Making Mining Sustainable: Overview of Private and Public Responses

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Mining and Sustainable Development
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Abstract

The last decade has seen a large expansion of the global mining sector as well as increased interest in the sector’s short- and long-term economic, environmental and social effects. While concerns about an imminent shortage of metals and minerals have been offset by improved technology and the discovery of new sources, focus today is on other sustainability challenges such as, for instance, access to land, managing acid mine drainage, ensuring regional benefit-sharing and the rights of indigenous people. This report reviews how industry, public authorities, NGOs and academics have addressed those challenges so far. Through collaborative initiatives best practice has been identified and promoted. Research has looked both from a societal and a company perspective at how to improve sustainability through the design and management of public policy processes, mining activities and stakeholder relations. The literature indicates a growing need for companies to go further than what legislation demands in order to gain popular support, known as a “social licence to operate”. Future research should include more comparative studies of experiences from different countries and time periods; on what actions are being done to promote sustainability, what their actual effects are, which trade-offs exist and how to address future sustainability challenges.
Preface

Minerals are essential for human welfare. However, their extraction is associated with both opportunities and challenges. Historical concerns around work conditions and the competitiveness of the mining sector have been complemented by a growing number of other issues. Today, an overarching goal is to find ways by which the mining sector can promote sustainable development.

Sustainable development is often defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” Furthermore, it is commonly agreed that this must incorporate economic, environmental and social concerns.

There is a growing literature that examines the relationship between extractive industries and sustainable development, yet much research is still conducted in a siloed fashion. For this reason, the Swedish state-owned iron ore mining company LKAB and Luleå University of Technology initiated a pre-study with the aim to establish a new multidisciplinary research programme on mining and sustainability.

The pre-study was conducted from January to October 2014. One part of the pre-study was to review existing research attempting to address mining and sustainable development – the current state-of-the-art – with focus on the past, present, and future situation in Sweden, but also to put the Swedish case into a broader perspective by comparing several international examples.

One of the outcomes of the pre-study is this report. It reviews how sustainable development has been addressed and defined in the context of mining so far. Past concerns about an imminent shortage of minerals have so far been proven exaggerated. At the same time, natural resource wealth has not always been translated into development for the broader society. Governments, companies and NGOs have addressed some of the key sustainability challenges through a number of initiatives. Researchers have looked at ways in which both public governance and mining company management can promote sustainability.

The report highlights a number of future research needs. Notably, there is a lack of information on how public and private agreements, standards and policies are being translated on the ground. Little empirical research has looked at their actual effects on the economy, environment and social well-being. And both historical and cross-country case studies are needed in order to identify best practice.

Four other reviews have also been undertaken as a part of this pre-study. While the present report provides a broad overview of mining and sustainability, the other reports focus on more narrow topics:

- **Environmental Aspects of Mining**, by Anders Widerlund and Björn Öhlander from Luleå University of Technology and Frauke Ecke from the Swedish University of Agricultural Sciences.
- **Environmental Regulation and Mining-Sector Competitiveness**, by Kristina Söderholm, Patrik Söderholm, Maria Pettersson, Nanna Svahn and Roine Viklund from Luleå University of Technology and Heidi Helenius from the University of Lapland.
- **Gender, Diversity and Work Conditions in Mining**, by Lena Abrahamsson, Eugenia Segerstedt, Magnus Nygren, Jan Johansson, Bo Johansson, Ida Edman and Amanda Åkerlund from Luleå University of Technology.
- **Mining, Regional Development and Benefit-Sharing**, by Patrik Söderholm and Nanna Svahn from Luleå University of Technology.

Together these reports provide a broad picture of the challenges and opportunities created by mining.

The pre-study has been made possible through a generous contribution from LKAB. All errors and opinions expressed in this report belong solely to the author.

Luleå, October 2014
Petter Hojem

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The last decade has witnessed a global boom in mining. A strong demand for natural resources, despite a temporary set-back following the financial crisis, has been fuelled by fast economic growth first and foremost in China and India. After decades of relatively low investment in increased supply, there has been a sharp increase in the rate of exploration, discovery and development of new mineral deposits. Existing mines have become more profitable, and some that have previously been closed have been re-opened due to the price increases caused by the stronger demand for metals and minerals. While there are signs that we have passed the peak of the current boom-cycle, prices still hover at levels far higher than about a decade ago.

The recent mining boom has also led to renewed interest and concern for the industry’s short and long term impacts. On the one hand, it has brought significant investments in new ventures, more jobs and economic growth to a number of regions, several of which previously were in decline. At the same time, the mining sector faces some difficult sustainability challenges. It leaves visible footprints in its surroundings. Local communities, who bear the brunt of environmental degradation, have come to expect and demand a greater say and share of benefits. Policy-makers and regulators are forced to weigh seemingly incommensurable pros and cons of mining when considering new and current projects.

What constitutes sustainable development in the context of mining? What are the greatest sustainability challenges faced by mining companies, mining communities, policy-makers and regulators? And how can public and private actors maximise the benefits from mining, minimise its negative impact and foster short- and long-term economic, environmental and social sustainability?
The purpose of this report is to review how the research literature and policy-makers have addressed sustainable development and mining, and to identify important gaps of knowledge. This in turn will provide important input to formulating a research programme, as described in the preface.

1. BACKGROUND AND PURPOSE

1.1. Study approach and limitations

The main topical focus of this report will be on mining and its relation to sustainable development in advanced industrialised countries, in particular Sweden. As a consequence certain challenges more specific for developing countries, such as small-scale, artisanal mining, are left out on purpose. Furthermore, we will concentrate on the mining of metals, thus excluding oil, natural gas and coal. It is worth noting that several studies and initiatives cover both developed and developing countries, and some address mining of metals as well as fossil fuels.

The research review will mainly cover the social science literature, inter alia anthropology, business and management, economics, history, law, political science and sociology. For identifying relevant publications, searches have been conducted using mainly Google Scholar, Proquest and Web of Science. These search engines cover a large number of journals and books in different strands of research. Key words include “mining” and “minerals” paired with “sustainable development” and “sustainability”.

Priority has been given to peer-reviewed articles with a relatively high degree of citation rate and/or articles that have been recently published, and that explicitly deal with “sustainable development”, “sustainability” and mining. Additional articles have been included through a snowball technique, e.g. through reviewing the references of the first publications identified. A drawback of this approach is the risk of overlooking articles that cover issues that are relevant but not couched in the above-mentioned terms. Moreover, the growing “grey literature” of governmental, consultancy and NGO publications on mining has not been the prioritised, even though it is evident from several initiatives that it plays an important role in formulating sustainability policies and practice.

This report also aims to investigate how policy-makers have addressed mining and sustainable development. As a proxy, the report reviews a broad range of collaborative initiatives including projects, programmes and organisations. These initiatives bring together policy-makers from government, civil society, academia and industry. Inter alia, they may aim at formulating an agenda and objectives for sustainable development and mining, sharing best practice, promoting accountability and/or improving the image of the sector. They are largely voluntary. As there is no commonly accepted metric for judging their importance or impact of initiatives, priority has been given to those ranked highest in Google searches, as well as those mentioned in the research literature (see e.g. Dashwood 2012).

One limitation regards national and international legislation and regulations associated with mining. These will only be touched upon briefly where relevant in this report. Legislation and regulations play an important role in framing how sustainable development should be understood in the context of mining. Obviously, they create opportunities and limit which actions are permissible. Legislation and regulations are also influenced by current political discourse and academic research, which inform legislators on what policy options facilitate or hinder a sustainable development. However, there are large variations between countries, and the relevant material is vast (e.g., Williams 2012). The interrelationship between legislation, regulations, sustainable development and mining therefore deserves a more dedicated and detailed study.

1.2. Outline of report

The rest of the report is organised as follows: Firstly, we will discuss how sustainable development can be understood in general and in the context of mining more specifically. Here, we will look more closely at some of the most important sustainability challenges associated with mining. Secondly, we will review the most prominent initiatives that address sustainability and mining. Thirdly, we will review academic research. This will be structured along two overarching themes: Society’s governance of mining, and Mining company sustainability management. Fourthly and finally, we discuss and suggest future areas of research.

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2 However, “voluntarism” may not be absolute. Even though they are not enshrined in law, internal and external pressure might increase the cost of non-participation for companies (see Schiavi & Solomon 2007).
2. Sustainable Development and the Impact of Mining

2.1. The “Sustainable development” concept in the context of mining

This report departs from the concept of “sustainable development”, which today is frequently quoted in political discourse. The most common definition of sustainable development comes from the United Nations World Commission on Environment and Development, which released its report Our Common Future in 1987. Also known as the Brundtland report, it states that sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (World Commission on Environment and Development 1987)

The concept is commonly divided into three "pillars" or "dimensions": economic, environmental and social. Accordingly, all three pillars need to be considered in order to achieve sustainable development.

