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NEXT
New Exploration Technologies

DELIVERABLE 5.3

REPORT ON THE ROLE OF EXPLORATION TECHNOLOGIES AND ASSOCIATED SOCIAL AND SAFETY RISK FOR SOCIAL LICENSING

FACTORS AFFECTING LOCAL ATTITUDES TO MINERAL EXPLORATION

Horizon 2020 Project: NEXT

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About NEXT

NEXT consortium consists of 16 partners from leading research institutes (3), academia (3), service providers (5) and industry (5). The members come from 6 EU member states (FI, FR, DE, MT, ES and SE) and represent the main metal producing regions of Europe, Fennoscandian Shield, Variscan Belt of Iberia and Central European Belt. The project consortium also has a vast international collaboration network, e.g. 50% of the Advisory Board members have been invited from outside the EU.

In addition to the variable geology, the vulnerability of the environment and the glacial sedimentary cover in the Arctic regions of northern Europe, and the thick weathering crust and more densely populated nature of the target areas in the Iberian and Central European belts influence the mineral exploration in different ways. New environmentally sound exploration concepts and technologies will be optimized and tested on diverse mineral deposit types.

NEXT will develop new geomodels, novel sensitive exploration technologies and data analysis methods which together are fast, cost-effective, environmentally safe and, potentially more acceptable to local actors and communities. Methods developed aim at reducing the current high exploration costs and enhancing participation of civil society from the start of exploration, thus raising awareness and trust.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 SUMMARY

This study aimed at exploring factors affecting local actors' and citizens' attitudes to and acceptance of mineral exploration ("Social License to Explore", SLE), and how attitudes to exploration relate to acceptance at later stages of the mining cycle ("Social License to Operate", SLO). It explored local actors' and citizens' perception of and attitudes to exploration in three local case studies which differed in contextual conditions that are important to the level of acceptance, i.e. community mining background, socio-economy and existence of indigenous people and traditional livelihoods. More specifically the study investigated the following questions:

- What are local actors' and citizens' understandings of mineral exploration?
- What are the key factors influencing local actors' and citizens' attitudes to mineral exploration? What is the importance of values, visions and understandings of sustainable development; perceptions of impacts, risks, the regulatory framework; and understandings of (new) technology?
- What is the importance of interaction during the exploration stage?
- What are actors' positions and outcomes in terms of resistance, acceptance or approval?
- What are the relationships between attitudes to mineral exploration and mining?

The theoretical framework that guided the study situates the concepts SLO and SLE in the context of governance – state, market and civil society interactions. A comparative case study approach was used to learn from comparing similarities and differences between three different cases located in Ylitornio/Rovaniemi municipality in Finland, and Gällivare and Jokkmokk municipalities in Sweden. The empirical material consisted of written sources, interviews and a mail survey to a representative sample of citizens in three localities.

The main conclusions of the study are:

- Local actors' and citizen's knowledge about exploration vary significantly. Exploration and mining are typically understood as different but interlinked activities: exploration aims at mine development and maintaining mining presupposes exploration.
- Fundamental values about nature, economy and visions for the future development of the local community shape attitudes to exploration and mining, i.e. these factors explain average citizens' as well as organized actors' positions.
- How local actors and citizens assess the balance between negative and positive impacts associated with exploration - and possible mining activities - seem to be one of the most important factors shaping attitudes.

- Exploration is not in itself associated with major risks but causes uncertainty about the future development of the community, including anxiety for environmental risks, or expectations about economic benefits, associated with a possible mine development.
- Local actors' experiences and perceptions of the regulatory system affect their trust in the permitting processes and the legitimacy of their outcomes.
- The quality of company-community interaction is important and can affect attitudes to and understanding of exploration as well as and mining.
- Less intrusive exploration technologies are welcome and proactive information can increase knowledge and interest in them, but other factors appear to be more important to local attitudes.
- Similar sets of perceptions, attitudes and positions (e.g. pro-, skeptical- and indeterminate) can be identified in many different places but their relative prevalence varies significantly and is context dependent.

Assessing "acceptance" is not a simple exercise that results in a straightforward "yes" or "no". Attitudes can be interpreted and the level of agreement, or disagreement, can be assessed at a particular point in time. In a highly regulated context such as the EU, the concepts SLO and SLE may be most effective as an indicator to provide information about the quality of the relationship between a company and community and the performance of the regulatory system. Assessments of attitudes in one place, cannot easily be generalized to other places. But, insights about contextual conditions and drivers shaping attitudes can be generalized and help explain, even predict, local attitudes to exploration and mine-development across Europe. Consequently, the mechanisms and drivers of the attitudes identified in this study can also be generalized and transferred to other European contexts. Based on these findings, this report offers recommendations to exploration and mining companies working to improve their interaction and relationships with local communities.

2 INTRODUCTION

Increasing demand for metals and mines drive mineral exploration with the aim of identifying commercially extractable deposits across the EU (European Innovation Programme on Raw Materials, 2016). While some local actors welcome exploration in their communities, expanding exploration and mining activities also give rise to resistance and an increasing level of conflict (Beland Lindahl et al. 2018, Mononen 2020). Indeed, "social acceptance" is today seen as a major challenge for exploration as well as mining companies, and to the realization of EUs objectives (Lesser et al. 2020).

In short, mineral exploration is the process of finding ores (commercially viable concentrations of minerals) through geological and geophysical investigations of the (sub-)surface. The concept Social License to Explore (SLE) refers to the relationship between mineral exploration companies and the communities where the exploration takes place. SLE originates from the concept Social License to Operate (SLO), widely used in the mining sector, usually referring to local acceptance of operations earned by company performance (Thomson and Boutilier 2011). Neither SLO nor SLE is an official or legal permit, on the contrary, it is an informal and unofficial approval, acceptance or support from the local community. There is very little evidence-based knowledge about acceptance at the exploration stage, for example the factors that shape local attitudes, the role of context, the importance of early interaction and trust, the nature of impacts, the role of technology and the interplay between formal institutions and extra legislative commitments (Suopajärvi et al. 2019 2020). Actors' responses to exploration have not been prioritized in research, nor by industry, as the social impacts of exploration are considered less intrusive than those of mining. However, the exploration phase is associated with specific challenges. It's a long, costly, competitive, and high-risk activity characterized by uncertainty and ambiguity. Moreover, field work and financing are often undertaken by junior exploration companies operating with limited resources. Nevertheless, relationships and attitudes that are formed during the exploration stage may follow a project throughout its lifespan.

This study aimed at exploring the factors affecting local actors' and citizens' attitudes and acceptance at the exploration stage ("SLE"), and how attitudes to exploration relate to acceptance at later stages of the mining cycle ("SLO"). It adds to previous H2020 funded research on exploration and mining related attitudes, e.g. MIREAU (Mining and Metallurgy Regions of EU) and INFACT (Innovative, Non-invasive and Fully Acceptable Exploration Technologies), by exploring *local* actors' and citizens' perceptions and positions on *exploration* in greater depth in three different local *case studies* which differ in *contextual conditions* that have be shown to be important to the level of acceptance, i.e. community mining background, socio-economy and existence of indigenous people and traditional livelihoods (del Río et al. 2018). More specifically the study investigated the following questions:

- What are local actors' and citizens' understandings of mineral exploration?

- What are the key factors influencing local actors' and citizens' attitudes to mineral exploration? What is the importance of values, visions and understandings of sustainable development; perceptions of impacts, risks, the regulatory framework; and understandings of (new) technology?
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3 THEORY AND METHODS

The concept SLO evolved within the mining industry and was originally introduced with the intent to facilitate greater awareness on the industry side of the outcome of bad practices in states with weak regulation (Prno 2013, Moffat et al. 2016). Now, it is increasingly used as a general measure for community acceptance (e.g. Thomson and Boutilier 2011, Prno and Slocombe 2012, Boutilier 2020) or sustainability (Parsons and Moffat 2014, Bice 2014), while also serving as a mechanism for communities to keep companies accountable (Harvey and Bice 2014, Gunster and Neubauer 2019). Applied to the early stages of the mining cycle it has given rise to the concept Social License to Explore (SLE, Suopajärvi et al. 2019). However, the concept SLO is also critically viewed as an industry response to opposition and a mechanism to ensure the viability of the sector (Owen and Kemp 2013), thus undermining, or circumventing, regulatory structures already in place (Owen and Kemp 2017). Practices and measures used to assess social acceptance remain under-defined (Bice and Moffat 2014, Lesser et al. 2020), and disagreements prevail as to the meaning of the concept (Boutilier 2020). To bring clarity, Thomson and Boutilier (2011) introduced a hierarchical scale based on normative criteria – legitimacy, credibility, and trust – to indicate how a community views company behavior. The SLO literature acknowledges the importance of the broader socio-political interactions and places the social license in the context of the dynamic relations amongst the company representing the private sector, the government representing the public sector, and communities and non-governmental organizations (NGOs) representing the civic sector (Prno and Slocombe 2012). As pointed out by Boutilier (2020), socio-political power in the process of granting or receiving a license, is central to the interpretation and enactment of the concept.

The theoretical framework used for this study is based on the Prno and Slocombe (2012) model, but further informed by interactive governance theory (Jentoft and Chuenpagdee 2015, see fig. 2). The latter offers further tools to evaluate the quality of interaction, here understood as indicators of the relationships that are key to SLE and SLO. Institutions, i.e. rules and decision-making procedures that give rise to social practice (Young et al. 2008), and actors' visions and understandings of sustainable development (SD), are also addressed, since previous research highlights their importance to attitudes and outcomes (e.g. Beland Lindahl et al. 2018, Zachrisson and Beland Lindahl 2019). Reflecting the framework in fig. 2, this study analyzed the governance system

embedding mineral exploration/(mining) and its outcomes (SLE/SLO) by assessing: i) the natural system (landscape and natural resources); ii) the governing system (state actors) and the social system to be governed (e.g. company and community actors'/citizens, their visions, perceptions of risk, sustainability and technology, institutions and practices); iii) governing interactions and iv) outcomes in terms of attitudes and acceptance.

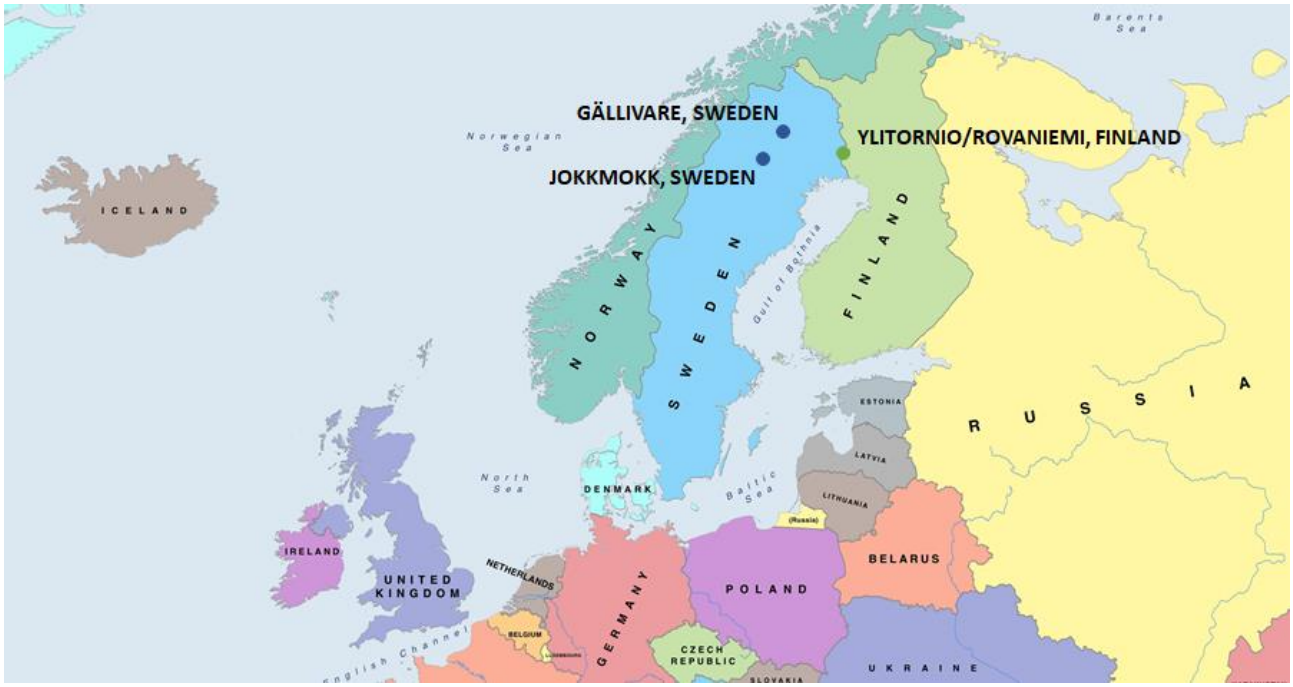

Figure 1: The location of three case studies selected for study. Source: Mapswire and self-edited.

This study applied a comparative case study approach, i.e. learning from comparing similarities and differences between different cases. Three case studies exhibiting interesting similarities and differences in a Northern/Fennoscandian mineral system and socio-cultural context were selected for study: Mawson's Rompas-Rajapalot project located on the border of Ylitornio and Rovaniemi municipalities in Finland (the Ylitornio/Rovaniemi case), Boliden's operations in the Aitik area in Gällivare municipality (the Gällivare case) and Jokkmokk Iron Mines AB´s (JIMAB's) Kallak project in Jokkmokk municipality in Sweden (see fig. 1). A most-similar-system design (Seawright and Gerring 2008) was applied, since many background variables in the three cases are similar but variables that are central to the analysis differ as shown in table 1. One key difference is the use of NEXT exploration technologies that were only applied in the Finnish case, and another is the history and presence of mining and mine development projects. The latter is important to the ambition to establish the relationships between attitudes to exploration and mining.

The methods used in this study are more detailly explained in appendix. 1. In short, the empirical material consisted of written sources (policy documents, official documentation of the permit processes, documents and digital information produced by the actors, media articles), interviews and a mail survey to a representative sample of residents in the three locations. Two questionnaires with 80 common questions (in Swedish and Finnish) were distributed by mail to 4100 respondents,

900 in Finland and 3200 in Sweden, in the three localities between March and June 2020. One reminder was sent to all non-respondents from the first round. The respondents, 18 to 70+ years old, were selected by the State Register of Swedish Individuals (SPAR) in Sweden and the Digital and Population Data Services Agency in Finland. After two rounds, the response rate was approximately 30 percent across the three municipalities. The survey respondents skew older than the demographics of all three communities and more men than women are represented in the sample.

In addition, semi-structured interviews were conducted in two of the cases: Ylitornio/Rovaniemi and Gällivare. A total of 38 semi-structured interviews were conducted with representatives of organized actors, i.e. organizations such as village associations, non-governmental organizations, business associations, Sami reindeer herding communities (SRHCs), authorities, etc., located in the selected municipalities, or with activities associated with the particular projects. 17 interviews were conducted in the Gällivare case and 21 in the Ylitornio/Rovaniemi case during the period May 2019 to March 2020. The interviews were recorded, transcribed and analyzed thematically with the help of the qualitative data analysis software N-Vivo. Organized actors in the Jokkmokk case were interviewed in a previous study (Beland Lindahl et al. 2016, 2018), and the results of these interviews feed into the discussion of this report. Other H2020 project reports (INFACT and MIREAU) were also reviewed to identify findings that supplement the Northern European focus of this study.

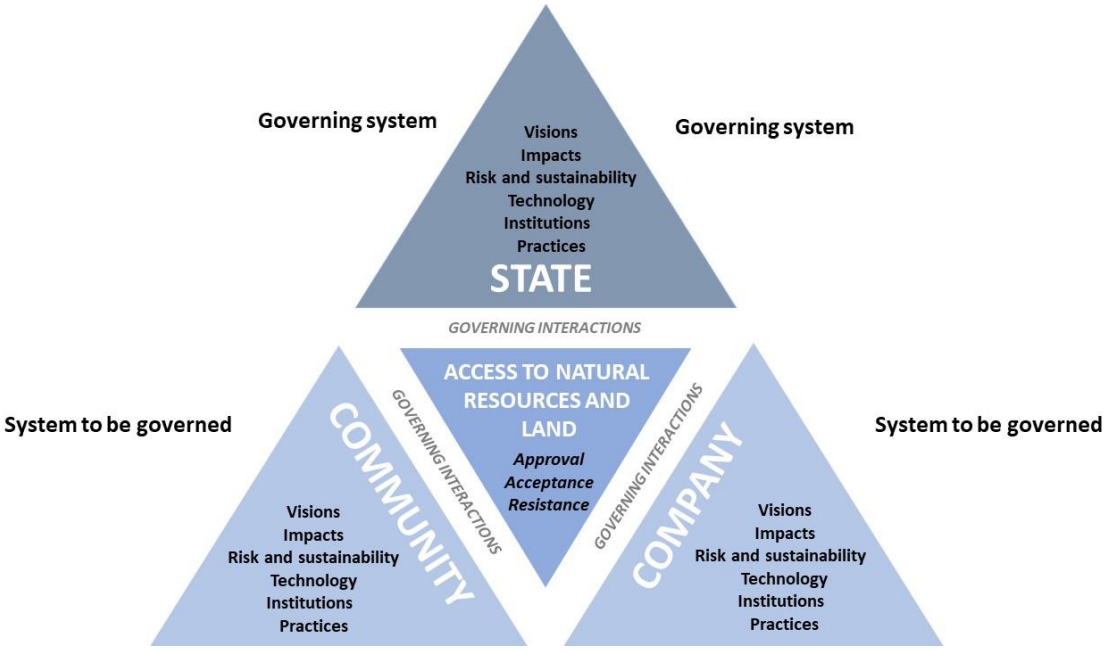

Figure 2: Theoretical framework developed from Prno and Slocombe (2012) and Jentoft and Chuenpagdee (2015).

4 SITUATING THE CASES: MINERAL EXPLORATION (AND MINING) IN SWEDEN AND FINLAND

The Fennoscandian shield is composed of old, Paleoproterozoic and Archean rocks that host abundant mineral deposits. It is stretching through Norway, Sweden, Finland and parts of Russia, and has been the target for mining for over a thousand years. This, together with other factors, such as infrastructure, legislation, and accessibility to relevant expertise, makes the Nordic region an attractive area for exploration which increased dramatically in both countries in the beginning of the 21st century (Tarras Wahlberg 2014, Liikamaa 2020). Yet, it is considered underexplored compared to corresponding geological areas (SveMin 2020) in other parts of the world (e.g. Australia, South Africa and Canada), partly because foreign exploration and mining companies were not allowed to operate freely in the Nordic region until the 1990s.

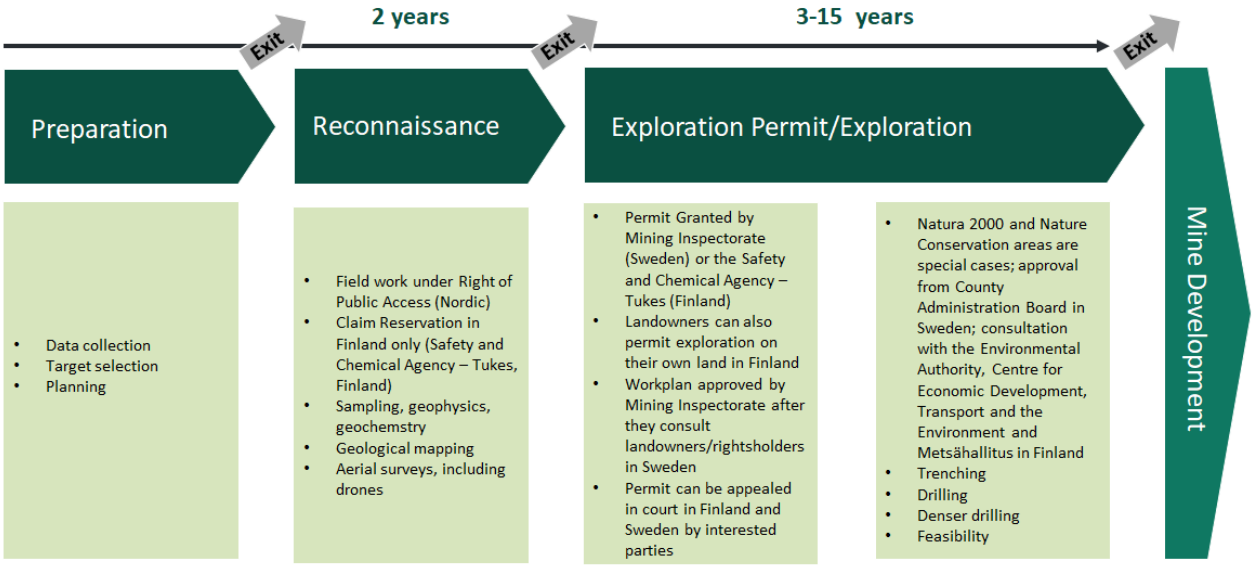

Fig. 3. The different phases of mineral exploration and the formal permitting processes in Finland and Sweden.

