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2017–2018 Minerals Yearbook

FINLAND

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The Mineral Industry of Finland

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

In 2017, Finland's real gross domestic product (GDP) increased by 2.8% and the nominal GDP was $242.7 billion.[1] The total sales value of all industries combined was $442.69 billion. The highest sales increase was recorded in the mining and quarrying sector at 37.2%, followed by a 13.8% sales increase in real estate activities and a 10.5% sales increase in administrative and supportive service activities. The principal products of Finland's industrial sector were chemicals, electronics and optical products, machinery, metals and metal products, and paper products. The unemployment rate decreased to 11.2% in December 2017 from 13.6% in December 2016 (Ministry of Economic Affairs and Employment of Finland, 2018, p. 1; Statistics Finland, 2018a, b; U.S. Central Intelligence Agency, 2018).

Finland was the leading peat and mica producer in the world, accounting for approximately 35% and 16% of world production, respectively. Finland was also a leading producer of selenium, ranking sixth in the world and accounting for 4% of world production (Anderson, 2019; Brioche, 2019; Curry, 2019).

Minerals in the National Economy

In the mining and quarrying sector, the number of employees increased to 5,890 in 2017 from 5,305 in 2016, or by 11%, and the number of companies increased to 947 in 2017 from 829 in 2016. Compared with that of 2016, the total investment in mines increased by 25% in 2017. The major investments were focused on the Kevitsa copper-nickel mine, the Suurikuusikko gold mine, the Talvivaara nickel mine, and the Siilinjarvi phosphate mine (Liikamaa, 2018, p. 2; Statistics Finland, 2019a).

During the past few years, nearly three-quarters of the monetary investment in exploration in Finland's mining sector came from international sources. Finland's allocation of domestic capital to fund exploration and mining activities was limited. Finnish banks and investors, however, were becoming more interested in the opportunities of financing or investing in mining operations. Finnish Industry Investment Ltd., which was a Government-owned investment company, invested in exploration and mining companies, as did some Finnish pension funds. The only Government agency participating in exploration activities was the Geological Survey of Finland (GTK), which focused on assessing and modeling potential ore-rich areas (Holopainen and Skogström, 2018; Vasara, 2018, p. 10, 27, 28).

In 2017, industrial minerals were extracted and processed domestically. Metallic ores also were mined, and most of them were processed domestically, with only small quantities being transported to other countries in Europe and Asia for refining. Forty-six companies submitted exploration reports about progress on their projects to the Finnish Safety and Chemicals Agency (TUKES). Compared with that of the previous year, drilling increased by 53%. Excavation of ore and total excavation at 42 mines increased by 11% to 48.8 million metric tons (Mt) and by 3% to 120.4 Mt, respectively (Liikamaa, 2018, p. 2, 3, 5; Vasara, 2018, p. 21).

Government Policies and Programs

The Government regulates the mineral industry through two main laws—the Land Extraction Act (555/1981, effective on July 24, 1981), which regulates the extraction of sand and gravel and the quarrying of natural stone, and the Mining Act (621/2011, effective on July 1, 2011, and amended with an effective date of January 1, 2016), which regulates the mining of metallic and industrial minerals other than stone, sand, and gravel. The Mining Act's objective is to ensure that exploration and mining activities are conducted in an environmentally, economically, and socially sustainable way. The Mining Act takes account of other key laws applicable to exploration and mining, including the Finnish Constitution and legislation concerning the Sami regions in northern Finland. According to the Mining Act, appeals of the mining authority's decisions all the way through to the Supreme Administrative Court are restricted unless a special retrial permit is granted. TUKES is the major governing body for the mining industry and acts as the mining authority. TUKES grants and supervises permits and enforces compliance with the Mining Act; responsibilities of the Ministry of Employment and the Economy include providing guidance for monitoring and development activities related to the Mining Act. The Regional State Administrative Agency (AVI) grants the environmental permits required for mining. The Centres for Economic Development, Transport, and the Environment (ELY Centres) supervise and protect the public interest concerning environmental and water issues. The Finnish Government rules on matters related to mining reclamation permits and permits for mining thorium and uranium, whereas the Radiation and Nuclear Safety Authority of Finland (STUK), which is under the Ministry of Social Affairs and Health, is responsible for matters related to radioactive substances (Finlex Data Bank, 1981, 2011; United Nations, 2015, p. 1; Holopainen and Skogström, 2018).

Production

In 2017, mineral commodities that had significant increases in production included nickel (mine, Ni content), 68%; zinc (mine, Zn content), 45%; pyrite (sulfur content), 22%; platinum (mine, Pt content), 20%; phosphate rock (apatite concentrate, P_2O_5 content), 14% (estimated); nickel (refinery)

[1]Where necessary, values have been converted from euro area euros (EUR) to U.S. dollars (US$) at an annual average exchange rate of EUR0.923=US$1.00 for 2017.

and palladium (mine, Pd content), 13% each; and copper (mine, concentrates, Cu content), 12%. Significant decreases in production were reported for cobalt (mine, Co content), 29%; quartz, 23%; feldspar, 20%; nickel matte, 19%; silver (mine, Ag content), 16%; and ferrochromium and platinum (refinery), 11% each. Data on mineral production are in table 1.

