

2011 Minerals Yearbook

FINLAND [ADVANCE RELEASE]

THE MINERAL INDUSTRY OF FINLAND

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Finland's main industrial activities were the manufacture of chemicals, electronics, metals and metal products, and scientific machinery and instruments; paper and paper pulp manufacturing; and shipbuilding. Its real gross domestic product (GDP) in 2011 was \$266.6 billion which was an increase of 2.9% compared with that of 2010. Finland was a member of the European Union (U.S. Central Intelligence Agency, 2012).

Minerals in the National Economy

Finland's deposits of chromite, cobalt, copper, iron, lead, nickel, and zinc were the foundation for the country's metal industry. 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 was the leading talc producer in Europe and the fifth ranked talc producer in the world (United Nations, 2012; Virta, 2012).

About 3,500 people were employed in the mineral sector in Finland in 2011. This number was expected to increase to 5,000 in the near future in line with the expected growth in the mineral industry (Invest in Finland, 2011).

Government Policies and Programs

The revised Mining Act, which became effective on July 1, 2011, promotes mining but also takes into account environmental issues and the rights of citizens, landowners, and municipalities to influence decisionmaking. Under the revised Mining Act, the right to exploit a deposit is based on a mining permit, and the review of permits is more comprehensive than under the original 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 Chemical Agency is the new mining authority under the revised Mining Act (Ministry of Employment and the Economy, 2011).

Production

Finland produced mostly base metals, gold, and platinum-group metals (PGMs), as well as industrial minerals. The production of mineral commodities continued to be significant in terms of volume and contribution to the country's economy. Data on mineral production are in table 1.

Structure of the Mineral Industry

The Finnish mining sector consists of two types of companies; small quarry and sand and gravel pit operators and a small group of large companies operating metal and industrial mineral

mines (United Nations, 2012). Finland's mining companies were mostly privately owned, although the Government held an equity position 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

Cobalt.—The OM Group (OMG) which was the sole producer of cobalt in Finland, increased its cobalt production by 10.9% in 2011. According to the OMG, the increase in the volume of cobalt production as measured by sales, including metal resale, was the result of an increase in demand for all its advanced materials products, which were manufactured using unrefined cobalt as the principal raw material. This increase in the volume of production, however, was offset by a decrease in the price of refined cobalt, which affected the OMG's revenue for the year. A source of concern for OMG in 2011 was the acquisition of sufficient raw materials for its advanced materials products because of the uncertainty in the supply of cobalt in the world market.

The OMG indicated that, at the end of 2011, the group had secured critical technology by acquiring Rahu Catalytics, a company that produced specialty additives for coatings and composite applications. The OMG used the new technology to produce its line of Borch Oxy-coat cobalt replacement additives that serve as catalysts for coating materials and paints (OM Group Inc., 2012, p. 19–24).

Copper.—Boliden AB'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 (Boliden AB, 2012).

Gold.—Agnico-Eagle Mines Ltd. of Canada owned the Kittila Mine in the Lapland region. In 2011, the mine had a record production of about 4,465 kilograms (kg) of gold content. This increase in production was owing to ongoing exploration that, in 2011, expanded the Kittila mineralization in the Rimpä and the Roura deposit areas at depth and to the north of the deposits. The company was evaluating a 25% throughput expansion that could be operational by 2015. Further expansions were envisioned as the deposit appeared to be significantly

richer and thicker beneath the Rimpi zone (Agnico-Eagle Mines Ltd., 2012, p. 7).

Dragon Mining Ltd. of Australia's Orivesi Mine is located 80 km northeast of the Vammala production center within the Tampere schist belt. Two vertical pipe-like lode systems, the Kutema and the Sarvisuo, occur in strongly deformed, andalusite-rich, silicified zones. Two diamond-drilling programs were completed above and adjacent to the Sarvisuo lode. A 10-hole drilling campaign provided evidence of the existence of a new mineralized pipe or pipe clusters. The intercepts confirmed that the Sarvisuo system could extend at widths and grades that were potentially amenable to underground mining. Further drilling would be required to better define the extent and geometry of the identified mineralization prior to mining (Proactive Investors Australia, 2011).

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.

In 2011, Talvivaara reported production of 16,087 metric tons (t) of nickel from its Sotkamo Mine. The mine went through a period of maintenance during the months of April and May, and further changes to the mineral production process meant that full production was not again reached until October; however, these changes reduced bottlenecks in the production process and increased the volume of production of the mine. Talvivaara stated that it was expecting a target production of between 25,000 and 30,000 t of nickel in 2012.

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 km southwest of Sotkamo in eastern Finland. The deposits constitute one of the largest known nickel sulfide resources in Europe (Mining-technology.com, 2012; Talvivaara Mining Co. plc, 2012, p. 7).

Belvedere produced about 2,150 t of nickel from its Hitura Mine in 2011. The mine had re-started operations in July 2010. In February, Belvedere commenced a drill campaign in the southern edge of the old Hitura open pit, and drilling was completed in November. Subsequent pit optimization studies led to part of the open pit resources being converted into reserves (Belvedere Resources Ltd., 2010, p. 2).

Industrial Minerals

Wollastonite.—Nordkalk Corp. which was owned by the Rettig Group, was the only European producer of wollastonite in 2012. Nordkalk produced all its grades of wollastonite in its facilities in Lappeenranta in south Karelia. The company launched a new generation of high-aspect-ratio wollastonite

fillers. The name of the new product was Norwoll wollastonite, and it was designed for thermoplastic and thermoset applications (Nordkalk Corp., 2012).

