
	de Fomento Minero, 51%; Mitsubishi	B.C.S.	
	Corp., 49%)		
Silver kilogran	s Industrias Penoles, S.A. de C.V. (private	Naica, Chih.; Fresnillo, Zac.; Las Torres,	654,000.
	Mexican, 97%; U.S. private, 3%) 6/	Gto.; Cuale, Jal.; La Negra, Qro; La	
		Encantada, Coah.; La Minita, Mich.	
Do. de	 Mexico Desarollo Industrial Minero, S.A. 	San Martin Mine, Sombrerete, Zac.; Taxco,	467,000.
	(Grupo Mexico, 74%; Asarco Inc. of U.S.	Gro.; Charcas, S.L.P.; Santa Eulalia,	
	and others, 26%)	Chih.; Refiney at Monterrey, N.L.	
Do. de	 Minera Real de Angeles, S.A. de C.V. 	Open pit mine and concentrator at Noria	924,000.
	(Frisco, S.A. de C.V., 100%)	de Angeles, Zac.	
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%)	Subsurfaces brines at Laguna del Rey, Coah	350.
Steel	Altos Hornos de Mexico, S.A. (AHMSA),	Steelworks at Monclova, Coah. (Iron ore	3,900.
	Grupo Acereros de Norte (GAN)	from Pena Colorada Mine in Col.)	
Do.	Hylsa de Mexico, S.A. (Grupo Industrial ALFA, 100%)	Direct-reduction units at Monterrey, N.L.,	1,800.
		and Puebla, Pue., (Iron ore from Cerro	
		Nahuatl Mine in Col.)	
Do.	Siderurgica Lazaro Cardenas-Las Truchas, S.A.	Port of Lazaro Cardenas, Mich.	1,300.
	S.A. (SICARTSA) (Grupo Villacero, 80%;		
	Government, 20%)		
Do.	Siderurgica del Balsas, S.A. (SIBALSA)	SICARTSA II Plant Facilities as Lazaro	2,000 (steel),
	(Caribbean ISPAT, 100%)	Cardenas Plus 29% share in the Pena	1,500 (steel
		Colorada Mine.	plate).
Strontium (celestite)	Cia. Minera La Valenciana (private Mexican, 100%)	San Agustin Mine in Coah	50.
Sulfur	Azufrera Panamericana, S.A. (APSA)	Coachapa, Patapa, Jaltipan, Ver.	1,230.7/
	(Fideicomiso de Fomento Minero, 96%; private, 4%)		
Do.	Cia. Exploradora del Istmo, S.A.	Texistepec, Ver.	750.7/
	(Government, 64%; Texasgulf, Inc., 34%; private, 2%)		
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 Ca	lifornia Norte (B.C.N.), Baja California Sur (B.C.S.), Campeche (Cam.), Cl	hiapas (Chia.), Chihuahua (Chih.), Coahuila	

I/ State abbreviations: Baja California Norte (B.C.N.), Baja California Sur (B.C.S.), Campeche (Cam.), Chiapas (Chia.), Chihuahua (Chih.), Coahuil. (Coah.), Colima (Col.), Distrito Federal (D.F.), Durango (Dgo.), Guanajuato (Gto.), Guerrero (Gro.), Hidalgo (Hgo.), Jalisco (Jal.), Mexico (Mex.), Michoacan Mich.), Nuevo Leon (L.) Oaxaca (ax. Puelba (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, Mexico Desarrollo Industrial Minero and Grupo Industrial Minera Mexico were reorganized to form Grupo Mexico.
4/ Grupo Industrial Camesa, S.A. de C.V. is owned by private Mexican (59.4%) and Noranda, Inc. of Canada (40.6%).
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.

8/ Smelter output from mostly imported concentrates.

TABLE 3MEXICO: RESERVES OF SELECTED MINERAL COMMODITIES FOR 1994

(Thousand metric tons unless otherwise specified)

Comr	nodity 1/	Reserves
Antimony		181
Barite		7,000
Bismuth	metric tons	10,000
Cadium	do.	35,000
Copper		14,000
Fluorspar 2/		19,000
Gas, natural 3/	billion cubic meters	1,940
Graphite, natural		3,100
Lead		3,000
Manganese		3,600
Mercury	metric tons	5,000
Molybdeum	do.	90,000
Petroleum, crude 3/	million 42-gallon barrels	49,800
Selenium	metric tons	4,000
Silver	do.	37,000
Sodium carbonate, natural		180,000
Sodium sulfate, natural		165,000
Sulfur 4/		75,000
Zinc		6,000

1/ All metals expressed in metal content.2/ Measured as 100% calcium fluoride.

3/ Yearend 1994. Source: PEMEX Statistical Yearbook 1994.

4/ Sulfur in all forms.