



2015 Minerals Yearbook

SWEDEN [ADVANCE RELEASE]

THE MINERAL INDUSTRY OF SWEDEN

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Sweden is located in northern Europe and shares the Scandinavian Peninsula with Norway (which borders it to the west and north) and Finland (which borders it to the north and east). Sweden also shares its southern border with Denmark. Sweden is underlain by Precambrian rocks that are part of an area known as the Baltic Shield (or Fennoscandian Shield). Archaean rocks occur only to a limited extent in the northernmost part of the country. The rocks in the rest of the north of Sweden and in the eastern and southern parts of the country were formed, and were in many cases also metamorphosed, in connection with the Sveconorwegian orogeny. In contrast, the bedrock in southwestern Sweden was metamorphosed during the Sveconorwegian orogeny. Phanerozoic sedimentary rocks rest upon the Precambrian shield area and cover large parts of Skåne, the islands of Öland and Gotland, the Östergötland and Närke plains, the Västgötaland mountains, the area around Lake Siljan in Dalarna and areas along the Caledonian front in northern Sweden. The youngest rocks in Sweden are Tertiary rocks that formed about 55 million years ago (Geological Survey of Sweden, 2017a; U.S. Central Intelligence Agency, 2017).

In 2015, Sweden's real gross domestic product (GDP) was \$517.4 billion, representing a real growth rate of 4.2% compared with that of 2014. The country was the 11th ranked iron ore producer in the world in 2015, and it was also a significant producer of industrial minerals, including limestone and feldspar. Sweden has alum shale-hosted uranium-molybdenum-vanadium deposits and Kiruna-type iron deposits in the north. The country also had abundant hydroelectric power, although it sources 34.33% of its electricity from nuclear power produced by 10 active reactors (Geological Survey of Sweden, 2017b; International Atomic Energy Agency, 2017; Tuck, 2017).

Minerals in the National Economy

Sweden's mines are found mostly in the country's three ore regions—Bergslagen, the Norrbotten, and Skellefteå. More than a century ago, in the late 1910s, Sweden had nearly 500 mines and the country produced nearly 8 million metric tons (Mt) of ore. About 50 years ago, that number had decreased to about 100 mines that produced about 20 Mt of ore (Geological Survey of Sweden, 2017b). In 2015, the country had 17 mines in operation, including 15 metal mines and 2 clay mines that produced about 80 Mt of ore.

In 2015, about 8% of Sweden's industrial commodities were mineral-related commodities, of which 45% was mine-output-related production, 17% was aggregates-related production, and 38% was steel and metalwork production. Exports of all mineral commodities, including fuel-related minerals, amounted to 14% of the country's total exports, and of this share, 68.3% was composed of steel and metalwork production, and the remaining 31.7% was composed of mined minerals. Within Sweden's total industrial workforce, 6% was employed in the

production of minerals and mineral products; of this amount, 71% was employed in the production of steel and other refinery products, about 15.8% was employed in the mining sector, and the remainder (13.2%) worked in the industrial minerals, ballast, and dimension stone production sector (Geological Survey of Sweden, 2017b).

In 2015, Sweden exported mostly machinery, motor vehicles, paper products, pulp and wood, iron and steel products, and chemicals, and its main export trading partners were Norway (which received about 10.3% of Sweden's exports), Germany (10.3%), the United States (7.7%), the United Kingdom (7.2%), Denmark (6.8%), Finland (6.7%), the Netherlands (5.2%), Belgium (4.4%), and France (4.2%). Sweden imported mostly machinery, petroleum and petroleum products, chemicals, motor vehicles, iron and steel, foodstuffs, and clothing. Its main import trading partners were Germany (which supplied about 17.9% of Sweden's imports), the Netherlands (8.1%), Norway (7.8%), Denmark (7.7%), China (6%), the United Kingdom (5.5%), Finland (4.6%), France (4.3%), and Belgium (4.3%) (Statistics Sweden, 2017a, b; U.S. Central Intelligence Agency, 2017).

