

SWEDEN

By Chin S. Kuo

Timber, hydropower, and iron ore were the natural resource base of the economy that was heavily oriented toward exports, which was the main engine of economic growth. The gross domestic product growth was 1.4% for 2002. Privately owned companies accounted for 90% of industrial output. Sweden was active in mining and exploiting base metals, industrial minerals, and iron ore. Value-added manufacturing of metal products was the backbone of the mineral industry. Application of technology and efficient organization has enabled Svenskt Stal AB (SSAB) to become well known for its high-quality steel in Europe. The country relied heavily on imports of crude petroleum. Owing to the global economic slowdown, revenue declines, and spending increases, the Government registered a budget surplus of \$4.5 billion, which was about one-half of that achieved in 2001. The inflation rate was low at 2.1% (U.S. Department of State, 2003§¹).

Boliden Ltd. and North Atlantic Natural Resources AB (NAN) entered into an agreement to explore in the Skellefte district in northern Sweden for base metals. NAN was a joint venture between Boliden (38%) and South Atlantic Ventures Ltd. (38%). The agreement allowed each company to carry out exploration on the other's areas. Successful exploration of a mineralized zone sufficient to justify a prefeasibility study would earn the exploring party a 70% interest in the project. Certain exploration targets were to be pursued under a 50/50 joint-venture arrangement (Mining Journal, 2002c).

Lake Resources NL of Australia reached a joint-venture agreement with BHP Billiton for Lake Resources' Moskosel Project in northern Sweden. The project area comprising two licenses totaling 520 square kilometers was considered highly prospective for Broken Hill-type silver-lead-zinc deposits. BHP Billiton could earn a 51% interest in the tenements by funding exploration expenditure of \$500,000 and expenditure of \$2 million would earn 70%. Lake would be the operator of the project (Lake Resources News, 2002§).

Poplar Resources Ltd.'s Bottenbacken copper-palladium-gold deposit was estimated to contain inferred resources of 5.34 million metric tons (Mt) at 0.47% Cu, 0.28 gram per metric ton (g/t) Pd, and 0.18 g/t Au, by using a 0.18% Cu cutoff. The deposit comprised nine separate mineralized zones. The mineralized central zone with identified resources consisted of dissemination, fracture fillings, and veinlets of chalcopyrite and rare bornite (Mining Journal, 2002b).

Boliden discovered an extensive mineralization of zinc, lead, and silver at Lappberget in the Garpenberg area in central Sweden. The grades were higher than the average for the ore reserve at the currently operating Garpenberg Mine. A comprehensive exploration program was underway to determine

the grades and tonnage. Chemical analyses were carried out at Boliden's laboratory at Ronnskar and check assays were performed on samples sent to Chemex in Vancouver, British Columbia, Canada (Canada NewsWire, 2002§).

Boliden discovered a new zone of mineralization in zinc and silver (K-zinc zone) adjacent to the Einarsson ore body at its Kristineberg polymetallic mine in northern Sweden. The new zone was estimated to contain indicated resources of 1 Mt at 0.2 g/t Au, 197 g/t Ag, 0.4% Cu, 11.6% Zn, and 1.0% Pb. Continued exploration in the same area also revealed a new copper-gold-zinc mineralization (J-zone) underneath the ore body and the K-zinc zone. The ore reserves at Kristineberg were sufficient to last until 2003 at the current (2002) production rate; the new discovery could add 2 years to the mine's life (Mining Journal, 2002a).

Elkem A/S of Norway owned 36% of Sapa, which was a Swedish aluminum semi-fabricator, and increased its stake to 42.8% to fend off any other potential bidders. According to Swedish law, Elkem was compelled to make a bid for the remaining shares in Sapa when Elkem passed the 40% ownership threshold. Elkem, however, had limited interest in acquiring 100% ownership of Sapa and intended to let Sapa continue to operate as an independent company with broad international ownership (Metal Bulletin, 2002e).

NAN shipped the first ore from the Storliden base-metal mine, which began production in September, to Boliden's mill for processing. The mine was designed to produce 1.8 Mt of ore at 10.3% Zn, 3.4% Cu, 0.25 g/t Au, and 24 g/t Ag during a 6-year mine life. In 2002, 130,000 metric tons (t) of ore was processed at Boliden (Mining Journal, 2002d).

