

# Restructuring and risk-reduction in mining: employment implications for northern Sweden

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In the past, employment in northern Sweden has been largely dependent on natural resources. Shifting demands and price fluctuations for raw materials have caused boom periods as well as times of crisis in local communities. During the first decade of the 21st century, increasing global demand for minerals resulted in substantial investments in the Swedish mining industry. The purpose of this article is to assess the importance of mining for employment in the county of Västerbotten, northern Sweden, by focusing on the time period after 1990. Mining employment constitutes a rather small part of all employment in the study area, due to a restructuring process that started in the 1960s. However, results show that mining employment has increased slightly, especially after 2002. Global demand for minerals and related technology and services make it reasonable to believe that this change will have a deeper significance for employment opportunities in the study area. Restructuring in mining generates new business opportunities in subcontracting, consultancy and equipment production, but also creates new challenges. Consequently, it is important to make strategic decisions on regional and local levels concerning how to make use of the development in the mining industry to stimulate long-term regional employment growth.

Keywords: employment, mining, resource-based communities, restructuring, Sweden.

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## Introduction

The extraction and further processing of the county of Västerbotten's natural resources such as timber and minerals were of great importance for the industrialization and modernization of northern Sweden during the early 20<sup>th</sup> century (Sörlin 1988; Nilsson 2000; Westin 2006). In the 1950s, more than 12 000 persons were employed in Västerbotten's mining sector (SGU 2007). However, restructuring processes meant fewer job opportunities in resource-based activities such as mining (Pettersson 2002; Lundmark 2006). During the 1970s and 1980s, it was often questioned whether mining could continue to be of significant importance for regional development in a post-industrial society

(NÄRP 1982; Liljenäs 1992). Even in northern Sweden, where mining was still present, its role as a major industrial activity was beginning to be contested, particularly due to rationalizations leading to significantly fewer employment opportunities than just a couple decades previously. The Swedish mining industry also experienced fierce global competition from mines located in other parts of the world where production costs were generally lower, causing declining prices for minerals and metal products.

Nevertheless, during the late 1990s and early 21<sup>st</sup> century mining experienced a recovery. Swedish mining legislation was deregulated in 1992, allowing foreign companies to establish branches as well as conduct exploration and mining in Swe-

den. Another important aspect is that the world market prices for metals and other minerals were gradually rising over an unusually long time period (2003–2008), caused mainly by high growth rates in developing economies such as those of China and India (Humphreys 2010). This gave rise to a global boom in mining activities, affecting mining areas all around the world. In this sense, the development in Västerbotten and northern Sweden is far from unique. Similar changes have been observed in neighbouring Nordic countries Finland and Norway (Nordregio 2009), as well as in Australia (Rolfe et al. 2007).

Although many mining areas in developed countries have been hit hard by restructuring processes during the post-war period and some have even been completely abandoned by the mining industry, there are still countries, regions and communities where mining is of significant importance to the economy (Crowson 2009). Within the European Union it has been emphasized that the mining industry and the accessibility of metals and other minerals for the internal market is of strategic relevance (Commission of the European Communities 2008). From a theoretical perspective, Hayter et al. (2003) argue that it is urgent to bring natural resources into the focus of economic geography research. They claim that natural resources still play an important role in the global economy, whereas within economic geography the issue has received comparatively little attention in recent years. From this point of view, it seems highly relevant to study how the local and regional economies of sparsely populated and natural resource-dependent societies in developed countries respond to a development induced by changes at the global level regarding the demand for raw materials such as minerals.

In 2008 15 mining operations were undertaken in Sweden, making the country an important raw material producer in the European Union (SGU 2009). Mainly, three regions of Sweden are involved: two in the northernmost part of the country and one in south-central Sweden. First, there are three mines in the county of Norrbotten, two producing mainly iron ore and one copper. Secondly, there are six mines in the county of Västerbotten, producing complex sulphide ores. These activities are described in more detail further on. Finally, in south-central Sweden there are three mines producing complex sulphide ores (Bergstaten 2009). Between 2004 and 2008, large investments were made in exploring Sweden's mineral

assets (SGU 2007). The total exploration cost in Sweden was 92 million USD in 2007 (SGU 2009). According to the Mining Inspectorate of Sweden (Bergstaten), approximately one-third of all exploration activities in Sweden between 1990 and 2008 were undertaken in Västerbotten. 35% of those holding an exploration license in Sweden 2008 were foreign companies, bringing investments, know-how and new business networks to the region.

The increased interest in Sweden's mineral resources has to date resulted in an extension of the life expectancy of several mines: closed mines are being considered for re-opening and previously unknown deposits have been discovered in the county of Västerbotten (Fig. 1). Some of these newly found deposits have led to the opening of a mine, whereas others are in the planning phase for starting up in the forthcoming years. However, the recent financial crisis that began in autumn 2008 has meant that at least some of these mining projects face a more uncertain future. Even so, scenarios of hundreds of new jobs for each new mine, in areas characterized by small labour markets and structural unemployment, have been presented in the local and national media and by local politicians as a blessing and perhaps even the beginning of a new era of growth and prosperity similar to that of the early 20th century.

The purpose of this article is to analyse employment change within the mining sector and related activities in the county of Västerbotten. What implications will restructuring in the mining industry have for local and regional employment? Focus is on the development pattern since the early 1990s, particularly the period after 2000. Although this article focuses on employment within the mining industry, mining has further implications on aspects like policy making, land use, physical infrastructure and the environment.

The methods and data used are described in the following section. In the next part of the article a number of theoretical perspectives are presented on natural resource extraction and mining, and their importance for local and regional development. This is followed by a description of mining activities in the study area. Thereafter, results from the analysis of employment figures and the interviews regarding organizational changes within the region's mining sector are presented. In the final section, these results are related to the more general debate regarding the extraction of natural resources for promoting local/regional development

