



# 2006 Minerals Yearbook

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SWEDEN

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# THE MINERAL INDUSTRY OF SWEDEN

By Harold R. Newman

Geologically, Sweden can be divided into principal areas, each of which has its own distinctive characteristics concerning mineral prospectivity. Southern Sweden, south of a line running from Gothenburg to Stockholm, contains few known mineral occurrences, although the region was considered to have excellent potential for industrial and construction minerals. The main metal-mining activity has been north of this line; historically, the principal mining centers have been the Bergslagen, the Norrbotten, and the Skellefte districts.

## Minerals in the National Economy

Mining and metals production continued to be of economic importance to the country and contributed about 29% of the gross domestic product. Sweden was one of the leading ore- and metal-producing countries in the European Union (EU). The output of the mineral and manufacturing industries enabled Sweden to become a leading exporting country in the EU.

The total value of exported goods in 2006 was \$173,639 million, of which minerals contributed \$29,216 million. Significant mineral commodity exports included iron and steel (valued at \$9,875 million), petroleum products (\$9,417 million), nonferrous metals (\$3,585 million), and iron ore and concentrates (\$1,590 million). The total value of imported goods was \$149,548 million, of which minerals contributed \$14,574 million. Significant mineral commodity imports included iron and steel (valued at \$6,295 million), nonferrous metals (\$3,756 million), and metalliferous ores (\$2,321 million). Imports of mineral fuels included petroleum (\$10,452 million) and petroleum products (\$5,245 million).

## Production

Sweden has a variety of mineral resources and was a leading mineral commodity producer in the EU; the country produced and exploited base metals, gold, industrial minerals, silver, and produced metals and manufactured metal products. Sweden was a leading producer of iron ore in the EU, producing about 1% of the world's total. Owing to its lack of mineral fuels, the country depended on imports of crude oil to produce petroleum products for its domestic needs. In addition, the country has abundant hydropower and timber.

Sweden is a major trading country and the amount of mineral commodities produced depends mainly on demand for these commodities. Grade of the material, ongoing renovation, and sublevel stop development also can affect the amount of material produced.

## Structure of the Mineral Industry

The Swedish mineral industry was composed mostly of privately owned companies and operated on a free market basis. The Government was the major owner of the iron ore

operations and held equity in the steel operations. The structure of the mineral industry is described in table 2, including the major facilities, their production capacities, and the mineral commodities produced.

## Commodity Review

### Metals

**Copper.**—Boliden AB announced that it would invest about \$720 million to expand operations at the Aitik Mine at Gällivare. The investment would involve building a new concentrator that would double ore production to 36 million metric tons per year (Mt/yr) by 2010 from 18 Mt/yr in 2006. The new investment would make it possible for Boliden to mine about 60% of Aitik's total mineral reserves and extend the mine life by 10 years (InfoMine, 2006).

**Gold.**—Beowulf Mining plc's Grundtrask project is located near the town of Mala in the Skelleftea mining district and comprises three licenses that cover an area of 43 square kilometers (km<sup>2</sup>). A gold-bearing structure that runs for a strike length of 750 meters (m) and is up to 27-m wide has been associated through diamond drilling and is open at both ends and at depth. The gold is associated with arsenopyrite and chalcopyrite in quartz veins and stock works in altered pre-Cambrian basic volcanic rocks. The structure at the focus of the drilling in 2006 was one of five structures planned for exploration (Beowulf Mining plc, 2006a).

**Iron and Steel.**—Luossavaara-Kiirunavaara AB (LKAB) announced that work was continuing on the concentrating and pelletizing plant at Kiruna. The main part of the ground work and the laying of cable was completed for the concentrator. For the pelletizing plant, the main part of the ground construction was finished but some work on the connecting roads remained to be done. The new plants were scheduled to be operational by mid-2008 (Luossavaara-Kiirunavaara AB, 2006a).

LKAB announced that construction of the new pelletizing plant at Malmberget was ahead of schedule. The three parts of the project—expansion of the concentrating plant, construction of a new pelletizing plant, and construction of a new installation for loading and unloading at the switchyard—were being completed. The plant was expected to be fully operational by yearend 2007 (Luossavaara-Kiirunavaara AB, 2006b).

**Nickel.**—Mawson Resources Ltd. announced that it had signed a letter of agreement to a joint-venture agreement with Independence Group NL of Australia for the Storbodsund nickel sulfide project, which is located in the Arvidsjar district of northern Sweden. Historical drilling at Storbodsund intersected high-grade nickel sulfide mineralization. The mineralization consists of a flat sheet of semimassive sulfide lying 10 to 15 m below the surface and is composed of pentlandite and pyrrhotite and lesser amounts of chalcopyrite. Disseminated nickel

mineralization has also been mapped in an outcrop north of the Storbodasund project (CNX Marketlink, 2006).