Equinox Resources of Australia had an iron ore lease adjacent to state-owned Luossavaara-Kiirunavaara AB's (LKAB) Kiruna Mine in northern Sweden. The lease was due to expire in 2004 but was extendable to 2008. LKAB would want access to the iron ore contained in the Equinox tenement probably in about 5 years. LKAB's current (2002) plans were to extend mining at Kiruna into the ore under Lake Luossavaara (Metal Bulletin, 2002f). Kiruna produced 19.2 Mt of iron ore, and Malmberget produced 12.2 Mt in 2002. LKAB, which was one of the leading suppliers of iron ore and pellets for the steel industry, had a capacity of 20.3 million metric tons per year (Mt/yr) of its products with a plan to increase to 23 Mt/yr. At Kiruna, the two pellet plants produced 10 Mt/yr, and at Malmberget, a pellet plant produced 4 Mt/yr. In 2002, LKAB delivered 19.6 Mt of products, of which 13.2 Mt were pellets (LKAB, 2003§).

SSAB was holding on to its exports of quenched and tempered plate and high-strength sheet to the United States despite the import tariffs of 30% imposed by the U.S. Government. SSAB applied for exemptions from the tariff for

¹References that include a section mark (§) are found in the Internet References Cited section.

certain grades of its products. SSAB invested \$227 million to increase capacity for quenched plate by 50% as the market grew at a rate of from 5% to 7% per year. The company had a global market share of 20% in quenched plate. The market for high-strength sheet grew by 5% per year and accounted for 40% of SSAB's sheet sales (Metal Bulletin, 2002h). SSAB also operated its Oxelösund heavy plate mill at full capacity of 550,000 metric tons per year (t/yr). The mill was equipped with two blast furnaces, two continuous casting lines, and a rolling mill.

Sandvik Steel AB planned to close Gusab Stainless at Mjølby, which was one of its five stainless steel wire drawing plants, to improve efficiency, to reduce costs, and to increase profitability. The closure of Gusab would involve transferring the production of spring wire to other units in the division. Proximity to its customers largely dictated the location of Sandvik's wire drawing plants (Metal Bulletin, 2002g). Sandvik had a 250,000-t/yr minimill at Sandviken that produced cold-rolled material.

AvestaPolarit Oyj Abp planned to increase production of hot-rolled coils at its Avesta plant from 950,000 t/yr to 1.2 Mt/yr in 2003. The company also was to upgrade the single-strand slab caster in the Avesta plant's meltshop and awarded a contract to Voest-Alpine Industrie-anlagenbau (VAI) of Austria. The upgrade was intended to increase the speed and performance of the continuous caster, particularly with regard to slab tolerances. VAI installed a new hydraulic Dynaflex oscillator on the caster in 2002 (Metal Bulletin, 2002b).

In October, AvestaPolarit invested \$20.6 million in a new billet caster at its 600,000-t/yr stainless melting and continuous casting shop in Sheffield, United Kingdom. The billet would be rolled at its long product mills also at Sheffield and in Sweden. As a result of the investment, the company would close its 200,000-t/yr Degerfors melt shop in Sweden in 2003. AvestaPolarit would continue to supply hot-rolled coils to Sheffield from Avesta in Sweden and Tornio in Finland (Metal Bulletin, 2002a).

Boliden was interested in acquiring the Degerfors melt shop and converting it from stainless steel to carbon steel production. The company intended to produce carbon steel tube and pipe for the toolmaking industry and retain some 300 jobs that would otherwise have been lost. The existing carbon steel plate operations at Degerfors were not for sale (Metal Bulletin, 2002d).

AvestaPolarit won an order to supply 2,400 t of stainless plate and tube worth \$5.5 million for containers to store radioactive waste from Chernobyl in Ukraine. JSC Sumy Frunze NPO was to build the stainless steel storage plant that would be

commissioned in 2003. Hot-rolled plate that ranged from 14 to 45 millimeters thick would be supplied from Degerfors and welded tube from Nyby, both in Sweden; cold-rolled coil would come from Tornio in Norway (Metal Bulletin, 2002c).