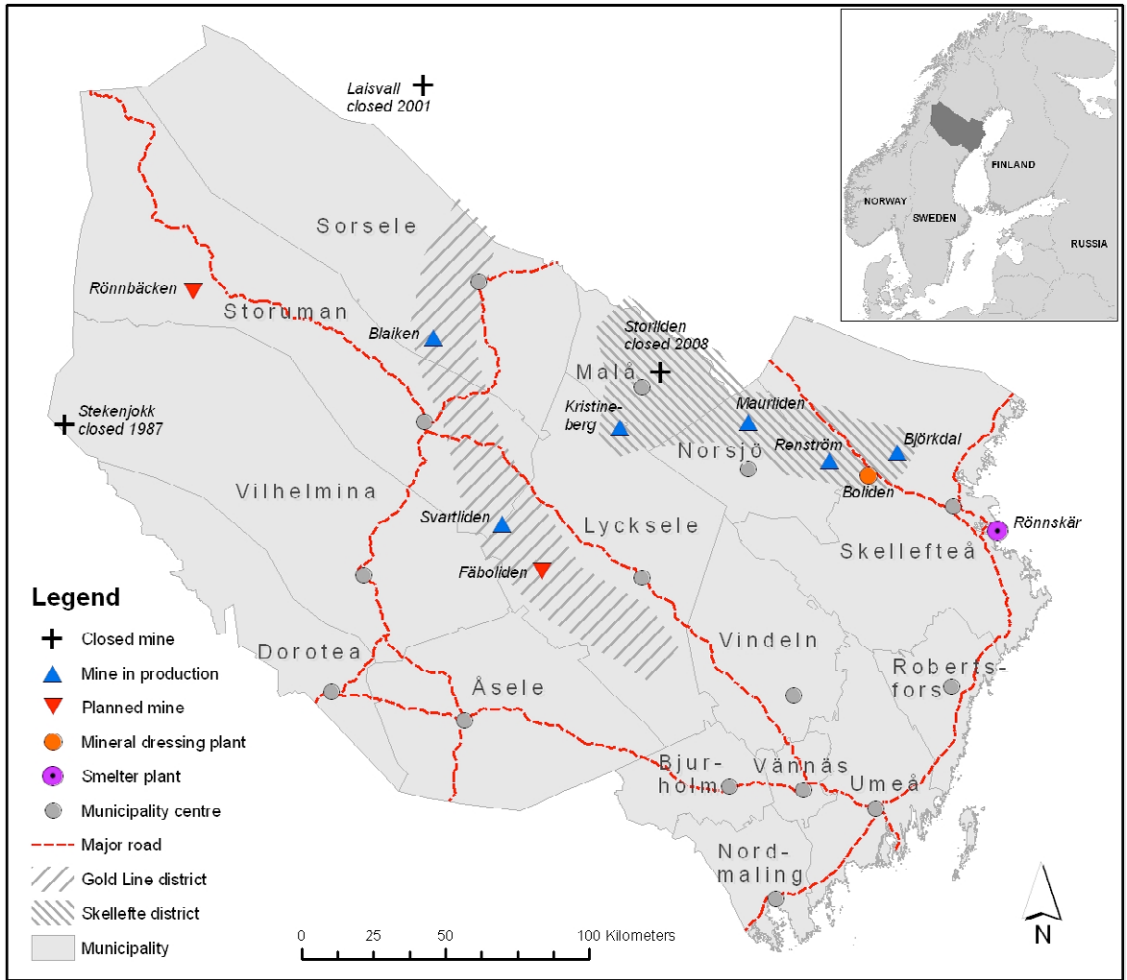


Fig. 1. Mining districts in the county of Västerbotten.

in sparsely populated areas in developed countries. The extent to which these changes offer new opportunities to these areas is also discussed.

### Methodology and data

The quantitative information behind the analysis comes mainly from two sources: official data from various government agencies and semi-structured interviews with 15 mining sector actors. Employment figures come from Statistics Sweden (SCB), whereas data regarding mining activities has been

provided by the Geological Survey of Sweden (SGU) and the Mining Inspectorate of Sweden (Bergstaten). Focus is on areas where mining activities are present, leading to a division of Västerbotten into three geographical areas (see Fig. 1): the Skellefte district (consisting of the municipalities Skellefteå, Norsjö and Malå) and the Gold Line (consisting of Sorsele, Storuman and Vilhelmina municipalities). Since the municipal level is the most disaggregated level of official data available from Statistics Sweden, and since the municipality of Lycksele is part of both the Skellefte district and the Gold Line, Lycksele has been

treated as its own 'district'. At the beginning of the studied period the development in Lycksele was largely due to changes in the Kristineberg mine, located in the northern parts of Lycksele municipality and belonging to the Skellefte district. During the 21<sup>st</sup> century the development in the Gold Line is also affecting the development in Lycksele, especially since 2005 when the Svartliden gold mine went into production.

In the article, activities related to the industry of mining and quarrying in the Swedish Standard Industrial Classification (SNI data) are examined (Table 1). Companies and production units in the SNI data are classified according to the activity they carry out, with data available for both the *day-time population* (defined as the number of employees at the workplace location) and the *night-time population* (defined as the residential location of the employee). Another source of information is the Swedish Standard Classification of Occupations (SSYK data). Several occupations are linked to the mining industry; however, data on specific occupations was only available from the early 21<sup>st</sup> century. Occupational data for the day-time population was available at municipal level, whereas night-time population data was available only at county level.

In addition, some key figures regarding active firms in the county's mining sector were gathered from three other sources: the Mining Inspectorate of Sweden, Georange (2008, a non-profit organization focusing on the development of the mining sector in northern Sweden) and Affärsdata (a data-

base containing information concerning Swedish firms).

Interviews with mining actors such as *juniors* (i.e. mining companies only performing exploration activities), *majors* (i.e. companies with mines in operation) and related activities/subcontractors in Västerbotten were held in late 2008. The semi-structured interviews mainly provided complementary information about recent changes within the mining sector, e.g. employment needs and organizational changes. In fact, the interviews were conducted during months when the demand for minerals dropped dramatically due to the economic recession. The 15 interviews were conducted with CEOs or managers working either at mining companies or at companies clearly related to the mining industry. Related companies, for example, manufacture machinery and instruments for mining and quarrying. They supply technical consulting and technical support for, e.g., chemical analysis, education and staff training, and repair machinery and conduct wholesale of mining machinery and equipment. The mining companies had mines in production or newly discovered deposits, for which they had applied for exploitation concessions.

As shown further on (Fig. 2), mining creates employment in additional sectors than those included in Table 1. It also has indirect quantitative and qualitative effects. Quantitative effects in the form of (localized) infrastructure, services, construction and transportation, as well as qualitative effects such as know-how, technological development

Table 1. Classification of industrial sectors and occupations in mining (SNI and SSYK codes).

Code	Refer to	In text	Geographical context	Available years	Day-time / Night-time population	Population
<b>SNI 10-14</b>	Relates to the industry of mining and quarrying	Mining industry workers	Municipal level	1990–2007	Yes/Yes	16–64 years
<b>SSYK 711</b>	Miners, quarry workers and stonecutters	Miners	Municipal and county level	2001–2007	Yes/No	16–64 years and gender
<b>SSYK 811</b>	Mineral-processing plant operators. Drillers and related workers	Mineral plant operators	Municipal and county level	2001–2007	Yes/No	16–64 years and gender
<b>SSYK 812</b>	Metal-processing plant operators and metal melters	Metal plant operators	Municipal and county level	2001–2007	Yes/No	16–64 years and gender

Source: SNI and SSYK classification, Statistics Sweden.

and innovations which can be sold and exported, are created in related activities (cf. Wiberg 2009). The intention of this paper is to calculate the actual workforce in the industry instead of making general assessments about multiplier and induced effects.<sup>1</sup> However, all majors and a selection of juniors in Västerbotten were interviewed about which related businesses they make use of, making it possible to calculate the minimum employment levels in related activities.

