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The Mineral Industry of Mexico

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In 2016, Mexico's real gross domestic product (GDP) increased by 2.9% compared with that in 2015. The Mexican peso had a year-on-year average depreciation in relation to the United States dollar of about 17.8% in 2016, and Mexico's average inflation for the year was about 3.4%. The country's nonfuel mineral sector accounted for 5.8% of the total GDP, and the petroleum-based fuels sector accounted for 4.4%. Mexico was estimated to be the world's leading producer of silver, by amount, accounting for about 21% of world production. The country also ranked second among the world's leading producers of fluorspar (accounting for 17% of world production); third among the world's leading producers of bismuth (3% of world production) and wollastonite (8% of world production); fifth among the world's leading producers of molybdenum (4% of world production); sixth among the world's leading producers of lead (5% of world production) and zinc (5% of world production); and seventh among the world's leading producers of cadmium (5% of world production) (Bennett, 2018; Brioche, 2018; George, 2018; Klochko, 2018; Secretaría de Economía, 2018, p. 8; Tolcin, 2018).

Mexico was the 12th-ranked crude petroleum producer, by volume, in the world and the 4th-ranked producer in the Americas, after the United States, Canada, and Brazil. In recent years, the country's petroleum production had been decreasing as a result of natural depletion from the Cantarell and other large offshore fields. In 2013, in an effort to address the decrease in crude petroleum production, the Government enacted constitutional reforms that ended the monopoly of state-owned Petróleos Mexicanos S.A. de C.V. (PEMEX) on petroleum and natural gas production and opened the industry to foreign direct investment. The country continued to be a significant crude petroleum exporter in 2016, and its leading trading partner was the United States (U.S. Energy Information Administration, 2017).

Minerals in the National Economy

In 2016, mining and processing of metallic minerals accounted for 3% of the country's total GDP, and mining for base metals accounted for 1% of the portion of the GDP that is contributed by all mining activities combined, including mining of mineral fuels. As reported by the Secretaría de Economía (2018, p. 10), the mining and production of "nonmetallic minerals" accounted for 0.4% the country's total GDP. The value of the "metallic minerals" sector, including production and processing, increased by 1.9% in 2016 compared with that of 2015, and that of the nonmetallic minerals sector increased by 2% during the same period (Secretaría de Economía, 2018, p. 10).

In 2016, the total value of nonfuel mineral production in Mexico increased by 12.9% compared with that of 2015. Of this total, the production of metallic minerals accounted for 57% and increased in value by 21.4% compared with that of 2015. The value of nonmetallic mineral production, excluding production of petroleum and its derivatives, increased in value by 3.4% compared with that of 2015 and amounted to 43% of the total value of nonfuel mineral production. Gold accounted for a 21% share of the total value of nonfuel mineral production in 2016, followed by copper (14.7%), silver (11.7%), zinc (5.6%), lead (1.8%), coal (1.6%), coke (1.4%), iron pellets (0.9%), salt (0.7%), and molybdenum (0.7%) (Servicio Geológico Mexicano, 2017a, p. 14, 35, and 36; Secretaría de Economía, 2018, p. 8).

In 2016, a total of 25,652 mining concessions were registered for an area of 220,650 square kilometers, which accounted for about 11.2% of the country's territory. The State of Sonora had the most concessions (4,454), whereas the State of Durango had 3,603, the State of Chihuahua had 3,369, and the States of Zacatecas and Coahuila had 2,311 and 1,977, respectively. The State of Sonora was the principal producer of nonfuel minerals, by value, producing about 33.3% of the country's total output. The principal minerals that Sonora produced were, in order of total value of production, gold, silver, copper, molybdenum, coal, iron ore, graphite, barite, and silica sand. The State of Zacatecas was the second-ranked producer of nonfuel minerals, by value, producing about 19.3% of the country's total output. The principal minerals that Zacatecas produced were, in order of total value of production, gold, silver, copper, lead, and zinc. The State of Chihuahua was the third-ranked producer of nonfuel minerals, by value, producing about 9.9% of the country's total output. The principal minerals that Chihuahua produced were, in order of total value of production, gold, silver, lead, copper, zinc, iron ore, barite, dolomite, kaolin, and gypsum. The other 7 of the principal 10 States that produced nonfuel minerals were, in order of the value of production, Durango, Coahuila, Guerrero, San Luis Potosi, Baja California Sur, Colima, and Mexico; together, these 7 States accounted for about 28.7% of the total value of Mexico's nonfuel mineral production (Camara Minera de México S.A, 2017, p. 137, 171; Servicio Geológico Mexicano, 2017a, p. 14, 21, 27; Secretaría de Economía, 2018, p. 18).

In 2016, employment in the mineral and metal processing sector accounted for about 3.7% of the total workforce in the country and increased by 2.8% to 354,702 workers from 344,912 workers in 2015. Of the total employed in the sector in 2016, 39.3% worked in the processing of nonmetallic minerals; 29.5% worked in the metallic minerals industry; 19.9% worked in the mining and processing of metallic ores; 10.6% worked in the mining of coal, graphite, and nonmetallic minerals; and 0.6% worked in the mining of salt. The State of Nuevo Leon accounted for 15% of the total employment in the mineral and metal processing sector, followed by the States of Coahuila (10.9%), Mexico (8.7%), Guanajuato (5.6%), Chihuahua (5.5%), and Sonora (5%) (Cámara Minera de México S.A, 2017, p. 51, 164; Secretaría de Economía, 2018, p. 49–50).

Investments in the mineral and metal processing sector totaled $3.8 billion in 2016 compared with $4.6 billion (revised) in 2015, which represented a decrease in investment of about 19%. About 9.8% of these investments were in mineral exploration, 15% were in expansion projects, and 12% were in new projects (Servicio Geológico Mexicano, 2017a, p. 20).

In 2016, a total of 274 companies were involved in 947 mining projects in Mexico. Of these companies, 176 had their central offices in Canada and 44 were headquartered in the United States; 13, in China; 10, in Australia; 5, in Japan; 4 each, in the Republic of Korea and the United Kingdom; 3 in Spain; 2 each, in Chile, France, and India; and 1 each, in Belgium, Brazil, Ireland, Italy, Luxembourg, the Netherlands, Peru, Philippines, and Switzerland. Of the 947 projects in the country, about 67% were at the exploration stage, 18% were postponed or on hold, 10% were in production, and 5% were at the development stage. Precious metals, particularly gold and silver, were the primary targets for 597 of the projects, whereas polymetallic projects totaled 139. Copper and iron ore accounted for 121 and 53 projects respectively, and the remaining were diverse projects involving various mineral commodities. The State of Sonora accounted for 24% of all projects involving foreign direct investments, followed by Chihuahua (13%), Durango and Sinaloa (11% each), Zacatecas (8%), and Jalisco (6%) (Servicio Geológico Mexicano, 2017b, p. 544–547).

Government Policies and Programs

In 2016, there were no significant changes to the mining laws and regulations in Mexico, except for the enactment of the 2015 Energy Reform Law in which PEMEX, the state-owned petroleum company, was restructured into seven state-owned subsidiaries. The seven subsidiaries are PEMEX Exploración y Producción [PEMEX Exploration and Production], PEMEX Perforación y Servicios [PEMEX Drilling and Services], PEMEX Transformación Industrial [PEMEX Industrial Transformation]; PEMEX Logística [PEMEX Logistics], PEMEX Etileno [PEMEX Ethylene], PEMEX Fertilizantes [PEMEX Fertilizers] and PEMEX Cogeneración y Servicios [PEMEX Co-Generation and Services]. This restructuring assigned each subsidiary a particular sector of PEMEX's production, such as gas, fertilizers, or petroleum exploration or production. Previously, the company was centrally structured. These changes allow private investment in the new subsidiaries, but petroleum production and ownership are retained by the Government (Petróleos Mexicanos S.A. de C.V., 2017, p. 10–11).