**Titanium.**—Beowulf Mining announced that it had been granted an exploration permit for the Ruoutevare area, which covers a large ore deposit of iron and titanium. The mineralization consists of ilmenite, magnetite, spinel, and smaller amounts of chalcopyrite, pentlandite and pyrrhotite. Reserves were estimated to be 116 million metric tons (Mt) at an average grade of 38.2% iron, 5.6% titanium, and 0.17% vanadium. An additional section of 20 Mt was registered with a grade of 47% iron, 11% titanium oxide, and 0.15% vanadium pentoxide. Beowulf was obtaining bulk samples to work with LKAB to see if iron and titanium metallurgical separation could be obtained economically (Beowulf Mining Ltd., 2006b).

### *Mineral Fuels and Related Materials*

**Uranium.**—The Nordic Council of Ministers announced that although permission had been granted for surveys in the Swedish mountains, it did not mean that uranium mining would be allowed. The Government's decision to close down its nuclear powerplants would be incompatible with a policy that allowed uranium mining (Nordic Council of Ministers, 2006).

### **Outlook**

Mining has been very significant to Sweden's economy in the past and this situation is expected to continue. The global role of Sweden as an iron ore producer may increase dramatically. Within 5 to 10 years, iron ore production could reach 50 Mt/yr,

which is about double that of today. Sweden has substantial base metals, gold, and iron ore deposits, which will continue to be actively exploited and developed. Foreign companies are likely to continue to explore actively in Sweden for base metals, diamond, and gold. The quantity of profitable ores in existing mines will likely be increased by effective and successful exploration in the vicinity of the mines.

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

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005	2006 <sup>c</sup>	
<b>METALS</b>						
<b>Aluminum, metal:</b>						
Primary	100,600	101,200	101,400	102,567 <sup>r</sup>	101,180 <sup>2</sup>	
Secondary <sup>c</sup>	28,000	30,000	29,000	30,000	32,000	
Total	128,600	131,200	130,400	132,567 <sup>r</sup>	133,180 <sup>2</sup>	
<b>Copper:</b>						
Mine output, Cu content	76,200	96,000	90,600	97,800	86,700	
<b>Metal:<sup>c</sup></b>						
<b>Smelter:</b>						
Primary	188,000	185,000	206,000	192,000	194,200 <sup>2</sup>	
Secondary	35,000	30,000	30,000	55,000 <sup>r</sup>	54,000	
Total	223,000	215,000	236,000	247,000 <sup>r</sup>	248,200 <sup>2</sup>	
<b>Refined:</b>						
Primary	199,000	189,000	235,620 <sup>r</sup>	223,482 <sup>r</sup>	229,241 <sup>2</sup>	
Secondary	25,000	25,000	25,000	22,000	25,000	
Total	224,000	214,000	260,620 <sup>r</sup>	245,482 <sup>r</sup>	254,241 <sup>2</sup>	
<b>Gold:</b>						
Mine output, Au content	kilograms	4,500	4,300	5,200	6,600 <sup>r</sup>	4,500
Metal, primary <sup>c, 3</sup>	do.	8,000	8,000	8,000	8,000	8,000
<b>Iron and steel, metal:</b>						
<b>Iron ore concentrate and pellets:<sup>c</sup></b>						
Gross weight	thousand metric tons	20,300	21,500	22,300	23,300	24,000
Fe content	do.	13,400	14,100	14,700	15,300	16,000
<b>Metal:</b>						
Pig iron and sponge iron	do.	3,703	3,710	3,871	3,500 <sup>e</sup>	3,500
<b>Ferroalloys:</b>						
Ferrochromium		118,823	110,529	128,191	127,451	136,374 <sup>2</sup>
Ferrosilicon <sup>c</sup>		21,500 <sup>r</sup>	17,100 <sup>r</sup>	18,500 <sup>r</sup>	9,800 <sup>r</sup>	4,000
Total <sup>c</sup>		140,000 <sup>r</sup>	128,000 <sup>r</sup>	147,000 <sup>r</sup>	137,000 <sup>r</sup>	140,374 <sup>2</sup>
Steel, crude	thousand metric tons	5,754	5,707	5,949	5,692	5,435 <sup>2</sup>
Semimanufactures <sup>c</sup>	do.	4,695	4,600	4,700	4,700	4,500
<b>Lead:</b>						
Mine output, Pb content		43,000	51,000	54,300	60,400 <sup>r</sup>	55,600
<b>Metal, refined:<sup>c</sup></b>						
Primary		30,000	24,200	21,500 <sup>r</sup>	32,800 <sup>r</sup>	25,400
Secondary		39,700	52,000	52,000	46,100 <sup>r, 2</sup>	39,800 <sup>2</sup>
Total		69,700	76,200	73,500 <sup>r</sup>	78,900 <sup>r, 2</sup>	65,200 <sup>2</sup>
Molybdenum, oxide, roasted, Mo content <sup>c</sup>		3,000	3,000	3,000	3,000	3,000
Nickel, metal, secondary <sup>c</sup>		50	50	50	50	50
Selenium, elemental, refined <sup>c</sup>		20	20	20	20	20
<b>Silver:</b>						
Mine output, Ag content	kilograms	293,900	319,600 <sup>r</sup>	319,600 <sup>r</sup>	309,900 <sup>r</sup>	292,000 <sup>2</sup>
Metal, primary <sup>c, 3</sup>	do.	250,000	250,000	250,000	250,000	250,000
Zinc, mine output, Zn content		148,600	185,900	197,000	215,670 <sup>r</sup>	208,551 <sup>2</sup>
<b>INDUSTRIAL MINERALS</b>						
Cement, hydraulic	thousand metric tons	2,642 <sup>r</sup>	2,476 <sup>r</sup>	2,588 <sup>r</sup>	2,600 <sup>c</sup>	2,600
Diamond, synthetic <sup>c</sup>	thousand carats	20,000	20,000	20,000	20,000	20,000
Feldspar, salable, crude and ground <sup>c</sup>		40,000	41,000	42,000	43,000	43,000
<b>Fertilizer, manufactured:<sup>c</sup></b>						
Nitrogenous	thousand metric tons	400	400	400	400	400
Phosphatic	do.	10	10	10	10	10
Mixed	do.	300	300	300	300	300
Graphite <sup>c</sup>		900	850	800	800	800
Lime <sup>c</sup>	thousand metric tons	580	590	590	600	600
Quartz and quartzite <sup>c</sup>	do.	600	600	700	700	700

