



2017–2018 Minerals Yearbook

CHILE

THE MINERAL INDUSTRY OF CHILE

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Note: In this chapter, information for 2017 is followed by information for 2018.

Chile's position in the world's mineral economy was that of a leading supplier of many raw materials, especially metals associated with the mining of copper, and industrial minerals, such as lithium. In 2017, the country was estimated to be world's leading producer of mined copper (accounting for 28% of the world production); iodine (63% of world production); and rhenium (55% of world production). Chile was also estimated to be the world's second-ranked producer of lithium and molybdenum (21% each) and boron (ulexite); the fourth-ranked producer of pumice and pumicite (5%) and the fifth-ranked producer of silver (5%). The country's world rankings for mineral reserves were estimated as follows: first for copper, lithium, and rhenium; second for iodine; fourth for molybdenum and boron; and seventh for silver (Bennett, 2018, 2019; Crangle, 2018; 2019a, b; Flanagan, 2018, 2019; Jaskula, 2018, 2019; Polyak, 2018a, b; 2019a, b; Schnebele, 2018, 2019; Brioche, 2019).

The country's real gross domestic product (GDP) increased by 1.5% in 2017 compared with that of 2016. The mineral sector continued to be a significant part of Chile's economy, accounting for 9.9% of the total GDP. The copper mining activity accounted for 8.9% of the country's total GDP and about 90% of the mineral sector GDP. The state-owned Corporación Nacional del Cobre de Chile (CODELCO) was the world's largest copper producer in terms of number of active projects or operations. In 2017, CODELCO accounted for 33% of Chile's total copper production. Escondida continued to be the world's largest copper mine in terms of output, and in 2017, accounted for about 17% of Chile's total mined copper production. The Escondida Mine, which was operated by Minera Escondida Ltda., was a joint venture among BHP Billiton Ltd. of Australia (57.5%), Rio Tinto plc (a British-Australian multinational company; 30%), and Japan Escondida (12.5%) (table 2; Banco Central de Chile, 2018a, p. 4; 2018c; Corporación Nacional del Cobre, 2018, p. 17, 60; Servicio Nacional de Geología y Minería, 2019, p. 61).

Chile is part of what has become to be known as South America's "Lithium Triangle"—an area that hosts lithium-bearing salt flats along the borders of Argentina, Bolivia, and Chile. Historically, Chile's lithium production was recovered from two brine operations in the Salar de Atacama, which is located in the Andes Mountains. The two leading producers of lithium in the country were Albemarle Corp. of the United States and Sociedad Química y Minera de Chile S.A. (SQM). Chile and Argentina were the principal sources of lithium carbonate and lithium hydroxide imported by the United States. In 2017, the production of lithium carbonate increased by 4% compared with that of 2016; all production was exported. Exports of lithium carbonate increased in value by 47% compared with that of 2016 and accounted for about 55% of the country's total industrial mineral exports. The increases in lithium carbonate

production and exports were owing to the rapidly increasing demand for these mineral products for use in the production of cathodes for rechargeable batteries. Batteries were the leading application for lithium, especially for electric vehicle batteries (table 2; Comisión Chilena del Cobre, 2018, p. 26, 30; Servicio Nacional de Geología y Minería, 2018, p. 112–113; Sociedad Química y Minera de Chile S.A., 2018, p. 21; Jaskula, 2019).

Chile was the fifth-ranked consumer of fossil fuels in South America and was heavily dependent on coal, crude petroleum, natural gas, and refined petroleum products imports to meet domestic demand. Crude petroleum and natural gas were produced exclusively from the Magallanes y de la Antartica Chilena Region. Chile held about 150 million barrels (Mbbbl) of crude petroleum reserves and about 98 billion cubic meters of natural gas reserves. In 2017, coal, crude petroleum, and natural gas accounted for 6% of Chile's total imports and for 91% of the country's total mineral products imports. The country's crude petroleum imports were mainly from Argentina, Brazil, Colombia, Ecuador, and Peru. The United States, however, was Chile's leading source of refined petroleum products (U.S. Department of Energy, 2016; Banco Central de Chile, 2018b, p. 60; Servicio Nacional de Geología y Minería, 2018, p. 140–141; U.S. Central Intelligence Agency, 2021).

Minerals in the National Economy

In 2017, the value of Chile's mineral sector decreased by 2.0%, which was mainly attributed to a decrease of 1.6% in the value of the country's copper mining activity well as an overall decrease of 4.5% in the value of the rest of the mining activities. The downturn in the value of copper was mainly attributed to a decrease in the production of copper following a 44-day union strike at the Escondida Mine in the first quarter of 2017. The overall downturn in the rest of the country's mining activities was mainly attributed to a decrease in the production of gold and zinc. Chile's employment in the mining and quarrying sector decreased to 217,404 workers in 2017 from 218,160 workers in 2016 (Banco Central de Chile, 2018a, p. 6–7; Comisión Chilena del Cobre, 2018, p. 17; Servicio Nacional de Geología y Minería, 2018, p. 176).

According to the Comisión Chilena del Cobre, investments in mining during the next 10 years, which were expected to include 47 projects at various stages of exploration and (or) development, were projected to total \$64.9 billion. About 65% of the estimated investments were from Chile (\$42.2 billion); 15%, from Canada (\$9.7 billion); 7%, from Australia (\$4.8 billion); 5%, from United States (\$3.2 billion); and 3%, from Japan (\$2.1 million). Among the mining companies investing in the country, private large- and medium- scale companies accounted for 49% of total mining investments (or 22 projects), followed by CODELCO, which accounted for about

36% (or 9 projects). Investments in copper accounted for about 91% or \$59.2 billion of the total investment in mining, followed by gold and silver, industrial minerals, and iron ore, which accounted for the remaining 9% or \$5.6 billion of the total investment in mining. Of the \$59.2 billion investment in copper, the Antofagasta Region would receive about \$29.7 billion, followed by the Atacama Region (\$9.5 billion), the Libertador General Bernardo O'Higgins Region (\$6.6 billions), and the Valparaíso Region (\$5.3 billion) (Comisión Chilena del Cobre, 2017, p. 5–6, 11, 13, 15).

According to the Economic Commission for Latin America and the Caribbean, in 2017, Chile accounted for about 4% of total foreign direct investment (FDI) inflows into the Latin America and the Caribbean region. FDI inflows to the country decreased for the third consecutive year in 2017, however, by 48.1% to \$6.4 billion; this decrease was mainly owing to the decline in the international price of copper between 2011 and 2016 as well as to the additional capacity built during the commodity price boom (Economic Commission for Latin America and the Caribbean, 2018, p. 30, 51).

Government Policies and Programs

Regulations governing Chile's mineral industry are contained in the Decree with Force of Law (DFL) No. 302. The Ministerio de Minería [Ministry of Mining] exercises control of the mineral industry through state-owned companies and regulatory agencies, including the Comisión Chilena del Cobre (COCHILCO), CODELCO, Empresa Nacional de Minería (ENAMI), and Empresa Nacional del Petróleo (ENAP). The legal framework for mining in Chile is based on the country's Organic Constitutional Law on Mining Concessions [law No. 18.097 of 1982] and the Chilean Mining Code [law No. 18.248 of 1983]. COCHILCO was created in 1976 by law No. 1.349. COCHILCO advises the Government on matters concerning the production of copper, copper byproducts, and other metals, and on industrial minerals mining. CODELCO was involved in industrial, mining, and trade activities. Decree Law 1350 (1976) created CODELCO, which began managing all large-scale mines nationalized in 1971. CODELCO reports to the Government through the Ministry of Mining (Corporación Nacional del Cobre, 2018, p. 21; Comisión Chilena del Cobre, 2019b, c; Ministerio de Minería, 2019).

ENAMI, which is the national mining corporation, was founded in 1960 to promote small- and medium-size private sector mining in Chile. It does so by providing incentives aimed at correcting market failures, and by supplying technical, financial, metallurgical production, and trading services to help the companies be competitive. ENAP was created by Organic Law No. 9618 of June 19, 1950. It operates as a commercial company under a public law juridical regime and is autonomously managed (Empresa Nacional de Minería, 2021).

ENAP's main line of business is the exploration, production, refining, and marketing of hydrocarbons and their byproducts. ENAP participates in the exploration and production of hydrocarbons through its subsidiary Enap Sipetrol S.A. and in the refining, transportation, storage, and marketing of petroleum-based products through Enap Refinerías S.A. (Empresa Nacional del Petróleo, 2021).

The main environmental law in Chile (law No. 19.300) was enacted on March 1, 1994, and was amended on December 7, 2002, by Decreto Supremo 95, which requires environmental impact studies for any new investment projects that involve either exploration for or extraction of the country's natural resources (including minerals). In July 2011, the Chilean Congress approved law No. 20.551 to regulate the closure and environmental remediation of mine sites and mining facilities. The law entered into force on November 11, 2012. On June 18, 2012, the Chilean Congress approved law No. 20.600, which established new environmental courts to arbitrate in cases of environmental violations (Biblioteca del Congreso Nacional de Chile, 2013).

