



2013 Minerals Yearbook

FINLAND

THE MINERAL INDUSTRY OF FINLAND

By Alberto Alexander Perez

In 2013, metallic minerals mining and the processing and refining of metals were the principal areas of the Finnish mineral industry that expanded and demonstrated the potential to contribute to exports. Finland was the leading peat producer in the world, accounting for 23% of world production; it was the leading talc producer in Europe and the sixth-ranked talc producer in the world, accounting for 6.4% of world production (Invest in Finland, 2011; Apodaca, 2015; Virta, 2015).

In 2013, Finland had an estimated nominal gross domestic product (GDP) of \$260 billion, which was a decrease of 1.5% compared with that of the previous year. The leading contributor to Finland's GDP in 2013 was its services sector; industry accounted for 25.1% of the country's GDP. The principal products that Finland's industrial sector produced in 2013 were electronics, metal and metal products, scientific instruments, ships, and wood pulp and paper products. Finland was a member of the European Union (EU). Its main export partners in 2013 were Sweden (which received 11.6% of Finland's exports, in terms of value), Germany (9.8%), Russia (9.5%), the Netherlands (6.3%), the United States (6.2%), the United Kingdom (5.3%), and China (4.9%). Its main import partners were Russia (which supplied 18% of Finland's imports, in terms of value), Sweden (16.1%), Germany (14.1%), and the Netherlands (8.3%) (U.S. Central Intelligence Agency, 2014).

Minerals in the National Economy

In 2013, Finland had 46 mines and quarries. All mines and quarries were regulated by the Finnish Mining Act. Employment had increased owing to mining operations, particularly in eastern and northern Finland. Finland was a significant processor and refiner of copper, nickel, and zinc. 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 metals industry (Invest in Finland, 2011; United Nations, 2013 p. 1–3; Ministry of Employment and the Economy, 2014b; Virta, 2014).

Government Policies and Programs

The Government of Finland regulates its mineral industry through two legislative acts; the Finnish Mining Act, which regulates the exploitation 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 project, 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 exploit 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 that are necessary for the exploitation of the mineral resources of the country (Ministry of Employment and the Economy, 2011, 2014a).

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 amount and contribution to the country's economy. In 2013, production of chromite increased by 131%; platinum, by 120%; biotite, by 55.6%; copper (content of mined ore), by 52.2%; ferrochromium, by 50.8%, and feldspar, by 10.5%. Production of selenium metal decreased by 22%, and that of mica concentrate decreased by 7.2%. 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 operations and mines in Finland and abroad (United Nations, 2013, p. 1).

AutoKumpu Oyj (AutoKumpu) and Rautaruukki Oyj (Ruukki) were the two leading companies in Finland in the metals manufacturing industry; they specialized in manufacturing steel and stainless steel. AutoKumpu also operated the Kemi chromite mine in Lappland and, in addition to steel, also produced cadmium and ferroalloys. AutoKumpu was no longer reporting mercury production in Finland, although some production as byproduct was likely. AutoKumpu also had operations in Germany, Mexico, Sweden, the United Kingdom, and the United States.

Mondo Minerals B.V. (Mondo), which was a subsidiary of Advent International Corp. of the United States, and

Nordkalk Corp., which was owned by the Rettig Group, were two of the principal industrial mineral producers in Finland. Mondo was the second-ranked producer of talc, by tonnage of output, in the world. Mondo had its main mine and processing facilities in Sotkamo and Vuonos (Mondo Minerals B.V., 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.

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. of Canada; Inmet was purchased in 2011 by First Quantum (First Quantum Minerals Ltd., 2014).

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 previous estimate of 33 Mt. OutoKumpu also indicated that it planned to double its ferrochrome production by 2015. Outokumpu operated the Kemi chromite mine in Lappland, and it used the chromium to produce ferrochromium for the production of stainless steel at its plant in Tornio. The Kemi Mine was the only chromite mine located within the EU (OutoKumpu Oyj, 2014a, p. 29, 122; 2014b, p. 2).