The mineral sector is administered by the Secretaría de Economia [Ministry of Economy]. The Direccion General de Regulacion Minera [General Department of Mining Regulation], which is part of the Ministry of Economy, is the organization in charge of revising the mining law and its regulations, as well as granting concessions and titles. The Servicio Geológico Mexicano [Mexican Geological Survey], which is part of the Ministry of Economy, is responsible for generating and providing knowledge for territory planning and for facilitating the development of the country's natural resources. Mineral commodities are considered part of the national patrimony of Mexico under its Constitution. Article 27 deals with issues of ownership and the mining of natural resources. The Ley Minera [Mining Law] became effective in 1992 and was subsequently modified and expanded in 1996 and again in April 2005, June 2006, and on August 11, 2014. The Mining Law provides the legal framework for the exploration, production, and processing of the country's mineral resources. Neither petroleum and its derivatives nor radioactive materials are covered by this law. Under the law, mining concessions can be granted only by the Ministry of Economy. Exploration concessions are granted for 6 years and are not renewable. Production concessions are awarded for 50 years and are renewable for an additional 50 years. The Reglamento de la Ley Minera (Rules of the Mining Law), which was published in the Diario Oficial [Official Journal] of the Mexican Congress in 2012, was modified in October 2014. The Reglamento de la Ley Minera regulates the granting and the administration of mining concessions and how the rights and obligations derived therefrom are exercised and fulfilled (Camara de Diputados del H. Congreso de la Union, 2014a; 2014c, p. 1, 3, 11, 27).

Mexico's energy sector is regulated by the Secretaría de Energia [Ministry of Energy] and the Comision Nacional de Hidrocarburos [National Hydrocarbons Commission]. In 2013, the Government enacted constitutional reforms ending the PEMEX monopoly and opening the industry to foreign investments. On November 15, 2016, the latest reforms to the Hydrocarbons Law were published in the Official Journal of the Mexican Congress. Under the law, all hydrocarbon resources are still considered to be the property of the Mexican state. The law establishes that the Ministry of Energy, with technical assistance from the National Hydrocarbons Commission, is responsible for awarding allocations to PEMEX or any other state-owned company to conduct exploration for and extraction of hydrocarbons. The reforms also allow for new exploration and production contract schemes, such as issuing licenses, allowing production sharing, profit sharing, and granting service contracts (Camara de Diputados del H. Congreso de la Union, 2016, p. 1, 4, 8; U.S. Energy Information Administration, 2017).

As stipulated in the reform, PEMEX is allowed first refusal on developing the country's resources before private companies can begin bidding, which is known as Round Zero. Round Zero intends to reach a balance between the facilities that PEMEX would operate and those that the state would grant to others in subsequent bidding rounds. PEMEX would send requests to the Ministry of Energy for the allocation of leases for exploratory areas and producing areas, according to its operational capabilities (U.S. Energy Information Administration, 2017).

The Foreign Investment Law, which established the parameters for foreign direct investment in Mexico, was published in 1993 and amended in 2014. Under the law, foreign investors seeking to obtain exploration and mining concessions within the country must submit to the Secretaría de Relaciones Exteriores [Ministry of Foreign Affairs] a statement of agreement accepting the conditions established in Article 27. Companies are also responsible for obtaining the corresponding mining permits from the Ministry of Economy. The law also establishes that foreign investors may hold 100% of the capital stock of any Mexican corporation or partnership, except in those few areas expressly subject to limitations under the law

(Camara de Diputados del H. Congreso de la Union, 2014b, p. 7; U.S. Department of the State, 2015).

Production

In 2016, production of kaolin increased by 67% to 259,272 metric tons (t) from 155,100 t (revised) in 2015, and that of ferromanganese, by 51% to 84,529 t from 55,919 t (revised) in 2015. These increases were likely owing to increases in demand for the minerals. Production of phosphate rock in terms of P_2O_5 content and gross weight increased by 51% to 815,000 t and 2,909,000 t, respectively, from 540,000 t and 1,930,000 t, respectively, in 2015, most likely as a response to the demand in the fertilizer industry. Production of perlite increased by 46% to 19,000 t from 13,000 t in 2015; the reason for this increase was not reported. Copper concentrate production increased by 40% to 529,000 t from 379,000 t in 2015, and production of marble increased by 38% to 2,162,521 t from 1,571,288 t (revised) in 2015. Both increases were likely owing to the evolution of the prices of these commodities. The production of silica increased by 37% to 2,398,971 t from 1,750,548 t; production of bituminous coal increased by 12% to 8,130,000 t from 7,245,000 t; and production of wollastonite increased by 11% to 63,683 t from 57,451 t; these increases were most likely in response to demand for these minerals (table 1).

Decreases in production included that of bentonite, by 63% to 109,176 t from 294,236 t in 2015, and celestite, by 58% to 33,230 t from 79,022 t in 2015; the reasons for these decreases were not reported by the industry. Talc production decreased by 44% to 11,392 t from 20,452 t in 2015 and barite production decreased by 43% to 150,970 t from 265,598 t, whereas graphite production decreased by 41% to 3,839 t from 6,524 t in 2015. Limestone production decreased by 36% to 361,704,000 t from 569,505,000 t in 2015, and feldspar mine production and metallurgical coke decreased by 23% each to 122,176 t from 159,372 t, and to 1,368,000 t from 1,779,000 t, respectively, in 2015; these changes were due mostly to changes in demand. Sulfur production decreased by 22% to 673,285 t from 858,127 t; this decrease was most likely owing to the decrease in the production of crude petroleum and natural gas. Mine production of zinc decreased by 16%, whereas primary smelter production of zinc decreased by 15.5%; these decreases were probably owing to changes in either demand or international prices. Production of bismuth decreased by 11% to 539 t from 603 t (revised) in 2015, and that of iron ore (gross weight), by 10% to 12,089,000 t from 13,462,000 t in 2015; these changes in production were likely owing to changes in the demand for these commodities. Data on mineral production are in table 1.

Structure of the Mineral Industry

Mexico's leading silver and gold producers included Fresnillo plc. (Fresnillo), Goldcorp Inc. of Canada, Grupo Mexico S.A.B. de C.V. (Grupo Mexico), Industrias Peñoles, S.A.B. de C.V. (Industrias Peñoles), and Pan American Silver Corp. of Canada. Industrias Peñoles, through its subsidiary Metalurgica Met-Mex Peñoles S.A.B. de C.V., was the leading producer of bismuth in the country. The refinery, located in Torreon in the State of Coahuila, had the capacity to produce 1,440 metric tons per year (t/yr) of bismuth. Exportadora de Sal, S.A. de C.V., which was a joint venture between the Government (51% interest) and Mitsubishi Corp. of Japan (49%), was the leading producer of salt in the country. Exportadora de Sal, located in Guerrero Negro in the State Baja California Sur, had the capacity to produce about 9.5 million metric tons per year (Mt/yr) of salt. Minera Roca Rodando, S. de R.L. de C.V., a subsidiary of S&B Industrial Minerals S.A. of the United States, owned the Pilares Mine, which was the only mine in the country that produced wollastonite. The Pilares Mine is located in Hermosillo, State of Sonora. Mexichem, S.A.B. de C.V., through its wholly owned subsidiaries Fluorita de México, S.A. de C.V. and Mexichem Fluor, S.A. de C.V., was the leading producer of fluorspar in the country. Fluorita de México operated La Sabina Mine, which is located in the State of Coahuila and had the capacity to produce about 100,000 t/yr of fluorspar. Mexichem Fluor operated the Las Cuevas Mine, located in the State of San Luis de Potosi. The mine had the capacity to produce about 1.2 Mt/yr of fluorspar. Table 2 is a list of major mineral industry facilities.