## **The restructuring of the mining industry**

The mining sector is a mature industry that has undergone substantial changes over the past decades. Increasing globalization, neoliberal tendencies, innovation and technological development have led to industrial restructuring in several ways, with major implications for firms, places and regions related to mining activities (Neil et al. 1992; Neil & Tykkyläinen 1998; Dale 2002; Bridge 2004).

The mining sector has long been known to be sensitive to the development of the world economy and business cycles. Increasing demand for raw materials drives up the world market prices in a way that increases mining companies' profitability. Deposits that were previously judged as unprofitable can suddenly be worth considering again. Increased demand also stimulates the search for new deposits and investments in high-risk projects such as new mines. During the recent global boom, the demand generated by investments and economic growth in Asia, especially China and India, drove up the market prices of many minerals (Humphreys 2010). When the economy turns down, there is a need to reduce costs and slow down production. During such periods mines can be closed, temporarily or permanently (Cutter & Renwick 2004). Mining is well known to be a risky business, with high levels of financial risk taking (Houghton 1993; Tykkyläinen 1998; Hayter 2000; Storey 2001; Bridge 2004). The richness and profitability of a single mine is seldom known to any high degree of precision in advance, and dramatic turns in market prices could make production extremely profitable during some periods and not profitable at all during others. The capital intensity of mining is another factor that makes the business hazardous. The need for heavy investments in infrastructure and

equipment, and also the fact that it usually takes several years from the discovery to the start-up of a new mine, imply difficulties in launching production during periods of high demand and high price levels for specific minerals. To cope with these problems some shallow, rich deposits are extracted as open-cast mines, which lowers the necessary investment and reduces the risk.

Mining is a highly globalized industry in the sense that many companies operate in several countries and on various continents (Ds 2002: 65; SGU 2007: 1; UNCTAD 2009). Low transport costs for raw materials also imply that mining can take place far from the end markets. Furthermore, for instance, the Frasier Institute performs a global survey among mining companies and, based on this, map the pros and cons of the world's different mining regions and countries (Frasier Institute 2008)<sup>2</sup>. Their index indicates that Sweden is of great interest to the global mining industry from many points of view.

Neoliberal tendencies have contributed to the development and restructuring of the world's mining business (Bridge 2004). A sign of this is that Sweden, together with more than eighty other countries, has implemented deregulation and liberalization of relevance to the mining sector (Ds 2002: 65). During the late 1980s and early 1990s, Swedish mineral legislation was changed to attract and to make it easier for foreign mining companies and investors to explore and start operations within Sweden. The mineral sector had previously been protected, not least because natural resources and the supply of minerals were long recognized to be of strategic (military) importance (Humphreys 1995). In the past, exploration activities were mainly conducted by the Geological Survey of Sweden, but due to increasing costs this exploration nearly ceased and is today conducted by the mining companies themselves. The end of the Cold War, increased free trade and the gradual reduction of economic importance of the mineral sector in relation to other and faster-growing sectors in developed economies led to a reduction of protectionism in the mineral sector. Instead, deregulation was seen as a way to attract foreign TNCs (transnational corporations) to invest in the country's mining industry and bring in new capital and technological know-how, thereby contributing to the industry's survival in increasing global competition. It is interesting, however, to note that in recent years the European Union has begun to engage in issues relating to raw materials. For in-

stance, the EU Commission has highlighted it as a problem that the trade bloc largely relies on imports of important minerals from other parts of the world (Commission of the European Communities 2005, 2008; SGU 2009). Sweden's role, not least the northern parts' importance, in the supply of certain metals has been recognized as valuable both for the EU and for the regional/local level (the County Boards of Norrbotten and Västerbotten 2008; SGU 2009).

For many decades, the mining industry was generally organized according to the same principles as many other large scale manufacturing businesses. This production mode has been labelled Fordism. The level of vertical integration was rather high, and the mining companies often dominated the manufacturing sector and labour market in mining towns. There is a vast body of literature on communities that are dependent on the exploitation of natural resources (Neil et al. 1992; Neil & Tykkyläinen 1998; Halseth 1999; Hanink 2000; Barnes et al. 2001; Dale 2002). Since the mining industry as such is based on localized, limited and non-renewable resources, many mining towns and regions have experienced dramatic lifecycles (Bengtsson 1997; Hayter 2000). An initial start-up period with many new jobs in the construction of the necessary physical infrastructure as well as mining and surrounding services would cause a local boom. Since many of these mining projects demanded a great deal of labour and were located in relatively sparsely populated and isolated areas, it was often necessary to build up new communities around the mining activities. Thereafter usually followed a period when the mining company made efforts to reduce production costs through different rationalization measures. If no new jobs were created in other businesses, this strategy led to economic stagnation or the beginning of a negative trend in terms of job opportunities and population. Finally, the resource became exhausted and the mine was closed down. Several case studies describe the difficulties these towns and regions experience due to winding down and final closures (NÄRP 1982; Neil et al. 1992; Dale 2002). The heavy reliance on one production sector, the relative isolation and the lock-in effects of path dependency among local businesses, decision makers and people, have often given rise to difficulties in pursuing alternative strategies for local development (Crowson 2009). Structural unemployment, social problems, out-migration and calls for government intervention, public grants etc. were

common (Dale 2002). However, in some places new businesses, for example in the tourism sector, have mitigated the problems of restructuring within the mining sector (Johansen 1998; Jussila & Järviluoma 1998; Neil & Tykkyläinen 1998).

There have also been changes within the mining sector, not least in order for the firms involved to handle the financial risks associated with mining. The main tendency has been towards a more flexible production mode (often labelled Post-Fordism; see for instance Holly 1996; Peck 2000). For example, the contemporary mining industry is less vertically integrated compared to some decades ago. One example of flexible specialization is that many functions have been out-sourced and that mining companies often rely on subcontractors and consultants for substantial parts of their activities. In this way, the mining companies reduce their risk by transferring it to other actors, while the major company itself can adjust production volume and costs more easily.

The binding up of financial capital and the societal responsibility associated with single-company mining towns also imply high exposure to risks related to the dramatic changes in world market prices for minerals and metals (Houghton 1993; Tykkyläinen 1998; Hayter 2000; Storey 2001; Bridge 2004; Humphreys 2010). The mining industry as such is well known for attracting risk capital in global economic boom periods, while less financial capital is available during times of economic recession. This cyclic pattern regarding mining activities requires flexibility among authorities and municipalities, e.g. concerning physical planning and housing, as well as a dynamic labour market, to cope with temporary ups and downs (Rolfe et al. 2007).