In 2015, Chile enacted law No. 20.848, which repealed the 1974 foreign investment statute, known as Decree Law 600 (DL 600). Law No. 20.848, which became official in January 1, 2016, established a new legal framework for FDI in the country and created the Foreign Investment Promotion Agency, also known as InvestChile. InvestChile is the legal successor and continuer of the former Foreign Investment Committee and the agency responsible for promoting and attracting all types of FDI into the country. Under this law, the President of Chile established a strategy for the development and promotion of FDI and created a Committee of Ministers for the Development and Promotion of Foreign Investment (Committee of Ministers), whose purpose is to advise the President. The Committee of Ministers is chaired by the Minister of Economy, Development and Tourism and includes the Minister of Finance and all other Ministers whom the President appoints. All foreign investment contracts signed between the Government and foreign investors under the Decree Law 600 before January 1, 2016, are to remain in force, along with the rights and obligations envisaged in the contracts, and are to be administrated by InvestChile (Biblioteca del Congreso Nacional de Chile, 2015; U.S. Department of State, 2016; InvestChile, 2017, 2019).

Production

In 2017, estimated production of mercury increased by 450% to 11 metric tons (t) from 2 t in 2016, production of lead increased by 41% to 1,562 t from 1,110 t, and the production of molybdenum increased by 12% to 62,454 t from 55,834 t. Increases in the output of industrial minerals were led by peat (increased by 118%); lithium chloride (43%); quartz (38%); gypsum (24%); bentonite (23%); bauxitic clay (20%); and marble (14%). Among the mineral fuels and related materials, production of liquefied petroleum gas increased by 14% to about 3.3 billion cubic meters from about 2.9 billion cubic meters (revised). Zinc production decreased by 32% to 29,008 t in 2017 from 42,870 t in 2016; gold production, by 18% to 37,911 kilograms (kg) from 46,333 kg; silver production, by 12% to 1,318,582 kg from 1,501,436 kg; and copper refinery production, by 11% to 843,000 t from 952,000 t (revised). Decreases in the output of industrial minerals were led by zeolites (decreased by 78%), travertine (63%) potassium sulfate (39%), feldspar (30%), ground calcium carbonate (22%), and coquina, 18%. Among the mineral fuels and related materials, production of crude petroleum decreased by 17% to 1.2 Mbbbl in 2017 from 1.5 Mbbbl in 2016, and that of other refinery products decreased by 15% to about 5.1 Mbbbl from about 6.1 Mbbbl (revised). Data on mineral production are in table 1.

Structure of the Mineral Industry

The leading Chilean-owned companies in the mineral industry were state-owned CODELCO and the privately owned Compañía Minera del Pacífico S.A. (CMP), Molibdenos y Metales S.A. (Molymet), and SQM. CMP was the principal producer and exporter of iron ore and pellets in Chile; SQM was among the world's leading producers of iodine, lithium carbonate, and natural potassium nitrate; and Molymet was the world's leading producer of rhenium. CODELCO had seven operating mining divisions (Andina, Chuquicamata, El Teniente, Gabriela Mistral, Ministro Hales, Radomiro Tomic, and Salvador), all of which were located in northern and central Chile. CMP was the sole supplier of iron ore and pellets to the integrated Chilean steelmaker Compañía Siderúrgica Huachipato S.A. Table 2 is a list of major mineral industry facilities (BHP Billiton Ltd., 2018, p. 239; Comisión Chilena del Cobre, 2018, p. 17; Compañía Minera del Pacífico S.A., 2018, p. 27, 30, 33; Molibdenos y Metales S.A., 2018, p. 112; Sociedad Química y Minera de Chile S.A., 2018, p. 19, 22; Corporación Nacional del Cobre, 2021).

Mineral Trade

The total value of Chile's exports amounted to \$69.2 billion in 2017 compared with \$60.6 billion in 2016. The country's leading export partners were China (which received about 28% of the country's exports), the United States (14%), and the European Union (13%). In 2017, the mineral sector accounted for 56% of Chile's total exports, in terms of value. The total value of Chile's imports in 2017 increased to \$65.1 billion from \$58.8 billion in 2016. Imports of coal, crude petroleum, and natural gas accounted for about 7% of the country's total imports and about 91% of the mineral sector imports. Chile's major import partners were China, which supplied 24% of the country's imports, the United States (18%), and the European Union (15%) (Banco Central de Chile, 2017, p. 6–7, 32; 2018b, p. 6–7, 32, 60; Comisión Chilena del Cobre, 2019a, p. 30).

According to COCHILCO, the value of Chile's mineral exports increased by 24% to \$38.5 billion in 2017 compared with that of 2016. The country's leading mineral export partners were China (which received about 37% of the country's mineral exports), the United States (10%), and Japan (9%). In 2017, metals accounted for 96% of country's total mineral exports; and copper continued to be the leading mineral commodity export, accounting for 91% of the country's total metal exports and 87% of its total mineral exports. In 2017, the total value of the country's silver, copper, and iron ore exports increased by 28%, 26%, 21%, respectively, whereas the value of gold and zinc exports decreased by 20% and 16%, respectively. In 2017, the value of molybdenum exports increased by 30% (to \$1.2 billion from \$921 million in 2016); this was the second increase in value of molybdenum exports since 2015, when the value was about \$906 million. China continued to be the leading recipient of Chile's copper exports, in terms of value, accounting for more than 40% of the total copper exports (Comisión Chilena del Cobre, 2018, p. 37; 2019a, p. 30).

The value of Chile's industrial mineral exports increased by 12% to \$1.2 billion in 2017. During the year, the leading

exported industrial mineral commodity, by value, was lithium carbonate (\$684 million), which accounted for 55% of the total industrial mineral exports; followed by iodine, 28%; and rock salt, 10%. The value of lithium carbonate exports increased by 47% in 2017 compared with that of 2016; and the leading recipients of the country's lithium carbonate exports were, in terms of value, China, 29%; the Republic of Korea, 27%; and Japan, 20% (Comisión Chilena del Cobre, 2018, p. 26, 28; 2019a, p. 30).

Commodity Review

Metals

Copper.—In 2017, the total (combined) production of copper concentrates and of solvent extraction was about 5.5 million metric tons (Mt), which was about the same amount as in 2016. The Antofagasta Region continued to rank first among the country's copper-producing regions, accounting for about 40% of copper concentrate production in 2017 and 83% of cathode production. Chile's leading copper companies were, in order of output, CODELCO, which accounted for 30% of the country's total copper production, and Escondida, 27%. About 95% of the copper produced in the country was by large-scale mining operations (table 1; Comisión Chilena del Cobre, 2018, p. 17, 93; Servicio Nacional de Geología y Minería, 2018, p. 72–73).

During the year, CODELCO's leading producing mines were the Chuquicamata and the Radomiro Tomic Mines (located in the Antofagasta Region) and the El Teniente Mine (located in the Libertador General Bernardo O'Higgins Region). Production from these three mines accounted for about 60% of CODELCO's total copper production (joint ventures not included). CODELCO reported total proven and probable mineral reserves from Andina, Chuquicamata, El Teniente, Gabriela Mistral, Ministro Hales, Radomiro Tomic, and Salvador to be 6.9 Mt at an average grade of 0.66% copper. The company continued with its plans to convert the Chuquicamata open pit mine into an underground operation to extend the life of the mine by an additional 40 years. CODELCO began the development of the project in 2016 and, by yearend 2017, was more than halfway to completing construction. The company expected to begin underground operations in 2019. CODELCO also continued with its plans to deepen the mining of the El Teniente deposit, adding reserves that would increase El Teniente's mine life by an additional 50 years. The project, called El Teniente New Mine Level, was less than halfway completed at yearend and was expected to be finished by 2023 (Corporación Nacional del Cobre, 2018, p. 37, 115, 126; 2019).

Escondida is a porphyry copper deposit located in the Antofagasta Region in northern Chile. The Escondida project comprised two open pits that fed two concentrator plants, as well as two leaching operations (oxide and sulfide). In 2017, mined copper production decreased to 925,400 t from 1.0 Mt in 2016. The decrease in production was mainly attributed to a labor dispute resulting from failed negotiations with the labor union over a new collective agreement, as the existing agreement was set to expire on January 31, 2017. After negotiations were unsuccessful, the union commenced strike action on February 9, which resulted in a 44-day strike and the temporary suspension of operations at Escondida.

On March 24, a revised offer was presented to union members and the existing collective agreement was extended for 18 months. After the resolution, the company restarted operations gradually and returned to full production in April (BHP Billiton Ltd., 2018, p. 46, 58; Comisión Chilena del Cobre, 2018, p. 17).