Structure of the Mineral Industry

Finland's metallic mineral mines were mostly privately owned by foreign enterprises, although the Government held an equity share in some of the major mineral producers. The majority of the mining companies were subsidiaries of international mining companies from Australia, Canada, Sweden, or the United Kingdom (United Nations, 2015, p. 1; Holopainen and Skogström, 2018; Vasara, 2018, p. 10).

In 2017, initial economic feasibility studies were conducted for three new projects: the Sakatti copper and nickel deposit (owned by Anglo American plc); the Otanmaki iron, titanium, and vanadium deposit (Otanmaki Mine Oy); and the Lahtojoki diamond deposit (Karelian Diamond Resources plc). The Taivaljarvi silver mining project (owned by Sotkamo Silver AB), the Hautalampi cobalt-nickel mining project (Alandra Oy), the Keliber lithium mining project (Keliber Oy), the Hannukainen iron mining project (Hannukainen Mining Oy), and the Kaapelinkulma gold mining project (Dragon Mining Ltd.) were five new projects targeted at starting new mining operations. Another project under consideration was the reopening of the Pahtavaara gold mine (Rupert Resources Ltd.). Several ore prospecting projects were underway. The country's major mineral facilities and their annual capacities are listed in table 2 (Ministry of Economic Affairs and Employment of Finland, 2017; Vasara, 2018, p. 14).

Mineral Trade

Finland's total exports were valued at $59.7 billion in 2017 compared with about $57.6 billion in 2016; the total value of imports was $62.5 billion compared with $61.1 billion in 2016. The country's leading export products in 2017 included forest industry products, chemicals, metals and metallic products, machinery and equipment, and electronics. The leading import products included chemicals, electronics, transport equipment, and mining and quarrying products. Finland's leading export partners were Germany (which received about 14.2% of the country's total exports), Sweden (10.3%), the Netherlands (6.9%), the United States (6.8%), and China and Russia (5.7% each); the leading import partners were Germany (which supplied about 15.4% of the country's total imports), Russia (13.2%), Sweden (11%), China (7.4%), and the Netherlands (5.6%) (Statistics Finland, 2018c).

Commodity Review

Metals

Copper.—In 2017, copper production (mine output, Cu content) in the country totaled 53,144 metric tons (t), which was an increase of 12% compared with the 47,888 t (revised) produced in 2016. Boliden Mineral AB (Boliden) of Sweden owned and operated the Kevitsa copper-nickel open pit mine (acquired in 2016) and the Kylylahti polymetallic mine (acquired in 2014). In 2017, copper production increased by 46% to 29,957 t at the Kevitsa Mine and decreased by 20% to 9,686 t at the Kylylahti Mine compared with production at the mines in 2016. The decrease of copper in concentrate (Cu content) production at the Kylylahti Mine was owing to lower ore grades. Copper concentrates produced at these mines were mainly processed at the Harjavalta copper-nickel smelter, which was owned by Boliden. The smelter also produced gold, silver, and sulfuric acid as byproducts (Boliden AB, 2018, p. 33).

First Quantum Minerals Ltd. of Canada owned and operated the polymetallic Pyhasalmi Mine. The underground mine, which was located in central Finland, produced 13,501 t of copper, 692,124 t of pyrite, and 17,397 t of zinc in 2017. Copper production decreased by 9% compared with that of the previous year owing mainly to lower throughput, which was caused by nearly depleted ore reserves (First Quantum Minerals Ltd., 2018, p. 28, 29).

Gold.—In 2017, production of gold in Finland totaled 9,102 kilograms (kg), which was an increase of 2.7% compared with the 8,865 kg produced in 2016. The underground Kittila Mine located in the Lapland region of northern Finland was one of the largest known gold deposits in Europe. The mine was owned by Agnico Eagle Mines Ltd. of Canada. In 2017, it produced 6,125 kg of gold. Production at the mine started in 2009, and mine life was estimated to continue through 2035 (Agnico Eagle Mines Ltd., 2018).

In 2017, Dragon Mining Ltd. of Australia completed a drilling program for the Kaapelinkulma gold project in the Vammala municipality in southern Finland, which was scheduled to begin delivering ore to the Vammala plant in early 2019. The mine would become Dragon Mining's third gold mine in the country. The open pit mine was expected to produce approximately 160,000 metric tons per year (t/yr) of ore. The company owned two other gold mines at Jokisivu and Orivesi (Dragon Mining Ltd., 2018a, p. 6, 8; 2018b).

