

INFACT

INNOVATIVE NON-INVASIVE & FULLY ACCEPTABLE EXPLORATION TECHNOLOGIES

INFACT DELIVERABLE D2.3

BROAD OVERVIEW REPUTATION OF MINING AND EXPLORATION

Summary:

This study analyses the reputation and attitudes towards mining and mineral exploration in the three reference countries of INFACT Project (Spain, Finland and Germany) and in leading mining countries based on literature review.

The report reflects the difference in availability of literature on this matter between Finland and the other reference countries, mainly explained by differences in the evolution and development of the mining sector over the last decades.

Mineral exploration is inherently perceived as a prior stage of mining production itself. The general acceptance of mining in Europe is slightly positive, being higher in traditional mining regions.

The main factors laying out mining reputation or acceptance are the trust in public governance over mining companies, the potential negative environmental impacts perceived and the fairness of wealth distribution within local communities.

Authors:

Asistencias Técnicas Clave (ATC)	University of Eastern Finland (UEF)	Suomen Ymparistokeskus (SYKE)	Dialogik (DIA)
Virginia del Río	Juha M. Kotilainen	Sari Kauppi	Ludger Benighaus
Javier Gómez	Tuija Mononen	Kari Oinonen	Christina Benighaus
	Jari Lyytimäki	Matti Kattainen	Lisa Kastl
Spain	Finland		Germany



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Other beneficiaries:	ITA-Suomen Yliopisto – University of Eastern Finland (UEF) Dialogik (DIA) Suomen Ymparistokeskus (SYKE)		
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Reviewer	EFG			
Reviewer	SRK			
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Diffusion List		
Partner name	Name	e-mail
Helmholtz-Zentrum Dresden-Rossendorf EV (HZDR)	Helene Koepf	h.koepf@hzdr.de
	Richard Gloaguen	r.gloaguen@hzdr.de
	Moritz Kirsch	M.kirsch@hzdr.de
	Sandra Jakob	s.jakob@hzdr.de
	Chris Christesen	c.christesen@hzdr.de
	Anja Weigl	a.weigl@hzdr.de
Dialogik Gemeinnuetzige Gesellschaft Fuer Kommunikations- Und Kooperationsforschung mbH (DIA)	Leila Ajjabou	l.ajjabou@hzdr.de
	Ludger Benighaus	benighaus@me.com
	Christina Benighaus	benighaus@me.com
	Agnes Lampke	lampke@dialogik-expert.de

Asistencias Técnicas Clave, s.l. (atClave)	Virginia del Río Juan Requejo Alberto Castelló Javier Gómez	virginia@atclave.es requejo@atclave.es alberto@atclave.es javier.gomez@atclave.es
Suomen Ymparistokeskus (SYKE)	Sari Kauppi Jari Lyytimäki Kari Oinonen	Sari.Kauppi@ymparisto.fi jari.lyytimaki@ymparisto.fi kari.oinonen@ymparisto.fi
European Federation of Geologists (EFG)	Marko Komac Isabel Fernandez Vitor Correia Anita Stein Anita Demeny	marko.komac@guest.geo-zs.si isabel.fernandez@eurogeologists.eu vcorreia@apgeologos.pt anita.stein@eurogeologists.eu projects@eurogeologists.eu
Atalaya Mining	Angelo Farci Fernando Cortés	angelo.farci@atalayamining.com fernando.cortes@atalayamining.com
Cobre Las Cruces S.A. (CLC)	Chris Wijns Manuel Sevilla Juan Manuel Escobar Torres	Chris.Wijns@fqml.com Manuel.Sevilla@fqml.com JuanManuel.Escobar@fqml.com
Anglo American Sakatti Mining Oy (AAS)	Joana Kutonen-van't Riet Saari Rikka Jukka Jokela Eerika Tapio Joel Jansen	joanna.kutonen@angloamerican.com Riikka.Saari@angloamerican.com Jukka.Jokela@angloamerican.com Eerika.Tapio@angloamerican.com joel.jansen@angloamerican.com
SRK Exploration Services Ltd. (SRK)	Jon Russill Cathryn MacCallum Matthew Grimshaw	jrussill@srkexploration.com cmacallum@srk.co.uk mgrimshaw@srkexploration.com
Åarhus Geofisica SrL (Åarhus Geo)	Andrea Viezzoli	andrea.viezzoli@aarhusgeo.com
Geognosia S.L.	Isla Fernandez Ana Braña Bergshjorth	isla.fernandez@geognosia.com abb@nordikageo.com
Supracon AG	Jens Kobow Matthias Meyer Marco Schulz	jens.kobow@supracon.com matthias.meyer@supracon.com hans-georg.meyer@leibniz-ipht.de
GALSA (Geotech) (PTY) LTD (Geotech)	Paolo Berardelli Robert Wilson Malcolm Moreton Daniel Pagotto Pavel Tishin Jean M. Legault	paolo@geotechairborne.com Robert.Wilson@geotechairborne.com malcolm.moreton@geotechairborne.com daniel.pagotto@geotechairborne.com Pavel.Tishin@geotech.ca jean.legault@geotechairborne.com
Agencia de Innovación y Desarrollo de Andalucía (IDEA)	José Antonio Pascual Sánchez Stéphane Ruiz Coupeau Maribel Bermudez	jpascual@agenciaidea.es stephane.ruiz@agenciaidea.es mbermudez@agenciaidea.es
Fraunhofer Gesellschaft Zur Foerderung Der Angewandten Forschung E.V. (FRA)	Liza Wohlfart Sven Schimpf Frank Wagner	Liza.Wohlfart@iao.fraunhofer.de Sven.Schimpf@iao.fraunhofer.de Frank.Wagner@iao.fraunhofer.de

<p>Oulun Yliopisto – University of Oulu – Oulu Mining School (OMS)</p>	<p>Elena Kozlovskaya Holger Paulick Emma Pirila Jukka-Pekka Ranta</p>	<p>elena.kozlovskaya@oulu.fi Holger.Paulick@oulu.fi emma.pirila@oulu.fi Jukka-Pekka.Ranta@oulu.fi</p>
<p>ITA-Suomen Yliopisto – University of Eastern Finland (UEF)</p>	<p>Lasse Peltonen Mika Saikonen Juha Kotilainen</p>	<p>lasse.peltonen@uef.fi mika.saikonen@uef.fi jukoti@uef.fi</p>
<p>Directorate General of Industry, Energy and Mines – Junta de Andalucía (LPT to IDEA)</p>	<p>Manuel Vázquez Mora</p>	<p>manuel.vazquez.mora@juntadeandalucia.es</p>

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1 EXECUTIVE SUMMARY

This report provides an analysis of the reputation and public acceptance of mining and mineral exploration in the European Union. The aim of the report is to determine how European citizens value mining and mineral exploration reputation and which factors condition this perception. The findings are linked to INFACT Project to strengthen further studies on social perception of mineral exploration and the stakeholder engagement.

This report focuses on a comprehensive review of published academic literature on the topic. The analysis was primarily conducted in INFACT reference countries (Finland, Germany and Spain) and, when possible, in the three regions where reference sites are: Lapland, Saxony and Andalusia, respectively. Other countries with relevant studies on mining reputation were analysed as well, in order to obtain a broad overview of the matter worldwide. The heterogeneous data found have conditioned the elaboration of three independent country reports aimed at describing and evaluating the situation on a regional, national and European level. A final joint analysis draws up the key aspects on mining and mineral exploration reputation and public acceptance, as well as potential challenges for INFACT Project.

The report finds that mining sector has a slightly positive reputation in the European Union, with little differences between countries. Mineral exploration reputation could not be differentiated from overall mining reputation, but it may be inferred as more positive when studying the factors conditioning this public perception. One key factor is the mining history and identity of the community. It has been stated that in the European Union most citizens from mining regions value this sector higher than people from other rural or metropolitan areas. Indeed, in these other areas a NIMBY (“not in my backyard”) effect is found meaning mining is accepted in the country but not in the inhabited region. In addition, reputation has been found to have a direct positive relationship to economic and social benefits, mainly employment creation; trust, both in public governance over mining sector and in fairness of mining companies, and wealth distribution among local communities and the country.

However, it is inversely proportional to the perception of past bad mining experiences like accidents, tragedies, corruption or economic crisis; environmental impacts perceived; and health and safety risks.

It can be concluded that any mining or exploration project, in order to guarantee a positive reputation and social perception in the European Union, should focus its communication strategy on exposing its positive effects on decreasing external economic dependence, reducing environmental and health impacts, granting public participation and public decision-making processes, increasing public and private cooperation and transparency, and revitalising mining areas.

2 INTRODUCTION

2.1 Presentation of the report

This report summarises the key findings on mining and mineral exploration reputation for the three reference countries of INFACT Project. Furthermore, other countries with mining traditions have been included for comparative value. This report focuses on a comprehensive review of published academic literature, both at the national level for the three countries and on a global scale, in order to provide a broad overview of the subject.

Following each country report, a common analysis of the information gathered has been conducted. It is structured in an easily understandable way, taken from the renowned “Attitude towards mining” reports from Australian CSIRO (Commonwealth Scientific and Industrial Research Organisation) (Moffat et al., 2014). First, the general knowledge of the citizens about mining is evaluated, as well as the perceived role of mining and mineral exploration in the country. Second, the benefits and negative impacts of the mining sector are analysed from a social perspective. Finally, fairness, faith in governance and trust are studied to draw some conclusions on the level of acceptance that mining enjoys in the reference countries and the European Union.

As background definitions for this report, it may be useful to consider the following terms:

Mineral exploration is defined as the process of finding raw materials that could be potentially mined. It involves activities such as geological and geophysical research, prospecting and evaluating the dimension, composition and profitability of the ores. It implies little impact to the environment and, most of the times, it is not followed by mining exploitation.

Reputation is understood in this report as the representation of the collective perception of a person, linked with its morality or prestige, which conditions its relationships with the perceivers (Blackwell Encyclopaedia of Sociology, 2007). Reputation is extensible to groups, organizations and, in this case, the mining sector as a whole.

2.2 Objectives

The aim of the study is to understand the actual reputation and public acceptance of mineral exploration and mining activities in Finland, Germany and Spain from an academic point of view through published scientific literature concerning the topic. The *status quo* of mining reputation is drawn for the three reference countries (and by extension, for Northern, Central and Southern Europe) as a necessary framework to the INFACT Project objectives.

The conclusions of this report will set a foundation for several other INFACT tasks and it should be complemented with other planned studies (survey on public opinion, media analysis, expert interviews) that share the same objective: to improve the current knowledge about the attitudes and social perception of mining and exploration in Europe. This understanding will also be useful for the stakeholder engagement processes along the development of the project.

2.3 Methodology

In order to conduct the analysis of the literature properly, the partners in each reference country led the analysis in their respective region. Scientific articles, public and private surveys, reports, books, journals, as well as various research resources or academic publications on the fields of social sciences and mining were searched on all the relevant public and private databases at each country.

The gathered literature was revealed to be heterogeneous in its contents, structure, methodology and depth. Indeed, just a few publications were found for Germany and Spain. In contrast, Finland was the only reference country with comprehensive studies on the topic at both national and regional level. As

a result, the first challenge the report faced was the disparity between the available academic publications in Finland, where there has been a high academic activity in this field in the past 15 years, and Germany and Spain, where there is a lack of relevant publications.

In addition to the disparities in the available literature, methodological differences were also between the three reference countries. To adapt to these imbalances, an independent qualitative country report was conducted by each country. They aimed to:

- Present all the collected data on reputation of raw materials, mining, mineral exploration or any related field of interest found at national or regional levels (German and Spanish situations) in an informative manner. This included activities, such as mining of metalliferous ores, coal mining and exploration of sub-surface mineral resources.
- Contextualise the research, literature and the focus of social sciences on mining and exploration in each country by describing the relevant historical developments and socioeconomic context regarding the mining sector.
- Search for data of interest to the INFACT reference sites to support further INFACT reports. When possible, considerations on these sites or context have been included, or at least from comparable areas.
- Analyse mining and mining reputation. The country reports include studies on attitudes towards mining and mineral exploration, public opinion and other approaches about citizens' perceptions on mining activities found in literature.

Once the literature for Finland, Germany and Spain was studied, it was completed and compared with various references found from other European and non-European countries that were perceived as relevant for understanding the reputation of mining and mineral exploration at a global level.

The qualitative analysis is based on key factors of mining reputation extracted from the country reports. To define *reputation*, it is crucial to establish how citizens perceive the mining industry in their countries, which benefits or negative impacts they identify, how fair and trustful they feel the activity is, and finally, what leads to both positive acceptance and reputation.

The individual conclusions for each country were integrated in order to present a common view of mining perceptions in the European Union. A qualitative analysis has been developed following the renowned publications "Attitudes towards mining" done by Australian CSIRO (Commonwealth Scientific and Industrial Research Organisation) (Moffat et al., 2014). The following structure was settled:

- Perception of mining relevance in national economy
- Benefits and positive impacts of mining
- Damages and negative impacts of mining
- Fairness, governance and trust
- Acceptance
- Reputation

Finally, the information distilled from these analyses was studied from INFACT Project's perspective to identify potential challenges and opportunities for the development of the project.

3 COUNTRY REPORTS FOR EXPLORATION AND MINING IN SELECTED COUNTRIES

3.1 Introduction

Mining activities are extremely important for modern day societies. The resources that are being mined are crucial to many products of modern everyday life. However, mining activities can also have negative effects on the environment or communities.

This chapter includes the country reports developed for Finland, Germany and Spain. Due to the wide differences found between the academic literature available in the three countries, their scope and contents differ widely in the three cases. This first analysis of the topic helps to understand the different approach social sciences take when studying mining and mineral exploration reputation, acceptance and public opinion in different geographical, socio-economic and cultural scenarios.

3.2 Finland

As social environmental research emphasizes, mining is more than anything about choices regarding the future, land planning, societal values and transformation of social structures and practices. The impacts of mining often extend from the environmental impacts to the economy, culture and to the everyday life and wellbeing of the people living near the mine (Mononen & Suopajarvi 2016). The development of the Finnish mining sector illustrates these interactions well. In Finland, the historical context and the development in two decades of 21st century play a key role in helping to understand the status quo and the attitudes towards mining that exist today.

3.2.1 Geological and geographical context

Finland is located at the Fennoscandian (or Baltic) shield containing relatively large metallogenic areas of nickel, ferrous metals and precious metals together. The northern reference site is in the Finnish Lapland, in the municipality of Sodankylä. Sodankylä is located on the Central Lapland Greenstone Belt (CLGB), which is nationally, continentally and even globally significant area with mining potential. There are currently two operational metal mines within the belt and several mining projects at various development stages. There are also numerous mineral exploration projects in northern Finland, which are mainly concentrated on the CLGB as well. In Finland as a whole, there are five projects that are relatively close to establishing their mining activities (Kivinen 2017b).

There is no coal mining in Finland. The active mines produce precious or base metals, such as gold, chrome, copper, nickel and zinc, or minerals, such as talc, apatite, quartz, dolomite or limestone. Finland is also European Union's only cobalt producing country. Most of the active mines and mining projects are in eastern and northern Finland in relatively sparsely populated areas.

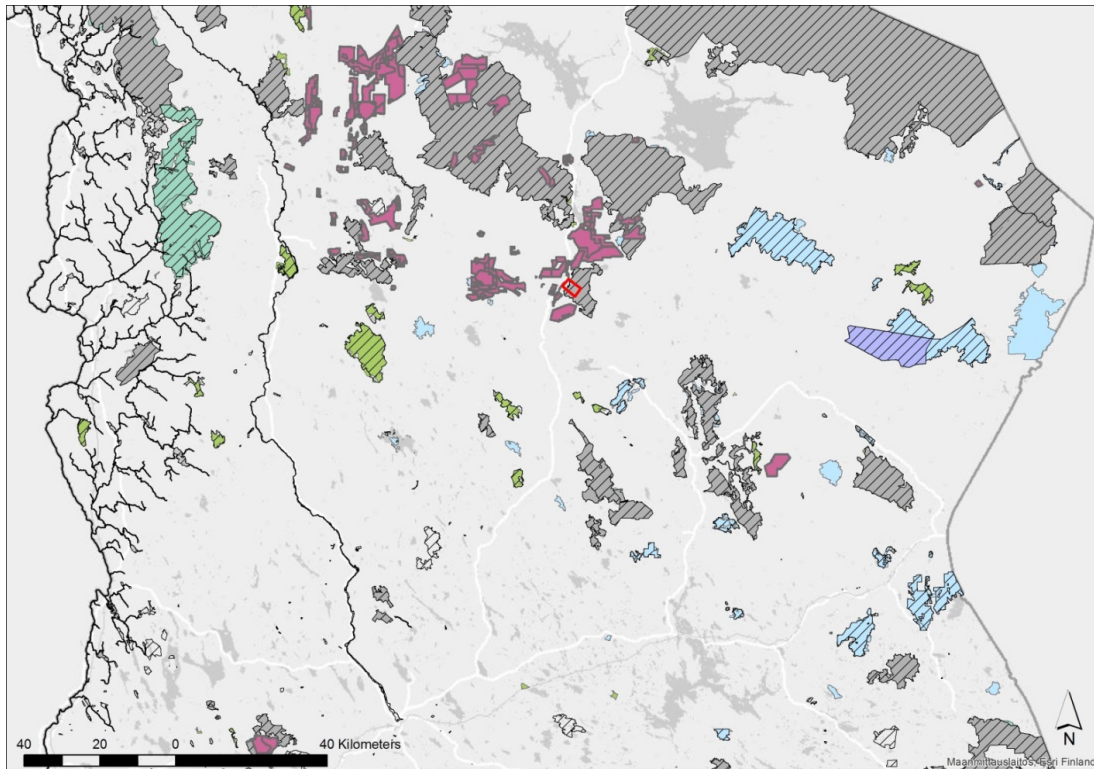


Figure 1: The nature protection areas (Natura 2000, private owned protection areas, state owned protection areas, wilderness areas) (grey), mineral exploration areas (purple) and INFACT Sakatti Reference area (red outline).

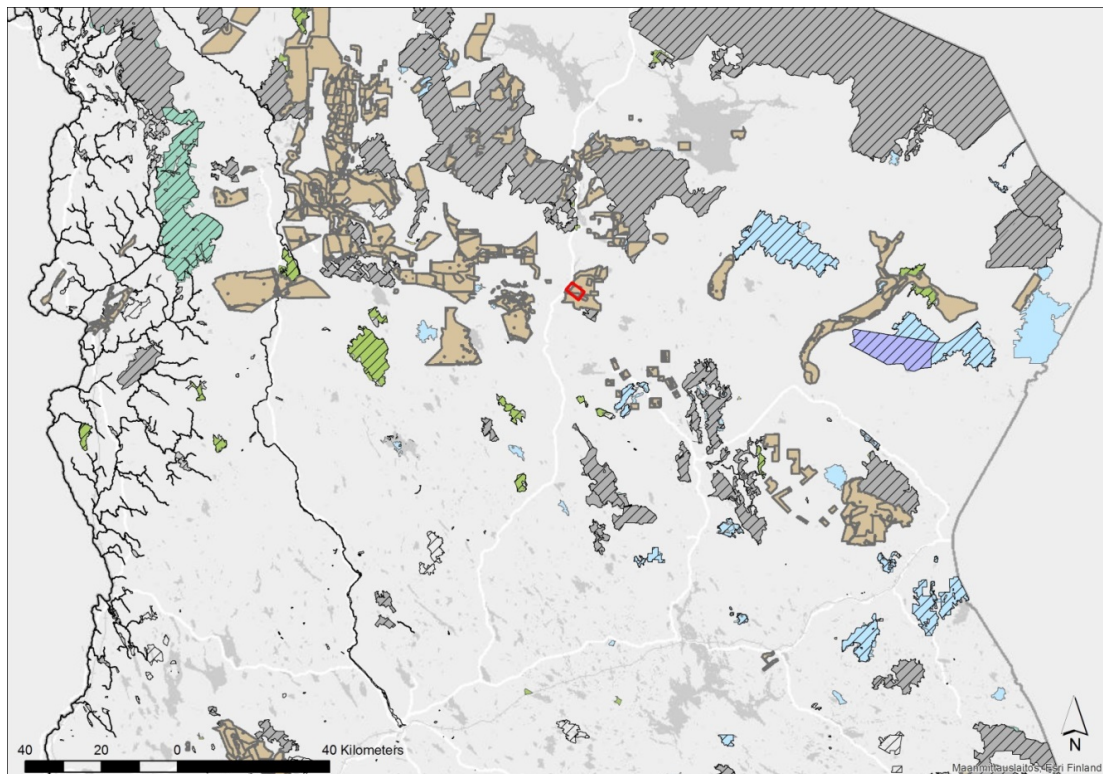


Figure 2: The nature protection areas (Natura 2000, private owned protection areas, state owned protection areas, wilderness areas) (grey), mine exploration application areas (beige) and INFACT Sakatti Reference area (red outline).

3.2.2 Economic context

The economic importance of mining to Finland has varied significantly in its history. Mining's regional impacts are often emphasized in the sparsely populated areas, where the mines are often located, as it can bring great economic benefits but also challenges to the local municipalities (Vasara 2017; Laukkonen & Törmä 2014). These mining locations have commonly suffered from high unemployment, caused by the recessing economy and population trends (Laukkonen & Törmä 2014). While the big mining investments increase the municipalities' tax income and net migration, the growing population may create a pressure to develop the public services and infrastructure. Sometimes environmental impacts of mining and negative impacts on other livelihoods have been considered economically too costly compared to economic benefit of a mine (Hietala et al. 2014; Koivunen 2016).

From the standpoint of employment, it is essential to consider who the mine employs and for how long period. The remote location has made recruiting employees more difficult (Mononen 2012). Unlike earlier practice, miners now travel longer distances to find employment and change employers according to the opening and closing of mines. In international discussion this phenomenon is known as drive in – drive out or fly in – fly out. These terms refer to the workers commuting between their places of residence and workplaces in situations where the distance between two is so long that daily commuting is not possible or practical. The workers live part of the workweek or even several weeks near the workplace. Many travel the distance between their homes and jobs daily. (E.g. Mononen 2012; Suopajärvi 2017) Generally, the mining companies use local labor and services from local companies whenever possible, but the increasing demand for highly trained workforce may place restrictions on that.

The expectations and actual economic effects often differ. The municipalities may try to help small local companies to take advantage of the opportunities provided by the mine, but there may be problems due to the differences in scale. In some cases, it has been proven to be difficult for the small local companies to succeed with the larger ones when competing contracts. Thus, the local companies have not been able to take advantage of the mining business as broadly as has been expected. Furthermore, mining has not been able to bring new services to the local communities, as it has been possible to meet the demand with the existing facilities. In general, mining benefits the local area indirectly through the services that are used by the workers (Mononen 2018).

