

1. Mining

Initiatives in enterprise policy are focused on assisting towards more and growing companies, simplification of the regulatory framework and markets that work effectively. A focus on the green issues in enterprise policy must contribute to meeting the climate challenge and at the same time be used as a lever for new jobs and growth.

A fundamental condition to be met is that ore deposits are managed in a long-term sustainable way. Sweden is one of the largest mining nations in the EU. Swedish ore directly creates employment for around 4,000 people. Most of these jobs are in the more sparsely populated parts of the country. The mining industry is of great significance to the development of these regions. The mining of ore is an ecologically sensitive issue. It is therefore important to have rules (Minerals Act, Environmental Code and other laws) that provide good conditions for a strong mineral sector with responsible companies while individuals and ecological interests are also respected.

The following issues are of strategic importance to the development of the Swedish mining industry and for sustainable extraction.

Access to geological information

There is no state exploration in Sweden. The Geological Survey of Sweden makes fundamental geological information of high quality available to companies carrying out exploration. When companies hand back areas they have had permits to explore, without this having led to any mining, their basic information has to be entered into geological databases so that new exploring companies do not need to start again from scratch.

Good flow in exploration for new deposits

Statistics show that there is one new mine per 200 exploration permits. The Swedish bedrock is marketed both nationally and internationally to obtain a good flow in exploration. The Mineral Information Office at the Geological Survey of Sweden is a one-stop shop for exploration-related information.

Research and development

Grants for strategic research on sustainable utilisation of natural resources have increased by SEK 70 million in research and development policy. The development of effective and sustainable solutions for modern society's needs for metals and minerals poses a challenge. It makes great demands on a technology that prioritises resource-efficient production of raw materials, innovative products with high added value and minimised

impact on health and the environment. There is a need for a continued long-term effort in cooperation with industry to exploit the potential that exists both nationally and regionally for the development of these raw-material assets. The efforts should be focused on technology, for instance to find new deposits and new methods of extraction and production that result in increased resource efficiency and minimised environmental impact.

Training and availability of labour

The need for the supply of skills varies over time and therefore requires continuous monitoring and updating. Central government plays a key role in providing and being responsible for training and regulations, while industry plays an important role by working on image issues in order to attract skills by offering work placements. To enable effective interaction to take place between the various actors it is appropriate for industry in dialogue with universities and colleges, as well as other training coordinators, to try to find ways of reviewing and ensuring that subjects that are relevant and in demand are included in the training courses offered. Cooperation with other mining nations is required in order to attain critical mass and make it possible to maintain relevant training.

Enhanced infrastructure

Continuous work is required to develop the transport infrastructure in such a way that ore producers can transport their raw materials to their customers in an environmentally friendly and sustainable way. This favours both raw-material suppliers and manufacturing industry.

2. Mining

Sweden today is one of the European Union's major mining countries but globally is a small mining player. At the end of 2008 there were thirteen mines operating in Sweden. Iron ore is mined at Kiirunavaara and Malmberget in Lapland, while sulphide ore and gold are extracted at other mines.

Our geological conditions offer great potential for new discoveries of mineral deposits. The law regulating mineral exploration and extraction on land is the Minerals Act. This is primarily an industrial policy instrument. Its purpose is to promote the extraction of minerals the Government and Riksdag consider to be industrially exploitable and socio-economically important and whose discovery through exploration and extraction is complicated and resource-intensive. In 1991 state subsidies for exploration were phased out. Since then the amount spent on exploration has risen.

The mineral sector is of vital importance for employment, primarily in the northernmost parts of the country. Two of the largest industrial investments in 2008 and 2009 have been in the mining sector in northern Sweden (LKAB and Boliden Mineral).

There is a cluster of companies in the exploration, mining, process engineering and environmental technology sectors that are world leaders in their field. The Swedish resource base has a long tradition of developing efficient and sustainable solutions to meet the country's metal and mineral needs.

The Swedish mining and ore processing industry has been, and still is, a demanding purchaser of equipment and services. It is also an important driver of national, regional and local economic development. This has helped Sweden to establish a unique international position in the supply of mining equipment.