In yearend 2015, PEMEX, through its subsidiary PEMEX Fertilizantes, announced the acquisition of Grupo Fertinal S.A. de C.V. at a cost of $680 million. Grupo Fertinal was the leading phosphate rock producer in the country through its Roca Fosforica de Mexico S.A. de C.V. Mine, located in San Juan de la Costa in the State of Baja California Sur (Ibarra, 2015).

Mineral Trade

Mexico's exports were valued at $373.9 billion in 2016 compared with $380.8 billion in 2015, which was a decrease of 1.8%. The country's major minerals export trade partner was the United States, which received 50.7% of Mexico's mineral exports, followed by China (14.5%), the Republic of Korea (8.6%), the United Kingdom (4.6%), Japan (3%), Switzerland (2.8%), Canada (2.4%), Belgium (1.9%), Australia (1.3%), Brazil (1.3%), Italy (1.1%), and Germany (1%). The remaining 6.8% was divided among several countries for which the exports received by each was less than 1% of Mexico's mineral exports. The total value of Mexico's imports in 2016 was about $387.1 billion compared with $395.2 billion in 2015. Its major import partners were, in descending order of the import value, the United States, which supplied 45% of Mexico's imports, Colombia (9%), Canada (8%), China (5%), Brazil (5%), Russia (4%), Chile (3%), the United Arab Emirates (2%), India (2%), and South Africa (2%) (Servicio Geológico Mexicano, 2017b, p. 34–42; Secretaría de Economía, 2018, p. 59–61).

Mineral and metal processing exports increased by about 7.6% to $15.6 billion from $14.5 billion in 2015. The increase in exports was attributed to an increase of 16.6% in the exports of base metals, precious metals, and industrial minerals, which together accounted for 92.8% of the total mineral and metal processing exports in 2016, by value. Gold accounted for about 31.2% of these exports, followed by copper (17.6%), silver (15.4%), lead (7.6%), zinc (7.2%), and iron ore (3.4%). Aluminum accounted for 29.1% of the mineral and metal processing imports, followed by iron ore (16.1%), copper (10.6%), and coal (7.4%) (Secretaría de Economia, 2018, p. 57–60).

In 2016, crude petroleum accounted for $15.5 billion of total exports; mining products, about $4.4 billion; and other petroleum-related exports, about $3.2 billion. Imports of petroleum-related products in Mexico were valued at $31.6 billion in 2016 compared with $33.3 billion in 2015. The value of imports of intermediate petroleum goods, such as preprocessed fuels and refined petroleum, amounted to about $20 billion in 2016 compared with $20.2 billion in 2015. In 2016, Mexico's exports to the United States decreased in value to about $294 billion from $296 billion (revised) in 2016 (Banco de Mexico 2017, p. 42–44; U.S. Census Bureau, 2017a, b).

Commodity Review

Metals

Antimony.—In 2016, United States Antimony Corp. (USAC) reported that production of antimony had started at its Wadley property in San Luis Potosi. The company produced 126 t of direct-shipping ore (DSO) at a grade of 35.9% antimony. The company planned to install a high-grade compressor and pneumatic hammers to increase the production of its high-grade ore; the low-grade ore would be milled to make concentrates that would contain between 25.1% and 41.2% antimony. A date for the improvements was not stated by the company. The company also reported that it had produced 70.6 t of antimony concentrate from mill concentrates produced at the Puerto Blanco mill in Soytal, Queretaro, and that the average grade of those concentrates was 24.6% antimony.

Copper.—In 2016, production of copper concentrate and electrowon increased to 529,000 t and 223,400 t, respectively. These increases were due to Grupo Mexico's consolidation and increased efficiency at the concentration plant II and at the ESDE III plant, both of which were located at the Buenavista de Cobre Mine in the State of Sonora. These improvements allowed for production to increase by 57.2%. Similarly, Grupo Mexico's operation in the La Caridad Mine increased production by 1.7%. Grupo Mexico continued with its $3.5 billion investment program at the Buenavista del Cobre Mine. Upon completion of the program, copper production capacity was expected to increase by 180%, and molybdenum production, by 42% (Grupo Mexico S.A.B. de C.V., 2016, p. 2, 8; Camara Minera de Mexico S.A., 2017, p. 192).

Gold.—In 2016, mined gold production decreased in Mexico by 1.7%; however, the production of gold in the Herradura Mine, which was owned by Fresnillo plc, increased by more than 30%. La Herradura Mine is the most important gold mine in the country in terms of production. The increase in production at the mine was due to an increase in the capacity to process mined ore. The company started a second Merrill-Crowe process plant in the new lixiviation section of the mine. In this way, the company eliminated the bottleneck in the production process that had limited production. Other mines that increased production in 2016 were the El Limon-Los Guajes Mine owned by Torex Gold Resources Inc. of Canada, which increased production by 28%, and the La India Mine, owned by Agnico Eagle Mines Ltd. of Canada, which increased production by 19%. Industrias Peñoles, through its subsidiary Fresnillo plc, owned a 75% interest in the Cienega, the Fresnillo, the Herradura, the Noche Buena, the Saucito, and the Soledad-Dipolos gold mines. The company continued exploration work at the Centauro Deep pit, which is located below the Centauro main pit at Herradura (Fresnillo plc, 2016, p. 3, 56; Camara Minera de Mexico S.A., 2017, p. 217–218).

Goldcorp Inc. of Canada held 100% interest in the Peñasquito Mine through its subsidiary Minera Peñasquito S.A. de C.V.; it also held 100% interest in the Los Filos Mine through its subsidiary Desarrollos Mineros San Luis S.A. de C.V. In 2016, gold production from the Peñasquito Mine, which is located in the State of Zacatecas, decreased by 46% to 14,463 kilograms (kg) from 26,758 kg in 2015; this decrease had been expected to happen in 2016 owing to the mining of lower grade ore at the Peñasco pit. As of December 31, 2015, total proven and probable mineral reserves at the Peñasquito Mine were reported as 587 million metric tons (Mt) at average grades of 30.04 grams per metric ton (g/t) silver and 0.52 g/t gold. Production of gold at the Los Filos Mine, which is located in the State of Guerrero, decreased by 19% to 7,185 kg of gold from 8,848 kg in 2015; the company stated that the decrease was also likely the result of mining lower grade ore. As of December 31, 2015, total proven and probable mineral reserves at the Los Filos Mine were reported as 41 Mt at an average grade of 1.12 g/t gold (Goldcorp Inc., 2016a, p.4, 62, 65; 2016b; Camara Minera de Mexico S.A., 2017, p. 218–219; Secretaría de Economia, 2018, p. 32).

Iron and Steel.—Leading iron ore producers in Mexico included ArcelorMittal Holdings AG of Luxembourg, Minera del Norte, S.A. de C.V. (a subsidiary of Altos Hornos de Mexico S.A.B. de C.V.), and Consorcio Minero Benito Juarez Peña Colorada S.A. de C.V. In 2016, Mexico was ranked 13th among the world's leading producers of crude steel and 2d among Latin America's leading producers. According to the Camara Nacional de la Industria de Hierro y del Acero [National Chamber of the Iron and Steel Industry], in 2016, steel production increased by 3.2% compared with that of 2015. In 2016, The country had an installed capacity of 29.2 Mt/yr of raw (crude) steel production and produced 18.8 Mt. The State of Coahuila was ranked first among the country's raw-steel-producing States, accounting for about 29% of the quantity produced, followed by the States of Michoacan (18%), Nuevo Leon (16%), Guanajuato (11%), Veracruz (7%), and San Luis Potosi (6%) (Camara Nacional de la Industria de Hierro y del Acero, 2016, p. 3, 6, 8–11; World Steel Association, 2017, p. 9).

