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NEXT
New Exploration Technologies

SOCIAL LICENSE TO EXPLORE

KEY FACTORS INFLUENCING SOCIAL LICENSE TO OPERATE DURING THE MINERAL EXPLORATION PHASE

Deliverable 5.1

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Summary

This is the first report by the Work Package 5 (WP5) of the NEXT (New Exploration Technologies) Project financed by the European Commission H2020 Program. The WP5 investigates the role of new technologies in the social license to operate (SLO) of mineral exploration. The SLO means an ongoing approval of the activity by a local community.

The report is a review on the relevant literature dealing with the subject, accompanied by a survey on websites of mineral exploration companies. The report examines the factors relevant for SLO), namely institutional frame; local context; and communication and interaction.

To the general understanding of SLO during exploration, the major challenges are set by its inherent nature. A dispersive and transitory activity in permanent state of uncertainty and ambiguity, exploration is sustained by limited funding in a high-risk environment. Further, a cost-efficient and tightly scheduled framework do not encourage companies to take a proactive role engaging with stakeholders.

Very little academic investigation of SLO has been done in relation to mineral exploration. Therefore, the institutional, contextual, communicative, and technological factors that affect SLO at the exploration stage specifically remain largely unknown. However, much of the general SLO related literature include practices that also apply to mineral exploration, such as quality of communication and stakeholder engagement.

There is a lack of studies on the effect of new technologies on SLO in mineral exploration. There are also a lack of companies communicating their technological innovations on the web pages. Consequently, the importance of technological innovation to social licensing at the exploration stage is not known and warrant further investigation.

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1 INTRODUCTION

The European Commission Horizon 2020 funded programme, New Exploration Technologies (NEXT), aims to create and test novel mineral exploration technologies. To help accomplish this aim, Work Package 5, Social License to Explore, is designed to identify factors influencing social license at the mineral exploration stage, including the importance of technology. This report is the first deliverable of the work package. It gives an overview and synthesis of SLO in the context of mineral exploration, particularly company practices during exploration and their effectiveness at obtaining and maintaining a SLO. It identifies the key factors that affect SLO positively and negatively including the legal/institutional set-up, the local context, communication and interaction and, in particular, new technologies that might influence attitudes during the exploration stage. Finally, it points to knowledge gaps and best practices.

The report is based on a review of scientific literature related to the concept SLO. It also includes information from a survey on websites of mineral exploration companies operating in Finland and Sweden which was done to reveal their SLO-related understandings and practices, in combination with the use of new technologies. The results of the survey complement the literature review to give examples of SLO approaches, and new technologies from mineral exploration companies in two Nordic partner countries.

The content is organized as follows. First, the report describes mineral exploration; second, it gives a brief explanation and definition of SLO; third, it reviews international, mostly peer-reviewed SLO literature on mineral exploration; and, fourth, it gives initial considerations on the role of new technologies on the SLO in mineral exploration. The aim of the project report is to open these themes and act as a starting point for further research.

2 MINERAL EXPLORATION

Mineral exploration is the very first stage of the mining value chain. Its goal is to find economically viable mineral deposits to later be exploited by mining[1]. Therefore, it is a fundamental activity for the mining industry, and society's raw materials supply. New mineral deposits require discovery and new mines are constructed in order to satisfy societal demand for those resources. In the case of the EU, new mines are central to the aim of reducing dependency on imported mineral raw materials.[2]

Mineral exploration is characterized by geo-scientific surveys and investigation of potential for mineral deposits. To accomplish this aim, huge areas are surveyed with the use of several geo-scientific methods and techniques. A successful mineral exploration project means finding an

[1] Moon & Whateley 2006.
[2] COM 2008.

economically exploitable ore body. However, according to the industry experience, the global average success rate is one mine for every one thousand mineral exploration projects[3].