The objectives and framework of mining and minerals policy

Geological information must contribute to greater knowledge and skills in the business sector and in organisations and be more extensively used for society's needs. This information must provide opportunities for business development and entrepreneurship.

Use must be made of the mineral resources, taking account of long-term sustainable development and the need to generate more job opportunities.

An effective and active system for organising permits, supervision and information must facilitate the exploration and extraction of the mineral substances covered by the Minerals Act.

The instruments available to the Government for the development of mining and minerals policy are the Geological Survey of Sweden, the Mining Inspectorate, the Minerals Act (1991:45) and the Act on the Continental Shelf (1966:314).

Planning legislation and environmental law are also of key importance for operations and development in this sector.

The Geological Survey of Sweden

The Geological Survey of Sweden is the government authority for geology and minerals issues in Sweden. It undertakes surveys, documents and provides information on bedrock, soil and groundwater in Sweden. The overall objective of its activities is to generate sustainable economic growth and greater employment by encouraging more and growing enterprises.

One of its most important tasks is to meet society's demands for geological information. This information is used, for example, by municipalities, county administrative boards, companies and agencies as a basis for environmental work and for infrastructure planning. It is also used by Swedish and foreign exploration companies seeking new ores, and by building and construction companies.

The Geological Survey of Sweden is responsible for the national environmental quality objective of "High-quality Groundwater" and takes part in work towards the national environmental quality objective of "Good Urban Environment". It is also the authority in charge of phasing out and environmentally assuring the facilities in which the state previously stored emergency oil stocks.

The Geological Survey of Sweden is also active in basic research and applied research in geosciences and administers a research programme for industrial minerals etc. The Geological Survey of Sweden has two advisory bodies for activities in the mining and minerals sector, namely the Advisory Council for Mineral Resources and the Advisory Council for Minerals Exploration. The Geological Survey of Sweden is the governing authority of the Mining Inspectorate, which entails certain administrative tasks.

The Mining Inspectorate

The Mining Inspector is an authority for issues related to the Minerals Act. The Mining Inspector is head of the Mining Inspectorate and appointed by the Government.

The Mining Inspector's task is to assess applications and issue permits required for exploration and exploitation of mineral deposits and to supervise compliance with the law. The Mining Inspectorate also provides information to prospectors and mineral companies, landowners, the general public, county administrative boards and municipalities.

The Mineral Resources Information Office in Malå

The Geological Survey of Sweden runs the Mineral Resources Information Office in Malå (in the county of Västerbotten). The staff have good knowledge and many years' experience of exploration and prospecting. Basic geological information and an extensive drill core archive are available at the Office. Exploration reports on geology, geophysics and geochemistry are collected, stored and made available at the Mineral Resources Information Office.

Swedish Minerals Act (1991:45)

The Act is applicable to exploration and exploitation on land regardless of its ownership, of the following mineral substances (concession minerals):

1. antimony, arsenic, beryllium, lead, caesium, gold, iridium, iron occurring in the bedrock, cobalt, copper, chromium, mercury, lanthanum and lanthanides, lithium, manganese, molybdenum, nickel, niobium, osmium, palladium, platinum, rhodium, rubidium, ruthenium, silver, scandium, strontium, tantalum, tin, titanium, thorium, uranium, vanadium, bismuth, tungsten, yttrium, zinc and zirconium,
2. alum shale, andalusite, apatite, brucite, fluorspar, graphite, kyanite, refractory clay or clinking clay, magnesite, pyrrhotite, nepheline syenite, sillimanite, coal, rock salt or other salt occurring in a similar manner, pyrite, barite and wollastonite.
3. oil, gaseous hydrocarbons and diamonds.

Exploration permits

An exploration permit is granted for a specific area where there is a likelihood of a successful discovery being made. The area should be of suitable shape and size and no larger than may be assumed can be explored by the permit holder in an appropriate manner.

A permit shall not be granted, however, if it is obvious that the applicant does not have the opportunity or intention to conduct appropriate exploration or has previously been shown to be unsuitable for conducting exploration work.