In 2002-2007, the economic development of the world was fast, especially in many developing countries. This had an impact on the raw material prices which radiated to Finland as the so-called mining boom began. In 2007-2008 the financial crisis caused a steep fall in the prices, but soon again they began to rise again, even though the numbers were not as good as in the earlier years. During the period from 2010 to 2015 the price development was slow and especially 2015 was a difficult year for the mining industry. However, 2016 once again turned the price development upwards and the forecasts for the future have been promising (Kivinen 2017).

According to the latest sector report from the Ministry of Economic Affairs and Employment, in 2016 the turnover of metal ore and industrial mineral production totalled about EUR 2 billion and it employed directly about 4500 persons in Finland. The multiplier impact for employment has been estimated to be 2,5-3,5 fold. In the same year, there were ten active metal ore mines and 27 industrial mineral mines operating in Finland. Mining investments totalled about EUR 240 million, showing a clear increase from the year before (54%). At the same time, investments in ore prospecting grew as well (19%). In 2016 drilling for exploration grew by 38 % and companies forecasted strong growth for 2017 (Vasara 2017).

In 2016 a total of 28 million tonnes of ore was quarried from the Finnish metal ore mines and the production of usable rock for industrial minerals totalled 15 million tonnes. Measured by the quarrying volume, the three largest mines in Finland were Kevitsa, Talvivaara and Siilinjärvi, from which all of

them are open quarries. Almost all the ore extracted by the metal mines is refined in Finland and thus, the exportation of ore and its produced forms has been marginal. However, in 2010s the exportation has grown steadily and in 2016 it was valued EUR 188,1 million. In contrast, the importation was much higher at EUR 1,3 billion for the same year (Vasara 2017).

3.2.3 Sociocultural context

The following unique socio-cultural features of Finland are often significant in the mining context. The Sámi homeland territories and reindeer herding areas limit and can place challenges to mining activities in the northern parts of Finland. Everyman’s right is a key part of the Finnish culture and tradition and almost everyone uses the rights it provides for land use in their everyday life. From mining perspective, it can also allow very small-scale prospecting and collection of fist size samples.

3.2.3.1 The Sámi

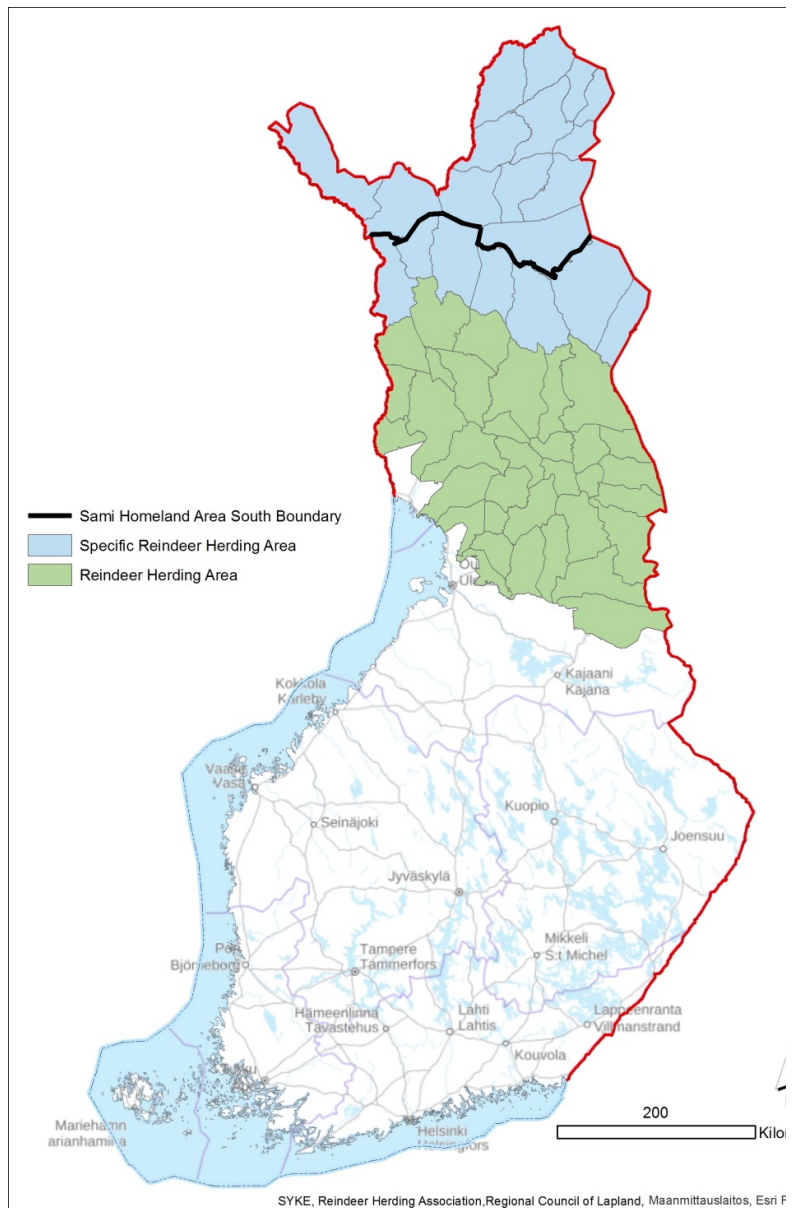
The Sámi homeland territory covers the northernmost part of Finland: the municipalities of Inari, Utsjoki and Enontekiö and the northern parts of Sodankylä. The amount of Sámi people depends on the definition, which is controversial. The Sámi parliament reports that the amount of Sámi people living in Finland is 10.000 and the amount of Sámi people in the whole territory of Finland, Norway, Sweden and Russia is 75.000 – 100.000. The Sámi homeland territory is defined in and protected by the Finnish constitution to be autonomous on issues relating to the Sámi culture and language. The Sámi Parliament is the representative self-government body of the Sámi. The Sámi Parliament represents the Sámi in national and international connections, and it attends to the issues concerning Sámi language, culture, and their position as an indigenous people.

Figure 3: The reindeer herding areas and Sami homeland areas in Finland.

3.2.3.2 Reindeer herding

The reindeer herding area of Finland covers 36% of the country. Reindeer herding is allowed everywhere in the reindeer herding area, regardless of land ownership or use.

Area covers Lapland region and northern parts of the Pohjois-Pohjanmaa and Kainuu regions. The Finnish reference site belongs to the specific reindeer herding area, where the other land uses may not cause significant disadvantage to reindeer herding. Reindeer herding is a particularly important employer in small villages and keeps them inhabited. The direct and indirect economic impacts of reindeer husbandry are significant. Reindeer is of great cultural importance to Lapland. Reindeer



herding requires large land areas and it can have land use conflicts with other land uses like forestry, energy production and mining. The key question is that other land uses may prevent the use of traditional pastures, disintegrate them or reduce the area of pastures, disturb the herding or cause extra costs if realized poorly. Reindeer herding is organized into local or regional reindeer herding co-operatives.

3.2.3.3 Everyman's Right

Finnish nature and everyman's right play a significant role in people's right to roam, the recreational use of natural areas, nature-based tourism, and the collection of natural products. The scope of everyman's right is much wider in Finland compared to other countries. Everyman's right applies to anyone living or staying in Finland. There's no need to obtain a permit or permission to enjoy everyman's right. It cannot be prevented without just cause and is always free of charge. Using an area based on everyman's right is not affected by land ownership (YM 2016.)

3.2.3.4 Legal and administrative factors

In the legal context the acceptance or reputation can be seen as the legality of legislation and the legitimacy of the law in action. The tension between the legality and legitimacy is the tension between the law of power and the power of law (Gribnau 2002). Recent surveys in the Finnish context have revealed mixed results both in the legality in relation to the mining legislation and legislator and legitimacy of mining authorities and courts. Survey conducted by the Canadian Fraser Institute, which focuses on the members of the industry, ranked Finnish mining jurisdiction as best in the world (Fraser Institute 2018). On the other hand, the recent citizen survey by Jartti et al. (2017) showed that the public had considerably lower acceptance towards the mining jurisdiction. The surveys' results show the tension between the expectations that the subjects of mining legislation often have.

The long history of mining in Finland as a state lead industry has considerably shaped the mining legislation in the country. The primary objective of the old Mining Act (503/1965) was to ensure the availability of mining minerals for the state and the domestic industry. The new Mining Act of Finland (621/2011) that came into force in 2011 has changed some of the fundamental elements of the old Act but at the same time, it aims to fulfil the society's broad expectations better than before. The new objective of the Mining Act is to promote economically, socially and ecologically sustainable in exploitation and exploration of mining minerals. The official mining authority, The Finnish Safety and Chemicals Agency (Tukes), must take into account all expectations based on the applicable fundamental rights when assessing reservations, explorations permits, mining permits, mining safety permits and other decisions.

Mining Act is based on two principles regarding exploration and exploitation of mining minerals. First, mining rights in Finland are separated from the landownership (to secure the supply of raw minerals). Second, the mining rights are established on a first come first served method. Reservation approved by Tukes, ensures first spot in line for the exploration permit and ultimately for mining permit. While everyone in Finland has the right to do minor prospecting work, an exploration permit is needed if the exploration cannot take place as prospecting work, the landowner has not given a permission for it or the exploration could cause harm to people's health, public safety. It is also needed if it could harm other industrial or commercial activity or cause deterioration of the landscape or nature conservation values. Finally, exploration permit is always needed for exploration of uranium and thorium.

In practice legality means how well the Mining Act can meet all the expectations of the current constitutional doctrine. Exploration and mining activities are also restricted by many other regulations. These restrictions and how they are applied in practice determine the acceptance of the mining jurisdiction. The Mining Act has to be applied in a way that for example the restrictions regarding Natura 2000 areas, indigenous people's rights (Sami and Koltta-people), and reindeer herding are

taken in account. Finally, mining activity often requires other permits, such as water and environmental permit and it can be subject of Environmental Impact assessment (EIA).

Stakeholders' experience of the legitimacy of Mining Act depends largely on how the stakeholder's right to participate, informational rights and freedom of expression are met in the process (Lämsineva 2006). The new Mining Act reinforced participatory rights overall but weakened it in the instances when there are more than thirty stakeholders or the number of stakeholders is unidentified. One issue that has been brought up is that the information of the exploration and mining permit application can be provided by a public notice instead of personal contact such as letters. This kind of method does not necessarily secure the stakeholders right for information and participation (Pölonen 2012).

In addition to participation procedures in Mining Act, participatory rights are secured in other permit procedures necessary to mining. Different independent processes can cause sometimes nuisance and confusion for stakeholder. Finnish environmental permitting is undergoing reformation base on one stop-shop principle in order implement these independent processes better together.

In Finland local people may express their views on mining projects in the land use planning process as defined in the Land Use and Building Act. The act grants municipalities a right to determine what kind of industries and livelihoods are accepted in the municipality's land areas. Finland is divided into 19 regional councils, which are made up of representatives from the municipalities. The councils are responsible for regional development strategies (for 20-30 years) and regional land use plans (for 10-20 years), which cover land use changes, new main roads, rail and energy infrastructure developments, protection of nationally or regionally valuable natural or cultural landscapes and developments of serving wider areas (i.e. popular recreational facilities or major water supply schemes). The regional plans indicate localities with potential for mining activity and mines in operation. (Kokko et al. 2014; TEM 2015).

Participatory planning process includes participation and assessment schemes, public meetings, planning objectives through consultations with interest groups and draft proposals that are exhibited in public places to allow all citizens and interest groups to examine them and officially express views. Regional land use plans are approved by the regional council and finally ratified by the Ministry of the Environment.

3.2.4 Historical context

Puustinen (2003) categorizes the Finnish mining history into five periods based on the national history, position and the general economic development:

- Pre-industrial period (1500-1809)
- Early industrial period (1809-1860)
- The first industrialization period (1860-1914),
- The second industrialization period (1914-1944)
- Large-scale industrial period (1945 until present).

Altogether, there have been over 1.000 metal, industrial mineral or carbonate mines operating in Finland. Almost all mines have been small scale enterprises operational for a short period of time. By 2008, there had been 1.057 active mines, 423 of which have been metal mines (Vasara 2017).

While the State Treasury was already doing significant exploration work in the 1800s, a large number of the most important known ore deposits of Finland were found in the 1900s, as the exploration methods and the mapping of the geological landscape improved (Papunen et al. 1986). The establishment of the Outokumpu mine in 1910 in the Eastern Finland is one of the milestones in the Finnish mining history. It can be seen as the beginning of the modern mining era. The mine itself had a significant role in the Finnish economy, development and for the country's broader industrialization

process (Särkkä & Suomela 2009). There are several examples in Finland of how the mining company has affected local development. Outokumpu is the best-known example in this sense. Mining was practiced for an exceptionally long time, nearly for 80 years, and the activity of the mining company dominated the entire region. City of Outokumpu was formed around the mine.

By the 1930s, state-owned Outokumpu Oy had become one of the most important copper producers in Europe and at its peak, its ore reserves were the largest known in the continent (Jartti et al. 2014). Outokumpu laid the foundation for the Finnish iron industry and provided raw materials for various other industries, such as shipbuilding, engineering works and the construction industry (Kuisma 1985). In the 1950s the company was one of the biggest export companies in Finland as it begun to shift from producing just copper to a multi-metal company (Kuisma 1985). In the 1960s and 1970s the technological development of mining was rapid in Finland and in the 1980s, Outokumpu was Finland's third biggest export company and the biggest exporter of the metal industry (Lindborg 1996). At its height, in 1974, Finland had 22 operational metal mines and the extraction totals exceeded 10 million tonnes (Finlex 2009). This prosperous era of mining, which was led by the state-owned Outokumpu, came to its end in the 1980s.

Indeed, mining almost completely ended in Finland by the late 1980s. Rautaruukki, which had been another major actor in the sector, gave away its mining activities and Outokumpu, which previously had profiled itself as a mining company and technology developer, focused purely on producing stainless steel, even though they kept the ownership of the valuable Kemi chromium mine (Hernesniemi et al. 2011). The reasons behind these decisions had been strategical changes in the companies' operations, problems related to profitability, the cyclical nature of the markets, the great need for capital and trust in the availability of inexpensive raw materials from the world market (Finlex 2009). As the exploration and mining activities declined, so did the education related to these fields. However, despite the downgrading of the mining activities, the mining cluster still accounted 1.5% of Finnish GDP at the end of the 1990s (Lindborg 1996).

While the discussion of mining in the earlier years often revolves around the success story of Outokumpu, the era was not without its problems. In fact, there were many concerns that have striking similarities with the modern disaster story of Talvivaara, which will be elaborated more in the later chapters. Talvivaara is not a unique case and many questions related to it were raised decades earlier. At one point during its operations, Outokumpu Ltd was for example planning to empty a whole nearby lake to remove the contaminated liquid that had been accumulating to the bottom of a lake. There were also instances with overflows of dam ponds in the 1940s. The ground water and surface water near the mine were polluted by the mine's wastewaters. Part of the wastewater flowed into the soil. Swimming was banned in a nearby lake in the 1940's because people swimming in the lake developed a rash. The water was acidic, and one lake died rapidly. The waste and ground water problems affected a large area around the mine. Local people as well as the agricultural and forestry sectors in the area suffered from the emissions. The situation came to a head when cyanide was found in the groundwater near Outokumpu in the early 1960s. It was taken for granted that cyanide had travelled from the mine's wastewater to the ground water. Authorities did not seem to suspect that the activities of the mining company were behind the contamination. The mining company in turn, tried to prove that the citizens that presented the charges were disturbed. The company announced publicly the names of the local people who made had made the complaints. The mining company sought to show that those raising the complaints were opposing the progressive mining industry. Outokumpu Ltd and other mining companies emphasized that they would concentrate on protecting the environment and natural resources and that the problems with water management would be addressed later in other mines. (Mononen 2016; Björn 2016.)

3.2.4.1 Mining Boom

Mining became a significant part of the Finnish society again in the beginning of the new millennium after two decades of relatively low activity. A new mining boom was beginning. Various international developments, boosting the world market prices of metals into record high numbers, played a major role in this.

Mononen & Suopajärvi (2016) recognize that the operational environment and the starting point for the new development were completely different from the 1900s. Previously, the legislation had been limiting mineral exploration in Finland as mining was an exclusive right, restricted only for the national industry. Three companies, Outokumpu, Rautaruukki and Kemira had been the central actors, of which the former two were state-owned. Furthermore, the main goal of Finnish mineral exploration had been to secure the supply of raw materials for the domestic industry. However, the industry's growing need for raw materials combined with the depletion of domestic mines and the international price developments, resulted in a shift to significant importation of raw materials (Finlex 2009).

Eventually, as Finland joined the European Economic Area, signing the EEA-Agreement, which came into effect in 1994, the restrictions considering foreign companies were removed from the legislation. Now the foreign companies had the same rights as the domestic companies had been enjoying earlier. Following this, mining and exploration in Finland began changing over to the international companies and ultimately became part of their global operations (Finlex 2009). The most active operators in Finland in the 2000s have been Australian and Canadian firms and medium to small sized Nordic mining companies (Mononen & Suopajärvi 2016). While the introduction of foreign actors did not cause any major conflicts at the beginning, there were some signs of potential problems in the future. These were issues related to the relationship of mining and nature conservation, local uncertainty and the need to inform about the activities as the opposition of mining was increasing (Eerola 2017).

In the 2000s, the rising global mineral prices had made the Finnish mineral resources profitable for mining once again. However, the higher market prices were not the only reason for the attractiveness of Finland as a mining environment for the global companies. Other factors were, and for the most part still are, the stable political system, developed social and technical infrastructure of a welfare state, easily available and high-quality geological research data, highly trained workforce, relatively sparse population and *generally positive attitude towards mining especially in mining regions suffering from economic recession and high unemployment rates* (Rytteri 2012; Vasara 2017). For example, Finland has been constantly placed near the top in the survey conducted by the Canadian Fraser Institute, which maps regional investment interests of mining companies annually. In the 2014 survey Finland was ranked at the first spot, dropping to 5th in 2016, and reclaiming the top spot in the latest 2017 list (Fraser Institute 2015; 2017; 2018).

While the country was entering the 2010s, the atmosphere was fairly optimistic regarding the opportunities brought by the new winds in the mining sector (Jartti et al. 2014). The companies attracted by the mining boom established several new mines at the turn to the 2010s. In 2011, there were 12 metal ore mines operating in Finland (Tukes 2012). In 2016 this number had fallen to 10, but the production increased significantly (33% from 2015 to 2016) (Tukes 2016; 2017). Only two of the mines were under Finnish ownership: Kemi and Talvivaara.

3.2.4.2 Reactions to the Mining Boom

The rapid increase in mining and exploration, the recent environmental problems and the inrush of foreign mining companies to Finland in the twenty first century, has been increasingly accompanied by the growing fears and opposition of mining (Litmanen et al. 2016). The first significant dispute which made headlines was the so called "uranium dispute" in 2006-2008 (Eerola 2014; 2015). Globally, public concerns caused by the earlier nuclear accidents were gradually declining and debate about climate change had brought coal-free nuclear power into the economic policy agenda again. The rising

uranium prices caused a worldwide uranium exploration boom, which also fell on Finland. Several foreign uranium exploration companies arrived in the country and applied for mineral licences all over the state, which consequently caused reactions locally and nationally. The sensitive issues were the uranium itself, the foreign companies and the national mining law, that was seen as unfair and outdated by many (Eerola 2015). The law allowed foreign companies to apply for uranium exploration claims, which would give them also the priority to apply for the permit to exploit the deposit. Many people were afraid of the possibility that several uranium mines would be opened in Finland. The foreign mining companies, which were accustomed to opposition around the world, had not anticipated this in Finland and thus, had not taken any preventive measures to counter it (Eerola 2017). According to Eerola (2008), the uranium dispute was caused partly by the lack of information and communications from the companies and the attempts to correct the situation came only afterwards. Today, uranium continues to be a sensitive issue in the public discussion and even plans to extract it as a by-product cause a reaction (see examples below). The Green party of Finland, which has grown to a major political party in the last twenty years, has profiled itself against all nuclear power and uranium mining in general (Vihreät 2014).

The next major conflict was related to the Finnish owned Talvivaara mine (now operated by Terrafame Ltd.), the aftermath of which is still being processed in the public discussion. Talvivaara has been widely described as an “environmental catastrophe” (Sairinen et al 2017), even though the environmental accident was described ‘a major but still local accident in Finland’ by the Finnish Environment Institute (Kauppi et al. 2013). The case has a major societal significance as it has become a defining moment for the whole mining sector. It has also become a prism through which to discuss the development of Finnish mining (Tiainen et al. 2014). The mine used new technology that had not been tested in the Finnish environmental context and struggled with continuous problems from its establishment in 2008. However, the main origins of the wider conflict and the negative public image of the mine are in the several leaks that occurred in the mine’s gypsum pond. The most significant gypsum pond leakage happened in 2012, when over 200 000 cubic meters of metal and sulphite contaminated water ran into the surrounding waterways (Kauppi et al. 2013). Prior to the leaks, there had already been a major public controversy related to the plans to produce uranium as a by-product from the mine. The company had not released these plans publicly beforehand, which resulted in intense public discussion when they eventually came out (Tiainen et al. 2014). Interestingly, according to Mononen (2015) uranium was not as big issue at the local level as the water problems.

Sairinen et al. (2017) analyze the Talvivaara crisis as a process, which began as a local environmental conflict but over time became a symbol of national conflict in the mining industry. They highlight four key features from the process that exacerbated it: the new untested technology, the high speed of the project, strong growth orientation and the high personification of the project. Moreover, they distinguish other dimensions, such as local contradictions, angering the citizenry, politicization, issues related to confidence in the authorities, the role of the media and the formation of company policy.

The implications of the case for the mining sector were numerous (Kotilainen 2015). There were changes in the environmental regulation and it sped up some of the already planned initiatives; Sustainable Action Plan for Finland was created; the mining authorities became more critical and cautious in the permit processes; and several reports were conducted which produced numerous recommendations for the mining sector. Furthermore, the case sparked heated discussion about several topics about mining in the wider context, such as the state’s role in mining, environmental governance’s lacking resources, and demands for more transparency and communications. Finally, the image of mining in Finland was impacted; other mines were compared to Talvivaara by the opposition; the increased fears and decreased trust in authorities increased public participation in mining issues; and mining became more prominently visible in media.

