



# 2009 Minerals Yearbook

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FINLAND [ADVANCE RELEASE]

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# THE MINERAL INDUSTRY OF FINLAND

By Harold R. Newman

Finland, which is a member country of the European Union (EU), has a long tradition of mining that dates back to 1540 when iron ore mining commenced. The country's mining laws and legislation encourage exploration and development. Finland is known for its metallurgical expertise and it has a well-developed infrastructure. The mining and mineral industry was very important to the country and played an increased role in the economy in 2009, both domestically and internationally.

The Government announced that it had initiated a plan to reform the Mining Act of 1965 to ensure that prospecting and mining are performed in an ecologically, economically, and socially sustainable manner. The new Mining Act would take into account environmental issues, as well as the rights of citizens, landowners, and municipalities to influence decisionmaking. Under the revised Act, the right to exploit a deposit would be based on a mining permit, and the review of permits would be more comprehensive than in the original Act. The mining operator's termination and after-care obligations would also be more extensive, and the mining operator would be required to lodge a security deposit to ensure that its after-care obligations are fulfilled. The Government would continue to provide access to high-quality geologic databases and other available exploration services (Mining Journal, 2009a, p. 20).

## Minerals in the National Economy

The Government offered the mineral resource industry a favorable investment and operating environment. There continued to be significant potential for new discoveries of mineral commodities to be made because areas of the country had not been well-explored. Activities of the mineral industry in 2009 were concentrated on the production of base metals, diamond, gold, industrial minerals, and platinum-group metals. The global economic downturn reduced capital investment in mineral exploration from the private sector. The metal industry was one of the key sectors of the national economy, and its output was largely exported (Mining Journal, 2009b).

## Production

The production of mineral commodities, although decreasing for some commodities (including refined cobalt, refined copper, mercury, and steel), continued to be significant. In 2008 (the latest year for which data were available), metals were mined from four mines that produced a combined 3.7 million metric tons (Mt) of ore; industrial minerals were mined from 40 mines and quarries that produced a combined 15.9 Mt of ore. The major industrial minerals produced were apatite, carbonates, and talc (Mining Journal, 2009b). Finland was the leading talc producer in Europe and the fourth ranked talc producer in the world (Virta, 2009). Data on mineral production are in table 1.

## Structure of the Mineral Industry

The mineral resource companies were mostly privately owned. The Government held an equity position in some of the major mineral commodities companies, however, such as Kemira Oyj, Outokumpu Oy, and Rautaruukki Oy. The mineral industry operated on a free market basis. The companies' major facilities and their annual capacities are listed in table 2.

## Commodity Review

### Metals

**Copper.**—Vulcan Resources Ltd. of Australia completed its feasibility study, with positive results, on its Kylylahti project in eastern Finland. The company reported that it intended to merge with Universal Resources Ltd. of Australia. Should the merger happen, it would create a significant copper group with advanced development-stage projects in Queensland, Australia, and in Finland (Universal Resources Ltd., 2009).

**Gold.**—Lapland Goldminers AB reported that it achieved its highest quarterly production in 2009 from the Pahtavaara Mine. In the fourth quarter, 211 kilograms (kg) was produced. For the full year, 688 kg was produced. Ore mined was 307,009 metric tons (t) at a grade of 1.64 grams per metric ton (g/t) gold. The annual production was marginally below that planned for the year; however, recoveries increased to 87% from a planned 85%. Gold grades in November and December exceeded 2 g/t of mined ore (Lapland Goldminers AB, 2010).

Dragon Mining Ltd. of Australia was engaged in gold exploration, development, and mining projects, which included the Jokisivu Mine and the Orivesi Mine. Dragon Mining announced the results of a drilling program to test the depth extensions of the Kujankallio deposit at the Jokisivu Mine. Open pit mining commenced at Kujankallio in 2009. Results from drill holes designed to examine about 300 meters (m) of strike length at the Kujankallio deposit returned significant intercepts, including 2.4 m grading 6.45 g/t gold, 3.75 m grading 29.73 g/t, 6.65 m grading 13.90 g/t, 3.1 m grading 9.08 g/t, 3.9 m grading 6.45 g/t, and 7.35 m grading 6.29 g/t. New intercepts were also received at the Basin 3 prospect, which is located 100 m northwest of the Kujankallio open pit. The best intercept from the five holes completed was 1.85 m grading 22.29 g/t gold (Dragon Mining Ltd., 2009a).