In Australia, for instance, the goal to become more flexible has resulted in the fly-in/fly-out model of mining employees, pursued from the late 1980s and onwards (Houghton 1993; Tykkyläinen 1998; Storey 2001). Instead of founding a permanent settlement close to a new mine as would have been natural in previous decades, the mining companies build up more temporal accommodation where the workforce stays during their working periods. Staffs mainly commute long-distance by airplane to and from the metropolitan areas. Technological improvements also mean that a mine can be run with a relatively small number of employees. Finally, the dispersal of production over several countries and continents could be seen as a risk-reducing strategy.

## Mining operations in the county of Västerbotten

In 2008 there were five mines in operation and 61 granted exploitation concessions in the study area (Bergstaden 2009). In early 2009 a sixth mine, Blaiken, was re-opened after having been closed for a period of time (SR 2009). Mines in the study area produce sulphides such as gold, zinc, copper, lead and silver.

Västerbotten's role as a raw material producer of sulphides took off in 1924 when a gold ore deposit was discovered 30 km west of the town of Skellefteå (Fig. 1). The so-called Boliden deposit was Europe's largest gold mine until 1967, when it closed (SGU 2009). The mine's location gave name to the mining settlement of Boliden and the (international) mining company Boliden. However, even before the opening of the Boliden mine it was known that there were other interesting exploration sites in the surrounding areas (Lundgren 2006). During a period of more than 80 years, several mines have been opened and closed within the area, usually referred to as the *Skellefte district*. The Skellefte district runs through several municipalities besides Skellefteå, such as Norsjö, Malå and Lycksele. The most long-lived mine is Kristineberg, which has been in operation since 1940 (Georange 2003). The mining activities in the Skellefte district have been of great importance for the development of the region and have given rise to substantial employment effects, particularly in the mining communities but also in the municipalities involved (Lundkvist 1980). In summer 2010, four mines were in operation in the Skellefte district: Maurliden, Renström and Kristineberg are operated by Boliden, whereas the Björkdal Gold Mine is run by the Canadian mining company Gold-Ore.

Over the years, other parts of Västerbotten have also been of interest for exploration and mining. For instance, the Swedish state owned and Boliden operated a copper mine in Stekenjokk (Vilhelmina municipality) during the period 1975-1987. The actual mine was located in the high mountains whereas many mine workers chose to settle in the relatively nearby village of Klimpfjäll, giving rise to a boom period for the settlement. The sudden closure of the mine in 1987 resulted in societal problems such as a dramatic increase in unemployment, out-migration and vacant housing (Nygren & Karlsson 1992).

In recent years, focus has shifted towards a regional tectonic zone in the interior areas of Västerbotten. This rather diffuse stretch is usually referred to as the *Gold Line* (SGU 2009: 1). It runs mainly through the municipalities of Sorsele, Storuman, Vilhelmina and Lycksele. Since the late 1980s, several juniors and majors have been involved in the exploration of this area and as a result a number of prospects have been found. Since 2005, the Australian major mining company Dragon Mining has had a gold mine in operation in Svartliden at the border between the municipalities of Lycksele and Storuman. In Blaiken, close to the border between the municipalities of Sorsele and Storuman, the Swedish mining company Scan Mining started up production in summer of 2006, but the production was stopped in December 2007 due to bankruptcy. In 2008 Blaiken was acquired by the regional mining company Lappland Goldminers, which went into production again in spring 2009 (Bergstaden 2009). For a number of years, Lappland Goldminers have been preparing to start up mining in Fäboliden in Lycksele municipality, relatively close to Dragon Mining's mine in Svartliden. Furthermore Rönnbäcken, a promising nickel deposit located in the mountain range outside the Gold Line in Storuman municipality, is being explored by Swedish IGE Nordic. It is generally expected that there are more mine deposits to extract along the Gold Line. As a result, the Gold Line has emerged as a new mining district, alongside the already established Skellefte district.

The development in recent years offers hope for new employment opportunities in the mining sector in municipalities or areas with little or no prior experience of mining activities. Some deposits in Västerbotten are rather limited and will only be in production for a short period of time. These mines cannot be expected to have long-term effects on the surrounding economy or create any larger employment needs compared to larger deposits, which can be in production for decades. The Storliden mine, which was in production between 2002 and 2008, is one example of a small-scale mine extracted during a short time period, with a very limited workforce consisting of 45 employees. However, it is quite often the case that further exploration at the depth or in nearby surroundings leads to continued mining for many years after the initial findings have been depleted.

Competitiveness and growth potential have a great deal to do with the ability of firms to change

and create new income sources in the mining industry. According to the interviews with majors and juniors in Västerbotten this process has taken different paths, for example through R&D, cost-efficiency measures, expanding to new markets or developing new products. There are several examples of activities in the study area that have previously been conducted by the mining companies but now are out-sourced to subcontractors. In the past Boliden AB, the largest major in Västerbotten, had its own personnel in most steps of the production chain, whereas new actors such as the foreign majors Gold-Ore and Dragon Mining, already from their planning phase in Västerbotten, used subcontractors for substantial parts of their production, even in steps which could be regarded as core activities such as exploration, drilling, blasting and transportation in the mine. Today, Boliden has changed its organization structure towards more out-sourcing. Nevertheless, their workforce still comes mainly from the surrounding area. Although the area is sparsely populated, the mines are within reach through daily commuting by car from several small to medium-sized communities. At the present scale of operation, there is no obvious need for solutions such as the fly-in/fly-out model frequent in Australia's and Canada's remote mining districts (Houghton 1993; Tykkyläinen 1998; Storey 2001; Rolfe et al. 2007). On the contrary, many majors and juniors prefer local employees due to their local knowledge and mining experience.

In 1990, 1.3% of the total workforce in Västerbotten was mining industry workers, and the county's mining sector represented 15.1% of the national mining sector. Since then the region's share of mining industry workers has decreased, to 10.7% in 2007. Recently, however, new possibilities to develop businesses and work opportunities connected to mining have emerged. Great interest in Västerbotten's mining districts has resulted in at least 95 related activities (Wiberg 2009). Both juniors and majors in Västerbotten work in close cooperation with subcontractors and consultants, who perform related activities such as exploration, drilling, mine development, chemical analyses etc. Regional demand has created new business opportunities in the area, which also can be exported (Wiberg 2009). This has, for instance, led to a specialization regarding mining among consultant firms in northern Sweden, and also to the establishment of a well known international consultant firm in the study area.

