FACTSHEET

Mining in the European Arctic

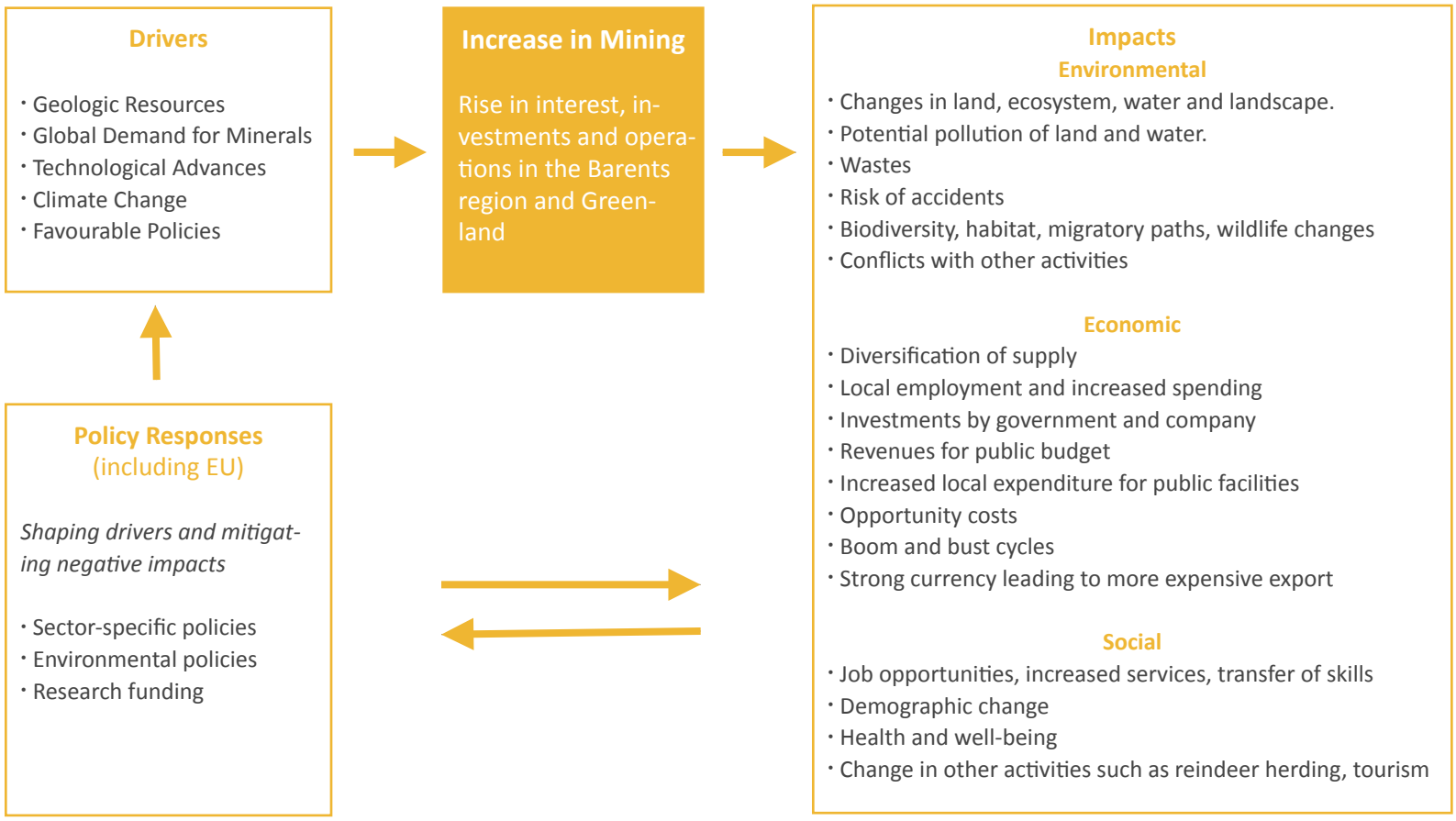
Overview

The European Arctic contains vast amounts of mineral resources. Mining activity in the Arctic is intensifying in response to growing global demand. Mining contributes to economic development, but not without consequences: mining can have considerable impacts on the physical environment, land use and societies.

