



2012 Minerals Yearbook

SWEDEN

THE MINERAL INDUSTRY OF SWEDEN

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Sweden is located on part of the Fennoscandian Shield, an area of Precambrian crystalline and metamorphic rocks. Common rocks of the shield and surrounding platform are gneiss, granite, granodiorite, sandstone, and marble. Glacial till covers about 75% of the landscape (Geological Survey of Sweden, 2014a).

In 2012, Sweden was among the most active mining countries in Europe. Sweden was the leading producer of iron ore in the European Union (EU), and it was one of the EU's leading producers of copper, gold, lead, silver, and zinc. Most notably, Sweden has alum shale-hosted uranium-molybdenum-vanadium deposits and Kiruna-type iron deposits in the north (Eilu, 2011, p. 14; Geological Survey of Sweden, 2014b).

Although the country has abundant hydroelectric power, it also relied on nuclear power produced by 10 active reactors for 42.7% of its electricity. The real gross domestic product (GDP) based on purchasing power parity was \$399.4 billion, which was 1.2% more than in 2011. Sweden had reached an advanced state of industrialization; as such, the largest portion of its GDP was from its services sector. Industry accounted for 27.4% of the country's GDP (U.S. Central Intelligence Agency, 2012; International Atomic Energy Agency, 2014).

Minerals in the National Economy

According to the Mining Inspectorate of Sweden [a part of the Geological Survey of Sweden (SGU)], growth in the Swedish mineral sector is crucial for creating employment in Sweden, particularly in those regions of Sweden where mines are located. The Inspectorate has also said that mining is vital to the development of the mining equipment industry, which is an important part of the Swedish industrial sector, regardless of where in the country it is situated. In 2010 (the latest year for which data were available), Sweden was the 17th-ranked country in the world in terms of the value of production of its mineral industry, which totaled \$3.96 billion, or 0.9% of the total value of world mineral production. Mineral production accounted for about 0.9% of Sweden's GDP, and the value of exports generated by the mineral industry was about 5.3% (International Council on Mining and Metals, 2012; Geological Survey of Sweden, 2014c).

Government Policies and Programs

The Mining Inspectorate is the Government office responsible for issuing permits for exploration and mining. It also arbitrates on matters relating to the Minerals Act of 1991, which is the law that governs the mineral industry in Sweden. The SGU is the Swedish Government's authority on matters relating to geology and minerals management, both nationally and at the EU level. The SGU monitors the developments in the minerals markets at the Swedish level and internationally, and also publishes

statistics on the production of mineral commodities (including aggregates and peat) and other commodities in Sweden and in the global market (Geological Survey of Sweden, 2014a).

Production

Sweden was the leading producer of iron ore in the EU and the 13th-ranked producer of iron ore in the world (Tuck, 2013). The country also produced copper, gold, lead, silver, and zinc, and extracted industrial minerals, including feldspar and limestone. In 2012, production of primary aluminum, iron ore, mined lead, and silver metal all increased whereas production of mined copper and crude steel decreased (table 1).

Structure of the Mineral Industry

The Swedish mineral industry was composed mostly of privately owned companies, and it operated on a free-market basis. The Government was the major equity owner of Luossavaara-Kiirunavaara AB's (LKAB's) iron ore operation, and had significant ownership in the Svenskt Stal AB steel operation.

Boliden AB was a leading Swedish mining and mineral processing company; it had operations in Sweden and abroad. The company principally produced copper, gold, lead, and silver. Boliden's main mines were the Aitik Mine and the Kankberg Mine.

Nordkalk AB was a leading international producer of limestone, crushed and ground limestone, concentrated calcite, quicklime, and slaked lime as well as dolomite and wollastonite, which Nordkalk extracted as a byproduct of mining for limestone. Nordkalk had operations in 30 locations in nine countries as well as mines in five countries. In Sweden, Nordkalk's limestone operations were located in Storugns. Table 2 is a list of Sweden's major mineral industry facilities in 2012.