Sustainable development, both as a policy aim as well as its most common definition, has been widely accepted. Yet it neither specifies what exactly needs to be sustained nor how. As a result, sustainable development has been open for competing interpretations.

There have been several attempts to re-conceptualise sustainable development into something which can be more practically applied, with varying points of departure. An ecological approach to sustainable development is through “resilience”. Resilience can be defined as “the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks.” (Walker 2004: 2) For example, humans contribute to global warming through emissions of greenhouse gases, which is partly mitigated by increased storage of carbon in forests. As the ecosystems’ response to human activity is dynamic rather than linear, predicting effects of human impact can be difficult. However, there are limits to how much ecosystems can adapt to and stabilise the effects of human activities. If those limits are transgressed, large-scale and non-reversible environmental change may occur. Sustainable development can therefore be interpreted as maintaining and strengthening resilience.

Mining has the potential to disturb resilience at the local level. For example, if toxic waste is leaked into rivers, fish stocks may collapse. In turn this affects other species dependent on fish for food, including humans. There have also been attempts at transferring “resilience” from ecological to social systems (see e.g. Folke 2006). Arguably though, in that context “resilience” is not necessarily any more practical or enlightening as a concept than “sustainable development”.

Within economics, a key presumption is that activities can create both positive and negative effects on society, such as innovation and job opportunities,
but also dust, noise and greenhouse gas emissions. Many of these effects are experienced by unrelated third parties, and are known in economic jargon as “externalities”. A key challenge to sustainability is to make sure that companies and individuals are made accountable for the externalities they cause. By making polluters pay, they will have a strong incentive to minimise negative harm on society.

In economics, we can also conceptualise sustainable development through the capital approach. According to this, our productive assets can be divided into financial capital, fixed capital (buildings and machines), environmental capital (natural resources and other ecosystem services) and human capital (knowledge and skills). From these assets, humankind receives rents which can be consumed or reinvested. For example, from forests we get timber, and with human knowledge we can produce services. In practice, this means we have to measure and value nature as well as other forms of capital.

A prerequisite for sustainability then is the long-term maintenance or growth of the aggregate sum of all kinds of capital. Thereby future potential for consumption is at least equal to the current level. This is also known as “Hartwick’s rule” (Hartwick 1977; Solow 1993). For example, forestry can generate income which can be spent on education, thereby investing in human capital. However, there has been an intense debate around the degree to which natural capital can be traded with other forms of productive assets. Proponents of “strong sustainability” argue that sustainable development requires the conservation of current natural capital, whereas advocates of “weak sustainability” believe that a certain degree of tradability between natural capital and other assets is permissible.

As a consequence, there has been a vivid debate around whether or not mining can be considered sustainable by definition. On the one hand, mining depletes known deposits, and the time needed for natural replenishment is beyond what can be considered meaningful for humankind. Therefore, a substantial part of the literature on mining and sustainable development focuses on the physical availability of minerals (e.g. Poulton et al. 2013; Mudd 2010; UNEP 2010; Mudd 2007a; Mudd 2007b; Gordon et al. 2006; Wellmer & Becker-Platen 2002).

Mining could be considered as essentially incompatible with a “strong” version of sustainability, since this by definition demands the conservation of current stocks of natural capital. On the other hand, according to a “weak” version, mining is sustainable if the mining rents are reinvested in education, infrastructure, new mines or other forms of capital, which can generate future welfare. The dispute between proponents of “strong” and “weak” sustainability has also been framed as a dispute between two different paradigms: the “fixed stock paradigm”, which is concerned about absolute stocks and their rate of depletion; and the “opportunity cost paradigm”, which purports that the market and price incentives will regulate and balance supply and demand. According to Tilton (1996), the proponents of the former tend to be ecologists, and the latter economists.

On the other hand, metals generally can be recycled and reused. Furthermore, the amount of available natural resources may actually grow over time as technological progress and increased demand make new sources identifiable and profitable. This implies, for instance, that the stock of economically exploitable materials will be dynamic and largely influenced by technical competence, prices, and the presence of exploration activities. Despite increased rates of...
extraction, reserves have grown. And society has been able to develop substitutes for a number of natural resources. Therefore, alternative definitions of sustainability have been proposed. One example is Allan, who suggests "the rate of use of minerals should not exceed our capacity to find new sources, acceptable substitutes or recycle" (Allan 1995: 4).

Notwithstanding this, a number of important questions remain. How should different types of capital be valued in different contexts? People disagree on the methods of valuation, which may be subject to both practical and philosophical challenges (see e.g. Söderholm 2000 for economic valuation of the environment in a mining context). Sustainable development can mean different things for different people, on different scales and in different sectors (Waye et al. 2009: 153). This is illustrated by Han Onn & Woodley (2014), who have identified eleven different conceptualisations of sustainable development used within the mining industry. While metals may be recycled, this will not necessarily happen at the same location as extraction. This is a challenge for the mining communities that will eventually need to find other sources of to generate future income streams, although mine lifetimes vary immensely.

As it seems impossible to find a consensus around a single interpretation, a perhaps more fruitful approach is to look empirically at what key sustainability issues have actually been brought to the fore by mining. Which issues are identified in turn depends on whose perspective is included.

### 2.2. Who are affected by mining, and how?

Historically, there has been a lot of focus on how mining impacts at the national level, and especially its contribution of income to government. At the same time, mining has often been conducted with little regard to those affected nearby. Today, “stakeholders” are a key issue of concern.

Stakeholder theory has been developed from management and organisational literature, and stakeholder management refers to how organisations deal with “any group or individual who can affect or is affected by the achievement of the organization’s objectives.” (Freeman 1984: 46) Following this broad definition, the list of potential stakeholders can be almost inexhaustible. Government is still an important actor, as are owners and investors. Even people abroad are affected, as mining contributes to global warming as well as to the provision of minerals. Increasingly though, focus has moved to local and regional stakeholders. They include inter alia employees and their families, subcontractors, local authorities, indigenous populations, all those who wish to enjoy the local environment for leisure or business, or the natural environment itself. And finally, stakeholders can include both current and future generations.

Stakeholders have different interests and are impacted differently by mining. Notably, employees and their families have a direct economic interest in the mine. Dust and noise affect mine neighbours. And mining companies create opportunities for local entrepreneurs, but also compete for access to land with other sectors such as forestry, tourism, hunting or husbandry. Not only has there been a trend towards policymakers and researchers increasing their attention to stakeholders living in close proximity to mines (referred to as “local communities”), but also including them in different stages of decision-making. As a result, finding ways to handle diverging stakeholder interests and opinions are today crucial questions in the context of sustainable development and mining.

Also notable is the fact that mines in developed countries such as Australia, Canada, Finland and Sweden are generally found in areas that are sparsely populated and where mining often is the dominant economic activity. This raises some additional challenges, such as how to manage economic dependency and post-mine development, which we will revisit shortly. Furthermore, several of these areas are characterised by relatively extreme climate conditions, and are host to indigenous populations.

The effects of mining vary not just according to who the stakeholders are, but also according to factors such as geological conditions, mining technology, economic and political context (see e.g. Bridge 2004). What kind of ore is being mined and how? For example, acid drainage is a large environmental threat when extracting sulphide-containing ores and gold mining is associated with a risk of cyanide-leakage. Some
mines can pose particular challenges to the work environment, for example deep underground mines. Furthermore, mines differ in the size and grade of their ore, and so do therefore also their economic contribution and lifespan.

In the following sections, we will look at some of the effects of mining documented in research. While most of the research focuses on one specific issue, such as job creation, Hajkowicz et al. (2011) have compared the gross value of minerals production with a broad set of quality-of-life indicators. Data have been gathered from 71 local government areas in Australia. They find a significant and positive correlation with regards to income, housing affordability, communication access, education levels and employment. Their study even shows a slightly weak but significant negative correlation between the gross value of minerals production and life expectancy. The authors’ theory is that this might be the result of the lower life expectancy of indigenous populations, as they constitute a relatively large portion of the population in Australian mining areas. They even stress that their results mask large inequalities within local government areas. Notably, the study reveals correlations, but not causality between mining and quality of life.

Although both policy-makers and researchers stress the need to consider the long-term effects of mineral development, very few studies actually examine development after mining closure. One notable exception is Bowes-Lyon et al. (2009), who have looked at two northern Canadian communities. In these case studies, they found that few benefits apart from some business creation outlived the local mine. On the other hand, research today very much reflects and shares the preoccupation of public discussion on the local and regional effects of mining. This includes how mining affects local environment, regional development and social cohesion. How public and private policy-makers try to mitigate the negative effects and maximise benefits through policies and actions will be revisited later on.

