



2019 Minerals Yearbook

MEXICO [ADVANCE RELEASE]

THE MINERAL INDUSTRY OF MEXICO

By Alberto Alexander Perez

In 2019, Mexico's real gross domestic product (GDP) increased by 1.7% compared with that in 2018, and Mexico's average inflation for the year was about 2.8%. The country's nonfuel mineral sector accounted for 8.1% of the industrial sector's portion of the GDP, and 2.3% of the total GDP. Mexico was estimated to be the world's leading producer of silver, by volume, accounting for about 22% of world production. The country also ranked second among the world's leading producers of fluor spar (accounting for 16% of world production); third among the world's leading producers of celestite (18% of world production), sodium sulfate (5% of world production), and wollastonite (8.4% of world production); fifth among the world's leading producers of molybdenum (6% of world production), lead (5% of world production), bismuth (1.4% of world production), and cadmium (6% of world production); sixth among the world's leading producers of diatomite (4% of world production), magnesium sulfate (2% of world production), and zinc (5% of world production); seventh among the world's leading producers of barite (4% of world production); eighth among the world's leading producers gypsum (4% of world production), and salt (3% of world production); and ninth among the world's leading producers of copper (4% of world production) and gold (3% of world production) (Cámara Minera de México, 2020, p. 193; Servicio Geológico Mexicano, 2020, p. 14–17; Anderson, 2021; Bolen, 2021; Callaghan, 2021; Crangle, 2021a, b; Flanagan, 2021; Klochko, 2021; McRae, 2021a, b; Merrill, 2021; Ober, 2021; Polyak, 2021; Sangine, 2021; Sheaffer, 2021; Tolcin, 2021).

Mexico was the fourth-ranked producer of crude petroleum in the Americas, after the United States, Canada, and Brazil, and was a significant crude petroleum producer in the world. The country continued to be a large crude petroleum exporter in 2019; however, Mexico was a net importer of refined petroleum products. The United States imported 51% of Mexico's crude petroleum exports, making Mexico the United States' second-ranked source of crude petroleum imports after Canada (U.S. Energy Information Administration, 2020, p. 1–5).

Minerals in the National Economy

As reported by the Servicio Geológico Mexicano, in 2019, mining and processing of "metallic minerals" accounted for 8.1% of the industrial sector of the country, and 2.3% of the country's total GDP (Servicio Geológico Mexicano, 2020, p. 20, 37). The value of Mexico's mineral industry decreased by 5.9% compared with its value in 2018 owing mostly to the drop in the international prices of base metals and decreased production of precious metals in Mexico during 2019. Metallic minerals made up 40% of all mineral production, in terms of value, whereas "nonmetallic minerals" made up 60%. Construction aggregates accounted for a 40.4% share of the total value of nonfuel mineral production in 2019, followed by gold (11.9%), copper (8.5%), silver (8.1%), basalt (5.5%), lime

(5.4%), zinc (4.4%), iron ore and pellets (4.2%), andesite and industrial sand (2.1% each), lead (1.5%), molybdenum (1.2%) and gravel (1%) (Servicio Geológico Mexicano, 2020, p. 55).

In 2019, a total of 24,066 mining concessions were registered for an area of 168,300 square kilometers, which accounted for about 8.6% of the country's territory. The State of Chihuahua accounted for 75.9% of the country's total mineral output, in terms of value, whereas the State of Zacatecas accounted for 11.2%; the State of Sonora accounted for 6.5%, and the States of Durango and Guerrero, for 1.5% and 1.2%, respectively. The State of Chihuahua was the principal producer of nonfuel minerals, by value, producing (in decreasing order of the total value of production) gold, silver, lead, copper, zinc, iron ore, barite, kaolin, dolomite, and gypsum. The State of Zacatecas was the second-ranked producer of nonfuel minerals, by value, producing (in decreasing order of the total value of production) gold, silver, lead, copper, and zinc. The State of Sonora was the third-ranked producer of nonfuel minerals, by value, producing (in decreasing order of the total value of production), gold, silver, copper, molybdenum, graphite, barite, dolomite, silica sand, gypsum, wollastonite, and salt (Cámara Minera de México, 2020, p. 28; Servicio Geológico Mexicano, 2020, p. 25, 32).

In 2019, employment in the mineral- and metal-processing sector accounted for about 2% of Mexico's total workforce. The number of people employed in this sector in 2019 totaled 379,093, which was nearly the same as the number of people employed in the sector in 2018. Of this total, about 38% were employed in the processing of nonmetallic minerals; 32% worked in the metallic minerals industry; 20% worked in the mining and processing of metallic mineral ores; 10% worked in the mining of coal, graphite, and nonmetallic minerals; and 0.1% worked in the mining of salt (Cámara Minera de México, 2020, p. 16, 224–225).

In 2019, a total of 238 companies were involved in 1,177 mining projects in Mexico. Of these companies, 153 had their central offices in Canada and 32 were headquartered in the United States; 14, in China; and 9, in Australia; the remaining 29 projects were headquartered in other countries (Cámara Minera de México, 2020, p. 23–30).

Government Policies and Programs

In 2019, the most significant change in the mineral laws and regulations was the approval in October by the Mexican Congress of a reduction in the Shared Utility Right rate for the Government-owned petroleum company Petróleos Mexicanos, S.A. de C.V. (Pemex). The Shared Utility Right, which is a tax on the company's production earnings, would be reduced in 2020 to 58% from 65% and again, in 2021, to 54%. The company reported that these changes were essential to make financial resources available for exploration and to counterbalance the company's decrease in output from its operations in the Gulf of Mexico as well as to finance

the company's restructuring and modernization (Petróleos Mexicanos, S.A. de C.V., 2020, p. 12, 132).

On November 15, 2016, changes to the Hydrocarbon Law were published in the Official Journal of the Mexican Congress. The newly reformed law reaffirms that all hydrocarbon resources are considered to be the property of the Mexican people and makes clear 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 law also allows for new exploration and production contract schemes, such as the issuing of licenses, establishment of production-sharing and profit-sharing agreements, and granting of service contracts (Cámara de Diputados del H. Congreso de la Unión, 2016, p. 1, 4, 8). Under the revised law, Pemex is allowed the right of 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, p. 3).