The mining industry can be seen as a production system (Dicken 2003). The basic functions in Västerbotten's mining industry are *core activities* (exploration, mining and mineral dressing) and are distinguished from activities performed by others than the mining companies, here called *related activities* in the production system (Fig. 2). Related activities are tasks such as development of equipment, transportation or drilling. Mining companies often perform core activities (grey boxes in the figure) themselves or in close collaboration with con-

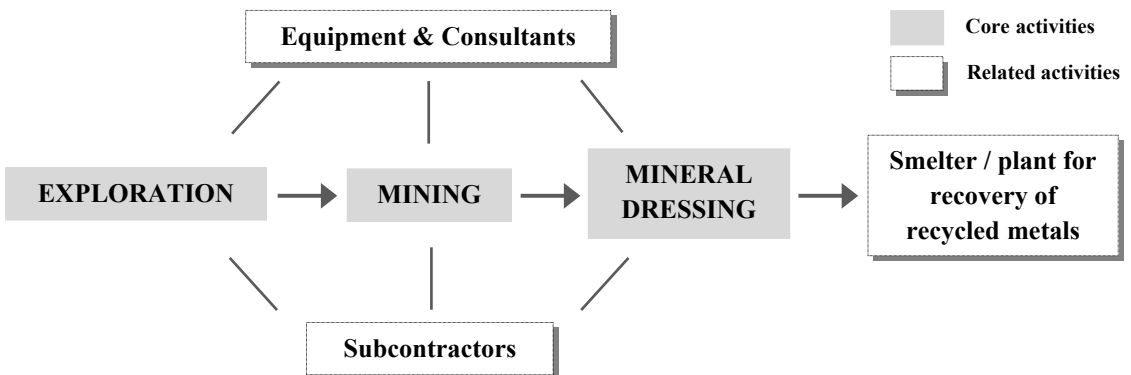


Fig. 2. Organization of mining activities in the county of Västerbotten.



sultants or subcontractors. Companies carrying out related activities are characterized by skill development and flexibility to various degrees. Activities found in the box in the upper part of Fig. 2, such as producers of equipment or consulting services performing chemical analyses or seeking permissions, need specialized skills and often a high degree of education to perform their work. They market and sell their specialized *knowledge* as either services or equipment. Businesses in the upper part of the figure are in this study from within the region, often developed as a spin-off from the mining companies. According to interviews they often have a close collaboration with mining companies, especially regarding development of medium to high-tech equipment used in core activities.

Subcontractors, in the lower part of Fig. 2, are characterized by more *labour-intensive* activities and usually require less highly educated personnel. Instead, they need to be flexible and trained to perform various tasks, in order to adjust to production in either the mines or other sectors within the region. These companies are often highly dependent on local labour and on flexible solutions, since the demand for their services often varies due to production fluctuations in the mines. The main focus in this study is on core activities, but related activities are also covered to some degree.

### Employment in Västerbotten's mining industry

During the period 1990–2007, the number of persons employed within the mining industry in Västerbotten decreased from about 1 700 to 880 (a 48% reduction). During the same period, the relative importance for the county's labour market has been reduced from 1.3% to 0.7% of total employment. The proportion of employment in the mining industry is naturally slightly higher in the mining districts (1.5%–1.8%). Employment in the mining industry therefore represents a rather small fraction of the total labour market, yet of significant importance to the local mining communities within these districts. Noteworthy is that, whereas many jobs were lost during the 1990s due to rationalizations, the early 21<sup>st</sup> century meant a significant upturn for employment in mining (Fig. 3). During the period 2001–2007, the number of those employed in the mining industry rose by 34%. This was in accordance with the development at the national level, though the shift came rather early in Västerbotten and was more profound. Intensified exploration, increased production in established mines and the start-up of new mine projects in the Skellefte district as well as in the recently discovered Gold Line contributed to

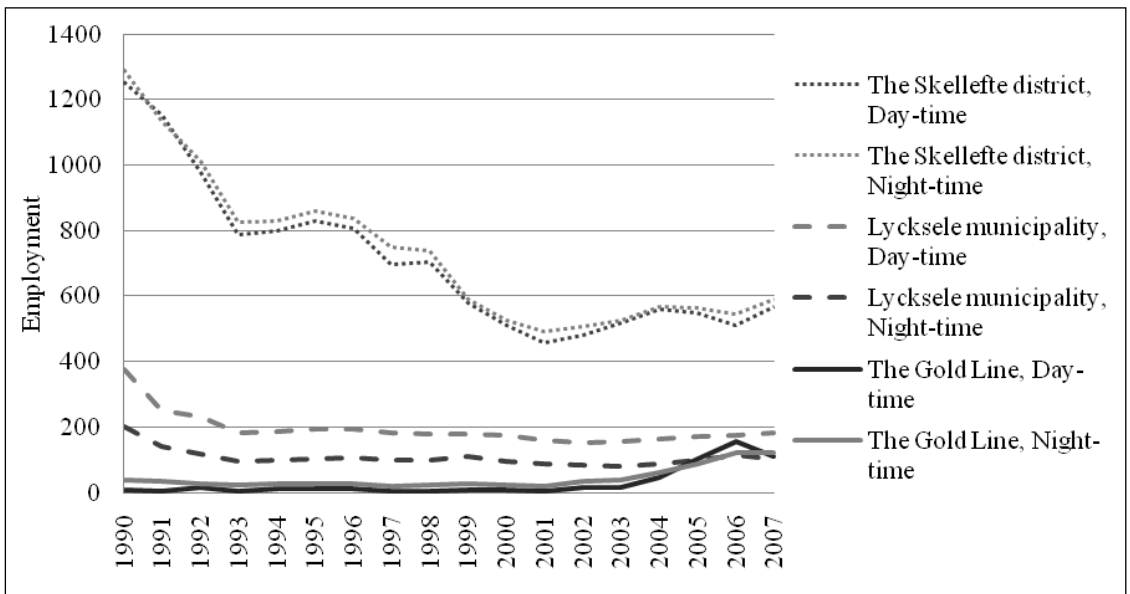


Fig. 3. Mining industry workers in Västerbotten 1990–2007.

this regional boom in mining activity. However, due to the economic recession, 2008 and 2009 saw a substantial drop in exploration activities and investments, causing lower employment needs in exploration (SGU 2009: 1). This has had a strong negative impact on a number of local subcontractors, particularly those performing exploration for juniors or majors.

In 2007, slightly less than two-thirds of all mining industry workers residing in Västerbotten worked in the Skellefte district (as compared to almost three-fourths in 1990). Approximately one of five had their workplace in Lycksele municipality and 13% in the Gold Line district. A small number worked in other municipalities.