Nickel.—In 2017, the nickel production (mine, Ni content) in Finland increased by 68% to 34,641 t from 20,654 t in 2016. The year 2017 was the second full year of production for the Talvivaara Mine, which was located in Sotkamo, Kainuu Region, and was owned by Terrafame Ltd. The mine produced 20,864 t of nickel in 2017 compared with 9,554 t in 2016. A comprehensive maintenance shutdown of the nickel production process at the Harjavalta smelter took place in 2017; as a result, production of nickel matte decreased by 19% to 25,000 t (Boliden AB, 2018, p. 39, 116; Terrafame Ltd., 2018).

Zinc.—Zinc output (mine, Zn content) in Finland increased by 45% to 66,284 t in 2017 from 45,852 t in 2016. Zinc smelter production in Finland totaled 284,992 t, which was a decrease of about 2% compared with the 290,599 t produced in 2016. In 2017, Boliden ranked fourth in zinc mining and sixth in zinc smelting in the world. The company owned and operated a zinc smelter in Finland's Kokkola municipality, which produced zinc and zinc alloys as well as silver concentrate and sulfuric acid. The Kokkola smelter was a major zinc producer. Most of the zinc concentrate consumed at the Kokkola smelter came from

Boliden's mines in Finland, Ireland, and Sweden (Boliden AB, 2017, p. 23; 2018, p. 18).

The Pyhasalmi Mine produced 17,397 t of zinc, which was a decrease of 16% compared with production in 2016. The decrease was owing to lower throughput, lower grade, and a lower recovery rate associated with depletion of reserves. The mine was one of the oldest and deepest underground mines in Europe. Terrafame operated the Talvivaara Mine, which was in the second full year of production in 2017 and produced 47,205 t of zinc compared with 22,575 t in 2016 (First Quantum Minerals Ltd., 2018, p. 28; Terrafame Ltd., 2018).

Industrial Minerals

Limestone.—Nordkalk Corp. (owned by Rettig Group Ltd.) was the leading limestone and limestone powder producer in Finland. In 2017, the company was expanding its extraction areas at the Lappeenranta and Pargas sites. Lappeenranta was Nordkalk's largest production site in Finland; it included a quarry, a grinding plant, and two flotation plants (Nordkalk Corp., 2018; Rettig Group Ltd., 2018, p. 18).

MINERAL INDUSTRY HIGHLIGHTS IN 2018

Minerals in the National Economy

In 2018, Finland's real GDP increased by 1.7%, and the nominal GDP was $275.9 billion.[2] The unemployment rate decreased to 9.7% in December 2018 from 11.2% in December 2017. Employment in the mining and quarrying industry increased by 4% to 6,143 employees in 2018 from 5,890 in 2017. Sales in the mining and quarrying industry increased by 9.4% compared with a 37.2% increase in 2017 (Ministry of Economic Affairs and Employment of Finland, 2019, p. 1; Statistics Finland, 2019a, b).

In 2018, 44 companies submitted exploration reports to TUKES. The Government received 148 exploration applications and 50 reservation notifications from these exploration companies. It also received excavation reports for 46 active mines. Investment in exploration in Finland increased by 15% to $83 million, but drilling decreased by 20% to 219 kilometers in 2018. The total investment in mining increased by 29% to $460 million (Liikamaa, 2019, p. 2, 3, 5).

Production

In 2018, significant increases in the production of commodities included that of zinc (mine, Zn content), by 29%; nickel (mine, Ni content), 26%; nickel matte and nickel chemicals, 24% each; ferrochromium, 18%; feldspar, 17%; pig iron, 14%; chromite (ore), mica (concentrate), palladium (mine, Pd content), and quartz, 13% each; platinum (refinery), 12%; and platinum (mine, Pt content), 11%. Significant decreases in production included cobalt (mine, Co content), 14%; and copper (mine, concentrates, Cu content) and sulfur (pyrite, sulfur content), 12% each. Data on mineral production are in table 1.

[2]Where necessary, values have been converted from euro area euros (EUR) to U.S. dollars (US$) at an annual average exchange rate of EUR0.848=US$1.00 for 2018.

Commodity Review

Metals

Copper.—In 2018, copper production decreased by 12% in Finland. Production at First Quantum Minerals' Pyhasalmi underground copper mine decreased by 12% to 11,904 t in 2018 owing to lower throughput and lower ore grade in the nearly depleted ore reserve. The company expected that 2019 would be the final full year of production at the Pyhasalmi Mine, forecasting 5,000 t of copper production. Copper production decreased by 8.2% to 27,498 t at Boliden's Kevitsa Mine and by 24% to 7,353 t at its Kylylahti Mine in 2018. The production decrease at the Kevitsa Mine was owing to lower milled volume and lower grades, and the decrease at the Kylylahti Mine was owing to lower ore grades. In 2018, the Kevitsa Mine milled 7.6 Mt of ore, and the mine produced cobalt, nickel, copper, gold, platinum, and palladium. To expand operations and increase the milled volume at the Kevitsa Mine to 9.5 million metric tons per year (Mt/yr) from 7.5 Mt/yr, Boliden acquired 17 new haul trucks. The new production capacity was expected to be reached by the end of 2020 (Boliden AB, 2019, p. 49, 50, 52, 61, 115; First Quantum Minerals Ltd., 2019, p. 32, 33).