An exploration permit is valid for a period of three years from the date of issue. After that, on application, it may be extended by another period of up to three years if suitable exploration has been carried out within the area. In exceptional cases, the period of validity of the permit may be further extended but for no more than a total of four years, and in extreme cases by a further maximum of five years. This means that the longest possible validity period for any one permit is 15 years if it is proven that extended exploration work has been carried out.

Exploration and exploitation cannot be carried out in national parks. Such activities are also seldom permitted in certain other areas, for example within 200 m of any inhabited building and within certain areas in the Swedish mountains.

Before the beginning of any exploration work that can have a significant impact on the natural environment, notice of consultation has to be made to the County administrative Board in accordance with the provisions of the Environmental Code.

Before exploration work begins, the permit holder must establish a working plan. The plan has to contain a description of the work intended, a timetable and an assessment of the impact on private rights and public interests.

The explorer has to provide security for the compensation of damage and encroachment from exploration work. Before any work can start the sum of security has to be guaranteed.

When an exploration permit is terminated without the granting of an exploitation concession within the exploration area, the permit holder – if he is carrying on exploration work professionally – within three months at the latest has to provide a report of exploration performed to the Swedish Geological Survey.

Exploitation concession

A concession is valid for a definite area, decided on the basis of the extent of the deposit, the purpose of the concession and other circumstances. A concession has to be granted if a mineral deposit has been found which can probably be exploited economically.

The Environmental Code is applicable in matters concerning the granting of a concession, which means, among other things, that an Environmental Impact Assessment has to be contained in an application.

An exploitation concession is granted for a period of 25 years unless the applicant requests a shorter period of time. The concession period is extended by ten years at a time without application if regular exploration is in progress when the period of validity expires. When mining, the holder of an exploitation concession must pay an annual minerals fee to the landowners of the concession area and the state. The fee is 2 parts per thousand (i.e 0.2%) of the average value of the concessions minerals mined, 1.5 part per thousand of which is paid to the landowners to be distributed among them in proportion to their share of the concession area. The remaining 0.5 parts per thousand (0.05%) is paid to the state to be used for research and development in the field of sustainable development of mineral resources.

Continental Shelf Act (1966:314)

In this Act “the continental shelf” means the seabed and its subsoil within public waters and within such an area of the sea outside Sweden’s territorial limit as the Government may determine in accordance with the Convention on the Continental Shelf, signed in Geneva on 29 April 1958.

“Natural resources of the continental shelf” refers in this Act to the mineral and other nonliving natural resources of the seabed and the subsoil, together with living organisms which, at the harvestable stage, either are immobile on or under the seabed or are unable to move except in constant physical contact with the seabed or the subsoil.

The right to explore the continental shelf and exploit its natural resources belongs to the State. The Government or such authority as the Government may determine may grant a permit to a person other than the State to explore the continental shelf by means of geophysical measurements, drilling or in any other way and to exploit its natural resources.

Exploration of the continental shelf and exploitation of its natural resources is subject to the provisions of Chapter 2 of the Environmental Code, even when such activities are undertaken outside territorial limits.

Other legislation

Regulations for compliance and monitoring public/stakeholder consultations and participation in decision making related to mining as well as rehabilitation and mine closure planning are incorporated into the Mining Act and in other legislation. Among the acts with provisions affecting the activities referred to in the Minerals Act are:

- Environmental Code
- Planning and Building Act
- Act concerning the Cultural Heritage Management

The rights of the populations of Sami settlements and the Sami as owners and citizens are safeguarded in various ways in Swedish legislation. The rights of the populations of Sami settlements as owners are recognised in the Minerals Act. The populations of Sami settlements being given an opportunity to play an active part in consultation processes is of great significance in enabling reindeer husbandry and mining to work together with respect for each other's circumstances.

Swedish Environmental Code

The Environmental Code is applicable to all citizens and economic operators undertaking operations or measures that conflict with the objectives of the Code. The rules of the Code apply to all whose activities are potentially detrimental to human health or the environment, damage the natural or cultural environment or deplete biological diversity. The rules apply to all kinds of impacts on the natural environment, whether large or small.