Sweden and Finland share legal tradition and many common traits in how they govern exploration and mining activities, including political ambitions to promote mining - and sustainable development (Finland's Ministry of Employment and the Economy 2010, 2013, Hojem 2015). In both countries, exploration is typically regulated by Minerals and Environmental laws and requires permits granted by a specific public authority. In Finland, landowners can also give permission for mineral exploration in their lands. However, this does not give a pre-emptive right to apply for mining license, like the mineral exploration license does. The exact permitting procedures differ slightly, but figure 2 provides a general overview of the process in both countries. Mineral exploration can be divided into three distinct phases. During "Preparation", the company familiarizes itself with the data, identifies geologically interesting target areas and deposits and, in Finland, applies for a claim reservation. The second phase, "Reconnaissance'' involves surficial field

surveying and minor sampling under the Right of Public Access. Landowners and other interested parties are normally informed. The third phase, "Exploration", is the granting of an exploration permit, as above, and the subsequent activities, such as mechanical drilling and excavation to identify interesting geological features. In Sweden, consultation with landowners and rightsholders is needed for an approved work plan, which is required before exploration can start. They can raise an objection to the exploration activity with Mining Inspectorate. The applicant must then work with the landowner or rightsholder to resolve the dispute. After the resolution work, the Mining Inspectorate makes a decision on the permit. In Finland, no approval of a workplan is needed but interested parties are consulted and if not satisfied, they can appeal for the High Court about an issued permit. In Sweden, interested parties can appeal to the Land and Environment Court. Companies can interact with community actors as they engage in their field work during the reconnaissance stage, but consultation with land- and rightsholders is required when the exploration permit is sought.

Both Sweden and Finland recognize Sami as an indigenous people with particular rights, but in different ways. In Finland, the "Sami homeland" is situated in the northernmost parts of Finnish Lapland, but the reindeer herding area covers over one third of the Finnish area and extends well south of the Province of Lapland. In Finland, reindeer herding is a livelihood practiced also by non-Sami (Finland's Ministry of Employment and Economy 2014, del Río et al. 2018). In Sweden, reindeer herding is reserved only for Sami reindeer herding communities (Sami RHCs), whose reindeer herding is given a certain degree of protection in relation to other land uses across the reindeer herding area (Hojem 2015). Both Swedish and Finnish mining legislation include some provisions to ensure consultations with the Sami, mitigate negative impacts caused by exploration and mining and make tradeoffs between different land uses (Finnish Mining Act 621/2011, Finlex 2011, Raitio et al. 2020). While some scholar argue that the existing provisions provide a certain level of protection (Koivurova et al. 2015b), recent research show that weak recognition of Sami rights and related impact assessment within the mineral permitting systems are urgent issues in both countries (Larsen 2018; Raitio et al. 2020).

In Sweden, two major mining companies developed during the 20th century, state owned LKAB (Luossavaara-Kirunavaara Aktiebolag) and privately owned Boliden. They dominated the sector and the development of the Northern towns Kiruna and Gällivare. In Finland, mining was in the hands of nationally owned companies until the 1990s. In the late 2000s, the activities in the mining industry in both countries were at low levels due to rationalizations, lack of capital and increasing global competition (Tano et al. 2016, Jartti et al. 2017, del Río et al. 2018). To strengthen the Swedish mining sector, it was deregulated and opened to international actors in the early nineties (Tano et al. 2016, Tarras Wahlberg 2014). Finland opened to foreign companies when the country joined the European Union in the mid-1990s. These developments in combination with rising demand and metal prices, stimulated exploration and resulted in a so-called mining boom in Finland and Sweden in the early 2000s (Jartti et al. 2017, del Río et al. 2018, Tarras Wahlberg 2014).

The relations between the Swedish mining companies and the local communities in the Northern mining districts have been characterized by lack of overt opposition rather than conflict during most of the 2000s (Knobblock 2013). In Finnish Lapland, metal mining has not been a major industry during the 20th century. Only one still active mine has been in operation for decades, the so-called Kemi mine, which started by Outokumpu Chrome Oy in Keminmaa municipality in the end of the 1960s. Rautaruukki Oy operated an iron mine in the Kolari municipality between 1962 and 1989. In addition to these, there have only been a couple of short-term mining projects before the "mining boom" in the 2000s. Accordingly, the Kittilä gold mine opened in 2009 by Agnico Eagle, and the Kevitsa mine started in 2012 and was acquired by Swedish Boliden in 2016. Based on surveys in these Finnish localities, the mining activities were broadly accepted and seen as important sources of income to the local economies (Kuisma and Suopajärvi 2017, Saariniemi 2018, Kantola et al. 2019). In general, the Finnish public perceive mining as important to the national and regional economy (Jartti et al. 2017). Nevertheless, the expansion of exploration, especially that of uranium, and mine development in the beginning of the 2000s raised questions in many local communities (Eerola 2008). Skeptical actors now form part of a broader social movement in Sweden and Finland where environmental and social critiques of national mining policies have been on the increase (Haikola and Anshelm 2016, Zachrisson and Beland Lindahl 2019, Mononen, 2020).

Although the degree of public scrutiny is notably higher now than the previous decades, all projects do not dredge up disputes. While several new exploration and mining projects have seen broad support from the local community (e.g. Mononen 2012, Koivurova et al. 2015a, Poelzer and Ejdemo 2018) others experience resistance or a polarized response. The resistance is typically driven by actors who are concerned with environmental impacts, for example in relation to nature conservation areas and tourism destinations, the issue of Sami rights and negative effects on reindeer husbandry (Beland Lindahl et al. 2016, 2018, Lawrence and Kløcker Larsen 2017, Lesser et al. 2017, Lyytimäki and Peltonen 2016, Lassila 2018). How mineral development is perceived, and where exploration and mining sits amongst competing interests and industries, is highly context dependent. Therefore, the three case studies explored in this study are similar enough to allow comparison, e.g. typical inland municipalities in depopulating Northern rural areas, but differ in a number of contextual variables that are central to the analysis, e.g. mining history, local economy and economic structure, and indigenous people and land use (see table 1).

As shown in table 1, all three municipalities are sparsely populated, with large elderly populations (especially Ylitornio) and long-term negative population trends (particularly in Ylitornio and Jokkmokk). Ylitornio and Jokkmokk share a typical northern history of socio-economic change: agriculture, forestry, and in Jokkmokk hydro power construction, were dominant until the 1970s when mechanization reduced the workforce and the service sector expanded. Forestry and hydro power development were important to Gällivare municipality as well, but the town Gällivare expanded together with the mining industry throughout the 20th century. Reindeer husbandry is part of the local economies in all cases, but particularly important in Jokkmokk which also displays a relatively high proportion of small-scale businesses. Gällivare municipality hosts four Sami RHCs:

Baste, Girjas, Unna Tjeurus and Gällivare SRHC. Five Sami RHCs exist in Jokkmokk five: Sirges, Jåhkågasska tjielde, Tuorpon, Sierri and Udtja.

Case	Gällivare	Jokkmokk	Ylitornio
Size of the municipality	16 818 square km	19 334 square km	2 213 square km
Population and demography	17 529 in 2019 Declining Elderly population	4 923 in 2019 Declining Elderly population	Around 4000 Declining Elderly population
Unemployment	Stable low/declining 1,8 % in 2019	Varying but currently low 2,2% in 2019	Varying, but currently lower than in 2000s About 12,6 % in 2020
Largest employers	Gällivare municipality: 23,5% LKAB (mining): 13% Boliden Mineral AB (mining): 7,5% Norrbotten County (health care): 9,1	Jokkmokk Municipality: 31,4 Vattenfall (hydro power production): 7,5% Norrbotten County (health care): 4,5% Small scale business: 10,2 %	Largest employer Ylitornio Municipality: 457 employees in 2019. Services 65,4% refinement 16,4% primary production 14,2
Average income	Above the national average due to well paid jobs in the mining industry	Slightly below national average	Low especially in “Lake Villages” where the majority of the residents are retired (40% belong to the lowest income group in Finland)
Indigenous peoples and minorities	Swedish majority Relatively large Sami and Finnish minorities but proportionally less Sami than Jokkmokk. 4 SRHCs	Swedish majority Approximately 20-30% of population is Sami 5 SRHCs Sami administration and organizations	Finnish population Not part of the Sami homeland of Finland
Political parties	Three largest parties in 2018 election: Social Democrats:15 Conservatives: 7 Left Party: 5	Three largest parties in 2018 election: Social Democrats: 10 Future of Jokkmokk: 5 Green Party: 3	Three largest political parties in 2017 election: Centre Party: 11 Left Alliance: 5 Social Democratic Party: 1

Table 1. Socio-economic conditions in the three case study areas. Sources: Statistics Sweden 2020a, Regionfakta 2020, Gällivare 2020, Jokkmokk 2020, Ylitornio 2020; Statistics Finland 2020.

5 THREE OPERATIONS AND LOCALITIES - THREE GOVERNANCE SYSTEMS

5.1 The Rompas - Rajapalot project in Ylitornio and Rovaniemi municipalities, Finland

Mawson Oy is a junior company, owned by Canadian Mawson Gold Ltd, which operates in Finland. It has around ten permanent employees and explores for gold and cobalt as part of the Rompas-Rajapalot project, primarily in Ylitornio but also in Rovaniemi municipality in Lapland, Northern Finland. The company holds a total of five granted exploration permits for almost 6000 hectares and ten exploration permit applications and reservations totalling 100 km^2 in the area (Mawson 2020a). The first mineral resources estimation made in 2018 was very promising, and a second resource estimate from September 2020 announced a doubling of the inferred gold-cobalt mineral resource estimate in the Rajapalot project compared to 2018. The mineralization was described to be one of Finland's largest gold resources by grade and a significant gold-cobalt resource (Mawson 2020b) and one of two significant minerals discoveries in the last decade in Finland (Kaivosteollisuus ry 2020).

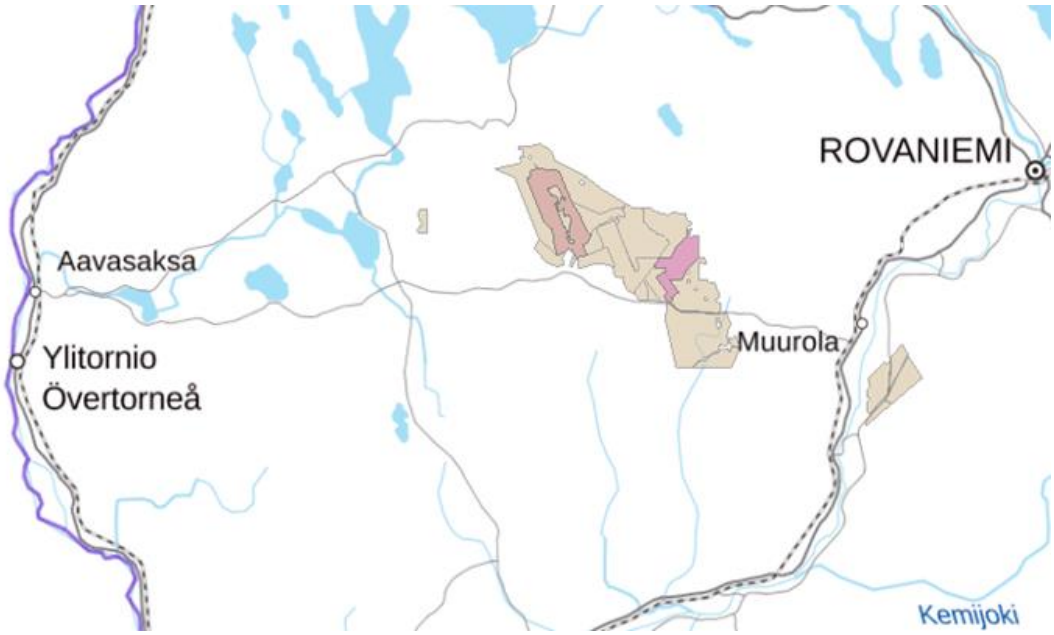

Figure 4. The Rompas-Rajapalot project in Ylitornio and Rovaniemi municipalities. Brown indicates previous permit applications and red existing permits. Source: TUKES November 2020.

In December 2020 (after the data collection of this study was completed), Mawson Oy launched the news that it starts to develop a mine; starting the environmental impact assessment process and suggesting to the municipalities that the land-use planning for mining in the area would start parallel (Lapin Kansa 17.12.2020).

Ylitornio municipality is located by the Swedish border in Finland's northernmost county Lapland. The southwestern part of the municipality is situated in the Valley of River Tornionjoki and the northeastern part is locally called the "Lake Villages" (Järvikylät). The area is sparsely populated, and the inhabitants live in small villages by several large lakes. The south-western parts of Rovaniemi municipality were included in this study since the exploration sites are located at the border of Ylitornio and Rovaniemi municipalities. In this area, the settlement is concentrated in several villages by the River Kemijoki. The largest village and service center is Muurola, located 25 km from the center of the town Rovaniemi. It is also the village that is closest to the exploration site on the Rovaniemi side (see figure 4).

5.1.1 Land and natural resources

A high-grade gold (+uranium) mineralization was discovered in the Rompas area in 2007-2008 by Areva Resources Finland Oy, a company affiliated with the French Areva. The target was first discovered in 2007 by ground follow-up of an airborne radiometric anomaly by GTK, Geological Survey of Finland (Lauri & Turunen 2015). Early stage mineral exploration in the Rompas area was extended to the Rajapalot area which is situated about ten km east of the Rompas site. The Mawson's Rompas-Rajapalot project is geologically located in the northern part of the Palaeoproterozoic Peräpohja Schist Belt (Ranta 2014). The mineralizations in the Rompas-Rajapalot Project area are promising, as the measured gold concentrations in outcrop samples are very high, and the area where anomalous concentrations occur extends tens of square kilometers. The mineralizations are of two different types: i) fracture-hosted, nugget-style native gold and uraninite associated with quartz-carbonate-calc-silicate veins in metabasaltic rocks in Rompas, and ii) disseminated-style gold mineralization in highly altered rocks, associated with cobalt in Rajapalot (Mawson 2020a, Ranta 2014).

The Rompas project is partly located within the area Romppaat, a nature conservation area protected under the EU Habitat Directive's Natura 2000 program. The area includes the Tuorerommas wetlands, the Palorommas Grove conservation area, the Kuusikkorommas Grove Conservation Programme and Romppaat Old Growth Forest Conservation Programme areas (Metsähallitus 2018a). Moreover, the Natura 2000 area affected by the Rajapalot Project area is overlapping with the Mustiaapa-Kaattasjärvi Special Nature Conservation Area, of which major parts are included in the Finnish Mire Conservation Programme, and a small part in the Old Growth Forest Conservation Programme (Metsähallitus 2018b). The exploration area is uninhabited. In addition to nature conservation, the landscape is used for reindeer herding and commercial forestry, two traditionally important livelihoods and land uses in the region.

5.1.2 Mineral exploration activities

Exploration in the area started by Areva Resources Finland Oy in 2007 when the company applied for mineral exploration permits to search for uranium. In 2010, Areva's permits were bought by Canadian Mawson Resources Ltd and the affiliated company Mawson Oy started to explore the area. Mawson Energi Ltd, a predecessor of Mawson Oy, had been conducting exploration in the nature

conservation areas (see above) in 2010 and 2011. Mawson Energi Ltd., since 2011 Mawson Oy, was accused of damaging the nature in the Natura 2000 area overlapping with the Rompas-Rajapalot project and was demanded to compensate the damages. In 2014, after three years of police investigations and legal process, the Kemi-Tornio District Court partly dismissed the charge of the nature conservation crime and rejected the compensation requests. Nevertheless, two employees and the company Mawson Oy were fined for diminishing the diversity of the nature conservation values within the protected areas (YLE 2014; Mawson 2014). In 2015, Mawson Oy requested a police investigation of the regional chapter of the Finnish Association for Nature Conservation (FANC) and the charges in their appeal. The prosecutor did not take the matter further (Mawson 2015).

The Administrative Court received a number of appeals regarding exploration permits granted to Mawson in the Natura 2000 areas by the regional chapter of FANC (latest in 2019), and the environmental authorities Lapland's Regional Centre for Economic Development, Transport and the Environment and Metsähallitus Ltd (latest in 2018). The appeals have, for example, addressed the meaning of "minor" sampling, the adequacy of the company's assessment of environmental impacts, and the fact that the permit allowed exploration to proceed in spite of an ongoing court appeal. Some of the appeals led to changes in the company´s workplan, but some were rejected (see e.g. North Finland Administrative Court 2015a; 2015b; 2018; Supreme Administrative Court 2016.)

In parallel to the process about the contested exploration within the Natura 2000 area, Mawson Oy continued to report promising exploration results from the Rajapalot area. In 2020 the company continued its research work with geochemical and geophysical methods and also with deep drilling which started in 2017. In autumn 2020, the company estimated that exploration will go on at least for 7 years and announced plans for mine development (December 2020, Lapin Kansa 17.12.2020). Mawson Oy is a member of the NEXT project consortium which aims at developing fast, cost-effective and environmentally safe exploration technologies and reducing the environmental footprint of mineral prospecting activities. NEXT technologies include satellite data processing as well as more sensitive chemical analyses methods and geochemical sample collection at the research site, e.g. new sampling materials such as snow and plant transpired fluids along with more traditional soil and plant samples. These techniques help the geologists in locating the drilling and excavation locations smartly such that the impacts on nature can be minimized and unnecessary drilling avoided. They, along with drones carrying new geophysical instrumentation, were tested by Mawson and the NEXT-project at the Rompas-Rajapalot research site (see NEXT 2020, Mawson 2020a.)

5.1.3 Company - community engagement

The parent company, Mawson Gold Ltd., has their own environmental, health and safety policy, including 13 guidelines that set the rules for the entire company. It is mainly targeting employees and subcontractors to ensure operations are conducted in a responsible manner to avoid risks and to promote health and safety (Mawson Gold 2020b). Mawson Oy does not have additional specific guidelines for stakeholder engagement. On their web pages, the company informs that it aims to

develop mutual trust and respect with localities; to provide employment opportunities; and to use local goods and services, when possible (Mawson 2020b).

Mawson Oy is part of the Finnish Network for Sustainable Mining, which aims at developing socially responsible mineral exploration and mining in Finland. Mawson Oy has followed the Network's mineral exploration toolkit and sustainability evaluation criteria. In its corporate report for 2019, Mawson elaborates its stakeholder engagement strategy: keeping in touch; participating and organizing meetings with stakeholders; trying to be active and reachable for different stakeholders; organizing Open Houses where information about mineral exploration is shared; participating in different kinds of projects; and also cooperating with universities and research institutions (Finnish Network for Sustainable Mining 2020). In relation to the particular project at the center of attention of this study, the company is a member of a working group organized by Ylitornio municipality to discuss the development of the project, and organizes annual Open Days at the research site to demonstrate exploration technologies to the local public.

5.1.4 Relations with the local community and broader society

Based on the statements for mineral exploration permits by the host-municipality and the Palojärvi reindeer-herders association in the area, there are no major local concerns related to the mineral exploration in the area. Operations within the Natura 2000 area have caused opposition from environmentalists and the Finnish Association for Nature Conservation (FANC). The regional association of the FANC has made several courts appeals to the Administrative Court about the exploration permits granted by TUKES as described above. Some appeals have been dismissed, but the Court has also dismissed the decisions made by the mining authority (North Finland Administrative Court 2015b, 2018.) As outlined above, the environmental authority, The Regional Centre for Economic Development, Transport and the Environment and Metsähallitus, Parks and Wildlife Finland, i.e. the organization responsible for the state-owned protected areas, also appealed exploration permits to the Administrative Court. In some cases, the North Finland Administrative Court rejected permit decision made by TUKES (e.g. 2015b, 2018), but appeals were also rejected (North Finland Administrative Court 2015a, Supreme Administrative Court 2016).

5.2 Aitik in Gällivare municipality and Kallak/Gállok in Jokkmokk municipality, Sweden

Two cases were investigated in Sweden: exploration in relation to ongoing and expanding mining activities in the vicinity of Aitik, by Boliden, in Gällivare municipality; and JIMAB's exploration as part of planned mining operations in, and around Kallak/Gállok, Jokkmokk municipality.

Copper was first found in the Aitik and Liikavaara area in the 1930s. The development of the first mine in Aitik started in 1966 and was in operation in 1968 with a production capacity of 2 Mton per year. Since then, the Aitik mine has been expanded several times and the Liikavaara deposit has been further explored. There are now plans to increase production capacity in Aitik to 45 Mton per

year, establish a new mine in Liikavaara and possibly another one in Nautanen. Boliden operates six mining areas and five smelters in Sweden, Norway, Finland, and Ireland. The company primarily processes zinc, copper, gold, lead, and silver and is engaged in exploration, mining, smelting, and metals recycling. A majority of the exploration activities in Gällivare municipality area are tied to the Liikavaara and Nautanen deposits, to which Boliden currently holds multiple exploration permits (see figure 5). The Aitik mine (in operation) is located in Gällivare municipality about 15 km east of Gällivare town center, the Liikavaara deposit is located 3 km east of the Aitik mine, and the Nautanen deposit just to the north.