In the aftermath of Talvivaara, several development projects were launched in attempt to tackle the many issues revealed by the case and to improve the reputation of the industry that fell to record low

levels (Eerola 2014b). After the Talvivaara leakage accident The Ministry of Environment launched a voluntary self-evaluation tests called as Stress Testing for the Finnish mines and beneficiation plants. The goal of the self-evaluation, which features questions regarding several risk factors, was to assess the environmental risks posed by the mines. A questionnaire of seven risk situations and 15 questions was answered by the companies in response rate of 95 %. Stress tests highlighted some targets at the mines that need improvement but in general risk management was at good control. The process improved strong co-operation between authorities and showed co-operative attitude of companies (Välisalo 2014). The Ministry of The Economic Affairs and Employment launched an action plan in 2013 named “Making Finland a leader in the sustainable extractive industry” (TEM 2013). The plan, which is to be completed by 2019, includes 35 actions to be taken mainly by the industry and the public administration, aims to obtain the society’s support for the mining industry’s activities. Two of these actions pointed out the need for improved dialogue and better monitoring and mitigation of social and environmental impacts. Another notable project begun in 2014 when the Network for Sustainable Mining was established. The task of this roundtable process is to prevent and resolve any conflicts of interest between mining companies, the environment and the surrounding community. It works as a discussion and cooperation forum between the industry and the stakeholders while developing tools for more responsible and sustainable mining for the Finnish operational environment. The Finnish standard for sustainable mining contains eight protocols to enable the evaluation of the mining companies. The approach is similar as Canadian Towards Sustainable Mining (TSM) and those protocols were adjusted to Finnish legislation and conditions. New protocols were created for water management and mine closure of operations and some guidance was made for exploration. (Kaivosvastuu.fi n.d.) Furthermore, Green Mining programme by Tekes (Business Finland) was launched already in 2011, which has financed several research projects studying corporate, social and environmental responsibility. Finally, environmental safety report on mines was conducted (YM 2014) and the new guide for environmental impact assessment (EIA) in mining projects was published (Jantunen & Kauppila 2015) and more specific guidance for EIA by co-operation of scientist and the specialists of the field (Kauppila 2015).

The Talvivaara gypsum pond leakage was a turning point and there was a fear in the mining industry that the public discussion about its problems would destroy the industry’s reputation (Sairinen et al. 2017). However, through the case, the industry had an opportunity to learn how the operational environment has changed and how the old ways of managing environmental responsibilities are not enough anymore to gain the public trust or acceptance. In the end, many experts in the field have been generally optimistic about the future, as it is seen that even though the case was an unfortunate event, it will lead to improvements and better practices in the long run (Kotilainen 2015). Most recently, Terrafame (previously Talvivaara) has been in the news due to their new permit application to extract uranium as a by-product from the mine which has faced some opposition (Yle 2018a).

While Talvivaara may have exposed the potential environmental risks related to mining, the high economic expectations that were set for the industry in the beginning of the mining boom have also been questioned in the recent years (Mononen & Suopajärvi 2016). The regions of Eastern and Northern Finland, which have been suffering from high unemployment due to structural changes in the society, had been eager for mines to bring new jobs and economic benefits. Indeed, new mines were opened at Kittilä and Sodankylä (Kevitsa) and there have been plans to reopen old mines with larger scale production in Kolari (Hannukainen) and Taivalkoski (Mustavaara). In addition, there have been plans for completely new mines in Kuusamo, Sokli and Ranua. However, the downturn of the trade cycle starting in 2013 had already a major impact on several mines and led to bankruptcies (Mononen & Suopajärvi 2016). Pahtavaara mine in Sodankylä has made several bankruptcies, Northland pulled away from the Hannukainen project and at the same time Talvivaara was forced to bankruptcy and state takeover. The most recent bankruptcy of the Belvedere Mining company’s Hitura mine, resulted in there being insufficient funds for the necessary closure of the mine (Yle 2017c). Furthermore, other mines had to conduct employee cooperation negotiations to cut costs. All the

above has raised questions about the economic sustainability of mining and the unrealistic economic profitability assessments which have underestimated the associated risks (Vasara 2017).

Another economic topic that has surfaced to the public discussion is related to the sharing of the benefits of mining in the largely foreign owned field. Several recent studies indicate negative attitude towards foreign mining companies (Jartti et al. 2017; Jartti et al. 2014; Jartti et al. 2012). This can reflect a view that Finland as a nation does not receive a fair share of tax from the mining industry and more generally, resource nationalism, which is a view that Finland's mineral resources are a national endowment and should be developed to the benefit of Finland and Finnish citizens as much as possible. These attitudes also seem to be stronger in the mining regions compared to the other regions of Finland. (Jartti et al. 2017.) Generally, the discussion is revolving around the question of whether Finland is giving away its mineral resources too cheaply. For example, the NGO Finnwatch, which studies the Finnish companies' global business impacts, has criticized the current taxing system strongly in mining, comparing Finland to a developing country in this aspect (Finnwatch 2016). In this context, it is worth noting that almost all the ore extracted by the metal mines is refined in Finland (Hernesniemi et al. 2011). The degree of processing is significantly higher than in "pure" mining countries.

In addition to the fears of environmental damages, the foreign ownership of the industry and the economic uncertainties, the conflicting interests in land use between the resource industry and other livelihoods has been another source of many disputes (Hast & Jokinen 2016; Lyytimäki & Peltonen 2016; Kietäväinen 2017). Nature conservation, nature tourism and recreational development (e.g. ski resorts), traditional forms of land use, such as reindeer herding and forestry, often compete in the same areas where mining companies are operating or planning to operate. Especially the tourism sector has been opposing mining strongly in the Finnish Lapland, due to the fears of it hurting the image of pristine nature, which is one of the key commercial facts for the tourism and important for the visitors. These fears have been reflected in a study by Jokinen & Tyrväinen (2013), which indicates that a significant part of the tourists in the studied destinations (Ylläs and Levi) had negative attitude towards the planned mining projects and estimated them to damage the image and the environment of the area. Intensive mining can be exclusionary towards other livelihoods, which means some kinds of interest conflicts with other actors are bound to occur (Hast & Jokinen 2016). Trying to integrate different livelihoods causes multi-layered, multidisciplinary and political problems (Hast & Jokinen 2016).

Together with tourism, reindeer herding in the Finnish Lapland is often affected by mining as it requires and uses very wide areas. The natural pasture rotation can change, and the behavioural changes consequently affect the reindeer herders' work, which may require adaptation or additional hours (Hast & Jokinen 2016). However, good negotiation links between the mining companies and reindeer herders has made it possible to search for solutions and agreements on suitable compensations (Hast & Jokinen 2016). For the time being, big conflicts have been avoided. However, the reindeer owners' association has expressed their concern over the expanding impact of mining industry in the North and it has been noted that not all projects can be fitted with reindeer herding (Paliskuntain yhdistys 2014; 2015; Ollila 2014).

3.2.4.3 Recent developments in the mining sector

The sector report conducted by the Ministry of the Economic Affairs and Employment states that the mining sector's atmosphere in Finland is more positive than before as the raw material prices have been growing in the very recent years (Vasara 2017). The mines operating in Finland today are on a stable foundation after some difficult years and the investments in mineral exploration grew from 2015 to 2016 by 19% (Vasara 2017). The report lists as the most significant economic risks facing the industry: improving the productivity, allocation of capital, unstable prices and exchange rates, accessibility of infrastructure, social license to operate, benefit sharing, competence requirements and

the availability of water and energy. Academies have also expressed their fear that mining is not seen as attractive field anymore by potential students.

Recently in Finland, the mining industry has been focusing on investing in expansions and technology (e.g. Outokumpu Oyj 2017; Agnico Eagle 2018; Boliden 2018) and improving productivity (Vasara 2017). An interesting development, linking the mining industry to the green economy, is the globally growing investment in renewable energy and energy storage, which consequently increases the need for certain raw materials (Vasara 2017; Deloitte 2018). This has resulted also in discussions and preliminary plans of mining minerals suitable for the battery production in Finland, either by establishing new mines or readjusting some already existing plans (e.g. Yle 2017a & b; Yle 2018b). Transition for circular economy has been noted as being important for the mining sector, since metals and potentially mining waste can be recyclable (ICMM 2016). Minerals are needed for modern carbon free technology and this can in the future have an impact on the reputation of mining.

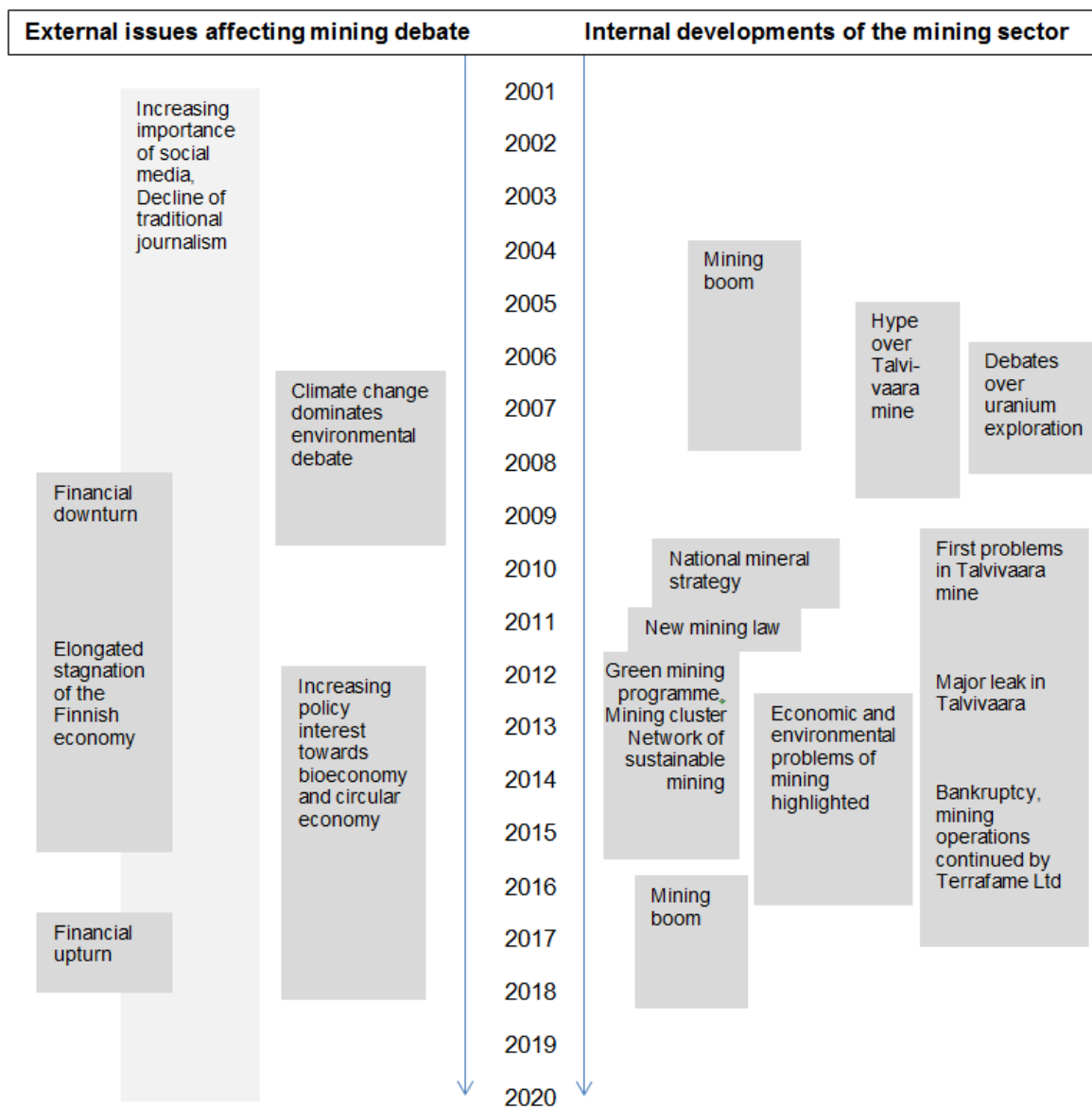


Figure 4: Timeline of the developments affecting the mining sector. External issues affecting mining debate in relation to the internal developments of the mining sector

3.2.5 Public perceptions of mining in Finland

Prior to the so-called mining boom and the revival of the mining sector, the field received very little attention from the social scientists in Finland. This may be due to the long recession of the mining sector (Jartti & Litmanen 2011). Soon after the millennium the field started to receive more public and media attention, followed by increased interest from academia. The first attitude studies were prompted by the uranium disputes, which revealed a spectrum of assumptions, beliefs and attitudes that came as a surprise to many of the mining actors operating in Finland (Eerola 2008).

A key study regarding the public perceptions of mining is the recently published citizen survey by Jartti et al. (2017), "Finnish attitudes toward mining", which studied the national attitudes toward mining using survey data from 2016. The study divided Finland into mining regions, metropolitan region and other regions, thus providing data about the differences between the people who live and work in the mining regions and those who do not. However, some mining areas exist in areas defined as 'other regions', and this might have an impact on the results. An earlier important study by Jartti et al. (2014) was the first survey that studied the Finnish mining attitudes broadly in three mining regions and in the capital region. The study brought in new knowledge about mining attitudes that was not available before. However, it is worth noting the data was collected early in 2012 before the major problems in Talvivaara mine, which were widely discussed and intensively covered by the media. These two studies are referenced heavily in this chapter.

In addition to the citizen surveys about attitudes, there are several Finnish studies that focus on more specific issues, such as uranium mining, mining's social impacts, and perceptions and opinions in case contexts (Jartti & Litmanen 2011; Litmanen et al. 2013; Lesser et al. 2016; Litmanen et al. 2016; Mononen 2012; Suopajärvi et al. 2017). At the municipality level, few studies have focused on the perceptions and acceptance of mining in Sodankylä, which is also the location for the reference area of the INFACT project (Kuisma & Suopajärvi 2017; Selinheimo et al. 2015; Selinheimo 2014). Finally, Lesser et al. (2017) compare and synthesize the Finnish and Swedish research on mining, both providing various results and conclusions on attitudes and opinions. Here we also point some selected findings from the Swedish literature.

3.2.5.1 What does mining mean to Finns?

According to the citizen survey by Jartti et al. (2017), the respondents generally viewed mining as being central to Finland and saw that it contributes positively to the Finnish economy. The respondents living in the mining regions agreed more strongly with this compared to the respondents from the metropolitan region, who did not see mining as important for the country and its future. In the earlier survey, Jartti et al. (2014) note that Lapland shows as a more mining-company-friendly region than the other reference regions of the study. However, when mining's economic importance for the future of Finland was compared to other industry sectors, such as forestry, mechanical engineering and metals industry, and electronics, it was at the bottom of the list in all regions (Jartti et al. 2017). While the metal ore produced by the mining sector is mainly used by the domestic industry (Vasara 2017), the respondents showed a disagreement of whether Finland is economically dependent on mining and disagreed even stronger whether the municipality where they live in is dependent on it (Jartti et al. 2017).

The general level of acceptance of mining was neither weak nor very strong (Jartti et al. 2017). When asked more specifically about different extractives, precious metals, base metals and industrial minerals were significantly more acceptable than uranium. According to earlier studies, the views towards the acceptance of uranium mining have been quite diversified in Finland, meaning there is a large group of people willing to allow uranium mining and similar sized group opposing it (Litmanen et al. 2013; Jartti & Litmanen 2011). On all extractives, the general acceptance went down when asked about mining in the respondents' home region (Jartti et al. 2017). The findings are in line with Jartti et al. (2014), but the overall acceptance of mining seems to have fallen from a very strong response to

somewhat positive (Jartti et al. 2017). The 2014 study indicated that women are generally more critical towards mining but with age, education, profession, industry and political preferences, there were no clear systematic correlations. Thus, demographic features did not seem to define acceptability of mining very clearly.

In the municipality level, the results from the survey conducted by Kuisma & Suopajärvi (2017) in Sodankylä are in line with the national findings. 76% of the respondents considered mining acceptable and a bit over half (53.9%) of the respondents considered the benefits more significant than local adverse effects. However, about half of the respondents (49.8%) thought that economic growth should not outweigh environmental damage and more than 40% were willing to lower their own standard of living to protect the environment.

3.2.5.2 The benefits of mining

The citizen survey by Jartti et al. (2017) shows that the most important perceived benefit from mining was employment and the opportunities that mining provides for the regional development. The respondents generally agreed that mining has helped to improve the transport infrastructure, but they did not believe that mining has helped to support social well-being outside the regional centres of Finland. While the national benefits of mining were rated higher, the respondents rated their personal financial benefits from mining lower. However, when asked if the average Finn is wealthier because of mining, they responded more positively but still below the midpoint of the scale. (Jartti et al. 2017.)

At the municipality of Sodankylä, the respondents felt that mining has had positive effect on the municipality's atmosphere and attractiveness (Kuisma & Suopajärvi 2017; Suopajärvi 2017). About 60% of the people felt that mining was a prerequisite for maintaining the current standard of living. Furthermore, they felt that it had improved the image of the area and brought new social networking possibilities. While the environmental impacts were significant, mining was still considered rather acceptable because of its positive effect on employment (Selinheimo 2014). Over 90% of the participants had noticed that mining has employed residents (Kuisma & Suopajärvi 2017).

Finally, at the wider northern context, Suopajärvi et al. (2017) point out the significance of the local history on social impacts of mining in the northern Europe. Depending if there is history of mining locally, it can be perceived as a traditional activity or as a new industry. Reopening a mine can bring back the mining identity in quintessential resource towns, which can be important for many in the local community.

3.2.5.3 The negative impacts of mining

In the earlier survey by Jartti et al. (2014) the results indicate that environmental impacts were not generally seen as a definitive obstacle for expanding mining in Finland, which was a stronger view especially in the region of Lapland. It is worth noting that there was a great amount of people in all the reference regions in the "it is hard to say" category. However, the respondents in all regions strongly agreed that the environmental impacts should be addressed in the decision making. Since the collection of the survey data, the environmental impacts of mining have been more visible in the media. Promises about new advanced and environmentally friendly mining technologies created by some mining companies were treated more critically and even cynically in the public debate after the major problems in the Talvivaara mine. In the more recent survey the respondents who felt that mining's impact on environment were negative also were less likely to accept the industry (Jartti et al. 2017). Furthermore, the respondents strongly agreed that mining has negative environmental impacts and it contributes to climate change. The negative impacts on tourism and agriculture were also recognized. Finally, there was slight agreement on mining's negative health impacts but the impact on cost of living was rated low.

The environmental impacts have been also recognized at the municipality level (Kuisma & Suopajärvi 2017; Selinheimo et al. 2015; Selinheimo 2014). In Sodankylä, roughly 50% of the respondents saw

that mining has harmed the environment and almost half of the respondents had experienced problems with dust (Kuisma & Suopajärvi 2017). The dust had diminished the locals' berry picking options and caused concerns about potential health risks. There are also fears that mines threaten Lapland's traditional livelihoods and the integrity of the nature (Selinheimo et al. 2015). This illustrates the conflict between economic growth and environmental concerns that are often present in the local mining discussions (e.g. Mononen 2016; 2012). In the northern areas of Europe, mining might be seen as an intruder to the northern nature and community or as a saviour since there are often high hopes for economic development of the municipality (Suopajärvi et al. 2017).

Other negative impacts of mining in Sodankylä were the perception of reduced safety, which may be due to increased traffic and the industry's sensitivity to economic changes (Kuisma & Suopajärvi 2017), noise near the Kevitsa mine and the perceived risk of emissions to the environment (Selinheimo et al. 2015). However, the most negative opinions in the survey conducted by Kuisma & Suopajärvi (2017) concerned the impact of mining on the price of housing and on outdoor recreation possibilities. The case study shows how the adverse effects affect different groups in different ways, based on the living distance from the mine and the practiced livelihood.

Finally, Suopajärvi et al. (2017) studied the social impacts of mining in eight communities in Norway, Sweden, Finland and Murmansk region of Russia, conducting a series of semi-structured interviews. Some of the major concerns from their study that are experienced by the locals are the environmental impacts, global economic fluctuations' impact on local mines, dependency on single industry, mining's impact on locally based livelihoods and nature-based practices, and the "global-local" tension, which is related to the distributional fairness that is elaborated below.

3.2.5.4 Fairness, faith in governance and trust

Overall, the respondents did not agree that the distribution of the economic benefits of mining are distributed fairly in Finland in the most recent survey by Jartti et al. (2017). Interestingly, the respondents from other than the mining regions felt more strongly that mining communities receive a fair share of the benefits from mining. The people disagreed, especially in the mining regions, that Finland receives a fair share of tax from the mining industry, which was also felt strongly at the municipality level in Sodankylä (Jartti et al. 2017; Kuisma & Suopajärvi 2017). In the wider northern European context, Suopajärvi et al. (2017) found that the environmental "bads" are experienced in the North, whereas the economic "goods" go to mining companies and consumers in the South. The mining companies can be seen as "outsiders" or "southerners" that want to exploit the local resources for the "southern" needs.

The foreign ownership in the mining industry seems to have an impact on the acceptability of mining. In the citizen survey of Jartti et al. (2017) most of the respondents agreed strongly that foreign ownership of mining operations in Finland should have restrictions and the level of acceptance of foreign companies conducting mining in the country was slightly below midpoint on the seven-step scale. The trust in foreign companies has been low in the earlier study as well, with a high number of people being uncertain what to think of them (Jartti et al. 2014). Jartti et al. (2017) suggest that these results may reflect a view that Finland does not receive a fair share of tax from the industry and resource nationalism, which has been also noted by the earlier studies (Jartti et al. 2014; Eerola 2008). Furthermore, there was a very strong support for securing national ownership and for establishing a state-owned company (Jartti et al. 2014), which was also echoed at the municipality level (Kuisma & Suopajärvi 2017).

One lesson that can be taken from the Swedish studies is that past experiences with mining matter a lot (Lesser et al. 2017). Local communities with history of mining tend to be more positive towards mining than people in "non-mining" communities where new mines are being planned. Lesser et al. (2017) state that this finding points to both the role of mining's economic importance and to the local understanding of mining in "social licensing". Communities that depend on mining know it and tend to

accept some of the negative impacts, but communities that are new to it, seem to be more apprehensive. Many communities in Northern Sweden have long histories of mining.

In relation to the above and the findings from Jarsti et al. (2014) and Jarsti et al. (2017), Koivurova et al. (2015) found that foreign companies may have to work harder compared to Sweden's relatively old domestic companies to be perceived as legitimate in Sweden. Furthermore, Tarras-Wahlberg (2014) note that newcomers in Swedish mining have taken more comprehensive approaches to EIAs and stakeholder engagement compared to the "old and established firms", but they still tended to face more resistance than them. He argues that more research is needed to explain this, but also proposes some possible reasons, such as that established firms appear to have over time gained social and community acceptance while newcomers have not had the time to build trust. He also highlights that the newcomers have mostly followed neo-liberal ideas of corporate social responsibility (CSR) in their stakeholder approach, which may not be appropriate in the context of a Nordic welfare state.

