

# FINLAND

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Finland's gross domestic product (GDP) growth rate amounted to only 0.7% in 2001 compared with 5.6% in 2000. The growth was stalled by a reduction in worldwide demand for products; exports amounted to \$46 billion. Exports of goods contributed 42% to the country's GDP, and industrial production contributed 28.3%. Per capita income was \$23,207. The 2001 unemployment rate of 9.1% was above the European Union average (U.S. Department of State, 2002<sup>§1</sup>).

Finland is an industrialized market economy country. The metals industry was one of the key sectors of the economy. Copper refining and metals production constituted a major mineral industry, and its output was largely exported. The country depended on imports of raw materials and energy except for several indigenous minerals. Crude oil, iron ore, nickel matte, petroleum products, and zinc concentrate were the main imports. Exploration activities were focused on base metals, diamond, and gold deposits.

Belvedere Resources Ltd. of Canada completed the first phase of exploration on its Susineva claims at Kaskela in central Finland to delineate further surface massive sulfide zinc and copper mineralization. The program consisted of 9 shallow drill holes, which totaled 626 meters (m), and 137 pits dug to sample bedrock. Surface pitting produced some good sulfide mineralization with anomalous zinc and copper values. Two closely spaced lenses that contain massive chalcopyrite, pyrite, and sphalerite had been identified along a 400-m strike length. Phase II of the exploration program to drill strong gravity anomalies was scheduled for late October 2001 (Canada NewsWire, 2001).

Riddarhyttan Resources AB of Sweden received better assay results than before from a continuing drilling program at the Suurikuusikko gold property in northern Finland. In 1998, Riddarhyttan won an international tender for the property, which is located in the middle of the Lapland greenstone belt. Riddarhyttan estimated that the deposit contained indicated and inferred resources of 6 million metric tons (Mt) at an average grade of 6 grams per metric ton (g/t) gold. A deposit model suggested that two zones of mineralization at the property were connected (Mining Journal, 2001d).

Outokumpu Oyj planned to expand its Harjavalta operation to a production capacity of 250,000 metric tons per year (t/yr) of copper by 2005. The smelter produced 170,000 t/yr of blister copper and smelted nickel on a toll basis for OM Group, Inc., of the United States. The furnaces would be converted to accommodate copper production. Copper concentrates would come from Sociedade Mineira de Neves-Corvo S.A. of Portugal and from Argentina and Chile. Capacity at Outokumpu Oyj's refinery in southwestern Finland also would increase to 250,000

t/yr of cathode copper from 125,000 t/yr (Metal Bulletin, 2001c).

AvestaPolarit Oyj Abp was a new stainless steel producer formed by the merger of Outokumpu Steel and Avesta Sheffield in January. Outokumpu would hold 55%; Corus Group of the United Kingdom, 23%; and the public, the remainder. Outokumpu was bound by the merger agreement to reduce its holding to 40% within 3 years of share flotation. In terms of a slab capacity of 1.75 million metric tons per year (Mt/yr) and a billet/bloom capacity of 230,000 t/yr, AvestaPolarit was the world's second largest stainless steel company after Nippon Steel Corp. Stainless coil would be produced at Tornio, Finland; Avesta, Langshyttan, and Nyby, Sweden; and Sheffield, United Kingdom (Metal Bulletin, 2001a).

Outokumpu Technology finalized its acquisition of the metallurgical businesses of Lurgi Metallurgie AG of Germany for \$46 million. The acquisition would significantly strengthen its technology business. As a result, Outokumpu Technology became the world's leading supplier of copper and zinc plants, a major supplier of aluminum technologies, and the key supplier of innovative technologies for the ferrous metals and ferroalloy industries. The company acquired Inprosys Inc., KHD Aluminium Technology GmbH, the grinding mill operations of Metso Corporation, and Royal Pannevis BV (Mining Journal, 2001c).

Imatra Steel planned to invest \$18.5 million to modernize its continuous bloom caster and heavy rolling mill to improve quality and to raise capacity by 10% to 300,000 t/yr. The changes at the works would be completed in 2003. The Imatra works, which produced round, square, and flat bars, also had an electric-arc furnace, ladle metallurgy, heat treatment facilities, and a billet rolling line. The other production unit in Finland was the Billnas Spring works that made leaf springs and tubular stabilizer bars (Metal Bulletin, 2001d).