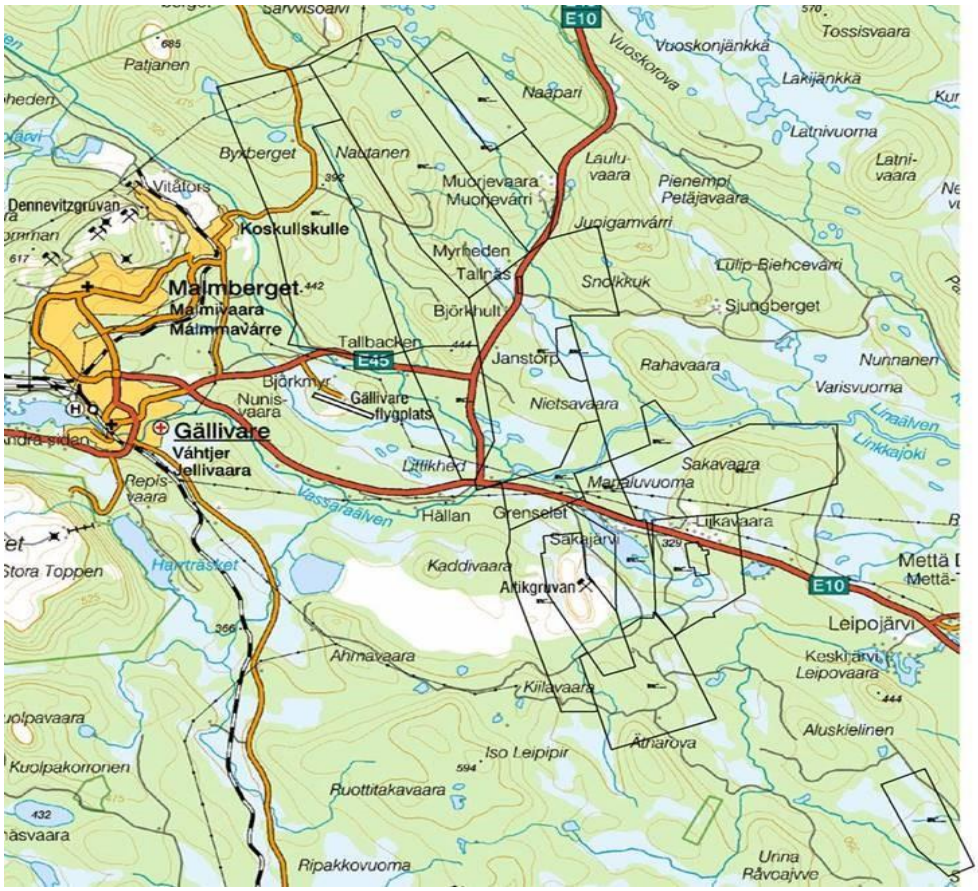

Figure 5: Boliden's exploration permits in Gällivare municipality (marked by black lines) east, north and south of the existing Aitik mine (white area on the map). Source: Boliden.

The iron deposit in Kallak (see fig. 6), about 40 km west of the municipal center Jokkmokk in Jokkmokk Municipality, has been known since the 1940s. The British company Beowulf Mining PLC has explored the area since 2006, and there are plans to establish a mine in the area. Their subsidiary, Jokkmokk Iron Mines AB (JIMAB) has further explored the area and was granted permission to conduct test mining in 2013. This generated local as well as national protests which have continued to follow the project. Later the same year, JIMAB submitted an application for Exploitation Concession for Kallak K 1 to the Mining Inspectorate. The application is currently under consideration of the Swedish Government.

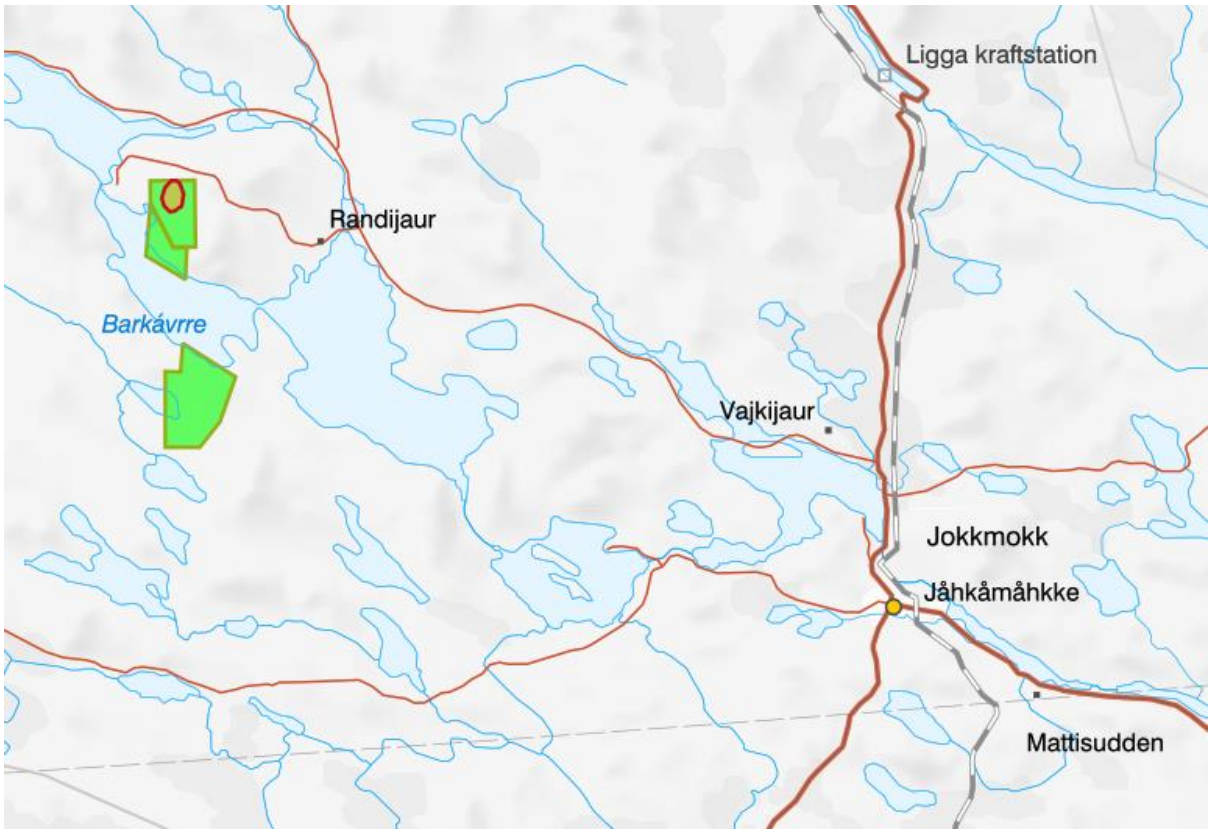

Figure 6. JIMAB's exploration permits (green) and mining plans (red) in the Kallak/Gállok area, Jokkmokk municipality (SGU 2020).

5.2.1 Land and natural resources

Aitik in Gällivare municipality

The primary minerals in the Aitik area are copper, zinc, lead, gold, silver, molybdenum, cobalt and iron, and Boliden is primarily processing copper and gold. The current mining area consists of two open pits (Aitik and Salmijärvi), waste rock, dumps and a tailings management facility (Boliden 2018a). In addition, the state-owned company LKAB is operating an iron mine in the twin town Malmberget. Due to the expansions of Boliden's and LKAB's mining activities, the town(s) are undergoing major transformations involving re-location of people as well as their property.

Gällivare municipality is vast and sparsely populated. About 40 percent of the land area is under various forms of nature conservation protection (Statistics Sweden 2019), but most of these areas are concentrated in the western mountain areas. The main land uses are mineral extraction, forestry, reindeer husbandry, tourism, hydro power production and wind power production (Gällivare 2020b). Gällivare municipality hosts four Sami RHCs of which Gällivare SRHC is most affected by Boliden's exploration and mining activities. Previous expansions affected reindeer herding negatively as new land areas were taken into use for mining, infra-structure development and deposits; lakes were emptied and rivers rerouted; and already existing impacts such as noise, dust and emissions to air and water increased (Boliden 2006). The planned expansion in Liikavaara will involve additional land use change and possible impacts on forest areas with identified nature

conservation values and water that may affect the Torne and Kalix river system which are protected under the EU Habitat Directive's Natura 2000 program. Two designated national interests, the Torne/Kalix river system and Leipojärvi, a national interest for reindeer husbandry, are affected by exploration and possible mining activities in the Liikavaara area. The village Liikavaara, and parts of the villages of Sakajärvi and Laurajärvi, are also impacted and negotiations with affected land- and property owners about expropriation and compensation is ongoing (Enetjärn Natur 2018). According to the Sami RHC, the planned expansion in Liikavaara is expected to aggravate the already negative impacts on reindeer herding to a critical level (Boliden 2018b). It is the cumulative effects of mining, forestry and other disturbing activities practiced across the territory that is considered particularly problematic.

Kallak/Gallók in Jokkmokk municipality

The Kallak deposit is located in the vicinity of the villages Björkholmen and Randijaur about 40 km west of Jokkmokk along the Lule River system. The Kallak North and Kallak South orebodies are centrally located and cover an area approximately 3 700 m in length and 350 m in width. The plan is to extract the iron, in one open pit mine over a period of 20 to 30 years but plans to develop additional mines in the area also exist (Beowulf Mining 2020). Jokkmokk municipality is neighboring Gällivare to the south and is likewise vast, sparsely populated, and hosts documented high nature conservation values, such as old growth forests, wetlands and spectacular mountain areas. About 48 percent of the total land area is under some form of nature conservation protection (Statistics Sweden 2019), much is tundra, swamps and low productive forests. Forestry, hydro power production, reindeer husbandry and tourism are the main land and resource uses.

JIMAB's exploration activities target the Kallak deposit and are conducted on forest land north and south of lake Parkijaure. The planned mine construction just north of lake Parkijaure is expected to impact the scenic qualities; affect forest areas with documented nature conservation value and the hydrology of the areas; and generate impacts due to noise, vibrations, dust traffic, etc. (Hifab 2013). Possible impacts on the UNESCO World Heritage Site Laponia, which is located within a 40 km radius of the planned mine, is also an issue (CAB 2017). In addition, exploration and particularly the planned mine, is associated with impacts on Sami reindeer husbandry (Hifab 2013). Whereas the company´s assessment is that the impacts of a mine are manageable (Hifab 2013), the two mostly affected SRHCs, Jåhkågaska tjiellde and Sirges, assess the effects as substantial and critical to the possibilities to maintain reindeer herding in the area (Jåhkågasska tjielde and Sirges 2014). According to the Sami RHCs, a possible mine would cut off migration routes, destroy resting and grazing areas, make their passage difficult and cause disturbance that will cause reindeers to avoid the area and invade on the neighboring communities' lands (Jåhkågasska tjielde and Sirges 2014).

5.2.2 Exploration and mining related activities

Both Boliden and JIMAB hold several permits for exploration activities in the Gällivare and Jokkmokk municipalities respectively. They are also currently engaged in different stages of the permit process for exploitation concessions in the Kallak and Liikavaara projects.

According to the Swedish Geological Survey (SGU 2020), Boliden is primarily involved in exploration related to the Nautanen and Liikavaara deposits, both located in proximity to their mining operations at Aitik. An Exploitation Concession for Liikavaara K nr 1, was approved by the Mineral Inspectorate already in 1999 (Mineral Inspectorate 1999). In 2018, Boliden applied for an exploitation concession for Liikavaara K nr 2, which is located next to Liikavaara K1 (Mining Inspectorate 2018), but no decision has been made to date.

JIMAB has held exploration permits in the Kallak area since 2006, but after their application for an exploitation concession in 2013 focus has turned to being granted the exploitation concession (Beowulf Annual Report 2019). In 2011, Jåhkågasska tjielde informed the Mining Inspectorate that the company (at the time Beowulf) had carried out exploration work (Kallak nr 2) without proper permits. The Mining Inspectorate opened a supervisory matter which subsequently was addressed and closed (Mineral Inspectorate 2011). In 2012, the Sami RHC Jåhkågasska tjielde appealed a decision by the Mineral Inspectorate to approve an exploration workplan after having demanded additional information and adjustments. The appeal was assessed by the Land and Environment Court but dismissed (Land and Environment Court 2013). JIMAB informed the authorities and right holders about planned test mining in March 2013 (Mineral Inspectorate 2013). This generated protests by activists who temporarily halted the operations. However, later the same year, JIMAB submitted an application for exploitation concession for Kallak K 1 to the Mineral Inspectorate (JIMAB 2013). In February 2015, the Mineral Inspectorate referred the application to the Government after having received a negative opinion from the County Administration Board (CAB, Mineral Inspectorate 2015). Since then, the case has wandered between the involved authorities and it is now with the Government awaiting decision.

For both Boliden and JIMAB, the primary exploration activity is drilling with some survey and reconnaissance work done in the air via drones and helicopters.

5.2.3 Company-community engagement

Boliden is currently in the process of developing internal guidelines for stakeholder engagement. The guidelines will be a sustainability management system, based on stakeholder management and developed within a research project with Luleå University of Technology. However, they have used a number of engaged activities to gain support for their operations and exploration in the Gällivare area.

In their 2019 Annual and Sustainability report, Boliden makes the point that relationships are key to success as a company. Boliden maintains a continuous dialogue with the stakeholders and conducts several consultations processes each year where the public and various business owners are invited to attend and submit their views. Special efforts have been made regarding school-children of different ages, different interest groups, neighborhoods, communities and the municipality, including citizens involved in the process of future use and development (Boliden Annual and Sustainability Report 2019).

Regarding indigenous relations, all types of operations overlap with those of the Sami RHCs, including exploration in the reindeer herding areas. According to Boliden, consultations are continuous and ongoing with the affected Sami RHCs regarding exploration, operations, project development and rehabilitation. Agreements on cooperation, development and compensation are generally negotiated between Boliden and the affected Sami RHCs. One particular project involves the re-establishment of lichens – pilot tests have been set up in Boliden and Aitik in partnership with the Swedish University of Agricultural Sciences (Boliden Annual Sustainability Report 2019).

JIMAB bases their engagement approach on three phrases: "Showing respect to all our stakeholders," "Becoming a local partner," and "Delivering responsible development" (Future Mine and Mineral Conference 2019). In their latest address to shareholders, Beowulf outlined their focus on community partnerships, pointing to their willingness to speak to all stakeholders. This includes on-going work with Sami RHCs. The approach taken by JIMAB to community engagement is on an issue-by-issue basis (interview with Beowulf CEO). SveMin is an umbrella organization of the Swedish mining industry that has developed detailed guidelines on consultation and community engagement (SveMin, Guidance for Exploration, 2018). All SveMin members, including Boliden and JIMAB, have the opportunity to consult with SveMin guidelines in their community engagement.

5.2.4 The local community and broader society

Aitik in Gällivare municipality

Boliden's exploration activities have attracted limited attention in public media and debate. No major controversies or open resistance is documented. More public attention was directed towards the plans to establish a new mine in Liikavaara and the associated re-localization of affected villagers and property. The media analysis displayed the main local actors that intervened in this debate: the local trade Union IF Metall supporting the project; Gällivare municipality supporting the project; and residents in the villages Sakajärvi and Liikavaara expressing general concerns and resisting the project. In addition, the affected Sami RHC has expressed concerns about the impacts of the expansion in several formal statements to the responsible authorities (e.g. Boliden 2018b)

Kallak/Gállok in Jokkmokk municipality

While JIMABs exploration activities have attracted less public debate, their test mining and mining plans have caused major controversies and open conflicts in and outside Jokkmokk municipality. In 2013, protesters took non-violent action to stop test extraction and police were called in to remove the activists on four occasions (Zachrisson et al. 2019). A media analysis and previous studies (Beland Lindahl et al. 2016, 2018) show that the main actors that have been visible in the public debate are: the networks and organizations "No-To-a-Mine-In-Jokkmokk", "What-Local-People", the local chapter of the Swedish Society for Nature Conservation and the national Bedrock Group who opposed the mine and mobilized resistance; the SRHCs Jåhkågasska tjielde and Sirges who also opposed the mine and mobilized resistance; the Sami Parliament who made statements against additional mine establishment in Sapmi; the Green Party in Jokkmokk who organized mining skeptic local citizens and connected the resistance with members of Parliament and the national

Government; the network Yes-To-a-Mine-in-Jokkmokk who organized and mobilized mine supporters; the Social Democratic party in Jokkmokk who organized many mine supporters, pushed for the project and connected the supporters with members of Parliament and the Government; SveMin (industry association) who supported the Swedish mining industry and JIMAB; the village associations in Björkholmen and Randijaur and the business community in Jokkmokk who include members with varying positions (Beland Lindahl et al. 2018).

6 ORGANIZED ACTORS' PERCEPTIONS AND POSITIONS

The results of the interviews conducted in this study, i.e. with local organized actors in the Finnish Ylitornio/Rovaniemi and Swedish Gällivare cases, are summarized in appendix 2. The main findings and differences between these cases are presented below. The results of earlier interviews with the organized actors in the JIMAB/Kallak case are not presented below, but in Beland Lindahl et al. 2016 and 2018, and will feed into the discussion in section 8.

6.1 Understandings of mineral exploration

Actors' understandings of mineral exploration reflect their prior experience and exposure. In the Finnish case study area, Ylitornio and parts of Rovaniemi municipalities, there are no operating mines and no experiences of the impacts of mining. Hence, many informants, especially from Rovaniemi, were not aware of ongoing exploration and described it as a distant or abstract activity. In Ylitornio municipality, where the company Mawson proactively informed different stakeholders about their activities, mineral exploration was far more familiar among representatives of village associations, the municipality, entrepreneurs as well as landowners. Indeed, informants witnessed an increased general interest in mineral exploration and mining industry in response to the ongoing exploration activities, for example more people actively followed news about the sector. Reflecting the information coming from the company, mineral exploration was generally understood as a research practice, i.e. a different thing than mining. However, actors with more mining skeptical views were more critical. Hence, representatives of Environmental NGOs (ENGO) and reindeer-herders linked exploration and mining arguing that the purpose of exploration is to find profitable mineralizations for mining.

Gällivare municipality in Sweden, has a long history of mining and mineral exploration is not new to the local actors. Nevertheless, the company, Boliden, generally experienced a certain lack of understanding about how the mining industry works and the role of exploration which, in the company's opinion, is not immediately connected to mine establishment. According to the interviews with local actors, most seemed to be aware that exploration and mine establishment are two different things. However, despite acknowledging the difference between the two, they understood them as intimately linked. Several actors stressed that exploration must be seen in its context: mining presupposes exploration and exploration aims at mine establishment. The County

Administration Board stated that there is a separation between exploration and mining, defined in the law, particularly regarding their responsibilities but, since the Minerals Act covers both exploration and mining, there is an emphasis on mineral development. For other authorities, such as the Mining Inspectorate, the legislation is distinct between these two activities and, subsequently, the purpose of exploration and mining are distinct as well.

6.2 Key factors influencing actors' attitudes and positions

6.2.1 Expectations, visions and understandings of sustainable development

In the Finnish case, Ylitornio municipality in particular, the majority of informants, i.e. municipality representatives, entrepreneurs and village associations, hoped that the exploration activities eventually will result in a mine in the exploration area. They were seriously concerned about the socio-economic situation in the region, especially in the "Lake Villages" as the northwestern area of Ylitornio municipality close to the exploration site is called by locals. In their opinion, mining would bring work opportunities, families with children and better prospects for this declining area. Accordingly, they, as well as the company, wanted to see the exploration proceeding without interruptions. As commercial mineral exploration had been conducted in the area for more than ten years, it was expected that it would continue for several more years. Some informants even argued they will be dead before any decision about a possible mine is made. With "interruptions", most informants referred to legal appeals made by "nature conservationists", interventions which in their opinion were made for hindering the work to progress in the area. This view was shared by the company. On the other side were environmental organizations who did not accept mineral exploration in areas protected under the EU Habitat Directive's Natura 2020 program. They argued that mineral exploration in protected areas had to be stopped, a view shared with other mining skeptical informants seeing conservation areas as irreplaceable natural sites.

In the Swedish Gällivare case, the goal of the company was to maintain operations and progression with planned expansions, hence continuous exploration was expected. But good relationships with municipal actors were also considered important. Realizing the town's dependence on mining, the expectation of Gällivare municipality and many other local actors was likewise that mining - and exploration - continue, but in a manner that limits environmental impacts. Respectful and fair treatment, proper compensation and adequate mitigation of impacts were expected. Everybody envisioned jobs that can help maintain the community and a good life. Beyond this, visions related to the municipality's mineral deposits varied. While many, and especially business-oriented actors, envisioned a future with expanded exploration and mining activities, there were also actors, for example representatives of Sami RHCs, who would like to see exploration and mining restricted.

The similarities and differences between local actors' perceptions of exploration and mine development in both cases, are further explained by a deeper analysis of their understandings of sustainable development, i.e. their visions for their communities' future development. In the Finnish case, actors who were positive to mine development, stressed that nature conservation will not

bring “bread to the table” - but mining will. They were concerned about population decline, need for work opportunities, local tax base, service provision and opportunities to keep small villages alive. Especially representatives of village associations elaborated on the need for families with children in the Lake Villages where the average age was steadily going up as residents were getting older. These actors clearly prioritized the economic and social dimensions of sustainable development. Opponents of mine establishment, like reindeer herders, representatives of E-NGO and individual critics stressed the meaning of nature for people in Finnish Lapland, and its fundamental importance for their livelihoods and way of life. Prioritizing the environmental and other social dimensions of sustainable development, they argued that diversified and small-scale businesses in combination with tourism, reindeer herding, and other nature-based activities would support an alternative future in the region.

In the Swedish Gällivare case, the majority of actors recognized that Gällivare is a municipality that is dependent on continued exploration and mining: no jobs, no future! Most local actors envisioned a future in which they have reversed the negative population development and can maintain a good life, i.e. near attractive recreation areas and nature. Many actors also stressed that sustainable development presupposes fair compensation of impacts and better distribution of benefits from the mining related activities. However, beyond this, visions and understandings varied. Actors who associated exploration and mining with positive economic impacts, typically envisioned a future with an expanded and developed mining industry in the municipality. The business community, along with the municipality, the trade union, and the company itself, wanted to see a modern mining community taking the lead in technology development and a green transition. These actors stressed the economic, and some social, dimensions of sustainable development, and the company highlighted the importance of their operations to the economy of Northern Sweden. Several actors stressed the intimate relationship between mineral extraction, battery production and a green transition. Actors with more mixed perceptions of the impacts of the mining industry, took a more cautious approach. Several representatives of village associations, Sami business and ENGO, questioned the environmental sustainability of mining, but could not see enough jobs, nor economic sustainability in Gällivare without the mines. Many argued for diversification of the local economy, e.g. development of tourism, reindeer husbandry and business based in Sami culture. Hence, they recognized all three dimensions of sustainable development, expressed ambivalence, but most accepted that jobs and economy must be given priority. A third approach was expressed by Sami RHC representatives, who acknowledged that the community is dependent on mining, but envisioned a healthy environment and a thriving Sami reindeer husbandry with access to grazing land, offering a future for young reindeer herders. They stressed the environmental and social dimensions of sustainable development and criticized the current order for being unbalanced: “money talks”. Along with several other actors they addressed consumption as an underlying driver of unsustainable use of nature.

