



2014 Minerals Yearbook

SWEDEN

THE MINERAL INDUSTRY OF SWEDEN

By Alberto Alexander Perez

Sweden's geology forms part of the Fennoscandian Shield, an area of old crystalline and metamorphic rocks. The Fennoscandian Shield stretches across Sweden, Finland, and northwestern Russia. The most common soil type is till, which covers about 75% of the landscape, with common rocks being gneiss, granite, granodiorite, marble, and sandstone. Historically, the mining of ore and minerals has been an important part of the Swedish economy, and records indicate that metal mining has taken place in the area for at least the past 4,000 years. Sweden is one of the European Union's (EU's) leading producers of ores and metals (Geological Survey of Sweden, 2014a; Ministry of Enterprise, Energy and Communications Sweden, 2015, p. 9).

In 2014, Sweden produced 92% of the EU's iron ore, 19% of its base metals (of which 53.2% was zinc, 20.1% was lead, and the remainder was copper), and 18% of its precious metals (of which 98% was silver and 2% was gold). Sweden was the 10th-ranked iron ore producer in the world (Ministry of Enterprise, Energy and Communications Sweden, 2015, p. 51; Tuck, 2016).

The country also produced industrial minerals, including feldspar and limestone. Most notably, Sweden has alum shale-hosted uranium-molybdenum-vanadium deposits and Kiruna-type iron deposits in the north (Geological Survey of Sweden, 2014b). The country also has abundant hydroelectric power, although it also relies on nuclear power produced by 10 active reactors that produce 41.47% of its electricity (International Atomic Energy Agency, 2014; U.S. Central Intelligence Agency, 2015).

Minerals in the National Economy

In 2014, Sweden had a gross domestic product (GDP) of \$472.4 billion, which was an increase of 1.2% compared with that of 2013. Sweden has reached an advanced state of industrialization; as such, the largest portion of its GDP was from the services sector. Production of mineral commodities accounted for 8% of Sweden's total commodity production and included mine-related production (accounted for 45% of the mineral commodity production), aggregates-related production (17%), and steel and metalwork production (38%). Total mineral commodities, including fuel-related minerals, contributed 14% of Sweden's total exports, of which 68.3% were steel and metalworks and 31.7% was mineral extraction. Of the total industrial workforce of Sweden, 6% was employed in the production of minerals and mineral products; of this subset, 71% was involved in steel production and metalworks; 15.8%, in mining; and 13.2%, in industrial mineral, ballast, and dimension stone production. In 2012 (the latest year for which data were available), Sweden's mineral industry production was valued at \$5.24 billion. The mineral industry generated about 1% of the country's GDP (International Council on Mining

and Metals, 2014, p. 31; Ministry of Enterprise, Energy and Communications Sweden, 2015, p. 51).

In 2014, significant mineral commodity exports to Sweden from the United States included, in order of value, metallurgical-grade coal (valued at \$77 million), nuclear fuel material (\$19 million), and coal and other mineral fuels (\$1.7 million). Significant mineral commodity imports from Sweden to the United States included iron and steel mill products (valued at \$541 million), petroleum products (\$441 million), fuel oil (\$297 million), and iron and steel products of advanced manufacture (\$100 million) (U.S. Census Bureau, 2015a, b).

Government Policies and Programs

According to the regulatory guidelines issued by the Government, Sweden has two types of minerals: concession minerals and landowner minerals. The Mining Inspectorate of Sweden grants permits for the exploitation of concession mineral resources and sets the terms under which such a license will be issued. These terms are specified in the Minerals Act (1991:45), which dates from 1991. The minerals that are considered landowner minerals are extracted according to agreements between the landowner, who provides access to the land, and the enterprise or party that will extract the minerals. Both types of minerals have to meet the same specified requirements laid out in the Swedish Environmental Code and the Swedish Planning and Building Act (2010:900). Prior to extraction, the planned activities have to be tested against the provisions in these codes.

The Mining Inspectorate of Sweden, which is a part of the Geological Survey of Sweden (SGU), is the official institution responsible for issuing permits for exploration and mining. It also decides matters related to the Minerals Act (1991:45). 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 mineral markets nationally and internationally, and it also produces and publishes statistics on mineral production in Sweden, including aggregates, peat, and other mineral commodities. The Mining Inspectorate of Sweden takes the following positions regarding Sweden's mineral sector: (1) it is crucial for employment in Sweden, particularly in those regions where the mines are located; (2) it is vital to the development of the mining equipment industry, which is an important sector of the Swedish industry, regardless of where in the country it is situated; (3) it is an important source of exports; and (4) it reduces the country's vulnerability in the event of international trade crises (Geological Survey of Sweden, 2014c; Ministry of Enterprise, Energy and Communications Sweden, 2015, p. 17).

Production

In 2014, the most significant changes (defined as greater than 10%) were in the production of mined zinc, which increased by 25.6%; mined lead, by 19%; mined silver, by 12%; and primary smelter copper, by an estimated 7.1%. The production of quartz and quartzite decreased by 28%; dolomite, by 14.8%; primary aluminum, by 13.7%; lime, by 13.2%; and feldspar, by 10% (table 1).