The Canadian company Lundin Mining Corp. had significant operations in Sweden. The company produced lead, silver, and zinc from its Ammeberg Mine.

HeidelbergCement AG of Germany owned Cementa AB, which had three cement plants in Sweden. The plants were located at Degerhamn, Skivode, and Slite and had a combined production capacity of about 3.4 million metric tons per year (Mt/yr) (table 2).

Mineral Trade

In 2012, significant mineral commodity exports to Sweden from the United States included, in order of value, nuclear fuel material (\$116.03 million), metallurgical-grade coal (\$87.12 million), and coal and other mineral fuels (\$45.26 million). Significant mineral commodity imports from Sweden to the United States included semifinished iron

and steel products (\$575.77 million); petroleum products (\$341.20 million); fuel oil (\$262.59 million); iron and steel products, except those of advanced manufacture (\$99.45 million); and unmanufactured steelmaking and ferroalloying materials (\$80.13 million) (U.S. Census Bureau, 2013a, b).

The principal products that the Swedish industry produced in 2012 were iron and steel, motor vehicles, precision instruments, processed food, wood pulp, and paper products. Sweden's main export partners were Norway (which received 10.4% of Sweden's exports, in terms of value), Germany (10.3%), the United Kingdom (8.1%), Denmark and Finland (6.7% each), the United States (5.5%), the Netherlands (5.2%), Belgium (5%), and France (4.8%). Its main import partners were Germany (which supplied 17.4% of Sweden's imports, in terms of value), Denmark (8.5%), Norway (8.4%), the United Kingdom (6.5%), the Netherlands (6.4%), Russia (5.6%), Finland (5.1%), China (4.9%), and France (4.2%) (U.S. Central Intelligence Agency, 2012).

Commodity Review

Metals

Aluminum.—Kubikenborg Aluminium AB (KUBAL), which was a wholly owned subsidiary of United Company RUSAL of Russia, was the only major aluminum producer in the country. KUBAL increased its output in 2012 by 16% compared with that of the previous year. As was the case in 2011, increased output was in response to an increase in demand for its products and the ability of KUBAL to produce them at a relatively low cost (United Company RUSAL, 2013, p. 29).

Copper.—Boliden's Aitik Mine, which is located in northern Sweden, was Boliden's and Sweden's largest copper mine in terms of production quantity. According to Boliden, Aitik's copper grade is low (about 0.22%), but the open pit mine uses a combination of large-scale extraction and high levels of automation to ensure high levels of productivity, which compensates for the low grades yielded by the mine. The Aitik Mine had been under expansion for the past several years, and the expansion was scheduled to be completed by 2014. Once completed, the mine would have an ore production capacity of 36 Mt/yr. In 2012, the mine produced 34.3 million metric tons (Mt) of milled ore (an increase of about 8.7% compared with that of 2011) at grades of about 0.22% copper, 2.50 grams per metric ton (g/t) silver, and 0.11 g/t gold (Boliden AB, 2013a, p. 17, 19, 97).

Boliden's Rönnskär smelter was a leading facility (in terms of tonnage produced) for the recycling of copper and precious metals in Sweden. The main products were copper, gold, lead, and zinc clinker. The smelter produced 844,000 metric tons (t) of concentrates and secondary materials and 214,000 t of copper cathodes in 2012 (Boliden AB, 2013b).

Gold.—Dragon Mining Ltd. of Australia and Elgin Mining Inc. of Canada owned gold mines in the Skelleftea mining district. Dragon Mining's Svartliden Mine is located 700 kilometers (km) north of Stockholm, and Elgin's Bjorkdal Mine is located 750 km north of Stockholm. In 2012, the Svartliden production center produced 382,104 t of mined ore

at a grade of 3.33 g/t gold and a gold recovery rate of 90.9%, which resulted in output of more than 1,000 kilograms (kg) of gold. In February, Gold-Ore Resources Ltd. announced an updated measured and indicated mineral resource estimate for the Bjorkdal Mine's open pit and underground mine of 30,295 kg of gold. The Skelleftea mining district where the Bjorkdal and the Svartliden Mines are located had been the focus of exploration for gold-rich polymetallic deposits since the mid-1920s (Gold-Ore Resources Ltd., 2012; Dragon Mining Ltd., 2013).

