The global context of mineral resources in northern Europe: geopolitical and sustainability dynamics

The Arctic holds abundant mineral resources, and mining has played an important role in industrial and economic development in many parts of the region. As in other mineral-rich parts of the world, exploration has intensified in the past decade, driven mainly by high international mineral prices and expectations that demand will continue to increase. The prospect of shorter shipping routes through the northern passages as ice-free summers become more common has added to hopes of future profitability.

This history of mining in the Arctic is punctuated by periods of intense activity linked to booming markets, followed by slowdowns and closures of unprofitable mines during market downturns. The most recent boom came to an abrupt end in 2014, following a general deceleration of economic growth in several regions that had been driving high global demand, especially China.

The impacts of mining activity are felt differently on different scales, and as a result opinions vary widely, and often strongly, on whether it is a blessing, a curse, or both. Extractive activities can have highly visible effects on the local environment, and repercussions for other economic activities such as reindeer herding. At the same time they can offer jobs to those living nearby. Mining can also be an important source of revenue for national governments; although as many countries have found, a too-heavy reliance on its contribution to the national economy can lead to a “resource curse” (Mikesell 1997).

This brief seeks to locate mining in northern Europe in a global context, with a focus on sustainability concerns and changing power relationships in faraway places that may also affect mining activities in the region. The brief focuses on copper and iron, which are base metals with significant reserves in northern Europe. It is intended primarily for planners and policy-makers who want to understand the changing global context within which local plans for base metals mining takes place. It is based on a review of grey and academic literature on mineral resources, geopolitics and sustainability.

Mining in Sweden: globally small, yet regionally significant
While there are only an estimated 50 mines north of the Arctic Circle – compared to roughly 25 000 worldwide – the scale of production in some places is much more significant than the numbers might suggest (Duhamine 2004; Andrew 2013). For example, the Russian Arctic hosts the largest nickel producer in the world, while over a third of Alaska’s export income comes from mining (Emmerson and Lahn 2012).

Northern Sweden is another case in point. Sweden is a regional metals giant: in 2013, it accounted for 91% of all iron ore produced in the European Union and 10% of all copper (see Figure 1). Ore extraction (mostly iron) has taken place since the 17th century in the Swedish Arctic. In 2010, the mining industry contributed 0.85% of Sweden’s GDP and in 2011, 12% of gross national exports (Näringsdepartementet 2013). However, on a global scale, Sweden and the EU are small players. In 2012, the EU’s total production of iron ore constituted only 1.6%
Most metal ore deposits are located in distinctive geological structures, which are referred to as resources. For example, copper and iron ore deposits are generally found in mountainous terrain. Most metal ore deposits are located in distinctive geological terrains; for example, the world's main copper deposits are in mountainous terrain around the Pacific basin (e.g. Chile and Peru) and the largest iron ore deposits are found in Western Australia. In early 2015, world copper reserves were estimated at 700 million metric tons, and world reserves of crude iron ore were estimated at 190 billion tons (with an iron content of 87 billion tons; US Geological Survey 2015). For comparison, world iron resources are estimated at over 800 billion tons of crude ore, with iron content in excess of 230 billion tons.

**Box 1: Copper: main economic uses, and user and producer countries**

Copper and copper alloys are essential in much transportation, buildings, electronics and industrial equipment, and copper use is considered a leading indicator of economic and societal development. Growth in the consumption of copper typically occurs at a later stage of development than that of iron ore (Poulton et al. 2013, p. 356). The world’s five largest copper producers in 2013 were Chile, China, Peru, the USA and Australia, with Chile being the dominant producer by far (US geological Survey 2015, p. 49).

Global consumption of copper has increased threefold since the 1970s, and has principally been driven by demand from China, which is the world’s largest copper importer. Copper supplies have been tight over the past decade, yet proven reserves have more than doubled over the same period (in contrast to iron ore, proven reserves of which only increased by 20%; Lee et al. 2012, p. 51). Despite this, available forecasts indicate that future supplies will remain stretched (see e.g. Lennon 2012).

Iron ore is the primary commodity for the world’s iron and steel industries and essential for maintaining a strong industrial base. Iron ore is mined in roughly 50 countries, but the seven largest producer countries account for about 75% of world production. In 2013, the world’s five largest extractors were China, Australia, Brazil, India and Russia (US Geological Survey 2015, p. 85).

