



2014 Minerals Yearbook

FINLAND

THE MINERAL INDUSTRY OF FINLAND

By Alberto Alexander Perez

In 2014, Finland had a highly industrialized open economy with a gross domestic product (GDP) of about \$271.6 billion, which was a decrease of about 0.4% compared with that of the previous year. Finland's mining industry was composed of the extraction and processing of metallic minerals, the extraction and processing of industrial minerals, and the production of steel. In 2014, Finland remained the leading peat producer in the world, with an estimated 24% of world production, and the country was the leading talc producer in Europe and the seventh-ranked talc producer in the world, with 5.3% of world production (Apodaca, 2016; Flanagan, 2016; U.S. Central Intelligence Agency, 2015).

The leading contributor to Finland's GDP in 2014 was its services sector; industry accounted for only 26.5% of the country's GDP. The principal products that Finland's industrial sector produced in 2014 were electronics, machinery and scientific instruments, metals and metal products, ships, and wood pulp and paper products. Finland was a member of the European Union (EU). Its main export partners in 2014 were Germany (which received 12.2% of Finland's exports, in terms of value), Sweden (11.2%), Russia (8.1%), the United States (6.7%), the Netherlands (6.2%), the United Kingdom (5.5%), and China (4.5%). Its main import partners were Sweden (which supplied 15.8% of Finland's imports, in terms of value), Germany (15.3%), Russia (14.8%), the Netherlands (8.7%), and Denmark (4.2%) (U.S. Central Intelligence Agency, 2015).

Minerals in the National Economy

According to information published by the Ministry of Employment and the Economy in 2013, Finland had 46 mines and quarries. All mines and quarries in Finland are regulated by the Finnish Mining Act. The principal facilities for the processing of copper and nickel were located at Harjavalta, those for the processing of chromium were located at Kemi, and those for the processing of zinc were located at Kokkola. Finland's deposits of chromite, cobalt, copper, iron, lead, nickel, and zinc were the foundation for the country's metal industry (Invest in Finland, 2015; Ministry of Employment and the Economy, 2015b).

Government Policies and Programs

The Government of Finland regulates its mineral industry through two legislative acts—the Finnish Mining Act, which regulates the mining of metallic and industrial minerals in Finland, including soapstone and marble, and the Land Extraction Act, which regulates only the extraction of gravel and sand and the quarrying of natural stone. The objective of the Finnish Mining Act (621/2011) is to enable exploration and mining activities and to regulate them so that they are carried out in a socially, economically and ecologically sustainable way. The Act ensures that in the development and exploration of any

mining projects, environmental, civil rights, and landowner concerns are included in the decisionmaking process. The Act also takes other Finnish law into account in its application, in particular Finland's Constitution and legislation concerning the Sami regions in northern Finland. Mining operators are subject to a number of permits. The Mining Act, which became effective on July 1, 2011, provides the right to mine a deposit based on a mining permit, and the review of permits is more comprehensive than under the previous Mining Act. The mining operator's termination and after-care obligations are also more extensive, and the mining operator is required to provide a security deposit for the purpose of fulfilling after-care obligations. The Finnish Safety and Chemicals Agency (Tukes) is the organization that grants and supervises the permits that are required by the Mining Act. The Finnish legislation also provides environmental protection guidelines and requires several types of environmental permits to conduct mining operations (Ministry of Employment and the Economy, 2011, 2015a, b).

Production

Finland produced mostly base metals, gold, and platinum-group metals, as well as industrial minerals. The production of mineral commodities continued to be significant in terms of tonnage and contribution to the country's economy. In 2014, production of silver metal increased by 41%; selenium metal, by 29%; pig iron, by 21%; refined copper, by 17%; refined cobalt, by 16%; platinum, by 12%; copper content of mined ore, by 10.3%; and chromite, by 5.4%. Gold mine production decreased by 6%, and that of zinc metal production decreased by 3%. Data on mineral production are in table 1.