While mining is often significant for national economies, it is in local Arctic communities that the environmental, economic, and socio-cultural impacts are mostly felt. In these communities, extractive resource industries may be viewed both as an opportunity for wealth creation as well as a threat to people's livelihoods. Extracting minerals in the Arctic is both challenging and expensive. It is complicated by the extreme environment, remoteness, lack of roads and limited availability of skilled labour. Yet there is a boom underway as high market prices and improved technology have triggered action by mining companies.

This factsheet deals with the increase of mining activity in the European Arctic (areas between Greenland and Northwest Russia). Notably, this trend is developing so quickly that reliable data are hard to obtain. Our focus is mainly on traditional metallic ores.

Figure 1: **Increase in Arctic Mining Activity: Drivers and Impacts**



ARCTIC

European Commission

Website: www.arcticinfo.eu

Strategic Environmental Impact Assessment of Development of the Arctic

This factsheet is to stimulate dialogue between stakeholders, Arctic experts and EU policymakers. Stakeholder input informs the analysis of trends and the role of the European Union in shaping Arctic developments. It will lead to recommendations to EU policymakers and be published as the Strategic Assessment of Development of the Arctic Report in spring 2014. The European Commission-funded project is implemented by a network of 19 institutions lead by the Arctic Centre in Rovaniemi and is linked to the EU Arctic Information Centre initiative.

Figure 2: Mining activities in Northern Fennoscandia and Greenland.

Source: Ricardo Prevettoni, GRID-Arendal 2014.

There is a Notable Upsurge in Mining Activity

More mining activity is a clear trend in most Euro-Arctic regions. Yet the state of the physical infrastructure, regulatory and administrative frameworks, human resources and the societal awareness of mining and its impacts differs.

Some are mature regions with a history of mining, such as Fennoscandia, with well-established social and physical infrastructure, and regulatory frameworks. In other areas, such as Greenland, mining is a new activity that brings challenges as well as opportunities.

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Development of the mining sector is sensitive to global price fluctuations. For example, mining activity slowed in Greenland with the 2008 economic crisis.

Mining has a "boom and bust" character and creates risk of economic decoupling whereby economic benefits are exported to other regions. There is concern over the uncertainty of mining impacts on local livelihoods.

Mining Rush in Fennoscandia and Russia

The mining industry has a long history in Fennoscandia, Svalbard and Northwest Russia and is a well-integrated part of the economy. Here mining activity is increasing rapidly, as evidenced by more private sector interest and government attention to ensuring relevant national policies. Today there are more than 40 active mines in the Fennoscandia region, of which ten opened (or reopened) in the last decade (Figure 2).

Mining Rush in Greenland

Greenland has major potential in the known geologic occurrences along the coastline (what is under the Greenland ice sheet is largely unknown). Greenland is an example of a frontier region with limited mining infrastructure and challenging physical circumstances, yet it is experiencing a significant increase in mining activity.

For instance, the number of licenses issued increased from 17 in 2002 to 94 in 2010 (Figure 3). The Government of Greenland favors mining development and wants to take advantage of economic opportunities, expecting that revenues will help finance expansion of its autonomy and possibly independence.

Today, Greenland has one operating gold mine with two more expected to open soon (Figure 2). The rare earth oxides deposit at Kvanefjled is second in size to rare earth elements (REE) deposits in China.

What is Driving the Boom in Mining?

Geology

Having the appropriate geology is essential. The European Arctic has significant mineral resources some of which are found in few other places in the world. For example, Greenland holds great potential for rare earth elements and uranium.

Global Demand and Prices

Trends such as rapid modernization in countries like China and India, and deployment of advanced technologies (such as wind turbine generators, mobile phones and hybrid cars) that require rare earth elements push global demand for minerals. This can augment prices and profitability and spur increased minerals mining.