Antofagasta Plc of the United Kingdom, through its subsidiary Antofagasta Minerals S.A. (AMSA), operated four copper mines, two of which produced gold and silver as byproducts. The company held a 70% interest in the Antucoya Mine, which produced copper cathodes; a 70% interest in the Centinela Mine, which produced copper concentrates containing gold and silver and copper cathodes; a 60% interest in Los Pelambres Mine, which produced copper concentrates containing gold, silver, and molybdenum; and a 50% interest in the Zaldivar Mine, which produced copper cathodes. In 2017, Los Pelambres Mine, which was located in the Coquimbo Region, accounted for about 6% of the total mined copper production in the country. An expansion project for Los Pelambres was underway during the year. The project was expected to have two phases. The company expected that after phase 1 is completed, copper production at Los Pelambres would increase to an average of 55,000 metric tons per year (t/yr). For phase 2, the company estimated an increase in throughput to 205,000 metric tons per day and that the mine's life would be extended past the currently approved 20 years. The company expected to begin production by 2022 and to increase copper production by 35,000 t/yr. Phase 2 would proceed only after the completion of phase 1, however, and would require the submission of extensive permit applications (table 2; Antofagasta plc, 2018, p. 2, 46; Comisión Chilena del Cobre, 2018, p. 17).

In 2017, copper output from the Sociedad Contractual Minera El Abra (El Abra) decreased by about 22%, which was attributed to lower ore grades at the mine. El Abra was a joint venture between Freeport-McMoRan Inc. of the United States (51%) and CODELCO (49%). Since 2015, El Abra, which is located in the Antofagasta Region, operated at reduced rates to achieve lower operational and labor costs, defer capital expenditures, and extend the life of existing operations. During the year, El Abra continued evaluating a potential large-scale milling operation to process additional sulfide material and to achieve higher recoveries; however, future investments would depend on economic factors, the results of technical studies, and market conditions. As of December 31, total recoverable proven and probable reserves were reported as 394 Mt at an average grade of 0.44% copper. El Abra accounted for about 1% of the country's total mined copper production in 2017 compared with nearly 3% in 2014. The company reported that the mine was expected to operate at full capacity during 2018 (Comisión Chilena del Cobre, 2018, p. 17; Freeport-McMoRan Inc., 2018, p. 39, 128).

Gold and Silver.—The Antofagasta Region was ranked first among the country's leading gold-producing regions, accounting for 49% of total gold production, followed by the Atacama Region (23%), and the Coquimbo Region (14%). Other gold-producing regions included Aysen, Maule, Metropolitana (Santiago), Libertador General Bernardo O'Higgins, and Valparaíso. In 2017, about 55% or 20,927 kg of the total gold output in Chile was produced from copper mining operations; 44% or 16,753 kg

was produced from gold mining operations; and the rest was produced from lead and zinc mining operations. Of the 16,753 kg produced from gold mines, large-scale gold mining operations accounted for 76%, medium-scale operations, 19%; and small-scale operations, 5%. Gold production from large-scale mining operations was produced mainly in the form of dore (83%). The Antofagasta Region also ranked first among Chile's silver-producing regions, accounting for about 60% of production, followed by the Atacama Region (10%) and the Coquimbo Region (8%). Of the 1,319 t of silver output, about 86% was produced from copper mining operations and the remainder was produced from gold, lead, silver, and zinc mining operations (table 1; Comisión Chilena del Cobre, 2018, p. 21; Servicio Nacional de Geología y Minería, 2018, p. 77–79, 83–84).

Iron Ore.—CMP continued to be the major producer of iron ore in Chile, and about 99% of the Chile's iron ore exported was produced by the company. In 2017, CMP held 1,799 active mining concessions that covered 414,922 hectares (ha) and 45 active exploration licenses that covered 18,200 ha. Its operations were divided into three production units—Valle de Huasco, which included Los Colorados Mine; Valle de Elqui, which included El Romeral Mines; and Valle Copiapo, which included Cerro Negro Norte. The Cerro Negro Norte and Los Colorados Mines are located in the Atacama Region and El Romeral is located in the Coquimbo Region. As of 2017, total mineral reserves at Cerro Negro Norte, Los Colorados, and El Romeral were reported to be 316.6 Mt at an average grade of 33.8% iron, 430.7 Mt at an average grade of 36.4% iron, and 100.1 Mt at an average grade of 30.3% iron, respectively (Compañía Minera del Pacífico S.A., 2018, p. 25–26, 30; 2019).

Lead and Zinc.—In 2017, Chile's lead production was mainly from the Aysen Region, which accounted for 79% of the country's total lead production, and was obtained from gold, lead, and zinc concentrates. Zinc production was from the Aysen, the Coquimbo, and the Metropolitana (Santiago) Regions. During the year, the Aysen Region produced about 70% of the country's zinc (Servicio Nacional de Geología y Minería, 2018, p. 87–88).

Molybdenum.—Molybdenum was produced as a byproduct of copper production. In 2017, the leading producing regions were Antofagasta and Coquimbo, which accounted for 54% and 17%, respectively, of the total molybdenum production in the country. CODELCO continued to be the leading producer of molybdenum in the country, accounting for about 46% of Chile's total molybdenum production during the year. Molybdenum production at CODELCO decreased by 6% owing mainly to lower grades at the Chuquicamata Division, which was the company's leading producer and accounted for about 60% of CODELCO's molybdenum production. Molybdenum production from Los Pelambres increased by about 48% to 10,500 t in 2017, which was attributed to higher grades and recoveries at the mine. The company forecasted molybdenum production at Los Pelambres to be between 10,000 and 11,000 t in 2018. In 2017, Centinela Mine, which is located in the Antofagasta Region, also produced significant byproducts, such as gold, silver, and molybdenum. In June, AMSA completed the construction of its molybdenum plant, which would have the capacity to produce an average of 2,400 t/yr, and also began precommissioning tests throughout the second half of 2017.

The molybdenum plant was expected to begin production in early 2018 and to produce about 1,500 t in 2018 (table 2; Antofagasta plc, 2018, p. 6, 36–39; Corporación Nacional del Cobre, 2018, p. 19; Servicio Nacional de Geología y Minería, 2018, p. 76).

Industrial Minerals

Boron.—The production of boron (ulexite) and boric acid were carried out mainly from the mining and (or) processing of the boron minerals contained in the Andean salt flats located in the northern part of Chile, mostly in the Arica y Parinacota and the Antofagasta Regions. The Arica y Parinacota Region produced about 95% of the country's ulexite output and 100% of the boric acid output. During the year, ulexite production increased by about 9% to 607,076 t from 558,854 t in 2016 and boric acid production increased by about 7% to 111,542 t from 104,299 t in 2016. The largest ulexite deposit in the world, Salar de Surire, was operated by Quiborax S.A. which had reserves reported to be 1.5 Mt. The ulexite mined from the Salar de Surire, which is located in the Arica y Parinacota Region, was processed in the company's plant, where it was converted into boric acid and agrochemical products. The processing plant, which was located about 69 kilometers (km) from the Port of Arica, had the capacity to produce 36,000 t/yr of boric acid. The company also mined ulexite from the Salar Ascotan, which is located in the Antofagasta Region (tables 1, 2; Servicio Nacional de Geología y Minería, 2019, p. 110–111, 145, 149; Quiborax S.A., 2019a, b).

Iodine.—In 2017, the production of iodine, which was extracted from solutions produced by leaching caliche ore, decreased to 17,976 t from 18,444 t in 2016. The Tarapaca Region accounted for 66% of the country's total iodine production and the Antofagasta Region accounted for the remaining 34%. SQM, through its wholly owned subsidiary SQM Salar S.A., continued to be the country's leading producer of iodine and had a production capacity of about 11,000 t/yr. The company produced iodine at its facilities at Nueva Victoria (including the Iris plant), which were located in the Tarapaca Region, and at Pedro de Valdivia and María Elena, located in the Antofagasta Region. SQM produced a total of 9,969 t of iodine in 2017, of which Nueva Victoria and Iris produced about 91%. During the year, the company was developing a project to increase its iodine annual production capacity at its Nueva Victoria facilities, which would increase SQM's production capacity to 14,000 t/yr (table 2; Servicio Nacional de Geología y Minería, 2018, p. 135; Sociedad Química y Minera de Chile S.A., 2018, p. 31).

Lithium.—The source of Chile's globally significant lithium reserves were the brine deposits of the Salar de Atacama, which is located about 250 km from Antofagasta. The brine deposits of the Salar de Atacama, which is a salt-encrusted depression in the Atacama Desert, contain high concentrations of lithium and potassium as well as significant concentrations of sulfate and boron. Chile's lithium continued to be recovered from two brine operations, which were owned by Albemarle through its subsidiary Rockwood Lithio Ltda., and SQM. Concentrated brines were transported and processed at Albemarle's lithium carbonate and lithium chloride plants located in La Negra, and SQM's lithium carbonate and lithium hydroxide plants located

near the city of Antofagasta (Salar del Carmen facilities). The Antofagasta Region had been producing lithium carbonate uninterruptedly since 1984; lithium chloride, since 1999; and lithium hydroxide, since 2005. In 2017, SQM's lithium carbonate production capacity was 48,000 t/yr and its lithium hydroxide production capacity was 6,000 t/yr. Owing to rapidly increasing demand for lithium carbonate and lithium hydroxide from electric vehicle battery manufacturers, SQM reported that it would increase its lithium carbonate and lithium hydroxide capacities to 70,000 t/yr and 13,500 t/yr, respectively, in 2018. Also, the company reported that it planned to further increase its lithium carbonate capacity to 100,000 t/yr by 2019 (table 2; Albemarle Corp., 2018, p. 4, 23; Servicio Nacional de Geología y Minería, 2018, p. 112; Sociedad Química y Minera de Chile S.A., 2018, p. 10, 21–22).