Structure of the Mineral Industry

The Finnish mineral industry consists of the following two types of companies: (a) small quarry and sand and gravel pit operators, and (b) a group of large companies that operate international metal and industrial mineral facilities and mines in Finland and abroad (United Nations, 2015, p. 1). Outokumpu Oyj (Outokumpu) and Rautararuukki Oyj (Ruukki) were the two leading companies in Finland in the metals manufacturing industry; they specialized in manufacturing steel and stainless steel. Outokumpu also operated the Kemi chromite mine in Lapland, and in addition to steel, also produced cadmium and ferroalloys. Outokumpu was no longer reporting mercury production in Finland, although some production as byproduct was likely. Outokumpu also had operations in Germany, Mexico, Sweden, the United Kingdom, and the United States.

Mondo Minerals Oy (Mondo) of the Netherlands which was a subsidiary of Advent International Corp. of the United States, and Nordkalk Corp., which was owned by Rettig Group, were two of the principal industrial mineral producers in Finland.

Mondo was the second-ranked producer of talc, by tonnage, in the world. Mondo had its main mine and processing facilities in Sotkamo and Vuonos (Mondo Minerals, 2014b).

Nordkalk was a leading international producer of limestone (crushed and ground), concentrated calcite, quicklime, and slaked lime as well as dolomite and wollastonite, which Nordkalk extracted as a byproduct of the mining of limestone. Nordkalk had operations in 30 locations in nine countries and mines in five countries. In Finland, Nordkalk owned mines in Lappeenranta, Pargas, and Parainen (Nordkalk Corp., 2014).

First Quantum Minerals Ltd. (First Quantum) of Canada owned the Pyhasalmi copper mine. Finland was one of the few countries in Europe where copper was still mined. The Pyhasalmi Mine had been owned previously by Inmet Mining Corp.; Inmet was purchased in 2011 by First Quantum (First Quantum Minerals Ltd., 2015).

Finland's mining companies were mostly privately owned, although the Government held an equity interest in some of the major mineral producers. The mineral industry operated on a free-market basis. The country's major mineral facilities and their annual capacities are listed in table 2.

Commodity Review

Metals

Chromium.—Outokumpu announced that its plans to ramp up production of chromite at its Kemi Mine had been implemented by the fourth quarter of 2012. In 2013, chromite production increased by 131%, and in January 2014, Outokumpu updated its estimate of proved reserves at the Kemi Mine to 50.1 million metric tons (Mt) from the previously estimated 33 Mt. Outokumpu also indicated that it planned to double its ferrochrome production by 2015; in 2014, its ferrochrome output had increased by 50.7%. Outokumpu used the chromium from its Kemi chromite mine in Lapland to produce ferrochromium for its production of stainless steel at its plant in Tornio. The Kemi Mine was the only operating chromite mine located within the European Union (EU) (Outokumpu Oyj, 2014a, p. 29, 122; 2014b, p. 2).

Copper.—Boliden AB of Sweden's copper complex in Finland consisted of two plants—the copper smelter in Harjavalta, which produced copper anodes, and the copper refinery at Pori, where copper anodes were refined into copper cathodes. The complex was known as Boliden Harjavalta. The Harjavalta smelter had the capacity to produce 130,000 metric tons per year (t/yr) of copper, which was cast into copper anodes. Sulfur was recovered as a byproduct. The copper anodes were then shipped to the Pori refinery, where the anodes were refined into copper cathodes. The capacity of the refinery was 155,000 t/yr. The refinery also produced gold and silver as byproducts (Boliden AB, 2015).

Industrial Minerals

Limestone.—Nordkalk was a leading producer of limestone and limestone-based products in the world. Nordkalk's largest production site in Finland was located in Lappeenranta where the company had a quarry, a grinding plant, two flotation plants,

and a lime kiln. Suomen Karbonaatti Oy, which was a subsidiary of Nordkalk, produced carbonate fillers and coating pigments and was also located in Lappeenranta (Nordkalk Corp., 2014).

Talc.—Mondo was a significant world producer of talc. In 2014, it produced an estimated 380,000 metric tons (t) of talc concentrate. Mondo indicated that the talc ore found in Finland was a mixture of magnesite and talc, so that a separating process had to be applied to the ore. Its main products were marketed as Finntalc, Microtalc, and Plustalc (table 1; Mondo Minerals, 2014a).

Outlook

The increased market interest in rare-earth minerals has reignited interest in areas of Finland that had previously been producing these minerals but had stopped because of economic and technical feasibility issues. Copper, gold, nickel, and silver production are expected to continue to be a significant element of the Finnish mineral industry, particularly as facilities are expanded to include polymetallic production projects. The Finnish Government program for 2011–15 indicates that Finland will promote the development and sustainable growth of the mineral industry, and private investment in the mining sector is likely to increase owing to the Government's support. Market prices will determine whether expansion of the Finnish mineral industry continues in the long run.