They also apply to the housing environment and the built environment and to all other places to which the public has access. All operations that give rise to emissions to land, water or air are deemed environmentally hazardous and must therefore comply with the rules.

The provisions of the Environmental Code apply to operations and measures that affect the environment and human health even where these are covered by other legislation. Its rules and the provisions of other legislation are thus applicable in parallel.

The purpose of the provisions concerning land management is to specify important areas of interest to community development that are to be given priority when decisions are made concerning land use. The interests referred to in the provisions are to be protected as far as possible from such changes in land use as would be detrimental to them.

The provisions concerning land management take into account both conservation interests and utilisation interests. In specific areas, these conservation and utilisation interests may be designated national interest by the government, which means that they enjoy even stronger protection against modification.

The provisions on national interests apply mostly to very large areas. They are therefore not intended to prevent the development of urban areas and local industry or total defence installations or the extraction of certain substances and materials.

Environmental Impact Assessment

An environmental impact assessment must be prepared by an operator before a permit application related to environmentally-hazardous activity is submitted and must be attached to the application. The cost of preparing such statements is borne by the operator. Together with a regulated consultation process, the assessment should provide the best possible decision guidance data from the point of view of the environment and health.

The purpose of the environmental impact statement process is to detect knowledge gaps and increase understanding of the environmental, health and natural resource issues involved in the project. Environmental impact statements are required under other legislation, such as the Minerals Act.

Fiscal policies

The Swedish tax structure is transparent and efficient and designed to meet the needs of international investors. Corporate income tax is low by international standards and effective rates can be even lower as companies have the option of making deductible annual appropriations to a tax allocation reserve of up to 25 percent of their profit. As of 1 January 2009 the corporate tax rate is 26.3 percent.

Best practices

Systematic environmental work and increased skills in companies, partly in response to legal requirements and financial policy levers, have helped reduce emissions and energy use within the mining and metals industries. The challenge now is to sustain development activities so as to meet the Swedish environmental quality objectives while also reaching targets for growth, greater competitiveness and increased employment. In other words, the three dimensions of the concept of sustainable development – economic, social and ecological – must be taken into account concurrently. Predictable and long-term rules are crucial for continued development.

All aspects of sustainability must be seen in the light of the fact that the mining industry, unlike most others, can only operate where there are suitable mineral deposits. These are deposits that can be extracted in an economically, legally, technically and environmentally acceptable way.

Mining operations impact the environment. Mines, quarries and gravel pits leave scars on nature; residual rock must often be land-filled. Gradual improvements are being made in Sweden and abroad. Abandoned mines and quarries are now being treated in a way that will allow new uses.

Sustainable development is also about reducing the need to mine or quarry new deposits. The principle is not to discard products unnecessarily when they can still be used. When a product is finally disposed of, this must be done in such a way as to allow the material in the product to be recycled.

Research and Development

Research and development is essential for a sustainable mining industry – as for all other industrial operations. It is important to assure sufficient and continuous support for targeted basic research and for more applied

research conducted in collaboration with trade and industry. This applies to the entire production chain – from finding new reserves to extraction, production and site remediation.

Applied research in the geosciences is conducted in Sweden at the universities, principally at Gothenburg, Lund, Stockholm, Luleå and Uppsala. In addition, long-standing collaboration takes place between universities, private enterprise, trade associations and public agencies in the form of various innovation centres, sectoral research programmes etc. In addition, the Geological Survey of Sweden awards grants each year for targeted basic research and applied research in the geosciences. In the last few years a proposal concerning a considerable increase in grants has been made, including those for ore geological research. In the minerals sector, a Mining Research Programme is currently in progress (2006-2010) as well as a programme for the industrial minerals, aggregates and dimension stone industries (MinBaS II, 2007-2011), for which the Swedish State is contributing half the funding, provided that the industry contributes at least the same amount.