6.2.2 Perceptions of impacts and risks

In relation to benefits and impacts, actors in both cases agreed that in comparison to mining, or large-scale forestry, the environmental impacts of mineral exploration are limited, or minor. On the Finnish side, actors reported no harm on flora, fauna, reindeer herding or hunting since drillings were done during wintertime, machinery was modern, and regulations set limits for the exploration activities. On the other hand, exploration had offered local work opportunities and the company used local services whenever possible. At the start of the project, Mawson's Finnish headquarters were located in a village close to the exploration area, but it moved to the city of Rovaniemi in 2016.

In the Swedish Gällivare case, the obvious benefit from exploration from the company's perspective, is knowledge about the geology - a prerequisite for planning future activities and continued mining. This relationship between exploration, continued mining activities and maintenance of the local community, was recognized by most local actors. Representatives of the municipality, the business association, trade union and some village associations, in line with the Finnish actors, viewed the environmental and social impacts of exploration as minor, or limited. Thus, exploration was primarily associated with positive expectations about jobs and income. However, other actors, e.g. representatives of Sami RHCs, ENGO, landowners and representatives of Sami businesses and some village associations, experienced significant impacts, particularly by drilling which was associated with heavy machinery, damages on the soil, damages on the vegetation caused by logging or driving, leaking pipes/holes and risks for water contamination. Reindeer herders also expressed concerns that activities associated with exploration lead to additional loss of grazing land and disturbance. Recognizing the need for exploration, a concern of some affected landowners was inadequate compensation for encroachment and damages on private property.

Reflecting the obvious connection between exploration and mining in the Gällivare area, the actors in the Swedish case tended to link impacts of exploration and mining. While all actors recognized that Gällivare municipality is dependent on mining for its existence, there were different ways to relate to the impacts. Those most preoccupied with the positive job creating impacts of exploration and mining typically argued that environmental and social impacts must be accepted for the sake of future survival. Those with a more mixed view, on the other hand, maintained that impacts must be avoided, limited, mitigated and properly compensated. Moreover, most local actors claimed that the current distribution of benefits and costs associated with mining related activities is unfair. Also, the County Administration Board noted that benefits tend to be unevenly distributed between local and national levels.

Most of the informants did not associate exploration with particular environmental risks beyond the impacts mentioned above. In the Swedish case, reindeer herders pointed to the use of cables for electromagnetic measurements as a risk since reindeers previously had been trapped and injured by such cables. Informants in both cases, who wanted to protect their communities from mining, saw mineral exploration - leading to mine establishment - as an environmental risk including loss of pristine nature, old forests, water and wetlands, grazing land as well as risks for pollution and disturbance by infrastructure and heavy traffic. As for social risks, actors in both cases argued that

exploration is associated with uncertainties that can fuel anxiety and stress. Actors longing to see a mine being realized feared disappointment while those that were more skeptical experienced anxiety for a possible mine establishment/expansion and its impacts. Social risk, on the Swedish side, thus included the risk of being forced to leave a home or property or losing land that is needed to maintain a reindeer herding business, in case of a mine establishment/expansion.

6.2.3 Perceptions of the regulatory framework

Most local actors that were not directly affected by exploration or mine development stated that their knowledge about the regulations is limited, but that they trust it is adequate. Generally, actors in the Finnish case had less direct experience of the regulatory system, and their assessment was that regulation is working well as long as exploration is concerned. For example, reindeer herders referred to restrictions that limited movements of machinery wintertime to certain trails. As for mining, the Finnish case shows that actors' perceptions are shaped by previous experiences and events. Hence, the accident in the Talvivaara mine was motivating many actors to demand stricter environmental legislation and implementation - if mining would indeed be an option for the region. As in the Swedish case, local actors wanted to see regulation ensuring local benefits from possible future mining activities, and mining skeptical actors argued that current mining legislation is unbalanced and biased in favor of the mineral sector and mine development.

Directly affected actors in the Swedish Gällivare case were more informed and forwarded suggestions as well as critical concerns. Landowners, representatives of village associations, Sami business and ENGO representatives argued that it is too easy to start exploration, that the MI is too generous with exploration permits and that landowner/Sami rights are not respected in exploration or mine development. Representatives of Sami RHCs argued that while they do have formal opportunities to voice their concerns, they lack influence and therefore did not see much point in using the formal instruments to try to influence exploration. While these actors were critical to the Mineral Inspectorate, they saw the County Administration Board (which has a limited role in permitting exploration) as a trustworthy authority taking responsibility for the environment. Representatives of the local business community, on the other hand, argued that permitting exploration and mining is both inconsistent and ineffective, in effect constituting a barrier to needed exploration and mine development. The company appreciated that the system is flexible enough to allow consultations and negotiations to occur outside of the formal framework but acknowledged problems with effectiveness and consistency. In terms of mining, several local actors argued for more strict regulation, for example compensation and mitigation measures, environmental requirements and benefit sharing. The municipality representatives were overall satisfied with the regulatory framework, but some found the boundary between legally required formal, and voluntary informal information and consultation blurry, hence aggravating transparency. The involved state authorities, the Mineral Inspectorate and County Administration Board, admitted unclarities but explained them with problems of interpretation, and contended that the formal process allows access for all actors.

A contentious issue in both cases was whether, and under what conditions, exploration, and in the Swedish case mining, should be allowed in, or in the vicinity of, areas protected by the EU Habitat Directive, so called Natura 2000 areas. This issue delayed the processes in both cases as overlapping EU, national and sectoral legislation had to be addressed by different authorities with varying roles and mandates. Especially in the Finnish case, this issue was addressed in the interviews with the company and the involved authorities who expressed different views on the legislation, its implementation and implications. The company's exploration permits in the Natura 2000 areas were consequently appealed, a development that generated mixed reactions among the informants on the local level.

So, how did actors assess the performance of the mineral governance system, in relation to exploration in particular? Their overall assessments seem to reflect their previous experiences of exploration and mining, which vary considerably across the two cases. Most actors in the Finnish case had fewer prior experiences of exploration and mining and generally trusted the system to be fair and well-functioning. However, the fact that different authorities disagreed, and appealed each other's decisions regarding exploration permits in Natura 2000 areas, made some actors question the performance of the system. The issue of restrictions on exploration in protected nature conservation areas was under review by the Government at the time of the investigation, which fueled uncertainty regarding the future of exploration in protected areas and raised different grievances both among the industry and nature conservationists.

Actors in the Swedish case generally had more experiences of exploration and mining, and their perceptions of the rules regulating exploration was clearly flavored by their impressions of the overall mineral governance system. While some actors trusted the system, others did not consider it fair and legitimate albeit for different reasons. Landowners deemed it inadequate to protect land- and property owners' rights; business representatives were concerned with too long lead times and inconsistent implementation; Sami RHC representatives did not trust the system because of its inadequate treatment of Sami rights and inability to address existing land use conflicts; several actors found it biased in favor of mine development. As in the Finnish case, unclarities as to how different regulations "talk to each other", how responsibilities are distributed between different state actors, as well as inconsistencies, delays, or biases, in implementation were addressed.

6.2.4 Understanding of exploration technology

In general, exploration technology was not a topic that engaged the informants and relatively little information was accessed through the interviews. When asked explicitly about exploration technology, most informants in the Finnish case mentioned drilling. When asked about the new technologies developed in the NEXT-project, drones were the first to come up. Those who mentioned them considered drones harmless for nature, e.g. for animals, but identified possible risks for disturbance during the hunting period and in the spring and early summer when the birds are nesting. Some of the informants who had visited the Information Days introducing new exploration technologies (organized by the NEXT project in Ylitornio in June 2019), found the snow and vegetation sampling methodologies interesting and fascinating. In general, new and less

intrusive technologies were seen as "a good thing" as they were associated with lower environmental footprint and possibly reducing the need for drilling.

In the Swedish case, no NEXT technologies were tested, but drones were used for surveying the areas around Gällivare. While some actors, notably representatives of village associations, reported no, or little, knowledge about what exploration technologies that are in use, other actors were more well informed. The latter were aware that measurements and geophysical surveys are carried out with the help of airplanes, helicopters or sampling on the ground; that drilling of varying intensity is needed to advance a project; and that drones have been used but primarily for surveying the land. Representatives of the Sami RHCs and the municipality acknowledged that exploration technologies have developed and are now less damaging. The majority of actors stated that less intrusive technologies are considered positive, especially if impacts, and the use of drilling, can be reduced. However, representatives of Sami RHCs stressed that new exploration technologies are only positive in so far as they reduce the overall amount of impact, and not if they facilitate the development of new mines. They also noted that reindeers, in general, are afraid of drones. Several actors explicitly stated that technology is not a major issue, and that other factors, such as the impacts of a possible mine, are more important to their attitudes to exploration. The authorities involved in the permitting process contended that the specific technology is not an issue under consideration in their current assessments or decisions.

6.3 Perceptions of interaction with companies and authorities

How exploration-, mining companies, authorities and other stakeholders formally interact in the permitting processes regulating exploration - and mine development - is determined in national legislation and described in sections 4 and 5 above. Beyond these requirements, companies may choose to interact informally to inform, consult, negotiate or develop collaboration and partnerships with local actors. As outlined in section 5, the companies may have internal protocols that guide their company community engagement. Below, is a presentation of actors' perceptions of how formal and informal interaction has materialized in the two cases.

6.3.1 Interaction in exploration and mine development processes

Mawson Oy, in the Finnish case, represented itself as, and is identified to be, an Ylitornio-based company for several reasons: the company is registered in Ylitornio; its exploration site is mainly in Ylitornio municipality; its office was based in Lohijärvi village in Ylitornio during the first years of the operations (although the office has been located in Rovaniemi since 2016). According to the company, local acceptance is very important and local people are considered the most noteworthy stakeholders. That is why the company has tried to engage proactively and be as open, easily accessible and trustworthy as possible. Accordingly, representatives of village associations, the municipality and entrepreneurs in the Ylitornio region, were very satisfied with the company's community engagement. These informants could not identify anything that the company should do better. They considered themselves well informed about the process; professionals explained

difficult things in an understandable way; company representatives were easy to talk to; and some people felt honored that company executives came to meet locals in meetings and seminars. However, more critical voices were expressed on the Rovaniemi side where the company had not organized any briefings, e.g. in the largest village Muurola which is situated approximately 30 km from the exploration site. Also, reindeer herders and hunting organizations stated that they would have liked to have separate briefings about the exploration. As for interaction with authorities, little experience and involvement were reported in the interviews, permitting is mainly done "behind the desk". This perception was partly confirmed by the mining authority, since permitting primarily involves reviews of documentation included in the applications and discussions with the company. The interaction between the mining authority and the company had been regular and included several visits to the exploration site.

In a case like Gällivare, on the Swedish side, the company is in constant contact with landowners, the municipality and the SRHCs, and interaction regarding exploration is hard to separate from communication about many other mining related issues. Also, relationships have shaped over many decades. According to Boliden, their overall track record of interaction with stakeholders is very good. Acknowledging that they need to continue to explore and mine, they recognize that it is difficult to please everyone. They point out that their relationships with the SRHCs have developed over time, and that regular information meetings, collaboration and agreements reflect their philosophy of co-management. However, the degree of involvement of local actors differed depending on their roles and legal status. The County Administration Board, as well as the Mineral Inspectorate, stressed that the formal opportunities for right holders as well as other actors to interact during the exploration stage is rather limited, while more opportunities exist in the later stages of the permitting process. Most actors that were not directly affected by exploration or mine development, had no direct contact with the company but were informed about exploration and other mining related events by media, public notices, and sometimes by public meeting if major impacts were expected. Land- and right holders, including the Sami RHC, are always informed by mail about exploration activities and provided the specific working plans by the Mineral Inspectorate. Beyond this legally required interaction regarding exploration, the company conducts regular consultation meetings with the Sami RHC where exploration as well as other mining related issues are discussed and agreements negotiated. Also, landowners directly affected by ongoing or planned mining activities have regular face to face meetings with the company and negotiate compensation for impacts caused by mining activities. The trade union is in constant dialogue with the company.

The quality of interaction between the company and the local actors involved in the Finnish case was generally perceived as good by most involved actors. Face to face meetings with demonstrations of exploration technologies and presence by representatives of the company were particularly appreciated, although exploration in the protected Natura 2000 area caused tensions. In the Gällivare case, the experiences were more mixed. Good quality, from the local actors' point of view, presupposes access to the process; mutual listening; openness and transparency; reciprocity and responsiveness; "good-will"; respect; equal power relations and access to resources;

substantive influence; and early information and involvement. While some actors thought communication with the company worked very well, others felt there is room for improvements. In relation to exploration, the Sami RHC representatives experienced an overload of written notices and work plans without the capacity to follow up and a general lack of responsiveness, i.e. influence, although personal relations were perceived as good. Uneven power relations and access to resources was a common theme, particularly with Sami RHCs and landowners that were affected by exploration and mine development. Some landowners and representatives of village associations were deeply dissatisfied with the company's communication and interaction, particularly regarding compensation issues - in relation to exploration as well as mining. While the municipality was overall pleased with the company's community engagement, particularly opportunities to take part in information meetings involving external experts, some representatives expressed a desire for a more proactive approach from Boliden on information about exploration. It was also noted that it was hard to assess the quality of the interaction that takes place, particularly during exploration, since much takes place behind closed doors. Local actors' experiences of interaction with the Mineral Inspectorate and County Administration Board during the exploration phase are limited but vary. Generally, actors with a more cautious attitude to exploration and mine development appreciate their interaction with the County Administration Board but distrust the Mineral Inspectorate, and vice versa.

6.4 Positions and outcomes

6.4.1 Positions

Actors' attitudes to exploration and possible mining and mine development in the case study areas generally reflect the actors' roles and perceptions outlined above. The attitudes to mineral exploration by actors in the Finnish case were generally positive although cautious and mining critical actors also exist. In Ylitornio municipality, positive attitudes were driven by expectations for future jobs and incomes with mine establishment, as outlined above. In Rovaniemi municipality, informants saw mineral exploration as acceptable since the environmental impacts so far were very limited. However, negative positions were expressed by representatives of ENGOs, who criticized mineral exploration in Natura 2000 areas, and reindeer herders, who were against possible mining and linked mineral exploration to possible mine development. Nevertheless, most people argued that knowledge about a possible deposit would be a good thing so that plans for different kinds of futures could be made. As for possible future mine development, also those positive to mineral exploration expressed more mixed views arguing that "mining is a different thing" and that environmental issues and possible environmental risks should be taken very seriously. They were not closing the door for a possible mine but typically conditionalized their approval, *if* environmental issues are taken care of and *if* mining could bring work opportunities, it could be accepted. Those who did not accept mining in nature conservation areas or thought that mining would seriously harm other livelihoods and intrinsic nature once and for all, were not accepting mining in any case.

The situation in the Swedish Gällivare case is fundamentally different since mining is an ongoing and important economic activity in the area. The position of the company along with representatives of the municipality, business association, trade union and some village associations, was that further exploration is critical for knowing where the ore is located, a prerequisite for continued mining, mine development, future survival of the municipality and the supply of ore to the rest of society. Actors with more mixed assessment of impacts, the regulatory framework and visions for the future, e.g. representatives of some village associations, landowners, ENGO and Sami business, displayed more cautious attitudes. While exploration necessary for obtaining knowledge about the bedrock, and the operations of the existing mines, were generally approved, exploration for additional mine development was undetermined, or negative. Sami RHC representatives generally wished to see exploration restricted, and no additional mines established. Although acknowledging that the existing mines are important for the economy of the municipality, the Sami position was that they never approved mining activities on their traditional territory in the first place. In addition, several actors wanted to see impacts of exploration and mining properly compensated, more respectful treatment, stricter environmental regulations and a higher return of benefits to the local community.

6.4.2 Outcomes

None of the cases displayed a situation where all local actors bestowed their approval or acceptance of ongoing or future exploration activities. However, a clear majority of local actors in Ylitornio municipality accepted, or approved, exploration, and many actors in Rovaniemi municipality were supportive as long as no harm is done to nature. But actors who were not supportive, or even resisting exploration, also existed, albeit in a minority. Moreover, actors' positions to future mine development seemed to reflect those of exploration, although all actors were more cautious, i.e. they conditionalized their possible acceptance. The Swedish case reflects a more complex land use situation involving indigenous people and more experiences of exploration, mining and interactions with the mining industry. In short, the actors' positions ranged from approval, acceptance and something that at best is described as acceptance by necessity or compliance. As outlined above, further exploration, existing mining operations as well as possible expansions and new establishments were accepted, or even approved, by many of the local actors. But there were also actors with more ambivalent perspectives and positions who accepted the existing mining operations because of the community's current dependence on mining and lack of alternatives. Some of these actors accepted further exploration for knowledge purposes, but not necessarily for exploration leading to new mine establishments. Some actors also pointed out that their own, or others', acceptance could be higher *if*, for example, procedures for fair compensation and distribution of benefits were in place. In line with the perceptions and positions presented above, the Sami RHC representatives accepted the existing mines, as they at the time had no other option than to comply and saw no alternatives, but they resisted further exploration and mine establishment. Although an ENGO expressed a readiness to ally with other local actors who are skeptical to further mine establishments, no protests have taken place.

7 LOCAL CITIZENS' ATTITUDES

7.1 Exploring citizens' attitudes

To widen the scope of analysis on attitudes towards mineral exploration, a survey was conducted in three localities: Rovaniemi/Ylitornio, Finland and Gällivare and Jokkmokk municipalities in Sweden. The respondents were more male than female and are an older sample than the native population.

		Rovaniemi/ Ylitornio	Gällivare	Jokkmokk
Gender	Female	42.5	35.0	43.3
	Male	57.5	63.6	55.8
Age	17-39	13.7	17.5	17.1
	40-59	23.8	26.3	31.9
	60-	62.5	56.1	51.0
Education	Comprehensive School	20.0	16.7	17.9
	Upper Secondary/Vocational Education	39.2	51.3	46.0
	Post-Secondary Education	22.3	31.6	34.6
	Graduate education	18.5	.3	1.5
Socio-Economic Status	Employed	37.3	51.2	51.7
	Retired	55.4	44.0	40.8
	Other	7.3	4.8	7.4

Table 2. Demographic summary. Percentages of the demographic variables. Rovaniemi/Ylitornio n=256-260, Gällivare n=343, Jokkmokk n=494.

This is important to note with men having generally more positive attitudes in previous studies on the acceptance of mining (Litmanen et al. 2016, Jagers et al. 2018). Education and employment are both representative of the population. A demographic breakdown of the respondents to the survey

is found above. The surveys primarily looked at the effect different values and perceptions hold on the attitudes towards exploration in these respective localities. The model below depicts the relationships analyzed.

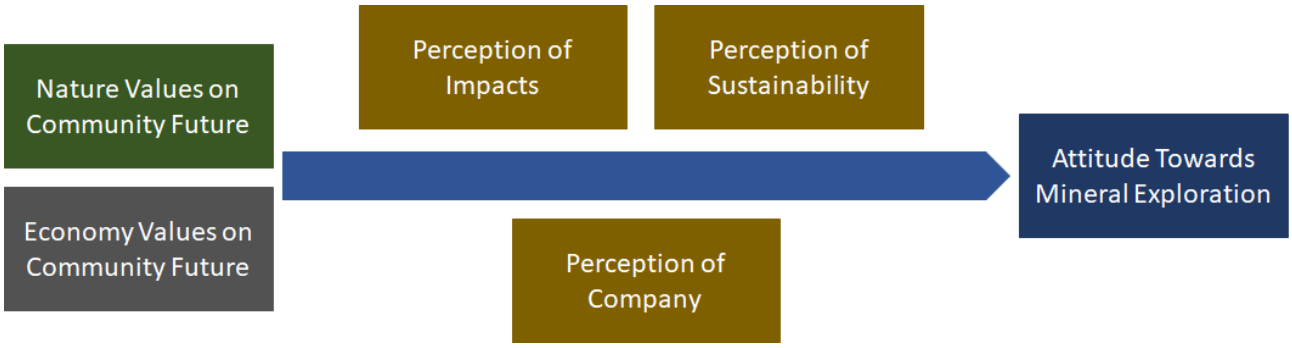

Figure 7. Model of relationship between values, perceptions, and attitudes towards exploration.

Each value or perception is composed of several items from the survey, 'nature values' refer to how the individual values the protection and sustainable use of nature, 'economy values' refer to how the individual values increasing jobs and population, 'perception of impacts' refers to the effects of exploration on the environment, community and livelihood, 'perception of sustainability' refer to tradeoffs between industrial development and environmental protection, i.e. different dimensions of sustainable development , and 'perception of company' refers to communication and interaction with the company. A more detailed table of the individual items in each variable can be found in the appendix 1. Attitude towards mineral exploration is the dependent variable. The principal component analysis used to distinguish values and frequencies of the sum variables are found in appendix 3. General attitudes, as well as attitudes to the specific projects under study were assessed in all three cases.

The analysis of the survey was done in several steps. First, comparing attitudes towards exploration and mining across the three cases. Second, analyzing the relationship between the variables identified above and the attitude towards exploration in the locality. Third, looking at the differences in attitudes based on demographics. And, fourth, outlining the attitudes towards specific exploration technologies.