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TABLE 1
 FINLAND: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons unless otherwise specified)

Commodity	2010	2011	2012	2013	2014	
METALS						
Aluminum, metal, secondary	metric tons	20,736	19,531	19,530	20,768	20,829
Chromite, concentrate, gross weight		598	693	425	982	1,035
Cobalt, refined	metric tons	9,413	10,441	10,547	10,798	12,551
Copper:						
Concentrate, gross weight	do.	51,222	47,802	104,393	145,758	163,016
Mine output, Cu content	do.	14,700	14,000	25,500 ^r	38,800	42,800
Metal:						
Smelter	do.	153,853	156,017	177,451 ^r	177,000	177,000
Refined	do.	146,344	148,639	155,021 ^r	143,524	167,879
Gold, mine output, Au content	kilograms	7,628	8,461	10,886 ^r	9,981	9,385
Iron and steel, metal:						
Ferrous alloys, ferrochromium		283	231	288	434	441
Pig iron	metric tons	2,564	2,500 ^r	2,130 ^r	2,050 ^r	2,475
Steel, crude		4,023	3,985	3,759	3,517	3,807
Mercury	kilograms	9,315	--	--	--	--
Nickel:						
Mine output, Ni content	metric tons	12,100 ^r	18,800 ^r	19,100 ^r	19,300 ^r	19,700
Metal, electrolytic	do.	41,317	49,823	39,374 ^r	44,498	42,750
Platinum	kilograms	718	836	429 ^r	946	1,060
Selenium, metal	do.	66,094	88,231	92,769	72,459	93,682
Silver, metal	do.	64,751	69,344	128,200	100,890	142,360
Zinc:						
Mine output, Zn content	metric tons	55,562	64,115	52,303 ^r	40,956 ^r	44,000
Metal	do.	307,144	307,352	314,742	311,686	302,024
INDUSTRIAL MINERALS						
Cement, hydraulic		1,215	1,387	1,293 ^r	1,400	1,400
Feldspar	metric tons	28,013	26,292	43,124	47,636	46,233
Lime		463	456	450	450	460
Mica:						
Biotite		38	32	27	42	41
Concentrate	metric tons	13,809	12,896	12,112	11,244	11,973
Nitrogen, N content of ammonia	do.	78,380	72,352	78,000 ^r	78,000	78,000
Phosphate rock, apatite, concentrate:						
Gross weight		817	870	858 ^r	877	946
P ₂ O ₅ content ^e		289	307	302 ^r	309	330
Pyrite, gross weight		706	939	993	990	990 ^c
Sodium sulfate		NA	4	-- ^r	--	--
Stone, crushed:						
Limestone and dolomite:						
Dolomite		NA	81	81	81	81 ^c
For cement manufacture		1,495	1,600	1,600	1,600	1,600 ^c
For agriculture		646	450	450	450	450 ^c
For lime manufacture		234	220	220	220	220 ^c
Fine powders		650	NA	NA	NA	NA
Metallurgical ^c		1	NA	NA	NA	NA
Total		3,030	2,400 ^c	2,400 ^c	2,400 ^c	2,400 ^c
Quartz, silica sand		267	312	257 ^r	260	260

See footnotes at end of table.

TABLE 1—Continued
FINLAND: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons unless otherwise specified)

Commodity	2010	2011	2012	2013	2014
INDUSTRIAL MINERALS—Continued					
Sulfur:					
S content of pyrite ^e	150	338	330	330	330
Byproduct: ^e					
Metallurgy	275	280	280	280	280 ^e
Petroleum	125	133 ²	130	130	130 ^e
Total	400	413	410	410	410 ^e
Sulfuric acid	949	887	975	975	975 ^e
Talc	419	429	396	362	380 ^e
Wollastonite metric tons	12,100	11,500	11,500	11,500	11,500 ^e
MINERAL FUELS AND RELATED MATERIALS					
Peat:					
For fuel use	7,533	6,847	5,824 ^f	6,800	6,800 ^e
For agriculture and other uses	867	674	676	670	670 ^e
Petroleum refinery products thousand 42-gallon barrels	88,137	90,686	106,033 ^f	109,500	109,000 ^e

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^fRevised. do. Ditto. NA Not available.