2.3. Economic effects of mining

There is an extensive literature on the economic effects of mining. A more detailed review can be found in a parallel report by Söderholm & Svahn (2014), who focus on the relationship between mining and regional development, and in particular employment. As they note however, a lot of the research has focused on effects on the national level, and often in developing countries.

Experience shows that while natural resource wealth can be a source for economic growth and welfare, it has often not translated into development for the broader society. This is also known as the “resource curse”. Causes include weak governance, corruption and irresponsible company behaviour (see e.g. Sachs & Warner 2001). The demand and price of mined resources are generally determined on global markets, which tend to be volatile and cyclical. The result is boom and bust economies and fragile communities (Radetzki 2008). Mining companies, whose investments and technologies have long life-cycles, in turn have difficulties adjusting to changes in the economy and society (see Bartos 2007). Also, due to the inflow of new revenues, the exploitation of natural resource wealth can lead to higher real prices and exchange rate appreciation, thereby deteriorating competitiveness in other sectors of the economy. This phenomenon is known as the “Dutch disease” (Radetzki 2008: 206–211).

In developed countries, focus has moved from the effects of mining on the national level, to considering how it contributes towards regional development. Historically, job creation and subsequent increased income is probably the most tangible benefit from mining for local communities. Jobs are created directly through hiring in mining companies. Indirectly, mining-related activities both upstream and downstream, such as exploration and beneficiation respectively, lead to more employment. And furthermore, new jobs appear elsewhere in the community as a result of mining, such as in service due to increased spending by miners and their families. The relation between the number of direct jobs created by mining, the total number of jobs including those indirectly created in other parts of the economy, is known as the employment multiplier.

Mining has become more capital-intensive, technical and automated. As a result, there are fewer direct jobs within the mining industry at the same time as the rate of extraction has increased (SGU 2013; Ejdemo
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Studies of the total employment effect of mining give widely different estimates of the multiplier, from less than one up to several jobs supported for each direct job in mining (see Söderholm & Svahn 2014; Ejdemo & Söderholm 2011). Studies rely on different methodologies for estimating the job creation effects.

The number of jobs captured by a region depends on the existence of potential for up- and downstream activities. This in turn depends on factors such as the local workforce’s qualification and experience, the potential to attract immigration, and on investment in infrastructure. In general, bigger and more diverse economies are better equipped to supply inputs needed and thus capture possible jobs (Fleming & Measham 2014; Ejdemo 2013; Ritter 2001: 224). Notably though, mines are often situated in sparsely populated areas. In some cases, mining companies have resorted to “fly-in fly-out” in order to supply the skills needed. This refers to arrangements by which employees commute to mines, often over long distances, in order to work for a number of days at a time before returning home for rest. It is especially common in Australia and Canada. But even in cases where mining companies employ from the local populations, input such as goods and services may be sourced from further afield. As a result, mining projects have increasingly become economically detached from the region in which they are located, as jobs and income no longer automatically benefit local communities (Ejdemo & Söderholm 2011; Radetzki 1994).

Diversification of the economy through development of up- and downstream activities may be important for capturing more indirect jobs as well as for long-term sustainability: the economic opportunities may still be viable even after local natural resources have been exhausted, through selling goods and services to mines located elsewhere, or to other sectors (Ritter 2001; 226). Synergies exist between mining and some economic activities. Common use of the same infrastructure is one example. But there can also be conflicts of interest, such as competition for workforce. Finally, successful local diversification also depends on the capacity to innovate, i.e. inventing new services, products or methods for the market. Arguably, developed countries such as Finland, Sweden and the US owe part of their development to the successful transformation of a natural resource-base into competitive, diversified and knowledge-intensive industries (Walker & Jourdan 2003). For example, Swedish companies have taken a large share of the global mining equipment market, despite a relatively small mining sector of its own. According to Kurkkio et al. (2014), one important explanation for Sweden’s success in innovating is the close and long relationship and collaboration between mining companies and their equipment suppliers.

Another way then to ensure that income generated from mining stays in a region or benefits a particular group of stakeholders is through benefit-sharing mechanisms. These include agreements between companies, communities and sometimes also the government, and often include provisions regarding job quotas and procurement from local companies, as well as direct payments. Benefit-sharing mechanisms will be revisited in more detail later on (see also Söderholm & Svahn 2014).

2.4. Environmental effects of mining

Mining is associated with considerable environmental challenges. Some of them it shares with other industrial activities, notably emissions of greenhouse gases. Other challenges are more specific to mining, and their effects are often found on the local and re-

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In total, the mining sector generated 129 million tons of waste, 6000 tons was classified as dangerous, of which 80 percent consisted of chemical pollutants (Swedish Environmental Protection Agency 2014a: 42).
Mining affects the physical landscape by moving and depositing large amounts of rock and through the construction of roads and railroads. In 2012, mining generated over 80 percent of waste from all companies and households in Sweden, the vast majority of which was waste rock (Swedish Environmental Protection Agency 2014a). A short summary of the most important challenges can be found below, while Widerlund et al. (2014) offer a more detailed study in a parallel report (see also Miranda et al. 2013).

Disposal of tailings is a significant environmental challenge. Tailings are materials left over from the process of separating valuable parts from ore, and they are typically disposed of in large dams. Some of the materials are potentially hazardous for local ecosystems. Thus, preventing leakages is important for reducing environmental impact of mining. Another potential discharge from mining is nitrogen, as the mining industry consumes large amounts ammonium-nitrate-based explosives. This can lead to eutrophication of lakes and rivers, harming local wildlife (Widerlund et al. 2014).

In addition to greenhouse gases, other airborne emissions from mining include dust and aerosols. These may affect human, for example through inhalation, or through the food chain, as plants absorb toxic elements. Uptake of some metals may lead to damages to vital organs and the nervous system (Csavina et al. 2013). Noise and vibrations are other mining-related environmental effects which may affect human welfare.

As already noted, some environmental challenges vary from mine to mine. Acid mine drainage is one of the most serious environmental challenge posed by mining, more specifically of sulphide-containing ores. This refers to outflow of acidic discharges which can seriously harm local flora and fauna. It occurs when sulphide minerals are exposed to water and air. Tailing dams are a notable source of acid drainage. The effects can last for as long as hundreds or even thousands of years (Widerlund et al. 2014). Gold mining, on the other hand, is associated with a risk of leakage of cyanide (Mudd 2007), and uranium mining may lead to radioactive contamination.

Mines differ in their environmental impacts depending on which related activities are taken into consideration, such as pelletising. Environmental challenges also vary over time. New technology makes it possible to reduce some negative consequences, such as emissions to land, water and the atmosphere. At the same time, extraction of lower-grade ores has resulted in the removal of larger amounts of waste rock, often through open-pit mining. In this way, other problems may be intensified, for example discharge of mine waters to ground and surface waters from pit lakes.

Lastly, a particular challenge is posed by closed mines. The Swedish Environmental Protection Agency lists over 300 such sites in Sweden (2014b). Legislation concerning mine closure and land rehabilitation has become tougher in the last decades (Otto 2009), but some of the mines that continue to pollute the environment pre-date this. In many cases those originally responsible have disappeared. Consequences may be both social and economic.

2.5. Social effects of mining

While social effects of mining have at times received less attention than the economic and environmental issues, today there is a large and growing literature. Abrahamsson et al. (2014) present a review in a parallel report, structured around three broad areas: diversity, gender and work environment. Notably though, borders between issues are blurred. In a report published by the Canadian Government entitled “The Social Dimension of Sustainable Development and the Mining Industry. A Background Paper”, the author sorts issues according to “Healthy people, healthy environment”, “Innovation and learning” and “Vigorous and proud communities” (Lapalme 2003).

Both non-physical and predominantly physical factors are important for social sustainability. Examples of the former include participation and local democracy, cultural traditions, training and social inclusion. Among predominantly physical factors are decent housing and accessibility (Abrahamsson et al. 2014). The list of potential factors is almost inexhaustible, and the impact of mining can be positive or negative. However, research on mining and sustainable development has to a large extent focused on a smaller set of key challenges.

While mining has the potential to support growth and development of vigorous and attractive societies,
it also has the potential to disturb social cohesion. Social cohesion may refer to the presence of common values, networks and solidarity in a community. Also, it is documented that an influx of workers can lead to housing shortage and put pressure on local welfare providers such as hospitals (Moffat & Zhang 2014: 62-63). In some cases, mining has also led to an increase in undesirable activities such as prostitution and alcohol abuse (Esteves 2008: 41). A number of other issues are identified by Petkova-Timmer et al. (2009) in a review of social impacts of mining on six Australian communities. They include increased traffic density and accidents, lower school enrolment, physical and social effects of shift work, and pressure on local social fabric and identity.