In the survey by Jarsti et al. (2014), the respondents from all reference regions agreed that the mining companies need to have a good operational environment in Finland. Furthermore, the finder's right to keep the deposit and fluent permit processes were supported. However, when asked if establishing a mine should be easy the responses were slightly critical. In addition, there was an agreement that the permit conditions should be made stricter. Jarsti et al. (2014) speculate that perhaps the respondents see that if establishing mine is made too easy and that the authorities cannot monitor the project properly. When it comes to the permit process, it could be that the respondents do not see that stricter permits would significantly impact mining's preconditions to operate negatively (Jarsti et al 2014).

The participants did not strongly agree or disagree when asked if they had opportunities to participate in decisions about mining (Jarsti et al. 2017). In the earlier study, all the survey regions slightly disagreed when asked are the locals are being heard in the decision-making (Jarsti et al. 2014). The participants rated below midpoint of the scale when asked about feeling heard and respected by the industry, government and municipality, the latter being rated slightly higher than the others (Jarsti et al. 2017; Jarsti et al. 2014). It was strongly felt that the official processes are not enough on their own when making decisions about mining and in addition, there needs to be constructive dialogue with the citizens and other stakeholders (Jarsti et al. 2014). Regarding the decision-making, there was a strong agreement that it should be open and transparent, also when it comes to informing the public.

The results showed a lack of faith in the formal institutions' ability to ensure that mining is done responsibly and there was some distrust towards both the authorities and the environmental legislation (Jarsti et al. 2017). Generally, trust in the environmental legislation and the authorities predicts acceptance well regarding mining (Jarsti et al. 2014). In the 2014 study, Jarsti et al. asked the participants to rate their trust on different actors related to mining expertise and the highest rated were the different knowledge producing organizations and specific expert organizations, such as GTK (Geological Survey of Finland), STUK (Radiation and Nuclear Safety Authority), Tukes (the Finnish Safety and Chemicals Agency), universities and private research institutes. While foreign mining companies were the least trusted actors in Uusimaa, Pohjois-Karjala and Kainuu, in Lapland non-environmental NGOs were at the last spot and the trust in foreign mining companies was slightly higher.

Down at the municipality level, in the survey at Sodankylä, almost half of the respondents thought that municipal authorities did not have enough knowledge and expertise in issues related to mining, the decision-making processes were considered unclear and it was seen difficult for the residents to participate in them (Kuisma & Suopajarvi 2017). Almost 40% of the participants felt that they had not been informed about the issues first-hand and about one-fourth thought the companies and the authorities were too closely connected.

At the national level, the respondents did not agree that the citizens of Finland can entrust the mining industry to do the right things in the country and saw that mining industry was not socially responsible (Jarsti et al. 2017). Overall, the trust in the mining industry was low. Finally, when asked if mining was

worthwhile to pursue in Finland, considering the benefits and costs, the overall mean response was above the midpoint of the scale, indicating slight agreement with the statement. (Jartti et al. 2017).

3.2.5.5 Going a little deeper, what leads to acceptance of mining?

There are various reasons for the increased opposition of mining, such as the growing environmental awareness, the questioning of consumption and the exploitation of natural resources, increased significance of private land ownership, resource nationalism, and the citizens' low understanding of life-cycle of mine (including exploration). Environmental problems of single mines as well as the bad reputation and history of mines around the world also have an impact everywhere. In the Finnish context, the case of Talvivaara mine has been a key event. One more possible reason for the growing opposition may be that prior to the mining boom, the typical Finnish mines were often small underground mines (Tuusjärvi 2013). More recently, new big open pit mines have been opened, which may also have significantly larger environmental impacts.

In the aftermath of Talvivaara, there was some discussion on media's impact on the specific case and about its role at the wider societal context. Negative issues tend to generate more media interest than positive news which may distort the public opinion. In the citizen survey by Jartti et al. (2017), 70% of the respondents self-reported their knowledge to be either somewhat narrow or very narrow, which were the two lowest categories of the five-step scale. The results are like the earlier survey of Jartti et al. (2014) where the majority of the respondents felt they did not have enough information about mining. Jartti et al (2014) note that there was a strong correlation between acceptability of metal and mineral mining and the respondents' level of knowledge of Finnish metal mines.

Jartti et al. (2017) use regression analysis in their study to examine how Finns' perceptions of mining associated impacts and benefits relate to the acceptance of mining. They found that the significant predictors of acceptance were impacts on environment, impacts on cost of living, impacts on other sectors, benefits on regional transport infrastructure and social well-being, and employment and other regional benefits. In practice, the more negative the respondents felt these impacts were, the less likely they accepted the industry. The more positive they felt the benefits were, the more likely they accepted the industry. The two strongest predictors of acceptance were impacts on other sectors and employment and other regional benefits. The importance of reconciliation with other livelihoods and especially tourism has been also emphasized by the growing amount of research on the subject in Finland (Lesser et al. 2017; Hast & Jokinen 2016; Lyytimäki & Peltonen 2016).

Jartti et al. (2014) also studied correlations with acceptability. The test variables were environmental attitudes, necessity of mining and negative impacts, knowledge of mining, trust in authorities, trust in environmental legislation, and the attitudes towards foreign companies. Their results show that issues regarding environmental protection and the views on benefits and impacts of mining have a link to the level of acceptability. Furthermore, the general knowledge about mining in Finland and trust in environmental legislation and authorities correlate with acceptability. For some extractives, the acceptability of foreign companies correlates positively with the general acceptability of mining. The results also indicate that overall environmental attitudes and concerns have links to the acceptability of some extractives. Uranium continues to divide opinion as it is also a political question and connected to nuclear power and waste. Its acceptance is significantly lower in Finland than other extractives (Jartti et al. 2017). The question of moral acceptability may also be relevant here (Rytteri 2012).

While looking at the future, in Sustainable Acceptable Mining project (2013-2015), various stakeholders of mining industry expressed their concern of environmental impacts and need for knowledge growth and tailored communication. The vision of sustainable acceptable mining in 2030 was seen in a way that mining sector must be a part of society, having interlinkages with other livelihoods and local people. Development on both corporate culture in mining industry as well as the authority actions was acknowledged (Kohl et al. 2013). Jartti et al. (2017: 36) conclude elegantly that "Finns trust and accept the industry more when they feel heard and respected by it, when it is

responsive to their concerns, when benefits from mining are shared equitably, and when the municipal and state governments and the legislative and regulatory frameworks we have in place provide confidence that the mining industry will do the right thing.”

3.2.5.6 Conclusions for mining acceptance in Finland

Mining’s significance in the Finnish society has varied greatly during the country’s history. In the 1900s, it played a key role in the industrial development of the country. The prosperous era, led by the state owned Outokumpu, came to its end in the late 1980s. The activities were limited until the revival of the industry in the 2000s. The new “mining boom” took the country almost by surprise. The relatively sudden and rapid increase of exploration and mining activity, the new operational environment and the environmental and other impacts caused a strong reaction in the society, which is well demonstrated by the attitude studies examined in this chapter.

The largely foreign owned mining industry has received criticism as it has been felt the benefits have been distributed unfairly. The hopes for state owned companies, restrictions on foreign actors and mining tax are issues that have been brought up in the recent attitude studies. At the same time, the mining industry has been strongly supported by the Finnish government by including it in government programs and strategies. However, the respect of ecological sustainability and rights of the indigenous peoples have been also visibly requested (Programme of the prime minister Katainen’s Government 2011, Arctic strategy 2013, Prime minister Sipilä’s government proposal to amend the Mining Act 2017).

In a survey by Jartti et al. (2017), mining was still seen as central to Finland but the attitudes towards mining have turned slightly more negative from before. The general acceptance is not very strong nor weak, with many people in the middle of the scale, meaning, the attitudes are not very polarized at the state level. Thus, future actions could have a major impact on which direction this group of people will swing.

Generally, the mining regions are more positive towards mining and exploration, but they also feel more strongly that the distribution of benefits and impacts has been unfair. The main benefits felt in the surveys are the economic benefits via jobs. The environmental impacts cause concern as do the impacts on other livelihoods, housing prices, and health and safety. The conflict between economic benefits and environmental impacts is well illustrated in the results. The trust in mining governance is low as it is in the foreign mining companies. The results may suggest resource nationalism and they display the commonly expressed fear that the profits from mining will go abroad, while the environmental impacts are left for the locals to bear. The low trust in mining governance and the authorities could be part of a wider trend, but the Talvivaara case is most likely the biggest reason for the low reputation in the mining context as the authorities’ competence was questioned by the public several times during the problems.

While the acceptance of mining remains positive in Finland, the growing importance of local communities recognized in the literature, the demands for better environmental conservation and the reconciliation of different livelihoods, all require more sustainable practices from the mining actors both socially and environmentally.

3.3 Germany

Comparable to the development of Finland and Spain, mining has shaped the social, economic and spatial planning at an early stage in Germany (Eberle et al. 2017). This chapter describes the historical context and the recent developments in the mining sector in Germany and analyses the key role mining has played in many mining regions from the Middle Ages until today. The history of mining provides an indication for the attitudes and perception of mining and mineral exploration in Germany and, more specifically, the reference site area in Geyer and Ehrenfriedersdorf in Erzgebirgkreis, Saxony, Germany (figure 5).

This report compares mining activities and their environmental and social implications for Germany and Austria, in order to cover all relevant literature written in German and published across Europe.



Figure 5: Location of the reference site Geyer in Germany and district Saxony (Source: Dreamstime 2018).

3.3.1 Geological and geographical context

The German reference site is located in the small municipalities Geyer and Ehrenfriedersdorf 10 km northwest from the old silver mining town Annaberg-Buchholz in the centre of the Erzgebirge/Saxony. The Erzgebirge geographically belongs to the German federal state of Saxony and a small northern stripe of the Czech Republic. Geologically the Erzgebirge lies in the Saxo-Thuringian zone, which is characterized by a metamorphosis of its rocks (Gneiss, Mica Schist, Marble) and the penetration of granitic plutons (see figure 6 and Henningsen and Katzung 1998).

The reference site is located on the Northwestern flank of the Annaberg anticline SW-NO-striking. The NW-falling metamorphic stratigraphy consists of gneisses. Mica consists of the amphibolite facies in the southeast and phyllites of greenschist facies in the Northwest (Hösel et al. 2104). It lies at the border of the Pre-Cambrian-Cambrian and Cambrian-Lower Carboniferous facies with an interbedded sequence of para- and orthogneiss of the “Erzgebirge” as well as mica schist, phyllite, slates, greywacke, quartzites, conglomerates, limestone, siliceous slate and diabase. The deposit tectonics which is around 500m thick in this area are determined by a diagonal shear tectonics. In addition, granites sub-plutons from the Upper Carboniferous (Perm) intruded the metamorphic sequences near the reference side (see Figure 6).

Saxony is a resource-rich part of Germany compared to the whole country. In addition to lignite, resources include aggregates and ores to the important raw materials of the state (SLUL 2010, see figure 6). In the Erzgebirge – as the German name “Erz” (“ore”) implies - there are deposits of ores such as silver, copper, tin, iron, nickel, cobalt and uranium.

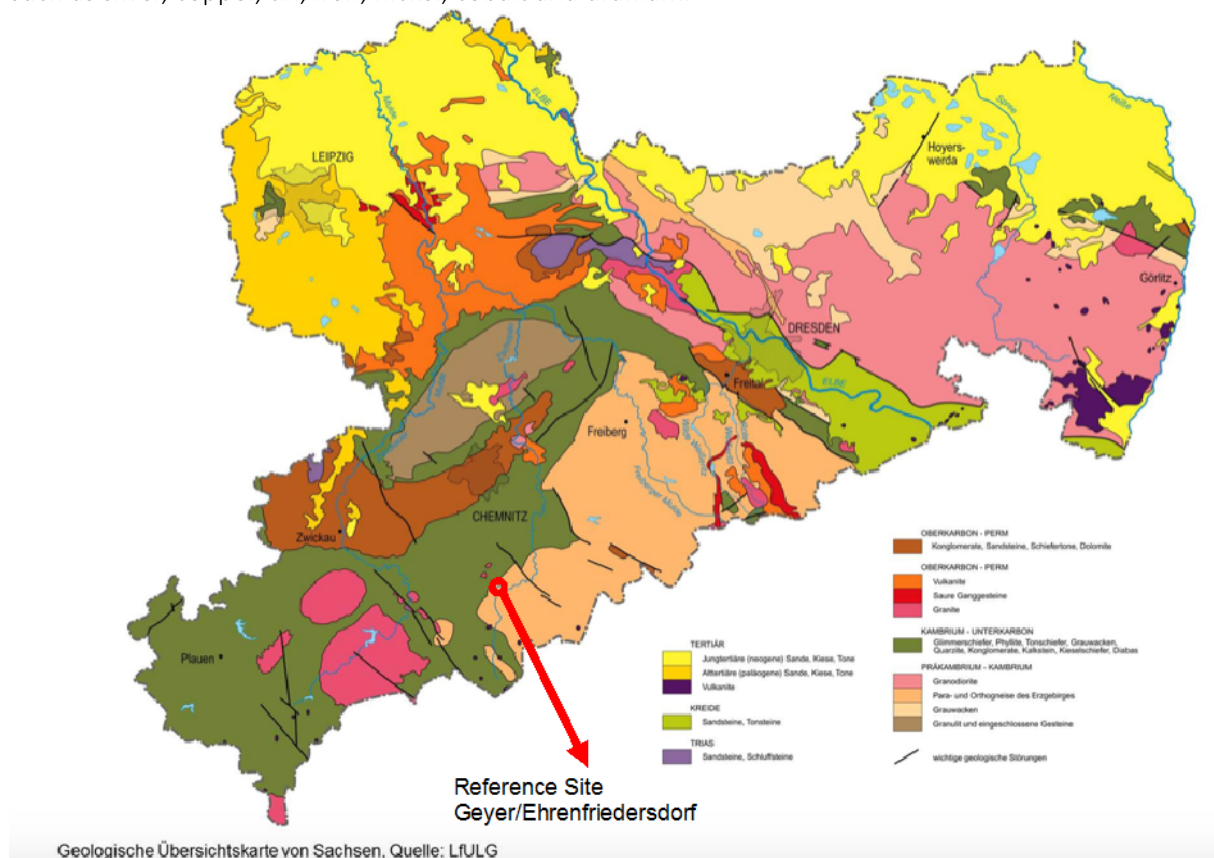


Figure 6: Overview of the geology of the State of Saxony (Saxony official website, <http://www.geologie.sachsen.de>)

3.3.2 Socioeconomic context and mining history

3.3.2.1 Historical context

Just like many other European countries, the German mining has a long tradition and the earliest mining extraction in this region goes back 7000 years (Eberle et al. 2017: 170 ff.). Four periods of mining in Germany can be distinguished (after Tenfelde and Pierenkemper 2016, Tenfelde et al. 2015, Schanetzky and Ziegler 2013, Bartels and Slotta 2012):

- First period. The earliest mining activities - from 5000 BC to the middle of the 18th century: copper, silver and iron.

- Second period. Modernity in the 18th and early 19th centuries: salt, iron and coal.
- Third period. German mining history in the 19th and early 20th centuries – German industrialization with a high level of coal mining and iron ore extraction.
- Fourth period. Raw material extraction and its structural change in the 20th century to today: coal, ore and especially uranium ores for nuclear power

However, no ores were mined in the pre-Christian era, but only native metals, those that occur in nature in their pure form. These included tin, copper, silver and gold and at first tools ware or jewellery was produced. The first weapons were made from a mixture of copper and tin, from about 2200 to 800 BC (Deutsches Geo Forschungs Zentrum 2018, vgl. Bartels and Slotta 2012). From the 10th century the extraction of ore started in the German region Harz and Erzgebirge and, until the 19th century, mainly copper, silver and iron were obtained in different mining regions in Germany (compare Bartels and Slotta 2012 and Tenfelde et al. 2015). During the industrial revolution in Germany in the 19th and early 20th centuries (third period), the focus of mining extraction was on coal and iron which were the driving factors for the industrialization (compare Tenfelde and Pierenkemper 2016). In the 20th century, an intensive extraction of uranium ores was added, which became, among other things, the basis of nuclear power (compare Schanetzky and Ziegler 2013).

3.3.2.2 Historical context in the state of Saxony

The region of Saxony in the South-Eastern part of Germany was always a centre of mining, for several hundred years. Until the Middle Ages, people of Saxon mined products of value. Around the year 1168, the area around Freiberg experienced an era of intensive mining after a sensational discovery of silver and especially Saxony and Bohemian parts of the Erzgebirge entered with the whole of central Europe into a new age of metal mining with a boom of silver mining between 1470s and 1540s (Kraschewski, H.-J. 2012). The mining industry turned into one of the economic driving forces during this time and brought wealth to the region for the next 500 years.

Additionally, administrative structures were established in the region which last until today. In Freiberg a mining office was first mentioned in 1241 (Sächsisches Oberbergamt 2018) and Adam Ries was nominated as a mining official in Annaberg in 1523. The Bergakademie Freiberg, founded in 1765, is regarded the first scientific university in the world. Later in the 19th century, the mining authority also established a geological service (Sächsisches Oberbergamt 2018). Frequently cited is also the “Freiberger Bergrecht” from around 1300, a legal framework which came into effect in mining regions around Europe (Sächsisches Oberbergamt 2018).

After a temporary decline of silver and metal ore mining, activity was extended from the middle of the 15th century. The area around Altenberg, Schneeberg and Annaberg became extended centres for mining activities. The mining lasted for several hundred years, until most of the mines were closed for economic reasons in the 1990s (Deutsches GeoForschungsZentrum 2018). In Freiberg the ore mining officially ended in 1969, two remaining mines in Altenberg and Ehrenfriedersdorf closed in 1991 after the unification of Germany, for economic reasons (Sächsisches Oberbergamt 2018).

At the beginning of the 20th century, lignite mining in two central German districts (Southern area of Leipzig and in Lausitz) grew constantly and became a large-scale operation. The original underground operations became open-pit mining. In the GDR lignite mining reached enormous dimensions, with a huge capacity for the production of power. Here, the former GDR became the largest lignite producing country in the world (Sächsisches Oberbergamt 2018). The state government argues that lignite mining in both areas in Saxony guarantees crisis-proof and economic power generation (Freistaat Sachsen, Staatsministerium für Wirtschaft, Arbeit und Verkehr 2017c).

Uranium mining started after World War II, initiated by the Soviet Union, and reached considerable dimensions in the GDR. The GDR was the third largest uranium producer in the world and the largest of the Eastern European countries (Sächsisches Oberbergamt 2018). In the Erzgebirge, uranium was

mined until 1990, in Bad Schlema, Dresden-Gittersee and in Königstein in the Elbe Sandstone Mountains, but all mining was closed after the unification of Germany, transforming the German economic system from a planned to a market economy. In addition to the closure of uranium production, the spade pits and tin mines were closed until March 1991 and the nickel production was stopped too - an intensive era of mineral mining came to an end (Hösel et al 1994). The decommissioning of uranium and partly lignite mining are today among the largest environmental projects in Europe to revitalize the region (Sächsisches Oberbergamt 2018).

The area of the reference site looks back of more than 750-year of mineral tin ore exploration. The first mining industry develops in the 13th century near Sauberg and mines and stamp mills were built (Hösel et al 2014). Especially after the 30 years' War, up until the end of the 18th century mining enjoyed a period of high economic prosperity (Hösel et al. 1994). As part of the foundation of the „Vereinig-Feld-Fundgrube Ehrenfriedersdorf" ("United Ehrenfriedersdorf") construction of the Sauberger and the Freiwaldner main shaft started in 1857. Followed by some ups and downs during the year between the First and Second World War, mining continued in this area until the unification auf Germany in 1990 (Hösel et al. 1994).

The Ehrenfriedersdorf tin ore deposit was accessible through the following shafts and galleries (After Hösel et al. 1994: 8).

Table 1. Ehrenfriedersdorf tin ore deposit, shafts and galleries (After Hösel et al. 1994: 8).

Name	Starting point (in NN)	Depth in m	In operation since	Function and duration of use
Sauberger Haupt-/Richtschacht 1	611,5	258,0	857	Until 1966 production shaft
Sauberger Haupt-/Richtschacht 2	639,2	351,2	1966	Production, ventilation and escape shaft till 1994
Kurt-Leopold- Schacht (fomer Hammerschmidt-schacht)	662,8	197,0	1954	Ventilation and escape shaft, till 1977
Schacht 524	581,9	74,5	1949	Ventilation, Wismuth shaft, until 1993
Greifensteinstolln	600,0	58,0	1979	Exploration, water solution, until 1992
Tiefer Sauberger Stolln	493,0	-	1536	Water solution, partly rebuilt 1992/93
Großvierunger Stolln	589,2	-	vor 1650	Water solution, collapsed
Tiefer Haus Sachsen Stolln	630,0	-	unknown	Water solution, collapsed
Goldgrund-Stolln	579,0	-	vor 1790	Water solution, collapsed

In summary the ore extraction in Saxony and the reference site lasted for several hundred years, until most of the mines were closed for economic reasons in the 1990s. With this, ore production stopped in Germany (Deutsches GeoForschungsZentrum 2018, Hösel et al. 1994).

3.3.2.3 Recent situation of the mining industry in Germany

In Germany, around 1.3 billion tons of energy and mineral resources are needed each year (Vereinigung Rohstoffe und Bergbau e. V. 2015). Different industries as the construction industry (stones, gravel, and sand), transport infrastructure (ceramics), chemical industry (salt), agriculture (potash fertilizers) and other parts of the industrial value chain are in demand and supplied by the German raw materials industry.

Today, one third of the primary energy supply is also based on domestic sources (lignite, hard coal, natural gas, nuclear energy and renewables). The majority of these raw materials, around 765 million

tons in 2014 plus around 9 billion m³ of natural gas, come from domestic raw material extraction and ensure the supply of these raw materials in whole or in part. Ores and metallic raw materials as well as rare earths must be fully imported. For oil and gas, German production accounts for at least 10% of consumption (Vereinigung Rohstoffe und Bergbau e. V. 2015).

In the case of metallic raw materials, which have not been produced in Germany for about 20 years, and for energy raw materials (oil, gas and hard coal), the country is largely dependent on foreign producers. The import dependency on commodities, especially in the case of metallic commodities, whose prices are very volatile in the international markets, gives reason for suitable strategies for securing raw materials at the level of the federal states, the federal government and the EU. The commodity strategies contain numerous proposals to increase the future of raw materials.

Germany relies on imports to supply crucial raw materials. The value of raw material imports to Germany in 2014 amounted to around 130 billion Euros (Vereinigung Rohstoffe und Bergbau e. V. 2015). In particular, the purchase of heavy rare earth metals is still viewed critically. Nearly all (93%) of the rare earths come from the People's Republic of China (Vereinigung Rohstoffe und Bergbau e. V. 2015).