Gold.—In 2018, Agnico Eagle Mines began a new processing plant expansion project at its Kittila Mine. The $188 million expansion would increase the mill throughput by 25% to 2 Mt/yr and would include construction of a 1,044-meter-deep shaft with hoisting capacity of 2.7 Mt/yr (2 Mt/yr of ore and 0.7 Mt/yr of waste). The construction of the plant was expected to be completed in 2021. In 2018, Agnico Eagle Mines produced 5,878 kg of gold. For 2019, the company forecasted a decrease in production to 5,450 kg (Agnico Eagle Mines Ltd., 2019).

Nickel.—Terrafame's Talvivaara Mine was in its third full year of production in 2018, nearly reaching its capacity of 30,000 t/yr by the end of the year. In 2018, the company produced 27,377 t of nickel compared with 20,864 t in 2017. In the summer, Terrafame completed the third hydrogen sulfide production line that eased a major bottleneck in production, increasing Talvivaara's metal production capacity and improving the production process. The Talvivaara Mine produced nickel, zinc, and byproduct cobalt and copper using a bioleach process. Terrafame was part of Terrafame Group Ltd., which changed its name to Finnish Minerals Group Ltd. in 2018. The name change did not affect the parent company's 77% ownership of Terrafame. Subsequent to a comprehensive maintenance shutdown of the nickel process at Boliden's Harjavalta smelter in 2017, production of nickel matte increased by 24% to 31,000 t in 2018 (International Mining, 2018; Boliden AB, 2019, p. 53, 117; Terrafame Ltd., 2019a, p. 3, 10, 54; 2019b).

Silver.—Construction of the first silver mine in Finland, the Sotkamo Mine owned by Sotkamo Silver AB, began in the spring of 2018. The mine was expected to start production in March 2019 and be in full production by the end of May. The Sotkamo Mine would have a production capacity of 45,000 kilograms per year of silver concentrates (Ag content); the concentrates would be delivered to Boliden's smelters at Kokkola in Finland and Ronnskar in Sweden (Finnish Minerals Group, 2019; Kajastie, 2019; Sotkamo Silver AB, 2019).

Zinc.—The production of zinc (mine, Zn content) in Finland increased to 85,335 t in 2018, or by 29% compared with that of 2017. By the end of 2018, Terrafame was producing at nearly its full capacity of 64,000 t/yr at the Talvivaara Mine. The mine produced 61,608 t of zinc compared with 47,205 t in 2017. First Quantum Minerals' Pyhasalmi Mine produced 22,716 t of zinc, which was an increase of 31% compared with production in 2017. The increase was owing to a higher zinc grade and recovery rate; the zinc grade was 2.01% in 2018 compared with 1.55% in 2017, and the recovery rate was 91% in 2018 compared with 89% in 2017. For 2019, the last full year of operation for the mine, the company forecasted 10,000 t of zinc production. Zinc production increased as well at Boliden's Kokkola zinc smelter. There, the company produced 295,000 t of zinc compared with 285,000 in 2017 (Boliden AB, 2019, p. 117; First Quantum Minerals Ltd., 2019, p. 32, 33; Terrafame Ltd., 2019b).

Outlook

Mining activities most likely will remain at a high level in Finland owing to extensive exploration and new discoveries. Copper, gold, nickel, and zinc are expected to continue to be the most economically significant metallic mineral commodities produced in Finland. In coming years, copper and zinc production may decrease, whereas gold and silver production may increase. The Pyhasalmi copper-zinc mine is expected to cease production in 2019, and production is expected to begin at the Kaapelinkulma gold mine and the Sotkamo silver mine. The extent of active exploration taking place in Finland continues to increase and is likely to result in new deposit discoveries that would replace the exhausted ones.

References Cited

Agnico Eagle Mines Ltd., 2018, Operations & development projects, Kittila: Toronto, Ontario, Canada, Agnico Eagle Mines Ltd. (Accessed November 14, 2018, at https://www.agnicoeagle.com/English/operations/default.aspx.)

Agnico Eagle Mines Ltd., 2019, Operations & development projects, Kittila: Toronto, Ontario, Canada, Agnico Eagle Mines Ltd. (Accessed October 7, 2019, at https://www.agnicoeagle.com/English/operations/operations/kittila/default.aspx.)

Anderson, C.S., 2019, Selenium: U.S. Geological Survey Mineral Commodity Summaries 2019, p. 146–147.

Boliden AB, 2017, Metals & innovation for the future, annual report 2016: Stockholm, Sweden, Boliden AB, 122 p. (Accessed November 14, 2018, at https://vp217.alertir.com/afw/files/press/boliden/201703089998-1.pdf.)

Boliden AB, 2018, Metals for long-term value creation, 2017 annual report: Stockholm, Sweden, Boliden AB, 121 p. (Accessed November 14, 2018, at https://vp217.alertir.com/afw/files/press/boliden/201803060710-1.pdf.)