Lead and Zinc.—The Peñasquito Mine, which was owned by Goldcorp, was the leading producer of lead, by tonnage produced, in the country; in 2016, the mine produced 49,600 t of lead. The Fresnillo and El Saucito Mines, both owned by Fresnillo plc, were the second- and third-ranked producers of mined lead, by tonnage, producing 21,330 t and 20,940 t, respectively, in 2016. All these mines were polymetallic mines, and the main metal being mined was not lead but, rather, gold, silver, or zinc. According to Industrias Peñoles, which was one of the leading producers of lead and zinc, the Velardeña Mine accounted for about 30% of the company's zinc production and 4% of the company's lead production. The Velardeña Mine, which is located in the State of Durango, was the second-ranked zinc mine in the country. In 2016, Velardeñas's production

of zinc was 85,800 t. The leading zinc-producing mine in the country was Peñasquito; this mine produced 119,500 t of zinc in 2016. As of December 2015, proven and probable mineral reserves at Velardeña were reported as 31.3 Mt at average grades of 23.2 g/t silver, 0.18 g/t gold, 3.86% zinc, 0.38% lead, and 0.21% copper (Fresnillo plc, 2016, p. 52; Industrias Peñoles, S.A.B. de C.V., 2017, p. 2, 27, 29, 42; Secretaría de Economia, 2018, p. 35, 36).

Silver.—In 2016, the Saucito Mine was Mexico's leading silver mine by quantity of production, accounting for 23.9% of Mexico's total production of silver. The Peñasquito Mine was the second-ranked silver mine in the country, producing 19.5% of total silver production, followed by the Fresnillo Mine, with 17.3% of total production. The San Jose Mine, owned by Fortuna Silver Mines Inc. of Canada, produced 6.7% of Mexico's silver production. The Saucito, the Peñasquito, and the Fresnillo Mines are all located in the State of Zacatecas, and the San Jose Mine is located in the State of Oaxaca. As of December 31, 2015, measured and indicated mineral resources at the Saucito Mine were reported as 14.61 Mt at average grades of 334 g/t silver, 1.93 g/t gold, 3.07% zinc, and 1.57% lead, and inferred mineral resources were reported as 26.49 Mt at average grades of 255 g/t silver, 1.05 g/t gold, 1.68% zinc, and 0.95% lead. Proven and probable reserves were reported as 12.98 Mt at average grades of 313 g/t silver, 1.75 g/t gold, 2.93% zinc, and 1.49% lead. The Fresnillo underground mine, which was one of the world's oldest polymetallic mines, began operating in 1554. In 2015, measured and indicated mineral resources at Fresnillo were estimated to be 33.3 Mt at average grades of 397 g/t silver, 0.85 g/t gold, 3.34% zinc, and 1.67% lead, and inferred mineral resources were reported as 31.38 Mt at average grades of 319 g/t silver, 0.70 g/t gold, 2.45% zinc, and 1.24% lead. Proven and probable reserves were reported as 21.17 Mt at average grades of 296 g/t silver, 0.77 g/t gold, 3.53% zinc, and 1.75% lead (Fresnillo plc, 2016, p. 1, 3, 15, 20, 50, 52, 225, 229; Camara Minera de Mexico, 2017, p. 222–223; Secretaría de Economia, 2018, p. 33).

Industrial Minerals

Clay (Kaolin).—In 2016, the production of kaolin in Mexico increased by 67% compared with that of 2015 and the value of production increased by 71.4% compared with that of 2015. The increase was due to an increase in prices and international and local demand for kaolin. Mexico had been producing at lower levels than in previous years owing to a decrease in the price of kaolin on the international markets. Kaolin in Mexico was produced principally in, in order of volume of production, the States of Michoacan, Chihuahua, Veracruz, and Queretaro (Camara Minera de Mexico, 2017, p. 251).

Phosphate Rock.—The production of phosphate rock in Mexico increased by 50.8% in 2016 compared with that of 2015, and the value of production increased by 74.4%. These increases were due to the increase in the international price of phosphate rock, which is used for the production of fertilizers and other industrial applications. The largest phosphate rock mine, in terms of quantity of production, is located in the State of Baja California Sur (Camara Minera de Mexico, 2017, p. 253).

Mineral Fuels

Crude Petroleum and Natural Gas.—According to PEMEX, as of January 1, 2017, proved crude petroleum reserves were estimated to be about 6.5 billion barrels (Gbbl), of which 4.9 Gbbl was located offshore and 1.6 Gbbl was located onshore. Proved natural gas reserves were estimated to about 476 billion cubic meters (reported as 16,817 billion cubic feet), of which 58% consisted of associated gas and the remaining 42% consisted of nonassociated gas. About 57% of the proved natural gas reserves were located onshore and about 43% were located offshore (Petróleos Mexicanos S.A. de C.V., 2017, p. 25–26).

In 2016, PEMEX reported that it had produced an average of 2,154,000 barrels per day (bbl/d) of crude petroleum in 2016 compared with 2,267,000 bbl/d in 2015; 1,103,000 bbl/d consisted of heavy crude petroleum; 785,000 bbl/d, of light crude petroleum; and 266,000 bbl/d, of extra light crude petroleum. The company divides Mexico in three regions: Marine, North, and South. The Marine region accounted for 77% of the total production; followed by the Southern region, which accounted for 17%; and the Northern region, which accounted for 5%. The company reported that the decrease in crude petroleum production was mainly attributed to the decrease in the production of heavy crude petroleum from the Cantarell field, as well as production of extra light crude petroleum from the Pijije, the Sen, and the Terra fields, and production of light crude petroleum from the Cantarell, the Bellota-Jujo, and the Litoral de Tabasco fields (Petróleos Mexicanos S.A. de C.V., 2018a–d).

In 2013, in an effort to address the decreases in petroleum production, the Government enacted constitutional reforms that ended the 75-year monopoly of PEMEX and opened the industry to foreign investments. As part of this effort, in 2014, the Ministry of Energy announced an estimate of the areas that were offered as part of the Round One process, which included onshore conventional fields, shallow waters, fields rich in extra-heavy petroleum, and the Chicontepec fields, as well as areas with conventional and unconventional prospective resources. Total prospective resources in 2014 (exploration) amounted to 14,606 million barrels (Mbbl) of petroleum equivalent, and proven and probable reserves (extraction) amounted to 3,882 Mbbl of petroleum equivalent. The consortium made up of Premier Oil plc of the United Kingdom; Sierra Oil & Gas, S. de R.L. de C.V., and Talos Energy LLC of the United States, was awarded Blocks 2 and 7, which are located in the Southeastern basins. Block 2 covers an area of about 194 square kilometers (km^2), and the area's prospective resources were estimated to be about 142 Mbbl of petroleum equivalent. Block 7 has an area of about 465 km^2, and the area's prospective resources were estimated to be about 102 Mbbl of petroleum equivalent. Talos Energy was the operator and held 45% interest in the two blocks. Sierra Oil & Gas and Premier Oil held the remaining 45% and 10% interests, respectively (Comision Nacional de Hidrocarburos 2015d; Premier Oil plc, 2015; Talos Energy LLC, 2015; U.S. Energy Information Administration, 2017).

In October 2015, the Comision Nacional de Hidrocarburos [National Hydrocarbons Commission] announced the results of its second auction phase of Round One, which included five areas located in the shallow waters of the Gulf of Mexico in the Southeastern basins. Eni International B.V. of Italy was awarded area 1, which included the Mizton, the Amoca, and the Tecoalli fields. The fields had estimated proven and probable reserves of 107 Mbbl of light crude and 2.0 billion cubic meters of natural gas, and they cover an area of about 67 km^2; the hydrocarbons are found in Pliocene sands in water 33 meters (m) deep. The consortium made up of Pan American Energy LLC of Argentina and E&P Hidrocarburos y Servicios S.A. de C.V. was awarded area 2, which includes the Hokchi field and covers an area of 40 km^2. The Hokchi field had estimated proven and probable reserves of 61 Mbbl of light crude and 820 million cubic meters of natural gas found in Tertiary sands in water 28 m deep. Also, the consortium of Fieldwood Energy LLC of the United States and Petrobal, S.A.P.I de C.V. was awarded Area 4 (the Ichalkil and the Pokoch fields), which covers an area of 58 km^2 and had estimated proven and probably reserves of 68 Mbbl of light crude and 2.6 billion cubic meters of natural gas found in Cretaceous and Jurassic limestone in water 45 m deep (Comision Nacional de Hidrocarburos 2015a–c, e).