In 2015, the Government enacted the Energy Reform Law in which Pemex was restructured into seven state-owned subsidiaries. These 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 allowed for private investment in newly formed subsidiaries, but petroleum production and ownership are retained by the Government (Petróleos Mexicanos, S.A. de C.V., 2017, p. 10–11).

Mexico's mineral sector is administered by the Secretaría de Economía [Ministry of Economy], and the energy sector is regulated by the Secretaría de Energía [Ministry of Energy] and the Comisión Nacional de Hidrocarburos [National Hydrocarbons Commission]. The Dirección General de Regulación 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 of the Constitution 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 and 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 may 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 (Mining Law Regulations), 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 (Cámara de Diputados del H. Congreso de la Unión, 2014b; 2014c, p. 1, 3, 11, 27).

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 a statement of agreement accepting the conditions established in Article 27 to the Secretaría de Relaciones Exteriores [Ministry of Foreign Affairs]. 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 (Cámara de Diputados del H. Congreso de la Unión, 2014a, p. 7).

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 (Comisión Nacional de Hidrocarburos, 2015; U.S. Energy Information Administration, 2017, p. 1–3).

Production

In 2019, production of vermiculite increased by 35.2% to an estimated 330 metric tons (t) from 244 t (revised) in 2018. Primary smelter production of zinc increased by 15.5%, probably owing to changes in either demand or international prices, and the production of antimony increased by 15.4% to an estimated 300 t from an estimated 260 t in 2018. Production of primary refined lead increased by 14.3%, and the production mined molybdenum increased by 9.8% compared with that in 2018. The production of acid-grade fluorspar increased in 2019 by 7.8% to an estimated 830,000 t from an estimated 770,000 t (revised) in 2018; the reason for this increase was not reported. Barite production increased by 4.9% to 384,150 t from 366,234 t (revised), and copper concentrate production increased by 1% to an estimated 535,000 t from 529,400 t (revised) in 2018. These increases were likely owing to increases in demand for these mineral commodities (table 1).

Decreases in production included that of ammonia, which was not produced in 2019 because of the suspension of activities at the Cosolecaque petrochemical plant owing to insufficient natural gas supplies and to required maintenance work.

Production of mercury decreased by 73.1% to 63 t; iron ore (gross weight), by 49.3% to 11.3 million metric tons (Mt) from 22.3 Mt in 2018; iron, by 49.1% to about 7.1 Mt; phosphate rock (gross weight), by 24.8% to 558,000 t; and phosphate rock (P₂O₅ content), by 23.8% to 160,000 t. These changes were most likely in response to decreased demand in the fertilizer industry. Production of perlite decreased by 24.2%; ferromanganese, by 23.5%; and mined cobalt (Co content), by 21.4%. Sulfur production decreased by 17.6% to 365,000 t from 443,000 t (revised); this decrease was most likely owing to the decrease in the production of crude steel and natural gas. The production of cement decreased by 10.2% to an estimated 43.4 Mt; and that of bismuth decreased by 9.9% to 300 t from 333 t. Pig iron decreased by 13.3% to 3,840,000 t, and raw steel production decreased by 8.0% to 18,595,000 t from 20,204,000 t (revised) in 2018. Bentonite production decreased by 5.6% to an estimated 250,000 t from 264,800 t (revised) in 2018, and mine production of zinc decreased by 2.1% to 676,677 t. 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, Goldcorp Inc. of Canada, Grupo México S.A.B. de C.V. (Grupo México), Industrias Peñoles, S.A.B. de C.V. (Industrias Peñoles), and Pan American Silver Corp. of Canada. Industrias Peñoles, through its subsidiary Metalúrgica Met-Mex Peñoles S.A.B. de C.V., was the leading producer of bismuth in the country. The refinery, which was 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 operated a solar salt complex, which was located in Guerrero Negro in the State Baja California Sur and 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., which was 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, and had the capacity to produce about 150,000 t/yr of wollastonite. 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 the 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, which is 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.

Mineral Trade

In 2019, Mexico's total exports represented 77.6% of the GDP. Mexico exported mainly vehicles and parts for vehicles,

machines for the automatic processing of data, crude petroleum, and industrial machinery. Mexico's principal mineral imports included refined petroleum, parts for vehicles, and integrated circuits (Servicio Geológico Mexicano, 2020, p. 27).

In 2019, metals accounted for 93.6% of the country's total exports and industrial minerals and fuels accounted for 6.4%. Precious metals made up 48.5% of metallic mineral exports, and industrial metals, 51.5%. Gold exports decreased by 39.8% compared with those in the previous year, and silver exports decreased by 32.2%. Lead exports decreased by 55.7% and zinc exports, by 86.6% (Servicio Geológico Mexicano, 2020, p. 28, 207).

In 2019, the country's major mineral export trade partner was the United States, which received 67.4% of Mexico's mineral exports, followed by China (27.2%), the Republic of Korea (2.7%), Hong Kong (1%), and Belgium (1%). The remainder was divided among several countries for which the exports received by each was less than 1% of Mexico's total mineral exports. Mexico's major import partners were, in descending order of value, the United States, which supplied 67.8% of Mexico's imports, China (4.9%), Canada (4%), the United Arab Emirates (3.6%), India (2.8%), and Russia (2.6%) (Servicio Geológico Mexicano, 2020, p. 212, 218).

Commodity Review

Metals

Antimony.—In May, United States Antimony Corp. (USAC) reported that it had doubled the capacity of its smelter in Madero, Coahuila, when it started up the No. 2 long rotary furnace (LRF) at the facility. The doubling of the smelter capacity was expected to also double the country's total production of antimony by the end of the second quarter of 2019 owing to an expected increase in output at the Wadley and the Guadalupe Mines. During the first quarter of 2019, the production per month of the smelter was approximately 31 t (reported as 69,000 pounds). The company stated that, for future production increases, there were already four more LRFs installed at Madero that could be brought into production, and construction had begun on another furnace (the No. 3 LRF) to increase production even further (United States Antimony Corp., 2019).

USAC announced in September that it had made progress on construction of the gold, silver, and antimony Los Juarez project. The company stated that major milestones towards production were reached, such as the installation of the High density polyethylene pond liner in the 5-acre tailings pond, and the deepening of the water well to 222 meters (m) to provide more than 240 gallons of water per minute to the plant. The pond and the well, the company stated, would help to ramp up production from 100 metric tons per day (t/d) to 400 t/d of gross weight ore. The company stated that it still planned to fence the pond and to complete the laboratory for the fire assaying of precious metals and to house the atomic adsorption equipment for assaying antimony silver and gold in the leach circuit (United States Antimony Corp., 2019).