3.3.2.4 Hard coal mining in Germany

The adjustment process in the German coal industry and the associated reduction in employment continued in 2015 in a socially responsible manner. The RAG German hard coal AG had two mines on the Ruhr and one in Ibbenbüren. As of December 18th, 2015, the production at the Auguste Victoria Mine was launched at the Ruhr. Since the year 2000 the German coal production has been reduced from 33,3 million t to 6,2 million t in 2015 and at the same time, the workforce was reduced from 58.100 to 9.640 employees (BMW I 2015). For the period from 2015 to 2019, the mining industry has received notifications of public subsidies with an amount up to 6.015,4 million Euros (BMW I 2015). In 2007, a coalition agreement was reached and the subsidized coal production in Germany will therefore be completed in a socially responsible manner by the end of 2018 (BMW I 2015).

The following diagram (figure 7) shows the amount of hard coal extraction and the number of staff. The dark blue bars indicate the amount of raw production, the light blue bars the usable production. The green bar shows the number of employees, but only until 2015 (BMW I 2015).

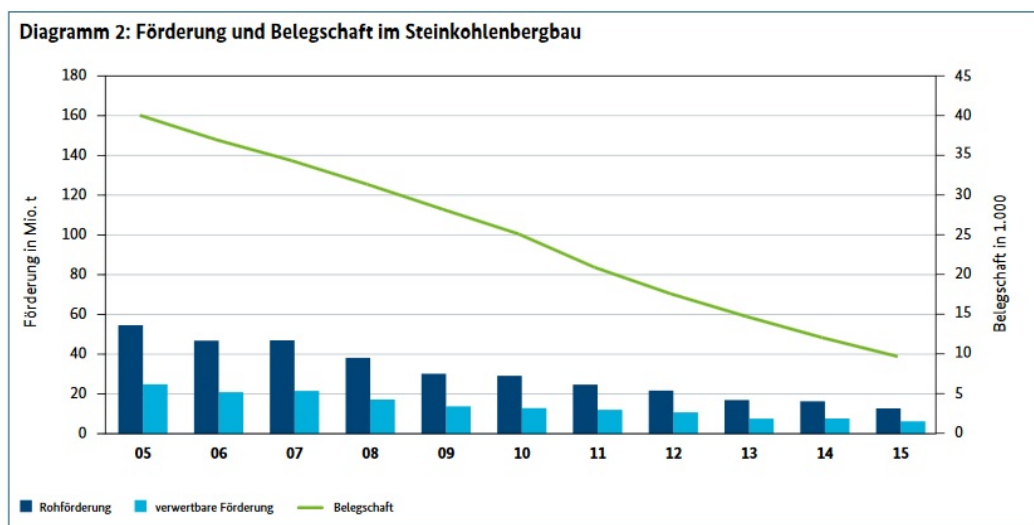


Figure 7: Extraction of hard coal and number of employees in hard coal mining industry (BMW I 2015, page 10)

The raw production volumes in the coal industry are steadily declining: In 2005, just under 55 million tons were produced. Ten years later, there are only about 15 million tons and the flow rates of exploitable production are based on those of raw production. In 2005, on usable coal, just under 25 million t. were produced, which decreased to 7,5 million tons in 2015.

The decreasing production of coal has led to a rapidly fallen number of employees over these ten years: In 2005, 40.000 people were employed in the coal industry. By the year 2015, this number has shrunk by a factor of 4 to 10.000 employees (BMWI 2015).

3.3.2.5 Lignite mining in Germany

The production in lignite mining is subject to fluctuations. From 2007 to 2010, a downward trend can be observed. Over the next three years, production increased to over 185 million t. From then on, a slight downward trend can be noted again until 2015. But the number of employees in the lignite mining industry shows a nearly constant downward trend. In 2010, almost 17.000 people were still employed in the lignite mining industry. In 2015, there were only just under 15.300 workers. This has reduced many jobs in a short period of time (BMWI 2015).

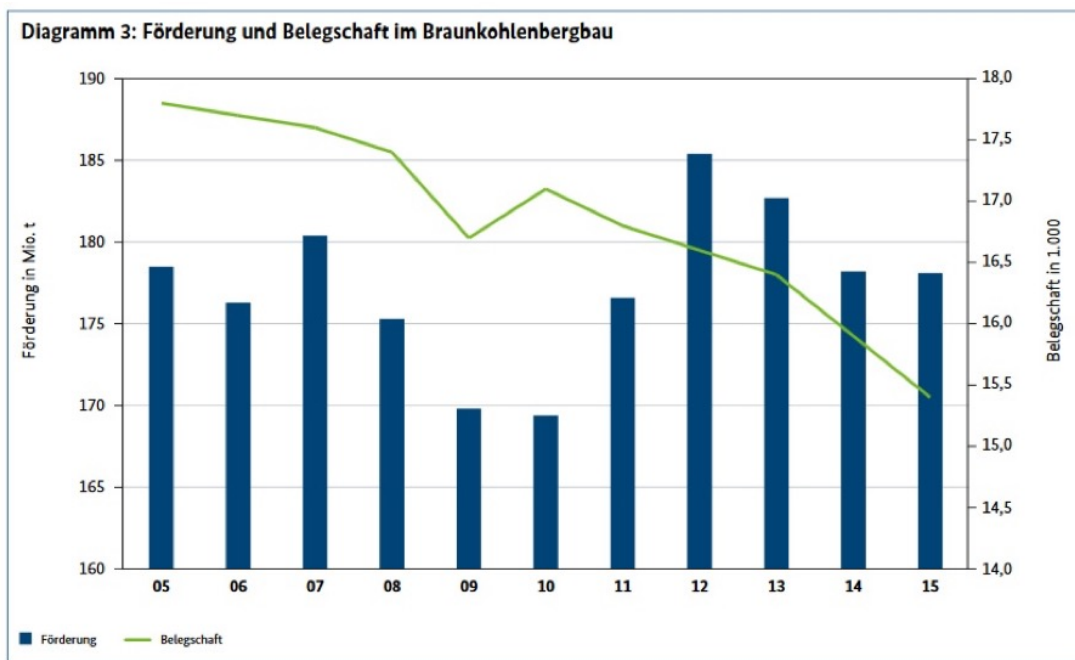


Figure 8: Production and number of employees in lignite mining industry (BMWI 2015, page 12)

3.3.2.6 Innovations in mining in Germany

The statistics below show the innovation expenditures of the mining industry in Germany from 2008 to 2018 (figure 9). Innovation expenditures in this industry include research and development and innovation-related expenditures for property, plant and equipment and intangible assets, training, marketing, design, construction, design, and production and sales preparation.

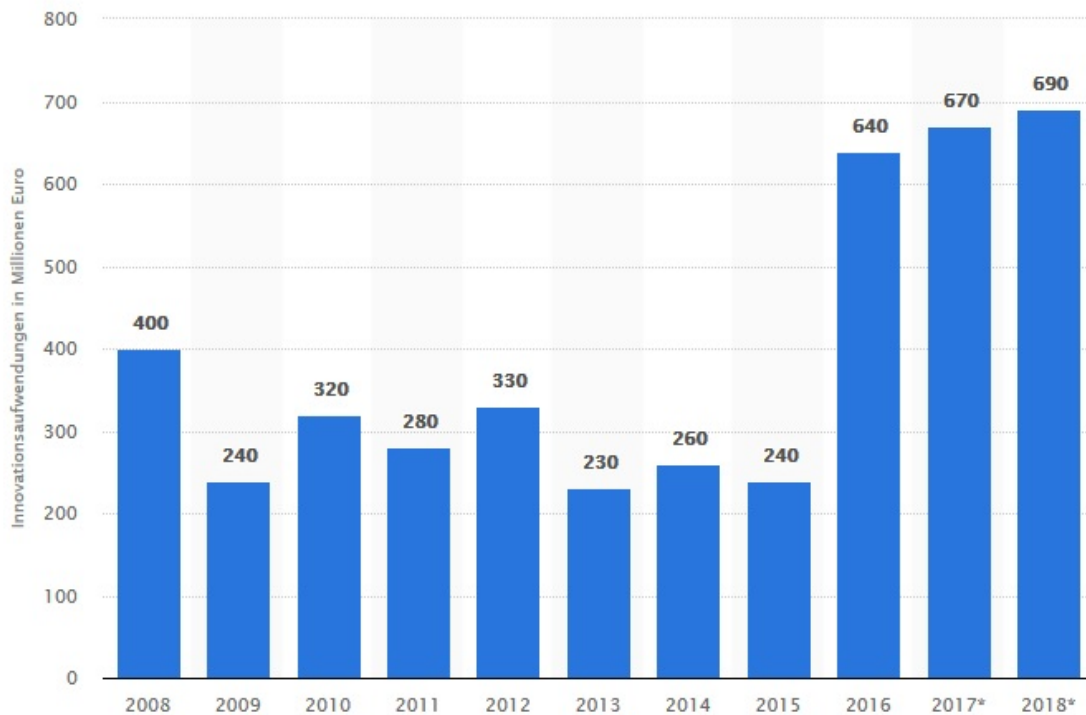


Figure 9: Innovation expenditures of the mining industry 2008 to 2018 (Statista 2017).

The innovation expenditures of the mining industry in 2018 amount to about 690 million euros. It is interesting to see that from 2016 a clear upswing can be seen. Compared to 2015, more than twice as many euros were invested in innovation expenditures. Despite the decline of production in the mining sector linked with the decline of and jobs, investment is being made in the industry again.

3.3.2.7 Raw material strategy of the Free State of Saxony

The economic relevance of ore, tin and uranium has decreased in recent years in the Erzgebirge/Saxony. To revitalize the exploration and mining in Saxony the industry receives support and promotion from the government of the Free State of Saxony. Since 2012, two key institutions, Saxon State Ministry of Economic Affairs, Labour and Transport and the State Mining Authority of Saxony implemented the “raw material strategy” (Freistaat Sachsen, Staatsministerium für Wirtschaft, Arbeit und Verkehr (2017a, b, c and d). This strategic framework aims at establishing Saxony as a centre for mining, putting the raw material production high up on the agenda. Because of this is expected in Saxony that, in the long run, the local industry for raw materials will benefit from the improved opportunities for exploring and mining.

The strategy outlines a set of guidelines, which cover topics such as enhancing skills of the workforce, broaden research, networking among stakeholders, establishing expert knowledge transfer and international cooperation as well as increasing the awareness for the necessity of raw materials for the overall economic well-being.

3.3.2.8 Mining in Saxony, district of the Geyer reference region

The recent low raw material prices have been the reason why new mining activities in Germany are mostly static. The focus of the development of new mining activities so far lies in the federal states of Saxony and Thuringia. The assessment of the extraction and processing possibilities of these sometimes very complex deposits has changed with the technological improvements and the impression of limited worldwide availability in recent years. As a result, numerous exploration and

exploration licenses have recently been applied for and granted in Saxony and Thuringia (Vereinigung Rohstoffe und Bergbau e. V. 2015).

The figure below shows the distribution of significant known mineral occurrences and prospective areas. Among them are lead, gold, copper, lithium and many others of value. The region around Ehrenfriedersdorf and Geyer, centre for the research activities of INFACT, is labelled as hosting tin occurrences.

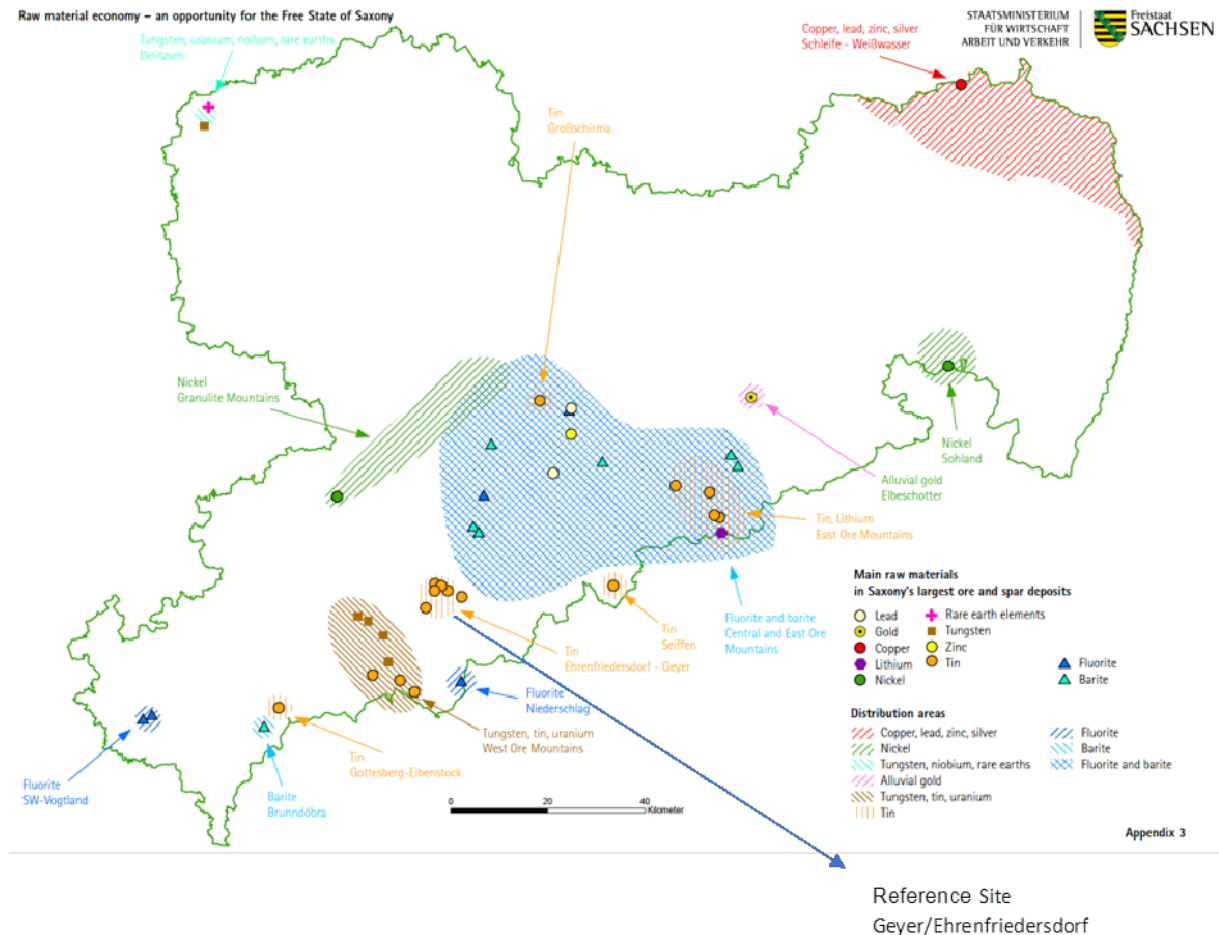


Figure 10: Main mineral occurrences and prospective areas in Saxony (Freistaat Sachsen, Staatsministerium für Wirtschaft, Arbeit und Verkehr 2017c, appendix 3).

After the closing of most mines soon after the reunification of Germany, Saxony experienced a new era of mineral exploration and an increase of applications for mining licenses. The locals have a term for this, calling it "Berggeschrey", a word for the hope for new mining and new prosperity in the Erzgebirge (see figure 11).



Figure 11: Bergsgeschrey. Mining permits for ore and spar (Freistaat Sachsen, Staatsministerium für Wirtschaft, Arbeit und Verkehr 2017c, p. 24).

3.3.2.9 What impact does this historical and socioeconomic context have for Saxony and its development?

Even though Saxony has experienced many ups and downs with mining throughout the centuries it is still dedicated to this industry. The region of the Erzgebirge has a long tradition, with over 700 hundred years of mining, which can still be seen in local customs, traditions, old remains of mining infrastructure or administrative and research structure (Bergamt, University of Freiberg) which still exist today.

Many of the people living in this area have members in their family history, relatives or friends who worked in the mining industry and were part of the mining community. They gained both profit and experienced negative impacts at the same time such as benefitting from the industrialization and economic upswing during the industrial revolution and encountering negative impacts such as environmental pollution or the decrease of employees after closing down the industry. The mining industry had always been part of the region and the people support mining activities more than people in regions without this long history.

After the closing of most mines in the Erzgebirge, new activities are clearly visible. The Saxon State Ministry of Economic Affairs, Labour and Transport and the State Mining Authority of Saxony implemented the “raw material strategy” to revitalize the mining industry for new demands of metals in the industrial sector which seems to be supported by the local communities and the citizens. The increasing production of high-tech and electronic products correlates with slightly rising prices for several raw materials on the world market, which could result in a greater interest for the mining industry to explore and invest in Saxony.

One sign of this new redevelopment was the opening of a new underground mine for calcium fluoride in Oberwiesenthal near the Czech border 2013, after a long break, raising hopes among many people. It could mark the beginning for the intensifying of new economic activities and more raw materials being mined in Saxony in the future.

3.3.3 Mining reputation in Germany and Austria

3.3.3.1 Mining reputation in Germany

It has been difficult to find studies on the perception of mining in Germany, hence these findings all stem from a study on the “Perspective of Coal Utilization in Germany – 2014” by Michael Nippa. The study is based on a telephone survey of 1.001 persons living in Germany. All are at least 14 years old and are the representative sample for the entire population in Germany. 51% of the respondents were female, 55% said they are working, and 18% live in the new federal states. Parts of this study focus on the attitude of mining in Germany in general and gives interesting insights for this analysis. However, it does not give further details on mining of metals.

Germany being a key player in the European energy transition is still very dependent on coal. This also is linked to the German Government’s goal to entirely exit nuclear power. Renewable resources are not yet able to support the country entirely with energy. Coal remains Germany’s substitution energy resource in this regard. It is particularly interesting how opinions and attitudes amongst citizens differ:

- In Germany there is a large diversity of opinions concerning coal/energy resources and the way it should be dealt with related issues.
- Germans are very interested in energy-related topics. Slightly more than half of Germans show interest, only 18% are very interested, and especially the significantly lower interest of younger people is remarkable.
- The German population is lacking essential factual knowledge considering the energy market, which makes the collective decision-making process rather difficult.
- Especially the younger generation has no or a limited knowledge about energy supplies.
- The public considers the industry very important for growth and prosperity and recognizes the need for mining activities in Germany to a large extent. An almost equal proportion of the German population also believes that the industry is responsible for climate change.
- The approval for domestic mining in the German population is surprisingly high. Three out of four Germans believe that mining activities in Germany should continue.
- The general attitude of German citizens towards coal remains undecided, with no clear bias in favor or against coal.
- Whether coal really has a potential or not remains unclear to the public and it seems unlikely that the public image of coal will be regarded positive in the future.
- Germans are very hard to mobilize in terms of participation. There is a large gap between having a distinct attitude or opinion and the step to actually becoming politically active e.g. by signing a petition.

3.3.3.2 Mining reputation in Austria

Information stems from the study “Zur Lage des Bergbaus: Entwicklungen auf internationaler und nationaler Ebene“ (Authors: Schönbauer, Holnsteiner, Reichl and Strobl). In the survey period in March 2016, 1000 Austrians were surveyed from the age of 16 years and above. The subjective proximity to extractive factories (sand / gravel pit / quarry and mine) to the place of residence of the interviewed persons was taken into account in the evaluation of the results. The survey was composed of issues related to raw material awareness, the pros and cons of extracting raw materials in Austria, the reuse of mining areas and personal concerns.

According to the observation of companies and authorities, the acceptance of mining activities is steadily declining in Austria. The actors of the mining industry have to cope with the fact that the

framework conditions have changed or will continue to change in the future. This becomes apparent among other, more complex, costly, and time-consuming administrative procedures:

- Energy commodities are more important for the Austrians in everyday life than the construction minerals that are unimportant.
- Two-thirds of Austrians believe that the extraction of raw materials in the region creates many jobs.
- 68% of the respondents state that Austria's extraction of raw materials is important for the security of supply for industry and society.
- For two-thirds of the Austrian population, the demand for raw materials is a pillar of the industrialized society. Here, too, the industrialized federal states of Upper Austria and Styria, but also Tyrol and Vorarlberg are characterized by their high level of awareness.
- 43% of male and female Austrians believe that extractive industries, such as sand, gravel and quarries pollute the environment.
- The most positive environmental image is perceived by the mining industry in Styria, as well as by those living in the immediate vicinity of a mining operation.
- Two-thirds of the respondents are thinking that the Austrian industry relies on mineral raw materials.
- 60% of the interviewed persons think that recycled raw materials can only partially replace naturally occurring raw materials.
- 44% of Austrians believe that raw material-gaining businesses make a community unattractive as a place of residence.
- An interesting observation is that the vast majority of respondents who live near a mining operation say they perceive little or no negative external effects from living close to a mining site.
- Noise, dust and traffic pollution are seen as possible factors to disturb the people interviewed the most. The least objectionable factors are the visibility of the equipment and the intervention in the nature.
- For 84% of Austrians, public participation on construction and operation of extractive industries is important. Slightly more than half of the respondents believed they can currently represent their interests and concerns in public participation procedures. Most frequently of this opinion are the citizens in Vienna, Carinthia and Salzburg. The Tyroleans and the Vorarlbergers, as well as the people who live in subjective proximity to a resource-extracting operation, are more of the opinion that they can currently not bring in their concerns sufficiently.

3.3.3.3 Conclusion on mining and exploration reputation

Based on the studies on reputation of mining and mineral exploration, the question whether the attitudes of the Germans and Austrians are positive or negative, is hard to answer. In-depth analysis and polls that cover the whole spectrum of public opinion are not available. Looking at coal mining, according to public, raw materials are needed and mineral exploration is perceived by the society as a chance to maintain the economic growth and reduce external dependence. However, environmental issues and the effect on climate change are factors forming the public attitude and could be seen critical in the public.

The region of the Erzgebirge – and specifically Geyer and Ehrenfriedersdorf - has a long tradition with over 700 hundred years of mining, which can still be seen in local customs, traditions, old remains of mining infrastructure or administrative and research structure: The mining industry had always been part of the region.

The activity of the INFACT Project can be framed in continuing this tradition and the locals will probably support mineral exploration and mining activities more than people in regions without such a long history and identity.

3.4 Spain

The aim of this study is to understand the actual reputation and public acceptance of mineral exploration and other mining activities in Spain from an academic point of view through published scientific literature concerning the topic. As previously discussed, *reputation* is defined as the representation of the collective perception of a person, linked with its morality or prestige, which conditions its relationships with the perceivers (Blackwell Encyclopedia of Sociology, 2007). It is extensible to groups and organizations, in this case the mining sector as a whole. However, this concept is not used among Spanish researchers, which means that articles and surveys on public opinion, acceptance, attitudes and other types of social perception will be considered in this study.

After an exhaustive literature review in Spain, checking public and private databases, it can be stated that at a national level no study, article or survey has been found on reputation or social perception of mineral exploration and other mining activities. At subnational levels, literature is scarce.

3.4.1 Geographical and geological context

Both reference sites in Spain, Riotinto and Las Cruces, are located in the Iberian Pyrite Belt (IPB) which is located in the SW of the Iberian Peninsula, comprising part of Portugal and of the provinces of Huelva and Seville in Spain. It forms an arch about 240 km long and 50 km wide, trending westwards from near Seville in Spain to west-northwest in South Portugal. Both the eastward and westward extents of the belt are covered by Tertiary sedimentary rocks.