From a company and employee perspective, “fly-in fly-out” may be an attractive alternative to developing and moving into more permanent local settlements. It can help avoid some of the problems associated with mining and mine closure, such as the disturbance of local indigenous culture or local inflation (Ritter 2001: 230-231). However, there has also been criticism of “fly-in fly-out” arrangements. Negative social effects include disruption of families, lower community cohesion and entrenchment of gender roles (Abrahamsson et al. 2014). It is also associated with occupational fatigue and associated health problems such as high blood pressure and injuries caused by accidents (ibid.: 34, 36).

Gender in turn has been another prominent focus in the literature on the social effects of mining. Mining is a male-dominated industry, where men often make up almost 90-95 per cent of blue-collar workers. Stereotypical gender roles such as “macho-masculinity” among miners has resulted in dysfunctional organisations that inhibit learning and create opposition to the introduction of new technology and to safety procedures (ibid.: 22). Male-dominance within the mining industry has societal repercussions. High wages vis-à-vis other sectors aggravate gender income differences (ibid.: 26). Strict norms about gender roles and a “masculinised” local culture may create difficulties for the recruitment and retention of talent. Most obviously this is illustrated by the exodus of young women experienced in many mining regions, but also by men feeling anxious about taking up jobs that are associated as more “feminine” than mining (ibid.: 25).

Finally, a lot of the public debate as well as research on mining have centred on the situation of indigenous populations. This is at least in part due to the history of gross mistreatment in many areas (Heisler & Markey 2013: 398). While mining may provide jobs, the number of indigenous employees is in many cases low. Furthermore, mining sometimes competes with traditional forms of livelihood and disturb natural surroundings which are important for indigenous identity and cultural heritage. There is a trend towards mining companies negotiating agreements with local communities and indigenous people, including inter alia workforce quotas and support to regional development funds. Experience so far show mixed results of such agreements (Söderholm & Svahn 2014; O’Faircheallaigh 2013; O’Faircheallaigh 2010a).

2.6. Effects, synergies and trade-offs

Summarising, the three dimensions of sustainability; economic, environmental and social; seem like a fruitful point of departure for identifying the effects of mining. Some of the most important effects include job creation and regional economic development; acid drainage and emissions of dust and greenhouse gases; and potential disruption of local communities. However, there are large variations between mines, their surroundings and stakeholders. Furthermore, there is no consensus on how to conceptualise sustainable development in the context of mining. Considering issues in isolation risks overshadowing the fact that important synergies and trade-offs exist. For example, the quality of the environment has social implications, inter alia through affecting people’s health. Company profitability may in turn be affected by the health of their workers. As already mentioned, economic development might aggravate gender wage differentials. And demands for increased local participation in decision-making might increase short-term costs for companies, though with the hope to reduce long-term risk of conflict. For policy-makers, synergies and trade-offs create difficulties as they need to be added to the equation when pros and cons of mining are weighed. However, research that explicitly explores synergies and trade-offs is sparse.
3. Reviewing Initiatives on Mining and Sustainable Development

3.1. Introduction

During the last two decades, several initiatives have appeared that address sustainable development and business. As mentioned earlier, they include collaborative and voluntary projects, programmes and organisations that bring together policy-makers from government, civil society, academia and industry. Inter alia, they may aim at formulating an agenda and objectives for sustainable development, setting standards, sharing best practice, promoting accountability and/or improving the image of the sector. In one review, over 300 such initiatives are identified. They cover areas such as forestry, chemicals and textiles (Vogel 2008), as well as mining. In the following sections we will review some of the most prominent examples of the latter.

Initiatives have different sources. One notable source is NGOs, including Greenpeace, Transparency International and the World Wildlife Foundation (WWF). They have played an important role in raising awareness, mobilising opinion, lobbying and launching litigation (Dashwood 2012: 80-81). NGOs have set up their own initiatives that focus on sustainability in the mining sector, but have also participated in similar effort initiated by other actors, such as governments and inter-governmental forum. The latter include international organisations like the UN and the World Bank, which have also initiated and led their own set of initiatives. And finally, some initiatives emanate from the industry itself and its associations (Schiavi & Solomon 2007).

Initiatives can be divided according to their primary target audience: the public sector; companies and company management; and investors. We have structured the following sections accordingly. Consumer-oriented initiatives have been less apparent compared to sectors such as clothing and food. Some cases exist, notably within the jewellery and electronics industries, where consumers are encouraged to buy products using minerals that are certified “conflict-free” or “fair trade”. However, most of such initiatives are first and foremost oriented towards other companies.

Some initiatives have multiple target audiences. One notable example is the World Economic Forum, which has launched a “Responsible Mineral Development Initiative”. The initiative purports to “[p] rovide a neutral platform for multi stakeholder engagement at country, regional and international level.” (World Economic Forum 2014) Based on consultations around the world, the World Economic Forum has proposed a tool for “enhancing understanding of the drivers of value in mining” (ibid.), dubbed “Mineral Value Management”. It has also published a
report in which it identifies examples of solutions to challenges faced with regards to responsible mining development (ibid.). Notably though, while the World Economic Forum engages various stakeholders, its membership is constituted of companies.

As mentioned earlier, we will not explicitly address legislation or regulations. On a general note, though, there seems to be some convergence between different countries’ mining legislation. This can be explained by similar concerns regarding the environment, human rights and competitiveness (Otto et al. 2006: XIII; Liedholm Johnson 2010). On the other hand, differences remain. One indication of this is the annual survey of mining and exploration companies performed by the Fraser Institute, a Canadian think tank. Inter alia, respondents are asked to evaluate different jurisdictions’ public policy climate according to how attractive they perceive these to be for investment. Factors included are regulatory uncertainty, disputed land claims, taxation regimes and environmental legislation. In 2013, the 690 respondents ranked Sweden as having the most investment-attractive policy climate with a score of 95.2 (on a composite index with which ranges from 0 to 100). Finland, Ireland and Norway as well as several provinces and states in Australia, Canada and the US also received high scores. Conversely, Kyrgyzstan was considered the least attractive of all 112 included jurisdictions with a score of 5.3 (Wilson & Cervantes 2014). It should be noted though that companies’ perception of the investment climate in a country does not automatically reflect formal legislation, but is also influenced by other factors including political stability and corruption.

3.2. Public sector-oriented initiatives

Initiatives that target the public sector and public governance focus on reforms and policies which can help maximise the benefits emanating from the mining sector. They are guided by that awareness that good governance is important for translating mineral wealth into development for society.

Most of the initiatives focus on developing countries and on strengthening institutions and transparency. One prominent example is the Extractive Industries Transparency Initiative (EITI), where participating governments must require companies operating within their territory to publish what they pay policymakers for their right to explore and extract energy and minerals. Furthermore, governments also have to record the revenues received, and create multi-stakeholder groups which are tasked to evaluate information disclosed by both companies and public sector. Most of EITI’s member countries are found in the developing world, though Norway has been a compliant member since 2011. France, the UK and the US have announced their candidacy (EITI 2013).

On a regional level, the European Union (EU) has addressed the mining and minerals sector, notably through the Raw Materials Initiative. Established in 2008 by the European Commission, the Initiative builds on three pillars: Access to raw materials on world markets at undistorted conditions; fostering sustainable supply of raw materials from European sources; and reducing the EU’s consumption of primary raw materials (European Commission 2008). “Sustainability” in this context is mostly associated to ensuring a supply of raw materials through promoting the exploitation of European sources, improving resource efficiency and recycling, as well as through securing access to non-European sources. Consequently, an ad-hoc working group has identified critical raw materials for which the EU is currently import-dependent and should monitor (European Commission 2014a). Also, a European Innovation Partnership on Raw Materials has been established in order to coordinate effort for improving the supply-security of raw materials (European Commission 2014b).

Nonetheless, the EU has touched upon other sustainability-related issues through its initiative. The European Commission has developed a guidance document on how to undertake resource extraction near Natura 2000-environmental protection areas (European Commission 2011). An ad-hoc working group on “Exchanging Best Practice on Land Use Planning, Permitting and Geological Knowledge Sharing” has also been established, which released its final report in 2010. In the report (European Commission 2010: 6–7), the group states that the following elements need to be included to attain a sustainable mineral policy:
Facilitation of the transformation of natural mineral capital into built physical, economic, environmental or social capital of equal or greater value;

- ensuring that environmental and negative social impacts of mining are minimised and their costs incorporated into production functions;
- requiring transparency and information sharing;
- reconsidering the allocation of rights and the availability of resources across generations;
- addressing benefit risk trade-offs from the perspective of multiple stakeholders and create contingency plans that will ameliorate the effects of mineral market booms and busts; and
- correlation and consistency with other governmental policies.