7.2 Local citizens' attitudes

Absolute levels of attitudes must always be interpreted with caution in all surveys not achieving a 100 percent response rate. Again, because of the disproportionate number of old and male respondents, we can expect the responses to skew more positive regarding attitudes towards exploration and mining (Litmanen et al. 2016, Jagers et al. 2018). From our results, the demographic variables showed that men are generally more favorable to mining, as well as an increase in positive attitudes the older the individual. Education and employment were more evenly distributed with a slight decrease in acceptance with a higher level of education. For a more detailed overview of the

relationship between the demographic variables and attitudes towards exploration, please refer to appendix 3. However, from the survey responses across the three areas, there are similar attitudes towards exploration and mining, both generally and locally.

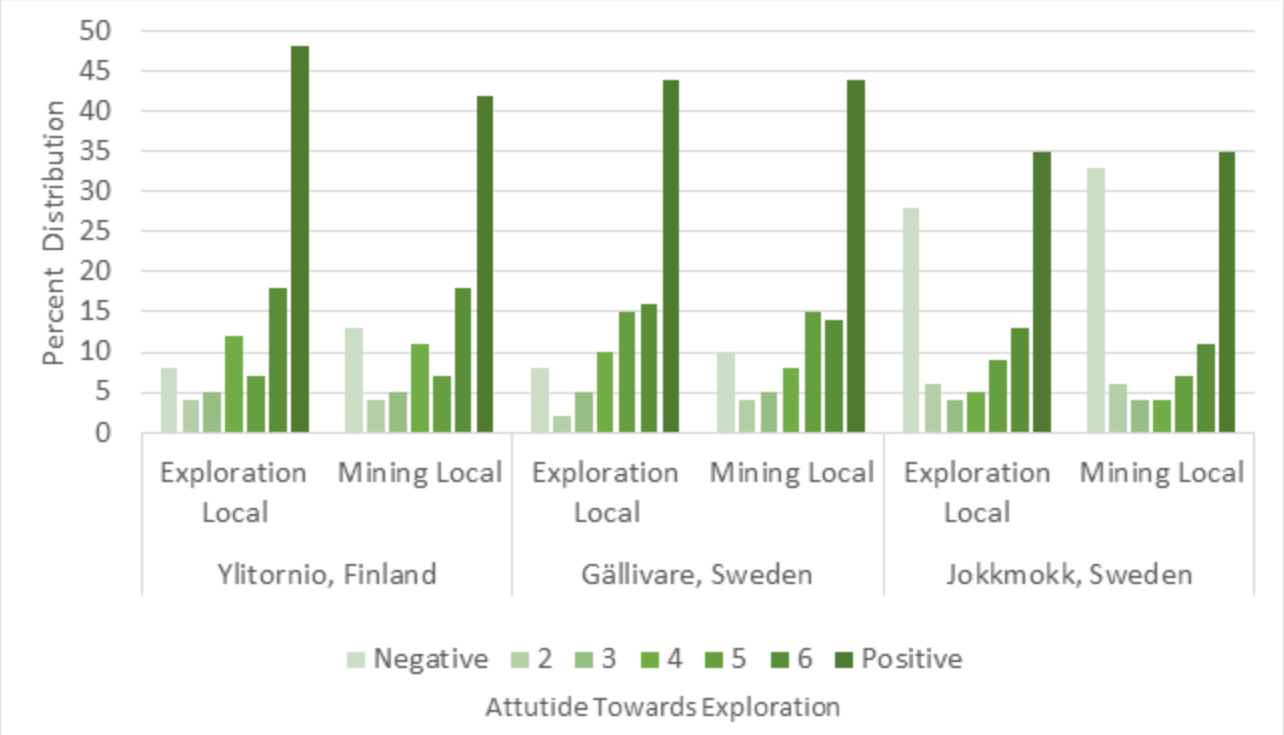

Figure 8. Comparison of attitudes towards mining and exploration.

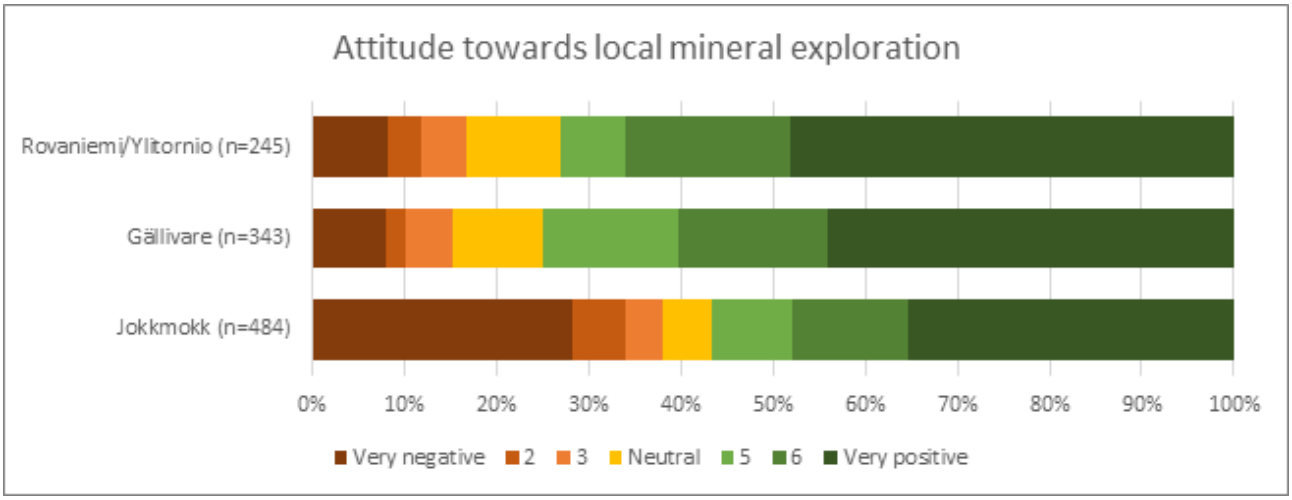

Figure 9. Attitudes towards local mineral exploration in Rovaniemi/Ylitornio, Gällivare and Jokkmokk.

In both Ylitornio and Gällivare, positive attitudes towards mining and exploration greatly outnumber negative, but less so in Jokkmokk where positive attitudes slightly outpace negative. Moreover, the general and local-specific attitudes are similar, and attitudes towards both exploration and mining also follow each other closely. Hence, local citizens' attitudes to exploration appear to reflect their attitudes to mining, and citizens are not significantly more positive or negative to mining related

activities in their own municipality than somewhere else. Having established these relationships, we focused specifically on local exploration, i.e. the specific project under study, when looking at the relationship with the value and perception variables.

7.3 Factors affecting attitudes

Mineral exploration in my home region perceived as positive		Company	Impacts	Sustainability	Economy	Nature
Rovaniemi/ Ylitornio	Pearson Correlation	.647**	.807**	-.682**	.475**	-.166**
	Sig. (2-tailed)	.000	.000	.000	.000	.009
	N	205	244	243	243	243
Gällivare	Pearson Correlation	.424**	.468**	.634**	.614**	.164**
	Sig. (2-tailed)	.000	.000	.000	.000	.002
	N	338	343	342	343	343
Jokkmokk	Pearson Correlation	.753**	.742**	.793**	.728**	-.045**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
	N	476	481	476	482	484

Table 3. Correlation table with sum variables and 'Mineral exploration in my home region is perceived as positive'. Correlations significant at the .01 level marked with **.

For the most part, the relationship between the value and perception variables and attitude towards local exploration is consistent in all three cases. However, there are some differences between the localities and variables that warrant attention. First, the relationship between perception of company, impacts, and economy correlates positively with the attitudes on mineral exploration in all three cases. This shows that citizens who hold positive attitudes towards economic development, the company, and have an ecological modernization view of sustainability relate positively to mineral exploration which would indicate the inverse for those with pro-environment.

Mineral exploration in my home region is perceived as positive		Unstadardized β	Standardized β	Sig.	R^2
Rovaniemi and Ylitornio	Model				.703
	Constant	2.652		.002	
	Impacts	1.213	.579	.000	
	Sustainability	-.417	-.202	.000	
	Economy	.502	.170	.000	
	Nature	-.501	-.127	.002	
Gällivare	Model				.561
	Constant	.097		.746	
	Company	.111	.094	.025	
	Impacts	.322	.209	.000	
	Sustainability	.387	.313	.000	
	Economy	.500	.365	.000	
Jokkmokk	Model				.761
	Constant	-.493		.205	
	Company	.303	.221	.000	
	Impacts	.371	.213	.000	
	Sustainability	.395	.276	.000	
	Economy	.473	.296	.000	
	Nature	-.140	-.054	.032	

Table 4. Regression model with the dependent variable 'Mineral exploration in my home region is perceived as positive'.

Sustainability is negatively correlated with positive attitudes in Finland but positively in Sweden, which indicates the stronger attitudes amongst respondents in Finland on a conservation-oriented view on sustainability. Values on nature are split differently and overall has the weakest correlation with acceptance of exploration. This may reflect the way the formulation of the questions which did not explicitly probe tradeoffs between nature and economy. Nature even slightly positively correlates in Gällivare, which may point to the acknowledgement that both exploration and nature-

oriented activities are compatible when the practices have coexisted for a long period of time, or the recognition of a strong economic dependence on mining.

Next, we used a regression with the same independent variables and attitude towards local exploration as the dependent variable. In Rovaniemi/Ylitornio, impacts has the strongest effect on attitudes towards exploration, with values about community economy being the second strongest predictor. In both of the Swedish cases, values of community economy was the strongest predictor for a positive attitude towards exploration, but perception of company, impacts, and sustainability all positively predict attitudes but to a lesser degree. The inverse would be true of perceptions of negative environmental impacts predicting negative attitudes towards exploration. Interestingly, sustainability has a negative effect in Finland but positive in Sweden while nature holds a negative relationship in all three cases, albeit weaker in Sweden than Finland. This probably reflects the respondents' different understandings of sustainability and tradeoffs between its different dimensions.

Looking at the attitudes towards exploration technology shows a very different perception, and understanding, in Finland and Sweden. The option of 'Don't Know' was an option along with a five-point acceptance scale, nearly 80 percent of Swedish respondents state that they do not know whether specific technologies are acceptable or not compared to the Finnish respondents where fewer than 5 percent did not know. For more details on these results of the survey, please refer to appendix 3. There could be several reasons for this difference. First, the different technologies being used in the Finnish municipality. The new technologies listed are part of the work done by Mawson in Finland and therefore public awareness may be higher. Second, Mawson has worked extensively on providing information on their work and informing the public about the reduced impact of the technology they use. This could have an effect not only on knowledge of technologies, but their acceptance. Third, the respondents on the Swedish side are only aware of traditional exploration technologies, such as drilling and aerial surveys, which is indicated by the lower 'don't know' responses, but for technologies that remain outside public knowledge, providing a response is much less likely. Nevertheless, an interesting finding is that in the Finnish case where new technologies are used and promoted by the company, the knowledge and acceptance of these technologies is positive.

8 CONCLUDING DISCUSSION

8.1 Understandings of exploration and relationship between SLE and SLO

- **Exploration and mining are understood as different but interlinked activities: exploration aims at mine development and maintaining mining presupposes exploration.**

The literature (del Río et al. 2018) and previous public opinion surveys (Benighaus et al. 2018) suggest that citizens don't make a difference between mineral exploration and other mining activities. This study supports this conclusion but shows that local actors' understanding of

exploration vary considerably. In the case of our survey, nearly all the Swedish respondents stated they did not know about the specific exploration technologies. The interviews suggest that actors with different preferences, those supporting ongoing or future mining as well as those wanting to protect their environment from mining, do not conflate - but connect - exploration and mining as the two activities are understood to presuppose and justify each other. Accordingly, local citizens' attitudes to exploration and mining correlate strongly as shown by the survey results. This has sometimes been interpreted as an effect of insufficient knowledge and information but may also reflect a holistic and consequential conceptualization of the role and purpose of exploration. Moreover, SLE and SLO are intimately linked in the sense that relationships that are critical to a possible SLO, are founded already at the exploration stage.

8.2 Key factors affecting attitudes, positions and outcomes

- **Visions and understandings of sustainable development shape perceptions and attitudes: values matter!**

All three cases show that fundamental values about nature, economy and visions for the future development of the local community shape attitudes to exploration and mining, i.e. these factors explain average citizens' as well as organized actors' positions. In the Ylitornio/Rovaniemi case, perceptions of an urgent need for economic development and values prioritizing the economic and some social dimension of sustainable development drive pro-mining attitudes. In the Swedish Gällivare case, visions for a high-tech mining town generating societal benefits, perceptions of economic benefit from mining and values prioritizing economy over environment likewise drive strong pro-mining attitudes. Similar values that connect mining to economic benefit also exist in the Jokkmokk case. However, in Jokkmokk are also alternative visions of the community, including a future for Sami reindeer husbandry and prioritization of the environment over economic gains, that drive strong attitudes that resist exploration and mine development and more forcefully challenge the economically driven pro-mining positions (Beland Lindahl et al. 2016, 2018). Controversies over a project are often reflecting actors' different values and ideas of what is the most desirable development of the jointly inhabited place. Many potential mineral deposits exist in places inhabited by indigenous peoples, raising the issue how indigenous rights and livelihoods are recognized and respected (Raitio et al. 2020). Several studies highlight the importance of impacts, procedural and distributional factors (del Río et al. 2018, Benighaus et al. 2018, Kivinen et al, 2020) which will be further discussed below. However, the findings of this study, in line with other mining related case studies (Beland Lindahl et al. 2018, Suopajärvi et al. 2019, Avci et al. 2010, Lesser et al. 2020) stress the importance of acknowledging actors' different values and worldviews. While impacts, process and distribution of costs and benefits are issues that can be affected by the actions of companies and states, actors' values and worldviews are usually difficult to change (Shön and Rein 1994, Gray 2004). Government may have an important role in handling these values differences in ways that are effective and legitimate (Poelzer and Yu, 2020). Yet, they shape interactions and outcomes and have to be taken into consideration.

- **Perceptions of benefits and impacts of exploration - and mining - shape attitudes in powerful ways**

How actors and citizens assess the balance between negative and positive impacts associated with exploration - and possible mining activities - seem to be one of the most important factors shaping actors' attitudes in the investigated cases. This study shows that hopes for jobs and incomes from future mines, or socio-economic benefit and/or dependence on existing mines, drive acceptance of exploration and mining. The interviews reveal that some actors are even ready to accept impacts that they perceive as environmentally unsustainable to access desperately needed jobs and economic development. Negative attitudes, on the other hand, are primarily driven by perceptions of exploration - and mining - causing negative environmental and socio-economic impacts. This is in line with the mining related literature which identify socio-environmental impacts on land, water, and livelihoods as the most common reason for conflicts (Bebbington and Williams 2008, Silva-Macher and Farrell 2014, Conde 2017, Beland Lindahl et al. 2018), and expected socio-economic benefits as the most important driver of pro-mining attitudes (Beland Lindahl et al. 2018; Suopajärvi et al. 2017). Previous H2020 projects, e.g. INFACT, likewise stress the importance of perceived impacts of mining as central to actor's attitudes of mining - and exploration (Benighaus et al. 2018, del Río et al. 2018), while other, i.e. MIREAU, point to procedural fairness and legal certainty as central to acceptance (Lesser et al. 2020). Benighaus et al. 2018 conclude that "mineral exploration reputation", is directly proportional to the perceived benefits for the local host community, e.g. employment creation, and inversely proportional to the expected damages to regional environment and public health. This study focuses on local actors and citizens and comes to similar general conclusions. However, it also highlights that different people in the same locality assess benefits, impacts and experiences in very different ways, and that the distribution of benefits and burdens of all projects are key (Prno and Slocombe 2012). The latter can be greatly facilitated by procedural fairness and legal certainty (compare Lesser et al. 2020).

In contrast to most previous studies, this investigation explored local perceptions of exploration related impacts in greater depth. According to the interviews, the exploration activities in the Finnish case, were generally associated with less negative environmental impacts than exploration in the Swedish Gällivare case. As shown by the survey, perceptions of impacts were more positively related to exploration than in Sweden. Particularly those most directly affected (landowners and Sami RHCs) in the Swedish Gällivare case, reported significant negative impacts, particularly by drilling. However, it is hard to say if the observed differences between the cases reflect varying practices and technology, intensity of the exploration activities, mining related impacts generally, or perceptions shaped by different expectations. The survey suggests that the relationship between individual values and attitude towards exploration was weaker where mining is already established, in Gällivare. Because these activities are embedded into everyday life, have existed for long period of time, and the community depends on them, individuals are likely to hold less polarized opinions. At the same time, this likely points to the heightened attitudes that come with the expectations of what mining could bring and the resultant impacts, positive and negative, in cases where only exploration has occurred and a mine or not still is an open question.

- **Exploration is not in itself associated with major risks - but causes uncertainty about future risks**

Beyond the impacts addressed above, most local actors and citizens did not identify specific risks related to mineral exploration. However, local actors generally associated exploration with hopes and fears causing uncertainty about the future. Exploration was seen as a "risk" as it constituted a source of uncertainty hampering local planning and development. It caused anxiety, stress or expectations related to a future unwanted development in the form of a mine - or a lost promise about a mine. In addition, environmental risks associated with mining seemed to affect local actors' perceptions and attitudes to exploration (see also Murguia et al. 2018).

- **Experiences of the regulatory system affect trust in the permitting processes and the legitimacy of their outcomes**

Institutions, i.e. written and unwritten "rules", define actors' space for interaction and shape outcomes. Previous studies from weak as well as highly regulated governance contexts (see Murguia et al. 2018, Zachrisson and Beland Lindahl 2019, Poelzer et al. 2020) suggest that design of, and trust in, the regulatory framework is important to mining related resistance and attitudes. According to online surveys conducted in several EU countries as part of the H2020 projects INFACT and MIREAU (Benighaus et al. 2018, Lesser et al. 2017), trust in "mining authorities" is currently in the medium range although "a fair legal system" is identified as one of the most important factors for achieving SLO (see also Jartti et al. 2017). Although mineral related resistance and open conflicts are relatively rare in Europe and the Nordic countries (Eerola 2017, Lessser 2020), mineral extraction projects increasingly trigger resistance as illustrated for example by the Swedish Jokkmokk case. In this context, previous studies show that the design of the institutional framework is important: confrontational mining resistance at the national level is likely to grow when the state offers little access nor influence to mining-skeptical actors in policy formulation and implementation (Zachrisson and Beland Lindahl 2019).

The interviews conducted in the context of this study confirm that local actors' perceptions of the mineral permitting process affect their trust in the performance and outcomes of the mineral governance system. They also establish a connection between mining related experiences of the regulatory system and its capacity to handle exploration related issues. This is most evident in the Swedish Gällivare case but also in the Finnish Ylitornio/Rovaniemi case where the actors remembered the mining accident in Talvivaara (Sairinen et al. 2017, Kivinen et al. 2020). Some actors in both the Finnish and Swedish cases point to inconsistencies in implementation which affect their trust in the specific institutions regulating exploration, a finding consistent with previous studies in Sweden by Poelzer and Yu (2020). In this study, this connection was primarily made in relation to exploration on indigenous lands and in areas protected under the EU Habitat Directive (Natura 2000 areas), but similar observations have been made in previous studies (e.g. Beland Lindahl et al. 2018, Raitio et al. 2020, Lyytimäki and Peltonen 2016, Eerola 2017, Lassila 2018). Some local actors in all cases called for stricter regulation of environmental impacts, benefit sharing and compensation of impacts on private land and property. Actors that had more direct experiences of exploration

seemed to be more informed and had more developed opinions about process and the overall performance of the governance system. Generally, the knowledge of the permit process regulating exploration was quite low. However, the interviews also suggest that actors' overall attitudes to exploration and mining, may shape their perceptions of the regulatory system, e.g. actors who were critical to exploration and mine developments tended to see the regulation as "pro-exploitation", too generous and too slack, and vice versa (compare Beland Lindahl et al. 2018).

8.3 The role of interaction

- **Quality of interaction is important and can affect attitudes to and understanding of exploration - and mining**

Mutually satisfactory interaction of sufficiently high quality, particularly between the company and local actors, is key to any project and at the heart of the SLO concept (Thomson and Boutilier 2011, Boutilier and Thomson 2012). The interviews and survey of this study highlight the importance of *quality* of interaction and local actors' perceptions of the company's interactive performance. The survey results reveal that positive assessments of the involved companies' interaction and information sharing (i.e. trust) are strongly correlated with positive attitudes to exploration - and mining - and vice versa. The interviews stress the importance of quality in interaction, i.e. early contact, mutual respect, reciprocity, influence, equal power relations and access to resources. All cases show that relationships develop over time. While the Finnish case illustrates how a new-coming exploration company with a proactive engagement strategy can shape predominantly positive attitudes, the Swedish Jokkmokk case illustrates the difficulties to repair relations that did not go right from the start (Beland Lindahl et al. 2016, 2018). However, the interviews also showed that the relationship between interaction and acceptance is not necessarily straightforward. While some actors were positive to exploration (and mining) without much interaction with the company, and others expressed a readiness to accept far reaching impacts *if* properly treated and compensated, yet others stated that they wanted to see exploration (and mining) further restricted, or stopped, regardless of the quality and quantity of interaction. While many actors' attitudes are affected by their perception of the company's interactive performance, others are not. This is consistent with on-line surveys in a number of European countries suggesting that compliance with legislation is more important to the public than companies demonstrating behaviors beyond it (Lesser et al. 2017), particularly in Sweden and Finland where trust in government is much higher than the OECD average (OECD, 2020). In sum, sufficient information and quality of interaction is a precondition for good company-community relations; positive perceptions of company is one important factor that drives positive attitudes to exploration (and vice versa); but some actors are likely to remain skeptical regardless of the process or interaction with the company.