Although China is the largest producer, in 2011 it could only produce 29% of the iron its economy required (Lee et al. 2012, p. 26). Some forecasters warn that China’s domestic production faces growing challenges, as raw ore grades decline and production moves further underground. The world’s two largest exporters are Australia and Brazil, which each make up about 30% of total world exports.

Iron ore prices increased steadily between 2006 and 2011, but fluctuated widely in 2012-2014, from as low as USD26 to a peak of nearly USD190 per metric ton (see Figure 2). At the start of 2015 they were at roughly half the peak price and declining. This drop is due to a combination of a prolonged slowdown in demand combined with increasing supply.

Because of the influence of such situational factors, data on resources are an unreliable gauge of future supply. For example, the commercial viability of a deposit – whether, and how much, it is possible to extract at favourable cost – can vary widely with global market prices. Even when market prices are high, viability often depends on the availability of financial support from governments, in the form of subsidies and tax waivers. The state can also be directly engaged in extraction through state-owned enterprises. State investments in infrastructure such as roads, railways and harbours can also play a crucial role in determining whether mining is commercially viable. The type of backing varies between countries and over time, as do other influencing factors such as environmental regulation requirements and expectations for corporate conduct.

Availability is also influenced by factors linked to the perceived sustainability of extraction, which is an issue where environmental, socio-political, and economic arguments fuse together. A key enabler of mining is “social licence to operate” (SLOP). SLOP implies that those living within the vicinity of a mine are happy to live or deal (directly or indirectly) with the side-effects of mining activities, such as pollution, land degradation and on working conditions (Prno and Scott 2012). However, if SLOP is not established, there can be local protests and even direct action, sometimes stalling the expansion or continuation of a mine. Due to their proximity to major cities and ports, mining regions often face significant social and environmental challenges.
to projects, sensitivity to the effects and their ability to affect outcomes, local communities are thus key stakeholders in mining activities.

Local environmental sustainability relates both to capacities to prevent local pollution and to the availability of ancillary resources required for mining, such as water and energy. In some regions, mining may be impossible because these ancillary resources are unavailable in sufficient quantity to meet the needs of the mine and other competing local demands. Such competition can reduce SLOP (Kolinski 2001). It may thus be necessary for mining companies to invest in their own infrastructure, for example for electricity supply, to ensure sustained output – with significant impact on the economics of extraction.

Ancillary resources, especially water supply, may also be vulnerable to climate change impacts such as changes in precipitation. Changes in how water moves in the environment can also affect the environmental impacts of mining, for example in the dispersal of pollutants and risks related to tailing ponds. In the Arctic, melting permafrost can add new challenges for mining operations.

As the supply of minerals is contingent on so many factors, it is difficult to reliably assess how supply might change over time, and what it will be in a specific region. It is furthermore not certain that a change in one area will lead to more extraction, as it could be offset by other determinants. While there are many unknowns, it is important to be conscious of these different factors, and the links between them, when planning for future mining activities.

**Demand**

Global demand for base metals is dominated by China. Even with a marked slowdown in demand linked to the recent economic situation, China’s demand for copper and iron ore has been remarkably high in the past decade and a half. China’s per capita consumption of steel (of which roughly 98% is iron) already exceeds that of the USA, and per capita copper consumption is starting to reach US levels. Furthermore, the value of China’s metal and ore imports increased almost tenfold between 2000 and 2010 (see Figure 3), and currently, almost half of the metals traded worldwide go to China (Lee et al. 2012, pp. 17, 26).

China’s large share of world imports is not due to lack of a domestic reserves – it has one of the largest mining industries in the world. China’s seemingly unquenchable thirst for metals has been driven largely by an extremely resource-intensive development pathway that depends on a large manufacturing sector, a booming construction industry, rapid urbanization, and infrastructure development, especially in the coastal provinces (Farooki 2012). Such rapid increases in metals demand over a limited time are not unique. For instance, Japan went through a similarly resource-intensive industrialization in the 1950s and 1960s, and dominated critical markets at that time (Vernon 1983).