Copper.—In 2019, production of copper concentrate and electrowon increased to an estimated 535,000 t (a 1.1% increase) and 180,000 t (a 7.7% increase), respectively.

Grupo Mexico reported that it had started the Pilares project, located in the State of Sonora about 6 kilometers from the Grupo Mexico operation La Caridad, also located in the State of Sonora. The project consisted of an open pit mine operation with a projected annual capacity of 35,000 t of copper in concentrates. The company stated that the ore would be transported from the pit to the primary crushers of the La Caridad plant's copper concentrator by a 25-m-wide offroad route for mining trucks that the company had finished building in 2019. The company reported that environmental permit studies were presented to the Mexican Government, and that the company was acquiring additional permits for the project. The company expected that the Pilares project would significantly improve the overall mineral ore grade of both the Pilares and the La Caridad Mines by combining the expected ore grades from the Pilares Mine (0.78% copper) with that of the La Caridad Mine (0.34% copper) (Southern Copper Corp., 2019, p. 7; Grupo Mexico S.A.B. de C.V., 2020, p. 26).

Gold.—In 2019, mined gold production in Mexico decreased by 5% to 111,404 kilograms (kg) from 117,323 kg in 2018. Sonora was the country's principal gold-producing State, accounting for 33.2% of the country's total production. The amount of gold produced in the State of Sonora in 2019, however, decreased by about 10% compared with production in 2018. Production at the El Chanate and the Mulatos Mines, which were owned by Alamos Gold Inc. of Canada, decreased by 67.7% and 19.1%, respectively. In particular, production at the El Chanate Mine had been decreasing since October 2018 owing to the ending of its mining activities and its transitioning into the processing of tailings through lixiviation. Production at the Noche Buena Mine, owned by Fresnillo plc, decreased by about 23.9% owing to lower concentrations of gold in the ore mined. However, the production of gold at the Herradura Mine, which was also owned by Fresnillo plc, increased. The Herradura Mine was the most significant gold mine in Mexico in terms of volume of production; the mine produced 15,014 kg of gold in 2019. Another mine that increased production in 2019 was the El Limon-Los Guajes Mine, which was owned by Torex Gold Resources Inc. of Canada. The mine, which was located in the State of Guerrero, increased production by 28.5% and had a record-high volume of production of 14,146 kg of gold in 2019 (Cámara Minera de Mexico, 2020, p. 37–39).

Industrias Peñoles, through its subsidiary Fresnillo plc, owned a 75% interest in the Cienega, the Fresnillo, the Herradura, and the Noche Buena gold mines. The company continued work at the Centauro Profundo deep pit, which is located below the Centauro main pit at Herradura. The mine had indicated and inferred gold resources of about 68,428 kg and was expected to start production in 2024 (Cámara Minera de Mexico, 2020, p. 37–39; Fresnillo plc, 2020, p. 3).

Goldcorp Inc. of Canada and Newmont Inc. of the United States concluded an agreement to merge both companies into a new entity called Newmont-Goldcorp Corp. According to the Cámara Minera de México, this merger, in terms of the companies' joint worth, was one of the largest mergers of gold-producing companies in the world, achieving a combined net worth of \$10 billion. One of the most important assets of the merger was the Peñasquito Mine in the State of Zacatecas, of

which the newly merged company held a 100% ownership through its subsidiary Minera Peñasquito S.A. de C.V. The Peñasquito Mine produced 4,012 kg of gold in 2019, which was a decrease of 52.6% compared with that produced in 2018. The decrease was a result of workers blocking access to the mine on two occasions because of contractual disputes with truck drivers and transportation workers. These work stoppages lasted, in the first instance, for 49 days, and in the second, for 25 days. As of December 31, 2019, total proven and probable mineral reserves at the Peñasquito Mine were reported to be 587 Mt of ore 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 and owned by Equinox Gold S.A. de C.V., increased by 6,221 kg of gold in 2019. The company reported that it had begun the process of expanding its operations at the mine in the third quarter of 2019; the actual construction phase of the expansion was scheduled to begin in 2021 and would cost \$213 million to complete. As of December 31, 2019, 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 (Cámara Minera de Mexico, 2020, p. 32–39; Servicio Geológico Mexicano, 2020, p. 24).

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 Juárez Peña Colorada S.A. de C.V. In 2019, Mexico was ranked 15th among the world's leading producers of crude steel compared with 14th in 2018, and 2nd (after Brazil) among Latin America's leading producers. In 2019, raw steel production decreased by 8% compared with that in 2018, mostly owing to a decrease in the national and international demand for steel. Despite the decrease in demand, Mexico continued to import steel to meet its domestic demand. The consumption of steel in Mexico in 2019 was 24.2 Mt, which was a decrease of about 5% from that in 2018 (table 2; World Steel Association, 2020, p. 7–16).

Mexico imported about 10.2 Mt of steel in 2019, principally from the United States (35%), followed by the Republic of Korea (19.4%), Japan (16.2%), China (4.8%), Canada (3.8%), Germany (3.8%), the Netherlands (2.1%), Taiwan (2.0%), Vietnam (1.8%), and Spain (1.4%). The remaining 9.7% of imports came from several other countries (Cámara Nacional de la Industria de Hierro y del Acero, 2020, p. 1).

Mexico also exported about 3.5 Mt of steel in 2019, principally to the United States (62.4%), Colombia (13.6%), Canada (4.2%), Guatemala (3.7%), Peru (2.1%), Chile (1.7%), El Salvador (1.7%), India (0.9%), Honduras (0.8%), and Cuba (0.6%). The remaining 8.3% was exported to several other countries (Cámara Nacional de la Industria de Hierro y del Acero, 2020, p. 1).

In 2019, the State of Coahuila was ranked first among the country's raw-steel-producing States, accounting for about 34%, or 6.34 Mt of the quantity produced, followed by the States of Michoacan, 3.83 Mt (21%); Nuevo Leon, 3 Mt (16%); Veracruz, 1.75 Mt (9%); San Luis Potosi, 1.02 Mt (5%), and the other six States, the remainder (Cámara Nacional de la Industria de Hierro y del Acero, 2020, p. 1; World Steel Association, 2020, p. 7–9).