Geologically, it belongs to the South Portuguese Zone, the southernmost of the zones in which the Iberian Massif is divided. The Iberian Pyrite Belt is one of the most important volcanogenic massive sulphide districts in the world, and has been mined during more than 5.000 years.

Mining in the Iberian Pyrite Belt was very important in Tartessian and Roman times, working the oxidation and cementation zones of the deposits for gold, silver and copper. After centuries of almost complete inactivity, the mines were again worked during the XIX and XX centuries, focusing the production on copper and sulphuric acid. At the end of the 20th century and up to the present day, mining activity has intensively worked the base metals, gold and silver. Between 2005 and 2007 there was no mining in Spain, although the activities are being retaken in Las Cruces (Seville) and Aguas Teñidas (Huelva), and different viability and exploration projects are under development such as those in La Zarza, Río Tinto, Lomero Poyatos or Masa Valverde (Tornos, 2009).

The Pyrite Belt also sets a worldwide example of the environmental impact caused by long-lasting and intensive mining development. Continued works for more than 3.000 years have modified the landscape and caused a steadily increasing pollution of water resources at a regional scale. The generation of acid waters from the erosion of massive sulphides and mine waste washing, and the drainage of mine waters have originated extremophile ecosystems unique in the world. The natural or anthropogenic character of this phenomenon in the basins of the Tinto and Odiel rivers is still debated, but the prevailing idea is that, in any case, it is an environment to be preserved.

The stratigraphic sequence of the Iberian Pyrite Belt is relatively simple. It begins with a basal unit (Phyllite-Quartzite Group or PQ Group) with more than 2.000 m of slate and sandstone with siliciclastic shelf facies and of Late Devonian age. The PQ Group is overlain by the Volcano-Sedimentary Complex (CVS, Late Devonian-Early Carboniferous), reaching a thickness of 1.300 m and deposited in an intracontinental basin during the oblique collision of the South Portuguese Zone against the Iberian Massif. The volcanism of the Pyrite Belt shows compositions from basalt to rhyolite. The most felsic terms dominate, as domes and sills associated to volcanoclastic deposits with similar composition, as well as slate and chemical sediments. The Culm Group diachronically lays on the CVS, and consists of a synorogenic flysch with an Early Carboniferous age.

The whole series is affected by very low degree metamorphism and a fold and thrust tectonic ("epidermic belt") within the context of Variscan Orogeny (Silva et al., 1990; Quesada, 1996). Most of the mineral deposits in this area consist of massive sulphides within the Volcano-Sedimentary Complex (e.g., Leistel et al., 1998; Carvalho et al., 1999).

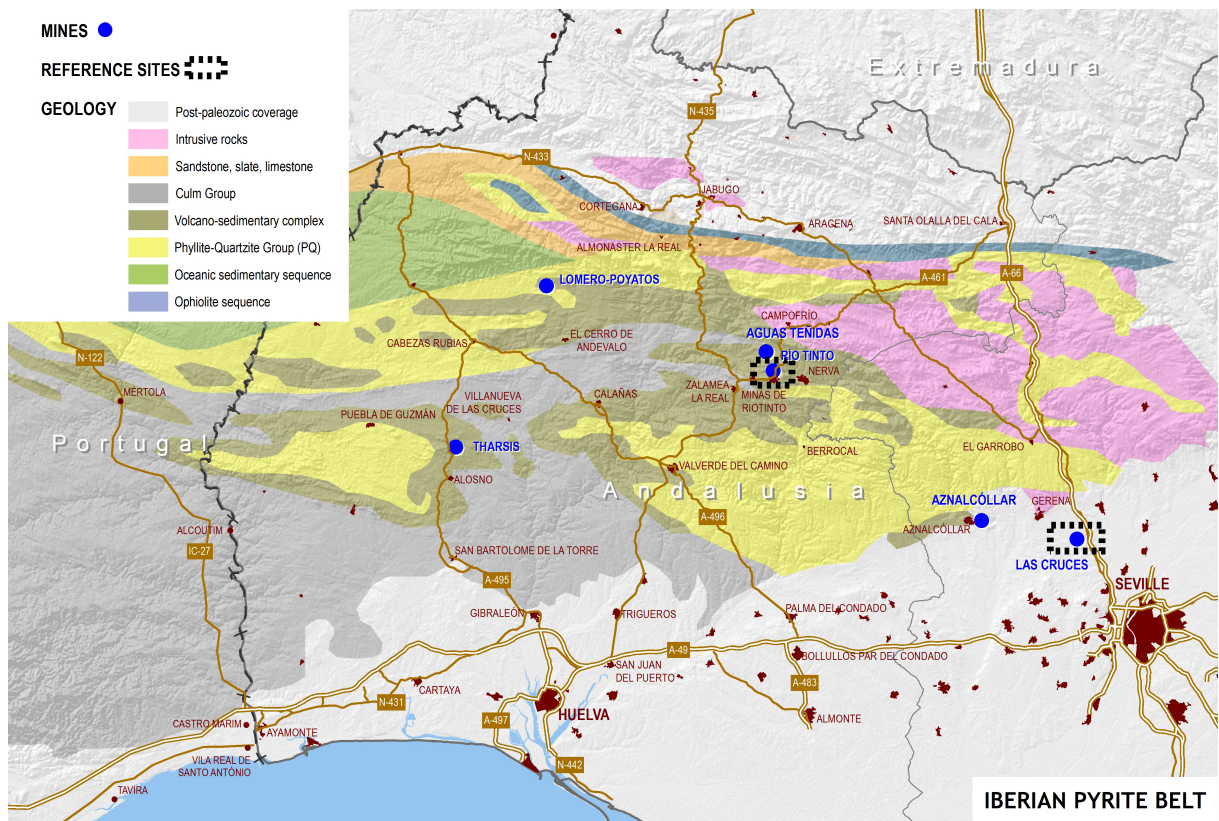


Figure 12: Iberian Pyrite Belt and reference sites situation

- Rio Tinto Mines is one of the most famous mining districts in the world for the size of the mineralization and for its intense history: it has been worked discontinuously for about 5000 years by the Tartessians, Phoenicians, Romans, Arabs, British and Spanish. The high geological

interest of this mining district is because it is most probably the biggest Sulphur anomaly on the Earth's crust, with original tonnages around the 2500 million tons of mineralized rock in different degrees. A fifth of it was massive sulphides with an average content of 45% S, 40% Fe, 0.9% Cu, 2.1% Zn, 0.8% Pb, 0.5 g/t Au and 26 g/t Ag (García Palomero, 1992).

The Las Cruces deposit is located at the eastern margin of the Iberian Pyrite Belt, beneath the Neogene-Quaternary deposits of the Guadalquivir Basin. These sediments covered and preserved the supergene profile somewhat after its generation until its recent discovering. For this reason, the Las Cruces ore deposits, together with Lagoa Salgada in Portugal, are the only known deposits in the Iberian Pyrite Belt that preserve the entire weathering profile, including both the gossan and the enrichment zone. The primary mineralization consists of massive and semi-massive polymetallic sulfides overlaying a cupriferous and pyritic stockwork. The supergene enrichment extends from the primary zone to gossan and consists of a thick cementation zone characterized by intense replacement of part of the primary sulfides by Cu-rich supergene sulfides (Yesares, 2015).

3.4.2 Socioeconomic context and mining history

The lack of literature specifically concerning mineral exploration is mainly a result of the critical situation experienced by the Spanish mining sector in the last decades (Cueto Alonso 2016, Berumen 2012, Junta de Andalucía 2013, Junta de Andalucía 2013b, C3IT 2013). The location of mining activity in certain areas of the country led to it becoming the main and almost sole economic activity in these regions, known as "comarcas mineras". As it will be exposed, the decline and crisis at the end of the XXth century due to the fall of raw material prices entailed the closure of the mines and the emergence of multiple social, economic and demographic problems. It affected local communities deeply, whose members felt it was the end of this model of regional development. Migration to urban or industrial areas ensued. Indeed, this vision was shared by local and subnational authorities. Only in recent times alternative models have been implemented to create present and future growth in these regions (Cueto Alonso 2016, Junta de Andalucía 2013, Junta de Andalucía 2013b, C3IT 2013, Solá et al. 2009).

This socio-economic context means that social sciences research on the Spanish mining sector focuses on emigration from the mining regions, the psychological footprint on resident citizens, the employment and subsidies crisis, the return to traditional economic activities and the undertaking of new economic activities such as mining tourism. The potential revival of the mining sector is not taken into account. The idea of mining as a residual economic sector is widely spread among Spanish academics. As a result, new mining experiences in Spain and Europe are happening unnoticed by the social sciences field, only being partially analysed from a CSR point of view (Corporate Social Responsibility) (Botín 2009). However, the actual perception of mining in Spain clashes with the historic relevance of the sector.

In the Iberian Peninsula, the first complex surface and underground metallic mines with archaeological evidences date back to the Chalcolithic period (Carrasco Martiáñez 2000, Vidal 2012). This mining activity was located mainly in the Iberian Pyrite Belt, where the Spanish reference sites are defined. Indeed, the oldest one, El Chiflón copper mine in Huelva, functioning between 2830 and 1890 B.C., is only 10 kilometres away from Riotinto (Vidal 2012). Mining activity in this region has been developed almost incessantly since then.

The Romanization of the Iberian Peninsula led to an expansion and intensification of the mining activity through all the territory, thanks to the abundance of gold, silver, copper, tin, iron and lead, among others (Carrasco Martiáñez 2000). The main ore fields were explored and identified in this era, establishing the mining territories. After the fall of the Roman Empire, mining activity experienced a period of long decay until the 17th century due to the end of the slave-based economy, political instability in the Peninsula and lack of technical, logistical and cultural knowledge necessary to meet the requirements of mining activity (Carrasco Martiáñez 2000). The colonization of America drove

mining and mineral exploration overseas. Only the most accessible or lucrative mines, such as iron and mercury ores, held a constant level of activity in the Peninsula.

Spanish mining activity reactivated timidly during the 17th century with the rediscovery of numerous forgotten mining fields (Carrasco Martiáñez 2000). In 1624 the Junta de Minas (royal mining agency) was constituted to enhance mineral exploration, which was driven by private initiatives and adventurers. In 1725 Liberto Wolters, a Swedish citizen resident in Spain, requested an exploration license for copper mining in Riotinto and its surroundings (Carrasco Martiáñez 2000). It was the seed for modern mineral exploration in the Iberian Pyrite Belt and the Spanish reference sites.

At the beginning of the 19th century the mining sector became an engine for economic growth. Spain was going through a deep internal crisis due to the Napoleonic Wars and the Spanish American Wars of Independence at the time, and found a way to recover prosperity in the supply of raw materials to industrialised European countries (Cueto Alonso 2016, Fernandez Mateo 2015). Mining activity was conducted by both national and foreign companies. British industry was the main target, followed by the French and German markets. In 1880, Spain was one of the main producers of lead, pyrite, copper and zinc in Europe (Carrasco Martiáñez 2000, Cueto Alonso 2016). To reduce social unrest in mining regions, companies developed a closed, stratified and self-sustained community model in which social privileges were dependant on the role and behaviour inside the company (Carrasco Martiáñez 2000).

In the Iberian Pyrite Belt mining activity was based around small national associations and adventurers operating on copper and pyrites ores, but this situation changed between 1870 and 1875 with the acquisition of the mines by transnational companies (Carrasco Martiáñez 2000). British and French entrepreneurs, linked to the incipient chemical industry, where the main buyers. The Tharsis Sulphur & Copper Co. Ltd and The Rio Tinto Company Ltd., key companies in the region, were founded in 1866 and 1873 respectively (Carrasco Martiáñez 2000). The mining boom in the region was so intense that by the end of the century Huelva was known in Europe as “Copper’s California”, its port became the second most important cargo port in Spain, more than 1.000 kilometres of railways were built in the region and 90% of acid produced in England came from Iberian pyrite (Carrasco Martiáñez 2000).

Environmentally, the consequences were disastrous: a huge area was deforested and soil, water bodies and the atmosphere were polluted in a way that can still be felt today. A dense cloud of toxic gases from calcination and roasting locally known as “La Manta” (The Blanket) covered the sky day and night. Most of the population not linked to mining activities migrated due to the high mortality rate and the destruction of croplands, forests and grasslands (Carrasco Martiáñez 2000). It is estimated that more than 500 metric tons of sulphurous and arsenic gases were emitted daily in Riotinto only. In February 1888 a massive demonstration against roasting and calcination considered the first environmental public protest in Spain, took place in Minas de Riotinto (Carrasco Martiáñez 2000). It was brutally suppressed. During that year the region experienced popular unrest, which led to the abolition of such deadly metallurgic techniques. Its memory is still present in the region, the year 1888 being known even today as “Año de los Tiros” (Year of the Gunshots).

During the first decades of the 20th century, the Spanish mining sector kept growing and experienced a renovation of the infrastructure and techniques and the testing of new mining methods. Annual production of Spanish pyrite in these years is estimated to represent between 50% and 60% of worldwide production, while copper was just 8% and iron 3% (Carrasco Martiáñez 2000, Cueto Alonso 2016). The Spanish Civil War (1936-1939) and the autarchic policies of the dictatorship that followed put an end to all that. Mining production was nationalised with the Mining Law of 1944 (Carrasco Martiáñez 2000, Cueto Alonso 2016). Mining activity became relevant again with the opening of Spain to international markets in the 1960s, but not at the same level it had enjoyed at the beginning of the century (Carrasco Martiáñez 2000, Cueto Alonso 2016). The 1986 Oil Glut deeply affected the mining sector, entailing the closure of many companies and resulting in the decay of the Spanish mining sector. The situation was dire due to the debt incurred by the companies throughout the 1970s and 1980s in order to renovate infrastructure and techniques in an effort to adapt them to the new global

needs, and at the same time developing old mining fields (Carrasco Martiáñez 2000, Cueto Alonso 2016). Many mining regions have not recovered since.

The Iberian Pyrite Belt employed a fifth of the Spanish mine workers during the first decades of the 20th century (Carrasco Martiáñez 2000). The competition between the Tharsis Sulphur & Copper Co. Ltd and the Río Tinto Company Ltd determined the development of the region. However, after WW1 they signed a collaboration agreement to establish a production quota and to absorb the other companies in the region, motivated by fears of an international recession (Carrasco Martiáñez 2000). These policies caused one of the toughest strikes in Spanish history, but the duopoly was successfully established. During the dictatorship, the nationalization of the mining sector implied these two companies had to transfer many mining fields to Spanish companies. At the end, both companies were partially intervened. To get over the 1986 Oil Glut, Río Tinto Minera S.A. (formerly The Río Tinto Company Ltd) changed its production from copper to gold and silver and Compañía Española de Azufre y Cobre de Tharsis, S.A. (formerly The Tharsis Sulphur & Copper Co. Ltd) survived as the only raw pyrite producer (Carrasco Martiáñez 2000). The polymetallic ores of the Iberian Pyrite Belt were crucial for the continuation of the mining activity in the region, despite collective layoffs and the fact that the sector has never recovered the situation it enjoyed at the beginning of the century.

The reputation of mining in Spain was at a minimum at the end of the 20th century, due to its own crisis and the high rate of fatal accidents, so distrust in mining companies and public control over them grew among Spaniards (Carrasco Martiáñez 2000, Cueto Alonso 2016). Between 1970 and 1999 at least 7 fatal mining accidents happened, with a total death toll of 122. In 1998 the Aznalcóllar Disaster occurred, the worst environmental catastrophe in current times: a holding dam of the Iberian Pyrite Belt burst and released 6 million cubic meters of mine tailings, toxic muds and acid waters, rich in heavy metals, into the Guadiamar River and the Doñana National Park, one of the main wetlands in Europe.

3.4.3 Mining reputation in Spain

3.4.3.1 Mining and mineral exploration reputation at a national level

As it has been mentioned previously, no specific studies on this topic have been conducted in Spain. However, among the analysed literature, an opinion survey conducted in 2014 for ACIEP stands out (fossil fuel research, exploration, production and storage Spanish companies association). Whilst it does not belong to the metallic mining sector, it is the only publication in Spain that studies the social perception of subsurface resources exploration (SIGMADOS, 2014).

The survey registers a positive attitude towards fossil fuel exploration (60.9% of the participants). It is conditioned to the goal of reducing external economic dependence. The support to exploration is higher among the elders and young adults (67.8% of participants over 65 years old and 64.1% under 29 years old). The public administration is considered the main reason for the lack of exploration initiatives (31.8%) followed by the environmental risks (30.0%) and its low profitability (25.5%). However, the disagreement grows when exploration is conceived in the region inhabited by the participants (support decreases to 44.6%) essentially because it could impact negatively on other economic sectors in the region: 62.4% of the participants expressed that fear despite half of them recognising the economic advantages linked to employment creation and industrial development. Thus, a NIMBY effect (“Not in my backyard”) is confirmed. It is higher among young adults: only 38.6% of them support fossil fuel exploration in their region.

The survey also reveals that Spanish citizens do not value positively or negatively the impact of fossil fuel exploration and production on different aspects of Spanish society like economic growth, employment creation, social development or the increase in the quality of life. Indeed, despite most of the participants believing it is a profitable activity, 4 in 10 of them are sure it will not benefit the country in the long-term.

The methodology of the survey was a structured questionnaire carried out through phone interviews for a sample of 1000 adult participants at a national level. Maximum error for global data was $\pm 3.16\%$ for a confidence of 95.5% (two sigma) and $p/q=50/50$.

Fossil fuel exploration is comparable to mineral exploration not from a technical point of view, but from its social perception as a preliminary stage on the production of subsurface resources of high economic value with high environmental and social risks. It can be concluded that its reputation in Spain is positive, but not positive enough to be supported if performed in the region inhabited by the participants. The survey does not explore further the reasons driving this disagreement.

3.4.3.2 Mining and mineral exploration reputation at a regional level

Scarce studies have been conducted at a regional level in Spain on attitudes towards mineral exploration or mining activity as a whole. Public acceptance is deduced in most of the literature analysed through direct contact with local population, extrapolation of widespread public opinion or other general essays on the topic. Regional studies have been mainly conducted on existing mining areas, not in potential ones. Besides, they do not differentiate between mineral exploration and other mining activities.

A positive attitude towards mining is observed in mining regions (Ruiz Martín 2010, Berumen 2012, Berumen 2016, Junta de Andalucía 2013b, Navarrete Lorenzo et al. 2000, Escalera Reyes and Valcuende del Río 1995). This reputation is linked to the local history and traditions, the cultural identity of the individuals and communities, the actual or expected employment opportunities and the development of infrastructure and equipment, especially public services, in the region thanks to the mining activity. On the contrary, mining reputation deteriorates when impacts on the environment or on other traditional activities are considered. Also, the risk of a new decay of the mining sector concerns many of the inhabitants. As a whole, the revitalization of the mining sector in mining regions is highly valued (Ruiz Martín 2010, Berumen 2012, Junta de Andalucía 2013b, Navarrete Lorenzo et al. 2000).

Among the studies analysed, an exhaustive quantitative study on mining public perception in the mining region of Alto Guadiato (near to the Spanish reference sites) is significant (Ruiz Martín 2010). It considers many variables that are relevant to mining reputation. Its proximity to the reference sites makes its conclusions useful because both territories share common social, natural and economic characteristics, despite the fact that mining in Alto Guadiato is mainly focused on coal.

The study was conducted through surveys among the local population and interviews of relevant persons linked to the territory. It reveals a positive attitude towards mining (63.6% of support among the participants on the surveys and 68.1% between the people interviewed). The figures are even higher when considering regional mining activity (79.2% and 89.6%, respectively). A potential revitalization of the local mining sector is widely supported (94.9% and 95.7%) because the participants perceived it could launch regional economic growth and solve social and economic problems.

Regional mining is only perceived to have a negative impact on the environment (57.8% and 77.1%) and agriculture (45.3% and 58.1%). It is considered positive over other aspects of economic (industry, services sector, employment) and social nature (education, health services, infrastructure, public services, leisure, sports, housing, religiousness and other societies and quality of life). Participants also considered that the mining sector is poorly treated by media and public administration.

Table 2. Perceptions on mining sector in Alto Guadiato mining region (Ruiz Martín, 2010)

Mining impact on:	Positive opinions	
	Surveys (%)	Interviews (%)
Agriculture	54.7	41.9
Industry	85.4	93.5
Services sector	92.9	97.9
Education	81.7	95.7
Health service	68.0	87.0
Infrastructure	84.4	91.7
Other public services	86.9	95.5
Environment	42.2	22.9
Leisure and quality of life	75.2	91.5
Sports	64.6	93.2
Social services and employment	85.0	93.8
Housing	78.0	85.1
Religiousness	52.6	60.0
Associations	73.2	88.9
Valuation of:		
Public image of mining	63.6	68.1
Media coverage	48.8	30.4
Public administration treatment	46.4	31.8
Mining jobs	73.7	79.2
Environmental impacts	35.2	22.2
Mines restoration	68.0	61.7
Regional mining	79.2	89.6
Image of miners	86.8	93.8
Mining revitalization	94.9	95.7
Economic effects of revitalization	95.3	-
Social effects of revitalization	95.1	-
Global valuation of mining	93.2	-

In the event of a potential mining revitalization in the region, the most valued variables are its capacity to generate economic growth (36.9% of participants in the survey and 37.5% of interviewees considered it the main positive effect), its integration of occupational safety (18.9% and 15.9%) and the remuneration of workers (16.9% and 20.5%). The type of mining (surface and underground) and the later restoration projects are not relevant. On the contrary, the most rejected variables are hazard risks (49.0% and 33.0%) and environmental impacts (27.3% and 22.7%). Despite the positive attitude towards mining in the region, there is a lack of knowledge about the way the sector operates. Many of the participants and interviewees are unaware of the role of raw materials in the economy and their daily consumption.

The methodology of the study was a structured questionnaire conducted, on the one hand, by a set of interviews with 48 relevant persons linked to the territory not necessarily belonging to the mining sector, and on the other hand, by direct surveys on a sample of 413 adult participants selected by quotas for a universe of 13.550 elements. Maximum error for global data was $\pm 4.8\%$ for a confidence of 95.48% (two sigma).

In conclusion, mining reputation in Alto Guadiato region is high thanks to its positive impact on diverse social and economic regional aspects, and low when it comes to environmental aspects. The potential

benefits of a revitalization of local mining sector, provided that it covers particular needs related to wealth generation and employment quality, outstand the environmental concerns.

Similar conclusions can be inferred from the other pieces of literature analysed, despite them not being quantified, and they may be extendable to the Spanish reference sites.