Lesser known initiatives include the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development, which aims to be a forum for dialogue between member-country governments, mining companies and industry associations. It was inaugurated in 2005 and gathers 48 countries, including Canada and the UK. In 2009, the forum conducted a survey among its members which led to the publishing of a "Mining Policy Framework", which subsequently has been revised. The framework gives advice to governments on mining reform within the following broad areas: legal and policy framework; financial benefit optimisation; socio-economic benefit optimisation; environmental management; postmining transition; and artisanal and small-scale mining (Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development 2013). Another initiative is the Natural Resource Charter; a set of twelve principles for how governments and societies best can manage the opportunities created by natural resources for development (Natural Resource Charter 2010).

3.3. Company-oriented initiatives

Several initiatives target companies and their management, with varying focus such as proposals for principles and policies for sustainable practice; management standards; accountability, reporting and assurance. The most influential and well-known initiatives of the first kind include the UN Global Compact and its Ten Principles, which cover human rights, labour, the environment and anti-corruption; the UN Guiding Principles on Business and Human Rights; and the OECD Guidelines for Multinational Enterprises. While these are formulated for business in general, several mining companies have signed up for these principles and guidelines, and report on their progress in implementation.

One of the broadest and most cited initiatives focused on the mining sector is the International Council on Mining and Metals (ICMM). Its predecessor, the International Council on Metals and the Environment (ICME), was established in 1991. It was a corporate membership-based organisation and focused on giving the industry access to multilateral forum. However, it soon became apparent that the ICME had a too narrow mandate and could not promote global standards, thereby improving the image of the sector. In response to this and prior to the upcoming ten year anniversary of the United Nations Conference on Sustainable Development, nine mining companies formed what was called Global Mining Initiative (GMI) in 1999. The GMI in turn led to two notable outcomes: the Mining, Minerals and Sustainable Development (MMSD) project, and the transformation of the ICME into the ICMM (Dashwood 2007; 2013).

Through the World Business Council for Sustainable Development, the GMI commissioned the International Institute for Environment and Development (IIED) to undertake a study on the challenges facing the mining sector with regards to sustainable development. The result was MMSD. The MMSD project involved almost forty mining companies, and also invited the participation of mining associations, NGOs and academics. It resulted in several reports, including the final report "Breaking New Ground: Mining, Minerals and Sustainable Development".

The MMSD final report was released in 2002. It focused on nine key challenges for the sector:

1. Viability of the minerals industry.
2. The control, use, and management of land.
4. Local communities and mines.
5. Mining, minerals, and the environment.
6. An integrated approach to using minerals.
7. Access to information.
8. Artisanal and small-scale mining.
Following an analysis of these challenges, the report suggested a list of key actions in order to promote increased sustainability. Inter alia, these included the establishment of complaints and dispute resolution mechanisms; reporting guidelines; community sustainable development plans; identifying “no-go” protected zones for mining; and reaching a global labour-management agreement. These actions were to be carried out by mining companies, but also governments, NGOs and international organisations (IIED 2002). Subsequently, several mining companies adopted the Toronto Declaration, which included a set of commitments building on lessons from the report. While the MMSD project was lauded for its ambition and scope, it was also criticised by several stakeholders for merely being an exercise in public relations. Notably, some NGOs refused to participate. Others, including indigenous organisations, were largely sceptical and refused to endorse the final report (Dashwood 2012: 233).

At the same time of the MMSD project, ICME was overhauled; its mandate broadened, and became ICMM. The aim of ICMM is to “represent the world’s leading companies in the mining and metals industry and to advance their commitment to sustainable development.” (ICMM 2014a) The transformation of ICME into ICMM was also meant as a way to ensure that lessons from the MMSD project would be followed up (Dashwood 2012: 235). ICMM today gathers 21 of the world’s largest mining companies as well as 33 national and regional mining associations. The organisation publishes regularly reports, guidelines and position statements on environment and climate change, health and safety, materials stewardships, and social and economic development. Membership is conditional on the adherence of ten principles:

1. Implement and maintain ethical business practices and sound systems of corporate governance.
2. Integrate sustainable development considerations within the corporate decision-making process.
3. Uphold fundamental human rights and respect cultures, customs and values in dealings with employees and others who are affected by our activities.
4. Implement risk management strategies based on valid data and sound science.
5. Seek continual improvement of our health and safety performance.
6. Seek continual improvement of our environmental performance.
7. Contribute to conservation of biodiversity and integrated approaches to land use planning.
8. Facilitate and encourage responsible product design, use, re-use, recycling and disposal of our products.
9. Contribute to the social, economic and institutional development of the communities in which we operate.
10. Implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders.

Members of ICMM are furthermore obliged to report their performance in accordance to Global Reporting Initiative (GRI) guidelines, and provide independent assurance (ICMM 2014b). Similar initiatives can be found within the mining industry on the national-, sector- and individual company level. For example, the Minerals Council of Australia has established a framework for sustainable development known as “Enduring Value”. Another prominent example is the Mining Association of Canada’s “Whitehorse Mining Initiative”, which was established in 1993 as a comprehensive nation-
A roundtable with the aim to achieve a consensus among key stakeholders including industry, environmental networks, labour, and indigenous groups. The result was a policy framework for handling mining issues in a collaborative manner. Later on, in 2004, the Mining Association of Canada launched the “Towards Sustainable Mining”-initiative. Compared to its predecessor, “Towards Sustainable Mining” has a narrower focus around a few guiding principles and performance indicators, but includes a stronger mechanism for monitoring (Fitzpatrick et al. 2011).

An example of a sector initiative is the International Cyanide Management Code, an industry voluntary program for gold mining companies. Furthermore, individual companies have in many cases established their own sustainability policies. At the regional level, the inter-parliamentary body the Nordic Council has recommended their national governments to establish clear sustainability criteria for the mining sector. They further recommend that the criteria be published in a form of a declaration or manifest, to which mining companies may become signatories (Nordic Council 2014). At the time of writing, the recommendation has yet to be addressed by the Nordic Council of Ministers.

There also exist a number of international standards for sustainability management. These cover areas such as environmental management (e.g. ISO 14001), human rights (e.g. OHSAS 18000) and labour practice (e.g. OHSAS 18001). These standards are commonly implemented by companies, which in turn can be certified by an external party. In 2010, ISO 26000 was released, which covers corporate social responsibility. According to the International Organization for Standardization, which has developed the standard, ISO 26000 “is intended to assist organizations in contributing to sustainable development.” (ISO 2010: 3) In Spain, a voluntary standard for sustainable mining management system requirements was released in 2008, coupled with a standard listing 38 indicators to assess implementation (European Commission 2014c).

Many of the most prominent initiatives around mining and sustainable development are focused on promoting increased availability and comparability of information on the impact of mining. This includes the already-mentioned Extractive Industries Transparency Initiative (EITI), where participating governments must require companies operating within their territory to publish what they pay policymakers for their right to explore and extract energy and minerals. In 2010 the US Congress passed the Dodd–Frank Wall Street Reform and Consumer Protection Act which, inter alia, requires oil, gas and mining companies to report payments made for the acquisition of licences. Similarly, other initiatives also push for increased transparency within the mining sector. At the same time, several proposals for standardised sustainability reporting frameworks have appeared. One recent overview of sustainability indicator initiatives included over twenty which were applicable for the mining industry (Fonseca et al. 2013: 180).

The most well-known standard for reporting comes from the Global Reporting Initiative (GRI). GRI was founded in 1997 and describes itself as “an international not-for-profit organization, with a network-based structure” (GRI 2014). It released its first full set of guidelines in 2000, and published its fourth and latest version in 2013. Today, it is used by a large number of companies from different sectors.

The guidelines include instructions on what to report and how. In addition to the “general standard disclosure”, which includes information on governance, values and strategy, there are also specific standard disclosures. The latter are divided into three categories: economic, environmental and social. In turn, the social category is divided into four sub-categories: labour practices and decent work; human rights; society; and product responsibility. For each of these categories, a number of sustainability issues are included. Depending on the level of disclosure, reports are graded from C to A+.
GRI has developed a mining sector-specific standard for sustainability reporting, in cooperation with ICMM: the Global Reporting Initiative Mining and Metals Sector Supplement. Released in 2005, the aim of the supplement is to give more information on “the aspects of sustainable development that characterize the mining and metals sector, often because they are encountered more frequently or in greater measure than in other sectors.” (GRI 2011: 7) The main contextual issues covered by the supplement are (ibid.):

- The control, use, and management of land.
- The contribution to national economic and social development.
- Community and stakeholder engagement (e.g. policies regarding community consultation).
- Labour relations (e.g. policies and practices applied to contractors).
- Environmental management (e.g. management of tailings and sludges).
- Relationships with artisanal and small-scale mining.
- An integrated approach to minerals use.

