

SWEDEN

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Economic growth in Sweden as indicated by GDP increased by 1.9% during 2002 compared with the previous year's 1.1%. The inflation rate slowed down from 2.9% in 2001 to 2.3%. Also, industrial production showed an increase in 2002 of 3% compared with 2001 when it fell by 1.6%. Total investments are estimated to have fallen by 3% compared with 17% the previous year. The average exchange rate with the US dollar was SK9.72 (compared with SK10.31 in 2001). The unemployment rate rose marginally to 4.1% of the workforce by the end of the year compared with 4.0% the previous year. There was an increase in labour costs for manufacturing and mining in 2002 of 4% (6% in 2001).

Exploration slowed somewhat and exploration expenditures decreased to SK177 million, from SK193 million in 2001. The lower activity reflected the trends in the rest of the world as well as low base metal prices.

The number of exploration permits granted, mainly for ore minerals, rose from 137 in 2001 to 159 in 2002. The area covered by the permits was 2,368 (2,630) km². There were also some permits given for diamond exploration. The total area covered by exploration permits related mainly to ore minerals at the end of the year was 9,124 km² and, including diamonds, the total was 12,322 km². In the area west of the Skellefte ore field, in the vicinity of Boliden's gold-sulphide deposit, several gold occurrences are being investigated.

Svartliden, which is owned 80% by Australian junior Dragon Mining, was recently awarded an exploitation concession by the Inspector of Mines and is awaiting an environmental permit. Svartliden is situated northwest of the city of Lycksele in southern Lapland. Reserves at Svartliden are 1.4 Mt averaging 5.7 g/t Au. Financing will be provided by Macquarie Bank Ltd, which is a major shareholder of Dragon Mining.

Close to Svartliden is the Fäboliden gold deposit, which has been drilled intensely in recent years. The owner, Lapland Goldminers AB, is in the process of making an application for an exploitation concession. Indicated resources are 17.5 Mt at 1.5 g/t Au and there are plans for a 1,300 m long open pit. Drilling continues.

Iron ore

At LKAB's Kiruna mine, production of crude ore in 2002 was 20.7 Mt compared with 21.3 Mt in 2001. The entire production is hoisted from the main haulage level at 1,045 m. The mine sub-level employs caving. The volume drilled decreased during the year to 564,000 m. Productivity has increased continuously, with better performance from the equipment. The number of rigs has been kept low and availability is high. There are now four remote-

controlled Atlas Copco rigs with Wassara water-powered drilling machines, and two remote-controlled Solo 1,000 rigs. Mine development included 12,800 m of drifting.

Much effort has been directed towards securing higher production capacity in recent years. Increased availability and better utilisation of the existing equipment have been crucial for this work. The night shifts, which started in 1994, are now run entirely with remote-control equipment. The number of remote-controlled 25 t loaders in use was eight during 2002.

The output of finished products at the Kiruna and Svappavaara plants increased to 13.0 Mt in 2002 from 12.4 Mt in 2001 of which 10.1 Mt (9.8 Mt in 2001) was pellets and the rest fines.

Crude ore production at Malmberget was 12.2 Mt in 2002, marginally lower than the 12.3 Mt in 2001. The ore grades delivered to the dressing plant were higher than in the previous year. The new main haulage level at 1,000 m, which was inaugurated in the autumn of 2000, is contributing an increasing part of the production – 6.7 Mt in 2002. Production drilling was higher at 443,000 m (406,000) and productivity was high, and more than is required for the present production. All production drilling is done with four remote-controlled rigs. Development work included 14,600 m of drifting, more or less the same as in 2001.

The output of finished products at Malmberget reached an all time high of 7.2 Mt, 1.0 Mt more than in 2001. The finished products consisted of 4.0 Mt of pellets and 3.2 Mt of concentrate. The grinding process was improved during the year, and resulted in a higher and more stable performance at the pellet plant.

Base and precious metals

Boliden Mineral AB operated seven of its own mines, and the total production of crude ore from these mines was 22.8 Mt.

The mines were served by three ore-dressing plants situated at Boliden, Aitik and Garpenberg. Production from the Aitik open-pit copper mine was 18.6 Mt of copper ore. In the two underground mines of Garpenberg and Garpenberg North, 1.0 Mt of zinc, silver, lead and copper ore were mined at depths of 800 to 1,000 m utilising backfill methods. The four mines of Kristineberg, Maurliden, Petiknäs and Renström produced 1.5 Mt of complex sulphide ore. Ore from these mines was treated at the mill in Boliden.

Concentrates produced contained 78,900 t of copper, 151,000 t of zinc, 18,200 t of lead, 5 t of gold and 263 t of silver.

At Garpenberg, drilling was continued at the new Lappberget deposit situated between the mines at Garpenberg and Garpenberg North. High grades of mainly zinc, lead and silver have been discovered. Preparation for future mining has begun. Fortunately, the present infrastructure of drifts at the 900 m level can be utilised to a great extent.

Two new ore prospects, the K-zinc and J-zone, have been investigated at the Kristineberg mine. K-zinc was developed into reserves during the year, with grades higher than has been previously obtained in the mine. The J-zone will be further drilled during 2003.

At Renström, mining is mainly performed in the high grade Simon orebody situated below the 1,000 m level. New investigations indicated continued mineralisation to the east.

Rehabilitation work was begun at the Laisvall lead mine in the mountains of northern Sweden, following its closure in December 2001. The work will be completed during 2004-05.

Most of the Boliden concentrates are treated at the company's Rönnskär smelter near of Skellefteå. During 2002, a new production record was reached at 224 402 t of copper. Also, the figures for gold at 15.6 t and silver at 408.4 t, were new records. Besides concentrate from the mines, Rönnskär also treats secondary material.