The mineral exploration can be subdivided into four stages: 1. Preparation, 2. Reconnaissance, 3. Mineral exploration, and 4. Pre-feasibility study. In the preparation stage, all existing geological, geochemical, and geophysical data of the target region is collected and analyzed as a desktop study. During the reconnaissance stage, a company surveys and geologically maps the region, and then collects rock and soil samples in the field. Systematic geophysical and geochemical surveys are carried out. Geophysics can be performed in the air by airplane or drone or by ground surveys. Geophysical surveys help to characterize the target area's geophysical properties by locating highly conductive, magnetic, gravimetric, or radiometric zones that may indicate mineral deposits. The results are drawn in geophysical maps that help to visualize and locate interesting areas. For instance, geochemistry shows the distribution of the elements on the soil, and bedrock. The results of those surveys orient subsequent stages of mineral exploration.

The exploration stage is characterized by mechanized soil sampling, trenching, and drilling on the targets appointed by previous investigations. Deep soil samples are collected by drills mounted in vehicles. Trenches, and pits are excavated into the soil in order to reveal bedrock underneath. Diamond drilling is the most important, and expensive mineral exploration technique performed to reach major depths of tens to even hundreds of meters, and to obtain drill cores to be examined and analyzed. Because of its high price of 100 to 200 euros/meter, drilling is only performed when a potential target has been located. In cases where an economically potential deposit has been located, the pre-feasibility stage evaluates its economic characteristics by denser drilling.

New, low environmental impact techniques and technologies have been created and tested for mineral exploration in especially sensitive areas such as nature conservation areas.[4] Examples are surficial geochemical soil, snow, and plant sampling and manual geochemical analysis device. Drones are applied for geophysical field surveys, and audiomagnetotellurics and gravity data are used in the investigation of electrical properties and deep structures in the bedrock[5].

Many of the technological innovations in mineral exploration are found in the interpretation of the data. Self-organizing maps, multidimensional modelling, digital elevation maps, and semi-automated detection of geological features can reveal zones and structures potential for mineral exploration.[6]

All those innovations provide new ways of obtaining indications on possible mineralization from surficial deposits and the greater depths of the bedrock. These data can be used in regional and local-scale geological models, which help in understanding the geological processes and especially in locating deep-seated mineral deposits with a low impact on the environment[7]. Many of those

[3] Thomson & Joyce 1997, Moon and Evans 2006.
[4] Sarala 2015.
[5] Sarala 2015.
[6] Sarala 2015
[7] Sarala 2015.

innovations are also used in the NEXT Project. But, despite these technological innovations, uncertainty in finding prospective mineral deposit remains central to exploration activity.

Although mineral exploration is part of the mining industry, mineral exploration and mining are different activities. Mining is an industry focused on production; exploration is an industry based on research and development. Mining demands vast investments and is mainly operated by major companies; mineral exploration companies are generally small juniors. Mining is restricted to a fixed place in one site; mineral exploration is dispersed over large areas[8]. Mining generates operating capital through production; mineral exploration finds its funding from financial market shares, and, therefore, is strongly influenced by global commodity prices. The junior companies exploring green fields (previously under or unexplored areas) are very dependent on international finance, and hence more affected by the cyclical nature of the industry[9]. It is also common to take several years or even decades between the first identification of the economic potential of a mineral deposit and the decision to mine[10].

Operators may also change several times during the life cycle of a project.[11] A junior company, i.e. small company that practices only mineral exploration, may sell its property to a major company, which will develop it to a mine, or it may pass through the various juniors and/or majors before the right circumstances are found for mine development. Furthermore, exploration projects advance in general episodically, with periods of intense activity (drilling etc.) separated by times of little or no activity, and they can be also often interrupted due to several reasons: unpromising mineral showings, end of financing, opposition, or economic, political or legislative changes in the country of operation.[12] Luning[13] described the implications of those situations, including also the impact of the financial crisis of 2008 on paralysing mineral exploration, breaking promises and aborting community expectations related to a project.

Thomson and Joyce[14] pointed to the challenge of creating good company-community relations during exploration already in the late 1990s, it appears that little changed. Although some models, guidelines, and programs have been created to promote CSR, and SLO for the exploration companies since then, the challenges of the activity regarding SLO are still the same today.[15] Many of the constraints in this regard are created by the inherent characteristics of mineral exploration, primarily uncertainty and risks.