Lead and Zinc.—In 2019, The majority of lead production in Mexico was obtained as a byproduct of the mining of other minerals, such as silver and zinc. Estimated lead mine production increased by 7.9% compared with that in 2018, and primary refined lead production also increased in 2019, by 14.3% compared with that in 2018. In 2019, the majority of lead produced in Mexico (66.1%) was produced by the following five companies: Fresnillo plc, which accounted for 21.5% of the country's total production of lead; Newmont-Goldcorp, which accounted for 18.9%; and Industrias Peñoles, Grupo Mexico, and Minera Frisco, which together accounted for 25.7%. Newmont-Goldcorp owned the Peñasquito Mine, which in addition to being the country's leading gold-producing mine, was also the country's leading lead-producing mine. In 2019, the mine produced about 49,000 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 21,470 t and 20,760 t, respectively, in 2019. 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, the Francisco I. Madero Mine, which is located the State of Zacatecas, produced 8,910 t of lead in 2019, and its Tizapa Mine, located in the State of Mexico, produced 8,200 t of lead (Cámara Minera de Mexico 2020, p. 52–54; Fresnillo plc, 2020, p. 52).

In 2019, the production of mined zinc in Mexico decreased by 2.1% and that of primary smelted zinc increased by about 15.5% to 388,511 t. The State of Zacatecas produced about 43.3% of the country's total mined zinc, and in particular, Newmont-Goldcorp's Peñasquito Mine produced 84,820 t of zinc, or about 13% of the country's mined zinc output in 2019. Industrias Peñoles' La Velardeña Mine accounted for about 28% of the company's zinc production. The Velardeña Mine, which is located in the State of Durango, was the second-ranked zinc mine in the country and produced 82,480 t of zinc in 2019. As of December 2019, 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 (Cámara Minera de Mexico, 2020, p. 48–50; Industrias Peñoles, S.A.B. de C.V., 2020, p. 35, 29, 42).

Silver.—In 2019, the Fresnillo, El Saucito, San Julian, and La Cienega Mines (all owned by Fresnillo plc) had reduced production of mined silver, by 14.0%, 13.3%, 11.1% and 3.4%, respectively. In terms of output, the El Saucito Mine was Mexico's leading silver mine, accounting for 534,980 kg of mined silver in 2019. Of the other mines owned by Fresnillo plc, the Fresnillo Mine produced 368,543 kg of mined silver, the San Julian Mine produced about 368,500 kg, and the La Cienega Mine produced 180,400 kg (Cámara Minera de Mexico, 2020, p. 41–42).

The Peñasquito Mine was the second-ranked silver mine in the country, producing 494,545 kg in 2019. Other significant silver-producing mines in 2019 were the La Colorada Mine, owned by Pan American Silver Inc. of Canada, and which produced 255,048 kg; the San Jose Mine, owned by Fortuna Silver Mines Inc. of Canada, 245,717 kg; the Palmarejo Mine, owned by Coeur Mining, Inc. of the United States, 211,503 kg; the San Dimas Mine, owned by First Majestic Silver Corp. of Canada,

195,951 kg; and the Tizapa Mine, owned by Industrias Peñoles, 180,340 kg (Cámara Minera de Mexico, 2020, p. 41–43).

Of the five highest producing silver mines in the country, by weight of output, the La Colorada, Fresnillo, El Saucito, and the Peñasquito Mines are all located in the State of Zacatecas, whereas the San Julian Mine is located in the State of Chihuahua. As of December 31, 2019, measured and indicated mineral resources at the El 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 the 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 to be 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 2019, the 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 the 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, 2020, p. 1, 3, 15, 20, 50, 52, 225, 229, 238, 240; Cámara Minera de Mexico, 2020, p. 41–43).

Industrial Minerals

Barite.—In 2019, barite production in Mexico increased by 4.9% to 384,150 t from 366,234 t (revised) and represented 4.2% of the total value of production of the mineral industry in Mexico. Barite was produced in, in order of production volume, the States of Chihuahua, Coahuila, Jalisco, Sonora, and Nuevo Leon (table 1; Servicio Geológico Mexicano, 2020, p. 20, 32).

Phosphate Rock.—The production of phosphate rock in Mexico decreased by 24.8% compared with that in 2018, This decrease was due to a decrease in production from operations in the State of Hidalgo, which had been producing at much higher rates in previous years and had slowed down for unknown reasons. The largest phosphate rock mine, in terms of the volume of production, was the San Juan de la Costa Mine, which is located in the State of Baja California Sur (Servicio Geológico Mexicano, 2020, p. 70, 123).

Vermiculite.—In 2019, the production of vermiculite in Mexico increased by an estimated 35.2% compared with that in 2018, and the value of its vermiculite exports represented 3.43% of the value of all nonmetallic mineral exports from Mexico in 2019. Vermiculite was produced principally in the State of Oaxaca (Cámara Minera de Mexico, 2020, p. 146, 210).

Mineral Fuels

Crude Petroleum and Natural Gas.—According to Pemex, as of January 1, 2020, proved crude petroleum reserves were estimated to be about 5.6 billion barrels (Gbb), of which 4.2 Gbb were located offshore and 1.4 Gbb were located onshore. Proved natural gas reserves were estimated to be about 244 billion cubic meters (reported as 8,630 billion cubic feet). About 60% of the proved natural gas reserves were located onshore and about 40% were located offshore (Petróleos Mexicanos, S.A. de C.V., 2020, p. 40).

In 2019, Pemex reported that it had produced an average of 1.7 million barrels per day (Mbbbl/d) of crude petroleum compared with 1.83 Mbbbl/d in 2018. The company divides Mexico into three regions: Marine, North, and South. The Marine region accounted for 78% of the total production; followed by the South region, 17%; and the North region, 5%. Pemex also reported that the total decrease in crude petroleum production was mainly attributed to the decrease in the production of heavy crude petroleum from the Cantarell oilfield as well as the production of extra light crude petroleum from the Pijije, the Sen, and the Terra oilfields, and the production of light crude petroleum from the Cantarell, the Bellota-Jujo, and the Litoral de Tabasco fields. The volume of crude petroleum exports in 2019 was the lowest reported volume produced in the past 5 years, with an average of 1,103 barrels per day, or a decrease of 6.8% compared to the level of exports in 2018. This decrease in exports was due to a 4.7% decrease in the production of heavy crude oil and to an 86.7% decrease in the production of istmo (or isthmus)-type crude petroleum owing to the gradual reduction in output from wells that produced these types of crude petroleum (Petróleos Mexicanos, S.A. de C.V., 2018a–d; 2020, p. 42, 122).