Government Policies and Programs

According to the guidelines issued by the Government of Sweden, the minerals in Sweden's bedrock are categorized as either concession minerals or landowner minerals. Sweden's Chief Mining Inspector grants permits for the production of concession minerals and the terms under which such licenses will be issued. These terms are stated in the Swedish Mineral Act (1991:45) of 1991. Those minerals that are considered landowner minerals are extracted according to agreements between the landowner, which provides access to the land, and the enterprise or party that wishes to extract the minerals. The extraction of both categories of minerals has to be in accordance with the environmental requirements laid out in the Swedish Environmental Code and the Swedish Planning and Building Act (2010:900). The Mining Inspectorate of Sweden, which is under the Geological Survey of Sweden (SGU), is the official institution responsible for issuing permits for exploration and mining. It also decides on matters relating to the Swedish Mineral Act (1991:45). 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 mineral markets at the Swedish level and internationally, and it also produces and publishes statistics on the production of aggregates, peat, and other mineral commodities in Sweden and in the global market. According to the Mining Inspectorate, the Swedish mineral sector is crucial for creating employment in Sweden, in particular in those regions of Sweden where the mines are located. The Inspectorate has identified mining as being vital to the development of the country's mining equipment industry, which is an important sector of Swedish industry, regardless of

where in the country the mining is done. Mineral production in Sweden forms a basis for important exports and reduces the country's vulnerability in the event of international trade crises, according to the Inspectorate (Ministry of Enterprise, Energy and Communications Sweden, 2015, p. 17; Mining Inspectorate of Sweden, 2017).

Production

In 2015, the most significant changes in mineral production in Sweden (defined as a greater than a 10% change during the past year), were the increase in production of limestone, by 63%; secondary refined copper, by 55%; ferrochromium, 35%; silver mine output (Ag content), 25%; silver (primary), 23%; lead mine output (Pb content), 12%; and zinc mine output (Zn content), 11%. The most significant decreases were in the production of primary refined copper, by 19%; iron ore, 14%; and gold mine output (Au content), 12% (table 1).

Structure of the Mineral Industry

Sweden's Kiruna Mine is the largest underground iron ore mine in the world in terms of the value of production, and the Aitik Mine is the largest copper mine and largest gold producer in Europe, in terms of the value of production. According to the SGU, by 2020, there could be as many as 30 operational metal mines in Sweden, and by 2030, about 50 operational mines. This information is based on assessments of the projects that have been given or have applied for permits and where active efforts to implement these projects were being made (Ministry of Enterprise, Energy and Communications Sweden, 2015, p. 11).

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. The leading Swedish privately owned mineral producer operating in Sweden was, in terms of the value of its production, Boliden AB—a mining and mineral-processing company that produced principally copper, gold, lead, and silver. Boliden's main mines were the Aitik and the Kankberg Mines; Boliden also had a smelter and refinery at Ronnskar. Lundin Mining Corp. of Canada had significant operations in Sweden.

Cemita AB, which was owned by HeidelbergCement AG of Germany, had three cement plants in Sweden located at Degerhamn, Skovde, and Slite; these plants had a combined production capacity of about 3.4 Mt. Nordkalk AB, which was part of the Rettig Group of Germany, was a leading international producer of concentrated calcite, limestone (including crushed and ground limestone), 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 9 countries as well as mines in 5 countries. In Sweden, Nordkalk's limestone operations were located in Storugns. Table 2 is a list of Sweden's major mineral industry facilities (Nordkalk AB, 2014).

Commodity Review

Metals

Aluminum.—In 2015, Kubikenborg Aluminium AB, which was a wholly owned subsidiary of United Company RUSAL (RUSAL) of Russia, increased production at its Sundsvall smelter by about 3%, to about 116,000 metric tons (t) in 2015 from 113,000 t in 2014. RUSAL indicated that the increase in 2015 was mostly owing to the restarting of Group 6A (comprising 20 reduction cells), which had stopped operations in December 2013, as well as the establishment of new production process parameters and an overall reduction in the number of outages (United Company RUSAL, 2016, p. 44, 45).