[8] Thomson & Joyce 1997.
[9] Moon & Whateley 2006
[10] Thomson & Joyce 1997
[11] Thomson & Joyce 1997, Luning 2012.
[12] Lyons et al. 2016.
[13] Luning 2012.
[14] Thomson & Joyce 1997.
[15] Bebbington 2009, Lyons et al 2016, Eerola 2017.

3 SOCIAL LICENSE TO OPERATE

Local communities and their increasing importance have become emphasized in the global mining industry since the 1990s[16]. Their attitudes towards mining may range from resistance to tolerance, and acceptance to approval[17]. The concept of good company-community relationships was called as SLO by mining executive Jim Cooney from Placer Dome.[18] Commonly viewed as a means to address insufficient legislation[19], SLO was originally introduced with the intent to create greater awareness on the industry side regarding the outcome of bad practices.[20] Now, it is increasingly used as general measure for community acceptance – or even degree of sustainability.

Today, SLO is the most studied topic in social science research on mining[21], first appearing in scholarly work in 1998.[22] A SLO is regarded as the acceptance or approval of specific activities by the local community[23] or more extensively by the society[24]. It should be earned and maintained every day but can be lost at any moment without notice. Therefore, a SLO is not a formal or legal license given by the authorities, but the consent of those stakeholders, who (1) are affected by and/or (2) can affect the activities in certain locality.[25]

Despite spreading to other industries,[26] SLO remains especially critical for the mining industry[27] as mining operations cannot be relocated[28]. Minerals must be explored and extracted where they are or where they are expected to be located[29]. Therefore, the consent from local actors is critical. Many times, minerals occur in challenging places to be explored or exploited due to other forms of land-use and/or local values. As a result, local stakeholders are particularly significant for the mining industry to build up company-community relationships and cooperation.[30] In a more general context, access to land to explore and exploit minerals is also important to the industry's and EU's ambitions to secure a future availability and supply of minerals.[31]

There have been attempts to measure the image of mining[32], and SLO[33]. However, many scholars stress its intangible and dynamic nature as it is not formalized and reflect a continuously changing

[16] Thomson & Joyce 1997, Joyce & Thomson 2000, Boutilier & Thomson 2011, Thomson & Boutilier 2011, Prno & Slocombe 2012, Prno 2013.
[17] Joyce & Thomson 2000, Thomson & Boutilier 2011.
[18] Joyce & Thomson 2000, Thomson & Boutilier 2011.
[19] Prno 2013.
[20] Moffat et al. 2016, see Schloss 2002, Thomson and Boutilier 2011.
[21] Karakaya & Nuur 2018.
[22] Esty & Porter 1998.
[23] Thomson & Boutilier 2011.
[24] Joyce & Thomson 2000.
[25] Prno 2013.
[26] Gallois et al. 2016.
[27] Lacey et al. 2012.
[28] Prno & Slocombe 2012, Prno 2013.
[29] Prno & Slocombe 2012, Prno 2013.
[30] Joyce & Thomson 2000, Thomson & Boutilier 2011, Lacey et al. 2012, Prno & Slocombe 2012, Prno 2013, Parsons et al. 2014.
[31] Eerola 2017.
[32] Ruiz-Martín et al. 2014.
[33] Prno 2013, Prno and Slocombe 2013.

relationship between companies and communities.[34] A fundamental critique concerns the level of support that is needed for a license to be bestowed. [35]Accordingly, it is usually easier to know when a project has no SLO,[36] typically revealed by protests, court rulings or even interruption of a project.[37] In many cases, the communities may have diverse reasons to oppose for mining, such as their different worldviews, values, way of living, traditions, livelihoods, the environment and land use, which may be affected.[38] In this sense, the concept of SLO has also been criticized[39]. Despite protests, mining companies have been able to continue their operations, and the concept has failed to articulate a collaborative developmental agenda for the mining sector. According to its critics[40], SLO is designed to reduce or suppress opposition rather than increasing engagement and collaboration in the long term. In either case, however, it has raised the profile of social issues in the mining industry.