The region is also host to the company's Orivesi Mine. Both the Jokisivu Mine and the Orivesi Mine are located in the Paleoproterozoic Svecofennian (Tampere) schist belt in southern Finland. The Orivesi Mine had been in production from 1994 until 2003 and produced about 13,000 kg of gold from 1.4 Mt of ore from near-vertical pipe-like lodes at Kutema. Dragon Mining recommenced remnant mining in mid-2007 and was continuing in 2009 from the Kutema decline. A project to deepen the mine to 820 m was under consideration, and

the company expected to be make a decision in 2010 (Dragon Mining Ltd., 2009b).

Agnico-Eagle poured the first gold from its Kittila Mine in January; this was Agnico-Eagle's first mine to open outside of Canada. The Kittila Mine has estimated proven and probable gold reserves of 21.4 Mt grading 4.7 g/t gold. The mine was expected to produce 3,534 kg of gold in 2009. Agnico-Eagle announced that it had budgeted \$16 million for exploration spending in 2009 on resource-to-reserve conversion at Kittila and on other exploration around the current reserves; this was the largest ongoing exploration program for the company (Agnico-Eagle Mines Ltd., 2009b).

Initially, the Kittila ore bodies were being mined from two open pits—the Roura and the Suuri—followed by underground operations to mine the ore zones at depth. Surface mining was expected to last for 5 years. Underground mining was planned to commence in 2010 by open stoping followed by delayed backfill (Agnico-Eagle Mines Ltd., 2009a).

**Lithium.**—In mid-2009, Nortec Ventures Corp. of Canada changed its name to Nortec Minerals Corp. and announced that it was granted two claim reservations totaling 317 hectares (ha) for two lithium targets in the Tammela district in southwestern Finland. The lithium mineralization in this pegmatite region, particularly in the Hirvikallio and the Kietyönmäki areas, occurs as swarms of lithium-bearing pegmatite dykes. The two claim reservations were collectively known as the Tammela lithium project (International Mining, 2009a, p. 50).

**Nickel.**—Belvedere Resources Ltd. announced that Finn Nickel OY had decided to initiate voluntary bankruptcy proceedings but that the proceedings would not affect the solvency of Belvedere Resources or Belvedere Resources Finland OY. Belvedere Resources Finland holds the gold resources of the group. Finn Nickel's main assets included the Hitura and the Särkiniemi nickel mines, the Hitura and the Luikonlahti processing plants, the permitted Hautalampi cobalt, copper, and nickel project, and a number of exploration properties (Belvedere Resources Ltd., 2009).

The Kevitsa nickel deposit, which is located in northern Finland, was one of the world's major undeveloped nickel sulfide deposits. In April 2008, First Quantum Minerals Ltd. of Canada and Scandinavian Minerals Ltd. entered into an agreement in which First Quantum would acquire all the outstanding shares of Scandinavian Minerals. In November 2008, Quantum Minerals announced that it was proceeding with the development of the Kevitsa project and with the construction of an open pit mine and 5-million-metric-ton-per-year (Mt/yr) ore treatment plant. Estimated proven and probable reserves were 107 Mt at a grade of 0.29% nickel. Production was scheduled for mid-2012 (First Quantum Minerals Ltd., 2009).

Talvivaara Mining Company plc announced that it had shipped its first nickel sulfide ore from its Talvivaara Mine to Norilsk Nickel Harjavalta in Finland. The production target for 2010 remained unchanged; there were plans for expansions to 45,000 t of nickel ore in 2011 and 50,000 t of nickel ore in 2012 (International Mining, 2009b, p. 43).

Vulcan Resources announced updated resource estimates for three deposits within the Suomussalmi Greenstone Belt which forms the northern part of the Kuhmo nickel project area. These

three deposits—the Hietaharju, the Peura-aho, and the Vaara—were estimated to host a combined 37,300 t of contained nickel, 17,855 t of contained copper, 1,964 t of contained cobalt, and 3,685 kg of contained palladium. The 2009 resource estimate for the Vaara deposit was 8.2 Mt grading 0.32% nickel 0.02 copper, 0.01 cobalt, 0.14 palladium; for the Hietaharju deposit, 1.1 Mt grading 0.80% nickel, 0.04% copper, 0.05% cobalt, and 1.17 g/t palladium; and for the Peura-aho deposit, 495,000 t grading 0.60% nickel, 0.27% copper, 0.04% cobalt and 0.58 g/t palladium in about 9,82 Mt total ore. Vulcan Resources had applied for a mining license at Hietaharju (Vulcan Resources Ltd., 2009).

### *Industrial Minerals*

**Diamond.**—Sunrise Diamonds plc of the United Kingdom announced that it had entered into an agreement with Nordic Diamonds Ltd. to acquire 100% ownership of Nordic's Kaavi-Kuopio claims in Finland. The claims covered 14 of the 25 known kimberlites in Finland's main diamondiferous area at Kaavi-Kuopio, including Kimberlites 10, 14, and 17 where Nordic had completed diamond sampling, and a number of other pipes containing diamond grades of economic interest (Resource Investor, 2009).