Cobalt.—Freeport-McMoRan Copper & Gold Inc. of the United States (Freeport) announced in March that it had completed the acquisition of the cobalt production business of OM Group, Inc. of the United States, including the cobalt refinery facility in Kokkola, Finland. The new company to be formed, Freeport Cobalt OY, would operate as a joint venture of Freeport, which would hold 56% share; Lundin Mining Corp. of Canada, 24%; and La Générale des Carrières et des Mines (Gécamines) of the Democratic Republic of the Congo [Congo (Kinshasa)], 20% (Freeport-McMoRan Copper & Gold Inc., 2013).

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 210,000 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. In 2013, the complex processed 471,000 metric tons (t) of copper concentrates, 119,000 t of copper cathodes, and 251,000 t of nickel concentrates (Boliden AB, 2014).

Nickel.—The two main producers of mined nickel in Finland were the Talvivaara Mining Company Plc (Talvivaara), which owned a polymetallic mine at Sotkamo, and Belvedere Resources Ltd. of Canada (Belvedere), which owned a mine and other installations in Hitura.

Talvivaara reported that it was expecting to produce between 25,000 and 30,000 t of nickel in 2012, which was the latest year for which data were available. Talvivaara's Sotkamo nickel project was the world's first bioheap-leach project for nickel. It was centered on two polymetallic deposits—the Kolmisoppi and the Kuusilampi deposits, which are located about 30 kilometers southwest of Sotkamo in eastern Finland. The deposits constitute one of the largest known nickel sulfide resources in Europe (Talvivaara Mining Company Plc, 2012, p. 7).

Belvedere produced about 2,200 t of nickel from its Hitura Mine in 2012. The mine had restarted operations in July 2010, but it was put on care-and-maintenance status in 2013. Belvedere continued with its current expansion of the mine, however, and further expansion was also projected (Belvedere Resources Ltd., 2013, p. 13).

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., 2013, 2014).

Talc.—Mondo was a significant world producer of talc. In 2013, it produced an estimated 362,000 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 (Mondo Minerals B.V., 2014a).

Wollastonite.—Nordkalk was the only European producer of wollastonite in 2013. Nordkalk produced all its grades of wollastonite at its facilities in Lappeenranta. The company launched a new generation of high-aspect-ratio wollastonite fillers. The new product was designed for thermoplastic and thermoset applications (Nordkalk Corp., 2013).

Outlook

The Finnish Government Program for 2011–15 states that Finland will take measures to promote the development and sustainable growth of the minerals industry. It is foreseeable that the Government will increase efforts to support its mineral