Technological Advances

Progress in exploration and operation technologies and methods, as well as shipping technologies make Arctic resources more accessible, usually at lower costs. Examples include improved seismic exploration and mapping technologies, and methods to mine in permafrost.

Legal, Administrative and Political Landscape

Public attitudes in the European Arctic are often, though not exclusively, in favor of mining developments. This is represented in generally conducive regulatory frameworks, comparatively smooth administrative processes and support of local and national decision-makers.

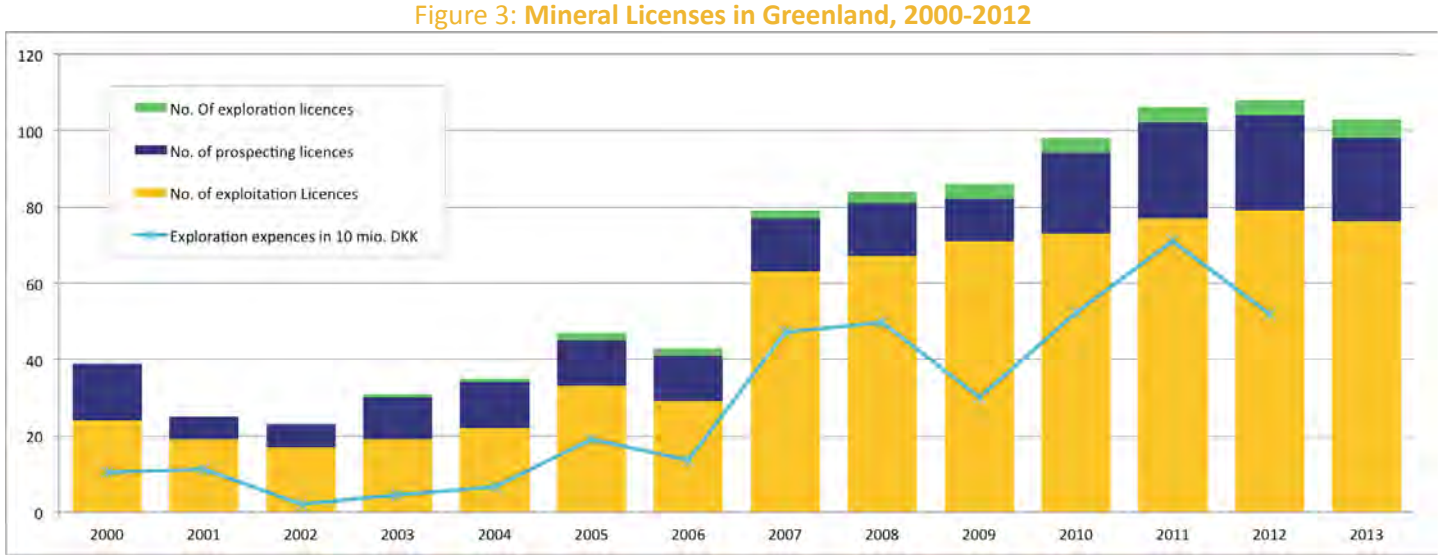
Climate Change

Physical changes also seem to be a driving force behind increased mining activity, although to a rather modest degree, especially in Fennoscandia. Climate change may influence mining directly through easier access to resources (in particular in Greenland), longer operating seasons and possibly indirectly via lower transport costs due to shorter shipping routes.

Impacts of Mining Development in the Arctic

Mining activities have considerable effects on the economy, environment and society. Impacts differ depending on the spatial scale (global, national, and local), stage of mine development, type of mining activity and the existing infrastructure. Impacts can be both positive and negative.

Figure 3: **Mineral Licenses in Greenland, 2000-2012**



Notes: A prospecting license is non-exclusive permission to explore in a given area, so more than one company may conduct exploration activities. An exploration license has an exclusive character. Source: Bureau of Minerals and Petroleum, Government of Greenland, *www.bmp.gl.*

Impact Assessments are in place in all European Arctic countries. Ideally they are based on an integrated assessment of the interrelated environmental, economic and social impacts.