There is also a growing focus on assurance of sustainability information and certification of responsible behaviour. ICMM has developed an Assurance Procedure for its member companies and assurers. In parallel, the Initiative for Responsible Mining Assurance (IRMA) was established in 2006 with the aim of “establishing a multi-stakeholder and independently verifiable responsible mining assurance system that improves social and environmental performance.” (IRMA 2014) According to Fonseca (2010), progress in discussions within IRMA seems to have been hampered by conflicting views around adequate performance standards. By July 2014 however, the first standard was released for public consultation in 2014. While some of the initiatives around certification target the mining companies themselves, others are primarily focused on companies in other parts of the value chain. The most examples focus on so-called conflict minerals. These are minerals sourced from conflict areas and where income is often used to fund and fuel the conflict itself (see United Nations 2002). The OECD has developed a Due Diligence Guidance for companies that source minerals conflict-affected and high-risk areas (OECD 2013). Its recommendations revolve around how companies should strengthen their management systems; identify and assess risks; design and implement strategies to respond to those risks; carry out independent third-party audit of supply chain due diligence at identified points in the supply chain; and report (ibid.)

Other initiatives on conflict minerals include the Conflict-Free Sourcing Initiative, which runs a “conflict-free smelter program”; the Kimberley Process Certification Scheme for diamonds; and a number of fair trade gold certification schemes (see Hilson 2008 for a critical discussion). The already-mentioned Dodd–Frank Act requires companies to report on their sourcing of conflict minerals.

For other sustainability issues, such as environmental performance, common certification schemes have not been as successful yet. However, demand from consumers and companies downstream may change that. Another important group which can wield influence over mining companies are investors, which we turn to next.

3.4. Investor-oriented initiatives

Investors and company-owners such as banks, funds, individuals or governments have increasingly come to play an important role in promoting social responsibility. They can obviously leverage pressure on companies, through ownership or choosing whether or not to invest in specific mining projects, which often are very capital-intensive. According to Jenkins and Yakovleva, investors’ interest in sustainability may be driven by risk management, or by pressure from other groups, notably NGOs (Jenkins & Yakovleva 2006: 276; see also Dashwood 2012: 82).

Among the more well-known initiatives directed towards investors are the Dow Jones Sustainability Index and FTSE4Good Index, which are benchmarking tools for including sustainability considerations in investment assessments. The Equator Principles is a credit risk management framework for determining, assessing and managing environmental and social risk in project finance transactions. 79 financial institutions have officially adopted the principles (Equator Principles 2014). The Carbon Disclosure Project reports that it is backed by 767 institutional
investors for whom it collects company information on greenhouse gas emissions and water usage, as well as strategies for managing climate change, water and deforestation risks (Carbon Disclosure Project 2014). These initiatives are not exclusive for the mining industry. EITI also has an “Investors’ Statement on Transparency in the Extractives Sector”, which is signed by around 80 institutional investors that collectively manage over USD 19 trillion (EITI 2014).

The World Bank provides loans for developing countries and has supported a number of mining projects. Due to the awareness of that natural resources in many cases have not delivered development, the World Bank commissioned a review of its support to extractive industries. The resulting report, “Striking a better balance”, was published in late 2003 and included a number of recommendations on how the World Bank can work to ensure that its support to oil, gas and mining leads to poverty alleviation. The report states that the ultimate goal of its recommendations is to lift up the role of civil society; to raise social and environmental considerations; and to strive for a human rights-based development. The recommendations to the World Bank Group focused primarily on how it could strengthen the transparency and accountability of recipient countries, ensure benefit-sharing, and push companies to engage directly with affected communities (Salim 2003). Since then, the World Bank publishes annual report on its activities in extractive industries. The report also led to the International Finance Corporation, a member of the World Bank Group, to adopt a set of Policy and Performance Standards on Social and Environmental Sustainability, to which Equator Principles signatories have to adhere (Dashwood 2012: 82).

Finally, individual owners and investors have also developed their own policies and standards to ensure sustainable investment. For example, all Swedish state-owned companies are obliged define and adopt relevant sustainability targets and to report annually according to GRI. The Norwegian sovereign wealth fund, which is the world’s biggest equity investor, has divested its holdings in several companies in the extractive industries due to sustainability concerns. The Norwegian Ministry of Finance decides which companies are excluded for investment, which in turn is guided by recommendations from a Council of Ethics. In early 2014, it announced that it would cut its investment in gold and coal miners and would review the entire sector the same year (Reuters 2014).

3.5. General trends and effects of initiatives

The role of initiatives is a heated topic for debate, both within and outside of academia: ranging from those who see them as a powerful tool for sustainable development, to those who see initiatives as another exercise in public relations (see e.g. Kirsch 2010; Whitmore 2006).

Two notable trends emerge: firstly, they focus on larger mining companies. And secondly, there is a movement towards a narrower, operationalised approach towards sustainability. The first trend is confirmed by Schiavi & Solomon (2007), who further note that voluntary initiatives tend to focus on companies that have shown relatively better performance with regards to sustainability. While the performance of larger companies is of obvious interest due to the scale of their operations and impact, smaller companies today play an important role in mining development. The relative performance of smaller companies is debated in the academic literature. While some note that they often lack resources and experience to act responsibly (see e.g. Bebbington et al. 2008: 978; Heisler & Markey 2013: 395), a review of mining concessions held in Sweden finds that relatively new mining and exploration companies have generally taken a more ambitious approach to developing Environmental Impact Assessments and stakeholder consultations than their more established peers (Tarras-Wahlberg 2014).

Following the second trend, many initiatives have a narrow focus, such as a few guiding principles, performance standards, indicators and reporting frameworks. Particularly many initiatives focus on the latter. While this has increased the possibility for monitoring and comparability, the different frameworks also have their shortcomings. In a review of five prominent such frameworks, Fonseca et al. (2013) note that the GRI Mining and Metals Sector Supplement requires reporting on a company level rather than mining sites or regions. Furthermore, the GRI Supplement follows a “silod approach in which indicators are considered in isolation rather than looking at
trade-offs and synergies (Fonseca et al. 2012; 2013). GRI and other reviewed frameworks largely ignore the question of mineral stocks (Fonseca et al. 2013). Petrie et al. (2007) argue that many of the sustainability indicators used, such as within the GRI framework, are useful for evaluating past performance, but less so for supporting decision-making. As decision-making generally is prospective, indicators needed are predicted measures of outcome (Petrie et al. 2007: 140). Petrie et al. conclude that “there is little in the public domain, which demonstrates how sustainability metrics and frameworks are actually used to support decision making, and whether better decision outcomes are achieved as a result.” (ibid.: 142) Similarly, Fonseca et al. state that GRI “focuses excessively on organizational data drawn from the past year’s performance of a company, rather than trying to understand the future implications of mining operations to the sustainability of ecosystems and communities on the ground.” (Fonseca et al. 2013: 183) However, proposals that have attempted to correct shortcomings of the GRI framework, such as Azapagic (2004), have yet to be adopted by companies (Fonseca et al. 2013: 182). So despite being more comprehensive, their practical impact has been limited.

Compared to the amount of literature and initiatives focused on the proliferation of sustainability reporting frameworks, there is substantially less research on their actual impact (Fonseca et al. 2013: 180). Generally, it is difficult to assess the effect of individual policy initiatives, or their combined effect. As Schiavi & Solomon (2007) state, their effects are difficult to separate from other sources of influence, and there is no baseline against which to judge their impact.

Within academic research, case studies exist where the authors have at least tried to identify the pre-conditions for an effective initiative. One example is Fitzpatrick et al. (2011). In comparing the Mining Association of Canada’s relatively narrowly-focused “Towards Sustainable Mining” with its predecessor “Whitehorse Mining Initiative”, they conclude the following: “Whether [the former] represents a stronger or weaker commitment to sustainable development depends, in part, on what various interests believe is achievable and the most effective way forward.” (Fitzpatrick et al. 2011: 382)

Schiavi & Solomon (2007) have identified the following factors as particularly important for initiative effectiveness: if and how monitoring is conducted; transparency; possibility to enforce through sanctions; clear and rigorously defined content; and degree to which adoption is perceived as compulsory and wide-spread.