By yearend 2016, Albemarle amended its agreement with the Government to increase its authorized lithium quota in the Salar de Atacama. The new agreement would support the production of more than 80,000 t/yr of technical- and battery-grade lithium salts at the company's facilities in La Negra during the next 27 years. In September 2017, however, Albemarle requested Chilean Economic Development Agency (CORFO) approval to increase its authorized lithium quota in the Salar de Atacama to 125,000 t/yr. The company reported that it had developed new technology that would allow it to obtain more lithium without the need for additional brine pumping at the Salar de Atacama. The request was under revision and was expected to be approved in 2018 (Albemarle Corp., 2016; 2017; 2018, p. 4).

Pumice.—Production of pumice decreased to 838,890 t in 2017 from 840,976 t in 2016. Metropolitana (Santiago) continued to be the leading producing region, accounting for 73% of total pumice production the country, followed by the Libertador General Bernardo O'Higgins Region (19%). Pumice-producing companies included Compañía Minera Polpaico Ltda., Imerys Minerales Santiago Ltda., Minera El Way S.A., Minera Melón S.A., and Minera Rio Teno S.A. (tables 1, 2; Servicio Nacional de Geología y Minería, 2018, p. 121, 149, 157, 159).

Mineral Fuels

Coal, Natural Gas, and Petroleum.—Coal production from Magallanes y de la Antartica Chilena accounted for 97% of the country's total coal production, followed by the Biobío Region, which accounted for the remaining 3%. Mina Invierno S.A., which mined coal at Isla Riesco in the Magallanes y de la Antartica Chilena Region, continued to be the leading producers of coal in the country. Mina Invierno was jointly owned by Empresas Copec S.A. and Inversiones Ultraterra Ltd. Mina Invierno's mining concessions included the Adela, the Elena, the Invierno, and the Rio Eduardo deposits, which had total (combined) mineral reserves of 387 Mt. In 2017, coal production at Mina Invierno decreased to 2.3 Mt in 2017 from 2.4 Mt in 2016. About 60% of Empresas Copec's coal was sold domestically and the remainder was sold in Asia (22%) and Europe (18%). The country's crude petroleum and natural gas production was exclusively from the Magallanes y de la Antartica Chilena Region (table 2; Empresas Copec S.A., 2017, p. 90; 2018, p. 87; Servicio Nacional de Geología y Minería, 2018, 140–141).

Reserves and Resources

Table 3 lists Chile's reserves of major mineral commodities.

MINERAL INDUSTRY HIGHLIGHTS IN 2018

In 2018, Chile's GDP increased by 4.0% compared with that of 2017. The mineral sector, which continued to be a significant economic activity in the country, accounted for 10.1% of the country's total GDP in 2018. The value added of Chile's mineral sector increased by 5.2%, following three consecutive years of decrease. The increase in the mineral sector's value added was attributed mainly to an increase of 5.9% in the value of copper production. Chile's employment in the mining and quarrying sector increased by 5% to 228,340 workers in 2018 (Banco Central de Chile, 2019a, p. 4, 7; 2019c; Comisión Chilena del Cobre, 2019a, p. 64; Servicio Nacional de Geología y Minería, 2019, p. 174).

In 2018, the total value of Chile's exports amounted to \$75.5 billion, which was an increase of 9% compared with the value in 2017. The country's leading export partners were, in order of value, China (which received 34% of the country's exports), the United States (14%), and the European Union (12%). The total value of Chile's imports increased by 15% to \$75.0 billion in 2018; and its major import partners were, in order of value, China (which supplied 23% of the country's imports), the United States (19%), and the European Union (15%) (Banco Central de Chile, 2018b, p. 6; 2019b, p. 6–7).

According to COCHILCO, the value of Chile's mineral exports increased by 9% to \$42.1 billion. The increase was attributed mainly to an increase in the value of the metals (by 9%), which accounted for 96% of total mineral exports. Copper continued to be the leading mineral commodity export in 2018, accounting for 86% of Chile's total mineral exports and for 90% of its total metal exports. In 2018, the total value of the country's zinc exports increased by 25% (to \$59.2 billion); gold exports, by 9% (to \$736.5); and copper exports, by 7% (to \$36.4 billion). The total value of molybdenum exports also increased, by 55% (to \$1.9 billion) in 2018; this was a significant increase in molybdenum exports since 2015, when the value was about \$906.2 million. The leading industrial mineral commodity export, by value, continued to be lithium carbonate (valued at \$948 million); exports of lithium carbonate increased by 39% in 2018 and accounted for 57% of total industrial mineral exports (Comisión Chilena del Cobre, 2019a, p. 30).

Production

In 2018, Chile's copper sulfate production increased by 14% to 13,523 t from 11,893 t in 2017. Increases in the output of industrial minerals were led by lithium chloride (increased by 51%); kaolin (47%); zeolites (42%); salt (35%); lithium hydroxide (23%); coquina and lithium carbonate (18% each); iodine (12%); and nitrogen (11%). Among the mineral fuels and related materials, production of liquefied petroleum gas increased by 53%. Lead production decreased by 54% to 712 t in 2018 from 1,562 t in 2017, and iron content production, by 11%. Decreases in output of industrial minerals were led by bentonite (decreased by 67%) ground calcium carbonate (47%),

bauxitic clay (44%), feldspar (37%), ulexite (34%), marble (30%), gypsum and peat (21% each), potassium chloride (17%), silica sand (11%), and diatomite (10%). Among the mineral fuels, production of crude petroleum (including condensate), decreased by about 10% to 1.1 Mbbbl from 1.2 Mbbbl. Data on mineral production are in table 1.

Structure of the Mineral Industry

In April, Teck Resources Ltd. of Canada acquired an additional indirect 13.5% interest in Compañía Minera Teck Quebrada Blanca S.A. (QBSA) through the purchase of Inversiones Mineras S.A. As a result, Teck Resources increased its interest in the Quebrada Blanca operations to 90%. The remaining 10% interest continued to be held by ENAMI. In December, however, Sumitomo Metal Mining Co., Ltd. and Sumitomo Corp. of Japan entered into an agreement with Teck Resources to acquire a 30% indirect interest in QBSA. The transaction was expected to be completed by April 2019. Quebrada Blanca, located in the Tarapaca Region, produced copper cathodes (table 2; Sumitomo Corp., 2018; Teck Resources Ltd., 2019, p. 22).

Commodity Review

Metals

Copper.—The total production of copper concentrates and solvent extraction was about 5.8 Mt, which was an increase of about 6% compared with that of 2017. The Antofagasta Region continued to rank first among the country's copper-producing regions, accounting for more than 40% of copper concentrates production in 2018 and 80% of the total cathodes production. Chile's leading copper companies were, in order of output, CODELCO, which accounted for 31% of the copper production and Escondida (21%). About 96% of the copper produced in the country was produced by large-scale mining operations (table 1; Comisión Chilena del Cobre, 2019a, p. 97; Servicio Nacional de Geología y Minería, 2019, p. 67).

CODELCO continued with its plans to convert Chuquicamata into an underground operation at an investment cost of about \$5.8 million. Construction was about three-quarters complete, and the company expected to begin underground operations in 2019. As of 2018, Chuquicamata's proven mineral probable reserves were reported to be 1.3 Mt at an average grade of 0.73% copper. AMSA continued with its expansion project at Los Pelambres, which included two phases. The construction of phase 1 was expected to begin in 2019, and first production was projected to take place by the second half of 2021. For phase 2, the company expected to extend the mine's life by 15 years past the currently approved 20 years. The company reported that first production from phase 2 was expected to begin in 2023; however, phase 2 would proceed only once phase 1 was significantly advanced, and phase 2 would require the submission of extensive permit applications. In December, Teck Resources' board approved the construction of the Quebrada Blanca Phase 2 project, which was expected to begin production by the fourth quarter of 2021 and to have an initial mine life of 28 years. An average annual copper-equivalent production of

Quebrada Blanca Phase 2 during the first 5 years of operations was estimated to be about 316,000 t (Antofagasta plc, 2019, p. 71; Corporación Nacional del Cobre, 2019, p. 92, 101; Teck Resources Ltd., 2019, p. 22–23).