Following completion of a new access ramp, mining started in April 2002 at the Storliden zinc-copper mine in the Skellefte mining district in northern Sweden. This is only four years after the initial discovery in 1998 (probably a record for a mine these days). The mine is owned by North Atlantic Mineral Resources (NAN). Under an agreement with Boliden Mineral AB, the latter is acting as contractor and operator. The ore is being processed at the mill in Boliden some 90 km to the southeast.

The Storliden deposit is hosted by a series of metamorphosed sedimentary and tuffaceous volcanic rocks of Proterozoic age. The mineralisation comprises a series of lenses that dip rather uniformly to the southwest at 20° to 40° at a depth from 100 to 150 m below surface. Various mining methods are employed because of the irregular shape of the ore bodies. Methods include modified mechanised cut-and-fill, as well as modified mechanised drift-and-fill where the lenses thin.

In 2002, a total of 1.57 Mt were mined at an average grade of 11.4% Zn, 3.6% Cu, 0.4 g/t of Au and 35 g/t of Ag. Of this total 131,508 t were processed in Boliden to yield 14,410 t of copper concentrate containing 4,187 t of copper, and 26,174 t of zinc concentrate with 14,339 t of zinc. The recovery rate was over 91% for both types of concentrate. For 2003, the production target is at 300,000 t of ore.

Zinkgruvan Mining AB, a wholly-owned subsidiary of Rio Tinto, continued its operations at the Zinkgruvan mine. Ore production during 2002 amounted to 173,000 t averaging 7.2% Zn, 3.8% Pb and 90 g/t Ag, 82,000 t less than in 2001. The main part of the ore production (85%), came from drifts and benching work, 14% from development work and the remaining 1% from back-fill mining. Development, mainly in the Burkland area, also contributed 116,000 t of barren rock of which almost 75% could be deposited underground in open rooms no longer in use. The equipment was expanded

to include two new generation Atlas Copco units, one Simba M7 and one Boltec LC, the latter for bolting, and a Volvo L 70. A new ventilation system completed in the Burkland area will provide 120 m³ of air per second down to 965 m. Preparation of the system required 2,000 m of fullface raiseboring and 690 m of drifting.

Two minor caving incidents in the older parts of the mine diluted the ore grade. In order to prevent further incidents of the same kind, bolting was increased and the size of the rooms was reduced. In the Burkland area, good stability in the new benched has been obtained using paste filling. Cement is mixed into the tailings at the mill and the slurry is then pumped into the mine through drilled holes in the rock. Some problems with the paste flow were eliminated by casing the holes.

The Zinkgruvan concentrator treated 735,900 t of ore and produced 86,800 t of zinc concentrate and 36,000 t of lead concentrate, substantially less than in 2001 owing mainly to lower zinc grades. A paste-fill plant was brought into operation during the year. Cement is mixed into the tailings to create a paste, which is pumped back into the mine to form a stable fill.

An extension of the mining concession to the northwest was obtained from the inspector of mines during the year. This will enable the Burkland ore to be mined below 950 m. A permission was awarded by the Environmental Court for increased production to 1.5 Mt/y. The permission also includes mining and treatment of copper ore and an extension of the present tailings dam to accomodate another 5 Mm³.

Björkdalsgruvan owned by Björkdalsgruvan KB (equally owned by Dormant Properties and International Gold Exploration AB -IGE), restarted mining during 2002 with a total production of 131,377 t crude ore. Milling began in September 2001 with feed from stockpiled low-grade ore. The Irish junior Minmet has since purchased Dormant Properties' 50%-share and has an option to obtain 40% of the IGE share.

Industrial minerals

Limestone production in Sweden was 8.5 Mt during 2002, down 400,000 t from the previous year. Nordkalk (formerly Partek Nordkalk) produced 3.3 Mt in its Swedish plants (Storugns, Uddagården, Ljung, Ignaberga and Orsa), 100,000 t less than in 2001. Of the production, 3.0 Mt came from the Storugns plant. Nordkalk's parent company, Partek, was acquired by the Finnish company Kone during the year. Kone sold the entire share capital of Nordkalk Corp. to a Finnish investor group in February 2003. The other major limestone producer, Svenska Mineral, operates quarries at Gåsgruvan, Rättvik and Stucks.

Omya operates the Sala, Glanshammar and Larsbo dolomite quarries.

Cement production at the plants Slite, Degerhamn and Skövde plants, operated by Cementa, part of the Heidelberg Cement Group remained at 2.6 Mt, the same as last year. Of the total sales, 46% were exported.

At Kringelgruvan, there was no production of graphite during the year. The owner, Woxna Graphite was granted a permit to build a leaching plant to get higher-grade concentrates and initiated a co-operation agreement Timcal Graphite & Carbon Ltd to develop the products at Kringelgruvan.

Clay is produced by a number of companies at several locations in the southern part of Sweden. The clay is used mainly for the production of light clinker, brick and ceramics.

Swedish Ore and Mineral Products ('000 t)

	2000	2001	2002
Iron ore products ¹	20,557	19,484	20,281
Processed sulphide ores	23,608	22,695	22,100
Copper concentrate	252	268	263
Lead concentrate	147	123	68
Zinc concentrate	320	285	271
Gold concentrate (t)	0.2	1.3	3.8
Lime and limestone	8,351	8,658	8,520
Cement	2,600	2,600	2,600
Talc/soapstone	20	14	20
Graphite ore	5.6	1.0	0
Clay	244	238	267

¹. Marketable products