Rautaruukki Oy planned shutdowns so that the two blast furnaces at its Raahe works could be repaired in fall 2002 and fall 2003. The company will have to buy slab on the open market. Fundia AB (a subsidiary of Rautaruukki) announced 80 job cuts at its plants in Dalsbruk and Koverhar in 2001 to 2002. In 2001, an endless rolling system was installed at Dalsbruk. The Koverhar works would reduce its exports of billets. Fundia started up a new ladle furnace and modernized caster at Koverhar (Metal Bulletin, 2001b).

Outokumpu started talks with the 150 employees at its Hitura nickel mine in Nivala about the possible closure of the operation. The company was obliged by law to consult with workers before shutting the mine. The decision on whether to close the operation would be made in fall 2001. The mine, which has been in operation for 30 years, supplied nickel concentrates mainly to the company's Harjavalta nickel smelter (Metal Bulletin, 2001f).

<sup>1</sup>References that include a section twist (§) are found in the Internet References Cited section.

South Atlantic Resources Ltd. of Canada acquired a 100% interest in the Nordic Platinum project in northern Finland from North Atlantic Natural Resources AB. The project encompassed more than 300 square kilometers and is adjacent to the Arctic Platinum Partnership's (Gold Fields Ltd./Outokumpu) platinum-group metal (PGM) discoveries. An airborne electromagnetic survey showed at least 15 significant anomalies. The company was organizing an exploration program that would include reconnaissance geochemical sampling and prospecting, ground geophysics, and preliminary scout drilling (CCN Newswire, 2001§). Ground geophysical program was underway with horizontal-loop electromagnetic survey.

The Arctic Platinum Partnership received an updated resource estimate for the PGM deposits at Ahmavaara and Konttijarvi. The Ahmavaara model was based on data from 322 diamond-drill holes (for 28,000 m) and that at Konttijarvi was based on data from 163 diamond-drill holes (for 19,200 m). At a cutoff grade of 0.5 g/t platinum, palladium, and gold, the total resources were estimated to be 803,000 kilograms (kg), of which 75,000 kg was proven and 728,000 kg was probable (Mining Journal, 2001a).

Kemira Pigments (part of the Kemira Group) invested \$18.5 million to implement a 10,000-t/yr-capacity increase at its titanium dioxide plant at Pori. Capacity would be increased from 120,000 t/yr to 130,000 t/yr by 2003 and to 150,000 t/yr with long-term planning. Kemira was the world's seventh largest producer with a 3% share of total global capacity of 4.514 Mt/yr in 2001. The principal raw material at the Pori plant was ilmenite; titanium dioxide pigment, which is used in paint, paper, and plastic, was produced (Industrial Minerals, 2001).

Outokumpu sold its Pyhasalmi zinc-copper mine in central Finland to Inmet Mining Corp. of Canada. The mine produced 14,000 t/yr of copper-in-concentrate and 30,000 t/yr of zinc-in-concentrate. Concentrates would be supplied to Outokumpu for smelting. The agreement also called for cooperation with respect to smelting and refining material from other Inmet mines. The mine had proven and probable reserves that total 17.2 Mt at a grade of 1.2% copper, 2.8% zinc, 0.4 g/t gold, and 39% sulfur; the mine could produce until 2015 at its 2001 production rate of 1.2 Mt/yr. Pyrite concentrate was sold under long-term contract to the domestic fertilizer industry (Mining Journal, 2001b).

Outokumpu's Kokkola zinc plant expansion came on stream in October and raised the capacity to 260,000 t/yr from 225,000 t/yr at a cost of \$27 million. Through the Kokkola expansion and the Norzink of Norway acquisition in 2000, the company

was the third largest zinc metal producer in Europe with a 15% share of the market and had a 5% share of world zinc production (Metal Bulletin, 2001e).

WMC of Australia elected to sell its 50% interest in the Mondo Minerals Oy talc joint venture in Finland as a result of the growing concern about the market. Its partner in the joint venture Omya AG offered \$62 million for the share, and WMC accepted the offer (Mining Magazine, 2001). Mondo Minerals was the largest producer of paper-grade talc in Europe and operated three talc mines and beneficiation plants.

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- U.S. Department of State, 2002 (June), Finland—Economy, Background Note, accessed June 20, 2002, at URL <http://www.state.gov/r/pa/ei/bgn/3238.html>.