4 SOCIAL LICENSE TO OPERATE IN MINERAL EXPLORATION

The vast majority of international research on CSR and SLO in the mining industry focuses on the activities after exploration: planning, construction, operation and closure.[41] It is understandable because mines have greater economic, environmental and social impacts. However, more research on mineral exploration phase is needed, as this early stage plays a significant role in the attitudes of the local population towards the project as it moves forward.[42] Mineral exploration is indeed the very first phase in which a company makes contact with the local community[43] but some suggest that conflicts generated during the mineral exploration are far fewer than during planning and construction phases.[44] In all cases, literature does highlight the importance of engagement early in the mine development process, including exploration.[45]

Thomson and Joyce[46] published the seminal paper on the company-community relationship in mineral exploration. They argued that the challenges regarding the SLO in mineral exploration are mainly due to the nature of the activity. Mineral exploration is a long, costly, competitive, high risk, dispersive, transitory, and somewhat secretive activity characterized by uncertainty and ambiguity. Mineral exploration companies are usually small, with limited resources. As people in general have few or none information on mineral exploration and its techniques, one of the major challenges

[34] Nelsen 2006, Thomson & Boutilier 2011.
[35] Owen & Kemp 2013.
[36] Gallois et al. 2016.
[37] Gallois et al. 2016, Jijelava & Vanclay 2017, pp.1084-1085.
[38] Paredes 2016, Conde & Le Billion 2017, Conde 2017.
[39] Owen & Kemp 2013.
[40] Owen & Kemp 2013.
[41] Kapelus 2002, Handelsman 2003, Jenkins 2004, Jenkins & Yakovleva 2006, Kemp et al. 2006, Esteves & Vanclay 2009, Fonseca 2010, Kemp 2010, Esteves & Barclay 2011, Owen & Kemp 2013.
[42] Thomson & Joyce 1997, Moon & Whateley 2006, Thomson & Boutilier 2011, Luning 2012, Eerola 2017.
[43] Thomson & Joyce 1997, Moon & Evans 2006, Moon & Whateley 2006, Bebbington 2009.
[44] Franks et al. 2014.
[45] E.g. Thomson & Joyce 1997, Mercer-Mapstone et al. 2018, Zhang et al. 2018.
[46] Thomson and Joyce 1997.

concerning the SLO of mineral exploration are the expectations that it raises, and their management;[47] some welcome mining due to its economic benefits, while others fear its negative environmental impacts. They recommended effective engagement to alleviate potential and existing concerns, and dialogue with the local communities.

Several other authors after that have discussed the same issues. Eerola[48] described opposition towards uranium exploration in Finland in 2000's as the first major controversy regarding mining industry in the country. The author proposed a stakeholder engagement model for the very first contacts with the local communities adapted to Finland. Bebbington[49] followed considerations given by Thomson and Joyce[50], and recognized the role of mineral exploration companies aggravating mining conflicts in the Andes. Luning[51] examined the stakeholder engagement of mineral exploration from two perspectives: training given by consultants at the Prospectors and Developers Association Convention in Toronto, Canada, in 2007, and practices of mineral exploration companies in Burkina Faso. She identified a gap between the reality in the field and consultants' and companies' good intentions. The consultants draw an ideal picture of stakeholder engagement without considering the reality in which licenses change hands, and projects can be interrupted without continuity in company-community relationship. Although the case company apparently held a SLO in its area of operation, its preference to share benefits for certain communities caused tensions with others.

Others focused on sustainability as it relates to early SLO activity. Moon and Evans[52] and Moon and Whateley[53] discuss the relationship between sustainability, stakeholder engagement, and SLO, emphasizing the importance of early interaction with local communities already in the reconnaissance phase. They also appoint out the lack of awareness of mineral exploration by local communities, and that giving information on it plays a significative role in corporate communication. Caron and her co-authors[54] created and proposed a sustainability standard with principles and criteria for mineral exploration. The principles related to SLO were environmental quality; quality of life; work environment; local investment; business ethics; transparency and reporting; innovation and finally, economic efficiency.