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Major Source of Information

Geological Survey of Sweden
Mineral Resources Information Office
Skolgatan 4
93070 Mala, Sweden

TABLE 1
SWEDEN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1998	1999	2000	2001	2002	
METALS						
Aluminum, metal:						
Primary	95,670	99,340	100,800	101,800	100,600	
Secondary ^c	25,000	25,000	26,000	25,000	28,000	
Total	120,670	124,340	126,800	126,800	128,600	
Copper:						
Mine output, Cu content	73,685	71,200 ^e	77,765	74,269	72,100	
Metal:^c						
Smelter:						
Primary	90,000	85,000	95,000	173,000	188,000	
Secondary	35,000	30,000	35,000	35,000	35,000	
Total	125,000 ²	115,000	130,000	208,000	223,000	
Refined:						
Primary	100,000	95,000	105,000	179,000	199,000	
Secondary	25,000	20,000	25,000	25,000	25,000	
Total	125,000	115,000	130,000	204,000	224,000	
Gold:						
Mine output, Au content	kilograms	5,944	4,400 ^e	3,570	4,986	4,800
Metal, primary ^{e,3}	do.	9,000	8,000	8,000	8,000	8,000
Iron and steel, metal:						
Iron ore concentrate and pellets:						
Gross weight	thousand tons	20,930	18,558	20,557	19,486	20,000 ^e
Fe content	do.	12,977	11,506	13,556	12,811	13,000 ^e
Metal:						
Pig iron and sponge iron		3,373	3,212	3,146	3,614	3,700 ^e
Ferroalloys:						
Ferrochromium		123,958	131,140	135,841 ^r	109,198	118,823
Ferrosilicon		20,356	21,440	20,000 ^e	22,000 ^e	23,000 ^e
Total		144,314	152,580	156,000 ^e	131,000 ^e	142,000 ^e
Steel, crude	thousand tons	5,062	5,075	5,227	5,518 ^r	5,754
Semimanufactures ^c	do.	4,485 ²	4,400	4,500	4,500	4,600
Lead:						
Mine output, Pb content		114,430	116,300	106,584	85,975	37,600 ^e
Metal, refined:						
Primary		40,600	38,000 ^e	30,604	31,322	30,000 ^e
Secondary		52,000	48,000 ^e	47,255	44,056	39,700 ^e
Total		92,600	86,000 ^e	77,859	75,378	69,700 ^e
Molybdenum, oxide, roasted, Mo content ^e		3,000	3,000	3,000	3,000	3,000
Nickel, metal, secondary ^e		100	60	50	50	50
Selenium, elemental, refined ^e		20	20	20	20	20
Silver:						
Mine output, Ag content	kilograms	299,051	284,100	328,737	306,029	299,300
Metal, primary ^{e,3}	do.	250,000	250,000	250,000	250,000	250,000
Zinc, mine output, Zn content		164,711	174,400	176,788	156,334	142,900
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	2,252	2,298	2,651	2,600	2,700 ^e
Clays, kaolin	do.	450 ^e	450 ^e	--	--	--
Diamond, synthetic ^c	thousand carats	25,000	25,000	20,000	20,000	20,000
Feldspar, salable, crude and ground		45,000	45,000 ^e	35,000	40,450	40,000 ^e
Fertilizer, manufactured:^c						
Nitrogenous	thousand tons	400	400	400	400	400
Phosphatic	do.	10	10	10	10	10
Mixed	do.	300	300	300	300	300
Graphite		3,011	4,500	5,108	963	900 ^e
Lime ^c	thousand tons	600	500	550	550	580
Quartz and Quartzite ^c	do.	500	500	500	600	600

See footnotes at end of table.

