

Focus: Sweden

Finding a balance

Swedish mining is booming, but exploration funding is hard to come by

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The Swedish mining industry enjoyed a record year of production in 2012. More than 71Mt of metallic ores were hauled from five ferrous and 10 non-ferrous mines.

Some 38 mines produced around 9Mt of industrial minerals and together 57 quarries delivered 167,000t of dimension stone in 2012. This is the third consecutive year of growth in the country's mining sector and ore production is set to grow again in 2014.

The growth was mainly dependent on strong demand for minerals and metals during the first six months of the year. State-owned miner LKAB started operations at Gruvberget, a new open-pit operation not far from its Kiruna mine in the Svappavaara district.

The company also opened main haulage levels at Kiruna and at its Malmberget underground iron-ore mine in 2012. The combined investment for both developments is around US\$2.5 billion.

Meanwhile, the Dannemora iron-ore mine, located some 100km north of Stockholm, was reopened in 2012 after lying dormant for two decades. The mine is now operated by Dannemora Mineral AB, which acquired the land and installations in 2008 to make the mine operational again.

Both Malmberget and Dannemora were opened by Sweden's King Carl XVI Gustaf, marking the importance of these developments for the country's mining industry.

After a difficult year financially, Northland Resources SA has been ramping up production at its Tapuli iron-ore mine and is close to completing investment in its greenfield Kaunisvaara iron-ore project in Pajala in the north of the country.

Further investments were made in Boliden AB's Aitik deposit, which is the country's largest copper



Scaling at the Garpenberg mine

Photo: Boliden

Fast facts: Sweden



- ▼ **Capital:** Stockholm
- ▼ **Population:** 9.5 million
- ▼ **Real GDP growth:** 1.2% (2012 est)
- ▼ **Currency:** Swedish krona

Exploration drilling on the surface



Photo: LKAB

mine. Production capacity at the mine is expected to reach 36Mt by 2014.

In terms of the metal content of ore produced, Sweden maintains its position as one of the European Union's (EU) leading mining countries.

In terms of total value of metal production, Sweden accounts for 0.79% of the total value of global metal production at the mine stage. By this measure, Sweden is the number-one mining nation in the EU. Poland is in second place, accounting for 0.62%, followed by Finland, Bulgaria and Ireland. In Europe, but outside the EU, the Ukraine is much bigger, accounting for 1.75%.

Major players

In total, mining accounts for more than 10% of total industry investments in Sweden and this exceptional figure is even more noteworthy given that most of these investments are made in the northern parts of the country, where a fall in population and poor general economic performance have been the norm to date.

Growth has been strong in recent years and investments are expected to remain at around SK5-10 billion (US\$0.8-1.6 billion) in 2013 and over the next couple of years.

Swedish metal mining is dominated by two major companies: LKAB for iron ore and Boliden for non-ferrous production. Two other miners mentioned above, Northland Resources and Dannemora Mineral, are much smaller.

LKAB's mines are located in the far north of the country, north of the Arctic Circle. In 2012, its two large underground mines – Kiruna and Malmberget, which are among the largest in the world – together produced 26.2Mt of saleable products from huge magnetite orebodies of very high grades.

This is the largest volume in more than 35 years, but there is still some way to go before it is likely to

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get near the high levels of the early 1970s. Around 85% of these volumes were delivered as pellets. Most of the production is exported out of Narvik on Norway's Atlantic coast or through Luleå on the Baltic Sea.

Northland started production in December 2012 after a very short investment period and initial start-up phase. In early 2013, however, the company ran out of money and it was only in June that these problems were resolved and a new group of owners took over. The previous shareholder lost almost all of its investments in the process. LKAB, through one of its subsidiaries, Norrskenet, came in as a major new owner.

Likewise, Dannemora has had some problems in its start-up and in September 2013 it had to renegotiate the terms of its outstanding bonds. Both cases illustrate how difficult it is for a junior company to make the transition from an exploration company to a fully-fledged miner.

Boliden has also embarked upon a major investment programme: aside from the large expansion at Aitik, the company's Garpenberg mine is opening up some new deposits underground. This mine has been in operation intermittently for 700 years and still has many years to go.

A smaller investment, SK475 million, was completed in 2012 for Kankberg, a gold mine with an important by-product: tellurium. This demonstrates how small global demand really is for these so-called 'critical metals'.

Kankberg has been under consideration by Boliden for many years as a gold deposit. However, separation of the gold from the tellurium and arsenic containing ores has been difficult and the project was unable to get off the ground due to the low recovery of the gold.

However, these problems were resolved following a long research and development effort. By the time the mine was opened in 2012, demand for tellurium had grown dramatically. The mine is expected to produce 41t/y of tellurium, which is equivalent to around 10% of total world production. It is clear that some of the critical metals can easily become abundant.