Outlook

Mexico's economy was growing by the end of 2019. The economic effects of the coronavirus disease 2019 (COVID-19) pandemic in 2020 will likely be severe in all sectors of the economy, as Mexico's economy is heavily dependent on exports.

Excluding mineral fuels, the production of metals, and precious metals in particular, will likely continue to generate the largest amount of income for the Government of all the Mexican mineral industry. Canada is likely to continue to play an important role in the development of mining projects in Mexico, in particular in the precious metals sector, where the majority of mines owned by foreign interests are Canadian. The United States will also likely play a role in this development, but to a lesser degree, owing to the significantly smaller number of investments that the United States has in that sector.

Copper, gold, lead, silver, and zinc are likely to be Mexico's leading mineral exports in the near future, and aluminum, coal, and iron ore are likely still to be the leading mineral imports into the country. The opening of the petroleum and natural gas sector to foreign direct investment is expected to continue to contribute to increases in the production of petroleum and natural gas in the medium term and to increased private participation in the sector in the long term.

References Cited

- Anderson, C.S., 2021, Silver: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 150–151.
- Bolen, W.P., 2021, Salt: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 138–139.
- Callaghan, R.M., 2021, Cadmium: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 40–41.
- Cámara de Diputados del H. Congreso de la Unión, 2014a, Ley de inversión extranjera [Foreign investment law]: Mexico City, Mexico, Cámara de Diputados del H. Congreso de la Unión, 53 p. [In Spanish.]

- Cámara de Diputados del H. Congreso de la Unión, 2014b, Ley minera [Mining law]: Mexico City, Mexico, Cámara de Diputados del H. Congreso de la Unión, 34 p. (Accessed March 9, 2018, at http://www.diputados.gob.mx/LeyesBiblio/pdf/151_110814.pdf.) [In Spanish.]
- Cámara de Diputados del H. Congreso de la Unión, 2014c, Reglamento de la ley minera [Regulations of the mining law]: Mexico City, Mexico, Cámara de Diputados del H. Congreso de la Unión, 51 p. (Accessed March 9, 2018, at http://www.diputados.gob.mx/LeyesBiblio/regley/Reg_LMin_311014.pdf.) [In Spanish.]
- Cámara de Diputados del H. Congreso de la Unión, 2016, Ley de hidrocarburos [Hydrocarbons law]: Mexico City, Mexico, Cámara de Diputados del H. Congreso de la Unión, 76 p. (Accessed November 6, 2018, at <https://cnh.gob.mx/media/14111/3-ley-de-hidrocarburos.pdf>.) [In Spanish.]
- Cámara Minera de México, 2020, Informe anual 2020 [Annual report 2020]: Mexico City, Mexico, Cámara Minera de México, 337 p. (Accessed February 2, 2021, at https://camimex.org.mx/application/files/5816/0204/8730/info_2020.pdf.) [In Spanish.]
- Cámara Nacional de la Industria de Hierro y del Acero, 2020, Radiografía de la industria del acero en México [Radiography of the steel industry in Mexico]: Mexico City, Mexico, Cámara Nacional de la Industria de Hierro y del Acero, 1 p. (Accessed February 3, 2020, at https://www.canacero.org.mx/en/aceroenmexico/descargas/Radiografia_de_la_Industria_del_Acero_en_Mexico_2020.pdf.) [In Spanish.]
- Comisión Nacional de Hidrocarburos, 2015, Ronda 1—Aguas someras [Round 1—Shallows]: Mexico City, Mexico, Comisión Nacional de Hidrocarburos. (Accessed January 3, 2021, at <https://rondasmexico.gob.mx/wp-content/uploads/2017/12/3.-Documento-Soporte.pdf>.) [In Spanish.]
- Crangle, R.D., Jr., 2021a, Diatomite: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 56–57.
- Crangle, R.D., Jr., 2021b, Gypsum: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 74–75.
- Flanagan, D.M., 2021, Copper: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 52–53.
- Fresnillo plc, 2020, Annual report 2019: London, United Kingdom, Fresnillo plc, 245 p. (Accessed February 2, 2021, at <http://www.fresnilloplc.com/media/451923/fres-33085-annual-report-2019-web.pdf>.)
- Grupo México S.A.B. de C.V., 2020, Reporte anual 2019 [Annual report 2019]: Mexico City, Mexico, Grupo México S.A.B. de C.V., 138 p. (Accessed March 17, 2018, at <https://www.gmexico.com/Pages/reportes-financieros.aspx>.) [In Spanish.]
- Industrias Peñoles, S.A.B. de C.V., 2020, Annual report 2019: Mexico City, Mexico, Industrias Peñoles, S.A.B. de C.V., 171 p. (Accessed February 10, 2021, at <http://www.penoles.com.mx/wPortal/content/conn/UCM/path/Carpetas/www/English/Press%20Room/Annual%20Reports/Annual%20Report%202019.pdf>.)
- Klochko, Kateryna, 2021, Lead: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 94–95.
- McRae, M.E., 2021a, Barite: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 28–29.
- McRae, M.E., 2021b, Fluorspar: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 60–61.
- Merrill, Adam, 2021, Bismuth: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 34–35.
- Ober, J.A., 2021, Strontium: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 158–159.
- Petróleos Mexicanos, S.A. de C.V., 2017, Informe anual 2016 [Annual report 2016]: Mexico City, Mexico, Petróleos Mexicanos, S.A. de C.V., 140 p. (Accessed March 3, 2018, at http://www.pemex.com/acerca/informes_publicaciones/Documents/Informe-Anual/Informe_anual_2016.pdf.) [In Spanish.]
- Petróleos Mexicanos, S.A. de C.V., 2018a, Monthly petroleum statistics—Liquid hydrocarbons production: Mexico City, Mexico, Petróleos Mexicanos, S.A. de C.V., 1 p. (Accessed March 2, 2018, at http://www.pemex.com/en/investors/publicaciones/Indicadores%20Petroleros%20Archivos/eprohdro_ing.pdf.)
- Petróleos Mexicanos, S.A. de C.V., 2018b, Monthly petroleum statistics—Value of crude petroleum exports: Mexico City, Mexico, Petróleos Mexicanos, S.A. de C.V., 1 p. (Accessed March 2, 2018, at http://www.pemex.com/en/investors/publicaciones/Indicadores%20Petroleros%20Archivos/evalorexporta_ing.pdf.)
- Petróleos Mexicanos, S.A. de C.V., 2018c, Monthly petroleum statistics—Volume of crude petroleum exports: Mexico City, Mexico, Petróleos Mexicanos, S.A. de C.V., 1 p. (Accessed March 2, 2018, at http://www.pemex.com/en/investors/publicaciones/Indicadores%20Petroleros%20Archivos/evolexporta_ing.pdf.)