**Future supply and demand prospects**

Assessments of mineral resources and reserves are continually revised to reflect the discovery or exploitation of new deposits, along with technological changes, and many, such as the Mineral Resource Summaries published by the US Geologi-
As the factors that affect both supply and demand can change rapidly, market projections are often made based on extrapolations of past trends. They are sensitive to shifts in GDP, demographics and technological change, and should be regarded with caution. Most projections of market supply are made by financial institutes and used solely by traders and their clients. Consequently, there are few publicly available projections that are reliable and give the full picture.

Many experts, such as geologist Stephen Kesler, argue that “... increases in demand for minerals are almost inevitable for the next 50 years or so unless there is a major breakdown in global economic activity or a catastrophic decrease in world population” (Kesler 2007, p. 58). Chatham House analysts have predicted that China’s share of global metals consumption will increase from 40% today to about 50% in 2020 (Lee et al. 2012).

Nevertheless, the dramatic drop in iron ore prices since 2014 (see Box 2) underlines the fact there are no guarantees that global demand, or prices, will remain steady. Factors affecting demand include, for example, economic conditions in emerging economies (the recent price drop has been widely linked to slowing industrial and infrastructure investment in China), and countries’ development priorities – industrial development and urban growth use far more steel and copper than economic growth based on personal consumption (Economy and Levi 2014, p. 33). Prices will also be affected by the output of operational mines, and on resource efficiency and recycling.

**Sustainability and geopolitics**

While often receiving substantial government support, a majority of mining companies operate on thin margins and are sensitive to international price fluctuations. This contributes to “boom and bust” cycles that affect both mining industries and communities. Booms are often marked by sizable investments in frontier mines and related technological systems, while a bust can see mines closing down, leaving people jobless and with poor prospects of finding other employment locally. This direct link between global demand and supply and people’s livelihoods highlights the reciprocal dynamics between local matters – such as sustainability concerns linked to extractive industries – and the global politics and economics of minerals.

The specifics of how future demand for minerals might affect mining prospects in northern Europe are likely to vary depending on local circumstances and the companies involved. However, the social, economic and political processes that shape local dynamics are globally interconnected. To illustrate the close links between sustainability concerns and geopolitics, it is useful to look at other parts of the world, such as Chile and China. Both countries are important mineral resource players, and developments in them have indirect knock-on effects on mining elsewhere, including northern Europe.

**Copper in Chile and the sustainability of extraction**

Chile is the world’s largest producer of copper (see Box 1), delivering around 34% of global production (KPMG Global Mining Institute 2014). Chile also has the world’s biggest known reserve of high-quality copper ore, estimated at over 100 million tons. Yet technological, financial and environmental limits to extraction have come to the fore in recent years, and Chilean mines are struggling to maintain high productivity (Lee et al. 2012, p. 51). One of the main limitations on output is declining ore grades in current production sites, which is forcing extractors to invest in new projects, often in more difficult terrains where special technologies are needed.

Copper mining also requires large amounts of water and energy, two ancillary resources that are becoming scarce in parts of Chile, which is beginning to impact operations. New developments instead have to rely on desalinated seawater, production and distribution of which uses significant amounts of energy (KPMG Global Mining Institute 2014, p. 9). Other environmental impacts of mining in Chile include destruction of parts of nearby glaciers, a common side-effect of copper exploration (Leach 2014). There are, furthermore, persistent energy and power shortages, linked in part to climate change, as efforts to expand hydropower generation have suffered setbacks due to recurring droughts (KPMG Global Mining Institute 2014). Prices for electricity have recently soared due to increasingly tight natural gas supplies (Leach 2014).

Mining projects that put pressure on already limited natural resources are meeting social resistance. In a town close to the mine of Los Pelambres, villagers fought against the construction of a hydropower dam, built by a mining company to bring more water to the valley where the mine and village are located, for over a decade. Supporters of the mine are regularly harassed, windows are shattered and cars are burnt, bearing testament to a divided town (Franklin 2014).
China’s demand and its geopolitical implications

As a counterweight to such local turbulence, Chile’s high share of global copper production has given the country leverage on the international resource market. In 2012, 80% of the copper Chile exported went to China, worth around USD14 billion, making Chile China’s primary supplier of copper. Economic relations between the two countries are not limited to minerals. Between 2005 and 2012, Chilean exports of non-mining products to China grew by 83% (Rey Mallén 2013). Chilean actors are also reportedly in the process of securing investments from Chinese companies in infrastructure, energy and mining projects (Ng and Yang 2014).