Priority areas for research include developing multi-dimensional geological models to improve our knowledge of deep-lying ores, thereby increasing available ore reserves. A demand for minerals and metals that were previously of no economic interest increases the need for more detailed knowledge of all types of mineral deposits and greater understanding of the various ore-forming processes. Advanced and deepened knowledge of bedrock geology and refined geophysical monitoring methods can provide greater understanding of the structure and properties of the bedrock and also create new opportunities to locate deposits in areas other than the known ore regions. Greater understanding of rock properties and characteristics is also important as mining depths become ever greater and bring with them a growing importance of worker safety issues as well as technical challenges.

Many complex deposits might be minable if the various constituent metals could be separated out by leaching. This is also of interest from an environmental viewpoint, since unwanted metals can then be removed from the process and isolated as early as the ore dressing phase. The production systems for mining and beneficiation can also be improved by lower energy consumption, better yields and minimised environmental impact. For instance, improved rock disintegration can cut costs and reduce incorporation of rock waste, raise ore yields, improve product quality and reduce spillage. Since metals are not really consumed, there is great potential for recycling. Even today, 40 percent of new steel produced comes from scrap, and there is scope for further recycling of most metals.

Improved infrastructure

An important – often decisive – difference between mining and other industrial operations concerns the scope for location of operations. Normally, an industrial plant can be sited close to existing infrastructure such as roads, railways and ports or energy supply systems. Proximity to customers and sub-contractors and the availability of skilled labour also influence the location chosen.

However, for obvious reasons mining must always be located where the mineral deposits are. Access to strategic infrastructure is therefore often a factor deciding whether or not a given mining operation will be profitable and sustainable.

Global development cooperation

Associated with the Swedish mining and steel industry is a cluster of companies engaged in exploration, extraction, process engineering and environmental technology that are world leaders in their respective fields. Thanks to Sweden's position as a mining nation, with efficient public administration and effective regulation in the field of minerals, it can make a real difference to the efforts of developing countries possessing rich mineral resources to build capacity to achieve fair and sustainable development. This will help to reduce poverty and stabilise markets. The Swedish Geological Survey, together with the Swedish Development Cooperation Agency (SIDA), has recently started a project "Meeting Point Mining" for development cooperation with mining countries such as South Africa, Botswana and Namibia.

An example of work on sustainable development in the mining industry

LKAB is a world-class mining company, which has two iron ore mines, more than 1000 metres deep in the north of Sweden. It is a world-leading producer of upgraded iron ore products, mainly pellets used in steel manufacturing.

LKAB is increasing its production of iron ore and pellets by investing in new enrichment plants and new head levels in both its mines in Kiruna and Malmberget.

The investments are being made in two small communities, Kiruna and Gällivare/Malmberget. In addition, LKAB's mining method (sub-level caving) has such an impact on the ground that parts of both the towns of Kiruna and Malmberg gradually need to be moved.

This is a long-term process that makes great demands on the mining company, on the municipalities and the county administrative board in Norrbotten and above all on the people affected by the impact of the mining operation.

The Government is following developments closely through Malmfältsgruppen (the 'Orefield Group') under the Minister of Enterprise, Employment and Communications – a high-level forum for dialogue on overarching issues that affect the growth of the mining industry in the two localities. In addition the Government has set up a working group containing officials from various affected ministries. The Group's task is to coordinate the cooperation for effective administration of cases that relate to the planned changes in Kiruna and Gällivare/Malmberget.

The international conference City Move Interdesign was recently held in Gällivare/Malmberget so that 38 participants from 18 countries over a period of two weeks could find specific solutions using modern design methods for a positive, secure and flexible social conversion with the involvement of the population. Special emphasis was put on environmentally sustainable and effective system solutions.

City Move Interdesign recommended that the following procedure be followed when a town has to be moved:

- Involve the population
- Create a realisable vision based on humanistic, social, sustainable, economic and architectural principles
- Draw up a timetable and follow it
- Inform too much rather than too little
- Be prepared to argue, including with opponents
- Highlight positive and hopeful aspects
- Involve the young

This is an example of a way of dealing with an unusual problem with great global relevance. The result can provide a good basis for real and humanistic comprehensive solutions for the sustainable cities of the future.