Boliden AB, 2019, Metals for a sustainable society, 2018 annual and sustainability report: Stockholm, Sweden, Boliden AB, 121 p. (Accessed October 1, 2019, at http://reports.boliden.com/globalassets/boliden-annual-and-sustainability-report-2018_indexerad.pdf.)

Brioche, A.S., 2019, Peat: U.S. Geological Survey Mineral Commodity Summaries 2019, p. 118–119.

Curry, K.C., 2019, Mica (natural): U.S. Geological Survey Mineral Commodity Summaries 2019, p. 108–109.

Dragon Mining Ltd., 2018a, Dragon Mining announces 2017 results: Subiaco, Western Australia, Australia, Dragon Mining Ltd., February 26, 71 p. (Accessed November 20, 2018, at http://www.dragonmining.com/static/files/61/2018-02-26_dra_fy2017_results_combined.pdf.)

Dragon Mining Ltd., 2018b, Kaapelinkulma Gold Mine: Subiaco, Western Australia, Australia, Dragon Mining Ltd. (Accessed November 20, 2018, at http://www.dragonmining.com/kaapelinkulma.)

Finlex Data Bank, 1981, Land Extraction Act (555/1981): Helsinki, Finland, Finlex Data Bank, July 24, 5 p. (Accessed November 9, 2018, at https://www.finlex.fi/en/laki/kaannokset/1981/en19810555_19970463.pdf.)

Finlex Data Bank, 2011, Mining Act (621/2011): Helsinki, Finland, Finlex Data Bank, June 10, 53 p. (Accessed November 9, 2018, at https://www.finlex.fi/en/laki/kaannokset/2011/en20110621.pdf.)

Finnish Minerals Group, 2019, Europe's first silver mine to be opened in Sotkamo: Helsinki, Finland, Finnish Minerals Group, March 15. (Accessed October 11, 2019, at https://www.mineralsgroup.fi/blog/europes-first-silver-mine-to-be-opened-in-sotkamo.html.)

First Quantum Minerals Ltd., 2018, 2017 annual report, building: Vancouver, British Columbia, Canada, First Quantum Minerals Ltd., 100 p. (Accessed November 15, 2018, at https://s24.q4cdn.com/821689673/files/doc_financial/annual/2017-Annual-Report.pdf.)

First Quantum Minerals Ltd., 2019, 2018 annual report, delivering growth: Vancouver, British Columbia, Canada, First Quantum Minerals Ltd., 108 p. (Accessed October 3, 2019, at https://s24.q4cdn.com/821689673/files/doc_financial/annual/FQM_2018_AR_aoda.pdf.)

Holopainen, Pekka, and Skogström, Panu, 2018, Mining: Helsinki, Finland, Getting the Deal Through, July. (Accessed November 2, 2018, at https://gettingthedealthrough.com/area/22/jurisdiction/57/mining-finland/.)

International Mining, 2018, Finnish Minerals Group established: Berkhamsted, Hertfordshire, United Kingdom, International Mining, July 10. (Accessed October 15, 2019, at https://im-mining.com/2018/07/10/finnish-minerals-group-established/.)

Kajastie, Nia, 2019, Sotkamo Silver opens Finland's first silver mine: Mining Magazine, March 29. (Accessed September 24, 2019, at https://www.miningmagazine.com/operational-excellence/news/1359886/sotkamo-silver-opens-finlands-first-silver-mine.)

Liikamaa, Terho, 2018, Review of mining authority on exploration and mining industry in Finland in 2017: Rovaniemi, Finland, Finnish Safety and Chemicals Agency (TUKES), March 23, 12 p. (Accessed November 14, 2018, at https://tukes.fi/documents/5470659/6373016/Review+of+mining+authority+on+exploration+and+mining+industry+in+Finland+in+2017/f66a9043-1d1e-4e8d-b27f-630a0d566b38/Review+of+mining+authority+on+exploration+and+mining+industry+in+Finland+in+2017.pdf.)

Liikamaa, Terho, 2019, Review of mining authority on exploration and mining industry in Finland in 2018: Rovaniemi, Finland, Finnish Safety and Chemicals Agency (TUKES), March 29, 8 p. (Accessed September 24, 2019, at https://tukes.fi/documents/5470659/6373016/Mining+in+Finland+2018/9d25562b-f170-0cf3-a5cd-a6fdfbec711f/Mining+in+Finland+2018.pdf.)

Ministry of Economic Affairs and Employment of Finland, 2017, Sector report—Interest in ore prospecting predicts growth for the mining sector: Helsinki, Finland, Ministry of Economic Affairs and Employment of Finland press release, October 31. (Accessed November 17, 2018, at https://tem.fi/en/article/-/asset_publisher/toimialaraportti-kiinnostus-malminetsintaan-ennakoi-koko-kaivostoimialan-kasvua.)

Ministry of Economic Affairs and Employment of Finland, 2018, Employment bulletin December 2017: Helsinki, Finland, Ministry of Economic Affairs and Employment of Finland, January 25, 14 p. (Accessed November 2, 2018, at http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160502/TKAT_Dec_2017_en.pdf.)