Gold and Silver.—In 2018, the regions of Antofagasta and Atacama accounted for 77% of the total gold produced in Chile. About 65% or 23,980 kg of gold production in the country was from copper mining operations and lead and zinc mining operations. The remaining 35% or 13,086 kg of gold was produced from gold mining operations. Gold production from large-scale mining operations was produced mainly in the form of dore (93%). During the year, total silver output was 1,370 t; of that total amount, about 89% was produced from copper mining operations and the remainder was produced from gold, lead, silver, and zinc mining operations. The Antofagasta Region continued to be the leading producer of silver, accounting for 66% of total production (Servicio Nacional de Geología y Minería, 2018, p. 73–75, 79–80).

Molybdenum.—Molybdenum production at Los Pelambres Mine increased by about 27% to 13,300 t in 2018; the increase was attributed to higher grades and recoveries at the mine. The new molybdenum plant at the Centinela facility began operations during the year and produced 300 t of molybdenum concentrate. Antofagasta forecasted molybdenum production at Los Pelambres to be between 9,500 t and 10,500 t in 2019 and that at Centinela to be 2,000 t (Antofagasta plc, 2019, p. 63–64).

Industrial Minerals

Iodine.—SQM, which increased its iodine production capacity to about 14,000 t/yr, produced iodine at its Nueva Victoria facility, which included the Iris and the Pedro Valdivia plants. A total of 11,255 t of iodine was produced during the year; of this amount, Nueva Victoria produced about 79% (Sociedad Química y Minera de Chile S.A., 2019, p. 20, 32).

Lithium.—SQM continued the production of lithium carbonate and lithium hydroxide at its Salar del Carmen facilities. In 2018, the production capacity at the company's lithium carbonate plant and lithium hydroxide plant increased to 70,000 t/yr from 48,000 t/yr and to 13,500 t/yr from 6,000 t/yr, respectively. The increase in production capacity was attributed to the approval from CORFO and the Chilean Nuclear Energy Commission to increase SQM's lithium production quota as well as the growing demand of lithium carbonate and lithium hydroxide by electric vehicle manufacturers. SQM reported that it planned to further increase its lithium carbonate capacity to 180,000 t/yr in the future. In March, Albemarle received approval from CORFO to increase its lithium production quota in the Salar de Atacama to up to 145,000 t/yr of lithium carbonate equivalent through 2043. The company had requested approval in 2017 after developing a new technology that would allow it to obtain more lithium without the need of additional brine pumping at the Salar de Atacama. During the year, Albemarle completed the commissioning of La Negra II plant, which would produce battery-grade lithium carbonate and would have the capacity to produce 20,000 t/yr of lithium carbonate. After the rampup of La Negra II plant, the company's total capacity at La Negra's facility would be 44,000 t/yr

(Albemarle Corp., 2019, p. 4, 28–29; Sociedad Química y Minera de Chile S.A., 2019, p. 23; 2021).

Outlook

Chile's GDP is forecasted to increase by 1.1% in 2019. The mineral sector is expected to continue to be a significant part of the country's economy and to account for about 10% of the total GDP. The mineral sector GDP is expected to slightly decrease by about 2% in 2019, however, owing mainly to a projected decrease in the production of copper, which is likely to continue to be affected mainly by lower ore grades. The copper industry is likely to continue to account for about 9% of the country's total GDP and about 90% of the mineral sector GDP. The production of lithium hydroxide and lithium carbonate are likely to increase by more than 10% and more than 50%, respectively, in 2019 owing mainly to the increasing demand for these mineral products from electric vehicle battery manufacturers. Escondida is expected to remain the world's top copper-producing mine, and CODELCO is expected to continue to be the world's largest copper producer in terms of the number of active projects or operations. Mineral exports are expected to continue to account for more than 50% of Chile's total exports; however, the value of the country's mineral exports is expected to decrease by about 10% in 2019 because of an expected decrease in the export value of copper (by less than 10%). The mineral sector is likely to continue to be one of the principal sectors receiving FDI in the country owing mainly to the growing interest in the country's lithium resources (Banco Central de Chile, 2020, p. 5, 9; Comisión Chilena del Cobre, 2020, p. 14, 26, 59).

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TABLE 1
CHILE: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ²	2014	2015	2016	2017	2018	
METALS						
Copper:						
Mine, Cu content:						
Concentrates	3,917,100	3,993,700	3,892,300	3,917,300	4,256,300	
Solvent extraction	1,844,000	1,778,400 ^r	1,660,300 ^r	1,586,200	1,575,300	
Copper sulfate	10,292	9,496	11,410	11,893	13,523	
Smelter, primary	thousand metric tons	1,362 ^r	1,382 ^r	1,365 ^r	1,265	1,246
Refinery, primary, other	do.	885	910	952 ^r	843	886
Gold, mine, Au content	kilograms	46,031	42,501	46,333	37,911	37,066
Iron ore, mine:						
Gross weight	thousand metric tons	18,866	15,448	14,619 ^r	15,426	14,013
Fe content	do.	10,149	9,148	9,009	9,549	8,493
Iron and steel:						
Pig iron	do.	584	644	678	670	661
Raw steel	do.	1,079	1,112	1,153	1,158	1,145
Lead, mine, Pb content		2,678	2,979	1,110	1,562	712
Mercury, Hg content ^c		18 ^r	14 ^r	2 ^r	11	10
Molybdenum, mine, Mo content		48,898 ^r	52,398 ^r	55,834	62,454	60,248
Rhenium, Re content ^c	kilograms	25,000	26,000	27,000 ^r	27,000	27,000
Silver, mine, Ag content	do.	1,571,788	1,504,271	1,501,436	1,318,582	1,370,000
Zinc, mine, Zn content		45,094	48,071	42,870	29,008	26,810
INDUSTRIAL MINERALS						
Boron:						
Boric acid, H ₃ BO ₃		94,986	101,170	104,299	111,542	105,694
Ulexite, natural		496,533	517,584	558,854	607,076	398,411
Cement, hydraulic ^c	thousand metric tons	4,200	4,300	4,200	4,200	4,300
Clay:						
Bauxitic clay		16,903	29,166	19,113	22,862	12,707
Bentonite		1,083	1,434	1,288	1,584	525
Kaolin		60,000	60,000	60,000	60,000	88,262
Diatomite		31,000	26,186	26,937	27,557	24,736
Feldspar, mine		4,233	6,577	6,352	4,421	2,789
Gypsum, mine		843,490	860,075	934,033	1,157,466	909,191
Iodine, elemental		18,989	21,179	18,444	17,976	20,216
Lime ^c	thousand metric tons	900	910	920 ^r	930	930
Lithium:						
Lithium carbonate		55,074	50,418	70,831	73,563	87,029
Lithium chloride		2,985	2,069	1,775	2,535	3,826
Lithium hydroxide		4,194	3,888	5,576	5,280	6,468
Nitrogen, nitrates, crude, natural	thousand metric tons	722	795	806	853	949
Peat, horticultural use		2,276	2,306	3,621	7,908	6,249
Phosphate rock:						
Apatite:						
Gross weight		8,727	6,781	1,604	--	--
P ₂ O ₅ content ^c		3,000	2,000 ^r	500	--	--
Guano		2,717	3,408	4,601	4,238	4,154
Phosphorite		11,415	9,360	--	--	--
Potash, products:						
Potassium chloride, KCl		1,759,490	1,775,974	1,964,201	1,900,166	1,569,067
Potassium sulfate, K ₂ SO ₄		110,811	113,101	123,627	75,085	--
Pumice and related minerals, pumice and pozzolan		808,879	804,121	840,976	838,890	803,916
Salt	thousand metric tons	10,533	11,831	8,140	7,441	10,012
Sand and gravel, industrial, silica		924,059	824,153	911,729	887,851	792,328

See footnotes at end of table.

TABLE 1—Continued
CHILE: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons, gross weight, unless otherwise specified)

Commodity ²	2014	2015	2016	2017	2018
INDUSTRIAL MINERALS—Continued					
Stone, sand, and gravel, construction:					
Stone:					
Crushed, quartzite	269,208	433,560	399,576	551,765	584,061
Dimension:					
Marble	4,453	2,401	4,395	5,025	3,511
Travertine	4,176	2,999	3,292	1,220	--
Other, size and shape unspecified:					
Coquina	510	506	481	394	464
Ground calcium carbonate	26	44	49	38	20
Limestone	6,314	6,147	6,846	6,591	6,136
Sulfur, byproduct, metallurgy, S content	1,514 ^r	1,488 ^r	1,596 ^r	1,524	1,500 ^e
Zeolites	92	--	386	86	122
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous ³	4,168	3,162	2,525	2,495	2,295
Coke, metallurgical	443	440 ^e	440 ^e	440 ^e	440 ^e
Natural gas	907	1,064 ^r	1,175	1,200	1,221
Petroleum:					
Crude, including condensate	2,499	1,796	1,503	1,242	1,120
Refinery: ⁴					
Diesel, including distillate fuel oil	23,458	22,239 ^r	21,760 ^r	23,005	23,000
Gasoline	21,980	24,320	24,867 ^r	25,684	25,000
Kerosene	5,742	5,327	5,534 ^r	5,824	6,000
Liquefied petroleum gas	3,075	3,050	2,868 ^r	3,277	5,000
Residual fuel oil	8,220	8,283	8,075	7,742	7,600
Other	12,816	6,377	6,069 ^r	5,138	5,100
Total	75,300	69,600 ^r	69,200 ^r	70,700	71,700

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

¹Table includes data available through November 7, 2019. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²In addition to the commodities listed, arsenic trioxide, barite, ferroalloys, hydraulic lime, lapiz lazuli, manganese, methanol, pyrite, sodium sulfate, and steel semimanufactures may have been produced, but available information was inadequate to make reliable estimates of output.