In December 2015 and January 2016, the Comision Nacional de Hidrocarburos awarded 25 onshore exploration fields in its third auction phase of Round One. The awarded companies were Compañía Petrolera Perseus, S.A. de C.V. (for the Fortuna Nacional and the Tajón fields); Consorcio Manufacturero Mexicano, S.A. de C.V. (the Calibrador and the Mareógrafo fields); Construcciones y Servicios Industriales Globales, S.A. de C.V. (the Duna field); Diavaz Offshore, S.A.P.I. de C.V. (the Barcodón and the Catedral fields); Grupo Diarqco, S.A. de C.V. (the Calicanto and the Mayacaste fields); Renaissance Oil Corp. S.A. de C.V. of Canada (the Malva, the Mundo Nuevo, and the Topén fields); Sarreal, S.A. de C.V. (the San Bernardo field); Servicios de Extracción Petrolera Lifting de México, S.A. de C.V. (the Cuichapa-Poniente field); Strata Campos Maduros, S.A.P.I. de C.V. (the Carretas, the Peña Blanca, and the Ricos fields); the consortium of Canamex Dutch B.V. of the Netherlands, Perfolat de México, S.A. de C.V., and American Oil Tools S. de R.L. de C.V. (the Moloacán field); the consortium of Geo Estratos, S.A. de C.V., and Geo Estratos Mxoil Exploración y Producción, S.A.P.I. de C.V. (La Laja, the Paso de Oro, the Pontón, and the Tecolutla fields); the consortium of Grupo R Exploración y Producción, S.A. de C.V., and Constructora y Arrendadora México, S.A. de C.V. (the Secadero field); the consortium of Roma Energy Holdings, LLC of the United States, Tubular Technology, S.A. de C.V., and Gx Geoscience Corporation, S. de R.L. de C.V. (the Paraiso field); and the consortium of Sistemas Integrales de Compresión, S.A. de C.V., Nuvoil, S.A. de C.V., and Constructora Marusa, S.A. de C.V. (the Benavides-Primavera field) (Comision Nacional de Hidrocarburos, 2015f; Petróleos Mexicanos S.A. de C.V., 2017, p. 23–24).

Outlook

Mexico's economy is expected to continue to grow. According to the Government, this growth will most likely be at an average rate of about 3% per year but will depend on the economic growth and health of the economy of the United States, as the economy of Mexico—and principally its mineral industry—are tied to the economic performance of the United States. The growth projected by the Government is moderate; this estimation is most likely due to the economic conditions that are currently affecting the country and will be sustainable only if the current exchange rate conditions remain favorable for exports and foreign direct investment.

Production of metals and precious metals will likely continue to be the most profitable part of the Mexican mineral industry. The United States and Canada are likely to continue to have major involvement in the country's mining projects, as they are important partners in several investment projects. Based on the country's likely trade trends, copper, gold, lead, silver, and zinc are likely to be the leading mineral exports in 2017, and aluminum, copper, coal, and iron ore are likely to still be the leading mineral imports. The opening of the petroleum and gas sector to foreign direct investment is likely to increase the production of oil and gas in the medium term and to increase private participation in the sector.

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TABLE 1
MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, gross weight, unless otherwise specified)

Commodity[2, 3]		2012	2013	2014	2015	2016
METALS						
Antimony, mine Sb content[4]		169	294	270 e	NA	63
Bauxite		96,000	--	--	--	--
Bismuth, refinery		798 r	825 r	864 r	603 r	539
Cadmium, refinery, primary, metal		1,482	1,451	1,409	1,283	1,188
Copper:						
Mine, Cu content, concentrate		342,000 e	317,000 e	327,000 e	379,000 r, e	529,000
Leaching, electrowon		158,000	162,000 r	188,000	216,000 r	223,400
Smelter:						
Primary		256,000 r, e	215,000 e	258,000 r, e	256,300 r, e	260,000 e
Secondary		5,000 e	5,000 e	5,000 e	5,000 e	5,000 e
Refinery:						
Primary		214,000 e	188,000 e	205,400 e	205,400 e	233,100
Secondary		5,000 e	5,000 e	5,000 e	5,000 e	5,000 e
Ferroalloys, ferromanganese		61,845	60,675	67,507 r	55,919 r	84,529
Gold:						
Mine, Au content	kilograms	102,802	119,774	117,771	134,758 r	132,413
Refinery	do.	38,926	35,985	32,808	46,769	47,526
Iron ore, mine:						
Gross weight		14,915	18,840	16,628	13,462	12,089
Fe content	kilograms	9,320	11,780	10,400	8,414	6,970
Iron and steel:						
Direct-reduced iron	thousand metric tons	5,586	6,100	5,976	5,499 r	5,306
Pig iron	do.	4,611 e	4,910 e	5,116	4,573	4,476
Raw steel	do.	18,073	18,200 r, e	18,900 r, e	18,218 r	18,809
Products, rolled[5]	do.	16,093	16,357	17,346	17,573 r	18,697
Lead:						
Mine, Pb content		238,091	253,361	250,462	263,772	241,271 r
Refinery:						
Primary		129,000 e	121,000 e	118,000 r, e	102,213 r	94,725
Secondary		255,000 e	250,000 e	245,000 e	230,000 r, e	230,000 e
Manganese:[6]						
Mine:						
Gross weight		511,000 r	580,309	652,465 e	600,000 e	600,000 e
Mn content		188,294	211,559	235,686	217,466	205,645
Silicomanganese		161,221	158,000 r, e	165,852	139,000 e	134,251 r
Mercury, Hg content		235	266	300 e	300 e	300
Molybdenum, mine, Mo content		11,366	12,562	14,370	12,279	11,896
Silver:						
Mine, Ag content:	kilograms	5,358,195	5,820,991	5,765,662	5,955,151 r	5,408,521
Refinery, primary:						
Mixed gold and silver bars	do.	923,056	1,322,059	1,091,439	1,244,783 r	685,195
Metallurgical products	do.	2,329,963	2,318,718	2,272,620	2,237,672 r	2,109,248
Zinc:						
Mine, Zn content		660,349	642,542	659,878	786,774 r	661,188
Smelter, primary		323,569	322,781	321,000	454,626 r	384,247
INDUSTRIAL MINERALS						
Barite		139,997	343,585	420,000 e	265,598	150,970
Cement, hydraulic[7]	thousand metric tons	36,184	34,612	36,597	39,613 r	40,577
Clay:						
Bentonite		956,224	826,886	474,025	294,236 r	109,176
Common clay		8,436,673	7,948,840	8,552,374	7,651,234 r	8,068,940
Fuller's earth		227,496	306,507	245,147	108,215 r	111,713
Kaolin		163,148	379,110	342,917	155,100 r	259,272
Diatomite		84,500 r, e	87,463	87,849	89,810	96,686

See footnotes at end of table.