Environmental Impacts

Mining has significant environmental impacts including visible changes in the landscape and potential pollution of water, air and land. The area affected is usually large and not restricted to the actual mining site and duration of operations. While the nature of impacts varies depending on local conditions, type of resource, and applied technology, all Arctic regions share the characteristic of having very sensitive ecosystems, with long recovery times.

Contaminated Release from Talvivaara Nickel Mine Waste Pond

Large quantities of contaminated water leaked into surrounding rivers and lakes from a waste water pond at the Talvivaara nickel mine in eastern Finland in November 2012 and again in April 2013. The waste water contained high levels of aluminum, cadmium, nickel, zinc and uranium (a by-product of nickel extraction). Both incidents met with vocal public outcry, especially when the mine resumed operations in May 2013.

Mining activities often conflict with other forms of land uses (see factsheet *Increasing Land-Use Pressures in the European Arctic*). Mining may seriously alter the landscape, destroy reindeer breeding grounds and migratory routes, and jeopardize fishing in rivers, lakes and seas.

> "A critical question is how to manage long-term impacts"

The environmental impacts of mining on land, water, air and wildlife are most evident when the mine is being constructed, subsequently during its operation and are cumulative. Exploration phase activities can disturb local conditions and communities, such as the use of land for camps and landing strips, and wastes from sampling programmes.

The boom and bust cycles of mining can turn active mines idle until the market for its commodity becomes more robust, raising concerns about environmental management during periods of inactivity. A critical question is how to manage long-term impacts such as waste, decommissioning and rehabilitation when the mine ceases operation.

Controversy Brewing: Uranium Mining

Uranium is a controversial commodity. A number of countries have banned its extraction. Some have lifted, or are considering to, moratoriums on uranium mining. Greenland, for instance, may abandon a zero-tolerance policy and allow uranium mining in southern Greenland (where uranium is found in combination with the highly sought rare earth elements deposits). Environmental NGOs fear chemical pollution, radioactivity in tailings and accidents that could harm the environment. A large number of environmental and civil society organisations are urging Greenland and Danish authorities to preserve the ban on uranium extraction. Similar discussions are ongoing in other countries, particularly in Finland.

Number of People Employed in Mining

Norway: 5.980 in 2012 (26% in three northern-most counties).

Sweden: 4.370 in 2011 (82% in two northern-most counties), two-thirds in iron ore mines.

Finland 5.762 in 2011 (45% in three northern-most regions).

Greenland 550 in 2011 with major annual changes (108 in 2008; 38 in 2009; 263 in 2010).

Sources: Greenland statistics, www.bank.stat.gl/; Statistics on establishments by ELY Centre, Tilastokeskus, yritys -ja toimipaikkarekisteri, 2011, www2.toimialaonline.fi/; Mineralressurser i Norge 2012, Publikasjon nr 1, NGU 2013.

Economic Impacts

Typically, developing a mine involves investment flows, employment opportunities, trade and transport spending. This can bring both positive and negative economic impacts.

Potential economic opportunities for wealth creation include:

- **Local employment** can be a strong source of positive economic impact at both the local and national level. In particular since it generates multiplier effects - local consumption increases and the demand for goods and services boosts economic activity at the local level. These benefits may even continue after the mines closes, as sustainable post-decommissioning plans are adopted, in particular with regard to minimizing the impact of job losses.

- **Royalties** can generate significant revenues for regional and national budgets. While at the same time governments may also increase spending for infrastructure and facilities for the new industry. Many mining companies have adopted the Corporate Social Responsibility agenda and therefore may be expected to contribute to the social, economic and institutional development of the communities in which they operate.

Testing in the Hannukainen mine, Finland.

Photo: yle.fi

Gold Mine in Kittilä, Finland.

Photo: Odd Iglebaek, Nordregio Journal 2009.