Boliden was the other main producer of gold in Sweden. Its polymetallic mines had an estimated production capacity of about 2,000 kilograms per year of gold. Its major gold mining operations were the Aitik Mine, which was principally a copper-producing mine, and the operations at the Boliden and the Garpenberg sites (table 2; Boliden AB, 2013a, p. 19).

Iron and Steel.—LKAB's Kiruna Mine was one of the world's largest underground iron ore mine in terms of volume; it has an ore body that is 4 km long and 80 meters wide and reaches to a depth of about 2 km. LKAB announced that it had been granted an environmental permit for a new open pit mine located at Gruvberget. This would be LKAB's first new iron ore mine in 50 years. Production at the new Gruvberget Mine was expected to be 2 Mt/yr. The ore body contains both hematite and magnetite (Luossavaara-Kiirunavaara AB, 2012a, b).

Industrial Minerals

Limestone.—SMA Mineral AB produced principally limestone and lime; however, the company also produced dolomite, magnesium hydroxide, and magnesium oxide. The company had operations in Boda and Rattvik. Svenska Kyanite AB, which was a fully owned subsidiary of SMA Mineral, produced kyanite in Halskoberg (SMA Mineral AB, 2014).

Rare Earths.—LKAB was investigating the tailings ponds at the Kiruna and the Malmberget operations; these ponds were thought to contain large quantities of rare-earth elements (REEs) bound in the phosphate mineral apatite, which is considered an impurity in iron ore. LKAB planned to conduct a study to determine the conditions for the recovery of apatite and REEs from the tailings in the ponds. Test drilling results indicated the occurrence of different REEs in the apatite. Estimates showed that there was enough apatite in the tailings ponds for the production of 400,000 metric tons per year of apatite concentrates for a period of 14 years. Startup of production was not expected before 2015 (Steel Orbis, 2011).

Mineral Fuels and Other Sources of Energy

Renewable Energy.—In 2011 (the latest year for which data were available), Sweden had the largest share of renewable energy in the EU. About 40% of Swedish energy consumption was covered by renewable energy sources. The Government had set its target at 49% use of renewable energy by 2020. In comparison, renewable energy was projected to cover only about 20% of the whole EU's energy consumption by 2020 (Nordic Energy Solutions, 2012).

Outlook

Mining, although a small part of the country's GDP, is expected to remain important to Sweden's economy. Iron ore production is expected to increase and reach 50 Mt/yr within 10 years. Sweden has substantial base-metal, gold, and iron ore deposits that are expected to continue to attract investors in the near future. Foreign companies are likely to continue to explore actively in Sweden for base metals, diamond, and, particularly, gold. The Government is expected to continue to support the production and use of renewable energy in electricity, heating, cooling, and transport.