3.4.3.3 Comparison of mining and mineral exploration reputation between national and regional level

Mining activities have a slightly positive reputation in Spain due to its capacity to create employment, wealth and infrastructure in areas where other economic sectors are not as profitable, despite the negative impacts on the environment. However, public opinion is not properly informed. Spaniards are not fully aware of the role of mining in national economy and the daily dependence on raw materials.

This aprioristic positive attitude towards mining turns negative at a national level when the location of mining is considered: a clear NIMBY effect occurs. Both the environmental risks and the potential impact on public health condition the opposition to mining in the areas populated by the citizens. This perception is totally opposite to the predisposition observed in mining areas to accommodate new mining initiatives, even at the expense of quality of life. As it has been shown previously, approximately 45% of Spaniards will support mineral exploration in their region meanwhile 95% of citizens inhabiting mining regions value positively a revitalization of the sector in their area.

Mineral exploration reputation in Spain is dichotomist. It is highly dependent on the historical integration of mining sector in the economy and society of the territory where it is expected to happen.

3.4.3.4 Key aspects of mining and mineral exploration reputation in Spain

The reputation analysis conducted is based on “key aspects”, identified as economic, political, social, cultural, territorial and environmental aspects that condition the social acceptance of mining and mineral exploration. It is necessary to point out that this reputation analysis is based on scientific literature that is limited, partial, mainly qualitative and with scarce territorial representation.

Table 3. Key aspects regarding mining reputation.

Key aspects regarding reputation of mineral exploration	Level of knowledge level mineral exploration
	Differences between the areas of mining tradition and new areas of exploration
	Assessment of socioeconomic aspects, property of the land and rights over it
	Assessment of environmental impacts
	Public nuisance and social perception of risk
Key aspects regarding reputation of mining	Assessment of public action and regulation with respect to mining
	Perception of the mining industry and mining companies
	Perception of mining according to its type and the produced raw materials
	Importance of local and regional socioeconomic context
	Assessment of environmental impacts
	Assessment of social and health issues
	Importance of regional cultural context
	Territorial integration of mining
Importance of mining history in the region and consequences of past accidents	

In relation to the “key aspects” of the reputation of mineral exploration in Spain, the characterization of its factors may be described as follows:

- Level of knowledge about mineral exploration: *Very low*. In the analysed studies, no distinction is made between exploration and production, the former being considered a preceding stage intrinsic to the latter. Mineral exploration is not conceived without a subsequent extraction of materials. At a technological level, no study examines in detail the diversity of existing techniques. To that we have to add the lack of collective consciousness with regards to mining activity in general.
- Differences between areas of mining tradition and new areas of exploration: *High*. It can be observed that a higher social acceptance of exploration is found in areas with mining tradition, as a first step in the consolidation of new projects that revitalize the zone. On the contrary, the mention of exploration in new areas may generate opposition, especially among middle age people, because it is associated with a high probability of the imminent establishment of a mine in the area, with the dangers that they perceive it entails.
- Assessment of socioeconomic aspects, property of the land and rights over it: *Mixed*. The ownership of the land for exploration and the rights attached to it are not a conflictive aspect analysed in the literature, not even in mining regions where knowledge about mining is higher. However, there are other socioeconomic aspects of great interest for the inhabitants of the explored territory, such as the contracting of regional companies, the employment created by the project, the indirect economic impact over the industry, services and primary sector, the inflow of new capital in the region, the renovation of infrastructure and public facilities and the gain or loss in quality of life among others.
- Assessment of environmental impacts: *High*. Given that citizens associate mineral exploration to mining production, concerns about the latter, due to the expected environmental deterioration, may be projected over the former. Environmental impacts generate a negative opinion of mining even in mining regions, which as a whole perceive this sector very favourably. Environmental impacts cause two types of concern: one is the irreversible alteration of the inhabited landscape, the other is the effects of potential pollution on animals’ health, crops, water, and air, which could result in health problems for the population.
- Public nuisance and social perception of risk: *High*. Exploration projects are conceived by the citizens as a phase within a mining project that will eventually take place in the area, with all the economic, employment, social and environmental consequences that it entails. Exploration generates expectations and fears, that become support or opposition as the belief that citizen participation can influence an imminent mining project becomes widespread.

With regards to the reputation of mining as a whole, the characterization of its “key aspects” in Spain is described as follows:

- Assessment of public action and regulation with respect to mining: *Low*. At a national level it is perceived that the administration does not get involved enough in the management of mining, while at a regional level, in a mining region, it is perceived that the administration does not treat the mining sector well. People distrust its work. This is increased by the demands from experts and collectives involved in a reform of the existing legal framework, in place since 1974.
- Perception of the mining industry and mining companies: *Moderated*. Even though mining companies enjoy a good reputation in the mining regions, at a national level there is certain suspicion that the benefits of their activity will not contribute to the national economy. In general, there is little awareness on how the mining sector works.

- Perception of mining according to its type and the produced raw materials: *Low*. Most of the literature does not make distinctions according to the type of the material or the methods of extraction, and treats coal, uranium or metal mines equally. The only work that attempts to explore this topic, regarding whether acceptance changes between an open-pit mine or an underground mine, was conducted by Ruiz Martín in 2010, who observed that, in the studied mining region, there is a slight preference for open-pit mines.
- Importance of local and regional socioeconomic context: *High*. The socioeconomic context is crucial for the acceptance or rejection of the mining activity in the region. Citizens value the expectation about the quality and remuneration of employment, the training possibilities, the direct and indirect economic impact in other regional economic activities, the inflow of new capital in the region, the investment in infrastructure and facilities, the effects on health, and in general, everything that affects their quality of life. A vulnerable, marginal or depressed socioeconomic context is more prone to accept mining than a different context in which other activities, unrelated or incompatible, prevail.
- Assessment of environmental impacts: *High*. The environment is one of the main causes of the opposition to mining, both because of the alteration of the land and regional landscape and because of the increase of potential pollution and health problems of the population. Nonetheless, the restoration of the environment is not usually valued by citizens, which focus their concerns in the conservation of the current environment.
- Assessment of social and health issues: *Moderate*. Mining is not perceived as a threat to public health, despite the history of the sector. However, occupational safety and health are important when valuing mining revitalization projects, as is hazard prevention.
- Importance of regional cultural context: *High*. As discussed in previous points, in Spain mining tradition is the defining aspect when it comes to the acceptance of mining activities in a region. In fact, in such regions there is a strong push to revitalize the sector and to implement new initiatives. In fact, in those regions identity is strongly related to mining.
- Territorial integration of mining: *High*. Both at the national and at the regional level, it is demanded that mining activity integrates with the socioeconomic context of the place where it will take place, developing initiatives that allow it to have a significant influence in the region, apart from the jobs and investment strictly related to the sector. In those areas that value it positively, mining is perceived as a crucial element of the region and is widely supported.
- Importance of mining history in the region and consequences of past accidents: *Mixed*. Just like mining cultural identity, in Spain the mining history of a region operates reinforcing the positive perception of the industry. However, recession periods have not been forgotten and the memories are fresh, so the population of the mining regions expects new mining projects not to lead the region into the same situations of crisis of the past. On the contrary, past accidents are not identified as a relevant variable in the literature, so their importance is not so high in the mining reputation (although this perception should not be necessarily similar when analysing media, which is not subject of this report).

3.5 Other countries

During the literature research other countries have been identified as relevant for understanding mining and mineral exploration reputation at a national level in the three reference countries (as it has been highlighted with Sweden in Finland's country report and Austria in Germany's country report). The analysis of this literature also includes the main studies at a global level.

3.5.1 Worldwide

The main study done at a global level belongs to the gold mining industry. The findings are distilled from the "ICMM 2017 Industry Stakeholders Opinion Survey" and "The Gold Mining Industry: Reputation & Issues - A Survey of Senior Stakeholders & Opinion Formers" Author: GlobeScan. For the last one the World Gold Council commissioned the contractor GlobeScan to conduct a study of the perception of global stakeholders of the gold mining industry, as well as identifying the industry's present and future. The core aim of this expert stakeholder review was to identify and understand "the perceptions of gold mining companies, current and future issues facing the gold mining industry and how to continue to make progress towards a more sustainable industry".

This survey is based on research conducted in 2013 when telephone interviews were conducted with nearly 170 senior stakeholders and opinion formers across twelve countries. In total seven stakeholder groups were conducted. Additional exhaustive, qualitative interviews were conducted with 20 of the respondents in order to gain further insights.

The overarching purpose of one assignment was to empower ICMM (International Council on Mining & Metals) to refine its understanding of the perceptions towards the mining and metal industry, and towards ICMM and its mandate amongst its key stakeholders.

Stakeholder groups invited to participate on the first study were from the private sector, public sector, academia, trade associations, non-governmental organizations and media.

The surveyed stakeholders show a very good level of familiarity with the mining and metals industry and its issues (62% "very familiar"). They largely acknowledge that this is a beneficial economic activity for society notwithstanding its impacts that need to be mitigated through regulation and scrutiny:

- The vast majority of stakeholders (almost 90%) believe the sector considers social and environmental factors as important in their decision-making (others, less important are health and safety, responsible production, employee treatment).
- The key challenge for the gold mining industry today, according to stakeholders, is managing community issues and environmental impacts.
- Ten years from now, the leading gold mining companies will need to be environmentally responsible and respectful of local communities.
- Performance of large scale mining companies considering different issues: how well large-scale gold mining companies perform on a range of different issues. Over half of the respondents gave positive performance ratings on working conditions, employment of local people and provision of competitive wages. Large-scale industry performance on safety, HR management, technology, and economic contribution is recognized by stakeholders. Areas of weakness relate to environmental management, community engagement and addressing artisanal and small-scale mining issues.
- The industry's provision of essential commodities for everyday products is by far the greatest perceived potential benefit of mining to the development of thriving and sustainable economies.

- The overall economic development impact is also a very clear benefit, as witnessed by the perceived importance of the current contributions to national host economies.
- These are seen through support to building or improving industrial infrastructure, the impact on employment creation within the sector, and the impact on significantly growing national revenue for host countries through taxes.
- The localized impact of operations is felt to be less beneficial if stakeholders have to compare different value points. Contributions to community and local economic development, social investments, and support to youth professional development are areas where the expected benefit potential is seen to be more moderate.
- The industry's benefit impact is expected to be very limited for long-term, localized, sustainability activities, such as mine reclamation, ensuring social and economic development of communities post closure, or support for sustainable local agriculture. The ability to drive equitable sharing of benefits from mining across society, or to reduce inequality near mine sites, is also not seen as a strong value point for the industry. It is also noteworthy that philanthropic contributions to charities, and support for good causes, are not considered a strong benefit point.

3.5.2 Australia

Mining in Australia has long been, and continues to be, a significant contributor to the Australian economy. The findings are based on two studies "Australian attitudes toward mining - Citizen Survey - 2014 Results" (Moffat, Zhang & Boughen) and "A balancing act: The role of benefits, impacts and confidence in governance in predicting acceptance of mining in Australia" (Zhang & Moffat).

The first one is the reference study written in mining reputation worldwide. Many others works on attitudes towards mining are based on it, such as the Finnish and Chilean studies. The report summarizes the key findings from a survey in which 121 Australians were asked about their attitudes toward the mining industry. The data was collected in two blocks, at the end of 2013 and in the first quarter of 2014.

Overall, mining was viewed as a central and significant contributor to Australia's economy and standard of living, a 'necessary' industry for Australia, and being important to Australia's future prosperity. It was found that people living in mining regions believed more strongly that mining was important to Australia's economy, standard of living, and way of life, although those in metropolitan areas most strongly believed that mining would support Australia's future prosperity.

While Australians felt mining was important for Australia, they were also concerned that Australia as a country, and their communities more specifically, were too dependent on mining.

The key findings on this study are:

- Dependence. Respondents felt the country as a whole was more dependent on mining than the communities they lived in. This pattern was less exaggerated for those living in mining regions who reported significantly higher levels of community dependency than those in non-mining regions or metropolitan areas.
- Creation of jobs. For Australians, it was the most important perceived benefit amongst respondents.
- Infrastructure development. The next strongest ratings around benefits related to improvements in infrastructure (transport, social, and communication and information technology) in regional Australia as a result of mining activity.

- Personal benefits. Whilst mining associated benefits at a national and regional level were rated quite positively, responses to ‘personal’ benefits were not as positive. Benefits in terms of personal and family financial benefit from mining were both rated quite low.
- Mining and community. When asked about their level of satisfaction with living in their community, participants from all regions responded quite positively, however participants living in mining regions reported a significantly higher level of satisfaction than those living in metropolitan areas.
- Negative impact perception. In general, the impacts on the manufacturing sector and tourism and retail sectors were perceived to be low, but impacts on the agriculture sector were perceived to be much higher. There was also moderate agreement, that mining has a negative impact on the health of local communities, while the impacts on cost of living and effects on housing costs were rated quite low overall. For those living in mining regions, however, these impacts were rated significantly more strongly than by those in non-mining regions and metropolitan areas.
- Fairness, Faith in Governance and Trust. Overall, people were not strongly of the view that the economic benefits of mining are distributed fairly, with the average rating across the whole sample below the midpoint of the scale used.
- Involvement of decisions. They were also asked to rate the extent to which people in Australia have opportunities to participate in decisions about mining on a scale from 1 (not at all) to 7 (very much so). Responses overall were around the midpoint of the scale (M = 4.10), with no significant differences between the three areas.
- Efficacy. Participants felt that the mining industry listened to and respected community opinions more than state and federal governments did. Second, those in metropolitan areas felt more heard and respected by industry and governments than those in mining and non-mining regions. One target was to examine, if the people are thinking, that the mining industry is doing the ‘right thing’. Finally, there was a very strong sentiment regarding the need to gain the consent of local communities and Indigenous communities before mining development takes place.
- Trust. People were asked to rate their level of trust on a scale from 1 to 5 in a range of important actors in the mining industry in Australia: the mining industry, state government, federal government, and non-government organizations (NGOs). First NGOs were most trusted, with industry second, followed by federal and state governments.

The second study comprises, indeed, two separate studies. Study 1 was performed on a smaller sample (N=210) and Study 2 was performed on a much larger population sample (N=2590). In study 1, an initial sample of 257 people viewed the link and the survey completion rate was 81.7%. Among the final sample of 210 participants, 103 were males (49%) and 107 were females (51%). All responses were provided on seven-point The Likert scale was used, ranging from 1 (strongly disagree) to 7 (strongly agree) unless stated otherwise. For multiple-item measurement, the average score was used to represent the value of the measured variable. On study 2, an initial sample of 3319 people viewed the link, of which 2590 completed the survey (78.04% completion rate). Among the final sample of 2590 participants, 1196 were males (46.2%) and 1394 were females (53.8%), with a mean age of 47 years (ranging from 18 to 86).

Their findings demonstrated that public's acceptance was at the highest when they perceived low environmental impact coupled with a perception of strong governance. Citizens also expect, that the legislative and regulatory processes that are in place to protect the environment reflect their interests and values alongside the need to develop mineral and energy endowments for economic benefit.

Australia has a long history of mining, which indicates that there is a more mature governance system in place and developed public understanding of mining. The key findings on this study are:

- It was proposed that when benefits outweighed costs, people would be more likely to accept mining.
- Furthermore, it was suggested that perceptions of governance strength would moderate the relationship between environmental costs and acceptance of mining. In particular, in relation to the effect of perceived environmental impact of mining, if people perceived stronger regulatory and legislative capacity in holding the mining industry accountable, they would be more likely to accept mining compared to those who perceived weaker governance.
- It perceived benefits of mining in general wealth, infrastructure, and employment were positively related to acceptance of mining, and perceived negative impacts of mining on living cost, other industries, and environment were negatively associated with acceptance of mining.
- The balance of benefits over costs played an important role in people's attitudes towards mining. The more people believed that the benefits of mining outweighed the costs, the more likely they were to accept mining.
- When regulatory and legislative systems were perceived to be strong and capable of holding the mining industry accountable, people were more willing to accept mining regardless of the levels of perceived environmental impact.

3.5.2.1 Comparison of mining between Australia and Germany

To understand the existing disparities between Australia and Europe, Germany has been selected as the reference country to describe the similarities and differences. Challenges arise when comparing small or medium sized European countries, in this exercise the densely populated Germany, with scarcely populated large countries with a different provision of ground resources such as Australia. Yet, Australia proves to be a very promising source of knowledge on research on public attitudes towards mining.

This is best illustrated in a brief analysis of some aspects related to the comparison of the total work force and the people employed in mining in both countries.

In Australia, mining is a topic that is often on the political agenda, as the country is aware of its status as “the world's largest exporter of coal, iron ore, bauxite, alumina, lead, and zinc” and “is also a leading exporter of uranium, diamonds, gold, copper, nickel, and liquid natural gas”¹. Mining is said to be one of the major industries of the Australian economy, with investments of more than \$260 billion in 2018². In Australia there are currently 173.388 people employed in the mining sector³ – in comparison, in 2015 in Germany the number of people employed in the mining industry was only 57.177⁴.

In Australia there are more chances for a set of sample citizens to actually have been in touch with mining issues or to come across topics related to it in the future.

In Germany the general public is less often confronted with the mining industry, also the resources in Germany differ greatly from the resources excavated in Australia. Whilst coal, which is a prominent

¹ <http://www.prepareforaustralia.com.au/employment-australia/industry-reports/mining-oil-gas.aspx>, accessed on March 12th, 2018.

² Ebd.

³ <http://www.abs.gov.au/ausstats/abs@.nsf/mf/8415.0>, accessed on March 12th, 2018.

⁴ https://www.bmwi.de/Redaktion/DE/Publikationen/Energie/Bergbaustatistiken/bergbau-in-der-brd-bergwirtschaft-statistik-2015.pdf?__blob=publicationFile&v=5, accessed on March 12th, 2018.

resource in Germany, is regarded rather critically concerning health and environment, gold and other metals as mined in Australia hold a bigger promise of wealth attached to the exploration activities.

Australia's strong engagement with mining and mining activities is also the reason why there is more research conducted on public attitudes and communication with the public. There is another aspect which lies in Australia's cultural background: Australia's growing culture of incorporating concerns of indigenous Australian population into the national agenda aimed at making up for past shortcomings of colonial Australia.

Australia, having a comparatively large amount of people working in the mining sector (over twice as much as Germany) as implied by the graphs above, serves as a very good model to consider. The studies conducted by Moffat et al. (2014) also hold the densest information on public attitudes towards the mining sector.

All these aspects make Australia a very fruitful source of material concerning how to incorporate the general public and how to mediate between industry and concerned members of the public.

- The benefits must outweigh the risks. In their research Moffat et al. (2014) have also introduced a very basic, yet very useful, rule stating that mining activities are very likely to be tolerated and/ or received with a positive local response as long as the perceived benefits outweigh the perceived risks. There are different benefits that can be communicated and enforced, such as prosperity for the region and the individual (employment, increased wages, better infrastructure, technology and communication), as well as more general perceived benefits such as the independence from external resources and a thriving economy. On an individual level, higher wages in mining regions seem to meet high approval rates for mining activities.
- Unaffected but critical. One of the most surprising key findings throughout this research is the fact that people living in a mining area have predominantly less negative attitudes towards mining than people not previously affected by mining at all. This becomes especially important when new sites are to be established or mining-related activities in previously non-mining areas must be conducted. Here we see a big responsibility with the communication of such research. When people know about other people living in mining regions and are exposed to their experiences, they may change their attitudes. The phenomenon of fearing the unknown is well known in stakeholder engagement research and the studies have found various means employed by mediators that work against it. Australia, as a result of a mature mining industry and significant work force, shows generally more public awareness than Germany.
- Engaging stakeholder – key measures. Even though the focus points of the studies vary as well as the factual conditions of the individual countries addressed in these studies, there are core steps always to be considered when attempting to engage the public. Especially in planning, the phase where stakeholder engagement is most valuable and important, there is a set of key points that must be carefully taken into account. It is pivotal for the success of stakeholder engagement in the planning phase to, firstly, provide a clear, yet flexible agenda and a time-plan. Secondly, it is intrinsic to the success of such a project that background knowledge about a region or community is thoroughly considered and – if not available – gathered before any activities begin. Thirdly, it is crucial to create tailored approaches informed by cultural and historical factors as well as by the attitudes of the public and the main stakeholders. The fourth aspect is a willingness from the part of the decision-makers to conduct their activities in an open and transparent way and take particular note of the responsiveness of their activities incorporating the public and stakeholders into their steps and planning processes.

Mining activities will continue in the future, accelerated by the increasing need for resources in the technology sector (e.g. rare earths and metals), the construction industry, and also as a part of activities related to energy resource exploration. Thus public acceptance will always be an extremely

important part of mining activities as on a global scale more people are likely to be affected by it. State governments and municipalities have an interest in informing the public and having them on their side when facilitating mining activities. Especially the mining industry has a strong interest in cost-efficiency in their planning of new sites and activities, which makes it a consumer and gives it an active role in stakeholder engagement research and services. An increase of the research on how the public is best engaged in mining activities will result in an improved knowledge for new mine development. Furthermore, the results of this research can also be used generally considering the public's engagement and acceptance of new technologies and on-site industry activities. This research will be able to provide additional insights which will be instrumental for that future challenge.

3.5.3 South American countries

Mining reputation and attitudes towards mining are topics considered by American academics due to the relevance of mining sector in the national economies and the social unrest it generates. Below a few country situations are analysed to offer a broad overview of mining reputation in South America, especially in the Andean mountain range.

3.5.4 Chile

Among Latin American countries, the Chilean mining sector is the most studied from a reputation point of view among Latin American countries because of its global relevance. Recently a study on attitudes towards mining has been published by CSIRO (Moffat et al., 2014) with a methodology shared with studies on other Pacific countries (Australia and China) that allows a direct comparison among them. This study does not differentiate between mineral exploration and other mining activities.

This study concludes that mining acceptance in Chile is dependent on the perceived governance capacity of the public administration over the mining sector. The highest level of acceptance was found among those Chileans that felt mining had a low impact on the environment and had strong faith that the country's governments and legislation/regulation can ensure mining companies do the right thing (60% of positive valuations against 54.3% when the environmental impact is high). However, Chileans do reject mining when a weak governance capacity is perceived (48.5% of support with low environmental impacts and 45.7% when they are high).

Mining is considered as a key sector necessary for the country because it contributes to the increase of quality of life and the economic growth. This idea is present in both mining and non-mining regions, especially in metropolitan areas. It goes hand in hand with concerns of a high dependence on Chilean economy on the sector. However, the majority of participants in the study acknowledge that they are not well informed on how mining works (4.7 over 10, being 10 the maximum level of knowledge).

The main benefit perceived is the employment creation, followed by the empowering of women and young people (remarkably in mining regions), the building of new infrastructure and the widespread increase of wealth over the region. There is disparity if mining allows the empowering of indigenous people. Surprisingly, the participants do not identify any benefits in their own lives such as an improvement in their economic situation or a decrease in poverty in their community.