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	2002	2003	2004	2005	2006 <sup>c</sup>	
<b>INDUSTRIAL MINERALS—Continued</b>						
<b>Stone:<sup>c</sup></b>						
<b>Dimension:</b>						
Mostly unfinished	thousand metric tons	160	170	160	170	170
Granite	do.	130	130	130	132	132
Limestone	do.	30	32	32	32	32
Slate	do.	15	15	15	16	16
Other	do.	6	6	6	6	6
<b>Crushed:</b>						
Dolomite	do.	450	440	430	450	450
Granite	do.	3,500	3,500	3,500	3,500	3,500
<b>Limestone:</b>						
Chalk	do.	70	80	80	80	80
For cement manufacture	do.	4,000	3,950	3,900	4,000	4,000
For lime manufacture	do.	900	950	950	950	950
For other construction and industrial uses	do.	1,700	1,700	1,700	1,800	1,800
For agricultural uses	do.	600	650	600	650	650
For other uses	do.	1,500	1,500	1,500	1,500	1,500
Total	do.	8,770	8,830	8,730	8,980	8,980
Sandstone	do.	10	15	20	20	20
Undifferentiated	do.	30,000	30,000	30,000	30,000	30,000
Other	do.	400	400	350	350	350
<b>Sulfur:</b>						
Metallurgy	do.	170 <sup>c</sup>	235	235	240	240
Petroleum	do.	60 <sup>c</sup>	57	59	60	60
Total	do.	230 <sup>c</sup>	292	294	300	300
Talc, soapstone <sup>c</sup>		15,000	15,000	14,000	14,000	14,000
<b>MINERAL FUELS AND RELATED MATERIALS</b>						
Coke, metallurgical <sup>c</sup>	thousand metric tons	1,200	1,250	1,300	1,400	1,400
<b>Gas, manufactured:<sup>c</sup></b>						
Coke oven gas	million cubic meters	500	500	500	500	500
Blast furnace gas	do.	3,500	3,500	3,500	3,500	3,500
<b>Peat:</b>						
Agricultural use <sup>c</sup>	thousand cubic meters	1,800	1,800	1,100	1,200	1,716 <sup>2</sup>
Fuel	do.	2,885	2,633	1,866	1,900	3,041 <sup>2</sup>
<b>Petroleum, refinery products:<sup>c</sup></b>						
Liquefied petroleum gas	thousand 42-gallon barrels	3,000	3,000	3,000	4,000	4,000
Naphtha	do.	500	500	500	500	500
Gasoline, motor	do.	40,000	41,000	41,000	41,000	41,000
Jet fuel	do.	1,500	1,600	1,600	1,600	1,600
Kerosene	do.	50	50	50	50	50
Distillate fuel oil	do.	58,000	58,000	59,000	60,000	60,000
Residual fuel oil	do.	40,000	40,000	41,000	41,000	41,000
Other	do.	7,800	8,000	8,000	8,000	8,000
Refinery fuel and losses	do.	5,000	5,000	5,000	5,000	5,000
Total	do.	156,000	157,000	159,000	161,000	161,000