- Petróleos Mexicanos, S.A. de C.V., 2018d, Reporte de resultados de Pemex al 31 de diciembre de 2017 [Reports of results of Pemex as of 31 December 2017]: Mexico City, Mexico, Petróleos Mexicanos, S.A. de C.V., 35 p. (Accessed March 2, 2018, at http://www.pemex.com/ri/finanzas/Reporte%20de%20Resultados%20no%20Dictaminados/Reporte_4T17.pdf.) [In Spanish.]
- Petróleos Mexicanos, S.A. de C.V., 2020, Informe anual 2019 [Annual report 2019]: Mexico City, Mexico, Petróleos Mexicanos, S.A. de C.V., 324 p. (Accessed February 2, 2020, at https://www.pemex.com/acerca/informes_publicaciones/Documents/Informe-Anual/Informe%20Anual%202019.pdf.) [In Spanish.]
- Polyak, D.E., 2021, Molybdenum: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 110–111.
- Sangine, E.S., 2021, Wollastonite: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 184–185. [In Spanish.]
- Servicio Geológico Mexicano, 2020, Anuario estadístico de la minería mexicana 2019, [Statistical yearbook of Mexican mining 2019]: Mexico City, Mexico, Servicio Geológico Mexicano, 555 p. (Accessed February 2, 2021, at http://www.sgm.gob.mx/productos/pdf/Anuario_2019_Edicion_2020.pdf.) [In Spanish.]
- Sheaffer, K.N., 2021, Gold: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 70–71.
- Southern Copper Corp., 2019, Southern Copper Corp. (4Q18 earnings): Southern Copper Corp., [conference call transcript], February 12, 18 p. (Accessed February 10, 2021, at <http://www.southerncoppercorp.com/ENG/invrel/INFDLPressRelease/cc190215.pdf>.)
- Tolcin, A.C., 2021, Zinc: U.S. Geological Survey Mineral Commodity Summaries 2021, p. 190–191.
- United States Antimony Corp., 2019, Newsroom, 2019: United States Antimony Corp., May 6. (Accessed February 10, 2021, at http://usantimony.com/2019_newsroom.htm#U._S._ANTIMONY_ANNOUNCES_CONTINUED_%C2%A0PROGRESS_ON_THE_LOS_JUAREZ_GOLD_AND_SILVER_PROJECT_AND_REDUCING_COSTS_OF_ANTIMONY_PRODUCTION.)
- U.S. Energy Information Administration, 2017, Mexico—Analysis: U.S. Energy Information Administration Country Analysis Brief, October 16, 18 p. (Accessed February 7, 2021, at https://www.eia.gov/international/content/analysis/countries_long/Mexico/archive/pdf/mexico_2016.pdf.)
- U.S. Energy Information Administration, 2020, Mexico—Analysis: U.S. Energy Information Administration Country Analysis Brief, November 30, 10 p. (Accessed February 7, 2021, at https://www.eia.gov/international/content/analysis/countries_long/Mexico/mexico.pdf.)
- World Steel Association, 2020, World steel in figures 2020: Brussels, Belgium, World Steel Association, 17 p. (Accessed February 5, 2021, at <https://worldsteel.org/wp-content/uploads/2020-World-Steel-in-Figures.pdf>.)

TABLE 1
MEXICO: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ^{2, 3}	2015	2016	2017	2018	2019
METALS					
Antimony, mine, Sb content	90 ^e	116	243	260 ^e	300 ^e
Bismuth, refinery, Bi content	603	539	513	333	300
Cadmium, refinery, primary	1,283	1,244	1,142	1,357	1,395
Cobalt:					
Mine, Co content ^e	--	980	1,000	1,400	1,100
Refinery, metal	--	419	420 ^e	226	215
Copper:					
Mine, Cu content:					
Concentrates	386,400	555,800 ^r	539,200 ^r	529,400 ^r	535,000 ^e
Solvent extraction	208,100	238,200 ^r	203,000 ^r	167,200 ^r	180,000 ^e
Smelter:					
Primary	256,300	267,800	270,200 ^r	286,200	285,000
Secondary ^e	5,000	5,000	5,000	5,000	5,000
Refinery:					
Primary, other	272,400	247,800 ^r	255,300 ^r	301,400 ^r	292,000 ^e
Secondary ^e	5,000	5,000	5,000	5,000	5,000
Ferroalloys:					
Ferromanganese	67,920	84,530	90,013	95,468	73,000
Silicomanganese	139,361	134,251	148,130	152,000	154,000
Gold:					
Mine, Au content kilograms	134,758	132,413	130,470	117,323	111,404
Refinery do.	46,769	47,526	37,974	35,000 ^e	35,000 ^e
Iron ore, mine:					
Gross weight thousand metric tons	21,400	19,200	18,600	22,300	11,300
Fe content do.	13,462	12,090	11,713	14,021	7,141
Iron and steel:					
Direct-reduced iron do.	5,499	5,306	6,011	5,972 ^r	5,975
Pig iron do.	4,573	4,476	4,245	4,428	3,840
Steel:					
Raw steel do.	18,218	18,809	19,924	20,204 ^r	18,595
Products, rolled do.	17,573	18,697	18,694	18,872	18,131
Lead:					
Mine, Pb content	263,772	241,271	243,022	240,000 ^e	259,000 ^e
Refinery:					
Primary	263,772	94,725	92,535	104,100 ^e	119,000
Secondary	230,000 ^e	230,000	230,000 ^e	330,000 ^e	328,000
Manganese, mine:					
Gross weight ^e	600,000	600,000	590,000	560,000 ^r	520,000
Mn content	217,466	205,645	211,510	209,023 ^r	201,776
Mercury, Hg content	306 ^e	262 ^e	225 ^e	234 ^e	63
Molybdenum, mine, Mo content	12,279	11,896	13,985	15,149	16,639
Silver:					
Mine, Ag content kilograms	5,591,510	5,408,521	6,108,722	6,049,000 ^r	5,919,000
Refinery, primary, metallurgical products do.	2,237,672	2,109,248	2,222,668	2,200,000 ^e	2,200,000 ^e
Zinc:					
Mine, Zn content	694,544	661,646	671,444	690,895	676,677
Smelter, primary	326,642	321,159	327,003	336,300	388,511