• **Self-sufficiency** of national economies regarding mineral resources may increase, thereby reducing import dependency.

Potential negative economic impacts associated with mining include:

• **Costs and benefits** may be unfairly distributed between stakeholders affected by or engaged in mining, in particular where regulatory frameworks for equitable benefit/tax sharing and provisions for social/economic impact assessment are insufficient. For example, higher health care and education expenditure by municipalities related to the inflow of construction and mining workers and their families does not always match the tax gains associated with mining.

• **Human resource drain** from other local economic activities.

Social Impacts

Social impacts are effects on the culture and livelihoods of the local and regional populations. They can emerge long before a mine is actually brought into operation, for example, expectations about future prospects may change social relations.

Impacts may include:

• Opportunities to build and expand local infrastructure.

• Opportunities to build and expand community services to meet additional demand such as schools, administration, law enforcement, health care and emergency response.

• Opportunities for other economic and social activities may follow the development of social and transport infrastructure.

• Increased dependence of communities on the dynamics of global minerals markets and potentially adverse social consequences of mine shutdowns. Demographic shifts in areas (*e.g.* Lapland) with patterns of out-migration may experience an influx of workers, which may outnumber the locals. This may disrupt the structure of the local population and contribute to social problems. Evidence indicates that newcomers who stay temporarily in the Arctic develop only a utilitarian relation to the surrounding area.

• Mining developments may take on an "island" character, particularly in remote areas, where a workforce may be brought in from outside the region.

• Adverse impacts on well-being and leisure may be experienced in connection with environmental impacts.

• Improved accessibility due to infrastructure developments associated with mining, as well as socio-economic and legal pressures, accelerates modernisation of societies and may adversely affect traditional livelihoods.

Governance

Due to social, economic and environmental concerns, mining in the Arctic is more and more a subject of debate. Protests of some stakeholders oppose others who support development. This is related to the increase in number and complexity of involved stakeholders and their role, interests and perceptions.

Circumpolar Information: Guide on Mining for Indigenous Peoples and Northern Communities

This guide provides information on how for every stage of mine development and operation that local stakeholders can understand, influence and participate in the process. It aims to maximise the benefits for communities and minimise the negative social, environmental and economic impacts of mining on their lives.

Sustainable Development Working Group of the Arctic Council, www.sdwg/media.php?mid=1206

Overall, national governments regulate and manage mining activity. They usually are responsible for geologic information, issuing permits for exploration and development, licensing, land management and environmental review processes.

Many Nordic countries have recently revised mining legislation or adopted strategies that stimulate mining development focused on its economic opportunities. Regional and local governments also have important roles in governance for planning, development, operation, decommissioning, monitoring and mitigating of impacts of mining activities.

Environmental impact assessments (EIAs) are a critical step in mining development. They include formal procedures for examining impacts of a project, identifying alternatives and mitigation measures.

However, the effectiveness and degree of influence of EIAs varies in different countries and generally is not straightforward, as decisions and permits are weighed in the context of other considerations. Ideally, an EIA should include social aspects (as in Finland) or be accompanied by social impact assessment (as in Greenland).

Most of current boom is determined by international mining companies and their investors (with a few exceptions, *e.g.*, Sweden's state-owned Kiruna LKAB iron mine). Often smaller companies are involved in the exploration phase, but major multinational enterprises build and operate the mine.

In addition, financial institutions, investors and insurers are needed to finance developments. Various co-management regimes have given more control over Arctic mining developments to indigenous and local populations, but unresolved issues regarding land rights and benefit sharing remain.

Various international environmental instruments may be relevant to mining operations, *e.g*. Ramsar Convention on Wetlands. However, regulations and guidelines specific to the Arctic mining can be considered fairly weak. For example, the Arctic Environmental Impact Assessment Guidelines (adopted in 1997 under Arctic Environmental Protection Strategy) remain largely unknown. Co-operation among the mining industry may also influence norms for mining operations and corporate standard-setting.