<sup>c</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>1</sup>Revised.

<sup>1</sup>Table includes data available through September 13, 2007.

<sup>2</sup>Reported figure.

<sup>3</sup>Includes only that recovered from indigenous ores, excluding scrap.

TABLE 2  
SWEDEN: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Granges AB (Glencore International AG, 100%)	Sundsvall smelter at Kubikenborg	100
Cement		Cementa AB (Scancem, 100%)	Plants at Degerhamn, Skovde, and Slite	3,400
Copper:				
Ore, copper content		Boliden Mineral AB	Mines at Aitik, Garpenberg, Kankberg, Kristineberg, Langdal, Petiknas, and Renstrom	68
Do.		Outokumpu Oyj	Mines at Pahtohavare	22
Metal		Boliden Metals AB	Smelter and refinery at Ronnskar	240
Feldspar		Berglins Malm & Mineral AB (Omya GmbH)	Mines at Beckegruvan, Hojderna, and Limbergsbo	50
Do.		Forshammar Mineral AB (Omya GmbH)	Mines at Limberget and Riddarhyttan	30
Do.		Larsbo Kalk AB (Omya GmbH)	Mines at Glanshamar and Larsbo	20
Ferrous alloys		Vargon Alloys AB	Plant at Vargon	175
Gold:				
Ore, gold content	kilograms	International Gold Exploration AB, 50%, and Dormant Properties AB, 50%	Bjorkdal Mine at Skellefte	3,000
Do.	do.	Boliden Mineral AB	Mines at Aitik, Akerberg, Kankberg, Kristineberg, Langdal, Petiknas, and Renstrom	2,000
Metal	do.	do.	Smelter and refinery at Ronnskar	17,000
Graphite		Woxna Graphite AB (Tricorona Mineral AB, 100%)	Mine and plant at Kringeltjärn, Woxna	20
Iron and steel		Svenskt Stal AB (Government, 48%)	Steelworks at Borlange, Lulea, and Oxelosund	3,900
Iron ore		Luossavaara-Kiirunavaara AB (Government, 98%)	Mines at Kiruna and Malmberget	32,500
Kyanite		Svenska Kyanite AB (Svenska Mineral AB, 100%)	Quarry at Halskoberg	10
Lead:				
Ore, lead content		Boliden Mineral AB	Mines at Garpenberg, Laisvall, Langdal, Petiknas, and Renstrom	110
Do.		North Mining Svenska AB	Zinkgruvan Mine at Ammeberg	20
Metal		Boliden Metals AB	Smelter and refinery at Ronnskar	115
Lime		Euroc Mineral AB	Plants at Limham, Koping, and Storugns	250
Do.		Svenska Mineral AB	Plants at Rattvik and Boda	250
Limestone		Kalproduction Storugns AB (Nordkalk AB, 100%)	Mines at Gotland Island	3,000
Marble	cubic meters	Borghamnsten AB	Quarry at Askersund	15,000
Petroleum, refined	42-gallon barrels per day	Skandinaviska Raffinaderi AB	Refinery at Lysekil	210,000
Do.		BP Raffinaderi AB	Refinery at Gothenburg	100,000
Do.		Shell Raffinaderi AB	do.	82,000
Do.		AB Nynas Petroleum	Refineries at Gothenburg, Malmo, and Nynashamn	54,000
Silver, metal	kilograms	Boliden Metals AB	Smelter and refinery at Ronnskar	408,000
Do.	do.	North Mining Svenska AB	Zinkgruvan Mine at Ammeberg	25,000
Zinc, ore, zinc content		Boliden Mineral AB	Mines at Garpenberg, Laisvall, Langdal, and Renstrom	112
Do.		Zinkgruvan Mining AB (North Ltd., 100%)	Zinkgruvan Mine at Ammeberg	60