Even though there have been prior periods of increased employment, for example in 1993 when production and employment levels in the Skellefte district rose, the years after 2002 are especially interesting concerning mining industry workers in the county of Västerbotten. Employment levels from 2002 and onwards increased throughout the time period in the region as such, but with various fluctuations among the three districts. There was a shift towards higher employment levels in all three districts in 1994–1995, and in 2004 and onwards. The increase in the 1990s was quite temporary, while changes occurring after 2004 seem to have stayed at a higher level due to the extraction of new deposits and changes in global demand, increasing the production pace and thereby raising the demand for labour.

Lycksele municipality, being part of both the Skellefte district and the Gold Line, has seen a slightly increasing number of workers since 2001. Another municipality with mining industry workers is Vilhelmina, which itself has no mining activities, but the Svartliden mine is located only about 5 km from the municipal border and, due to commuting, has an impact on the residential population (i.e. night-time population, see Fig. 3).

The day-time population, where the workplace location of employees is studied, is slightly higher than the night-time population of mining industry workers in Västerbotten, and has been so during the whole period, indicating commuting to the county from neighbouring areas (Fig. 3). The difference between day-time and night-time mining industry workers increased most rapidly in 2003, which is connected to the opening of the Svartliden mine. Commuters are mainly workers from nearby communities and municipalities, with former experience of mining from mines such as the Laisvall (closed 2001) in Norrbotten county. Commuting indicates that more municipalities than those included in the Skellefte district, such as Gold Line and Lycksele, are affected by the changes in the mining industry in Västerbotten.

Of all districts, Lycksele has the greatest difference between day-time and night-time mining populations, with more mining jobs than inhabitants working in the mining industry. Even if most people live and work in the same municipality, nearly half of Lycksele's mining industry workers had their residential location outside the municipality and were commuting to Lycksele. The Skellefte district has had more residential mining industry workers than actual mining jobs since the 1990s. Along the Gold Line, the day-time population has surpassed the night-time population in recent years, indicating commuting to the area due to new work opportunities.

Regarding specific mining occupations, the number of miners and mineral plant operators has increased by 72% since 2001. The Skellefte district had a peak in 2005, and the Gold Line had a gradually increasing level until the last year of available data (Table 2). These occupations have also risen gradually in Lycksele municipality, most likely as an effect of expanding production both along the Gold Line and in the Skellefte district (Table 2).

Table 2. Employment of miners and mineral plant operators 2001–2007, day-time population.

	2001	2002	2003	2004	2005	2006	2007	Change	Change, %
<b>Skellefte district</b>	207	234	254	274	322	276	295	+88	43
<b>Lycksele municipality</b>	66	61	73	75	77	84	93	+27	41
<b>Gold Line</b>	4	4	5	19	39	79	88	+84	2200
<b>Total</b>	277	299	332	368	438	439	476	+199	72

Source: Statistics Sweden, SSK codes 711 and 811.

Table 3. Employment of miners and mineral plant operators 2001–2007, night-time population.

		2001	2002	2003	2004	2005	2006	2007	Change	Change, %
<b>Miners</b>	Men	219	218	224	233	246	287	298	+79	36
	Women	8	9	7	7	23	29	33	+25	313
<b>Drillers and plant operators</b>	Men	59	98	88	125	149	152	201	+142	241
	Women	11	11	12	19	23	18	17	+6	55
<b>Total</b>		297	336	331	384	441	486	549	+252	85

Source: Statistics Sweden, SSK codes 711 and 811.

The change in the Gold Line is due to activities in the Blaiken and Svartliden mines. The development in the Skellefte district fluctuates during the period, not least caused by changed activities in two local mines. New employment has also been created in the Skellefte district, largely due to a restart of the Björkdal gold mine and intensified exploration. Since the increase is in the category of mineral plant operators (which includes well drillers, borers and related workers), it is most likely due to an exploration “boom” in Västerbotten.

The number of miners residing in the study area increased by 46% during the period 2001–2007, with a particularly sharp increase between 2004 and 2006. The proportion of women increased threefold during the period, and in 2007 represented about 10% of the miners (Table 3). Mining has traditionally been a sector dominated by men, and still is. However, technological advances have improved working conditions and slightly increased the number of women working in the sector.

### Related activities in Västerbotten’s mining industry

A trend among firms in various sectors and regions is their concentration of business to core activities and higher cost efficiency. This is also evident among major companies in Västerbotten, compared to the 1980s when major companies such as Boliden AB, sought to have many of their activities in-house (Metall 2000; Ds 2002: 65). The employment decline between 1990 and 2007 described above suggests that the number of work opportunities was reduced mainly due to cost-efficiency measures. This development is not exclusive to

mining operations in Västerbotten (Shapiro et al. 2007). Some related firms that were interviewed have activities abroad or are interested in further establishment outside Sweden and Europe, partly as a strategy for reducing their dependency on regional demand. However, most related interviewees stated that it is difficult to meet regional or national demand, especially during boom periods, and at the same time expand beyond national or European borders due to knowledge gaps, time constraints or a shortage of qualified labour.

In addition to mining industry workers, there are related activities and subcontractors that are not seen as core activities in Fig. 2, but still carry out work clearly related to the mining industry. In Västerbotten, employees in the category of metal plant operators (SSYK code 812) are mainly employed at the Rönnskär smelter in Skellefteå municipality, which is seen as a related activity according to Fig. 2. The number of employed metal plant operators in the study area decreased between 2001 and 2007 from 585 to 474 (night-time population), a decline of 19%. 28% of all women in the category had lost their jobs, compared to 18% of all men. In 2007, 424 men and 50 women worked as metal plant operators. The owner of the smelter, Boliden AB, has outsourced a substantial part of the activities instead of having all human resources in-house. The company had almost 900 persons working at Rönnskär in 2008 (Boliden 2009).

Based on the interviews, 27 related activities in Västerbotten were identified and have been divided into categories according to their SNI coding (Table 4). The largest group of related activities, apart from metal plant operators, are those producing equipment for the industry. The group which has increased most is drilling companies, followed by transportation, even if these numbers

Table 4. Employees in related activities 2004–2007.

Related activity	Number of companies	Employees per sector			
		2004	2005	2006	2007
Equipment	11	416	386	421	518
Drilling	3	47	92	185	243
Transportation	2	16	24	32	46
Services	7	74	75	84	91
Consultants	4	3	4	4	3
<b>Total</b>	27	556	581	726	901

Source: Affärsdata 2009.

are on a fairly low level. Another important group is those businesses providing construction, electricians and mechanical services. Employment in related activities increased from 556 employees in 2004 to 901 employees in 2007, a change of 62%. Figures include regional companies, whereas the Rönnskär smelter is excluded.