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TABLE 1
SWEDEN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2008	2009	2010	2011	2012 ^e
METALS					
Aluminum, metal: ^e					
Primary	81,546 ³	69,708 ³	93,000	111,000	129,000
Secondary	32,000	30,000	30,000	30,000	30,000
Total	113,546 ³	99,708 ³	123,000	141,000	159,000
Copper:					
Mine output, Cu content	57,688 ³	55,400 ³	76,500	83,000	82,422 ³
Metal:					
Smelter: ^e					
Primary	204,204 ³	125,398 ³	137,000	155,000	214,000
Secondary	67,795 ³	65,000	42,000	44,000	46,000
Total	271,999 ³	190,000 ³	179,000	199,000	260,000
Refined:					
Primary	227,774	205,759	150,497	179,316	179,000
Secondary ^c	25,000	25,000	40,000	40,000	40,000
Total ^e	253,000	231,000	190,000	219,000	219,000
Gold:					
Mine output, Au content	4,900	5,461	6,242	5,935	6,015 ³
Metal, primary and secondary ⁴	13,425 ^r	13,282	12,450	10,600	12,532 ³
Iron and steel:					
Iron ore concentrate and pellets:					
Gross weight	27,713	20,389	27,917	22,968	26,039 ³
Fe content (60%)	16,628	12,233	16,750	15,159 ⁵	17,186 ^{3,5}
Metal:					
Pig iron and sponge iron	3,583	1,966	3,447	3,240	5,253 ³
Ferroalloys, ferrochromium ^e	117,053 ³	31,345 ³	32,000	32,000	32,000
Steel, crude	5,196	2,805	4,844	4,866	4,326 ³
Lead:					
Mine output, Pb content	65,100 ^e	69,300	67,700	61,999	63,551 ³
Metal, refined: ^e					
Primary	56,800	55,000	56,000	52,400	62,000
Secondary	42,600	42,000	40,000	41,000	44,000
Total	99,400	97,000	96,000	93,400	106,000
Nickel, metal, secondary ^e	50	50	50	--	--
Silver:					
Mine output, Ag content	293,100	288,600	302,100	238,030	309,337 ³
Metal, primary	429,637	481,223	385,684	415,066	447,759 ³
Zinc, mine output, Zn content	188,048	192,538	198,687	190,251	188,300 ³
INDUSTRIAL MINERALS					
Cement, hydraulic ^e	2,900	2,950	2,900	2,900	3,000
Feldspar, salable, crude and ground ^e	42,000	44,000	44,000	30,000 ^{r,3}	27,000
Lime ^e	600	600	700	960 ⁶	960 ⁶
Quartz and quartzite	151 ^r	56 ^r	85 ^r	163 ^r	101 ³

See footnotes at end of table.

TABLE 1—Continued
 SWEDEN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2008	2009	2010	2011	2012 ^e	
INDUSTRIAL MINERALS—Continued						
Stone:						
Dimension:						
Mostly unfinished	thousand metric tons	170	170	180	NA	NA
Granite	do.	132	132	124	92 ^r	79 ³
Limestone	do.	32	32	43	23 ^r	21 ³
Other	do.	6	6	6	67 ^r	82 ³
Crushed: ^e						
Dolomite	do.	450	450	450	483 ^{r,3}	429
Limestone	do.	8,980	8,980	8,980	7,317 ^{r,3}	7,385
Sandstone	do.	20	20	20	NA	629
Undifferentiated	do.	30,000	30,000	30,000	NA	101
Talc, soapstone ^e		4,000 ^r	4,000 ^r	4,000 ^{r,3}	3,000 ^r	--
MINERAL FUELS AND RELATED MATERIALS						
Coke, metallurgical	thousand metric tons	1,177	987	1,197	1,190 ^e	1,200
Peat:						
Agricultural use	thousand cubic meters	1,434	1,198	1,250	1,611	1,000
Fuel	do.	2,135	2,143	2,213	2,139	1,800
Petroleum, refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	3,886	3,248	3,978 ^r	3,900 ^{r,e}	3,900
Gasoline, motor	do.	38,444	38,070	32,740 ^r	33,000 ^{r,e}	33,000
Jet fuel	do.	1,933	1,679	1,424 ^r	1,400 ^{r,e}	1,400
Distillate fuel oil	do.	59,450	57,232	56,393 ^r	56,400 ^{r,e}	56,400
Residual fuel oil	do.	29,826	28,543	33,252 ^r	33,200 ^{r,e}	33,200
Other	do.	--	22,119	25,331 ^r	25,300 ^{r,e}	25,300
Total	do.	133,539	150,891	153,118 ^r	153,000 ^{r,e}	153,000

^eEstimated; 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 November 18, 2013.