Considering the above-mentioned trends, there are obvious signs that initiatives increasingly have a clear content and may be monitored. Assurance, which can be a powerful tool for guaranteeing the quality of disclosure, has become more common and should result in increased transparency. However, previous research shows that assurance has suffered from quality problems, including an extensive variation in scope and verification criteria, thereby giving mining companies significant control over the procedure (Fonseca 2010). Furthermore, for most companies, sustainability reporting according to the above-mentioned initiatives and frameworks is done on a voluntary basis. They generally offer stakeholders little possibility for recourse in case of misbehaviour (Worrall et al. 2009). And as noted, initiatives generally focus on larger mining companies, which may feel pressured to participate, but largely ignore smaller actors. A possible result is that smaller and less-well performing companies have been able to “free-ride” on reputational gains. In sum, the judge is still out on the effect of policy initiatives.
4. Academic Research on Mining and Sustainable Development: An Introduction

There is a growing academic literature on sustainable development and mining. Several researchers have identified key sustainability challenges for the sector (e.g. Prno 2013; Shen et al. 2013; Laurence 2011; Solomon et al. 2008; Mudd 2007a; Yakovleva 2005; Azapagic 2004; Hilson & Basu 2003; IIED 2002). Others have concentrated on more specific issues regarding mineral development; economic, environmental, social or a combination of these. These include the reviews produced in parallel to this report (Abrahamsson et al. 2014; Söderholm et al. 2014; Widerlund et al. 2014).

Linde et al. (2012) have looked at existing social science research, in particular within political science, on political and institutional prerequisites for successful mining establishment and development. Their review is structured around the following topics, which they find discussed in literature: International conventions; Formal institutions; Informal Institutions; Stakeholders, resources, tactics and actions; and Process. They also compare the literature on mining with research on wind farms and hazardous waste facilities. Within management literature, Ranängen & Zobel (2014a) have reviewed research on how extractive industries practice CSR.

Solomon et al. (2008) have looked at how social issues are addressed in the research literature on mining, with a particular focus on Australia. They conclude that “[r]esearch that focused on clearly defined groups, such as employees and employment, Aboriginal and local communities, was more active and sophisticated in terms of volume and of being able to build a longer history of scholarship or practice.” Furthermore, relatively few comparative studies have been produced so far.

Research and practice gaps they identify are actual social performance compared to initial social impact assessment or policy commitments; the experience and perspective of different functional roles; industry work and working conditions; indigenous employment and agreement making; women and the mining industry; roles and power in public engagement and decision-making processes; and the roles and responsibilities of governments and companies in community- and regional development (ibid.).

Bridge (2004) has conducted a broad and much-cited survey of literature on mining.
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Development and the environment, in which he identified four distinctive approaches:

- Technology and management-centred approaches that focus on how to make production cleaner.
- Public policies studies of how institutions can be designed to prevent pollution and to capture and reallocate the benefits of mineral development.
- Structural political economy that studies rights and justice concerning resources and the environment.
- Cultural studies revolving around how mining is perceived in popular imagination and how it reflects society’s anxieties about the social and environmental impact of industrialisation and globalisation in general.

The different approaches are not clearly demarcated; rather, they overlap in significant ways. Depending on how the division into approaches or themes is done, different synergies and trade-offs are made visible. Here, we will focus on the following:

- Society’s governance of mining, i.e. the formal rules and norms regarding the right to access and exploit minerals, benefit-sharing and mine closure, and how they affect possibilities for sustainable development.
- Mining company management. Here, we will focus on how mining companies work to manage their impact on sustainability, including their stakeholder relations.

As already mentioned, this study focuses on mining in developed countries. Many issues relating to mining and sustainability are important both in the context of developing and developed countries, such as managing environmental impact and how to ensure local benefit-sharing. In other cases, challenges may differ. For example, artisanal and small-scale mining are uncommon in Australia, Canada and Sweden. Also, for countries which are heavily dependent on exporting natural resources, mining raises macroeconomic issues such as how to avoid decreasing competitiveness from increasing real prices, or ensuring future sources of income. In practice, these issues are mainly relevant for the developing countries that are the most dependent on exports of natural resources. In comparison, even for Australia and Canada, mining makes up a relatively small part of their economy. In Sweden the mining sector only constitutes about 1 per cent of the country’s gross domestic product.
5. Society’s Governance of Mining

Societal rules, regulations and norms influence both if and how mining should be conducted. It is therefore important for society as a whole that rights allocated and decisions made by public authorities promote sustainable development.

A lot of academic research on mining has focused on developing countries, where the capacity of governments to effectively regulate mining is weak. Developed countries generally have more sophisticated legislation or capacity to control compliance, for example to limit environmental degradation. However, mining operations are often located in remote or sparsely populated areas that are characterised by weak local government, which lack strategic and social planning (Estevés 2008: 40). As a result, society’s capacity to govern how mining activities are conducted may be limited.

The focus of the following sections will be on how society governs mining through mineral ownership and access; permitting processes; benefit-sharing; framework for handling mine closure and post-mining development; and finally, the shift from government to governance of the mining sector. Society in this context is most often represented by a central government, but may also be regional and local authorities, or the public at large. Mining company policy and practice will be addressed later on.

5.1. Ownership, access and sustainability

There is a large literature on the relationship between ownership and access to natural resources on one hand, and sustainability on the other (see e.g. Dietz et al. 2003; Hardin 1968). Two distinctions are commonly made: firstly, non-rival goods may be consumed by multiple persons without affecting availability for others, such as fresh air, radio or streetlights. Conversely, timber is a rival good as deforestation leaves less left for the rest. Secondly, some goods are excludable, whereas others are not. For example, fencing a plot of land may stop others from entering, but stopping people from fishing is more difficult. Rival, non-excludable goods are prone to unsustainable consumption, a dilemma also known as the “tragedy of the commons”; rational individuals acting in their own self-interest all have an incentive to use as much of the resource as possible, thereby leading to overexploitation.

Minerals are rival goods, but differ in the degree to which they are excludable. Some, like precious metals and gemstones, can sometimes be mined illegally. Other minerals are difficult or costly to extract compared to potential value, and are thereby effectively excludable. Thus, a basic way through which society can govern mining activities is through deciding how land and mineral rights should be owned and accessed.

In most of the world’s countries, mineral rights are held by governments (Eggert 1994: 5). A notable exception is the US, where mineral rights are held by property owners. The control of mineral resources has traditionally been framed in terms of importance for economic development and security (see e.g. Radetzki 2008: 170-172). Legislation in many countries makes a distinction between strategic and other minerals. Who actually owns a mineral may be difficult to establish (Liedholm Johnson 2010: 16). Bäckström (2012) has studied mineral ownership in Sweden, where legislation is silent on the issue. He concludes that minerals in principle belong to the property owner. However, the owner’s rights are circumscribed by the Swedish Mineral Act, by which third parties can explore and extract minerals. On a side-note, in Sweden as in many other countries, the state is a significant property owner.

In cases where the right to a mineral follows the property, third party access is often gained through negotiation with the owner or purchase of the land. In other systems, rights are usually conferred either through negotiation with governments, competitive bidding or claim staking. The latter implies that the
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In practice, these systems can be combined. In her doctoral thesis, Liedholm Johnson (2010) has compared legal systems governing exploration and exploitation of minerals in Finland, Ontario, Sweden and Western Australia. According to her, legislation surrounding mining historically reflects the interests of and relationship between landowners, mineral owners, miners and the state. Reform has alternated between strengthening public ownership and control on the one hand, and stimulating private initiative including financial capital and engineering competence to develop minerals into wealth on the other (see also Williams 2012). In the beginning of the 1990s, many countries reformed their mineral legislation in order to attract investment and encourage prospecting (Liedholm Johnson 2010: 22; McMahon & Remy 2001: 2). For example, they have included attributes such as non-discriminatory access on a first-come, first-served basis to mineral titles, and the transferability of those rights. More recently, there has been a trend towards strengthening state control, with the aim to capture a greater portion of the benefits from the mining boom (Williams 2012). We will return to the issue of taxation and benefit-sharing later on.

Complexity is increased by the fact that there are often competing claims for the right to hold or use land; not just between owners and miners, but also from a range of other interests. For example, property owners’ rights may be circumscribed for the sake of environmental protection. Aboriginal ownership and access to land is worth a particular note, as mineral resources are in many cases located in areas that have traditionally been inhabited and used by indigenous people. There is a growing literature that focuses on indigenous land rights that follow from historical use and ownership, also known as “aboriginal title” or “native title” in common law doctrine (e.g. Burger 2014; O’Faircheallaigh 2009; Parsons 2008; Fidler & Hitch 2007; O’Faircheallaigh 2006; O’Faircheallaigh & Corbett 2005; Ritter 2001). Today, indigenous groups’ rights span from the right to exercise traditional activities on land, to outright ownership. In some cases, aboriginal title has been extinguished through agreements between government and indigenous groups, whereby the latter have been compensated for giving up land claims (see e.g. Burger 2014 on the case of Alaska). In other cases, land claims may be unsettled. How indigenous rights and interests are included in policy processes will be revisited shortly. Claims may be incompatible. As mentioned, minerals are rival goods. The same may hold for the land which mines occupy and affect. How land-use is managed has economic implications for the state, mining companies and property owners, but also other stakeholders such as local and indigenous communities. There are also environmental and social consequences. A key challenge for society is therefore determining what land-use option contributes the most towards sustainable development.