## Concluding remarks

Substantial changes have taken place within the global mining industry since the early 1990s. Growing global demand for minerals and the Swedish mining deregulation in 1992 increased international mining actors' interest in Sweden's mineral deposits, leading to the entry of several foreign mining companies and substantial foreign investment. Today foreign companies conduct exploration and mining, but also related activities such as consulting in Västerbotten. The industry has been transformed by this internationalization and increased flexible specialization, and these changes have led to a growth in employment outside the mining companies. Consequently, some mining employment has moved from core activities performed by the mining companies to related activities (often subcontractors). Some of these firms are not registered as performing mining activities, according to the Swedish Standard Industrial Classification (SNI).

Mining employment in the study area of Västerbotten generally declined between 1990 and 2007. However, the implementation of flexible strategies leads to the conclusion that it is not entirely a case of declining work opportunities. Instead, mining employment is transferred into other

sectors, from core activities to related activities such as the development of equipment and manufacturing, or is outsourced to subcontractors. In fact, data and interviews indicate that the number of work opportunities among related activities is higher today than the number of jobs in the mining industry. There is, however, a significant difference between related activities like consulting and manufacturing, which are knowledge-intensive, and activities like mining and transportation, which are more labour-intensive. Subcontractors often perform labour-intensive tasks. During financial crisis these subcontracting firms face an uncertain future, while firms in other related sectors are usually less vulnerable. The high-risk profile of subcontracting firms reveals their weaknesses when it comes to local and regional development based on mining. In spite of this, flexibility also creates new business opportunities for related firms. As a matter of fact, some are highly competitive within their niche on the international market and also have the ability to sell their products to customers outside mining.

Even though employment in mining has generally decreased since 1990, more recent years have witnessed a remarkable employment recovery. During the period 2001–2007 there was 34% employment growth in the region's mining sector, also increasing the number of women employed in the sector. Mining has traditionally been totally dominated by men, but in 2007 about 10% of miners were women. This is a substantial change, albeit starting at a very low level. Another new feature during recent years is activities undertaken along the Gold Line, resulting in new mines and employment. Due to existing settlements, most employees live in the mining districts or commute

relatively short distances, even though the study area is remote and sparsely populated.

The difficulties involved in building a sustainable development in mining have been widely acknowledged (Neil et al. 1992; Freudenberg 2002; Cutter & Renwick 2004). Exhaustion of non-renewable resources lies in the very nature of mining communities, and dramatic fluctuations in demand for minerals and metals are the normal state of these businesses. However, the recent economic recession has not meant that mining investment in the study area is back at the same low levels as during the 1980s and 1990s. Instead, a rather quick recovery of the demand for minerals and metals has kept mining investments in Västerbotten at a high level. Exploration investments there are among the highest in Europe, and the demand for gold is still strong. However, exhaustion, shifts in demand and short-term mining investments affect municipalities in the region when planning for social services, housing, land use, etc. It is also difficult to attract labour to become residential and thereby contribute to local and regional growth when the individual mines tend to be rather small and short-lived. From this perspective, it is not likely that new mines will have large long-term effects on employment and population figures. At this stage, neither core nor related mining activities can alone reverse the declining tendencies in Västerbotten's mining districts.

As mentioned, new employment opportunities have lately been created in related activities rather than in the mines. Hence, one option would be to diversify the local and regional economies through mining-related activities, especially those knowledge-intensive activities that make use of the vast experience in mining and that are able to benefit from the presence of new international mining companies in the region. This could potentially contribute to making the firms, their employees and even the communities less vulnerable to the risks associated with exhaustion of the region's mineral resources, layoffs due to rationalizations and the recurrent dramatic up- and down-swings in the mining industry. Such a strategy could be promoted through investments in R&D, education and training. In this way, a strategy based on fostering mining-related activities could help to diversify the economy and thereby strengthen regional competitiveness and development potentials.

## NOTES

<sup>1</sup> Sörensson (2003) and Lind (2009) have estimated multiplier effects based on scenarios of increased mining activities in the Gold Line district.

<sup>2</sup> The Frasier Institute's survey includes, for example, questions about infrastructure, taxation, political stability, mineral potentials, employment agreements and regulations regarding environment and land use.

## REFERENCES

- Barnes TJ, Hayter R & Hay E 2001. Stormy weather: cyclones, Harold Innis, and Port Alberni, BC. *Environment and Planning* 33: 12, 2127–2147.
- Bengtsson O 1997. *Grängesberg utan gruvdrift. Avveckling och utveckling i ett 10-årigt perspektiv*. Arbetsrapport oktober 1997. Dalarnas forskningsråd, Falun.
- Bergstaten 2009. *Årsrapport 2008*. Bergstaten.
- Boliden 2009. *Årsredovisning 2008*. Boliden AB.
- Bridge G 2004. Mapping the bonanza: geographies of mining investment in an era of neoliberal reform. *The Professional Geographer* 56: 3, 406–421.
- Commission of the European Communities 2005. *European Industry: A Sectoral Overview*. Commission staff working paper. Brussels 5.10.2005.
- Commission of the European Communities 2008. *Communication from the Commission to the Council and the European Parliament on the Competitiveness of the metals industries. A contribution to the EU's Growth and Jobs Strategy*. Brussels 22.2.2008.
- The County Boards of Norrbotten and Västerbotten 2008. *Analys av Norrbottniska och Västerbottniska naturresursers betydelse för hållbar tillväxt*. Länsstyrelsen Västerbotten och Länsstyrelsen Norrbotten.
- Crowson P 2009. The resource curse: a modern myth? In Richards JP (ed). *Mining, society and a sustainable world*, 3–36. Springer, Berlin, Heidelberg.
- Cutter SL & Renwick WH 2004. *Exploitation, conservation, preservation: A geographic perspective on natural resource use*. 4<sup>th</sup> ed. John Wiley & Sons, Danvers.
- Dale B 2002. An institutional approach to local restructuring: the case of four Norwegian mining towns. *European Urban and Regional Studies* 9: 1, 5–20.
- Dicken P 2003. *Global shift. Reshaping the global economic map in the 21st century*. 4<sup>th</sup> ed. Sage, London.
- Ds 2002: 65 2002. *Inför en ändrad minerallag. Vissa kompletterande mineralpolitiska frågor*. Regeringskansliet, Näringsdepartementet.