While such investments can undoubtedly be of value for any economy looking for expanded investment flows, China’s dominance as a resource importer, consumer and producer comes with a set of interlinked geopolitical implications for producer countries. These are common to any exporter, especially those trading with a limited number of large importers, not just China.

The first set of implications is economic. The fate of any producer country, or individual mine, that relies on Chinese demand will be to a great extent dependent on developments in China (Lee et al. 2012, p. 26). With a significant share of China’s imports being in the form of unprocessed ores, high reliance on the Chinese market could imply a missed opportunity for exporting countries to climb up the value chain (International Copper Study Group 2013).

The financial reach of the importing country stretches far, and China, with an incomparable stockpile of foreign exchange and bonds, can reach further than many. When a limited number of actors purchase any good at a disproportionate scale, they automatically gain some power to set the price. In a market notorious for rapid price fluctuations, renegotiation of contracts at short notice – to the detriment of the producer – is not uncommon. Chinese importers of iron ore have been accused of breaking contracts during price slumps in order to negotiate lower prices on new contracts (Wong and Fabi 2012).

There are related political implications. As the availability and price of metals fluctuate, markets are becoming more political and governments are taking action to secure access. It has become more common for importers to deepen their relationships with exporters, for instance through direct investments in mines, to increase security of supply (Moyo 2012). Such relationships often expand beyond exchange of mining outputs, as illustrated in the China-Chile case. Furthermore, the willingness of Chinese companies to work in countries that are off-limits to other countries’ companies for political reasons, such as Sudan and Iran, have tilted the political landscape for resource investments. While too early to predict, it is not unreasonable to assume that this pattern of engagement could be replicated by other emerging economies as their demand for metals increases in the future.

Implications for northern Europe

Over the course of less than a decade northern Europe has experienced a major mining boom, driven by record high mineral prices, followed by a rapid slowdown with several mines reducing operations and laying off staff and others closing or under threat of closure as ore prices have dropped back to more historically normal levels. Nevertheless, long-term global demand for minerals is unlikely to wane (Jansson 2015). What then are the implications for mining in northern Europe?

Prices will continue to play a fundamental role. However, several other factors will also be influential. The first of these is the region’s potential attractions for mining investment. Environmental and sustainability concerns are likely to increasingly affect mining activity in some producer countries, as the Chile case illustrates. Such uncertainties tend to deter investment in mining activities. However, in the countries of northern Europe, much of the relevant political and environmental regulatory frameworks and necessary infrastructure are already in place, and the long-term availability of necessary ancillary resources, such as steady water and power supplies, is relatively assured. Both Finland and Sweden rate very high in the composite "policy perception" index in the Fraser Institute’s Annual Survey of Mining Companies (Jackson and Green 2015).

Even with these relative advantages, northern Europe’s decision-makers, including companies footing the investment bill and authorities providing regulatory and financial support, must consider the economic and environmental dimensions of opening up new mining activity, as well as the possible political and social implications. The shutdown of mining operations in the Swedish municipality of Pajala in the autumn of 2014 provides a telling example of the stakes for the local populations and economies when planned extraction is discontinued at short notice.

Also worth noting are the geopolitical dimensions of supplying the growing demand for copper, iron ore and other resources, and how they can shape the political, economic and social context. With their stable investment climates, it is not unlikely that countries in northern Europe will attract mining companies from countries in dire need of minerals. These companies may not follow European norms in their business dealings, a fact all stakeholders should be aware of. It is also worth reiterating how difficult it is to make long-term projections, especially on a regional scale. Each mine has to be treated as an individual case, paying careful attention to both global factors (demand projections, other export countries, market fluctuations) and local factors (access to deposits, environmental consequences, jobs and other social implications) factors that affect overall supply and demand of a mineral.

Municipal, regional and state-level planners and policy-makers need to be aware of these potential tensions, and consider whether and how they can be managed and minimized. Attention to these challenges will likely be key to determining successful strategies in the period to come.

References

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