How Arctic Mining May Affect the European Union

The European Union (EU) is a major consumer and importer of Arctic raw materials, and so is affected by the observed increase in mining activity in the Arctic. Some of the main EU interests affected are highlighted here.

EU Interest – Security of Supply

The EU is dependent on the import of minerals. It has defined security of supply a top priority in its policy regarding raw materials, including critical minerals such as cobalt and platinum, which are important in value chains and have a high risk of shortage within the next ten years.

> "A major part of the EU´s domestic hard mineral supply, with potential for growing importance, comes from the Barents Region."

The EU is fully dependent on imports of rare earth elements from China, which are essential in manufacturing many modern technologies. China accounts for 95% of the world's current supply of rare earth elements.

Critical Mineral Supply for Europe

In 2011, Sweden and Finland together provided 28% of gold production, 27% of zinc, 17.5% of silver and almost 11% of copper to the EU-35 (EU, EEA and EU candidate countries). Finland provided 62% and Norway 18% of EU-35 cobalt production.

North Russia has significant deposits and current production: Murmansk Oblast holds more than 200 deposits and 40 types of minerals. Surveys in Greenland indicate deposits of niobium, tantalum, graphite, platinum and rare earth elements.

A major part of the EU's domestic hard mineral supply, with potential for growing importance, comes from the Barents region. Further exploitation of European Arctic minerals may significantly influence EU supply by enhancing diversification and decreasing dependence on imports, especially from regions considered potentially unstable. Prospects for developing important rare earth minerals and raw materials further highlight the Arctic region in terms of political and strategic significance regarding mineral policy and diplomacy.

Stakeholders in Arctic Mining Developments

Engaged stakeholders are numerous and the scope is wide. Some of the principle stakeholders include national, regional and local authorities; local communities; reindeer herding co-operatives; the mining industry and its service providers; public and private interests (financial institutions, construction, management, maritime transport, insurance, etc.). Indigenous groups, local and international NGOs also have a keen stake. In addition to the eight Arctic states, many other countries are moving to assert claims as stakeholders with regard to Arctic issues and natural resource developments. The European Parliament passed a resolution in 2008 staking a claim to be accepted as a legitimate stakeholder in assessing Arctic issues.

EU Interest – Importance for EU Labour Market

Extractive industries are international in terms of ownership structure of mining companies as well as their workforce. In the Barents region and Greenland, construction and operation of mines involves foreign labour, a significant portion of which comes from EU Member States.

EU Interest – Global Environmental Protection

Mines have significant environmental impacts locally, which are also manifested in the European Arctic, but certain operations, especially in the case of minerals such as nickel, are noteworthy for the EU in relation to its greenhouse-gas emissions targets and mercury pollution (for gold mining).

> "In the Barents region and Greenland, construction and operation of mines involves foreign labour, a significant portion of which comes from EU Member States."

How Does the European Union Influence Arctic Mining?

The EU influences the mining sector directly and indirectly through legislation and various policy measures.

Creating Favorable Conditions for Mining in the European North

Recognizing the importance of resource development in the EU, the Raw Materials Initiative (EU COM/2008/699) was launched. It identified measures to secure supplies of raw materials for the EU from both domestic and international sources.

Mitigating Impacts of Mining and Setting Limits to Resource Extraction

- Natura2000 and related legislation aim to assure the long-term survival of Europe's most valuable and threatened species and habitats by limiting human activity. The EU elaborated specific guidance on extractive activities at designated Natura2000 sites.
- The Water Framework Directive (2000/60/EC) sets rules and standards to protect surface and ground water from chemical contamination from mine operations.

Abandoned mine in Pyramiden, Svalbard.

Photo: Frits Steenhuisen, Arctic Centre, University of Groningen.

- The Mining Waste Directive (2006/21/EC) sets management rules to apply best available techniques for extraction, treatment and storage of mineral resources. The aim is to avoid and minimise water and soil pollution from acid or alkaline drainage or leaching of heavy metals.