- Frasier Institute 2008. *Survey of mining companies 2007/2008*. The Frasier Institute.
- Freudenberg WR & Wilson LJ 2002. Mining the data: analyzing the economic implications of mining for nonmetropolitan regions. *Sociological Inquiry* 43: 4, 549–575.
- Georange 2003. *Exkursionslokaler i norra Västerbotten*. Georange.
- Georange 2008. *Klusterdatabas*. Data material from Georange.
- Halseth G 1999. "We came for the work": situating employment migration in B.C.'s small resource-based communities. *The Canadian Geographer* 43: 4, 363–381.
- Hanink DM 2000. Resources. In Sheppard E & Barnes TJ (eds). *A companion to economic geography*, 227–241. Blackwell, Oxford.
- Hayter R 2000. Single industry resource towns. In Sheppard E & Barnes TJ (eds). *A companion to economic geography*, 290–307. Blackwell, Oxford.
- Hayter R, Barnes TJ & Bradshaw MJ 2003. Relocating resource peripheries to the core of economic geography's theorizing: rationale and agenda. *Area* 35: 1, 15–23.
- Holly BP 1996. Restructuring the production system. In Daniels PW & Lever BF (eds). *The global economy in transition*, 24–39. Addison Wesley Longman, Harlow.
- Houghton DS 1993. Long-distance commuting: a new approach to mining in Australia. *The Geographical Journal* 159: 3, 281–290.
- Humphreys D 1995. Whatever happened to security of supply? Minerals policy in the post-Cold War world. *Resources Policy* 21: 2, 91–97.
- Humphreys D 2010. The great metals boom: A retrospective. *Resources Policy* 35: 1, 1–13.
- Johansen H 1998. Mining to tourism: Economic restructuring in Kellogg, Idaho. In Neil C & Tykkyläinen M (eds). *Local economic development: A geographical comparison of rural community restructuring*, 251–268. United Nations University Press, New York.
- Jussila H & Järviuoma J 1998. Extracting local resources: the tourism route to development in Kolari, Lapland, Finland. In Neil C & Tykkyläinen M (eds). *Local economic development: A geographical comparison of rural community restructuring*, 269–289. United Nations University Press, New York.
- Liljenäs I 1992. From mine to outer space: the case of Kiruna, a town in northern Sweden. In Neil C, Tykkyläinen M & Bradbury J (eds). *Coping with closure: an international comparison of mine town experiences*, 247–265. Routledge, London.
- Lind T 2009. *Back to the basics? Modelling socio-economic impacts of new mines in the interior of Västerbotten, Sweden*. Master thesis, Department of social and economic geography, Umeå University, Umeå.
- Lundgren Å 2006. *Guldfieber: berättelsen om Guldriket och dess människor*. Guldriket, Skellefteå.
- Lundkvist G 1980. *Den industriella utvecklingen 1990–1975: Basindustrin Boliden*. Skelleftebygdens historia del 2. Skellefteå kommun, Skellefteå.
- Lundmark L 2006. *Restructuring and employment change in sparsely populated areas. Examples from northern Sweden and Finland*. GERUM Kulturgeografi 2006: 2, Umeå University.
- Metall 2000. *Gruvnaeringen*. En rapport från Metall. Metalls utredningsavdelning, Stockholm.
- Neil C, Tykkyläinen M & Bradbury J (eds) 1992. *Coping with closure: an international comparison of mine town experiences*. Routledge, London.
- Neil C & Tykkyläinen M (eds) 1998. *Local Economic Development: a geographical comparison of rural community restructuring*. United Nations University Press, New York.
- Nilsson J-E 2000. Norrland – från förlovat land till förlorat stödområde? In Axelsson S (ed). *Några tankar kring sekelskiftets regionala problembild*, 81–97. SIR rapport 123. Swedish Institute for Regional Research, Östersund.
- Nordregio 2009. North Norden: a new mining era. *Journal of Nordregio* 2009: 3.
- Nygren L & Karlsson U 1992. Closure of the Stekenjokk mine in north-west Sweden. In Neil C, Tykkyläinen M & Bradbury J (eds). *Coping with closure: an international comparison of mine town experiences*, 99–118. Routledge, London.
- NÄRP 1982. *Tynande gruvsmåhällen i Norden*. Nordiska ämbetsmannakommittén för regionalpolitik. Basprojektet. December 1982.
- Peck J 2000. Places of work. In Sheppard E & Barnes TJ (eds). *A companion to economic geography*, 133–148. Blackwell, Oxford.
- Pettersson Ö 2002. *Socio-Economic Dynamics in Sparse Regional Structures*. GERUM Kulturgeografi 2002: 2, Umeå University.
- Rolfe J, Miles B, Lockie S & Ivanova G 2007. Lessons from the social and economic impacts of the mining boom in the Bowen Basin 2004–2006. *Australian Journal of Regional Studies* 13: 2, 134–153.
- SGU 2007. *Bergverkstatistik. Årsrapport*. Statistics of the Swedish Mining Industry 2007. Per. Publ. 2008: 2. Sveriges geologiska undersökning.
- SGU 2007: 1. *Årsredovisning 2006*. Sveriges geologiska undersökning.
- SGU 2009. *Metals and minerals. Sweden's contribution to raw material supply in Europe*. Geological Survey of Sweden.
- SGU 2009: 1. *Mineralmarknaden. Tema: Guld*. Per. Publ. 2009: 4. Sveriges geologiska undersökning.
- Shapiro D, Russel B & Pitt L 2007. Strategic heterogeneity in the global mining industry. *Transnational Corporations Journal* 16: 3, 1–34.
- SR 2009. Blaikengruvan öppnar omedelbart. Sveriges Radio Norrbotten.

- <<http://www.sr.se/cgi-bin/Norrboten/nyheter/artikel.asp?artikel=2643705>> 18.2.2009.
- Storey K 2001. Fly-in/Fly-out and Fly-over: mining and regional development in Western Australia. *Australian Geographer* 32: 2, 133–148.
- Sörensson R 2003. *Effektstudie av gruvetableringari i Lycksele och Storumans arbetsmarknadsregioner*. Report 11: 2003. CERUM, Umeå universitet, Umeå.
- Sörlin S 1988. *Framtidslandet. Debatten om Norrland och naturresurserna under det industriella genombröttet*. Kungliga Skytteanska samfundets handlingar nr 33. Carlssons, Stockholm.
- Tykkyläinen M 1998. Towards translocal communities: a mine in Western Australia. In Neil C & Tykkyläinen M (eds). *Local economic development: a geographical comparison of rural community restructuring*, 226–247. United Nations University Press, New York.
- UNCTAD 2009. *World Investment Report 2009. Transnational Corporations, Agriculture Production and Development*. United Nations Conference on Trade and Development. United Nations Publication, New York and Geneva.
- Westin L 2006. Trading natural resources for public grants. Development rhetoric image and social capital in north Sweden. In Ito K, Westlund H, Kobayashi K & Hathori T (eds). *Social capital and development trends in rural areas 2*, 71–84. MARG, Kyoto.
- Wiberg U 2009. *Förutsättningar för hållbar tillväxt i gruv- och mineralsektorn*. Swedish Agency for Economic and Regional Growth. Rapport 0004.