## Major Source of Information

Geological Survey of Finland  
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TABLE 1  
FINLAND: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity 3/ METALS	1997	1998	1999 e/	2000 e/	2001 e/
Aluminum metal, secondary	38,200	40,500	43,989 4/	44,824 r/ 4/	34,488 4/
Cadmium metal, refined	650	520	700	683 4/	604 4/
Chromite: e/					
Gross weight:					
Lump ore thousand tons	215	220	225	230	215
Concentrate do.	365	380	400	390 r/	350
Foundry sand do.	9	10	10	10	10
Total do.	589 4/	610 4/	635	630 r/	575 4/
Cr <sub>2</sub> O <sub>3</sub> content: do.					
Lump ore do.	75	75	75	80	75
Concentrate do.	150	150	150	150	130
Foundry sand do.	3	5	5	5	5
Total do.	228 4/	230 4/	230	235	210
Cobalt, metal, powder, and salts	5,000	5,250	6,200 4/	3,864 r/ 4/	3,908 4/
Copper: e/					
Concentrate, gross weight	22,000	25,000	28,000	29,000	29,000
Mine output, Cu content	8,500	9,500	10,500	43,062 r/ 4/	41,146 4/
Metal:					
Smelter	159,000	156,000	149,600 4/	155,400 4/	169,300 4/
Refined	116,000	123,000	114,700 4/	114,035 r/ 4/	119,677 4/
Gold metal kilograms	3,900	5,000 e/	5,900	4,951 4/	5,552 4/
Iron and steel, metal:					
Pig iron thousand tons	2,786	2,912	2,954 4/	2,983 4/	2,900
Ferroalloys, ferrochromium do.	237	231	256 4/	261 4/	237 4/
Steel, crude do.	3,687	3,932	3,956 4/	4,096 4/	4,100
Semimanufactures, rolled do.	3,314	3,682	3,700	3,750	3,800
Mercury	63	54	40	76 4/	71 4/
Nickel:					
Mine output, Ni content	3,252	1,967	70 4/	10,714 4/	27,610 4/
Metal, electrolytic	34,228	46,200	51,948 4/	50,087 r/ 4/	51,275 4/
Platinum-group metals: e/					
Palladium kilograms	180	150	150	-- 4/	-- 4/
Platinum do.	600 r/	500 r/	500 r/	441 4/	510 4/
Selenium metal do.	28,000	28,000 e/	26,000	36,293 4/	38,913 4/
Silver metal e/ do.	32,500	29,700	31,500	25,364 4/	23,998 4/
Zinc:					
Mine output, Zn content e/	30,800	30,700	20,000	30,493 4/	36,253 4/
Metal	173,000 r/	199,000 e/	225,200 4/	222,881 4/	247,179 4/
INDUSTRIAL MINERALS					
Cement, hydraulic thousand tons	905	1,098 r/	1,310 4/	1,422 4/	1,325 4/
Feldspar e/	40,000	40,000	40,000	33,200 4/	34,298 4/
Lime e/ thousand tons	400	400	305 4/	320 4/	333 4/
Nitrogen, N content of ammonia e/	60,000 r/	60,000 r/	60,000 r/	75,344 4/	80,000
Phosphate rock, apatite concentrate:					
Gross weight thousand tons	690	716	724	750 r/	750
P <sub>2</sub> O <sub>5</sub> content do.	254	260	268	277 r/	277
Pyrite, gross weight e/ do.	950	900	800	706 4/	632 4/
Sodium sulfate e/ do.	30	35	30	31 4/	30 4/
Stone, crushed:					
Limestone and dolomite: e/					
For cement manufacture do.	1,200	1,200	1,350	1,300	1,400
For agriculture do.	900	900	1,000	1,000	1,000
For lime manufacture do.	300	300	350	350	350
Fine powders do.	300	300	350	350	350
Metallurgical do.	2	2	1	1	1
Total do.	2,700	2,700	3,050	3,000	3,100
Quartz silica sand do.	30 e/	30	73 4/	73 r/	148 4/
Sulfur:					
S content of pyrite thousand tons	373	430 e/	500	377 4/	337 4/
Byproduct of metallurgy do.	307	296	300	300	300
Byproduct of petroleum do.	50	40 e/	45	50	45
Total do.	730	766 e/	845	850	795

See footnotes at end of table.