- The EU establishes minimum requirements for the conduct of environmental impact assessments (EIAs), implemented by EU and European Economic Area Member States (2011/92/EU). EIAs are critically important for mining projects. Revisions to the legislation are currently underway, enhancing the role for public authorities in conducting the assessments.

- The Mineral-Extracting Industries Directive (92/91/EEC) establishes the minimum requirements for improving the safety and health protection of workers related to drilling in extractive industries.

Transport for Mining

Expanding mining industry in the Barents region requires the development of transport corridors. There is a vital role for EU initiatives such as TEN-T network to enhance capacity and multi-modality of transport.

On the other hand, the recent amendment of the EU Sulphur Directive – following MARPOL convention amendments – limits the sulphur content in marine fuels (specifically in the Sulphur Emissions Control Areas, such as the Baltic Sea). This potentially influences economic conditions for mining operations in northern Sweden and Finland, using Baltic ports such as Kemi, since low-sulphur fuel increases transportation costs.

Supporting Research on Innovation and Sustainability in Mining

Research and innovation funding is provided through various Framework Programme 7 and EU regional funds. There are several research projects dedicated to mining, such as ABSORBNET (materials science related to rock fall protection) and ProMine (nanoparticle products from new mineral resources).

> "A new partnership agreement with Greenland for 2014-2020 is under consideration and co-operation on minerals may be one of its main elements."

Similar projects may be expected in the forthcoming research and innovation framework programme – Horizon 2020.

Strengthening Relations with Greenland

The 2007-2013 EU-Greenland Partnership Agreement included mineral resources as one of six areas for co-operation. A Letter of Intent signed in 2012 sets out the main areas of future co-operation regarding mining: geologic knowledge; analysis of infrastructure and investment needs; capacity building; environmental and social impacts.

A new partnership agreement for 2014-2020 is under consideration and co-operation on minerals may be one of its main elements. The European Commission has acknowledged the possibility that Greenland will become a significant partner with the EU regarding rare earth elements, which are of increasing importance to European industry's competitiveness on the global market.

The LKAB Mine and the Centre of Kiruna, Sweden.

Photo: Adam Stepien. Arctic Centre, University of Lapland.

What is the Role of the European Union in the Arctic?

The European Union is a complex international actor. It has acquired a number of decision-making powers from its Member States and hence influences the content of their national legislation. Based on the European Economic Area Agreement, the EU also influences relevant legislation in Iceland and Norway. The EU also influences outcomes of international negotiations – including those of importance for the Arctic.

Only a small part of the territory of EU Member States - in northern Sweden and Finland – is located in the Arctic and the EU has no Arctic coastline. Nevertheless, EU regulations and actions, including research funding and regional policies, influence Arctic developments. Moreover, the EU is a major environmental and economic actor in the Arctic and has established a special relationship with Greenland.

Since 2008, relevant EU activities have been brought under a common umbrella of "Arctic policy". A communication in 2012 stresses three key aspects: knowledge – support for scientific research; responsibility – promoting the sustainable use of natural resources; and engagement – enhancing co-operation with Arctic partners.

Key Questions to Stakeholders Regarding Mining in the Arctic

1. What are your concerns about environmental and social impacts of mining activities? Are these adequately considered in environmental assessments? Are environmental protection and social/cultural measures adequately adhered to? Does climate change influence mining activities in your region?
2. Do you expect local communities affected by mining developments to change (for instance by new people moving in)? Which changes are positive and which negative? How can they be mitigated?
3. Will European Arctic regions become important sources of raw materials for European Union economies in the next twenty years?
4. Do you see any EU influence on Arctic mining developments? What do you expect the EU to do in relation to mining in the Arctic?

Selected References

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The chapter "Mining in the European Arctic" in the final assessment report (see www.arcticinfo.eu) builds on this factsheet and on the stakeholder consultations conducted between October 2013 and February 2014.

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Image on page 1 by Arto Vitikka, Arctic Centre, University of Lapland.

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