8.4 The importance of the new sensitive technologies

- **Other factors appear to be more important to local attitudes, but less intrusive exploration technologies are welcome and proactive information can increase knowledge and interest.**

This study shows that local actor's and citizens' knowledge of exploration technologies vary but is generally low when it comes to new technologies. In the interviews, a majority of actors state that less intrusive technologies are considered positive, especially if impacts, and the use of drilling, can be reduced. According to the survey, the attitudes to flying vehicles and drones were generally positive (compare Benighaus et al. 2018), although reindeer herders report that reindeers may be afraid of drones.

In the Finnish case, knowledge of exploration and specific technologies appears to be significantly higher than in Sweden where most respondents did not express clear opinions on the technology related questions. However, these differences may reflect that Mawson was actively using new technologies in their exploration activities and citizens will likely have greater awareness and knowledge of them. Second, the community outreach and communication done by Mawson was intended to inform residents not only where exploration is taking place, but how the work will be done - including the technology used. In the interviews, actors critical to expanded exploration - and mine development - stress that new exploration technologies are only positive insofar as they reduce the overall amount of impact, and not if they facilitate the development of new mines. Several actors state that technology is not a major issue, and that other factors, such as the impacts of a possible mine, are more important to their attitudes to exploration. According to both survey- and interview results, the attitudes to exploration were the most positive in the Ylitornio-Rovaniemi case where environmentally sensitive NEXT technologies were used. This may point to the importance of both using and communicating more sensitive technologies during the exploration phase. Because attitudes are more positive to both exploration and mining in the Finnish case, it may be an indication that citizens' understanding of technology and its impacts is related to positive attitudes. However, as outlined above, several factors are likely to interact.

8.5 Assessing acceptance and the concepts SLE and SLO

- **Attitudes to exploration and mine development reflect different values, visions and perceptions of impacts and companies - in communities that rarely are unanimous**

The interviews conducted in this study reveal three different sets of attitudes that are represented by actors and citizens in all three case study locations. First are those who envision more jobs; focus on the need for population and economic growth; see positive socio-economic benefits of exploration and mining; welcome large-scale industrial investments and consequently perceive exploration - and most often mining - as opportunities. They typically support exploration and mine establishment. Second are actors who care for nature and local/indigenous ways of life; argue that there are limits to growth; focus on small scale development and economic diversification; see primarily negative environmental and social impacts; and perceive exploration - and mining - as

threats. Consequently, they are against - or skeptical to - exploration and mine development. In between, are actors with more undetermined positions; balancing the socio-economic benefits and environmental costs of the different alternatives; and assessing the trustworthiness of the company and the process. Underlying these varying sets of attitudes and positions are different values and worldviews, for example about nature and economy. These sets of correlated perceptions and attitudes are confirmed by the statistical analysis of the survey results. Similar sets of attitudes, or frames of understandings, have been identified in previous studies of mining and natural resource management conflicts in Sweden (e.g. Beland Lindahl et al. 2018).

However, the prevalence of these attitudes and positions vary significantly between the investigated communities, as illustrated by the survey results. While the pro-mining attitudes were the most common in Ylitornio/Rovaniemi and Gällivare, the pro-nature and local/indigenous ways of life attitudes were almost as common in the Swedish Jokkmokk case which is only 100 kilometers south of Gällivare. Hence, the level of the different attitudes is highly contextual. While previous research shows that it is unlikely that improved process, consultation, technology, etc. will induce strongly anti- or pro-mining actors to alter their positions fundamentally (Walter and Martinez-Alier 2010, Avci et al. 2010, Beland Lindahl et al. 2916, 2018), the actors in between are more open to change. Positive perceptions of company interaction and process can for example shift attitudes in a positive direction, and vice versa. Generally, this study stresses the importance of company performance.

Assessing “acceptance” is not a simple exercise that can result in a straightforward “yes” or “no”, neither on the local, national nor EU level. Attitudes can be interpreted and the level of agreement, or disagreement, can be assessed at a particular point in time (see also Benighaus et al. 2018, Murguia et al. 2018). In this context the concept SLO/SLE has its limitations as it departs from company strategies intended to achieve community “acceptance” for a company’s project, i.e. it reflects an asymmetrical relationship to start with. In a highly regulated context such as the EU, the concept SLO/SLE may be most effective as an indicator to provide information about the quality of the relationship between a company and community and the performance of the regulatory system (see Poelzer et al. 2020).

8.6 Context and generalization

- **Insights about contextual conditions and drivers shaping attitudes can be generalized and help explain, even predict, local attitudes to exploration and mine-development across Europe**

Values and worldviews shape local actors’ and citizens’ attitudes (e.g. Beland Lindahl et al. 2018, Avci et al. 2010, Hovardas 2020). However, values and worldviews are in turn products of different socio-economic and political contexts. This study shows how challenging socio-economic conditions such as outmigration, economic dependence on mining or need of new jobs and incomes drive pro-exploration- and mining attitudes in all three investigated cases. In the Jokkmokk case, however, a

relatively sizeable Sami population, several large Sami RHCs practicing traditional reindeer herding and a relatively high proportion of small scale business are reflected in relatively strong pro-environmental and Sami values and exploration/mining skeptical attitudes - in addition to the jobs- and growth induced pro-mining attitudes that predominate in Gällivare and Ylitornio/Rovaniemi. Recognizing that local responses to exploration and mining vary from community to community, highlights the importance of interpreting results from a limited number of case studies with caution, and with an eye to the contextual factors shaping different attitudes and positions. Communities, with other contextual pre-conditions than the ones studied here may display quite different power relations between major interests and sectors - factors that are known to shape the process of social licensing (Boutilier 2020). Hence, context matters and assessments of attitudes in one place, or three cases, cannot easily be generalized to other places. But, insights about contextual conditions and drivers shaping attitudes can be generalized and help explain, even predict, local attitudes to exploration and mine-development across Europe. Indeed, nationwide surveys conducted as part of the H2020 INFACT project conclude that it is the perceived balance between benefits in the form of local employment, income and infrastructure development, and risks in the form of unwanted environmental and social impacts, that shape attitudes to exploration and mining (Benighaus et al. 2018). According to del Río et al (2018), who conducted extensive literature reviews in Finland, Germany and Spain, attitudes in the three countries are similar to each other and can be considered valid for the EU as a whole. Although generalization across different contexts always must be done with caution, mechanisms and drivers of the attitudes identified in this study can be transferred to other European contexts.

9 RECOMMENDATIONS TO EXPLORATION AND MINING COMPANIES

What can exploration and mining companies learn from this study? Below are a number of take-home messages:

- Always provide accurate, easy accessible and proactive information about exploration at the outset of a project; apply best available company-community engagement practices to develop best possible relationships with local community actors and citizens; pay attention to representation, early contact, mutual listening and respect, reciprocity, influence, power relations and equal access to resources.
- Acknowledge the interrelated nature of exploration and mining and don't dismiss concerns that address issues that go beyond the exploration phase.
- Acknowledge and respect the value-based nature of exploration and mining related attitudes; lack of consent may reflect different values or visions rather than lack of information or knowledge.
- The balance between positive and negative impacts is a very important factor affecting local attitudes: develop consultation and collaboration to ensure

appropriate mechanisms for benefit sharing and fair mitigation and compensation of negative impacts are in place.

- Transparent, honest, realistic and easily accessible and understandable information about projects - exploration and their possible future development - can help address local people's expectations and anxieties.
- More sensitive exploration technologies are often welcome *if* they reduce overall impacts and intensity of drilling; *but* don't expect low impact technologies to significantly change local people's attitudes to exploration, particularly not in contested locations such as nature conservation areas or on indigenous territories.
- Legal compliance and consistent implementation of regulations are important to local people's attitudes to exploration and mining; state actors have the main responsibility but companies behavior/corporate conduct can help build or erode trust; by operating beyond the letter of the law companies can lead needed institutional change.
- Respect indigenous rights and protocols; acknowledge indigenous actors' status as right-holders.
- Use available knowledge about the conditions and drivers that shape local attitudes to make informed decisions about what projects to pursue; companies initiating activities in existing nature conservation areas and on indigenous territories should be aware that they are operating in contested terrain and that delays and resistance can be expected.
- Remember that context matters! Be sensitive to local conditions and differences.
- Apply the concept SLE/SLO with caution; don't claim "acceptance" if disagreement exists; use SLE/SLO as indicator of the quality of the relationship with the local community.

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11 APPENDICES

Appendix 1. Methodology

Methodologically the present study is a theory-driven comparative case study between cases in Northern Finland and Northern Sweden. Case-study research is an in-depth approach trying to give a rich and comprehensive analyses of the issue at stake, in this study local people´s perceptions and attitudes of mineral exploration and mining. Flyvbjerg (2006, 26) argues for the virtues of a case study approach:

"the advantage of large samples is breadth, while their problem is one of depth. For the case study, the situation is the reverse. Both approaches are necessary for a sound development of social science".

This study is based on a most-similar-system design (Seawright and Gerring 2008), since many background variables in the three cases are similar. They differ, however, in variables central to the analysis as shown by table 1. We used both quantitative and qualitative methodologies to explore and compare context dependent *differences* in local peoples' perceptions on mineral exploration. Meanwhile, we also tried to find *similarities* between the cases, i.e. asking if common themes could be identified by comparing these and other mineral exploration cases.

Our methodological approach is a theory-driven thematic analyses. This means that in planning the interview guide and surveys, relevant themes and questions were structured based on the SLO/SLE-related literature including themes like pre-conditions for SLE, importance of institutions, interaction, procedural fairness and distributional justice. More precisely, we used Prno & Slocombe's model (2012), and interactive governance theory (Jentoft and Chuenpagdee 2015) for analysing interactions between civil society (local actors and residents), state (authorities involved in the permit process) and the market (operating companies in mineral exploration), with focus on the perspectives of local people. In line with the focus of the NEXT project, we also included themes related to new technologies, risks and sustainability. A common theoretical framework (see figure 2) and a research guide was developed to streamline the research process.

Qualitative method and data

Thematic analyses (TA) is a qualitative method well-suited for the analyses of large data corpus. TA is used for identifying, analysing and reporting patterns (themes) within data and interpreting various aspects of the research topic (Braun & Clarke 2006, 79). An inductive approach of TA is data-driven, meaning that themes are constructed from the data, based on e.g. prevalence of the theme in the data set. Theory-driven thematic analyses is generated deductively from the theory and prior research that guides the analyses. (Braun & Clarke 2006, 83-84; Nowell et al. 2017, 8). In our research, the starting point was theory-driven TA, but the analysis, including the identification of relevant themes was also inductive, i.e. an alternately deductive and inductive approach was applied.

The interviews were made in two of the cases, Gällivare and Ylitornio/Rovaniemi by the involved researchers between May 2019 and March 2020 and transcribed to a textual format. The discussion of the Jokkmokk case was based on previous interviews presented in Beland Lindahl et al. (2018). Transcriptions were made by researchers or by research assistants. Following the *General Data Protection Regulation (GDPR)* all references to persons interviewed or others mentioned in the interview were deleted in the transcriptions. The lists of informants were stored separately and only the research team had access to it.

The informants approached in the Ylitornio/Rovaniemi and Gällivare cases are described in table A1. The idea was to target representatives of organized actors like municipalities, environmental and other non-governmental organizations like village associations, trade unions, business and other entrepreneurial local organizations, also including landowners. In Finland, 17 interviews were made, reaching 31 informants. In Sweden, 14 interviews with representatives of organized local actors including the municipality were conducted. In addition, representatives of the exploration/mining companies and involved authorities were made in both cases to understand the relations between community, state and company following our theoretical framework (see figure 2). In Finland, the company operating in the study area, also a partner in the NEXT-project consortium, is Mawson Oy. On the Swedish side, Boliden Ltd. and Jokkmokk Iron Mines AB were interviewed. In Finland interviews were conducted with civil servants of several authorities: TUKES, the permitting mining authority, Metsähallitus, as a landowner and authority with responsibility for nature conservation areas, and the Regional Centre for Economic Development, Transport and the Environment, the environmental authority. In Sweden, interviews were conducted with civil servants within the Mining Inspectorate, the mining permitting authority, along with the County Administration Board in their capacity as environmental assessment regulator.

In the analyses of the transcribed interviews, we applied a step-wise thematic analyses: familiarizing ourselves with the data, generating theory-driven and inductively identified themes (or codes) to be identified in the entire data corpus, thematizing the interviews in accordance with the different themes, reviewing the results theme by theme and reflecting on how they relate to theories informing the study , and finally, reporting the results in a project report (Braun & Clarke 2006; Nowell et al. 2017). At the first stage, all interviews were read one by one, as a singular data corpus and the main themes of the interview were identified and documented in a template, following the interview structure. During this preliminary reading we familiarized ourselves with the data and condensed the main points of the answers in “a nut-shell”. As a result, we had two case-study summaries, one for the Ylitornio/Rovaniemi case and one for the Gällivare case, which helped us to understand the main features of both cases. A summary of the aggregated interview data is in Appendix 2. As the informants of companies and authorities can be identified, the summary focuses only on the perceptions of local organized actors.

	Northern Fennoscandia Boliden/Aitik	Northern Fennoscandia Mawson/Rajapalot (n=35)
Company	1 Boliden	1 Mawson
Local Actors	4 Village associations 2 Business associations 1 Trade unions 1 ENGO 2 Sami reindeer herding communities	4 Village associations 2 Tourist entrepreneurs 1 Business association 1 ENGO 2 NGOs (hunters) 2 Reindeer herders (n=8) 2 Land owners/villagers
Relevant authorites	1 Mining Inspectorate 1 County Administration Board 4 Municipality	1 Mining Authority 2 Relevant Authorities 3 Municipality (also political leaders)

Table A1. Number of interviews conducted with different categories of organized actors in Finland and Sweden.

At the second stage, we coded the interviews according to the themes identified in research guide (see above). The coding was done by software (NVivo). During the coding it appeared that there were prevalent themes in the data corpus. In Finland, for example, the informants talked a lot about nature conservation in general and they also reflected on the local discussion about mineral exploration and mining. Hence, these two themes were also included to the research frame. Also, when coding the legislative frame, it became apparent in Finland, that in the data corpus included discussion about court appeals related to the studied case and hence, a sub-theme “court appeals” under the general legislative frame was created.

At the third stage the identified themes were categorized and compared systematically with the help of a theoretical understanding of the research theme. As the interview analysis evolved and was documented, the researchers continuously discussed the findings in meetings, where the results of both cases were compared. Writing the qualitative part of this report was done jointly in Google Drive so that both differences and similarities of the cases could be identified.

Quantitative method and data

Also the questionnaire was theory-driven; the framework outlined in figure 2, previous quantitative studies of SLO were reflected and earlier questionnaires about local perceptions on mining, made by the research team, were used as a base for the study. The questionnaire reflected the theoretical framework and the research questions and included the following themes: knowledge and experiences of mineral exploration and mining; perceptions of social and ecological impacts of

exploration, the regulatory framework, company – community interaction, place and future in the area; and attitudes towards old and new exploration technologies; as well as towards mineral exploration and mining.

In Finland, a sample of 900 addresses was ordered from the Digital and population data services agency. To Ylitornio was sent 600 questionnaires and 300 to southwest Rovaniemi in the early March 2020. By the end of the month, we received 173 answers. To get the respond rate higher, a new round was organized in April, 2020. As a result, we received 262 answers and the response rate rose to 29,1%. In June, in co-operation with the Ylitornio municipality the same questionnaire was opened as a web-based version in hope, that we could reach also second-home owners and those interested about the topic, but not included to the random sample. The questionnaire was open until August, but as there came less than 80 answers, this data is not used in the project report.

In Sweden, the survey was distributed to 3200 addresses in Gällivare (1600) and Jokkmokk (1600), provided by the State Register of Swedish Individuals (SPAR). 134 surveys went to duplicate or non-existent addresses and returned. After the initial mail-out in March and one reminder in June, 863 responses were received – producing a response rate of 28.1%.

While a response rate around 30% is far from 100%, we can conclude that the response rate was relatively high in both cases as mineral exploration is not that familiar among average citizens, not at least in Finland. As there has been mining developments for long in the Swedish study area, also questions related to mining were included. It is important to note that both surveys are biased. In Finland, around 55% of respondents were retired, whereas in the area their share of the population is 43%. This may be due to that the survey was done in early times of Covid 19 -pandemia and working aged people with children could not find time or interest to answer the questionnaire. Also, the share of male respondents in the survey is higher (57,5%) than their share among the population in the area (51,1%). In Sweden a similar phenomenon is true with 44% and 41% retired responding in Gällivare and Jokkmokk respectively. Even more skewed is the 64% and 58% response rate from men in the two communities.

The data was analysed in several steps. First, frequencies were run on the attitudes towards exploration and mining to see the relationships between general and local attitudes. Seeing the alignment between general attitudes towards exploration, general attitudes towards mining, attitudes towards local exploration and attitudes towards local mining allowed us to focus on one dependent variable: attitudes towards local exploration. We then identified five independent variables (individuals values on community economy, individuals values on community nature, perception of exploration impacts, perception of sustainability, and perception of the company) based on previous survey work in Sweden and adapted them to the questions that corresponded between the two surveys, i.e. the Finnish and the Swedish survey. Using sum variables, we used questions in the survey that corresponded with each independent variable above. The items included in each of these variables are found in the table below. Next, we ran bivariate correlations with all five independent variables and our dependent and then multiple regressions. In the Finnish data, the company variable was found to be statistically insignificant and removed from the model

and the same was found and done with the nature variable in the Gällivare data. We then ran a K-means cluster analysis on the dependent variables in order to overcome some of the discrepancies in the demographic data. The cluster results were then compared to age, gender, education level, and employment status using crosstabs.

Company:	**Cronbach's α**		
	Rovaniemi/ Ylitornio	**Gällivare**	**Jokkmokk**
How much do you agree or disagree with following statements about Mawson Oy? - Company gives enough information about its activities - Information given by company is reliable - Company's website is informative - Company listens to local people's concerns - Company takes responsibility of municipality's development - Company has held enough local briefings - Company's briefings have been informative - Company representatives are easy to contact	.963	.932	.958

Table A2: Items in variable 'Company' with Cronbach's α

Impacts:	Cronbach's α		
	Rovaniemi/ Ylitornio	Gällivare	Jokkmokk
How much do you agree or disagree with following statements about social, economic and ecological impacts of mineral exploration? - Mineral exploration has created jobs for locals - Mineral exploration has been beneficial to local economy - Mineral exploration is important to the future development of the locality - Mineral exploration causes uncertainty about the locality's future - Mineral exploration is beneficial to neighbouring villages and people living there - Mineral exploration causes permanent damage to nature - Mineral exploration has a negative effect on reindeer husbandry - Mineral exploration has a negative effect on forestry - Mineral exploration has a negative effect on tourism - Mineral exploration has a negative effect on berry and/or mushroom picking - Mineral exploration has a negative effect on hunting and/or fishing - Mineral exploration has a negative effect on nature hobbies such as hiking and photographing - Mineral exploration related traffic increases the risk of accidents - Mineral exploration causes safety risks - Mineral exploration causes sound nuisance - Mineral exploration brings unwanted strange people to the area - Landowners are being sufficiently compensated for mineral exploration - Possible negative effects to other businesses are being sufficiently compensated	.964	.910	.942

Table A3: Items in variable 'Impacts' with Cronbach's α

Sustainability:	Cronbach's α		
	Rovaniemi/ Ylitornio	Gällivare	Jokkmokk
How much do you agree or disagree with following statements? - Jobs are more important than nature conservation - Nature is adaptable and able to recover even from heavy stress - In the future science and technology will be able to solve sustainability problems related to mining - I am willing to reduce consumption and recycle more efficiently to reduce the need for metal and therefore mining	.811	.729	.855

Table A4: Items in variable 'Sustainability' with Cronbach's α

Economy:	Cronbach's α		
	Rovaniemi/ Ylitornio	Gällivare	Jokkmokk
How do you perceive your home municipality's future? How important are following things to your home region? - More efficient use of natural resources (e.g. forestry, mining, energy production like wind power) - Population growth - Increase of jobs	.677	.766	.808

Table A5: Items in variable 'Economy' with Cronbach's α

Nature:	Cronbach's α		
	Rovaniemi/ Ylitornio	Gällivare	Jokkmokk
How do you perceive your home municipality's future? How important are following things to your home region? - Sustainable use of nature and respect for the value of nature - Versatile small entrepreneurship - Improving small-scale tourism - Possibilities of recreational use of nature (e.g. hunting, fishing, hiking)	.654	.707	.653

Table A6: Items in variable 'Nature' with Cronbach's α

Some of the conclusions from the questionnaires are similar attitudes towards exploration and mining in all three cases, but these levels differed between the cases. Like the interviews, individuals interested in economic development were most likely to be positive to exploration, which was found in all three cases.