-- Zero.

¹Table includes data available through November 18, 2015.

²Reported figure.

TABLE 2
FINLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Ammonia		Kemira Oyj (Government, 98%)	Plant at Oulu	75
Apatite		Kemira Agro Oyj (Government, 98%)	Mine and plant at Siilinjarvi	8,000
Cadmium, metal		Outokumpu Oyj (Government, 40%, and private investors, 12.3%)	Smelter at Kokkola	1
Cement		Finncement Oy (Irish Cement Ltd., 100%)	Plants at Lappeenranta and Parainen	1,020
Chromite		Outokumpu Oyj (Government, 40%, and private investors, 12.3%)	Mine at Kemi	1,000
Cobalt		Norilsk Nickel Harjavalta (MMC Norilsk Nickel, 100%)	Plant at Kokkola	NA
Copper:				
Ore, Cu content		First Quantum Minerals Ltd.	Mine at Pyhasalmi, Kevista	10
Metal		Boliden Harjavalta AB (Boliden AB, 100%)	Smelter at Harjavalta	210
Do.		do.	Refinery at Pori	155
Feldspar		SP Minerals Oyj (Partek Corp., 50.1%, and SCR-Silbeco SA, 49.9%)	Mine and plant at Kemio	50
Ferrochrome		Outokumpu Oyj (Government, 40%, and private investors, 12.3%)	Smelter at Tornio	250
Gold:				
Ore, Au content	metric tons	Agnico-Eagle Mines Ltd.	Mine at Kittila	5
Do.	do.	Dragon Mining Ltd.	Mines at Orivesi and Jokisivu	4
Do.	do.	Lapland Goldminers AB	Pahtavaara Mine near Sodankyla	2
Metal	do.	Boliden AB	Smelter at Pori	4
Limestone		Nordkalk Corp. (Rettig Group, 100%)	Mines at Lappeenranta and Parainen	1,500
Do.		Rauma-Repola Oyj	Mine at Tornio	300
Mercury	metric tons	Outokumpu Oyj (Government, 40%, and private investors, 12.3%)	Smelter at Kokkola	150
Mica		Kemira Oyj (Government, 98%)	Mine at Siilinjarvi	10
Nickel:				
Ore, Ni content		Belvedere Resources Ltd.	Mine at Hitura	30
Do.		Talvivaara Mining Co. plc.	Mine at Sotkamo	20
Metal		Norilsk Nickel Finland (MMC Norilsk Nickel, 100%)	Smelter at Harjavalta	32
Do.		do.	Refinery at Harjavalta	50
Petroleum, refinery products	thousand 42-gallon barrels per day	Neste Oil Oyj, 50%, and Government, 50%	Plants at Naantali and Porvoo	250
Phosphate-apatite		Yara International ASA.	Mine at Siilinjarvi	850
Quartz and quartzite		SP Minerals Oyj (Partek Corp., 50.1%, and SCR-Silbeco SA, 49.9%)	Mines at Kemio and Nilsia	250
Selenium	metric tons	Boliden AB	Smelter at Pori	35
Silver	do.	do.	do.	30
Steel:				
Crude		Rautaruukki Oyj (Government, 39.7%)	Plants at Halikko, Hameenlinna, Kankaanpaa, and Raahe	2,100
Do.		Fundia AB (Norsk Jenverk AS of Norway, 50%, and Rautaruukki, 50%)	Plants at Aminnefors, Dalsbruk, and Koverhar	850
Do.		Ovako AB (Triton Adviser Ltd., 100%)	Plant at Imatra	300
Stainless		Outokumpu Oyj (Government, 40%, and private investors, 12.3%)	Plant at Tornio	550
Talc		Mondo Minerals Oyj (Advent International Corp., 100%)	Mines at Lahnaslampi, Lipsavaara, and Horsmanaho	500
Wollastonite		Nordkalk Corp. (Rettig Group, 100%)	Mine and plant at Lappeenranta	40
Zinc:				
Ore, Zn content		Inmet Mining Corp.	Mine at Pyhasalmi	25
Metal		Boliden AB	Smelter at Kokkola	315

Do., do. Ditto. NA Not available.