TABLE 1—Continued
MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, gross weight, unless otherwise specified)

Commodity[2, 3]		2012	2013	2014	2015	2016
INDUSTRIAL MINERALS—Continued						
Feldspar, mine		380,441	164,484	150,726	159,372	122,176
Fluorspar:						
Acid grade	thousand metric tons	749	700 r	632	624 r	593
Metallurgical grade	do.	487	503	476	400 e	395
Graphite, natural, amorphous[8]		19,730	21,163	22,018	6,524 r	3,839
Gypsum, including anhydrite		4,692,510	5,090,863	5,495,594	5,456,829 r	5,402,691
Magnesite		44,700	45,281	46,942	47,210	50,000 e
Magnesium compounds, magnesia[9]		88,400	86,000	85,500	77,800	78,000 e
Mica, all grades		160 e	160 e	160 e	160 e	145
Nitrogen, N content, ammonia		771,858	922,000 r	869,000 r	575,000 r	533,000
Perlite		29,950	27,200	26,000	13,000 r	19,000
Phosphate rock:						
Gross weight	thousand metric tons	1,725	2,217	1,663	1,930 r	2,909
P_2O_5 content	do.	483	620	466	540	815
Salt, all types	do.	8,730	9,461	10,251	9,088	8,907
Soda ash, synthetic		290,000	290,000	290,000	290,000	290,000 e
Sodium compounds, sulfates, natural, bloedite		638,000	641,500	637,141	732,600	750,021
Stone, sand and gravel:						
Sand and gravel, construction:						
Gravel	thousand metric tons	71,870	65,874	93,448	109,003 r	98,399
Sand	do.	92,374	90,723	108,765	115,565 r	96,739
Silica, mine, quartz and quartzite		3,592,813	2,937,949	2,548,336	1,750,548 r	2,398,971
Stone, crushed:						
Calcite, common		4,694,156	5,168,984	4,790,427	3,947,721 r	3,623,086
Dolomite		2,111,114	8,756,485	8,277,102	7,703,900 r	7,236,944
Limestone	thousand metric tons	55,725	52,289	250,224 r	569,505 r	361,704
Marble		3,820,517	3,569,140	7,271,993 r	1,571,288 r	2,162,521
Strontium, celestite		46,192	67,778	64,931	79,022	33,230
Sulfur, S content[10]		1,010,875 r	1,025,841 r	992,939 r	858,127 r	673,285
Talc		463,214	846,813	752,077	20,452 r	11,392
Vermiculite, elemental content		500	425	226	299 r	310
Wollastonite		55,204	57,302	54,579	57,451	63,683
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand metric tons	--	--	55	60	60
Bituminous, subbituminous	do.	13,656	13,065	13,435	7,245	8,130
Lignite	do.	--	--	570	1	NA
Metallurgical	do.	4,903	4,613	4,733	4,769	4,235
Coke, breeze and metallurgical[11]	do.	2,165	2,217	2,230	1,779	1,368
Natural gas:[12]						
Gross volume	million cubic meters	70,084	70,370	68,700 e	67,300 e	59,864
Marketable	do.	37,497 r	38,170 r	37,621 r	35,120 r	31,492
Petroleum:[12]						
Condensate, natural gas liquids	thousand 42-gallon barrels	133,225	132,130	132,860	118,260	111,325
Crude	do.	930,020	920,530	886,585	827,455	786,210
Refinery:						
Asphalt	do.	8,432	6,826	8,724	6,446	6,500
Distillate fuel oil, including diesel	do.	109,354	114,391	104,609	100,241	78,913
Gasoline, motor	do.	152,607	159,615	153,884	139,211	118,735
Jet fuel	do.	20,659	22,192	19,491	17,461	15,622
Liquefied petroleum gas	do.	65,335 r	75,227 r	74,391 r	63,693 r	58,108
Lubricants	do.	1,424	1,606	1,351	835	835
Refinery fuel, and losses	do.	20,915	27,631	24,346	24,000 e	24,000 e
Residual fuel oil	do.	99,791	98,112	94,608	86,647	83,266

See footnotes at end of table.

TABLE 1—Continued
MEXICO: PRODUCTION OF MINERAL COMMODITIES[1]

[e]Estimated. [r]Revised. NA Not available. -- Zero.
[1]Table includes data available through December 7, 2017. All data are reported unless otherwise noted. Estimated data are rounded to no more than three significant digits.
[2]In addition to the commodities listed, secondary aluminum and additional types of crude construction materials may have been produced in Mexico, but available information was inadequate to make reliable estimates of output.
[3]Sources: The Instituto Nacional de Estadistica y Geografia and the Servicio Geologico Mexicano, Secretaria de Economia.
[4]Sb content of antimonial lead.
[5]Includes flat and long hot-rolled and seamless pipes products.
[6]Mostly oxide nodules; includes smaller quantities of direct-shipping carbonates and oxide ores for metallurgical and battery applications.
[7]Includes gray and white portland and masonry cement.
[8]Figures based on U.S. import data from the U.S. Census Bureau.
[9]Reported by Industrias Peñoles, S.A. de C.V. as the only major producer. Includes caustic, electromelt, hydroxide, and refractory.
[10]Source: Statistical Yearbook 2016 by Petroleos Mexicanos S.A. de C.V.
[11]Includes coke made from imported metallurgical coal.
[12]Source: U.S. Department of Energy.

TABLE 2
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity[e]
Antimony	United States Antimony Corp., 100%	San Jose (Wadley) Mines, S.L.P.	365.
Barite	Baramin S.A. de C.V. (private Mexican, 100%)	Galeana and La Huiche Mines, Galeana N.L.	NA.
Do.	Barita de Santa Rosa, S.A. de C.V. (private Mexican, 100%)	Muzquiz, Coah.	256.
Do.	Barita de Sonora, S.A. (Grupo Acerero del Norte, S.A. de C.V., 100%]	Mazatan, Son.	219.
Do.	Minerales y Arcillas, S.A. de C.V. (private Mexican, 100%)	San Francisco del Huerto Mine in San Pedro, Coah.; La Escondida and Angelita Mines, N.L.	55.
Bismuth metric tons	Metalurgica Met-Mex Peñoles, S.A.B. de C.V. (Industrias Peñoles S.A.B. de C.V., 100%)	Torreon, Coah.	1,440.
Cement	CEMEX México (Cementos Mexicanos, S.A.B. de C.V., CEMEX 100%)	Ensenada, B.C.N.; Torreon, Coah.; Barrientos, D.F.; Arotonilco and Huichapan, Hgo.; Guadalajara and Zapotilic, Jal.; Hidalgo and Monterrey, N.L.; Tepeaca, Pue.; Tamuin and Valles, S.L.P.; Hermosillo and Yaqui, Son.; and Merida,Yuc.	29,300.
Do.	Holcim Mexico S.A. de C.V. (Holcim Group, 100%)	Acapulco, Gro.; Apaxco, Mex.; Hermosillo; Son.; Macuspana, Tab.; Orizaba,Ver.; Ramos Arizpe, Coah.; and Tecoman, Col.	12,200.
Do.	Corporación Moctezuma, S.A.B. de C.V. (Cementos Molins S.A., 50%, and Buzzi Unicem SpA, 50%)	Apazapan, Ver.; Cerritos, S.L.P.; and Tepetzingo, Mor.	6,400.
Do.	Cooperativa La Cruz Azul, S.C.L. (private Mexican, 100%)	Cruz Azul, Hgo; and Lagunas, Oax.	5,000.
Do.	Grupo Cementos de Chihuahua, S.A.B. de C.V.	Chihuahua, Cuidad Juarez, and Samalayuca, Chih.	2,500.
Do.	Cementos Fortaleza S.A. de C.V. (Elementia, S.A. de C.V., 100%)	El Palmar, Tula, and Vito, Hgo.	2,000.
Coal	Minera Carbonífera Río Escondido, S.A. [Altos Hornos de México (AHMSA), 100%]	Mina I, Mina II, and Tajo I at Nava and Piedras Negras, Coah.	6,500.
Do.	Altos Hornos de Mexico, S.A.B. de C.V. (Grupo Acerero del Norte, S.A. de C.V., 78.9%)	Mines at Coah. and coking plant at Monclova, Coah.	3,000.
Do.	Carbonífera de San Patricio, S.A. de C.V. (private Mexican, 100%)	Progreso, Coah.	1,314.
Do.	Industrial Minera México, S.A. de C.V. (IMMSA) (Grupo México, S.A.B. de C.V., 90%)	Nueva Rosita, Coah.	1,500.
Copper	Mexicana de Cobre, S.A. de C.V. (Grupo México, S.A.B. de C.V., 90%)	La Caridad Mine, smelter, refinery, SX-EW[2] plant at La Caridad, Son.	170 concentrates 300 smelter, 25 SX–EW,[2] 300 refinery.
Do.	Mexicana de Cananea, S.A. de C.V. (Grupo México, S.A.B. de C.V., 90%)	Buenavista del Cobre Mine and SX-EW[2] plant at Cananea, Son.	150 concentrates 150 SX–EW.[2]
Do.	Minera y Metalurgica El Boleo S.A. P. I. de C.V. (MMB) (Korea Resources Corp., 90%, and Baja Mining Corp., 10%)	Boleo Mine and SX-EW[2] plant in B.C.S.	20 concentrates 20 SX–EW.[2]
Do.	Cobre del Mayo S.A. de C.V. (Invecture Group S. A. de C. V., 100%)	Piedras Verdes Mine and SX-EW[2] plant, Son.	20 concentrates 32 SX–EW.[2]
Do.	Cia. Minera La Parreña de C.V (Industrial Peñoles, S.A.B. de C.V., 100%)	Milpillas Mine and SX-EW[2] plant at Santa Cruz, Son.	45 SX–EW.[2]
Do.	Minera María S.A. de C.V. (Minera Frisco S.A.B. de C.V, 99.6%)	Maria Mine and SX-EW[2] plant at Cananea, Son.	20 SX–EW.[2]
Do.	Red Tiger Mining Inc., 100%	Luz de Cobre Mine and SX-EW[2]plant at San Antonio del Huerta, Son.	8 SX–EW.[2]
Ferroalloys	Compañía Minera Autlán, S.A.B. de C.V. (Grupo Ferrominero, S.A. de C.V., 54%)	Plant in Tamos, Ver.	140.