Appendix 2. Summary of interviews with local actors

INTERVIEW THEMES	Local actors Gällivare municipality, Sweden	Local actors Ylitornio and Rovaniemi, Finland
Understanding of mineral exploration	Exploration and mining different things but intimately linked; mining presupposes exploration and exploration aims at mine establishment	Mineral exploration and mining are two different things (all). Those informants, who are more critical towards mining, link mineral exploration and mining more closely together and argue that the aim for mineral exploration is to find rich mineralization for mining (RH, E-NGO, LO).
Goals and expectations (exploration and possible mining)	Respect Fair treatment, compensation, mitigation of impacts Maintain community, good life and jobs More societal benefits (ENGO, B) Better balance and diversification of local economy (SB, SRHC) Expanded/maintained mining; supply metals; more exploration necessary (B, TU, VA) Restricted exploration and limited/no new mine establishment (VA, ENGO, BO, SRHC, LO)	To get to know, if there is a profitable deposit or not. People are waiting; exploration has continued year after year, which means times of uncertainty (VA, LO, B). Interest for the industry has aroused (VA, B). People follow the development of exploration with positive interest (VA, B, NGO), if they follow it at all (B). Mining would bring vitality to the region (M, B, NGO), but is a threat for the environment (RH, E-NGO, LO).
Perceptions of benefits and impacts of exploration and mining (including social risk)	No/limited env. and social impacts of exploration (B, VA, TU) Significant impacts by drilling; damages on soil by machinery; logging for access: leaking pipes/holes; loss of grazing land; dangerous cables; disturbance (LO, VA, ENGO, SB, SRHC) and test mining (B) Exploration associated with positive expectations; jobs (VA, TU) Exploration associated with uncertainty, worries and env. and social risks (relocation) caused by possible mine (VA, LO, SB, SRHC) Impacts by exploration (and mining) not properly mitigated/compensated (VA, LO, SRHC) Dependent on mining; must accept impacts on env. (dust, dams, pits) and relocation/loss of property (VA, TU) Dependent on mining; BUT impacts on environment, landowners and SRHCs must be limited/properly adjusted/ compensated (LO, VA, ENGO, SRHC, SB) Distribution of benefits and impacts of mining related activities not fair (ENGO, LO, VA, B, SRHC)	Environmental impacts of mineral exploration are minor and limited (all). Forestry has impacted reindeer herding much strongly (RH). Exploration until now has offered work opportunities for local people, use of local services and sub-contractors (VA, B). Mineral exploration means a threat of mine and will hinder nature-minded young people to move to the area (E-NGO). Mining would have no impacts as it situated far away from residents and regulated (B, VA). Mining would have negative impacts to priceless nature (LO, E-NGO) or could have (B), risk of heavy traffic with chemicals (LO,VA,M), to other livelihoods (RH). Mining would have positive impacts to employment (VA, B, RH, LO, NGO), to the prizes of real estates (E),wealth, well-being and vitality (B, M, VA, NGO), taxation and better municipal services (VA).

Perceptions of exploration technologies and their significance?	No/little knowledge about technologies in use (VA, SB) Technologies in use include measurements/geophysical surveys from airplanes/helicopters/the ground (use of cables + soil samples), (lots of) drilling and digging; drones for research (VA, LO, ENGO, B, SRHC) Technologies have improved (SRHC); is not a major issue (VA, B) Less intrusive technologies (NEXT) are positive if impacts (drilling and digging) are reduced (VA, LO, ENGO, SB); but reindeers scared of drones (SRHC) Not positive if leading to more exploration/expansion of mining (SRHC) Technology not important to attitude to exploration (VA); total amount of impact (possible mine) is (SRHC)	Drilling was the most familiar exploration method (VA, B, NGO) and especially drones were related to new technologies (VA, E-NGO, NGO). New exploration technologies were seen as a good and interesting (VA, B, LO, NGO), but not a major issue (VA, RH, B).
Interactions between actors in the exploration/mining permit process?	No direct interaction; informed about exploration/mining related events by media/public notices/public meetings (VA, ENGO, SB) Information about exploration by mail from the company and working plan from MI (LO; SRHC) Continuous dialogue with the company (TU) Yearly meetings with the company; information about planned mine expansion (involving expropriation and relocation, LO); information meetings with MI and CAB (LO) Regular consultation (exploration) with the company and negotiation of private agreements/involvement in EIA reindeer herding analysis (mine expansion, SRHC) Consultations and negotiations about expropriation and relocation in individual meetings between the company and landowners (LO)	Ylitornio municipality has a working group where the company is informing about developments (B), the company is visiting local village associations, when asked (VA, NGO). The company informs municipality and local people in Open Days and meetings (B, VA, NGO, LO). No face-to-face interactions steadily with reindeer herders and in Rovaniemi municipality (RH, VA).
Experience and quality of interaction (exploration and possible mine development)	Good quality presupposes access; mutual listening; openness and transparency; reciprocity; responsiveness; “good-will”; respect; equal power relations and access to resources; substantive influence and early information/involvement. Varying experiences No experience (VA) Communication with the company works well (VA, TU)	Interaction between company and local stakeholders is very good and sufficient. No need to change anything. (B, VA, NGO). Company tells about developments in an understandable way and keeps stakeholders informed about developments (B, VA, NGO, LO). Interaction missed among reindeer herders, hunters’ association and residents in the Rovaniemi municipality (RH, NGO, VA).

	Communication with the company could be improved (B, SRHC, ENGO) Communication and interaction bad; none of the criteria above are met (VA, LO) Personal relations good but interaction unbalanced; too little influence and responsiveness (SRHC) Little interaction with MI and CAB; mixed experiences	
Perceptions of the formal regulatory framework	Little insight and experience but trust the process (VA, TU) Too easy to start exploration; MI too generous with permits; landowner rights not respected (ENGO, VA, LO, SB) No point using formal instruments to influence exploration (SRHC) MI and mineral legislation biased: pro-mining (VA, LO, SB) CAB responsible for environment; upholds laws and rules (VA, SB) Permitting (exploration and mining) inconsistent and inefficient (B) Compensation/mitigation (VA, LO, SRHC); local return (B); environmental requirements (SRHC) should be more strictly regulated Sami rights/interests not respected; heard but lack means to influence (ENGO, SRHC)	No experiences, how the regulatory system works (VA, LO, B). Reindeer-herders have the possibility to give statements about permit applications, but overloaded with all land-use issues (RH). Mining Law and mining authority in a strong position (E-NGO, LO). Criticism towards "green outsiders" having the right to do court appeals although right to appeal seen part of the democracy in general (VA, B, NGO). Monitoring should be done more on the field (B). Exploration in nature conservation areas should not be allowed (E-NGO).
Vision for the future of the local community and its exploration/mining activities	Mining community dependent on continued exploration and mining; no jobs no future; must accept environmental risks/impacts (VA, LO) Expanding extraction industry; modern mining community takes lead in technology development and green transition (B) Maintained/increased population able to keep the young; attractive town (VA, ENGO, TU) Place for recreation and outdoor activities; close to nature and "village life" (VA) Diversified local economy; more tourism, cultural businesses and reindeer husbandry (ENGO, SB, SRHC) Thriving reindeer husbandry and a future (restored land!) for reindeer herding (SRHC)	Mineral exploration and mining needed as they provide work opportunities, in-migration and hope for the future in the declining "Lake Village" area and economic development for the municipality in genera. (VA, B, NGO). Mining is a threat that prevents nature-minded young people move to the area (E-NGO). Opportunities for reindeer herding should not be threatened by mining as reindeer is important also to the image of Lapland and tourism (RH).
	No jobs no local community!	

Understanding of sustainable development and whether exploration/mine development hinders or helps sustainability	Exploration and mining necessary for economic, i.e. sustainable, development in Gällivare (B, TU); must accept social/environmental impacts (VA) Mining is not environmentally sustainable (SB), but no economic sustainability in Gällivare without mines; ambivalence (ENGO, VA) SD is access to grazing land and a good environment (SRHC) SD is to give and take; not balanced now; money talks (SRHC) Minerals important for batteries/climate/ environment (VA); if not here somewhere else (B, TU) Consumption drives unsustainable use of nature (VA, SB, SRHC); Sustainability presupposes fair compensation and distribution of benefits (VA, B) Ore is a limited resource; unfair to future generations to exploit everything now (SB)	Exploration and mining seen necessary for social sustainability: to keep the "Lake Village" area inhabited and mining important for the economic sustainability and development in general (B, VA, NGO, LO). Environmental sustainability should be valued more and also social and cultural values, that are more important than economic values (E-NGO, LO). Cobalt necessary for batteries and hence mining supports sustainable development (VA, B).
Positions on ongoing mineral exploration/mine establishment?	Exploration, mines and mining needed to supply minerals (B, TU) Exploration needed to know where the ore is; dependent on mining (B); no alternative in spite of environmental impacts (VA) Exploration necessary for obtaining knowledge; existing mines needed, but don't know about additional mines (VA, LO, ENGO, SB) Exploration should be restricted and no additional mines established; never approved existing mines (SRHCs) Impacts of exploration and mining should be mitigated and compensated; respect and proper process (VA, LO, SRHCs) Better regulation to ensure proper compensation (VA, LO)	Exploration needed to identify the possible deposit. Mining would be a different thing, accepted if environmental issues taken care of and provides local benefits (VA, B, NGO). Local people supporting mining although it is a risk for living environment, other livelihoods and local way of life (E-NGO, LO). Local people divided in the early days because of the uranium discussion, gold and cobalt different things and discussion not any more polarized (VA, NGO).
Outcomes (SLE/SLO) Approval, acceptance, resistance	Approval/Acceptance/Acceptance by necessity or by coercion Exploration (technologies), existing mines and expansion of mining industry broadly accepted/approved (VA, TU) Further exploration and mine development accepted IF…(VA, LO, B)	Mineral exploration approved and supported (B, VA, NGO, LO) and mining seen as an opportunity, although different thing than exploration (B, VA, NGO, LO). Accepted, as brings economic opportunities (B). General opinion positive towards mineral exploration (B, VA, NGO, E-NGO, LO). Mineral exploration has minor environmental impacts, but

	Exploration for knowledge accepted but don't know/against additional mines (VA, LO, ENGO, SB) Exploration and mine expansion resisted but see no other option than to comply (SRHC); ready to support resistance (ENGO)	mining is a risk for the environment, reindeer herding and other nature-based livelihoods and to the local way of life, hence it is not acceptable (E-NGO, RH, LO).
Performance of the governance system (exploration and mining)	Trust in the process and the system (VA, TU) System inadequate to protect land/ property owners' rights to property and fair compensation (VA, LO) System and process is biased (pro-exploitation); unequal power relation; money talks; regulation to slack (VA, ENGO, SRHC) Insufficient quality of company community interaction (ENGO, LO) Inadequate treatment of Sami interests and rights (ENGO, SRHC) Inadequate to address existing land use conflicts (SRHC, SB) To weak mechanisms to ensure fair distribution of benefits (B) Too long lead times and inconsistent implementation (B)	The legislation is already now strict enough (B, VA). Role of the local people, reindeer herding and landowners should be stronger (RH, LO, NGO).

Table A7. Summary of interviews with local actors.

When all informants support a statement, no references to the informants are included in the table above. In cases of statements which are only supported by some informants, their abbreviations (below) are listed behind the statement.

Informants: Village Associations (VA), Business organizations/entrepreneurs (B), Sami business organizations/entrepreneurs (SB), Landowners (LO), Tourism associations (TA), Reindeer herders (RH), Sami reindeer herding communities (SRHC), Environmental non-governmental organizations (ENGO), Non-governmental organizations (NGO), Trade Unions (TU).

Appendix 3. Tables Statistics

Rotated component matrix of Principal Component Analysis with Varimax and Kaiser Normalization.

KMO	.705	
	Nature	**Economy**
% of Variance	32.5	19.2
More efficient use of natural resources (e.g. forestry, mining, energy production like wind power)		0.770
Population growth		0.733
Increase of jobs		0.836
Versatile small entrepreneurship	0.627	0.394
Sustainable use of nature and respect for the value of nature	0.701	
Improving reindeer husbandry	0.571	
Improving small-scale tourism	0.592	
Possibilities of recreational use of nature (e.g. hunting, fishing, hiking)	0.715	

Table A8: Principal Component Analysis

Based on the PCA results, inter-item correlations and further use of the sum variables in the regression analysis as independent variables, 'Versatile small entrepreneurship' was left out of the Economy variable and only included in the Nature variable.

Sum Variables Related to Acceptance

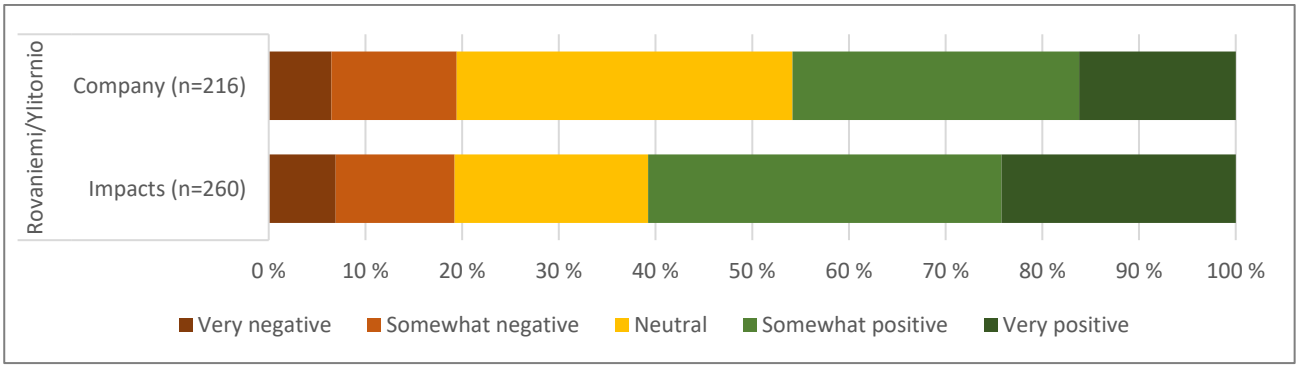

Figure A1: Distribution of 'Company' and 'Impacts' in Rovaniemi/Ylitornio

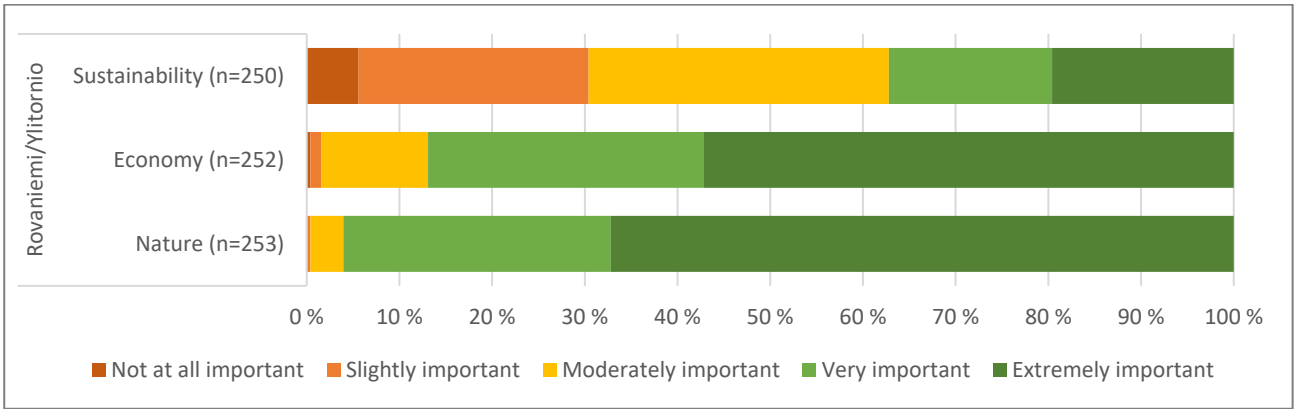

Figure A2: Distribution of 'Sustainability', 'Economy' and Nature' in Rovaniemi/Ylitornio

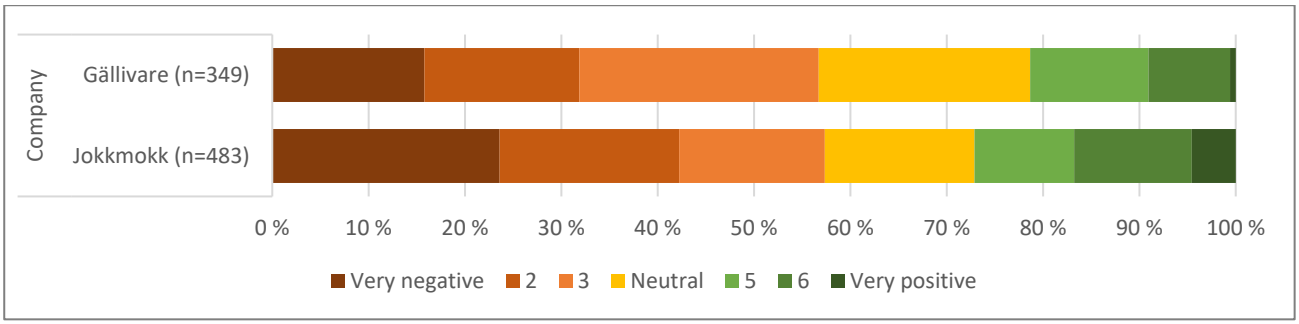

Figure A3: Distribution of 'Company' in Gällivare and Jokkmokk

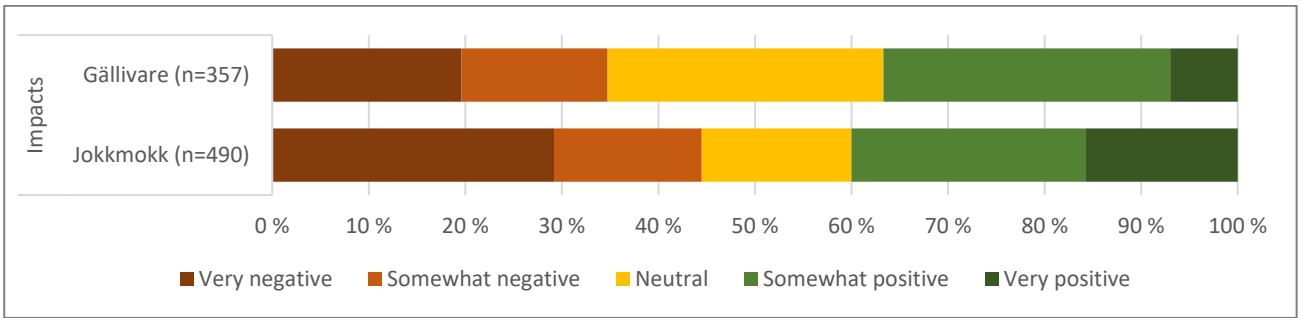

Figure A4: Distribution of 'Impacts' in Gällivare and Jokkmokk

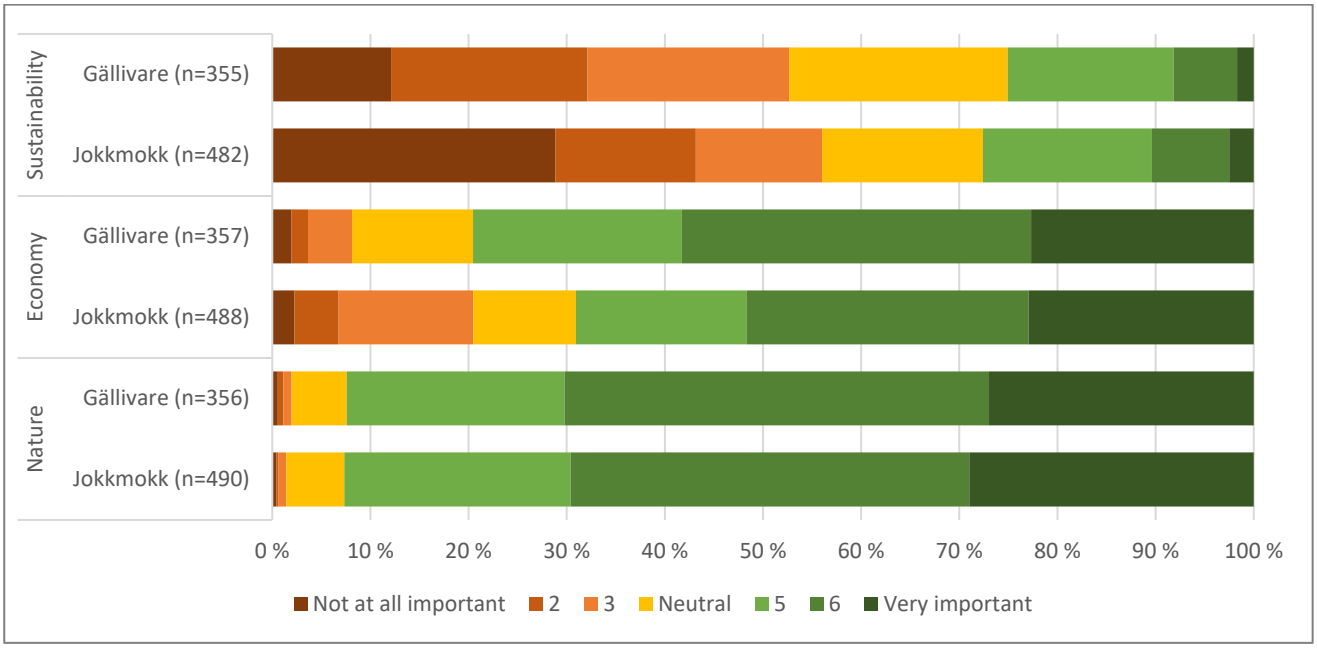

Figure A5: Distribution of 'Sustainability', 'Economy' and 'Nature' in Gällivare and Jokkmokk

Final cluster centers and frequencies of the cluster members

		Critical	Neutral	Positive
Mineral exploration in general is a positive thing	Rovaniemi/Ylitornio	2.76	5.13	6.75
	Gällivare	2.06	4.66	6.68
	Jokkmokk	1.84	4.42	6.59
Mineral exploration in my home region is a positive thing	Rovaniemi/Ylitornio	2.02	4.89	6.73
	Gällivare	1.81	4.73	6.77
	Jokkmokk	1.22	4.33	6.74
Mining in general is a positive thing	Rovaniemi/Ylitornio	1,87	4,36	6,55
	Gällivare	1.85	4.66	6.68
	Jokkmokk	1.66	4.13	6.50
Mining in my home region is a positive thing	Rovaniemi/Ylitornio	1.58	3.87	6.64
	Gällivare	1.56	4.47	6.72
	Jokkmokk	1.11	3.77	6.73
Number of cases in each cluster	Rovaniemi/Ylitornio	45	47	151
	Gällivare	48	93	188
	Jokkmokk	158	91	215