See footnotes at end of table.

TABLE 1—Continued
MEXICO: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ^{2,3}	2015	2016	2017	2018	2019	
INDUSTRIAL MINERALS						
Barite	271,697 ^r	156,854 ^r	359,912 ^r	366,234 ^r	384,150	
Celestite	79,022	33,230	40,699	40,000 ^e	40,000 ^e	
Cement, hydraulic	thousand metric tons	39,613	40,577	41,601	48,328	43,400 ^e
Clay:						
Bentonite		294,236	109,176	148,475 ^r	264,800 ^r	250,000 ^e
Common clay		7,651,234	8,068,940	7,397,721	8,042,884	7,500,000 ^e
Fuller's earth		108,215	111,713	110,860	110,000 ^e	110,000 ^e
Kaolin		155,100	259,272	279,225 ^r	143,156 ^r	140,000 ^e
Diatomite		89,800 ^e	96,686	96,374	96,000 ^e	96,000 ^e
Feldspar, mine		159,372	122,176	233,050	209,770	210,000 ^e
Fluorspar:						
Acid grade	thousand metric tons	624	649	692	770 ^{r,e}	830 ^e
Metallurgical grade ^e	do.	250	250	325	410 ^r	400
Graphite, amorphous, natural ⁴		8,100	8,500 ^e	9,000 ^e	9,000 ^e	9,000 ^e
Gypsum, including anhydrite		5,456,829	5,402,691	5,400,000 ^e	5,400,000 ^e	5,400,000 ^e
Magnesite		101,000	101,000	101,000	100,000 ^e	100,000 ^e
Mica, all grades		145	145	145 ^e	150 ^e	150 ^e
Nitrogen, ammonia, N content		473,000	438,000	411,000	124,000	--
Perlite		13,000 ^r	28,431 ^r	15,899 ^r	26,400 ^r	20,000 ^e
Phosphate rock:						
Gross weight	thousand metric tons	1,930	2,909	1,926	742 ^r	558
P ₂ O ₅ content ^e	do.	540	815	540	210 ^r	160
Salt, all types	do.	9,088	8,907	9,000 ^e	9,000 ^e	9,000 ^e
Stone, sand and gravel, construction:						
Sand and gravel:						
Gravel	do.	109,003	98,399	112,546	119,337	120,000 ^e
Sand	do.	115,565	114,276	210,286	212,733	213,000 ^e
Stone, crushed:						
Calcite, common		3,947,721	3,623,086	3,859,373	2,808,875	2,800,000 ^e
Dolomite		7,703,900	7,236,944	6,059,970	7,554,796	7,560,000 ^e
Limestone	thousand metric tons	569,505	361,704	362,654	355,592	355,600 ^e
Marble		1,571,288	2,162,521	2,352,614	1,964,041	1,965,000 ^e
Quartz and quartzite		1,750,548	2,398,971	2,356,000	2,356,000 ^e	2,356,000 ^e
Sulfur, S content		858,127	673,285	551,218	442,657 ^r	364,967
Talc		20,452	11,392	12,000 ^e	12,000 ^e	12,000 ^e
Vermiculite		299	310	464 ^r	244 ^r	330 ^e
Wollastonite		57,451	63,683	87,562	145,814	146,000 ^e
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous and subbituminous	thousand metric tons	7,245	8,130	7,280	6,773	6,780 ^e
Metallurgical	do.	4,769	4,235	4,637	4,630 ^e	4,630 ^e
Coke, breeze and metallurgical	do.	1,779	1,368	1,295	1,180	1,180 ^e
Natural gas, marketable	million cubic meters	35,120	31,492	31,573	31,570	28,702
Petroleum:						
Crude	thousand 42-gallon barrels	827,455	786,210	723,065	675,980	700,435
Condensate	do.	118,260	111,325	90,520	77,015	79,935

^eEstimated. ^rRevised. do. Ditto. -- Zero.

¹Table includes data available through February 1, 2021. All data are reported unless otherwise noted. Estimated data are rounded to no more than three significant digits; may not add to totals shown.

²In addition to the commodities listed, secondary aluminum, additional types of crude construction materials, and petroleum refinery products may have been produced, but available information was inadequate to make reliable estimates of output.

³Sources: The Instituto Nacional de Estadística y Geografía and the Servicio Geológico Mexicano, Secretaría de Economía.

⁴Figures based on U.S. import data from the U.S. Census Bureau.