Structure of the Mineral Industry

The Kiruna Mine is thought to be the largest underground iron mine in the world in terms of the value of production. The Aitik copper-gold mine is the leading gold producer in Europe. According to the Ministry of Enterprise, Energy and Communications of Sweden and the SGU, there could be as many as 30 operational metal mines in Sweden by 2020 and about 50 by 2030 based on assessments of projects that have been given or have applied for permits and those that are being developed (Ministry of Enterprise, Energy and Communications Sweden, 2015, p. 11).

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

The leading privately owned mineral company operating in Sweden, in terms of value, was Boliden AB (Boliden), which produced principally copper, gold, lead, and silver. Boliden's major mines were the Aitik and the Kankberg Mines; Boliden also had a smelter and a refinery at Ronnskar.

The Canadian company Lundin Mining Corp. had significant operations in Sweden. The company produced lead, silver, and zinc from its Zinkgruven Mine at Ammeberg. HeidelbergCement AG of Germany owned Cementa AB, which had three cement plants in Sweden. The plants were located at Degerhamn, Skovde, and Slite, and they had a combined production capacity of about 3.4 million metric tons per year (Mt/yr). Table 2 is a list of the major mineral industry facilities in 2014.

Nordkalk AB, which was part of the Rettig Group of Germany, 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 at 30 locations in 9 countries as well as mines in 5 countries. In Sweden, Nordkalk's limestone operations were located in Storugns (Nordkalk AB, 2014).

Commodity Review

Metals

Aluminum.—United Company RUSAL (RUSAL) of Russia stated that its wholly owned subsidiary in Sweden, Kubikenborg Aluminium AB (KUBAL), had decreased production in 2014 by 13.71% to 113,000 metric tons (t) from 131,000 t. RUSAL

indicated that the reduction in output was owing to the failure of a T32 transformer in February 2014, and the subsequent functioning of the operation with low amperage and repeated emergency de-energizing of potline A. Throughout 2014, the affected area was stabilized and the potline was not shut down. A program for retrofitting the smelter's power supply system was implemented, which required potlines A and B to be combined. The retirement of all units began at the end of 2014 (United Company RUSAL, 2015, p. 14, 32).

Iron Ore.—Northland Resources S.A. (Northland) announced in December 2014 that it had failed to refinance its mining business and was filing for bankruptcy. Northland had been in financial difficulty since digging began in 2010, and in October 2014, the company stopped all operations and issued notices of termination to all employees. Northland laid off 240 mine workers and 191 ore truck drivers when the Kaunisvaara Mine closed (Barents Observer, 2014).

Luossavaara-Kiirunavaara AB (LKAB) decided to build and operate two new iron mines (the Mertainen and Leveaniemi Mines) in the Svappavaara field south of Kiruna. After several years of litigation, the Mertainen Mine, was granted permission to operate and start production in 2016, and the Leveaniemi Mine was in the permitting process. The company's total investment, including investment in the existing Gruvberget Mine, was \$1.33 billion, which was expected to result in the addition of 1,500 new jobs in Sweden (Euromines, 2014).

Silver.—Boliden announced that the expansion of the zinc-silver mine at Garpenberg had begun in March 2014, and production commenced. Boliden estimated that the full capacity of 2.5 Mt/yr of ore would be achieved by the end of 2015. Boliden reported that the mine's silver production increased to 218,000 kilograms (kg) in 2014 and that the mine employed 404 people (Boliden AB, 2015a, p. 36, 39; 2015b).

Industrial Minerals

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

Mineral Fuels and Other Sources of Energy

Peat.—Statistics Sweden and the Swedish Energy Agency announced that peat fuel production in Sweden decreased by 7% in 2014 and that horticultural peat production decreased by 17%. The agencies reported a 24% decrease in peat imports in 2014 compared with that of the previous year and a 10% decrease in exports of peat for the same period (Statistics Sweden, 2015, p. 4, 6, 9).

Outlook

The Government's mining strategy that was first drafted in 2013 was scheduled to be updated in 2015. The update would have the Government more actively involved in promoting the

mineral resources of Sweden. The resources of Sweden are significant, and the Government has indicated that it considers mining to be an important part of the country's economy (Ministry of Enterprise, Energy and Communications Sweden, 2015). Although a small part of the country's GDP, mining is expected to remain an important component of Sweden's economy strategy.