**Wollastonite.**—Nordkalk Corp., which was the only European producer of wollastonite in 2009, announced that it had launched a new generation of high-aspect-ratio wollastonite fillers. The name of the new product is Harwold wollastonite and it was designed for thermoplastic and thermoset applications. Wollastonite ( $\text{CaSiO}_3$ ) is a calcium metasilicate with the theoretical composition of 48.3% calcium oxide and 51.7% silicon dioxide; it is used mainly in the production of abrasives, ceramics, elastomers, plastics, and some metallurgical processes (Nordkalk Corp., 2009).

### *Mineral Fuels and Related Materials*

Fingrid Oyj had a crucial role in the Finnish power system. By virtue of the Electricity Market Act, Fingrid was responsible for the functioning of the power system at a national level. Fingrid announced that it was ready to export 350 megawatts of electricity to Russia beginning in 2010 but that first new rules regulating the trade between Finland and Russia would have to be made. In 2009, it was possible for the Nordic countries only to import electricity from Russia, not to export it to Russia, but this was expected to change in 2010. Russia was conducting technical tests, and the results would show what the next step in the development of a two-way connection between Finland and Russia would likely be (Barentsobserver.com, 2009).

**Uranium.**—Mawson Resources Ltd. of Canada announced that it had been granted a 96-ha exploration claim over the historical Nuottijarvi uranium deposit in central Finland, which was one of the country's largest known uranium deposits. In 1969, Outokumpu Oy reported an estimated historical resource at Nuottijarvi of 2.9 Mt grading 0.044% uranium oxide ( $\text{U}_3\text{O}_8$ ) based on 43 diamond drill holes for 6,679 m, drilled on a 50-m by 50-m drill pattern. The mineralized body is about 40-m thick, extends from the surface to a vertical depth of 80 m, trends over

a strike length of more than 400 m, and remains open along strike and at depth. The uranium occurs as uraninite associated with fluorapatite within a 40-m-wide mineralized breccia, hosted by a carbonate-apatite horizon at the contact between quartzite and graphite-bearing phyllite. Mawson announced that it would complete a compliance report and begin metallurgical testing to produce yellowcake in 2010 (Canada Newswire, 2009).

## Outlook

Finland has a long mining history and a traditional focus on primary resources, which is expected to continue. Exploration, particularly for gold, is expected to continue at a strong pace. The operating environment for mining companies in Finland is generally favorable for exploration and mining and is expected to remain so. There is a significant potential for the occurrence of various mineral commodities as the Geological Survey of Finland continues to identify metallic and industrial mineral deposits and compile geoscience data.

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TABLE 1  
FINLAND: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Thousand metric tons unless otherwise specified)