See footnotes at end of table.

TABLE 2—Continued
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity[e]
Ferroalloys—Continued		Compañía Minera Autlán, S.A.B. de C.V. (Grupo Ferrominero, S.A. de C.V., 54%)	Plant in Teziutlan, Pue.	38.
Do.		do.	Plant in Gomez Palacio, Dgo.	35.
Fluorspar		Mexichem Fluor, S.A. de C.V. (Mexichem, S.A.B. de C.V., 100%)	Las Cuevas Mine, Zaragoza, S.L.P.	1,200.
Do.		Fluorita de México, S.A. de C.V. (Mexichem, S.A.B. de C.V., 100%)	La Sabina Mine, Muzquiz, Coah.	100.
Gold, mine	kilograms	Fresnillo plc. (Industrias Peñoles, S.A.B. de C.V., 75%)	Cienega, Dgo.; Fresnillo, Zac.; La Herradura, Son.: Noche Buena, Son.; and Saucito, Zac.	23,700.
Do.	do.	Minera Peñasquito S.A. de C.V. (Goldcorp Inc., 100%)	Peñasquito Mine, Zac.	27000
Do.	do.	Desarrollos Mineros San Luis S.A. de C.V. (Goldcorp Inc., 100%)	Los Filos Mines, Gro.	10,000.
Do.	do.	Torex Gold Resources Inc., 100%	El Limon-Guajes (ELG) Mine, Gro.	10,200.
Do.	do.	Minas de las Altas Pimerias, S.A. de C.V. (Goldcorp Inc., 100%)	El Sauzal Mine, Chih.	8,500.[3]
Do.	do.	Minera Frisco S.A.B. de C.V., 100%	El Coronel Mine, Zac.	5,300.
Do.	do.	Primero Empresa Minera, S.A. de C.V. (Primero Mining Corp., 100%)	San Dimas, Dgo.	4,500.
Do.	do.	Agnico Eagle Mines Ltd., 100%	Pinos Altos Mine, Chih.; and La India Mine, Son.	4,800.
Do.	do.	Alamos Gold Inc., 100%	Mulatos Mine, Son.	4,300.
Do.	do.	Timmins Gold Corp., 100%	San Francisco Mine, Son.	3,500.
Do.	do.	Minera Mexicana La Ciénega, S.A. de C.V. (Fresnillo plc.,100%)	La Cienega Mine, Dgo.	3,400.
Do.	do.	Ocampo Mining, S.A. de C.V. (Minera Frisco S.A.B. de C.V., 100%)	Ocampo Mine, Chih.	3,300.
Do.	do.	Yamana Gold Inc., 100%	Las Mercedes Mine, Son.	3,200.
Do.	do.	GoGold Resources Inc., 100%	Santa Gertrudis Mine, Son.	1,600.
Gold, refined	do.	Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles S.A.B. de C.V., 100%)	Torreon, Coah.	53,900.
Graphite		Grafitos Mexicanos, S.A. de C.V., 100%	Lourdes, Topiyeca, and San Juan Mines, Son.	60.
Gypsum		Cía. Occidental Mexicana, S.A. de C.V. (private Mexican, 51%, and Domtar, Ltd., 49%)	Santa Rosalia on San Marcos Island, B.C.S.	2,500.
Iron ore		Altos Hornos de Mexico, S.A.B. de C.V. (Grupo Acerero del Norte, S.A. de C.V., 78.9%)	La Perla Mine, Chih.; Hercules Mine, Coah.; and Cerro de Mercado Mine, Dgo.	5,000.
Do.		Consorcio Minero Benito Juarez Peña Colorada S.A. de C.V. (ArcelorMittal Holdings AG, 50%, and Ternium S.A., 50%)	Peña Colorada Mine, Col.	4,500.
Do.		ArcelorMittal Mexico S.A. de C.V. (ArcelorMittal Holdings AG, 100%)	El Volcan Mine, Son.	3,600.
Do.		ArcelorMittal Las Truchas, S.A. de C.V. (ArcelorMittal Holdings AG, 100%)	Las Truchas Mine, Mich.	2,600.
Lead		Industrias Peñoles S.A.B. de C.V. (private Mexican, 100%)	Mines at Bismark, Chih.; Francisco I. Madero, Naica, Chih.; and Sabinas, Dgo.	51.
Do.		Industrial Minera México, S.A. de C.V. (Grupo México, S.A.B. de C.V., 90%)	Charcas, S.L.P.; Santa Barbara and Santa Eulalia, Chih.; and San Martin, Zac.	35.
Do.		Fresnillo plc (Industrias Peñoles, S.A.B. de C.V., 75%)	Mines at Fresnillo, Zac., La Cienega, Dgo.; and Saucito, Zac.	43.
Do.		Minera San Francisco del Oro, S.A. de C.V. (Minera Frisco, S.A.B. de C.V., 99.6%)	San Francisco del Oro Mine, Chih.	13.
Do.		Minera Tayahua, S. A. de C. V. (Minera Frisco, S.A.B. de C.V., 89.9%)	Tayahua Mine, Zac.	10.
Do.		Minera Tizapa S.A. de C.V. (Industrias Peñoles S.A.B. de C.V., 51%; Dowa Mining Co., 39%; Sumitomo Corp., 10%)	Tizapa Mine, Mex.	10.
Do.		Metalurgica Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles S.A.B. de C.V., 100%)	Torreon, Coah.	180 refined lead.

See footnotes at end of table.