TABLE 1--Continued  
FINLAND: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity 3/	1997	1998	1999 e/	2000 e/	2001 e/
<b>INDUSTRIAL MINERALS--Continued</b>					
<b>Sulfur--Continued:</b>					
Sulfuric acid e/	1,200	1,200	819 4/	854 4/	298 4/
Talc e/	350	350	469 4/	-- 4/	-- 4/
Wollastonite e/	20,000	22,000	22,000	20,000	20,000
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
<b>Peat:</b>					
For fuel use	9,500	1,700	4,140 4/	3,932 4/	4,000
For agriculture and other uses	600	150	1,595 4/	1,174 4/	1,200
Petroleum refinery products	76,643	83,370	83,000	80,000	85,000

e/ Estimated. r/ Revised.

1/ Table includes data available through June 19, 2002.

2/ Estimated data are rounded to no more than three significant digits; may not add to totals shown.

3/ In addition to commodities listed, granite and soapstone are produced, but available information is inadequate to make reliable estimates of output levels.

4/ Reported figure.

TABLE 2  
FINLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Apatite	Kemira Agro Oy (Government, 98%)	Mine and plant at Siilinjärvi	8,000
Ammonia	Kemira Oyj (Government, 98%)	Plant at Oulu	75
Cadmium, metal	Outokumpu Oyj (Government, 40%; private investors, 12.3%)	Smelter at Kokkola	1
Cement	Finnccement Oy (Irish Cement Ltd., 100%)	Plants at Lappeenranta and Parainen	1,020
Chromite	Outokumpu Oyj (Government, 40%; private investors, 12.3%)	Mine at Kemi	1,000
<b>Copper:</b>			
Ore, Cu content	do.	Mines at Pyhäsalmi, Saattopora, and Hitura	10
Metal	do.	Smelter at Harjavalta	160
Do.	do.	Refinery at Pori	125
Feldspar	SP Minerals Oy (Partek Corp., 50.1%; SCR-Silbeco SA, 49.9%)	Mine and plant at Kemiö	50
Ferromanganese	Outokumpu Oyj (Government, 40%; private investors, 12.3%)	Smelter at Tornio	250
<b>Gold:</b>			
Ore, Au content	tons do.	Mine at Orivesi	4
Metal	do. do.	Smelter at Pori	4
Ore, Au content	do. Williams Resources Inc.	Pahtavaara Mine near Sodankylä	3
Limestone	Partek Nordkalk Oy (Partek Corp., 100%)	Mines at Lappeenranta, Pargas and Parainen	1,500
Do.	Rauma-Repola Oy	Mine at Tornio	300
Mercury	tons Outokumpu Oyj (Government, 40%; private investors, 12.3%)	Smelter at Kokkola	150
Mica	Kemira Oyj (Government, 98%)	Mine at Siilinjärvi	10
<b>Nickel:</b>			
Ore, Ni content	Outokumpu Oyj (Government, 40%; private investors, 12.3%)	Mine at Hitura	3
Metal	do.	Smelter at Harjavalta	32
Do.	OM Group, Inc.	Refinery at Harjavalta	50
Petroleum products	Fortum Oil and Gas Oy	Plants at Naantali and Porvoo	NA
Phosphate-apatite	Kemira Oyj (Government, 98%)	Mine at Siilinjärvi	700
Do.	Outokumpu Oyj (Government, 40%; private investors, 12.3%)	Mine at Pyhäsalmi	800
Quartz and quartzite	SP Minerals Oy (Partek Corp., 50.1%; SCR-Silbeco SA, 49.9%)	Mines at Kemiö and Nilsia	250
Selenium	tons Outokumpu Oyj (Government, 40%; private investors, 12.3%)	Smelter at Pori	35
Silver	do. do.	do.	30
Steel	Rautaruukki Oy (Government, 41.8%)	Plant at Raahе	2,100
Do.	Fundia AB (Norsk Jenverk AS of Norway, 50%; Rauraruukki, 50%)	Plants at Aminnefors, Dalsbruk, and Koverhar	850
Do.	Ovako Oy (SKF, 50%; Wartsila, 25%; Fiskas, 20%)	Plant at Imatra	600
Stainless	Outokumpu Oyj (Government, 40%; private investors, 12.3%)	Plant at Tornio	500
Talc	Mondo Minerals Oy (Western Mining Corp. Holdings Ltd., 50%; Plüss-Staufe AG, 50%)	Mines at Lahnaslampi, Lipsavaara, and Horsmanaho	500
Wollastonite	Partek Minerals Oy (Partek Corp., 100%)	Mine at Lappeenranta	30
<b>Zinc:</b>			
Ore, Zn content	Outokumpu Oyj (Government, 40%; private investors, 12.3%)	Mine at Pyhäsalmi	25
Metal	do.	Smelter at Kokkola	260

NA Not available.