Outlook

Finland's production of nickel and zinc is likely to increase, as projects to increase productive capacity will reach the production stage in the short term. The increased market interest in rare-earth minerals has reignited interest in areas of Finland that were producing these minerals but that had stopped because of economic and technical feasibility issues. Copper and silver production is 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 undoubtedly determine if the 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		2007	2008	2009	2010 ^e	2011
METALS						
Aluminum, metal, secondary	metric tons	44,223	24,706	17,885	18,000	19,531
Chromite:						
Cr ₂ O ₃ content		556	614	247	250	250 ^e
Of which:						
Foundry sand		5	5	5	5	5 ^e
Lump ore		80	85	80	80	80 ^e
Total		85	90	85	85	85
Cobalt, refined	metric tons	5,862	6,301	4,665	9,413 ²	10,441
Copper:						
Concentrate, gross weight	do.	47,798	47,077	49,730	50,000	54,500
Mine output, Cu content	do.	13,600	13,000	14,600	14,700	16,000
Metal:						
Smelter	do.	149,206	174,354	139,710	151,000	158,000
Refined	do.	109,837	137,953	105,549	112,700 ^{r,2}	116,500
Gold, metal, mine output	kilograms	4,621 ^r	4,148 ^r	1,785	1,800	6,417
Iron and steel, metal:						
Ferroalloys, ferrochromium		242	234	123	125	125 ^e
Pig iron	metric tons	2,915	2,943 ^r	2,042	2,400	2,600
Steel, crude		4,431	4,418	3,078	4,023 ²	3,985
Mercury	kilograms	45,195	33,120	6,210	6,000	5,000
Nickel:						
Mine output, Ni content	metric tons	3,465	4,303	4,400	4,400	18,244
Metal, electrolytic	do.	54,964	51,936 ^r	40,800	41,000	48,524
Platinum	kilograms	461	214	265	275	275 ^e
Selenium, metal	do.	52,459	58,069	66,028	65,000	65,000 ^e
Silver, metal	do.	33,447	59,375	60,019	64,596 ^{r,2}	73,081
Zinc:						
Mine output, Zn content	metric tons	72,118	51,900	56,415	55,562 ²	64,115
Metal	do.	305,543	297,722	295,049	307,144 ^{r,2}	307,352
INDUSTRIAL MINERALS						
Cement, hydraulic		1,743	1,633	1,052	1,200	1,514
Feldspar	metric tons	48,890	45,250	45,000	45,000	45,000 ^e
Lime		517	482	410	425	425 ^e
Mica:	metric tons					
Biotite		58	57	60	60	60 ^e
Concentrate		11,449	10,706	10,000	10,000	10,000 ^e
Nitrogen, N content of ammonia	metric tons	100,623	73,868	68,379	70,000	70,000 ^e
Phosphate rock apatite concentrate: ^e						
Gross weight		860	780	660 ³	700	800
P ₂ O ₅ content		325	NA	234	265	280
Pyrite, gross weight		509	510	679	650	938
Sodium sulfate		20	22	NA	NA	NA
Stone, crushed:						
Limestone and dolomite:						
Dolomite		NA	NA	NA	NA	81
For cement manufacture		1,764	1,807	1,800	1,800	3,543
For agriculture		547	647	640	640	NA
For lime manufacture		310	317	325	325	NA
Fine powders		625	650	650	650	NA
Metallurgical ^c		1	1	1	1	NA
Total		3,247	3,422	3,420	3,420	3,624
Quartz silica sand		2,958	3,160	2,241	2,400	2,400 ^e

See footnotes at end of table.

TABLE 1—Continued
FINLAND: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons unless otherwise specified)

Commodity ²	2007	2008	2009	2010 ^e	2011
INDUSTRIAL MINERALS—Continued					
Sulfur:					
S content of pyrite ^e	326	226	154	150	338
Byproduct: ^e					
Metallurgy	331	331	274	275	280
Petroleum	125	117	127	125	133 ²
Total	456	448	401	400	410
Sulfuric acid	904	956	851	850	1,068
Talc	536	528	500	500	500 ^e
Wollastonite metric tons	16,364	15,600	16,000	16,000	16,000 ^e
MINERAL FUELS AND RELATED MATERIALS					
Peat:					
For fuel use	8,671	6,933	5,576	4,032 ²	4,000 ^e
For agriculture and other uses	1,145	1,552	876	768	760 ^e
Petroleum refinery products thousand 42-gallon barrels	89,130	95,325	95,000	95,000	108,803

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

¹Table includes data available through September 28, 2012.

²Reported figure.

TABLE 2
FINLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2011

(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 (OJSC MMC Norilsk Nickel, 100%)		Plant at Kokkola	NA
Copper:					
Ore, Cu content		Inmet Mining Corp.		Mines at Pyhasalmi, Saattopora, and Hitura	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, 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 Co. plc		Mine at Sotkamo	20
Metal		Norilsk Nickel Finland (OJSC MMC Norilsk Nickel, 100%)		Smelter at Harjavalta	32
Do.		do.		Refinery at Harjavalta	50
Petroleum products	thousand barrels per day	Neste Oil Oyj, 50%, and Government, 50%		Plants at Naantali and Porvoo	NA
Phosphate-apatite		Yara International ASA.		Mine at Siilinjarvi	1,000
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 Oyj (Stahlbeteiligungs GmbH)		Plant at Imatra	600
Stainless		AvestaPolarit		Plant at Tornio	550
Talc		Mondo Minerals Oyj (BHP Billiton, 50%, and Plüss-Stauffer AG, 50%)		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.