Important differences also exist based on local circumstances. Lyons and her co-authors[55] focused on CSR challenges of mineral exploration in developing countries. They presented results of a survey on mineral exploration companies' concepts on CSR, and SLO. The revealed meanings and practices were highly context-based and ad hoc, in contrast to that of major mining companies. It also revealed striking contradictions and ambiguities between involved companies' CSR actions and

[47] Thomson & Joyce 1997, Luning 2012, Lyons et al. 2016, Eerola 2017.
[48] Eerola 2008.
[49] Bebbington 2009.
[50] Thomson & Joyce 1997.
[51] Luning 2012.
[52] Moon & Evans 2006.
[53] Moon & Whateley 2006.
[54] Caron et al. 2016.
[55] Lyons et al. 2016.

accountability and their assumed SLO. Eerola[56] examined the CSR and SLO of mineral exploration in Finland, but analyzed also their challenges in the Global North and South. Constraints were identified and integrated multi-stage model for stakeholder engagement and the sustainability standard created by the Finnish Network for Sustainable Mining for mineral exploration in Finland were analyzed.

The reviewed literature on mineral exploration rarely refers directly to the concept SLO. It mostly deals with company-community relationship, CSR, and stakeholder engagement. The CSR practices have a fundamental role, as those are seen as the way to achieve the SLO in mineral exploration[57]. From the three CSR pillars (environment, economy, and social), the social one is the most emphasized for obtaining a SLO in the form of effective communication, stakeholder engagement, dialogue, and collaboration.[58] There are also several guidelines and reporting templates for CSR and stakeholder engagement in mineral exploration. Some of them are international[59], when as other ones are national[60]. However, overall the findings of this literature review point to a dearth of investigation on SLO during the exploration phase – warranting greater attention.

Practical Examples

The surveyed mineral exploration company websites in Finland and Sweden do not usually mention SLO directly. Ten companies express it as respecting local people, company-community relationship, communication, stakeholder engagement, meetings, and benefit sharing, i.e. in the form of activities that are performed in order to earn and maintain the SLO. According to the AA Sakatti: *"We are committed to open communication and we look to engage with stakeholders. Our team in Sodankylä always welcome and value input and feedback from the local community and they strive to keep everyone informed about project and its activities."* However, Boliden, which is operating in both Finland, and Sweden, recognizes more clearly that its activities may impact on the local acceptance: *"perceptions of Boliden determine Boliden's license to operate and ability to develop business. Good community relations are as important for our business as the effective management of our operations".* Only one of the companies in Finland explicitly mentions the concept SLO, but it apparently misunderstands its meaning as it refers to formal permits.

4.1 Institutional framework

Institutions, which are defined as rules and decision-making procedures that give rise to social practice are key to understanding how and why specific outcomes, such as SLO, are achieved or not. SLO fills the gap when the regulatory framework falls short.[61] One of the critical points to consider

[56] Eerola 2017.
[57] Lyons et al. 2016, Eerola 2017.
[58] Lyons et al. 2016, Eerola 2017.
[59] Prospectors´ and Developers´Association of Canada 2012.
[60] SveMin 2018.
[61] Prno & Slocombe 2012.

in assessing the role SLO plays in the mining industry is its capacity to address the range of issues that fall outside of regulations that arise during exploration, development and operation of a project. SLO is a complex phenomenon which involves three actors - the state, civil society, and companies - and the nature of their relationship often determines the outcomes of projects.[62] Although the interplay between market, community and state actors is emphasized in the literature, current trends reveal that state intervention and legal regulation of the mining sector is actually increasing around the world.[63] Further, because ore deposits are often located on land used by indigenous communities, the established legal framework sets the room for negotiation on the development of indigenous rights and self-determination.[64]