TABLE 1--Continued
 SWEDEN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		1998	1999	2000	2001	2002
INDUSTRIAL MINERALS--Continued						
Stone:^c						
Dimension:						
Mostly unfinished	thousand tons	150	160	160	160	160
Granite	do.	100	100	130 ²	128 ²	130
Limestone	do.	5	5	32 ²	28 ²	30
Slate	do.	20	20	11 ²	16 ²	15
Other	do.	10	10	8 ²	5 ²	6
Crushed:						
Dolomite	do.	600	600	488 ²	456 ²	450
Granite	do.	3,500	3,500	3,500	3,500	3,500
Limestone:						
For cement manufacture	do.	4,000	4,000	3,770 ²	4,070 ²	4,000
For lime manufacture	do.	800	800	800	900	900
For other construction and industrial uses	do.	1,600	1,600	1,800	1,800	1,700
Chalk	do.	30	30	30	70	70
For agriculture uses	do.	400	400	450	550	600
For other uses	do.	1,000	1,000	1,500	1,500	1,500
Total	do.	7,830	7,830	8,350 ²	8,890 ²	8,770
Sandstone	do.	75	75	34 ²	5 ²	10
Undifferentiated	do.	25,000	25,000	30,000	30,000	30,000
Other	do.	500	500	580 ²	371 ²	400
Sulfur:						
Metallurgy	do.	73	65	91	152	150 ^e
Petroleum	do.	60	56	61	55	60 ^e
Total	do.	133	121	152	207	210 ^e
Talc, soapstone		25,000 ^e	25,000 ^e	20,000	15,000	15,000 ^e
MINERAL FUELS AND RELATED MATERIALS						
Coke, metallurgical ^c	thousand tons	1,150	1,200	1,200	1,200	1,200
Gas, manufactured: ^c						
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
Peat:						
Agricultural use		670	1,460	1,500 ^e	1,400 ^e	1,400 ^e
Fuel		390	2,652	1,372	2,496	2,500 ^e
Petroleum, refinery products: ^c						
Liquefied petroleum gas	thousand 42-gallon barrels	3,000	3,000	3,000	3,000	3,000
Naphtha	do.	500	500	500	500	500
Gasoline, motor	do.	38,862 ²	38,000	39,000	40,000	40,000
Jet fuel	do.	1,288 ²	1,400	1,500	1,500	1,500
Kerosene	do.	50	50	50	50	50
Distillate fuel oil	do.	56,582 ²	56,000	57,000	57,000	58,000
Residual fuel oil	do.	38,508 ²	38,000	39,000	39,000	40,000
Other	do.	7,800	7,800	7,800	7,800	7,800
Refinery fuel and losses	do.	5,000	5,000	5,000	5,000	5,000
Total	do.	152,000	150,000	153,000	154,000	156,000

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to total shown. ^rRevised. -- Zero.

¹Table includes data available through September 16, 2003.

²Reported figure.

³Includes only that recovered from indigenous ores, excluding scrap.

TABLE 2
SWEDEN: STRUCTURE OF THE MINERAL INDUSTRY IN 2002

(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, Skövde, 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 Viscaria (closed)/Pahtohavare	22
Metal		Boliden Metals AB	Smelter and refinery at Rönnskär	240
Feldspar		Berglins Malm & Mineral AB (Omya GmbH)	Mines at Beckegravan, Hojderna, and Limbergsbo	50
Do.		Forshammar Mineral AB (Omya GmbH)	Mines at Limberget and Ridrarhyttan	30
Do.		Larsbo Kalk AB (Omya GmbH)	Mines at Glanshamar and Larsbo	20
Ferroalloys		Vargon Alloys AB	Plant at Vargon	175
Gold:				
Ore, gold content	kilograms	William Resources Inc.	Björgdal Mine at Skellefte	3,000
Do.	do.	Boliden Mineral AB	Mines at Aitik, Akerberg, Kankberg, Kristineberg, Langdal, Petiknas, and Renstrom	2,000
Metal		do.	Smelter and refinery at Rönnskär	9
Graphite		Woxna Graphite AB (Tricorona Mineral AB, 100%)	Mine and plant at Kringeltjärn, Woxna	20
Iron ore		Luossavaara-Kiirunavaara AB (Government, 98%)	Mines at Kiruna and Malmberget	32,500
Iron and steel		Svenskt Stal AB (Government, 48%)	Steelworks at Borlänge, Luleå, and Oxelosund	3,900
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 Renström	110
Do.		North Mining Svenska AB	Zinkgruvan Mine at Ammeberg	20
Metal		Boliden Metals AB	Smelter and refinery at Rönnskär	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	barrels per day	Skandinaviska Raffinaderi AB	Refinery at Lysekil	210,000
Do.		BP Raffinaderi AB	Refinery at Goteborg	100,000
Do.		Shell Raffinaderi AB	do.	82,000
Do.		AB Nynas Petroleum	Refineries at Goteborg, Malmo, and Nynashamn	54,000
Silver, metal	kilograms	Boliden Metals AB	Smelter and refinery at Rönnskär	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