Ministry of Economic Affairs and Employment of Finland, 2019, Employment bulletin December 2018: Helsinki, Finland, Ministry of Economic Affairs and Employment of Finland, January 24, 15 p. (Accessed September 24, 2019, at http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/161312/TKAT_Dec_2018_en.pdf.)

Nordkalk Corp., 2018, Lappeenranta: Nordkalk Corp. (Accessed November 21, 2018, at http://www.nordkalk.com/contacts/locations/Finland/Lappeenranta/.)

Rettig Group Ltd., 2018, 2017 Rettig Group annual report: Rettig Group Ltd., March 21, 37 p. (Accessed November 14, 2018, at http://www.nordkalk.com/document/3/1212/68981e2/Rettig_Annual_Report_2017.pdf.)

Sotkamo Silver AB, 2019, Summary of year end report 2018; Sotkamo, Finland, Sotkamo Silver AB press release, Feb. 22. (Accessed October 22, 2018, at (http://www.silver.fi/sivu/en/press_releases/?show=one&lang=en&id=1CD411A5498F4AF8.)

Statistics Finland, 2018a, Appendix table 1. Enterprises turnover by industry in 2016–2017: Helsinki, Finland, Statistics Finland, September 20. (Accessed October 22, 2018, at http://www.stat.fi/til/yrti/2017/yrti_2017_2018-09-20_tau_001_en.html.)
Statistics Finland, 2018b, National accounts: Helsinki, Finland, Statistics Finland, July 12. (Accessed October 22, 2018, at http://www.stat.fi/til/vtp/2017/vtp_2017_2018-07-12_kat_001_en.html.)
Statistics Finland, 2018c, Trade: Helsinki, Finland, Statistics Finland, September 13. (Accessed November 5, 2018, at https://www.stat.fi/tup/suoluk/suoluk_kotimaankauppa_en.html.)
Statistics Finland, 2019a, Enterprises by industry by TOL 2008, year and information: Helsinki, Finland, Statistics Finland. (Accessed October 11, 2019, at http://pxnet2.stat.fi/PXWeb/pxweb/en/StatFin/StatFin__yri__yrti__oik/statfin_yrti_pxt_11qc.px/table/tableViewLayout1/.)
Statistics Finland, 2019b, National accounts: Helsinki, Finland, Statistics Finland, September 20. (Accessed September 24, 2019, at http://www.stat.fi/til/vtp/2018/vtp_2018_2019-09-20_tie_001_en.html.)
Terrafame Ltd., 2018, Terrafame annual report 2017, business activity, another record year in metals production: Tuhkakyla, Finland, Terrafame Ltd. (Accessed November 15, 2018, at https://www.annualreport2017.terrafame.fi/business-activity/production.html.)
Terrafame Ltd., 2019a, Annual and responsibility report 2018: Tuhkakyla, Finland, Terrafame Ltd. 136 p. (Accessed October 4, 2019, https://annualreport2018.terrafame.fi/media/pdf-paketit/terrafame-annual-report-2018.pdf.)
Terrafame Ltd., 2019b, The year 2018, CEO's review: Tuhkakyla, Finland, Terrafame Ltd. (Accessed October 4, 2019, at https://annualreport2018.terrafame.fi/the-year-2018/ceos-review.html.)
United Nations, 2015, Mining—General: United Nations, 8 p. (Accessed November 14, 2018, at http://www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/finland/Mining.pdf.)
U.S. Central Intelligence Agency, 2018, Finland, in The world factbook: U.S. Central Intelligence Agency. (Accessed November 5, 2018, at https://www.cia.gov/library/publications/the-world-factbook/geos/fi.html.)
Vasara, Heino, 2018, State and outlook of the mining industry: [Finland] Ministry of Economic Affairs and Employment, February 27, 35 p. (Accessed November 09, 2018, at http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160584/SectorReports_1_2018_MiningSector.pdf.)

TABLE 1
FINLAND: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons, gross weight, unless otherwise specified)