Iron Ore and Iron and Steel.—Svenskt Stal AB (SSAB) reported that, in 2015, it had modernized the blast furnace at its Lulea facility, which, according to the company, now had greater flexibility to produce crude steel for the Nordic market. The company reported that the modernization of the Lulea blast furnace as well as the replacement of the old coke plant cooling tower had resulted in 50% less dust emissions, less noise, and a better workplace environment for its personnel (Svenskt Stal AB, 2016, p. 11).

LKAB was building or planning to build and operate two new iron mines—the Mertainen and the Leveaniemi Mines—in the Svappavaara field south of Kiruna. After being involved in environmental litigation for several years, the Mertainen Mine had been granted permission to operate and was to start production in 2016. The Leveaniemi Mine was in the permitting process. LKAB's planned investments, including investment in the already existing Gruvberget Mine, would total \$1.33 billion, which was expected to result in the creation of 1,500 new jobs (Euromines, 2014).

Silver.—Silver production in Sweden increased in 2015 by about 25% as a result of the expansion of the zinc-silver mine at Garpenberg. Boliden stated that it had milled 2.36 Mt of ore in 2015 and had produced 288 t of silver. The company reported that the stated target was to reach 2.5 Mt at the facility. The company also reported that the mine, which also produced copper, gold, lead, and, zinc, employed 420 people in 2015 (Boliden AB, 2017).

Mineral Fuels and Other Sources of Energy

Peat.—Statistics Sweden and the Ministry of Enterprise, Energy and Communications Sweden (Sweden's energy agency) announced that, in 2015, about 1.1 million cubic meters of fuel peat had been harvested in the country, which was about a 49% reduction compared with the amount harvested 2014. In Sweden, the harvesting and use of peat for energy purposes became popular in the early 1980s as a consequence of the increase in energy prices. Fuel peat was used mainly in heating plants. The total energy created using fuel peat in 2015 was about 1.3 terawatt-hours (TWh). In addition to fuel peat, Sweden also produced peat for horticultural use, producing about 1.3 million cubic meters in 2015. The use of peat for energy is taxed through a tax on sulfur emissions; that tax in 2015 was about \$3.40 per kilogram of sulfur, or about \$2.05 per megawatt-hour (Statistics Sweden, 2016, p. 20, 21, 34, 36).

Outlook

The Government updated its mining strategy in 2015. The updated mining strategy proposes a more active promotion of the mineral industry by the Government and its agencies. The strategy calls for mining and commercialization of Sweden's significant mineral resources to become an important part of the national economy (Ministry of Enterprise, Energy and Communications Sweden, 2015). As a consequence, mining, although still contributing only a small part of the country's GDP, is expected to increase and to contribute more to Sweden's economy in the medium and long terms.