³Data may include production of subbituminous coal.

⁴Source: Empresa Nacional del Petróleo.

TABLE 2
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity ^c
Bentonite	S.C. Industrial Minera Geo Sinter Ltda.	Camaleón 1 al 3 Mine, Arica y Parinacota Region	NA
Do.	Sociedad Legal Minera Mabel Dos Primera de Arica	Zorrito 1 al 2 Mine, Arica y Parinacota Region	NA
Boron compounds:			
Boric acid, H ₃ BO ₃	Quiborax S.A. (private, Chile-based investors, 100%)	Boric acid plants, Arica y Parinacota Region	36
Do.	SQM Salar S.A. [Sociedad Química y Minera de Chile S.A. (SQM), 100%]	Salar de Atacama, Antofagasta	15
Ulexite, natural	Quiborax S.A. (private, Chile-based investors, 100%)	Mines at Salar del Surire and Salar de Ascotan	NA
Calcium carbonate, natural	INACAL S.A. (Cementos Bio Bio S.A., 100%)	Mine at Copiapo, Atacama Region	NA
Do.	Minera El Jilguero S.A. (Cementos Bio Bio S.A., 100%)	do.	NA
Do.	Minera El Way S.A. (Cementos Bio Bio S.A., 100%)	Mine at Antofagasta Region	NA
Do.	Minera Río Colorado S.A. (Cementos Bio Bio S.A., 51%, and Soprocal Calerías e Industrias S.A., 49%)	Mine at Río Colorado, Metropolitana (Santiago) Region	NA
Do.	Sibelco Chile Ltda.	Mine at Atacama Region	NA
Do.	Sociedad Minera Las Abuelitas Ltda. (Soprocal Calerías e Industrias S.A., 100%)	Mine at Melipilla, Metropolitana (Santiago) Region	NA
Cement	Cementos Bio Bio S.A. (private, 100%)	Curico plant, Maule Region	500
Do.	do.	La Negra plant, Antofagasta Region	500
Do.	do.	San Antonio plant, Valparaiso Region	1,700
Do.	do.	Talcahuano plant, Biobio Region	300
Do.	Melón S.A. (Inversiones Cordillera del Sur III Ltda., 99.5%)	La Calera and Ventanas plants, Valparaiso Region, Puerto Montt plant, Los Lagos Region	NA
Clay, kaolin	Minera Lealtad Ltda.	Mine at Lealtad, Metropolitana (Santiago) Region	NA
Coal	Mina Invierno S.A. (Empresas Copec S.A. 50%, and Inversiones Ultraterra Ltd. 50%)	Mina Invierno, Isla Riesco, Magallanes y de la Antartica Chilena Region	6,000
Coke, metallurgical	Cía. Siderúrgica Huachipato S.A. (subsidiary of CAP S.A.) (private, 100%)	Plant at Bahía de San Vicente, Talcahuano, Biobio Region	500
Copper, Cu content	Anglo American Sur, S.A. (Anglo American plc, 50.1%; Mitsubishi Corp., 20.4%; Corporación Nacional del Cobre, 20%; Mitsui & Co., Ltd., 9.5%)	Los Bronces Mine and SX-EW ¹ plant, Metropolitana (Santiago) Region	40
Do.	Antofagasta Minerals S.A. (Antofagasta Plc, 60%; JX Nippon Mining & Metals Corp., 25%; Mitsubishi Materials Corp., 15%)	Los Pelambres Mine, Coquimbo Region	370 ²
Do.	Antofagasta Minerals S.A. (Antofagasta Minerals Plc, 50%, and Barrick Gold Corp., 50%)	Zaldívar Mine and SX-EW ¹ plant, Antofagasta Region	100
Do.	Antofagasta Minerals Plc, 70%, and Marubeni Corp., 30%)	Antucoya open pit mine and SX-EW ¹ plant, Antofagasta Region	85
Do.	Cía. Contractual Minera Candelaria (Lundin Mining Corp., 80%; Sumitomo Metal Mining Co. Ltd., 15%; Sumitomo Corp., 5%)	Candelaria Mine, Antacama Region	180
Do.	Compañía Minera Carmen de Andacollo [Teck Resources Ltd., 90%, and Empresa Nacional de Minería (ENAMI) (Government, 100%), 10%]	Carmen de Andacollo Mine and SX-EW ¹ plant, Coquimbo Region	4
Do.	Compañía Minera Cerro Colorado Ltda. (BHP Billiton Ltd., 100%)	Cerro Colorado Mine and SX-EW ¹ plant, Tarapaca Region	70
Do.	Compañía Minera Doña Inés de Collahuasi SCM (Anglo American plc, 44%; Glencore plc, 44%; Mitsui & Co. Ltd., 12%)	Collahuasi Mine, Tarapaca Region	525 ²
Do.	Compañía Minera Minera Lomas Bayas (Glencore plc, 100%)	Lomas Bayas Mine and SX-EW ¹ plant, Antofagasta Region	75

See footnotes at end of table.

TABLE 2—Continued
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity ^c	
Copper, Cu content— Continued	Compañía Minera Teck Quebrada Blanca S.A. [Teck Resources Ltd., 90%, and Empresa Nacional de Minería (ENAMI) (Government, 100%), 10%]	Quebrada Blanca Mine and SX–EW ¹ plant, Tarapaca Region	25	
Do.	Complejo Metalurgico Altonorte S.A. (Glencore plc, 100%)	Altonorte smelter, La Negra, Antofagasta Region	310	
Do.	Corporación Nacional del Cobre (CODELCO) (Government, 100%)	Chuquicamata Division, including Chuquicamata and Mina Sur Mines; Chuquicamata SX–EW ¹ plant, and refinery, Calama, Antofagasta Region	50	
Do.	do.	Chuquicamata Division, Calama, Chuquicamata smelter, Antofagasta Region	450	
Do.	do.	Gabriela Mistral Mine and SX–EW ¹ plant, Sierra Gorda, Antofagasta Region	120	
Do.	do.	Radomiro Tomic Division, including Radomiro Tomic Mine and SX–EW ¹ plant; Ministro Hales Mine and SX–EW ¹ plant, Calama, Antofagasta Region	190	
Do.	do.	El Teniente Division, including El Teniente Mine and SX–EW, ¹ Machali, Libertador General Bernardo O'Higgins Region	2	
Do.	do.	El Teniente Division, Caletones smelter, Machali, Libertador General Bernardo O'Higgins Region	400	
Do.	do.	Ministro Hales Division, including Ministro Hales Mine, Calama, Antofagasta Region	180 ²	
Do.	do.	Ventanas Division, Las Ventanas refinery, Valparaiso Region	410	
Do.	do.	Ventanas Division, Las Ventanas smelter, Valparaiso Region	120	
Do.	do.	Andina Division, including Rio Blanco and Sur Sur Mines, Valparaiso Region	220 ²	
Do.	do.	Salvador Division, including Campamento Antiguo and Damiana Norte and Inca Mines, Chañaral, Atacama Region	50	
Do.	do.	Salvador Division, Potrerillos smelter, Chañaral, Atacama Region	180	
Do.	Empresa Minera de Mantos Blancos S.A. (Consortium led by Audley Capital Advisors LLP)	Mantos Blancos Mine and SX–EW ¹ plant, Antofagasta Region	25	
Do.	do.	Mantoverde Mine and SX–EW ¹ plant, Atacama Region	50	
Do.	Empresa Nacional de Minería (ENAMI) (Government, 100%)	Hernán Videla Lira smelter, Paipote, Atacama Region	80	
Do.	Lundin Mining Corp., 80%, and Sumitomo Corp., 20%	Ojos del Salado Mine, Atacama Region	25 ²	
Do.	Minera El Tesoro S.A. (Antofagasta plc, 70%, and Marubeni Corp., 30%)	El Tesoro open pit mine and SX–EW ¹ plant, Antofagasta Region	70 ²	
Do.	Minera Escondida Ltda. (BHP Billiton Ltd., 57.5%; Rio Tinto plc, 30%; Japan Escondida Corp., 12.5%)	Escondida Mine and SX–EW ¹ plant, Antofagasta Region	270 ²	
Do.	Minera Spence S.A. (BHP Billiton Ltd., 100%)	Spence Mine and SX–EW ¹ plant, Antofagasta Region	200 ²	
Do.	Sociedad Contractual Minera El Abra [Freeport-McMoRan Copper & Gold Inc., 51%, and Corporación Nacional del Cobre (CODELCO) (Government, 100%), 49%]	El Abra SX–EW ¹ plant, Antofagasta Region	100 ²	
Copper sulfate	metric tons	Compañía Minera San Gerónimo	Plant at Faena Lambert, El Romero, Coquimbo Region	13,000
Diatomite		Imerys Minerales Arica Limitada	Mines at Carol, Arica y Parinacota Region and Josefina, Tarapaca Region	NA
Feldspar		Eliana Morales Cueto	Quintay Mine, Valparaiso Region	NA
Do.		Juan Schiappacase Ahumada	Guayacan Segunda Mine, Valparaiso Region	NA