Table A9: K-Means Clusters on Acceptance and Demographics with Clusters

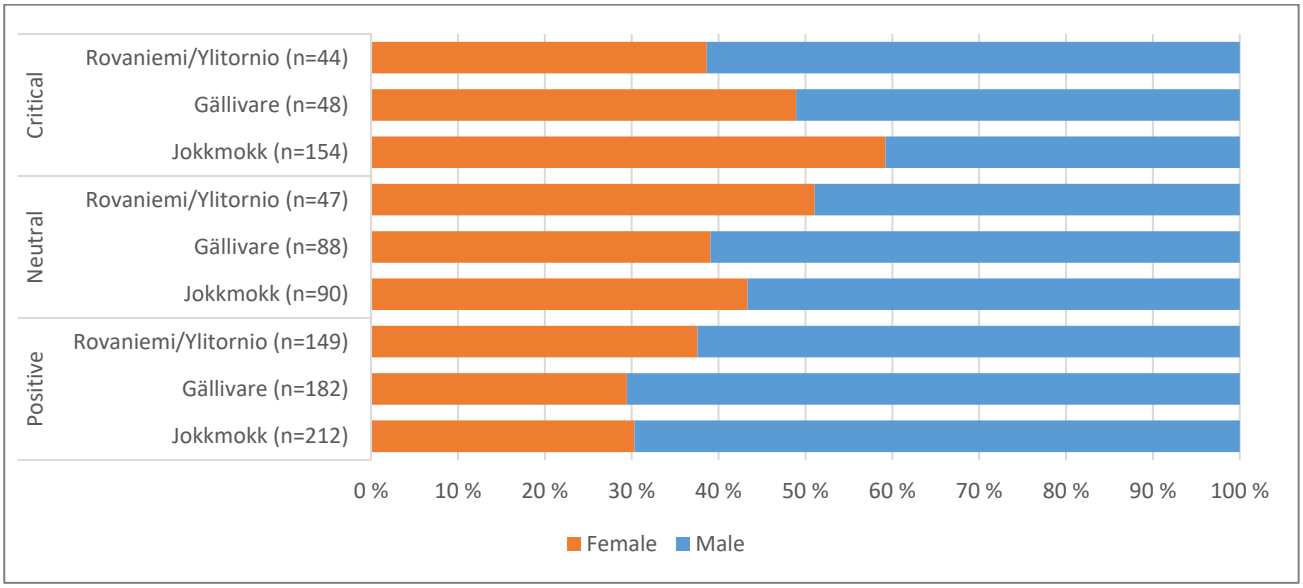

Figure A6: Figure 1Distribution of gender within the clusters, %

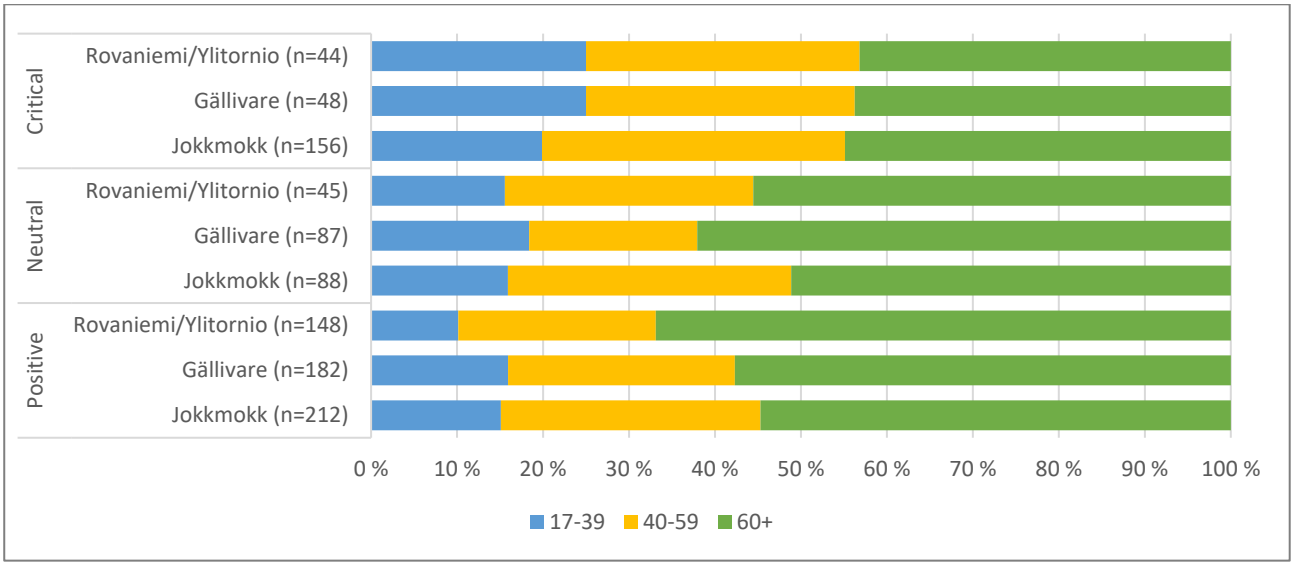

Figure A7: Distribution of age-groups within the clusters, %

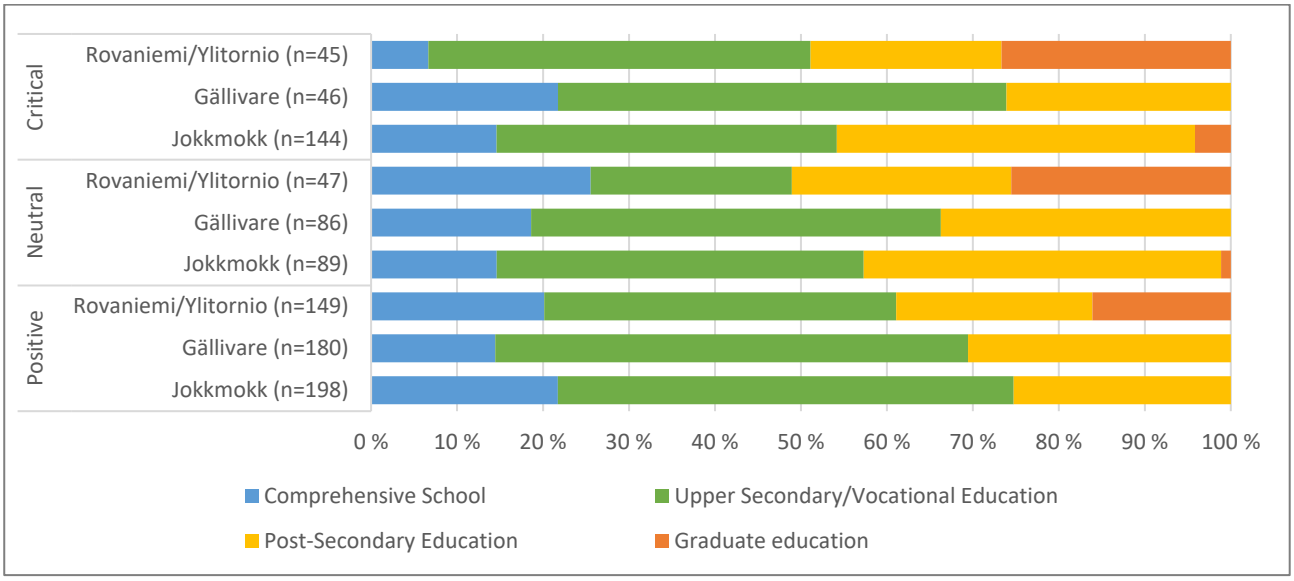

Figure A8: Distribution of education within the clusters, %

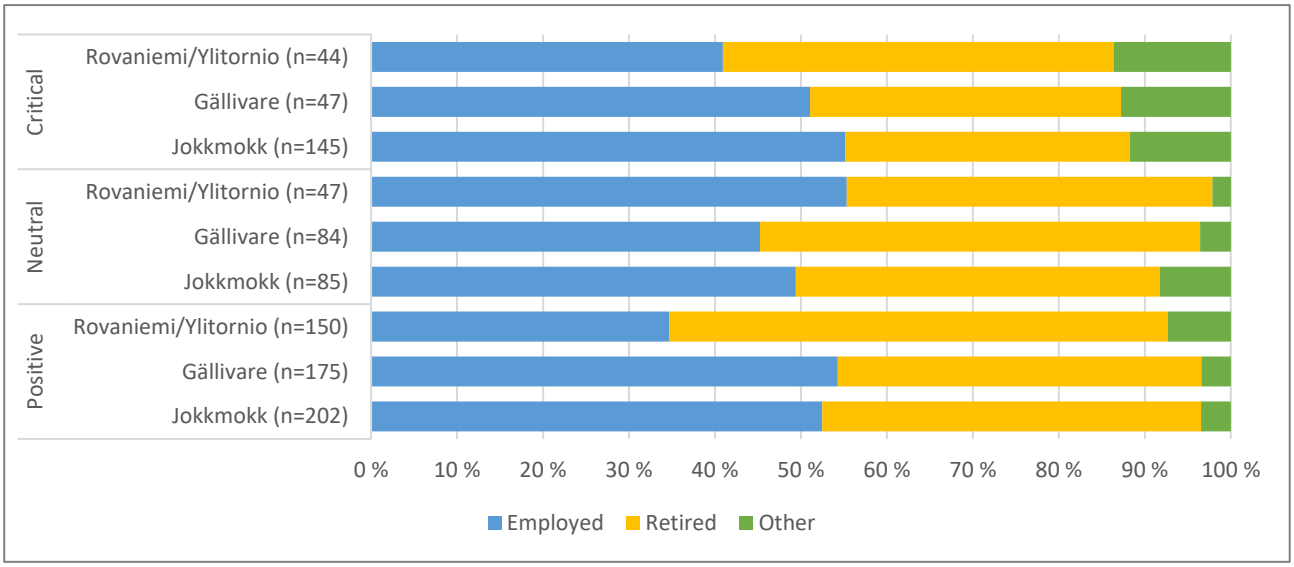

Figure A9: Distribution of socio-economic status within the clusters, %

		n	I don't know, %
Samples of trees, bushes and shrubs	Rovaniemi/Ylitornio	250	2.4
	Gällivare	346	76.3
	Jokkmokk	479	70.8
Samples of snow	Rovaniemi/Ylitornio	248	1.2
	Gällivare	347	88.8
	Jokkmokk	480	80.8
Samples of ground using a shovel	Rovaniemi/Ylitornio	251	.8
	Gällivare	350	84.0
	Jokkmokk	485	74.6
Exploration using a drone	Rovaniemi/Ylitornio	249	2.8
	Gällivare	343	78.1
	Jokkmokk	480	65.6
Exploration using an airplane or a helicopter	Rovaniemi/Ylitornio	249	3.6
	Gällivare	349	69.3
	Jokkmokk	480	56.7
Exploration through deep drilling	Rovaniemi/Ylitornio	252	3.6
	Gällivare	350	54.0
	Jokkmokk	485	48.2

Table A10: Attitudes towards different exploration technologies with n and % of 'I don't know' answers

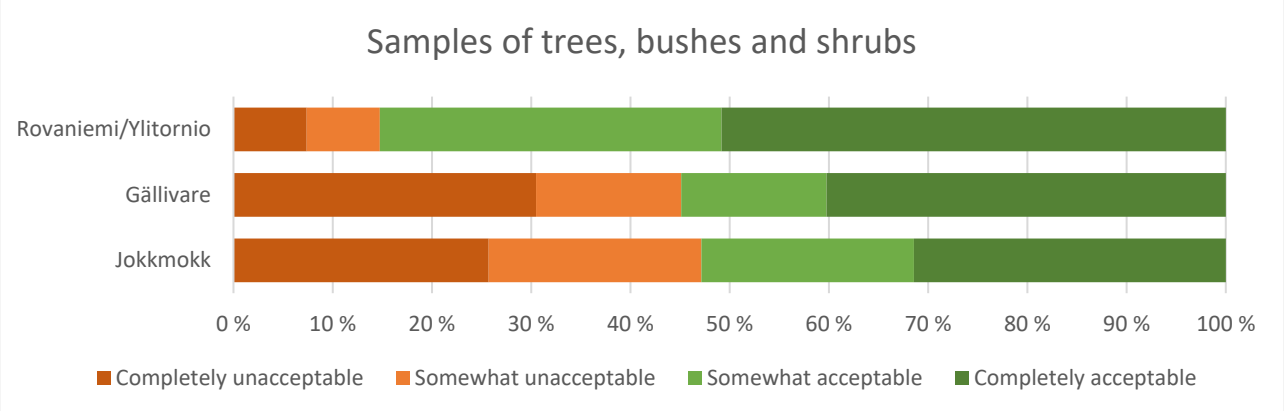

Figure A10: Distribution of acceptance towards bio sampling, %

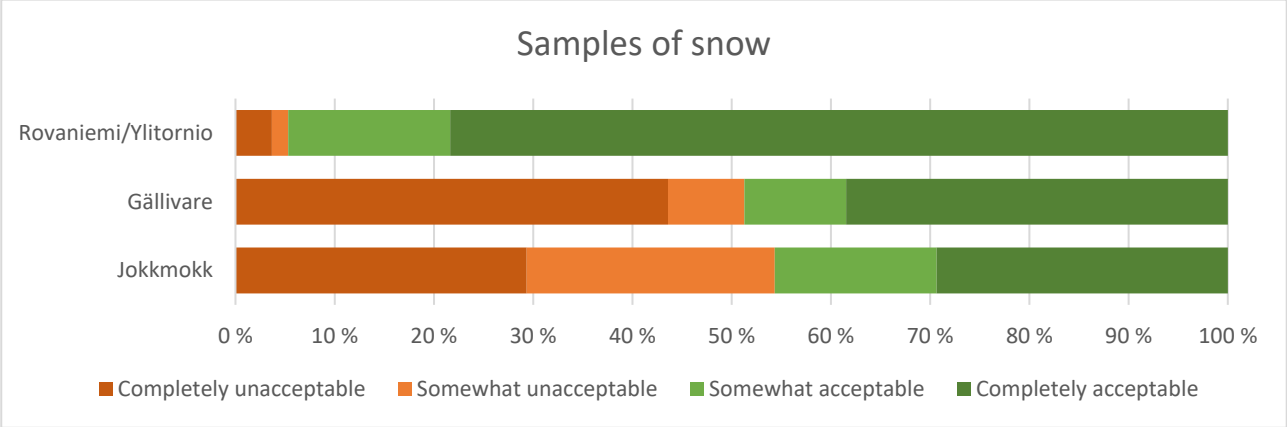

Figure A11: Distribution of acceptance towards snow sampling, %

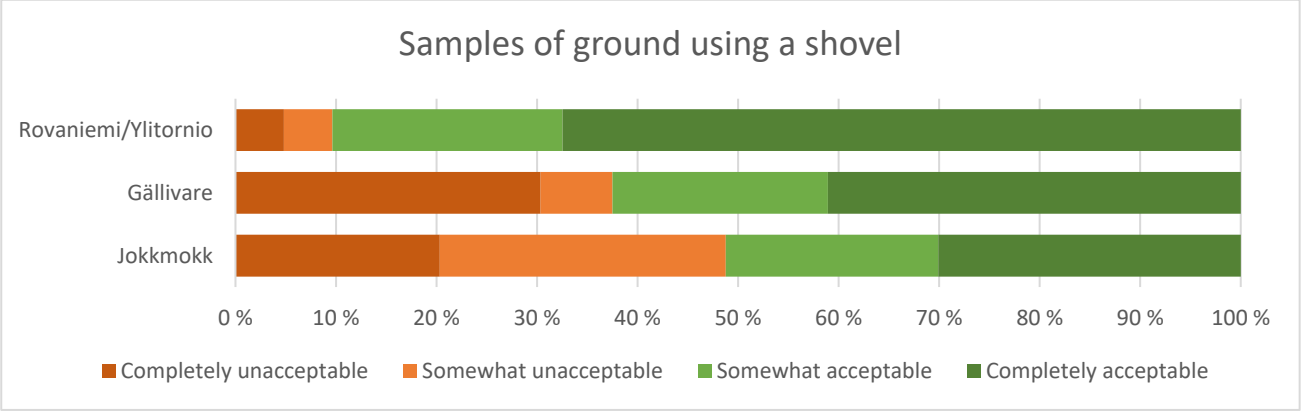

Figure A12: Distribution of acceptance towards ground sampling, %

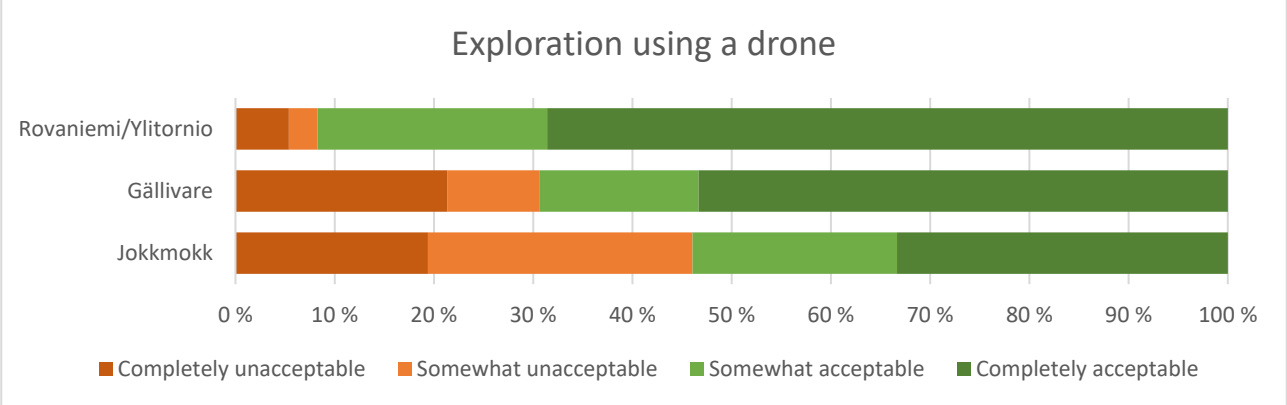

Figure A13: Distribution of acceptance towards drones, %

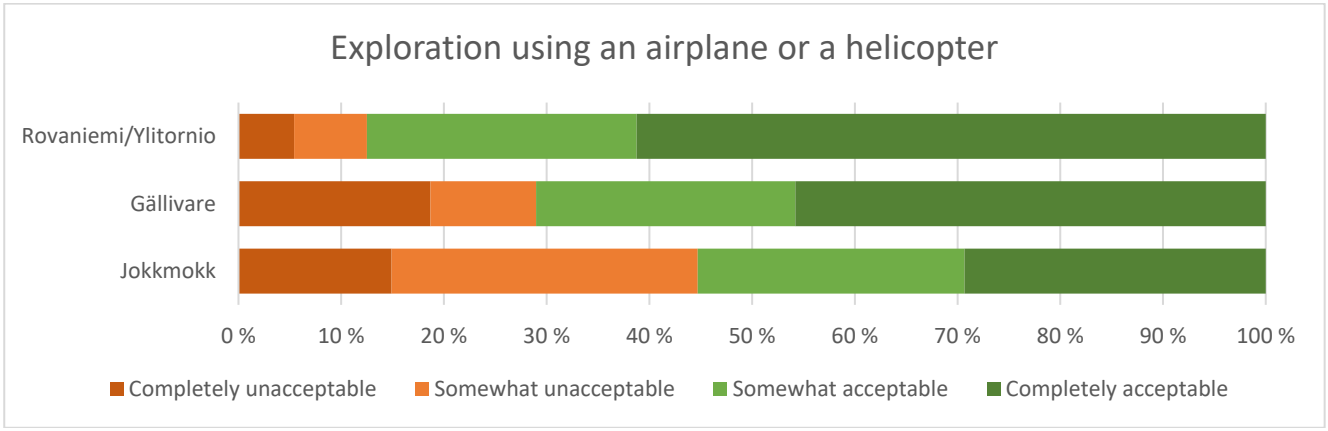

Figure A14: Distribution of acceptance towards helicopter survey, %

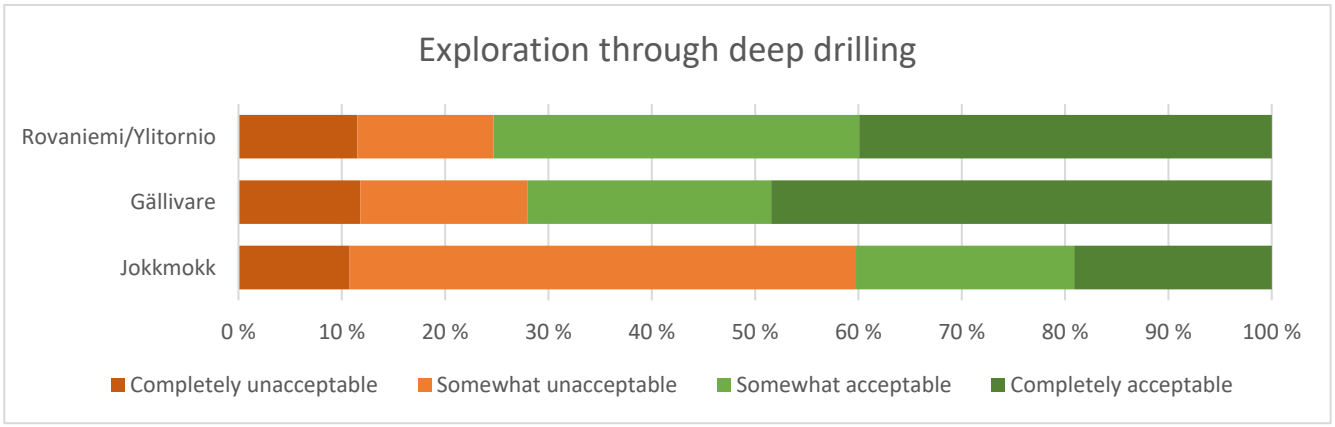

Figure A15: Distribution of acceptance towards drilling, %