Commodity <sup>2</sup>	2005	2006	2007	2008	2009 <sup>e</sup>
<b>METALS</b>					
Aluminum, metal, secondary metric tons	34,127	35,773	44,223 <sup>3</sup>	24,706 <sup>3</sup>	14,381 <sup>3</sup>
Chromite:					
Gross weight	571	549	556	614	247 <sup>3</sup>
Cr <sub>2</sub> O <sub>3</sub> content:					
Lump ore	82	80	80	85	80
Concentrate	126	125	125	128	125
Foundry sand	5	5	5	5	5
Total	213	210	210	218	210
Cobalt, refined metric tons	6,158	5,903	5,862	6,301 <sup>3</sup>	4,665 <sup>3</sup>
Copper:					
Concentrate, gross weight do.	53,489	44,663	47,798	47,077 <sup>3</sup>	49,730 <sup>3</sup>
Mine output, Cu content do.	15,600 <sup>e</sup>	13,000	13,600	13,000 <sup>e</sup>	13,000
Metal:					
Smelter do.	177,216	192,235	149,206	174,354	139,710 <sup>3</sup>
Refined do.	124,994	136,674	109,837	137,953	105,549 <sup>3</sup>
Gold, metal, mine output kilograms	3,747	5,292	2,727	2,064	1,785 <sup>3</sup>
Iron and steel, metal:					
Pig iron metric tons	3,056	3,158	2,915	21,171 <sup>r,3</sup>	15,704 <sup>3</sup>
Ferroalloys, ferrochromium	235	243	242	234	123 <sup>3</sup>
Steel, crude	4,738	5,052	4,431	4,418	3,078 <sup>3</sup>
Mercury kilograms	34,200	22,879	45,195	33,120	6,210 <sup>3</sup>
Nickel:					
Mine output, Ni content metric tons *	3,386	2,985	3,465	4,303	4,400
Metal, electrolytic do. *	34,709	47,469	54,964	43,036	10,304 <sup>3</sup>
Platinum kilograms	678	711	461	214	265 <sup>3</sup>
Selenium, metal do.	57,208	70,458	52,459	58,069 <sup>r,3</sup>	66,028 <sup>3</sup>
Silver, metal do.	24,822	38,428	33,447	59,375 <sup>r,3</sup>	60,019 <sup>3</sup>
Zinc:					
Mine output, Zn content metric tons	72,474	66,109	72,118	51,900	56,415 <sup>3</sup>
Metal do.	281,905	282,238	305,543	297,722	295,049 <sup>3</sup>
<b>INDUSTRIAL MINERALS</b>					
Cement, hydraulic	1,537	1,685	1,743	1,633	1,052 <sup>3</sup>
Feldspar metric tons	52,383	43,187	48,890	45,250	45,000
Lime	470	502	517	482	410 <sup>3</sup>
Mica:					
Unspecified metric tons	9,473	8,097	11,449	10,706	10,000
Biotite	59	63	58	57	50
Nitrogen, N content of ammonia do.	73,592	91,356	100,623	73,868	68,379 <sup>3</sup>
Phosphate rock apatite concentrate: <sup>e</sup>					
Gross weight	823 <sup>3</sup>	858 <sup>3</sup>	860	780	660 <sup>3</sup>
P <sub>2</sub> O <sub>5</sub> content	300 <sup>3</sup>	325 <sup>3</sup>	325	NA	NA
Pyrite, gross weight	489	495	509	510 <sup>r,3</sup>	679 <sup>3</sup>
Sodium sulfate	26	27	20	22	NA
Stone, crushed:					
Limestone and dolomite:					
For cement manufacture	1,537	1,569	1,764	1,807	1,800
For agriculture	566	657	547	647	640
For lime manufacture	342	328	310	317	325
Fine powders	629	625 <sup>e</sup>	625	650	650
Metallurgical <sup>c</sup>	1	1	1	1	1
Total	3,075	3,161	3,247	3,422	3,420
Quartz silica sand	2,860	3,003 <sup>r</sup>	2,958 <sup>r</sup>	3,160	2,241 <sup>3</sup>

See footnotes at end of table.

TABLE 1—Continued  
FINLAND: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Thousand metric tons unless otherwise specified)

Commodity <sup>2</sup>	2005	2006	2007	2008	2009 <sup>e</sup>
<b>INDUSTRIAL MINERALS—Continued</b>					
Sulfur:					
S content of pyrite <sup>e</sup>	270	250	250	250	250
Byproduct: <sup>e</sup>					
Metallurgy	300	300	300	300	300
Petroleum	70	70	70	70	70
Total	370	370	370	370	370
Sulfuric acid	1,057	971	904	956 <sup>3</sup>	851 <sup>3</sup>
Talc	508	559	536	528	500
Wollastonite metric tons	15,950	16,200	16,364	15,600 <sup>e</sup>	16,000
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Peat:					
For fuel use	7,696	6,919	8,671	6,933 <sup>r,3</sup>	5,576 <sup>3</sup>
For agriculture and other uses	778	896	1,145	1,552 <sup>r,3</sup>	876 <sup>3</sup>
Petroleum refinery products thousand 42-gallon barrels	78,796	79,835	89,130	95,325	95,000

<sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>r</sup>Revised. do. Ditto. NA Not available.

<sup>1</sup>Table includes data available through August 31, 2010.

<sup>2</sup>In addition to the commodities listed, granite and soapstone were produced, but available information is inadequate to make reliable estimates of output.

<sup>3</sup>Reported figure.

\*Correction posted September 16, 2011.

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Chromite:						
Gross weight		571	549	556	614	247 <sup>3</sup>
Cr <sub>2</sub> O <sub>3</sub> content:						
Lump ore		82	80	80	85	80
Concentrate		126	125	125	128	125
Foundry sand		5	5	5	5	5
Total		213	210	210	218	210
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Copper:						
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<b>INDUSTRIAL MINERALS</b>						
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Stone, crushed:						
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For lime manufacture		342	328	310	317	325
Fine powders		629	625 <sup>e</sup>	625	650	650
Metallurgical <sup>e</sup>		1	1	1	1	1
Total		3,075	3,161	3,247	3,422	3,420
Quartz silica sand		2,860	3,003 <sup>r</sup>	2,958 <sup>r</sup>	3,160	2,241 <sup>3</sup>

See footnotes at end of table.