See footnotes at end of table.
CHILE—2017–2018

TABLE 2—Continued
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity ^c
Ferromolybdenum		Molibdenos y Metales S.A. (Molymet) (private, 100%)	Nos plant 30 kilometers south of Santiago and Molynor Industrial Complex, Antofagasta Region	25
Gold:				
Mine output	kilo-grams	Antofagasta Plc, 60%; JX Nippon Mining Metals Corp., 15%; Mitsubishi Materials Corp., 10%; Marubeni Corp., 8.75%; Mitsubishi Corp., 5%; Mitsui & Co. Ltd., 1.25%	Los Pelambres Mine and plant, Coquimbo Region	1,700
Do.	do.	Cía. Contractual Minera Candelaria, 100%	Candelaria copper mine and plant, Atacama Region	2,500
Do.	do.	Compañía Minera Cerro Bayo Ltda. (Mandalay Resources Corp., 100%)	Cerro Bayo Mine, Aysen Region	950 ³
Do.	do.	Compañía Minera Doña Inés de Collahuasi SCM, 100% (Anglo American plc, 44%; Glencore plc, 44%; companies led by Mitsui & Co. Ltd., 12%)	Collahuasi Mine and plants, Tarapaca Region	NA
Do.	do.	Compañía Minera Mantos de Oro (Kinross Gold Corp., 100%)	La Coipa Mine and plant, Atacama Region, 140 kilometers north of Copiapo	6,000
Do.	do.	Compañía Minera Maricunga (Kinross Gold Corp., 100%)	Maricunga open pit, heap-leach mine, Atacama Region, 100 kilometers east of Copiapo	7,500
Do.	do.	Corporación Nacional del Cobre (CODELCO) (Government, 100%)	Andina Mine, Valparaiso Region; Chuquicamata and Radomiro Tomic Mines, Antofagasta Region; El Teniente Mine, Libertador General Bernardo O'Higgins Region; Radomiro Tomic, Antofagasta Region; and Salvador Mine, Atacama Region	2,000
Do.	do.	Empresa Nacional de Minería (ENAMI) (Government, 100%)	Manuel Antonio Matta plant, Paipote; Osvaldo Martínez plant, El Salado; Vallenar plant, Atacama Region; and José Antonio Moreno plant, Taltal, Antofagasta Region	400
Do.	do.	Lundin Mining Corp., 80%; Sumitomo Metal Mining Co. Ltd., 16%; Sumitomo Corp., 4%	Ojos del Salado copper mine and plant, Atacama Region	600
Do.	do.	Minera Escondida Ltda. (BHP Billiton Ltd., 57.5%; Rio Tinto plc, 30%; Japan Escondida Corp., 12.5%)	Escondida copper mine and plants, Antofagasta Region	4,500
Do.	do.	Minera Esperanza S.A. (Antofagasta plc, 70%, and Marubeni Corp., 30%)	Esperanza sulfides mine and milling-flotation plant, Antofagasta Region	8,000
Do.	do.	Minera Florida Ltda. (Yamana Gold Inc., 100%)	Minera Florida Mine, Metropolitana (Santiago) Region	3,000
Do.	do.	Minera Meridian Ltda. (Yamana Gold Inc., 100%)	El Peñón Mine, Antofagasta Region	5,000
Do.	do.	Sociedad Contractual Minera El Toqui Ltda. (Laguna Gold Ltd., 100%)	El Toqui Mine, Coyhaique, Aysen Region,	1,600
Gypsum, natural		Compañía Minera Polpaico Ltda.	Yeso Norte Mine, Antofagasta Region	NA
Do.		Compañía Minera Romeral S.A. (Etex Group S.A., 59.8%, and Melón S.A., 40.2%)	Mine at El Romeral, Metropolitana (Santiago) Region	NA
Do.		Improver S.A.	Corral I Mine, Coquimbo Region	NA
Do.		Minera Lo Valdés Ltda.	Mine at Metropolitana (Santiago) Region	NA
Do.		Minera El Way S.A.	Patty Mine, Coquimbo Region	NA
Iodine		ACF Minera S.A.	Lagunas Mine, Iquique, Tarapaca Region	NA
Do.	metric tons	Atacama Chemical S.A. (Cosayach) (Inverraz S.A., 100%)	Mine and plant near Iquique, Tarapaca Region	3,000
Do.	do.	Algorta Norte S.A. (Inversiones Minerales SA, 74.5%, and Toyota Tsusho Corp., 25.5%)	Mine at Baquedano, Sierra Gorda, Antofagasta Region	4,000
Do.	do.	Atacama Minerals Chile Minera (SCM Bullmine and RB Energy)	Mine and plant in Aguas Blancas, Antofagasta Region	2200
Do.	do.	Minera Centinela S.A. (Antofagasta plc, 70%, and Marubeni Corp., 30%)	Esperanza mine and milling-flotation plant, Antofagasta Region	8,000

See footnotes at end of table.

TABLE 2—Continued
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity ^c
Iodine— Continued	metric tons	SQM Químicos S.A. [Sociedad Química y Minera de Chile S.A. (SQM), 100%]	Nueva Victoria Mine and plant and Iris plant, Tarapaca Region; María Elena plant and Pedro de Valdivia mines and plants, Antofagasta Region	14,000
Iron ore, Fe content		Compañía Minera del Pacífico S.A. (CAP S.A., 77.56%, and Mitsubishi Corp. 19.27%)	Valle del Copiapo, including Cerro Negro Norte Mine, and Magnetita plant, Atacama Region	4,000
Do.		do.	Valle del Huasco, including Los Colorados Mine and Pellets plant, Atacama Region	10,000
Do.		do.	Valle del Elqui, including Romeral Mine, Coquimbo Mine	1,700
Iron and steel:				
Pig iron		Cía. Siderúrgica Huachipato S.A. (Compañía Minera del Pacífico S.A., 100%)	Plant at Bahía de San Vicente, Talcahuano, Biobío Region	1,200
Steel, crude		do.	do.	1,500
Do.		Gerdau AZA S.A.	Steel plants in Renca and Colina, Metropolitana (Santiago) Region	520
Lead, mine output	metric tons	Sociedad Contractual Minera El Toqui Ltda. (Laguna Gold Ltd., 100%)	El Toqui Mine, Coyhaique, Aysén Region	2,000
Lithium carbonate	do.	Rockwood Lítio Ltda. (Albemarle Corp., 100%)	Plant at La Negra, Antofagasta Region	145,000
Do.	do.	SQM Salar S.A. [subsidiary of Sociedad Química y Minera de Chile S.A. (SQM)] (private, 100%)	Plant at Salar del Carmen, Antofagasta Region	70,000
Lithium chloride	do.	do.	do.	NA
Do.	do.	Rockwood Lítio Ltda. (Albemarle Corp., 100%)	Plant at La Negra, Antofagasta Region	6,000
Lithium hydroxide	do.	SQM Salar S.A. [Sociedad Química y Minera de Chile S.A. (SQM), 100%]	Salar del Carmen, Antofagasta Region	13,500
Marble, dimension stone	do.	Compañía Minera Feltre Ltda.	La Pola Quarry, Atacama Region	NA
Do.	do.	Marmolería Italo Cedolin y Cía. Ltda.	Gabriela 1/3 Quarry, Atacama Region	NA
Methanol		Methanex Chile S.A. (Methanex Corp., 100%)	Two methanol plants at Cabo Negro, 28 kilometers north of Punta Arenas City, Magallanes y de la Antártica Chilena Region	1,700
Molybdenum, mine output	metric tons	Anglo American Sur, S.A. (Anglo American plc, 50.1%; Mitsubishi Corp., 20.4%; Corporación Nacional del Cobre, 20%; Mitsui & Co., Ltd., 9.5%)	Los Bronces Mine and Tortolas molybdenum flotation plant, Metropolitana (Santiago) Region	3,000
Do.	do.	Compañía Minera Doña Inés de Collahuasi SCM (Anglo American plc, 44%; Glencore plc, 44%; companies led by Mitsui & Co. Ltd., 12%), 100%	Collahuasi Mine and molybdenum plant, Tarapaca Region	6,000
Do.	do.	Corporación Nacional del Cobre (CODELCO) (Government, 100%)	Chuquicamata and Radomiro Tomic Mines, Antofagasta Region	20,000
Do.	do.	do.	El Teniente Mine, Libertador General Bernardo O'Higgins Region	6,500
Do.	do.	do.	Andina Mine, Valparaíso Region	5,000
Do.	do.	do.	Salvador Mine, Atacama Region	1,500
Do.	do.	Minera los Pelambres S.A. (Antofagasta Plc; 60%; JX Nippon Mining Metals Corp, 15%; Mitsubishi Materials Corp., 10%; Marubeni Corp., 8.75%; Mitsubishi Corp., 5%; Mitsui & Co. Ltd., 1.25%)	Los Pelambres Mine and plant, Coquimbo Region	12,500
Do.	do.	Minera Centinela S.A. (Antofagasta plc, 70%, and Marubeni Corp., 30%)	Esperanza Mine and milling-flotation plant, Antofagasta Region	2,400
Do.	do.	Molyb Ltda. (Corporación Nacional del Cobre (CODELCO) (Government, 100%)	Mine at Mejillones, Antofagasta Region	16,500

See footnotes at end of table.