The underground non-ferrous mines of Sweden are small in size but share the high productivity and effectiveness of the huge iron-ore operations. Lundin Mining Corp operates the Zinkgruvan mine in central Sweden. It is located in the southern limb of the Bergslagen arc, which has been the basis of Swedish mining since medieval times.

On the northern half of the crescent lies Garpenberg and the very small but high-grade Lovisa mine, which produces 40,000t of lead-zinc ore from a narrow – less than 2m wide vein – underground operation.

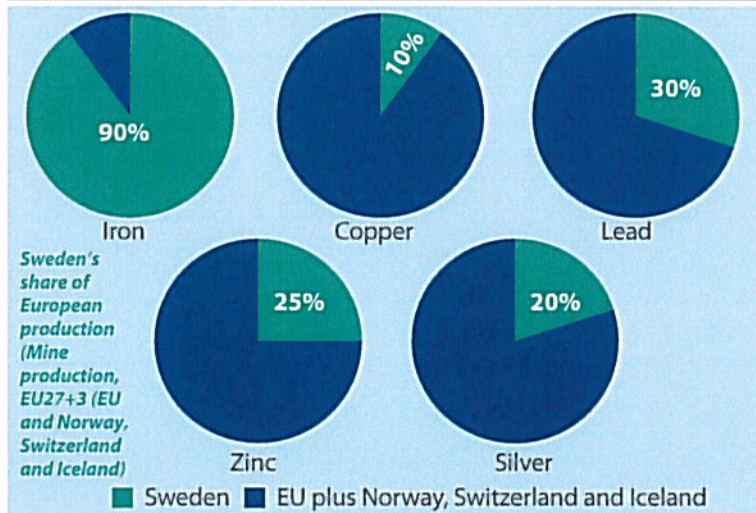
Finally, two dedicated gold mines have also opened over the past three decades – Björkdal in 1988 and Svartliden in 2005. They were founded by local exploration ventures and later developed by capital from Australia and Canada.

These are just two examples of how fresh ideas and new operating models have been brought in recent decades by foreign investors and geologists to rejuvenate the Swedish mining fraternity.

Mining in Sweden in 2012

Mine	Owner	Type	Production ore (Mt)	Metal content	Share of EU (%)
Iron ore				Mt	
Kiruna ¹	LKAB	UG	18.4	14.1	
Malmberget	LKAB	UG	9.7	8.6	
Gruvberget ²	LKAB	OP	1.2	3.1	
Tapuli	Northland	OP	0.2	0.1	
Dannemora	Dannemora	UG	0.9	0.3	
Total			30.4	26.2	91
Copper				('000t)	
Aitik	Boliden	OP	34.3	67.1	
Renström ³	Boliden	UG	0.3	11.9	
Mauriliden ^{4,5}	Boliden	OP	0.6		
Kristineberg	Boliden	UG	0.6		
Garpenberg ⁶	Boliden	UG		0.4	
Zinkgruvan ⁶	Lundin Mining	UG		3.1	
Total				82.5	9.9
Zinc				('000t)	
Zinkgruvan	Lundin Mining	UG	1.1	83.2	
Lovisa ⁷	Lovisagruvan AB	UG	0.04		
Garpenberg	Boliden	UG	1.6	74.8	
Boliden area ⁵	Boliden			30.4	
Total				188.4	24
Silver				(Moz)	
Zinkgruvan	Lundin Mining			1.8	
Lovisa ⁷	Lovisagruvan AB				
Garpenberg	Boliden			4.3	
Aitik	Boliden			1.6	
Boliden area ⁵	Boliden			1.3	
Total				9.0	18
Gold				(oz)	
Svartliden	Dragon Mining	OP/UG	0.4	32,472	
Björkdal	Elgin Mining	OP/UG	1.1	46,940	
Aitik	Boliden			63,015	
Boliden area	Boliden			45,975	
Garpenberg	Boliden			8,037	
Total				196,439	25.1

Source: Raw Materials Group data, Stockholm 2013. UG = underground OP = open pit. Notes: 1. Metal content refers to saleable products: fines, lump, pellets and concentrates. 2. The figure given for the Gruvberget production of saleable products also includes some ore from the Kiruna mine. 3. The figure 11.9 covers the entire Boliden area. 4. Mauriliden includes Mauriliden Östra and Mauriliden mines. 5. Mauriliden, Mauriliden Östra, Kristineberg and Renström are reported together under the heading Boliden area for metal contents. 6. Details of ore production for these mines are given below. 7. Lovisagruvan's metal content is included in Garpenberg.



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Exploration

Until the early 1990s, foreign ownership was prohibited in Sweden. Although it is now easier for foreigners to invest in the country's mining industry, there are still a number of legal obstacles that companies have to overcome.