²In addition to the commodities listed, Sweden produced synthetic diamond, manufactured fertilizer, manufactured gas, granite, limestone, molybdenum, selenium, slate, steel semimanufactures, and sulfur, but available information was inadequate to make reliable estimates of output.

³Reported figure.

⁴Series was updated to include metal production from ores and electronics scrap recycling.

⁵Iron content reported to be 66%.

⁶Quicklime; estimate based on volume sold.

TABLE 2
SWEDEN: STRUCTURE OF THE MINERAL INDUSTRY IN 2012

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Kubikensborg Aluminium AB (KUBAL) (United Company RUSAL, 100%)	Smelter at Sundsvall	125
Cement		Cementa AB (HeidelbergCement AG, 100%)	Plants at Degerhamn, Skivode, and Slite	3,400
Copper:				
Ore, copper content		Boliden AB	Mines at Aitik, Garpenberg, Kankberg, Kristineberg, Maurilinden, Maurilinden Ostra, and Renstrom	NA
Metal		do.	Smelter and refinery at Ronnskar	240
Feldspar		Berglins Malm & Mineral AB (Omya GmbH)	Mines at Beckegravan, Hojderna, and Limbergsbo	50
Do.		Silbelco Nordic AS	Mines at Forshammar	30
Ferroalloys		Vargon Alloys AB (Yildrim Group, 100%)	Plant at Vargon	255
Gold:				
Ore, gold content	kilograms	Dragon Mining Ltd.	Svartliden Mine, Skelleftea District	300
Do.	do.	Elgin Mining Inc.	Bjorkdal Mine, Skelleftea District	1,200
Do.	do.	Boliden AB	Mines at Aitik, Akerberg, Kankberg, Kristineberg, and Renstrom	2,000
Metal	do.	do.	Smelter and refinery at Ronnskar	15,000
Iron and steel		Svenskt Stal AB (Government, 48%)	Steelworks at Lulea and Oxelosund	3,900
Iron ore		Luossavaara-Kiirunavaara AB (LKAB) (Government, 98%)	Mines at Kiruna and Malmberget	32,500
Do.		Northland Resources S.A.	Mine at Kauniavaara	15,000
Kyanite		Svenska Kyanite AB (Svenska Mineral AB, 100%)	Quarry at Halskoberg	10
Lead:				
Ore, lead content		Boliden AB	Mines at Garpenberg and Renstrom	100
Do.		Lovisagravan AB	Lovisa Mine	3
Do.		Lundin Mining Corp.	Zinkgruvan Mine at Ammeberg	20
Metal		Boliden AB	Smelter and refinery at Ronnskar	30
Do.		do.	Smelter at Bergsoe	50
Lime		Svenska Minerals AB	Plants at Rattvik and Boda	250
Limestone		Kalproduktion Storugns AB (Rettig Group, 100%)	Mines at Gotland Island	3,000
Do.		NordKalk AB	Storugns	3,200
Marble	cubic meters	Borghamnsten AB	Quarry at Askersund	15,000
Petroleum, refined	42-gallon barrels per day	Preem AB (Corral Petroleum Holdings AB, 100%)	Refinery at Lysekil and Goteborg	210,000
Do.	do.	St1 Group Oy	do.	82,000
Do.	do.	AB Nynas Petroleum	Refineries at Gothenburg and Nynashamn	50,000
Silver, metal	kilograms	Boliden AB	Smelter and refinery at Ronnskar	408,000
Do.	do.	Lundin Mining Corp.	Zinkgruvan Mine at Ammeberg	25,000
Zinc, ore, zinc content		Boliden AB	Mines at Garpenberg, Laisvall, Langdal, and Renstrom	112
Do.		Lovisagravan AB	Lovisa Mine	3
Do.		Lundin Mining Corp.	Zinkgruvan Mine at Ammeberg	78

Do., do. Ditto. NA not available.