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TABLE 1
SWEDEN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2011	2012	2013	2014	2015	
METALS						
Aluminum, metal:						
Primary	111,000	129,000	131,000	113,000	116,000	
Secondary ^e	30,000	30,000	30,000	30,000	30,000	
Total	141,000	159,000	161,000	143,000	146,000	
Copper:						
Mine output, Cu content	83,000	82,422	82,904	79,681	75,113	
Metal:						
Smelter:						
Primary	162,000	151,000	140,000 ^r	150,000	150,000	
Secondary	45,000	56,000	59,000 ^r	60,000	60,000	
Total	207,000	207,000	199,000 ^r	210,000	210,000	
Refined:						
Primary	179,316	174,000	166,000	177,000	144,200	
Secondary	40,000 ^e	40,000 ^e	40,000 ^e	40,000 ^e	61,800	
Total	219,316	214,000	206,000	217,000	206,000	
Gold:						
Mine output, Au content	kilograms	5,935	6,015	6,530	6,849	6,030
Metal, primary and secondary ³	do.	10,600	12,532	12,000	12,000	13,000
Iron and steel, metal:						
Iron ore concentrate and pellets:						
Gross weight	thousand metric tons	22,968	26,039	27,300	34,002 ^r	29,391
Fe content (60%)	do.	15,159 ⁴	17,186	16,162	21,081 ^r	18,222
Metal:						
Pig iron	do.	3,240	2,805	2,896	3,078	2,865
Ferrous alloys: ferrochromium		81,500 ^{r,e}	39,852 ^r	49,000 ^{r,e}	67,000 ^{r,e}	90,480
Steel, crude	thousand metric tons	4,866	4,326	4,404	4,539	4,374
Lead:						
Mine output, Pb content		61,999	63,551	59,556	70,848	79,354
Metal, refined:						
Primary		52,400	62,000	69,000	69,000	71,000
Secondary		41,000	44,000	45,000	45,000	45,000
Total		93,400	106,000	114,000	114,000	116,000
Silver:						
Mine output, Ag content	kilograms	238,030	309,337	341,346	382,611	479,700
Metal, primary	do.	415,066	447,759	437,000	440,000	539,000
Zinc, mine output, Zn content		190,251	188,300	176,582	221,841	246,983
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand metric tons	2,064	2,500 ^e	3,000 ^e	3,000 ^e	3,200 ^e
Feldspar, salable, crude and ground ^e		30,000	27,000	30,000	27,000	27,000
Lime ^e	thousand metric tons	960 ⁵	960	806	700	700
Quartz and quartzite	do.	163	101	102	73	72
Stone:						
Dimension:						
Granite	do.	92	79	90	88	88
Limestone	do.	23	21	21	43	70
Other	do.	67	82	82	82	82
Crushed:						
Dolomite	do.	483	429	445	379	393
Limestone		7,317	7,385	7,448	6,791	6,715
Sandstone	thousand metric tons	NA	629	630 ^e	630 ^e	630 ^e
Undifferentiated	do.	NA	101	101 ^e	100 ^e	100 ^e
Talc, soapstone		3,000	--	--	--	--

See footnotes at end of table.

TABLE 1—Continued
 SWEDEN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2011	2012	2013	2014	2015	
MINERAL FUELS AND RELATED MATERIALS						
Peat:						
Agricultural use	thousand cubic meters	1,611 ^r	977 ^r	1,815 ^r	1,512 ^r	1,266
Fuel	do.	2,139 ^r	1,846 ^r	2,369 ^r	2,196 ^r	1,127
Petroleum, refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	3,139	4,490	3,577	4,745 ^r	4,700 ^e
Gasoline, motor	do.	33,799	37,048	28,945	40,880 ^r	40,800 ^e
Jet fuel	do.	1,496	1,898	1,314	1,971 ^r	1,970 ^e
Distillate fuel oil	do.	52,779	59,349	46,976	54,750 ^r	54,700 ^e
Residual fuel oil	do.	32,047	32,777	26,609	20,440 ^r	20,400 ^e
Other	do.	20,732	22,995	22,411	25,915 ^r	25,900 ^e
Total	do.	143,992	158,557	129,832	148,701	148,470 ^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 September 12, 2016.

²In addition to the commodities listed, Sweden produced coke, 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.

³Series was updated to include metal production from ores and electronics scrap recycling.

⁴Iron content reported to be 66%.

⁵Quicklime; estimate based on volume sold.

TABLE 2
SWEDEN: STRUCTURE OF THE MINERAL INDUSTRY IN 2015

(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		Berglings 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	4,000
Metal	do.	do.	Smelter and refinery at Ronnskar	15,000
Graphite		Woxna Graphite AB (Tricorona Mineral AB, 100%)	Mine and plant at Kringeltjarn, Woxna (closed 2008)	20
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		Kalproduction 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%))	Refineries at Lysekil and Goteborg	210,000
Do.		StI Group Oy	do.	82,000
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.