The state has an important role in guaranteeing the rights of citizens and providing public services but also in the management of natural resources, such as the minerals, through policy, regulation, supervision and taxation, as well as providing geological data[65]. Those are significant factors not only for the stability and predictability of business activities, but also regarding the trust towards the state and its authorities[66]. The citizens' trust in public institutions is highly a significant factor for social licensing.[67]

However, because SLO encourages extra-legislative activity, the role of government becomes ambiguous. Some argue that social licensing may involve transferring regulatory authority to largely unaccountable agents.[68] Others argue that SLO activities provide opportunities for innovative agreements and venues for establishing or refining local peoples' rights.[69] Unconstrained by the established regulatory process, a new arena for negotiations and bargaining opens and private agreements on land rights and land may offer the potential for broader institutional change in the longer term. However, the interplay between the established regulatory framework and the SLO related extra-legislative commitments are not well researched, not in the context of mining and even less in relation to exploration.

[62] Prno & Slocombe 2012.
[63] Pring & Noe 2002, Brereton & Forbes 2004.
[64] Fulmer et al. 2008, Howlett 2010, O'Faircheallaigh 2010.
[65] Eerola 2017.
[66] Conde & Le Billion 2017.
[67] Paredes 2016, Conde & Le Billion 2017.
[68] Utting 2005.
[69] Andolina 2003, Rumsey & Weiner 2004, Urkidi 2011, Yagenova & Garcia 2009.

Practical example – Finland

In most jurisdictions, mineral exploration is regulated by some form of a Mining Act. It is quite similar in most of the countries, but Nordic countries, especially Finland, have some peculiarities. In Finland, mineral exploration can be started by light operations (prospection) in the field based on the Everyman's Right (*Jokamiehen oikeudet*), which allows to walk in private lands, and collect rocks and minerals for a geological survey, but landowner need to be informed. However, most countries require claim reservation and/or mineral exploration license applied for the national mining authorities. When obtained, the license is valid for a certain period. In order to perform heavier, mechanized mineral exploration, there are two ways to do that in Finland: one is asking for a written permission for the landowners, and the other one is to apply for an exploration permit.

As the national and local conditions vary a lot across the world, many countries have created their own national guides and toolboxes for stakeholder engagement adapted to their specific contexts. Finland created the EU's first mineral strategy, and a unique forum for cooperation and self-regulation of mineral exploration and mining, the Finnish Network for Sustainable Mining, where companies and important stakeholders define joint goals, such as CSR reporting and toolboxes for stakeholder involvement. It also created a standard for sustainable mineral exploration that includes themes like guiding principles, stakeholder involvement, biodiversity conservation, safety and health, and crisis management. A guide on citizen's rights towards the mineral exploration and mining projects published by the Finnish Association for Nature Conservation is recommended by the Network to be presented to the stakeholders by companies in their meetings with local communities.

4.2 Local context

The concepts "local community" and (local) "stakeholders" are frequently used in the SLO literature, but they are often poorly defined. Moffat et al. [70] point out that while a legal license is granted by the state, a social license is granted by "community".[71] Accordingly, the terms of SLO are located in the values, expectations and perceptions of a broad set of "community stakeholders".[72] This implies that community representation, i.e. who are the stakeholders that take part in company–community consultations, is critical since the demands from the community will influence the terms of the SLO.[73]

As mineral exploration is a newcomer in the locality, understanding the local context is essential; even the smallest communities are heterogeneous and understanding their social fabric is

[70] Moffat et al. 2016.
[71] Lacey et al. 2012, Thomson & Boutilier 2011.
[72] Thomson & Boutilier 2011.
[73] See also Prno 2013.

important for gaining a SLO.[74] Different local groups have their own values, interests and expectations towards mineral exploration.[75] There may be other livelihoods that are critical towards the activity and might oppose the minerals industry. For example, tourism or reindeer husbandry alongside the European Union´s only indigenous group, the Sámi people, have been critical towards mineral exploration and mining in Northern Finland and Sweden.[76]

A critical theme may also be mineral exploration in nature conservation areas[77], as well as the explored commodity. Exploring uranium, or in association with it, is a source for opposition for mineral exploration in Finland[78]. Previous conflicts, and experiences about exploration or actual mining in the locality might have also influence on the SLO of new projects.[79] All the above mentioned factors have been called as the preconditions for SLO.[80] Described below are examples showing how exploration companies in Finland and Sweden approach local communities and the rules for engagement with them.