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TABLE 1
SWEDEN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2010	2011	2012	2013	2014	
METALS						
Aluminum, metal:						
Primary	93,000	111,000	129,000	131,000	113,000	
Secondary ^c	30,000	30,000	30,000	30,000	30,000	
Total	123,000	141,000	159,000	161,000	143,000	
Copper:						
Mine output, Cu content	76,500	83,000	82,422	82,904	79,681 ³	
Metal:						
Smelter:						
Primary	142,000 ^r	162,000 ^r	151,000 ^r	140,000 ^r	150,000	
Secondary	40,000 ^r	45,000 ^r	56,000 ^r	59,000 ^r	60,000	
Total	182,000 ^r	207,000 ^r	207,000 ^r	199,000 ^r	210,000	
Refined:						
Primary	150,497	179,316	174,000 ^r	166,000	177,000	
Secondary ^c	40,000	40,000	40,000	40,000	40,000	
Total	190,497	219,316	214,000 ^r	206,000	217,000	
Gold:						
Mine output, Au content	kilograms	6,242	5,935	6,015	6,530	6,849
Metal, primary and secondary ⁴	do.	12,450	10,600	12,532	12,000 ^c	12,000 ^c
Iron and steel, metal:						
Iron ore concentrate and pellets:						
Gross weight	thousand metric tons	27,917	22,968	26,039	27,300	28,000 ^c
Fe content (60%)	do.	16,750	15,159 ⁵	17,186	16,162	16,000 ^c
Metal:						
Pig iron	do.	3,447	3,240	2,805 ^r	2,896 ^r	3,078
Ferroalloys, ferrochromium ^c		32,000	32,000	32,000	32,000	32,000
Steel, crude	thousand metric tons	4,844	4,866	4,326	4,404	4,539
Lead:						
Mine output, Pb content		67,700	61,999	63,551	59,556	70,848
Metal, refined:^c						
Primary		56,000	52,400	62,000	69,000	69,000
Secondary		40,000	41,000	44,000	45,000	45,000
Total		96,000	93,400	106,000	114,000	114,000
Nickel, metal, secondary ^c		50	--	--	--	--
Silver:						
Mine output, Ag content	kilograms	302,100	238,030	309,337	341,346	382,611
Metal, primary	do.	385,684	415,066	447,759	437,000	440,000 ^c
Zinc, mine output, Zn content		198,687	190,251	188,300	176,582	221,841
INDUSTRIAL MINERALS						
Cement, hydraulic ^c	thousand metric tons	1,796 ³	2,064	2,500 ^r	3,000	3,000
Feldspar, salable, crude and ground ^c		44,000	30,000	27,000	30,000	27,000
Lime ^c	thousand metric tons	700	960 ⁶	960	806	700
Quartz and quartzite	do.	85	163	101	102	73
Stone:						
Dimension:						
Mostly unfinished	thousand metric tons	180	NA	NA	NA	NA
Granite	do.	124	92	79	90	88
Limestone	do.	43	23	21	21	22
Other	do.	6	67	82	82	82
Crushed:						
Dolomite	do.	450	483	429	445	379
Limestone		8,980	7,317	7,385	7,448	6,791
Sandstone	do.	20	NA	629	630 ^c	630
Undifferentiated	do.	30,000	NA	101	101 ^c	100
Talc, soapstone		4,000	3,000	--	--	--

See footnotes at end of table.

TABLE 1—Continued
 SWEDEN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2010	2011	2012	2013	2014
MINERAL FUELS AND RELATED MATERIALS					
Coke, metallurgical thousand metric tons	1,197	1,190	1,200	1,200	1,200
Peat:					
Agricultural use thousand cubic meters	1,250	1,611	1,000	1,800	1,800
Fuel do.	2,213	2,139	1,847	2,369	2,300
Petroleum, refinery products:					
Liquefied petroleum gas thousand 42-gallon barrels	3,978	3,139	4,490	3,577 ^r	3,600 ^e
Gasoline, motor do.	32,740	33,799	37,048	28,945 ^r	29,000 ^e
Jet fuel do.	1,424	1,496	1,898	1,314 ^r	1,400 ^e
Distillate fuel oil do.	56,393	52,779	59,349	46,976 ^r	47,000 ^e
Residual fuel oil do.	33,252	32,047	32,777	26,609 ^r	27,000 ^e
Other do.	25,331	20,732	22,995	22,411 ^r	23,000 ^e
Total do.	153,118	143,992	158,557	129,832 ^r	131,000 ^e

^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 15, 2015.

²In addition to the commodities listed, Sweden produced synthetic diamond, manufactured fertilizer, manufactured gas, granite, 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 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Kubikenborg Aluminium AB (KUBAL) (United Company RUSAL, 100%)	Smelter at Sundsvall	125
Cement		Cementa AB (HeidelbergCement AG, 100%)	Plants at Degerhamn, Skovde, and Slite	3,400
Copper:				
Ore, copper content		Boliden AB	Mines at Aitik, Garpenberg, Kankberg, Kristineberg, Maurliden, 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, Au 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	4,000
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	37,000
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		Kalkproduktion Storugns AB	Mines at Gotland Island	3,000
Do.		Nordkalk AB (Rettig Group, 100%)	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%)	Refineries at Lysekil and Goteborg	210,000
Do.	do.	St1 Group Oy	Refinery at Goteborg	82,000
Do.	do.	AB Nynas Petroleum	Refineries at Gothenburg and Nynashamn	50,000
Silver:				
Ore, Ag content	kilograms	Lundin Mining Corp.	Zinkgruvan Mine at Ammeberg	25,000
Metal	do.	Boliden AB	Smelter and refinery at Ronnskar	408,000
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.