TABLE 2—Continued
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity[e]
Manganese	Cía. Minera Autlán, S.A.B. de C.V. (Grupo Ferrominero, S.A. de C.V., 81.75%, and private Mexican, 18.25%)	Molango, Naopa, and Nonoalco Mines, Hgo.	600 ore and concentrate.
Molybdenum	Mexicana de Cobre, S.A. de C.V. (Grupo México, S.A.B. de C.V., 90%)	La Caridad Mine and molybdenum plant, Son.	11.
Do.	Mexicana de Cananea, S.A. de C.V. (Grupo México, S.A.B. de C.V., 90%)	Buena Vista del Cobre Mine and molybdenum plant, at Cananea, Son.	2.
Petroleum thousand barrels per day	Petróleos Mexicanos S.A. de C.V. (PEMEX) (Government, 100%)	Comalcalco, Poza Rica, Ver., and Gulf of Campeche, Cam., Districts	3,500.
Petroleum products do.	do.	Cadereyta, N.L.; Madero, Tamps.; Minatitlan, Ver.; Salamanca, Gto.; Salina Cruz, Oax.; and Tula de Allende, Hgo.	1,700.
Phosphate rock	Petróleos Mexicanos, S.A. de C.V. (PEMEX) Fertilizantes, 100%)	San Juan de la Costa Mine, B.C.S.	NA.
Salt	Exportadora de Sal, S.A. de .C.V. (Government, 51%, and Mitsubishi Corp. 49%)	Solar salt complex at Guerrero Negro, B.C.S.	9,500.
Silver, mine kilograms	Fresnillo plc. (Industrias Peñoles S.A.B de C.V., 75%)	Fresnillo Mine, Zac.	1,100,000.
Do. do.	Minera Peñasquito S.A. de C.V. (Goldcorp Inc., 100%)	Peñasquito Mine, Zac.	794,000.
Do. do.	Fresnillo plc. (Industrias Peñoles S.A.B de C.V., 75%)	Saucito Mine, Zac.	567,000.
Do. do.	Industrial Minera México, S.A. de C.V. (Grupo México, S.A.B. de C.V., 90%)	Charcas, S.L.P.; San Martin Mine, Zac.; Santa Barbara, Chih; Santa Eulalia, Chih.; and Taxco, Gro.	336,000.
Do. do.	Pan American Silver Corp., 100%	La Colorada Mine, Zac.; and Alamo Dorado Mine, Son.	283,000.
Do. do.	Coeur Mexicana S.A. de C.V. (Coeur Mining, Inc., 100%)	Palmarejo Mine, Chih.	190,000.
Do. do.	Primero Empresa Minera, S.A. de C.V. (Primero Mining Corp. 100%)	San Dimas Mine, Dgo.	170,000.
Do. do.	Fortuna Silver Mines Inc., 100%	San Jose Mine, Oax.	125,000.
Do. do.	Minera Mexicana La Ciénega, S.A. de C.V. (Fresnillo plc.,100%)	La Cienega Mine, Dgo.	114,000.
Do. do.	Minera Tizapa S.A. de C.V. (Industrias Peñoles S.A.B. de C.V., 51%; Dowa Mining Co., 39%; Sumitomo Corp., 10%)	Tizapa Mine, Mex.	150,000.
Do. do.	Co. Minera Sabinas, S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 100%)	Sabinas Mine, Zac.	140,000.
Do. do.	GoGold Resources Inc., 100%	Parral tailings project, Chih.	34,000.
Do. do.	Golden Minerals Co., 100%	Velardeña, Dgo.	16,000.[4]
Do. do.	Argonaut Gold Inc., 100%	La Colorada Mine, Son.	10,000.
Silver, refined do.	Metalurgica Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles S.A.B. de C.V., 100%)	Torreon, Coah.	3,350,000.
Sodium sulfate	Industrias Magnelec, S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 100%)	Química del Rey plant, Laguna del Rey, Coah.	780.
Steel	ArcelorMittal Lazaro Cardenas S.A de C.V. (ArcelorMittal Holdings AG, 100%)	Facilities at Lazaro Cardenas, Mich.	5,300 steel, 4,000 pellet.
Do.	Altos Hornos de Mexico, S.A.B. de C.V. (Grupo Acerero del Norte, S.A. de C.V., 78.91%)	Steelworks at Monclova, Coah.	3,320 steel, 3,800 pellet.
Do.	Hylsa S.A. de C.V. (Ternium S.A., 88.72%)	Steel works and direct-reduction units at Monterrey, N.L., and Puebla, Pue.; pelletizing plant in Col. and El Encino, Jal.	3,100 steel, 1,500 pellet.
Do.	DEACERO, S.A. de C.V. (private Mexican, 100%)	Steelworks at Saltillo, Coah., and Celaya, Gto.	1,450.
Do.	Tubos de Acero de México, S.A. (Teranis S.A., 100%)	Veracruz, Ver.	1,000.

See footnotes at end of table.

TABLE 2—Continued
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2016

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities[1]	Annual capacity[e]
Strontium (celestite)	Minas de Celestita, S.A. de C.V.	Octubre Mine, Coah.	NA.
Sulfur	Petróleos Mexicanos, S.A. de C.V. (PEMEX) (Government, 100%)	Nationwide petroleum operations	890.
Wollastonite	Minera Roca Rodando S. de R.L. de C.V. (S&B Industrial Minerals S.A.)	Pilares Mine, Hermosillo, Son.	58.
Zinc	Industrias Peñoles S.A.B. de C.V. (private Mexican, 100%)	Mines at Bismark, Chih.; Francisco I. Madero, Naica, Chih.; Sabinas, Dgo.; and Velardeña, Dgo.	210.
Do.	Industrial Minera México, S.A. de C.V. (IMMSA) (Grupo México, S.A.B. de C.V., 90%)	Charcas, S.L.P.; Santa Barbara and Santa Eulalia, Chih.; and San Martin, Zac.	130.
Do.	Fresnillo plc (Industrias Peñoles, S.A.B. de C.V., 75%)	Mines at Fresnillo, Zac.; La Cienega, Dgo.; and Saucito, Zac.	48.
Do.	Minera Tayahua, S. A. de C. V. (Minera Frisco, S.A.B. de C.V., 89.9%)	Tayahua Mine, Zac.	40.
Do.	Minera Tizapa S.A. de C.V. (Industrias Peñoles S.A.B. de C.V., 51%; Dowa Mining Co., 39%; Sumitomo Corp., 10%)	Tizapa Mine, Mex.	38.
Do.	Minera San Francisco del Oro, S.A. de C.V. (Minera Frisco, S.A.B. de C.V., 99.6%)	San Francisco del Oro Mine, Chih.	23.
Do.	Metalurgica Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles S.A.B. de C.V., 100%)	Torreon, Coah.	270 refined zinc.
Do.	Industrial Minera México, S.A. de C.V. (IMMSA) (Grupo México, S.A.B. de C.V., 90%)	Zinc refinery at S.L.P.	105 refined zinc.

[e]Estimated. Do., do. Ditto. NA Not available.
[1]State abbreviations used in this table include the following: Baja California Norte (B.C.N.), Baja California Sur (B.C.S.), Campeche (Cam.), Chihuahua (Chih.), Coahuila (Coah.), Colima (Col.), Distrito Federal (D.F.), Durango (Dgo.), Guanajuato (Gto.), Guerrero (Gro.), Hidalgo (Hgo.), Jalisco (Jal.), Mexico (Mex.), Michoacan (Mich.), Morelos (Mor.), Nuevo Leon (N.L.), Oaxaca (Oax.), Puebla (Pue.), San Luis Potosi (S.L.P.), Sinaloa (Sin.), Sonora (Son.), Tabasco (Tab.), Tamaulipas (Tamps.), Veracruz (Ver.), Yucatan (Yuc.), and Zacatecas (Zac.).
[2]Solvent extraction-electrowinning.
[3]Closed.
[4]Suspended.