Commodity[2]		2014	2015	2016	2017	2018
METALS						
Aluminum, metal, secondary		20,829	--	--	--	--
Chromium, chromite, mine, ore:						
Gross weight		2,284,970 r	1,951,779 r	2,105,338 r	1,954,282	2,211,284
Cr_2O_3 content		1,034,750	946,188	1,070,281	972,028	1,099,438
Cobalt, Co content:						
Mine, ore, including nonrecoverable		2,104	2,119	2,260 r	1,600	1,377
Refinery, metal powder and salts		12,551	9,615	12,393	12,222	12,874
Copper:						
Mine, concentrates:						
Gross weight		163,000	165,021	193,349	207,264	193,091
Cu content		42,800	41,805	47,488 r	53,144	46,674
Smelter, primary		169,000	166,500	150,000	150,000 e	150,000 e
Refinery, primary		132,000	127,900	125,100 r	129,200	135,100
Ferroalloys, ferrochromium		441,291 r	457,063 r	469,141 r	416,285	492,774
Gold, mine, Au content	kilograms	9,385	8,342 r	8,865	9,102	8,732
Iron and steel:						
Pig iron	thousand metric tons	2,475	2,594	2,670	2,604	2,976
Raw steel	do.	3,807	3,988	4,102	4,004	4,146
Nickel, Ni content:						
Mine, undifferentiated or other		18,730	9,383	20,654	34,641	43,572
Smelter, matte		-- r	17,000	31,000 r	25,000	31,000
Refinery:						
Chemicals		5,964 r	7,129 r	8,048 r	8,358	10,330
Metal, electrolytic		36,639 r	36,350 r	45,606 r	51,342	50,435
Platinum-group metals:						
Mine:						
Palladium, Pd content	kilograms	808 r	784	901	1,021	1,157
Platinum, Pt content	do.	1,060	992	1,178	1,418	1,576
Refinery, platinum[e]	do.	2,000	2,000	1,900	1,700	1,900
Selenium, metal, Se content	do.	93,682	93,051	104,420	100,198	108,918
Silver, mine production, Ag content	do.	14,500 r, e	13,051 r	16,348 r	13,654	12,849
Zinc:						
Mine, Zn content		43,000 e	25,332	45,852	66,284	85,335
Smelter, primary		302,024	305,717	290,599	284,992	295,029

See footnotes at end of table.

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

(Metric tons, gross weight, unless otherwise specified)

Commodity[2]		2014	2015	2016	2017	2018
INDUSTRIAL MINERALS						
Cement, hydraulic[e]	thousand metric tons	1,250	1,300	1,300	1,300	1,300
Feldspar		46,233	38,026	18,549	14,926	17,469
Lime[e]		460,000	470,000	470,000	470,000	470,000
Mica:						
Biotite		41,997 [r]	38,169 [r]	52,310 [r]	47,123	50,456
Concentrate		11,973	11,836	10,843 [r]	10,740	12,122
Phosphate rock, apatite, concentrates:						
Gross weight		946,000	956,564	939,631	978,613	989,073
P_2O_5 content[e]		380,000 [r]	380,000 [r]	370,000 [r]	420,000	410,000
Sand and gravel, industrial, quartz, silica sand	thousand metric tons	88	104	93	72	81
Stone, crushed, limestone, including dolomite	do.	3,692	3,130	3,539	3,565	3,726
Sulfur:						
Byproduct, metallurgy, S content	do.	336	336	340 [e]	340 [e]	340 [e]
Compounds, sulfuric acid	do.	1,722	1,760	1,768	1,803	1,793
Pyrites:						
Gross weight	do.	990	1,040	719	879	771
S content	do.	353 [e]	556	384	470	412
Talc		380,000	332,174 [r]	345,739 [r]	354,819	374,398
Wollastonite		11,500	NA [r]	NA [r]	NA	NA
MINERAL FUELS AND RELATED MATERIALS						
Peat:						
Fuel use	thousand metric tons	7,500 [r, e]	9,634 [r]	9,907 [r]	9,410 [e]	9,000 [e]
Horticultural use, including environmental uses	do.	800 [r, e]	1,013 [r]	1,046 [r]	970 [e]	970 [e]
Petroleum, refinery	thousand 42-gallon barrels	106,508	107,000 [e]	107,000 [e]	107,000 [e]	107,000 [e]

[e]Estimated. [r]Revised. do. Ditto. NA Not available. -- Zero.

[1]Table includes data available through October 2, 2019. All data are reported unless otherwise noted. Estimated data are rounded to no more than three significant digits.

[2]In addition to the commodities listed, secondary copper and sodium sulfate may have been produced, but available information was inadequate to make reliable estimates of output.