The dominance of LKAB and Boliden, together with Swedish government-funded exploration, made the country less attractive to international companies in the 1980s and early 1990s.

As a result, the Swedish mining industry's relative isolation on the international stage delayed the start of the country's exploration boom. Little interest from the outside world meant few new ideas were coming into the market.

However, by the early 2000s, exploration expenditure in the country had grown to become an important boost to the regional economy in the northern parts of the country.

Nevertheless, this period marked a turbulent time financially for the international mining industry, which further thwarted the country's exploration progress. It was a period when high-cost countries such as Sweden tended not to be on the top of most international mining companies' priority lists.

The introduction of junior capital in the early 2000s provided an additional injection of vitality into the industry. But the limited results of these explora-

Truck outside the Boliden Aitik mine in Sweden, which is the country's largest copper mine

"It was a period when high-cost countries such as Sweden tended not to be on the top of most international mining companies' priority lists"



Photo: Boliden

tion efforts illustrates just how difficult it is to find orebodies even in regions where the geological conditions are, or at least should be, excellent.

The only really significant discovery in the
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Photo: LKAB



Photo: Boliden

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Fennoscandian shield in the past 20 years is the Sakatti deposit, which Anglo American plc identified in 2009. The copper-nickel-platinum group metals deposit is located 150km north of the Arctic Circle.

In 2012, exploration expenditure in Sweden reached between SK600 million-SK650 million. This

Left to right: open-pit Gruvberget mine in Svappavaara; a view of Boliden Aitik's open-pit copper mine

was a little less than expected, mainly due to a reduction in activities towards the end of the year. A combination of falling metal prices and a lack of risk capital, both in the domestic and international markets, are believed to be the primary reasons behind these problems.

It is expected that exploration expenditure will

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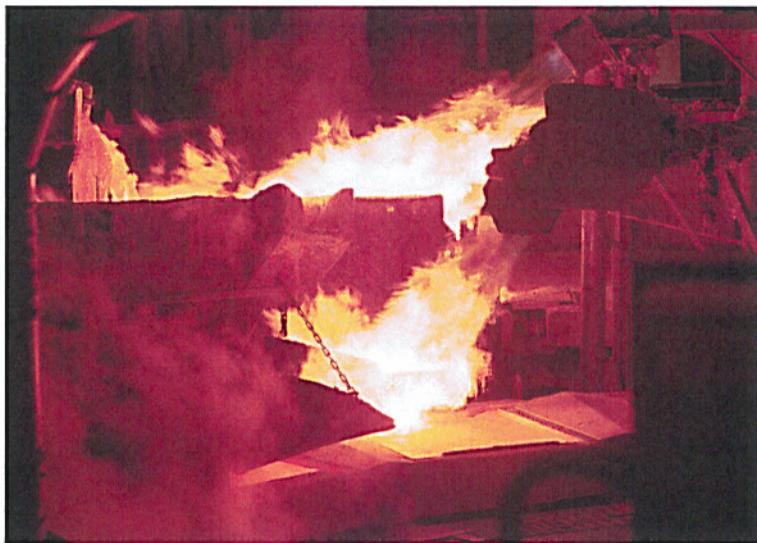


Photo: Boliden



Photo: LKAB

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fall further in 2014. Exploration in Sweden is dominated by Boliden, but in recent years LKAB has also resumed its activities outside existing operations.

There is, however, still a long way to go before LKAB is back to the coveted situation it was in during the 1980s, when its dedicated exploration subsidiary was looking for opportunities in a wide

Left to right: anode casting at Boliden's Rönnskär copper smelter; rock support in the Malmberget underground iron-ore mine

range of metals, both inside and outside of Sweden.

The juniors, both Swedish-based and a number of companies from Australia, Canada and elsewhere, have all experienced difficulties in getting funding for exploration programmes in the country. It is expected that this situation will last into at least early 2014.

Outlook

Public debate about the mining industry's social licence to operate and its contribution to the regional and national economy reached Sweden in 2013.

Local protests over the environmental effects of a limestone quarry on the island of Gotland in the Baltic Sea, and a potential iron-ore mine next to a national park in the north, broadened the discussion to a national level.

The idea of introducing a royalty has been put forward by certain political parties, but rejected by others.

At the same time, the government presented a new mineral strategy in 2013, which is, for the most part, pro-mining.

The policy recognises the importance of the sector, both directly for the northern regions and indirectly for major Swedish export earners such as Atlas Copco, Sandvik and other small and medium-sized equipment suppliers.

Support services

While Swedish mining companies may be highly efficient and profitable, they are small from a global perspective. The equipment suppliers, meanwhile, are global leaders and of crucial importance to the European quest for a more secure supply of metal raw materials.

The discussion is fierce and heated, but there is a high likelihood that a compromise can be reached that, in true Swedish fashion, will balance the interests of all stakeholders involved. ▼

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