The main negative impacts perceived derived from mining are environmental (water and soil pollution, contribution to global warming, ecosystem destruction and abandon of agriculture) and social and health hazards (affection at public health, work accidents, expansion of HIV/AIDS among miners and the local community, increase of the cost of living and housing).

However, the study goes further into the trust in mining and reveals Chileans are suspicious of both mining companies and public governance due to corruption. Therefore, many citizens support the civilian control of mining activities to these perceived risks. Thus, in Chile reputation is not only

dependent on public governance but in transparency of both companies and public administration and justice.

The methodology of the study was a structured questionnaire done through face-to-face interviews for a sample of 1598 adult participants at a national level from 4 different regions to value mining regions, non-mining rural regions and metropolitan areas.

3.5.5 Peru, Ecuador and Bolivia

Studies at a national level have been conducted in Peru, but they are not as in-depth as those in Chile (Rottenbacher de Rojas and De la Cruz Sanchez 2011, Arellano marketing 2013 and others). They present a low mining reputation mainly due to a strong mistrust in the agreement reached between mining companies and local communities (it goes up to 80% of opposition of mining in some regions) and the low governance capacity perceived of public administrations. The environmental impacts are the main negative output perceived (70% of Peruvians living in mining regions) followed by corruption (38%), prostitution and crime (37%) and an increase of the cost of living (30%) (Vásquez Quispe, 2012). It also criticises the lack of engagement on the creation of employment, infrastructure and long-term sustainable alternatives to mining (less than 25% of Peruvians). In metropolitan areas this idea is shared, despite a higher number of people defending mining as an engine of growth for the country. As in the Chilean case, there is a strong dependence between mining reputation and governance capacity over the mining companies.

Studies on mining public opinion in Ecuador and Bolivia are focused on conflicts between local and indigenous communities and mining companies in areas of recent mining activity. No study at national level was found, neither specifically on reputation. The methodology of these studies is qualitative, based on fieldworks and direct interviews with the communities.

3.5.6 Colombia

A periodic survey is done in Colombia on attitudes towards mining jointly by the mining sector and the public administration, named Brújula Minera (Mining Compass). In 2017 the methodology consisted of a structured questionnaire done face-to-face, virtually and telephonically for a sample divided in 4 interest groups: 266 mining executives, 268 public authorities and civil servants, 161 opinion leaders linked to media, universities and NGOs and 2.400 citizens from mining and non-mining regions. Mineral exploration is not differentiated from other mining activities.

This study reveals Colombians perceived mining positively in the country (63% of participants from mining regions and 60% of those from non-mining regions) but experienced a NIMBY effect (when asked if the mining should happen in their inhabited regions, just 56% and 48% of the formers valued it positively). As in other American countries, there is an extended mistrust of mining companies (support is only 36% and 28%, respectively). This problem is also perceived from the mining sector and the public administration. Indeed, only 38% of executives and 21% of public authorities and servants believe the communication with local communities works properly.

Mining companies are seen by citizens as careless, untrustworthy, haughty, selfish and powerful. It is like this because mining sector and public administration have failed to revert the situations that lead to this mistrust: legal insecurity, low empowerment of local public supervisors agents and environmental authorities, undefined criteria for obtaining licenses to operate or delimiting mining areas, lack of coordination between companies and administration, low quality of infrastructure, informal traditional mining and illegal mining.

Therefore, the mining reputation in Colombia is similar to the Chilean case: the activity itself is positively valued for its contribution to economic prosperity and development of rural areas but the low public governance capacity of the mining sector generates mistrust.

4 KEY ASPECTS ON MINING AND MINERAL EXPLORATION REPUTATION

4.1 How is mining understood by citizens

Before considering how mining is publicly valued in the reference countries and the European Union, it is necessary to understand how citizens view mining activities in a broad context and what level of knowledge they have on this economic sector.

Firstly, it needs to be stated that public opinion does not differentiate between mineral exploration and other mining activities, even in specific studies about the former. People consider exploration as a preceding stage of mining production and link this activity with the impending opening of a mine.

Mining is considered a significant economic sector in Northern, Central and Southern Europe, while in Australia, Chile and other South American countries mining industry is viewed as a key sector for the prosperity of the country. People living in mining regions agree more strongly with this idea compared to citizens from non-mining and metropolitan areas, as can be seen in the European Union in Finland, Sweden, Austria and Spain. It is regarded similarly in Australia and Chile, where citizens from mining areas view it as a central sector for the country's economy, standard of living and way of life. Further studies are required to better assess the perception of people living in active mining regions and in former mining regions in which mines have long been closed.

Dependency on mining in Europe is not such a concern as it is in Australia, Chile, Peru or Colombia. In the reference countries this statement may be applicable at a national level, but there are discrepancies at a regional level. For example, people from mining regions in Spain believe their community rely too much on mining but in Finland the disagreement on this idea is higher than the mean of the country. In Australia, there is a similar situation to Finland: inhabitants from mining regions feel the country as a whole is more dependent on mining than their own communities, however Australians do believe they have a national dependence on mining. There is no information for Germany at a regional level on this aspect.

There is an extended lack of knowledge on how the mining sector operates in European countries, except apparently in Austria. In Finland, people believe the country is not dependent on mining despite the metal ore produced mainly being used by the domestic industry. Besides, concerns on environmental impacts are influenced by media and there is misunderstanding among types of mining activities and the kinds of materials produced. Likewise, Spaniards are not fully aware of the role of mining in their national economy and the daily dependence on raw materials, but they are right when perceiving they are reliant on external importation. In Spain public opinion is highly influenced by media too. German citizens are interested in mining and energy topics but are lacking essential factual knowledge regarding the market and industry. This lack of knowledge is similar in all other analysed countries.

Recently the studies and surveys conducted in the European Union show a slightly positive acceptance on mining at a national level. Where a segregation of the opinion by materials could be achieved, metallic raw materials were more accepted than uranium or coal. A clear NIMBY effect is observed in most European countries because acceptance of mining turns negative when it is conceived in the region inhabited by the interviewee. Yet, the acceptance is highly positive in mining regions of Austria, Finland (3 out of 4 citizens from Sodankylä reference region) and Spain (9 out of 10 citizens from the Iberian Pyrite Belt reference region). In these areas many people consider the benefits are more significant than the potential adverse effects.

4.2 The benefits of mining activities

In Europe and worldwide the most important perceived benefit is employment creation. It is consistent across mining, non-mining regions and metropolitan areas. Other expected benefits from mining activities are valued but more diverse opinions have been found:

- Other labour opportunities such as training and indirect employment: They are highly valued in Europe, especially in the mining regions, as those communities have gone through a tough crisis since the 80s. European citizens believe mining provides new opportunities for regional development, increases the average wages and, in a minor way, allows a flow of wealth distribution, especially in depressed or marginal areas.
- Personal financial benefits: It has been found that people rate lower the effect of mining over their familiar economy than in national or regional economy. In mining areas, despite it is recognised as an increase in personal wealth, its effect is reduced by the higher cost of living and housing.
- Improved infrastructure and facilities: The creation of new infrastructure and the renovation of the existing ones are positively perceived worldwide. This implies mainly new transportation and communication facilities, but in Europe it also includes health, educational and energy infrastructure, highly demanded in remote areas. However, mining opponents perceive investment in infrastructure as a source for pollution, traffic congestion and environmental degradation.
- Opportunities for women, young people, minorities and other exposed groups: It is not as relevant in Europe and Australia as it is in South America, where these social groups tend to be marginalised from an economic point of view in their communities. Mining allows their empowerment by training and employing them.
- Support of social well-being and quality of life: Nowadays few Europeans believe this statement, but it is relevant in other regions of the world. However, in some mining regions of Finland and Spain mining is perceived as having a positive effect on its attractiveness, bringing new social networking possibilities, and it is crucial to maintain the standard of living.
- Maintenance of mining identity: New mining initiatives developed on historical European mining regions contribute to a revaluation of regional traditions and heritage linked to mining, that may positively influence in tourism or other sectors.

The potential benefits of exploration are not rated as relevant as the previous ones or even are not considered by citizens when valuing mining sector. Thus, the potential reactivation of existing mining areas due to the identification of previously unknown ores is the main perceived benefit of mineral exploration. The other benefits linked to this activity are: the identification of new mining areas, the technological advancements in the mining sector, the positioning of Europe as a worldwide reference in this research field, or the reduction of external dependence in raw materials supply to European industry.

4.3 The negative impacts of mining activities

The perceived negative impacts linked to mining sector are:

- Environmental impacts: it is globally agreed that the environment suffers the worst negative impacts of mining activities. It includes water and soil pollution, local atmospheric changes due to dust and toxic emissions, contribution to climate change, deforestation and desertification, destruction of ecosystems, and biodiversity loss, among others. However the main concerns for European citizens are the pollution of water bodies for human and agricultural consumption and the alteration of soils dedicated to primary activities. The

defence of mining's sustainability is tough because, as it has been stated in Finland, environmental friendly mining technologies can be treated critically, even cynically, by public opinion.

- Work accidents and other labour risks: In Europe it is not as relevant as it used to be but new mining initiatives in mining regions are expected to improve the current safety conditions. Unions are especially worried about this topic, mostly when no increase in wages or other labour benefits are perceived.
- Public health risks: The situation in the European Union is very different to other parts of the world, where the public and private health system and the legislation on this field are not so well developed. These risks are linked to the potential deterioration of the environment and the quality of life in the community, but also to an increase in prostitution, alcoholism, drugs abuse, domestic violence and other security issues. However, in Europe, citizens are threatened by potential long-term diseases derived from mining like cancer.
- Reduction of quality of life: It is a main concern in Europe, especially in Northern and Central countries. New mining initiatives are related to an increase of the cost of living, housing prices, traffic congestion and outdoor recreation possibilities, due to the increase in wealth expected in the region and the arrival of new workers to the community. This effect is stronger in marginal or stagnated regions. In the worst-case scenario, it even may lead to poverty as it happens in some situations analysed in South America.
- Effects on other relevant economic sectors: Many Europeans are concerned with the fact that mining production may compete for land uses against agriculture, forestry or other traditional sectors, such as reindeer herding in Finland. It can potentially oust these activities and other related to them, like agroindustry or tourism.
- Insecurity about the future: The population of historical European mining regions is aware of the cyclic nature of mineral exploration and production, mostly because they have experienced its crisis in the 80s. New mining initiatives may increase insecurity about the future because it can prevent the investment in other relevant economic sectors for the community or the arrival of other activities to the region. Also, it is crucial for European public opinion to perceive that mining will have a long-term positive impact in the community and that they will not suffer from global economic fluctuations.

4.4 Fairness, faith in governance and trust

As it has been presented, mining is a controversial activity that yields both huge benefits and negative impacts. Its economic impact on a community can bring wealth and many jobs, but sometimes at the costs of environmental damage or public health. Therefore, mining may create certain challenges for people living in mining areas and for their governments, and it is up to the community to accept or reject them. Accordingly, the compensation of the negative impacts with the positive ones is a result of the fairness perceived in the mining project the community comes in contact with. At a national level, fairness is translated into transparency, widespread of benefits, strength of regulatory frameworks and public participation.

The distributional fairness of benefits across the country and the mining regions is a key factor. Nowadays in Europe, many citizens feel that their countries do not receive a fair share of tax from the mining industry. This idea is fed with the fact that most companies are foreign, so people perceive that most of the profit leaves the country. The more involved in mining national or public companies are, the fairer the sector is perceived, as it has been stated in literature with the comparison between Swedish and Finnish mining sectors. However, in Southern Europe faith in governance is lower, so a strong intervention of the administration on mining may trigger fears of corruption or other fairness situations derived from the public sector.

At community level in mining regions, citizens tend to be more positive towards mining companies than people from new mining areas. Inhabitants of the former regions usually have a better understanding on how the sector functions and value less negatively its impacts (especially on the environment). They are less apprehensive.

In general, old companies operating in Europe are seen to be fairer than newcomers to the countries. There is no clear explanation for this perception, but it may be related with the fact that many established companies appear to have gained social and communal acceptance over time due to good practices.

Furthermore, fairness can be understood from the perspective of public participation if community members and citizens do have a reasonable voice in decision-making processes. Many studies correlate the engagement of the community in mining industry with the perceived fairness and acceptance of it. Indeed, there is a demand from European citizens for a stronger participation on decision-making processes in which mining is concerned. Furthermore, perception of public participation depends on the predisposition of mining companies and public administration to listen and include the community on decision-making processes. Indeed, this last variable is key to settle the trust level of mining in a country, a key factor for mining acceptance. Trust is mostly related to the governance capacity in the country.

A significant lack of faith in the ability of administrations and legislation to ensure that mining sector behaves responsibly is perceived in Northern and Southern Europe, but not in industrialised Central Europe. The administrations are considered to have a low knowledge and expertise on the topic and to be too closely connected to mining companies. This vision is highly dependent on bad past experiences, such as corruption or environmental catastrophes (the case of Finland and Spain). It is linked with the level of trust on governance capacity, so acceptance is highly dependent on this factor.

4.5 Acceptance of mining

As the studies in the reference countries and other related countries confirm, acceptance of mining is firstly conditioned by the governance capacity of the public administration over the mining companies, and secondly by the significance of the effect of mining activities on environment and public health. This is also the main conclusion of the reference report “Attitude towards mining” from Australian CSIRO (Commonwealth Scientific and Industrial Research Organisation) (Moffat et al., 2014).

Governance capacity is understood, as it has been stated previously, as the ability for both public administration and legislation to guarantee that mining sector behaves in a legal, transparent and ethical way. It is a complex time-varying factor, because European governments try to find balance between supporting the growth of mining development and managing the interests and concerns of citizens regarding mining. Also, it is not governance capacity itself what conditions mining acceptance but its perception. Trust and faith on them are the real key factor.

Concerning the key environmental and health impacts, it has been found that in the European Union the worst are those related to water and soil pollution, dust and toxic emissions to the atmosphere, climate change and land use conflicts.

In the three reference countries mining acceptance may be considered positive, slightly lower in Finland.

- Finnish mining acceptance has decreased in recent times to an almost neutral support for mining. It is higher in mining regions, like the reference site. Finns do perceived economic and social benefits but their distribution is not considered fair. Most of them demand a higher taxation or a nationalisation of foreign companies. In addition to that, trust in public governance is low. Other main concerns are negative impacts on the environment, traditional activities like forestry or reindeer herding, housing and leisure.

- German mining acceptance is valued positively but a clear NIMBY effect is detected. However the lack of information at both national and regional levels decreases the trust on this perception. Germans are aware of the economic and social benefits of mining, as of its main impacts on environment and public health. They trust, in general, both private companies and public authorities. There is a demand for reducing external economic dependence on raw materials and the developing of new technologies on exploration does not seem to be a concern.
- Spanish mining acceptance is high at a national level, but two opposite situations are observed at a regional level: in mining regions the support to mining is high but in non-mining regions a clear NIMBY effect is identified. The revitalisation of traditional mining regions is demanded. Spaniards value the economic and social benefits from mining and they are worried about environmental negative impacts. There is a relevant concern on experiencing a new crisis on the sector, so initiatives that bring long-term benefits are pursued. The trust in private companies is higher than in public authorities and their governance capacity.

4.6 Mineral exploration reputation

Mineral exploration reputation in the European Union cannot be separated from mining reputation itself, despite the efforts made gathering all the existing literature published in the reference countries and analysing it within the scope on this activity. To synthetize the previous chapters, mineral exploration reputation in Europe has been found to be dependent on the following factors, in decreasing order of significance:

1. Mining history and mining identity in the region. Regions and communities linked to mining tend to perceive its reputation higher.
2. Recent bad mining experiences. The memory of past accidents, tragedies, crisis or corruption scandals tend to make people oppose mining, mineral exploration and other economic activities related to this sector. It decreases mining reputation.
3. Trust in private companies and mining fairness. Reputation is directly proportional to this variable (the higher the trust, the higher its perception). It is higher in Southern Europe and lower in Northern Europe.
4. Trust in authorities and public governance. Reputation is also directly proportional to this variable (the higher the trust, the higher its perception). It is higher in Northern Europe and lower in Southern Europe.
5. Economic and social benefits. Reputation is directly proportional to the perceived benefits for the community, notably employment creation and regional development initiatives.
6. Environmental and health concerns. Reputation is inversely proportional to the expected damages to regional environment and public health. However, these fears are less relevant than the other factors when considering the reputation of mining perceived by the local community.

These factors that influence the reputation of mining and exploration will be further analysed in the reference areas along the experiences developed during the activities of the research.

In the basis of the above, according to the conclusions drawn by the literature review accomplished in this report, mineral exploration reputation can be considered positive thanks to the lack of strong environmental and health impacts derived from exploration, and its interpretation in terms of development of advanced technologies and research for European interests. Exploration also allows the discovery of new areas in Europe abundant in raw materials, which could mean the reduction of external dependence and the creation of employment along with other social and economic benefits for Europeans.

5 GLOBAL OVERVIEW AND CHALLENGES FOR INFACT PROJECT

This last chapter aims to present the main conclusions of this report linked to the INFACT Project. The information is distilled both from the qualitative analysis and the country reports. As it has been previously stated, this report has been useful to settle the basis for other public opinion analysis in INFACT Project and to identify potential challenges and opportunities on the reference sites.

Mineral exploration reputation is not distinguishable from mining sector reputation

The distinction between the reputation of mineral exploration and other mining activities has not been clearly differentiated in the literature review, except for some specific publications in Finland, where the topic has been deeply studied and there is a great amount of literature. The main reason is that neither academics nor citizens considered them as differentiated activities: exploration is inherently perceived as the first stage on the opening of a mine. It triggers the same fears and hopes as mining production itself if it is not explained previously. Further INFACT studies on this topic and the engagement with local communities and stakeholders during the exploration campaigns on reference sites should clearly present and detail the project's scope to avoid wrong expectations or unforeseen opposition. The difference between mineral exploration and mining across Europe and the fact that one may not lead to another is an important message for INFACT to convey.

Scarce published literature on this topic in Europe, except for Northern Europe. Reputation is slightly positive in INFACT reference countries

There is a significant lack of valuable published information in Germany and Spain to study metal mining and metal mineral exploration reputation. It has been analysed from indirect sources related to analogous industries (coal mining in the case of Germany and coal mining and fossil fuel exploration in Spain). In Germany no specific study or survey on the reference site region was found. Despite the fact that the reputation and acceptance expected from this report is positive in mining regions (especially in Spain where a potential mining revitalization is highly demanded by local communities), reputation and acceptance may vary at INFACT reference sites because of this indirect general analysis. However, in other countries metal mining is thought to be more trustable and fair than other mining industries, such as uranium mining.

In Finland attitudes towards mining are very well known both at a national and regional level, including the INFACT reference area. Reputation is aprioristically positive but it has decreased in the last years to an almost neutral acceptance situation. Finnish public opinion on mining is on the brink and is highly dependent on key factors such as:

- The perceived role of foreign actors. Many Finns mistrust foreign companies because of past scandals and accidents and the general association of the previous flourishing mining period with public or national initiatives. There is a growing demand for strengthening public governance and taxation on foreign companies and investors and for the promotion of national mining initiatives. It is also perceived that benefits are distributed unfairly and a higher proportion of them should stay in the country. Indeed, the level of trust in public governance is the most influent variable on mining acceptance and nowadays it is slightly low.

- Sustainability of mining. Past accidents and uranium mining initiatives have conditioned a strong control of environmental impacts derived from mining, both between citizens and authorities. The implementation of sustainable initiatives is welcome, while dubious ones that may threaten the country again are firmly rejected. Perceived environmental effects is the second most relevant variable.
- Indigenous people's rights and other conflicts with local communities. Mining in Finland happens in areas used or inhabited by Sámi people and traditional activities like reindeer herding, so it must adapt to local regulations. Besides, there is a strong protection of citizens' rights on nature enjoyment and, even in mining regions, mining is perceived as supplementary to forestry and other characteristic economic activities. Mineral exploration and production in Finland are strongly conditioned to their ability to adjust to local social requirements and singularities (that is one of the reasons why national mining is valued higher than foreign mining initiatives).

Key factors for positive reputation have been identified. INFACT Project may contribute to them.

The data analysed on this report allows to infer a slightly positive acceptance of exploration and new mining projects in Finland, Germany and Spain focused on (a) decreasing external economic dependence, (b) reducing environmental and health impacts, (c) granting public participation and public decision-making processes, (d) increasing public and private cooperation and transparency and (d) revitalising existing mining regions rather than expanding into new areas (it avoids the NIMBY effect detected in the three countries). A clear communication strategy based on how INFACT Project may support these factors may become a great opportunity to generate a positive response for the project.

INFACT reference countries are valid for understanding mining reputation in Europe.

The analysis conducted may be considered valid for the European Union as a whole. Attitudes towards mining and mineral exploration are similar in all the countries studied (reference and non-reference countries). The Finnish scenario is extendable to metal-rich Northern Europe, where mining growth is mainly led by foreign actors and where society is highly concerned by negative environmental, economic and social impacts. Germany is useful to understand the situation in industrialised Central Europe, where raw materials are needed and where mineral exploration is perceived by the society as a chance to maintain the economic growth and reduce external dependence. Finally, Spain is an example of the existing conflict in Southern and Eastern Europe between the demands on mining revitalization in traditional mining regions that suffer from high unemployment and lack of alternatives, and the fears against mining harboured by society as a whole, but mainly in urban areas.

Mining background on the community is critical for local reputation.

Mining background in the community is a key factor in conditioning the public perception of the European mining sector at a regional level. Past experiences are as important as profitable future scenarios. The valuation of perceived benefits (quality and quantity of jobs, wealth distribution, infrastructure investments, new facilities, regional revitalization) and negative impacts (environmental degradation, health issues, work hazards) are linked by the inhabitants of the mining regions with similar historical situations (prosperity or decay times, accidents, segregation or cohesion of the community, fairness, public or private company reputation, level of public governance over mining sector in past times). Knowing the socioeconomic and historical context of the INFACT reference sites is therefore mandatory when developing strategies to study and engage with the local communities.

Trust in public governance over mining sector is determinant for national reputation.

Trust in public governance over the mining sector is one of the most influential variables in its reputation, higher than trust in mining companies or other stakeholders involved. It is not only linked to the perception of a regulated framework that secures workers and citizens' rights. It is also seen as a way to ensure fairness in wealth distribution, investment in infrastructure and facilities and environmental protection. INFACT Project should pursue the enhancement of public governance over mining as a strategy to guarantee support for mineral exploration. It is especially relevant in Sakatti and Andalusia, where trust in public governance is slightly lower, therefore increased prominence should be given to highlighting the role of the European Union and other administrations in the project.

The results of this analysis conform the first basis of knowledge and feed into the overall INFACT project and into the research implemented at the reference sites in Finland, Germany and Spain.

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