Practical examples

Mineral exploration company´ websites in Finland and Sweden have often references to "local community" without any definition. Some companies identify their local stakeholders more precisely, such as Boliden, which is doing mineral exploration both in Northern Finland and Northern Sweden. Boliden refers to an *"open dialogue and long-term cooperation with Sámi communities"*.

Mawson, performing mineral exploration in Finnish Lapland, argue that they "*will ensure an appropriate level of contact and negotiations with all stakeholders including landowners, Sámi, community and hunting groups and regional authorities"*. Nordic Mines, which operates the Laiva gold mine in Raahe, and has mineral exploration also elsewhere defines *"municipality, residents of the close by areas, and landowners"* as its central stakeholders.

On the other hand, some mineral exploration companies include stakeholders that go far beyond the local interest groups. For example, Karelian Diamond Resources operating in the Kuhmo region in Eastern Finland defines their stakeholders as *"employees, suppliers, communities and regulatory bodies"*. In Finland, from the twelve companies mentioning SLO somehow, seven define more specific stakeholder groups. Boliden distinguishes only indigenous people (Sámi), whereas Mawson, Karelian Diamonds Resources, Nordic Mines, Sakumpu Mining, and Stonerol Oy are more detailed and mention employees, suppliers, municipality, media, residents of the close by areas, landowners, Sámi, reindeer herders, community, hunting groups and regional and regulating authorities. The Tertiary Gold Ltd mentions its shareholders, too. The set of

[74] Prno & Slocombe 2012, Prno 2013, Parsons et al. 2014.
[75] Suopajärvi et al. 2016, Eerola 2017, Lesser et al. 2017, Beland-Lindahl et al. 2018.
[76] Eerola 2008, 2017, Lyytimäki & Peltonen 2016.
[77] Eerola 2017, Saariniemi 2018.
[78] Eerola 2008, 2017, Jartti et al. 2014.
[79] Eerola 2017.
[80] Litmanen et al. 2016, Eerola 2017

stakeholders mentioned within the mineral exploration company websites is very similar in Sweden.

4.3 Communication and interaction

The company's behaviour and attitude are crucial for obtaining and maintaining a SLO[81]. Communities are looking at the impact of mining operations and, therefore, corporate communication and stakeholder engagement have an important role to play in terms of the SLO.[82] Several authors have suggested that the stakeholder engagement intended to prevent any conflicts should be initiated at an early stage of mineral exploration, i.e., already at the reconnaissance stage.[83] Moffat and Zhang[84] developed a model for critical elements of the SLO, composed by five interdependent variables: procedural fairness, contact quantity and quality, impacts on the infrastructure and trust. Critically, trust has a central role around which the SLO is articulated.

A good company–community relationship is an indicator for a SLO[85]. Approval is earned by open and fair dialogue with the different stakeholders in the operation area.[86] Prno[87] suggests that "key community stakeholders need to be identified by company representatives as early as possible in mineral development process as possible, appropriate engagement strategies must be planned and executed, commitments with local residents followed-up upon, and efforts at continuous relationship improvements made." Mercer-Mapstone and co-authors[88] have shown that SLO is reached when there is procedural fairness, i.e., people feel that they are informed and listened in a just and fair manner. Good dialogue is built on community members´ positive experiences, which also makes the relationships stronger between local people and company staff. Hence, personal contact is also important for the co-operation. It has also been proven statistically that good contact quality, instead of contact quantity, is important for the acceptance of operations.[89] If people are "feeling heard, listened to, and that the company would act on their concerns, their trust in the company was enhanced".[90]