industry. The increased market interest in rare-earth minerals has re-ignited 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 multimetallic production projects. 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		2009	2010	2011	2012	2013
METALS						
Aluminum, metal, secondary	metric tons	17,885	20,736	19,531	19,530	20,768
Chromite:						
Cr ₂ O ₃ content		247	598	693	425	982
Of which:						
Foundry sand		5	NA	NA	NA	NA
Lump ore		80	NA	NA	NA	NA
Total		85	NA	NA	NA	NA
Cobalt, refined	metric tons	4,665	9,413	10,441	10,547	10,798
Copper:						
Concentrate, gross weight	do.	49,730	51,222	47,802	104,393	145,758
Mine output, Cu content	do.	14,600	14,700	14,000 ^r	25,500 ^r	38,800
Metal:						
Smelter	do.	139,710	153,853	156,017	177,451 ^r	177,000
Refined	do.	105,549	146,344	148,639	155,021 ^r	143,524
Gold, metal, mine output	kilograms	5,749	7,628	8,461	10,814	9,981
Iron and steel, metal:						
Ferroalloys, ferrochromium		123	283	231	288	434
Pig iron	metric tons	2,042	2,564 ^r	2,600 ^r	2,461 ^r	2,400
Steel, crude		3,078	4,023	3,985	3,759	3,517
Mercury	kilograms	6,210	9,315	--	--	--
Nickel:						
Mine output, Ni content	metric tons	4,400	29,448	63,209	46,755 ^r	46,000
Metal, electrolytic	do.	40,800	41,317	49,823	39,374 ^r	44,498
Platinum, concentrate	kilograms	265	718	836	429 ^r	946
Selenium, metal	do.	66,028	66,094	88,231	92,769	72,459
Silver, metal	do.	60,019	64,751	69,344	128,200	100,890
Zinc:						
Mine output, Zn content	metric tons	56,415	55,562	64,115	51,467	49,800
Metal	do.	295,049	307,144	307,352	314,742	311,686
INDUSTRIAL MINERALS						
Cement, hydraulic		1,052	1,215	1,387	1,293 ^r	1,400
Feldspar	metric tons	23,120 ^r	28,013	26,292	43,124	47,636
Lime		410	463	456	450	450
Mica:						
Biotite		54	38	32	27	42
Concentrate	metric tons	7,855	13,809	12,896	12,112	11,244
Nitrogen, N content of ammonia	do.	68,379	78,380	72,352	78,000 ^r	78,000
Phosphate rock, apatite, concentrate:						
Gross weight		660	817	870	858 ^r	877
P ₂ O ₅ content ^e		234	289	307	302 ^r	309
Pyrite, gross weight		679	706	939	993 ^r	990
Sodium sulfate		NA	NA	4	-- ^r	--
Stone, crushed:						
Limestone and dolomite: ^e						
Dolomite		NA	NA	81	81	81
For cement manufacture		1,132 ²	1,495 ²	1,600	1,600	1,600
For agriculture		687 ²	646 ²	450	450	450
For lime manufacture		191 ²	234 ²	220	220	220
Fine powders		650 ²	650 ²	NA	NA	NA
Metallurgical		1	1	NA	NA	NA
Total		2,660 ^r	3,030 ^r	2,400 ^r	2,400 ^r	2,400
Quartz, silica sand		2,241	267	312	257 ^r	260

See footnotes at end of table.

TABLE 1—Continued
FINLAND: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons unless otherwise specified)

Commodity ²	2009	2010	2011	2012	2013
INDUSTRIAL MINERALS—Continued					
Sulfur:					
S content of pyrite ^c	154	150	338	330	330
Byproduct: ^c					
Metallurgy	274	275	280	280	280
Petroleum	127	125	133 ²	130	130
Total	401	400	413 ^r	410	410
Sulfuric acid	851	949	887	975 ^r	975
Talc	375	419	429	396	362
Wollastonite metric tons	9,200	12,100	11,500	11,500	11,500
MINERAL FUELS AND RELATED MATERIALS					
Peat:					
For fuel use	5,576	7,533	6,847	5,824 ^r	5,800
For agriculture and other uses	876	867	674	676 ^r	670
Petroleum refinery products thousand 42-gallon barrels	95,000	88,137	90,686	106,033 ^r	106,000

^cEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. do. Ditto.

NA Not available. -- Zero.

¹Table includes data available through October 19, 2014.

²Reported figure.

TABLE 2
FINLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2013

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
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	40
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-Silbco 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, Pargas, 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 Company Plc	Mine at Sotkamo	20
Metal		Norilsk Nickel Finland (MMC Norilsk Nickel, 100%)	Smelter at Harjavalta	32
Do.		do.	Refinery at Harjavalta	50
Nitrogen (ammonia)		Kemira Oyj (Government, 98%)	Plant at Oulu	75
Petroleum products	thousand 42-gallon barrels per day	Neste Oil Oyj, 50%, and Government, 50%	Plants at Naantali and Porvoo	NA
Phosphate rock, apatite		Kemira Agro Oyj (Government, 98%)	Mine and plant at Siilinjarvi	8,000
do.		Yara International ASA.	Mine at Siilinjarvi	1,000
Quartz and quartzite		SP Minerals Oyj (Partek Corp., 50.1%, and SCR-Silbco 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 Oyj, 50%)	Plants at Aminnefors, Dalsbruk, and Koverhar	850
Do.		Ovako AB (Triton Adviser Ltd. 100%)	Plant at Imatra	600
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	260

Do., do. Ditto. NA Not available.