TABLE 2
FINLAND: 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
Cement		Finncement Oy (Irish Cement Ltd., 100%)	Plants at Lappeenranta and Parainen	1,020
Chromium, chromite		Outokumpu Oyj (Solidium Oy, 21.69%)	Mine at Kemi	1,000
Cobalt	metric tons	Boliden Kevitsa Mining Oy (Boliden Mineral AB, 100%)	Kevitsa Mine at Petkula	600
Do.	do.	Boliden Kylylahti AB (Boliden Mineral AB, 100%)	Kylylahti Mine near Polvijarvi	280
Do.		Terrafame Ltd. (Finnish Minerals Group, 77%)	Talvivaara Mine at Sotkamo	NA
Do.	metric tons	Freeport Cobalt Oy [Freeport-McMoRan Inc., 56%; Lundin Mining Corp., 24%; La Générale des Carrières et des Mines Sarl (Gécamines), 20%]	Plant at Kokkola	15
Copper:				
Ore, Cu content		Boliden Kevitsa Mining Oy (Boliden Mineral AB, 100%)	Kevitsa Mine at Petkula	30
Do.		Boliden Kylylahti AB (Boliden Mineral AB, 100%)	Kylylahti Mine near Polvijarvi	12
Do.		First Quantum Minerals Ltd.	Pyhasalmi Mine at Pyhakumpu	18
Do.		Terrafame Ltd. (Finnish Minerals Group, 77%)	Mine at Talvivaara, Sotkamo	NA
Metal		Boliden Harjavalta AB (Boliden Mineral AB, 100%)	Smelter at Harjavalta	210
Do.		do.	Refinery at Pori	155
Feldspar		Sibelco Nordic Oy	Mine and plant at Kemio	50
Ferrochromium		Outokumpu Oyj (Solidium Oy, 21.69%)	Smelter at Tornio	530
Gold:				
Ore, Au content	metric tons	Agnico Eagle Mines Ltd.	Mine at Kittila	6
Do.	do.	Boliden Kevitsa Mining Oy (Boliden Mineral AB, 100%)	Kevitsa Mine at Petkula	1
Do.	do.	Boliden Kylylahti AB (Boliden Mineral AB, 100%)	Kylylahti Mine near Polvijarvi	1
Do.	do.	Dragon Mining Ltd.	Mines at Jokisivu and Orivesi	4
Do.	do.	Endomines AB	Mine at Pampalo, Ilomantsi	2
Do.	do.	Rupert Resources Ltd.	Pahtavaara Mine near Sodankyla	2
Metal	do.	Boliden Harjavalta AB (Boliden Mineral AB, 100%)	Smelter at Harjavalta and refinery at Pori	4
Iron and steel:				
Raw steel		Ovako AB (Nippon Steel Corp., 100%)	Plant at Imatra	300
Do.		Rautaruukki Oyj (Government, 39.7%, and SSAB AB, 41.3%)	Plants at Hameenlinna, Kankaanpaa, and Raahe	2,100
Stainless steel		Outokumpu Oyj (Solidium Oy, 21.69%)	Plant at Tornio	550
Mica		Yara International ASA	Mine and plant at Siilinjarvi	10
Nickel:				
Ore, Ni content		Boliden Kevitsa Mining Oy (Boliden Mineral AB, 100%)	Kevitsa Mine at Petkula	15
Do.		Boliden Kylylahti AB (Boliden Mineral AB, 100%)	Kylylahti Mine near Polvijarvi	1
Do.		Terrafame Ltd. (Finnish Minerals Group, 77%)	Talvivaara Mine at Sotkamo	30
Metal		Boliden Harjavalta AB (Boliden Mineral AB, 100%)	Smelter at Harjavalta	32
Do.		Boliden Kylylahti AB (Boliden Mineral AB, 100%)	Plant at Kaavi	NA
Do.		Norilsk Nickel Harjavalta Oy (MMC Norilsk Nickel, 100%)	Smelter at Harjavalta	32
Do.		do.	Refinery at Harjavalta	50
Petroleum products	thousand barrels per day	Neste Oyj, 50%, and Government, 50%	Refineries at Naantali and Porvoo	264
Phosphate rock		Yara International ASA	Mine and plant at Siilinjarvi	1,000
Platinum-group metals	metric tons	Boliden Kevitsa Mining Oy (Boliden Mineral AB, 100%)	Kevitsa Mine at Petkula	3
Quartz and quartzite		Sibelco Nordic Oy	Mines at Kemio and Nilsia	250
Selenium		Boliden Harjavalta AB (Boliden Mineral AB, 100%)	Refinery at Pori	NA
Silver	metric tons	do.	Smelter at Harjavalta and refinery at Pori	130
Stone:				
Dolomite		Juuan Dolomiittikalkki Oy	Mine at Paltamo, Reetinniemi	NA
Do.		SMA Mineral AB	Mine at Pieksamaki and Tornio	NA
Limestone		Nordkalk Corp. (Rettig Group, 100%)	Mines at Lappeenranta and Parainen	1,500
Do.		SMA Mineral AB	Mines at Pieksamaki and Tornio	300

See footnotes at end of table.

TABLE 2—Continued
FINLAND: 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
Sulfur	Boliden Harjavalta AB (Boliden Mineral AB, 100%)	Smelter at Harjavalta	NA
Do.	First Quantum Minerals Ltd.	Pyhasalmi Mine at Pyhakumpu	NA
Talc	Mondo Minerals BV (Advent International Corp., 100%)	Mines at Lahnaslampi, Lipsavaara, and Horsmanaho	500
Wollastonite	Nordkalk Corp. (Rettig Group Ltd., 100%)	Mine and plant at Lappeenranta	40
Zinc:			
Ore, Zn content	Boliden Kylylahti AB (Boliden Mineral AB, 100%)	Kylylahti Mine near Polvijarvi	2
Do.	First Quantum Minerals Ltd.	Pyhasalmi Mine at Pyhakumpu	25
Do.	Terrafame Ltd. (Finnish Minerals Group, 77%)	Talvivaara Mine at Sotkamo	64
Metal	Boliden Kokkola Oy (Boliden Mineral AB, 100%)	Smelter at Kokkola	315

Do., do. Ditto. NA Not available.