[81] Prno & Slocombe 2012, Prno 2013, Parsons et al. 2014, Zhang et al. 2014, Eerola 2017.
[82] Gallois et al. 2016, Lyons et al. 2016, Eerola 2017.
[83] Thomson & Joyce 1997, Moon & Whateley 2006, Thomson & Boutilier 2011.
[84] Moffat and Zhang 2014.
[85] E.g. Eerola 2017.
[86] E.g. Boutilier & Thomson 2011, Parsons et al. 2014, Prno & Slocombe 2012, Prno 2013.
[87] Prno 2013.
[88] Mercer-Mapstone 2018.
[89] Moffat & Zhang 2014.
[90] Moffat and Zhang 2014

Practical examples
Regarding communication of the 76 mineral exploration companies operating in Finland, only 34 companies have their own websites. Many of them only listed contact information in the internet or were represented by their parent company websites. In Sweden, out of 77 companies, 22 had their own websites and 21 were represented by the parent company websites. Therefore, web site communication does not seem to be a priority of the mineral exploration companies in Sweden and Finland.web communication in Sweden and Finland.

4.4 New technologies

Although the studies on public perception and attitudes towards mining industry are relatively abundant, studies on the role of its new technologies for the SLO are few. New and more sensitive technologies may potentially influence public attitudes towards the industry, and therefore, possibly on its SLO[91]. In May 2019, there were only some studies on the influence of new technologies on SLO of mining[92], but none on mineral exploration.

New mineral exploration technologies are developed in order to reduce costs, environmental impacts, and to increase efficiency.[93] There are also expectations that they may enhance social acceptance and make it easier for companies to obtain SLO. These aspirations are based on the assumption that less intrusive exploration technologies, i.e. a lower environmental footprint, and positive attitudes to exploration and mining at the local level, are positively correlated. However, this relationship is so far largely unproven. Consequently, studies exploring the relationship between a reduced ecological footprint and SLO of mineral exploration are needed.

Practical examples
The few technological innovations mentioned in five of the websites of Finnish mineral exploration companies are closed circuit drilling and drones. One company operating in Sweden mentions real time X-ray analysis and the other one “low impact methods”. Most of the methods used in mineral exploration are still traditional ones, used for decades or over a century.

5 CONCLUDING REMARKS

This project report provided an overview on three areas to assess the current state of research on SLO in relation to mineral exploration: (1) a general overview of SLO and exploration; (2) key factors that affect SLO positively and negatively; and (3) knowledge gaps and best practices.

[91] Franks & Cohen 2012, Lacey et al. 2019.
[92] E.g. Lacey et al. 2019.
[93] Sarala et al. 2015.

First, to the general understanding of SLO during exploration, the major challenges are set by its inherent nature. A dispersive and transitory activity in permanent state of uncertainty and ambiguity, exploration is sustained by limited funding in a high-risk environment. Further, a cost-efficient and tightly scheduled framework do not encourage companies to take a proactive role engaging with stakeholders. As mineral exploration raises expectations, while knowledge about it and its outcomes remains limited, communication and stakeholder engagement grow as one of the main challenges. Since most exploration projects do not develop into a mine, accurate and transparency information are key in building good relationships.

Second, very little academic investigation of SLO has been done in relation to mineral exploration. There are no case studies that specifically focus on the effect of company-community interaction at the exploration stage on public acceptance. Therefore, the institutional, contextual, communicative, and technological factors that affect SLO at the exploration stage specifically remain largely unknown. However, much of the general SLO related literature include practices that also apply to mineral exploration, such as quality of communication and stakeholder engagement. Importantly to this project, there is a lack of studies on the effect of new technologies on SLO in mineral exploration. There are also a lack of companies communicating their technological innovations on the web pages. Consequently, the importance of technological innovation to social licensing at the exploration stage is not known and warrant further investigation.

Third, the lack of empirical studies during the exploration phase leave several knowledge gaps to be filled. From the literature reviewed for this report, many of the best practices focused on early and open community engagement – producing trust. Thus, studying the effect of communication during exploration, and technology, is an important point to understand the perception of exploration project and how they affect social licensing in the longer term.

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