TABLE 2
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ¹	Annual capacity ^c
Antimony	United States Antimony Corp. (USAC), 100%	San Jose (Wadley) Mines, S.L.P.	365.
Do.	do.	Smelter in Madero, Coah.	5,000.
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%)	Mine in Muzquiz, Coah.	256.
Do.	Barita de Sonora, S.A. (Grupo Acerero del Norte, S.A. de C.V., 100%)	Mine in 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. de C.V. (Industrias Peñoles, S.A.B. de C.V., 100%)	Refinery, Torreon, Coah.	1,440.
Celestite	Minas de Celestita, S.A. de C.V.	Octubre Mine, Coah.	NA.
Cement	CEMEX México (CEMEX, S.A.B. de C.V., 100%)	15 cement plants, including Ensenada, B.C.N.; Torreon, Coah.; Barrientos, D.F.; Artonilco 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.	29,500.
Do.	Holcim Mexico S.A. de C.V. (LaFargeHolcim Group, 100%)	7 cement plants, including 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. (Buzzi Unicem SpA, 50%, and Cementos Molins S.A., 50%)	3 cement plants, including Apazapan, Ver.; Cerritos, S.L.P.; and Tepetzingo, Mor.	7,800.
Do.	Cooperativa La Cruz Azul, S.C.L. (private Mexican, 100%)	2 cement plant, including Cruz Azul, Hgo; and Lagunas, Oax.	9,000.
Do.	Grupo Cementos de Chihuahua, S.A.B. de C.V.	3 cement plants, including Chihuahua, Ciudad Juarez, and Samalayuca, Chih.	2,500.
Do.	Cementos Fortaleza S.A. de C.V. (Elementia, S.A. de C.V., 100%)	3 cement plants, including El Palmar, Tula, and Vito, Hgo.	3,500.
Coal	Minera Carbonifera Río Escondido, S.A. [Altos Hornos de Mexico, S.A.B. de C.V. (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. (AHMSA), (Grupo Acerero del Norte, S.A. de C.V., 64.1%)	2 mines near Moclova, Coah.	3,000.
Do.	do.	Coking plant at Monclova, Coah.	1,300
Do.	Carbonifera de San Patricio, S.A. de C.V. (private Mexican, 100%)	Mine near Progreso, Coah.	1,314.
Do.	Industrial Minera México, S.A. de C.V. (IMMSA) (Grupo México, S.A.B. de C.V., 90%)	Mine near Nueva Rosita, Coah.	900.
Copper	Mexicana de Cobre, S.A. de C.V. (Grupo México, S.A.B. de C.V., 90%)	La Caridad Mine, Pilares 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. (Investure 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 (Industrias Peñoles, S.A.B. de C.V., 100%)	Milpillas Mine and SX-EW ² plant at Santa Cruz, Son.	45 SX-EW. ²

See footnotes at end of table.

TABLE 2—Continued
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ¹	Annual capacity ^c	
Copper—Continued	Minera María S.A. de C.V. (Minera Frisco S.A.B. de C.V., 99.6%)	María 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., 81.75%, and private Mexican, 18.25%)	Plant in Tamos, Ver.	140.	
Do.	Compañía Minera Autlán, S.A.B. de C.V. (Grupo Ferrominero, S.A. de C.V., 81.75%, and private Mexican, 18.25%)	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%)	Mines la Cienega, in Dgo.; Fresnillo and Saucito, in Zac.; La Herradura, Soledad-Dipolos, and Noche Buena, in Son.	23,700.
Do.	do.	Minera Peñasquito S.A. de C.V. (Goldcorp Inc., 100%)	Peñasquito Mine, Zac.	27,000.
Do.	do.	Torex Gold Resources Inc., 100%	El Limon-Guajes (ELG) Mine, Gro.	10,200.
Do.	do.	Desarrollos Mineros San Luis S.A. de C.V. (Leagold Mining Corp., 100%)	Los Filos Mines, Gro.	6,000.
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 Mine, 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.	Metalurgica Met-Mex Peñoles, S.A. de C.V. (Industrias Peñoles, S.A.B. de C.V., 100%)	Refinery in 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 quarry on San Marcos Island, B.C.S.	2,500.	
Iron ore	Altos Hornos de Mexico, S.A.B. de C.V. (AHMSA) (Grupo Acerero del Norte, S.A. de C.V., 64.1%)	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.	Fresnillo plc. (Industrias Peñoles, S.A.B. de C.V., 75%)	Mines at Fresnillo, Zac., La Cienega, Dgo.; and Saucito, Zac.	43.	

See footnotes at end of table.

TABLE 2—Continued
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ¹	Annual capacity ^c
Lead—Continued	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. mines	35.
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.
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 crude barrels per day	Petróleos Mexicanos, S.A. de C.V. (Pemex) (Government, 100%)	Wells onshore and offshore in Comalcalco, Poza Rica, Ver., and Gulf of Campeche, Cam.	3,500.
Petroleum do. refinery products	do.	5 Refineries in Cadereyta, N.L.; Madero, Tamps.; Minatitlan, Ver.; Salamanca, Gto.; Salina Cruz, Oax.; and Tula de Allende, Hgo.	1,700.
Phosphate rock	PEMEX Fertilizantes [Petróleos Mexicanos, S.A. de C.V. (Pemex), 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. (IMMSA) (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. mines	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. 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. 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. GoGold Resources Inc., 100%	Parral tailings project, Chih.	34,000.
Do.	do. Golden Minerals Co., 100%	Mine in Velardeña, Dgo.	16,000. ³
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%)	Refinery in Torreon, Coah.	3,350,000.

See footnotes at end of table.

TABLE 2—Continued
MEXICO: STRUCTURE OF THE MINERAL INDUSTRY IN 2019

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities ¹	Annual capacity ^c
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.	7,500 steel, 4,000 pellet.
Do.	Altos Hornos de Mexico, S.A.B. de C.V. (AHMSA) (Grupo Acerero del Norte, S.A. de C.V., 64.1%)	Steel plant at Monclova, Coah.	4,320 steel, 3,800 pellet.
Do.	Hylsa S.A. de C.V. (Ternium S.A., 88.72%)	Steel plant and direct-reduction units at Monterrey, N.L., and Puebla, Pue.; pelletizing plant in Col. and El Encino, Jal.	4,100 steel, 1,500 pellet. ⁴
Do.	DEACERO, S.A. de C.V. (private Mexican, 100%)	Steel plant at Saltillo, Coah., and Celaya, Gto.	1,450.
Do.	Tubos de Acero de México, S.A. (Teranis S.A., 100%)	Steel plant in Veracruz, Ver.	1,000.
Sulfur	Petróleos Mexicanos, S.A. de C.V. (Pemex) (Government, 100%)	Nationwide petroleum operations, onshore and offshore	890.
Wollastonite	Minera Roca Rodando S. de R.L. de C.V. (S&B Industrial Minerals S.A.)	Pilares Mine, Hermosillo, Son.	150.
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. mines	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%)	Refinery in Torreon, Coah.	350 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.

^cEstimated. Do., do. Ditto. NA Not available.

¹State 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.).

²Solvent extraction-electrowinning.

³Suspended in 2015.

⁴The amount of direct-reduced iron (DRI) produced was not available.