TABLE 2—Continued
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity ^c
Phosphatic materials, natural:				
Guano		Guano Rojo S.A.	Mine at Covadera Punta de Lobos, Tarapaca Region	NA
Do.		Fernando Carvajal Maldonado	Mine at Punta Patache, Tarapaca Region	NA
Potash, compounds:				
Potassium chloride (KCl)		Rockwood Lithio Ltda. (Albemarle Corp., 100%)	Salar de Atacama, Antofagasta Region	NA
Do.		SQM Salar S.A. [Sociedad Química y Minera de Chile S.A. (SQM)] (private, 100%)	do.	2,680
Potassium sulfate(K ₂ SO ₄)		do.	do.	245
Pumicite, including pozzolan		Compañía Minera Polpaico Ltda.	Puzolana Norte Mine, Antofagasta Region, Puzolanal Pudahue Mine, Metropolitana (Santiago) Region	NA
Do.		Imerys Minerales Santiago Ltda. (IMERYS S.A., 100%)	Gaby 1-4 Mine, Metropolitana (Santiago) Region	NA
Do.		Minera El Way S.A. (Cementos Bío Bío S.A., 100%)	Juana Mine, Antofagasta Region	NA
Do.		Minera Melon S.A.	Las Casas Mine, Metropolitana (Santiago) Region	NA
Do.		Minera Río Teno S.A. (Cementos Bío Bío S.A., 100%)	Camarico Mine, Maule Region; Las Pataguas Mine, Libertador General Bernardo O'Higgins Region; and Popeta Yacimiento Mine, Metropolitana (Santiago) Region	NA
Rhenium, metal	kilograms	Molibdenos y Metales S.A. (MOLYMET) (private, 100%)	Nos plant, San Bernardo, Metropolitana (Santiago) Region	30,000
Do.	do.	Molyb Ltda. (Corporación Nacional del Cobre (CODELCO) (Government, 100%)	Mine at Mejillones, Antofagasta Region	8,000
Salt, NaCl		Cía. Minera Cordillera Chile S.C.M.	Tenardita Mine, Tarapaca Region	NA
Do.		Inversiones Alpina Ltda.	Irlanda 3 Mine in the Salar Grande de Tarapaca, Tarapaca Region	NA
Do.		Sociedad Minera Punta de Lobos S.A. (K+S Aktiengesellschaft, 100%)	Kainita and Lobera mines in the Salar Grande de Tarapaca, Tarapaca Region	NA
Silica, quartz		Antonio Zotti Rosetti y Cía. Sociedad Minera	Illapel Mine, Coquimbo Region	NA
Do.		Cedric Fernández y Compañía Ltda.	Nancy Mine, Antofagasta Region	NA
Do.		Cía. Minera Minerales de Copiapo Ltda.	Pedro Luis Mine, Atacama Region	NA
Do.		Migrin S.A.	Cuarzo Plant, Maule Region	NA
Silver:				
Metal grains	kilograms	Corporación Nacional del Cobre (CODELCO) (Government, 100%)	Ventanas refinery, Valparaiso Region	220,000
Mine output	do.	Anglo American Sur S.A. (Anglo American plc, 50.1%; Mitsubishi Corp., 20.4%; Corporación Nacional del Cobre, 20%; Mitsui & Co., Ltd., 9.5%)	Los Bronces Mine and plants, Metropolitana (Santiago) Region	35,000
Do.	do.	Antofagasta Plc, 60%; JX Nippon Mining Metals Corp, 15%; Mitsubishi Materials Corp., 10%; Marubeni Corp., 8.75%; Mitsubishi Corp., 5%; Mitsui & Co. Ltd., 1.25%	Los Pelambres Mine and plant, Coquimbo Region	42,000
Do.	do.	Compañía Minera Cerro Bayo Ltda. (Mandalay Resources Corp., 100%)	Cerro Bayo Mine and concentration plant, Aysen (Region XI)	110,000
Do.	do.	Compañía Minera Doña Inés de Collahuasi SCM (Anglo American plc, 44%; Glencore plc, 44%; companies led by Mitsui & Co. Ltd., 12%), 100%	Collahuasi Mine and plants, Tarapaca Region	60,000
Do.	do.	Compañía Contractual Minera Candelaria, 100%	Candelaria Mine and concentration plant, Atacama Region	30,000
Do.	do.	Compañía Minera Mantos de Oro (Kinross Gold Corp., 100%)	La Coipa Mine and plant, Atacama Region, 140 kilometers north of Copiapo	150,000
Do.	do.	Corporación Nacional del Cobre (CODELCO) (Government, 100%)	Andina Mine, Valparaiso Region; Chuquicamata and Radomiro Tomic Mines, Antofagasta Region; El Teniente Mine, Libertador General Bernardo O'Higgins Region; and Salvador, Atacama Region	300,000

See footnotes at end of table.

TABLE 2—Continued
CHILE: STRUCTURE OF THE MINERAL INDUSTRY IN 2018

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity ^c
Silver:—Continued				
Mine output— Continued	kilo- grams	Empresa Nacional de Minería (ENAMI) (Government, 100%)	Manuel Antonio Matta plant, Paipote; Osvaldo Martínez plant, El Salado; Vallenar plant, Atacama Region; and José Antonio Moreno plant, Taltal, Antofagasta Region	6,000
Do.	do.	Minera Meridian Ltda. (Yamana Gold Inc., 100%)	El Peñón Mine, Antofagasta Region	130,000
Do.	do.	Minera Escondida Ltda. (BHP Billiton Ltd., 57.5%; Rio Tinto plc, 30%; Japan Escondida Corp., 12.5%)	Escondida copper mine and plants, Antofagasta Region	180,000
Do.	do.	Lundin Mining Corp., 80%; Sumitomo Metal Mining Co. Ltd., 16%; Sumitomo Corp., 4%	Ojos del Salado copper mine and plant, Atacama Region	4,500
Do.	do.	Sociedad Contractual Minera El Toqui Ltda. (Laguna Gold Ltd., 100%)	El Toqui Mine, Coyhaique, Aysen Region	11,000
Sulfuric acid		Corporación Nacional del Cobre (CODELCO) (Government, 100%)	Plants at Chuquicamata Mine, Valparaiso Region; El Teniente Mine, Libertador General Bernardo O'Higgins Region; Ministro Hales Mine, Antofagasta Region; Ventana Mine, Valparaiso Region; and Salvador Mine, Atacama Region	2,900
Travertine, dimension stone		Andes Travertine & Stones S.A.	Quarry and plant in Antofagasta Region	NA
Do.	metric tons	Mármoles San Marino Chile S.A. (Grupo San Marino S.A., 100%)	Quarry near Calama, Antofagasta Region, and plant in Til-Til, Metropolitana (Santiago) Region	7,000
Zinc, mine output	do.	Sociedad Contractual Minera El Toqui Ltda. (Laguna Gold Ltd., 100%)	El Toqui Mine, Coyhaique, Aysen Region,	38,000

^cEstimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.

¹Solvent extraction and electrowinning.

²Concentrates.

³On care-and-maintenance status.

TABLE 3
CHILE: RESERVES OF MAJOR MINERAL COMMODITIES IN 2018

(Thousand metric tons unless otherwise specified)

Commodity	Reserves ¹
Coal, all types	million metric tons 387 ²
Copper, Cu content	do. 167
Gold, Au content	metric tons 998
Iodine	614
Iron ore, Fe content	million metric tons 7,300 ^e
Lithium, Li content	8,000 ^e
Molybdenum, Mo content	1,400
Nitrates	85,600
Silver, Ag content	metric tons 25,542

^eEstimated do. Ditto.

¹Source: Servicio Nacional de Geología y Minería (SERNAGEOMIN), Anuario de la Minería de Chile 2016.

²Source: Empresa Copec S.A., Annual Report 2017. Reserves at Mina Invierno.