According to the Coase theorem, bargaining between different parties can bring about an efficient outcome regardless of initial allocation of property rights. A precondition is well-defined property rights and no transaction costs. For example, a landowner can choose to sell his or her property to a mining company, a forest company, or to the state for conservation, depending on which is willing to pay the higher price, which in turn depends on the potential value that either activity may generate. In such a case, society can promote efficient land-use by ensuring land ownership is unambiguous.

In reality however, property rights are not always well-defined and transaction costs are high, inter alia due to the involvement of several stakeholder groups. Furthermore, the allocation of initial property rights may also have wealth implications, to the benefit of the initial holder. Instead of relying on imperfect markets and ownership alone, countries have built institutions and processes with the aim to weigh different claims and to decide which one can contribute to the most towards sustainable development (Cox 1994). We turn to this now.

5.2. Planning, permitting and public policy processes

The characteristics of processes that weigh competing claims vary from country to country. Furthermore, it is common to distinguish between exploration and prospecting; development and construction; and operation of a mine. The latter are obviously more intrusive and have a larger impact on the local
environment and communities, and may therefore be subject to tougher rules and scrutiny. It is therefore difficult to generalise around the relationship between sustainable development and planning, permitting and public policy processes.

According to Liedholm Johnson, there is a convergence internationally of mining law. One important reason is the increased focus on environmental issues and human rights (Liedholm Johnson 2010: 257). Stakeholders such as NGOs have exercised influence on legislation in order to safeguard consideration of environmental, social and cultural concerns (Liedholm Johnson 2010). In Sweden, conditions have been attached both to the right to access a mineral, as well as through the separate environmental permit needed in order to exploit minerals. Ultimately, the perception of a good balance between different stakeholders depends very much on how sustainable development is conceived (Liedholm Johnson 2010: 251).

Legal and political processes that weigh competing claims, such as planning and environmental permitting, can be seen as forum in which sustainable development is defined and contested (Cowell & Owens 1998: 807). How such processes can be formed to contribute to sustainable development has been addressed from different perspectives. Söderholm et al. (2014) have reviewed literature on the relationship between environmental regulation and competitiveness. While stringent demands on environmental performance may pose costs on companies, evidence from case studies shows that the predictability and timeliness of permitting processes is often a bigger concern. Also, costs may be lowered if there is flexibility in how companies meet those demands.

Another important aspect of permitting is on which tier of government decisions are made: nationally, regionally or locally. Depending on which, sustainable development might be interpreted differently. Whether or not regional or local decision-making fosters more socially fair or environmentally sustainable results has been widely disputed, and may depend on the scale on which sustainability is to be judged; while they facilitate the incorporation of local and regional considerations, they also limit the range of policy options available on the national level (Cowell & Owens 1998).

Closely related to where decision-making is made, is the question of who gets included. According to O’Faircheallaigh (2009), a lot of research on the public policy processes surrounding mining development has focused on public participation, which has increased in the last decades (see e.g. O’Faircheallaigh 2010b; O’Faircheallaigh 2009; Richardson 2003; Cragg & Greenbaum 2002; Zillman et al. 2002). Furthermore, there is a general assumption that greater public participation increases the likelihood that policies will promote sustainable development, although this relationship needs more investigation (O’Faircheallaigh 2009: 444). Obstacles to participation have been identified, such as short time frames, information asymmetries and a lack of financial resources, in particular on the part of indigenous communities (O’Faircheallaigh 2007; Ritter 2001: 243).

As mentioned, the role of indigenous people in mining development has received a lot of focus within the academic literature. In the past, indigenous people have been regarded as non-participants in negotiations with government or companies on mineral extraction (Ritter 2001: 228). However, in the last few decades there has been a trend towards the legal recognition of their rights. There is large variation in what rights are conferred by “aboriginal title” or “native title”, even between provinces and states within individual countries (on Australia, see O’Faircheallaigh & Corbett 2005). Indigenous groups consequently also have different possibilities to influence or veto mining development decision processes. Inclusion of indigenous voice and opinion seems to have become more frequent in parallel with increased public participation in general.

O’Faircheallaigh (2009) finds that the degree of public participation is only one of several relevant variables that shape processes, their outcome and implications for sustainability. Others include how authority is distributed; whether or not processes can be revisited; and criteria used for policy-making. Notably, the format of processes such as permitting may be governed by legislation, which circumscribes possible actions and alternatives in any given case. Processes and the possibility to influence them and their outcome has also been conceptualised as “opportunity structures” (see e.g. Cowell & Owens 2006).
A particular focus within the literature on processes has been directed towards Environmental Impact Assessments (EIA). EIAs are commonly used as a tool to ensure that sustainability considerations are included in the development process of a mine (Prino & Scott Slocombe 2012: 351). Social and economic impact is often included in this stage, and reports may also be known as Social Impact Assessments (SIA). Literature on EIA and SIA has, as mining development in general, also addressed the trend towards increasing public participation (e.g. Michell & McManus 2013; O’Faircheallaigh 2010b; Esteves & Vanclay 2009; Waye et al. 2009: 157). The purpose of this ranges from simply being an opportunity to inform the public of plans and their expected impact, through providing information to decision-makers, to actual negotiations on contents and conditions (see O’Faircheallaigh 2010b).

While EIAs and SIAs can be an important tool for foreseeing and preventing negative impact, a notable challenge is that follow-up is generally weak. Here too, increased public participation has been suggested as a remedy in order to ensure effective follow-up (O’Faircheallaigh 2007: 320). For example, local communities have been mandated to monitor impacts from mining, though they often lack the possibility to sanction violations of conditions (O’Faircheallaigh & Corbett 2005).

Decision-makers such as public agencies or courts can determine if and how mining projects should be developed based on the input they receive through legal and political processes where public participation, EIAs and SIAs are integral parts. While a thorough consideration of all factors such as the scale and type of a project, geological, environmental and social conditions, and so forth, would be ideal in order to ensure as informed decision-making as possible, this is circumscribed by the need to avoid delays and to limit the length of processes (Liedholm Johnson 2010: 25). Furthermore, instead of considering their cumulative effects, projects are often evaluated separately (see Ritter 2001: 244).

Other challenges faced by decision-makers include the inherent difficulty in putting a price on cultural heritage or natural assets and services, for which different people may attach different values (Cox 1994). Decision-makers may lack competence in some areas, such as technical possibilities or environmental impact. According to O’Faircheallaigh (2009: 454), assessments of mining projects have historically focused almost entirely on economic criteria. In some cases though, absolute restrictions on mining has been introduced. In Sweden, mining in natural parks is prohibited. Similarly, member companies of the ICMM have committed not to explore or mine in World Heritage properties. On the other hand, public processes have become more sophisticated, and it is now common to attach detailed conditions to rights and permits. Arguably, this may enable the opening up more areas for mineral exploration as negative impact can be circumscribed (Liedholm Johnson 2010: 250).

Ultimately, processes may be designed in different ways which lead to different trade-offs between economic, environmental and social concerns (see e.g. Bergqvist et al. 2013 who compare environmental permitting in Sweden between 1970 and 1990 with current practice). Planning, permitting and policy processes exist in order to determine if and how mining projects should proceed, with the aim to maximise benefits. Like ownership, process outcomes may have important implications for the distribution of negative and positive effects. This in turn may be influenced by other tools, such as taxation and impact agreements.

5.3. Capturing and sharing benefits

As the aforementioned policy initiatives show, there has been a considerable focus on ensuring that mining development leads to benefits for the wider society. From a societal perspective, it is important to ensure investment that may benefit both current and future generations. It is also important to make sure mining companies compensate for any negative externalities such as pollution and noise.

Historically, primacy was given to the mining sector’s contribution to the national level, where taxes and royalties have played an important role (Söderholm & Svahn 2014: 11; see Otto et al. 2006 for a discussion on taxes in general and royalties in particular. See also Waye et al. 2009 for an overview of royalty regimes). Governments may also secure economic gains through direct ownership of companies. For mining regions, one of the most important ways that mining...
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can lead to benefits is through employment opportunities and local procurement. As mentioned before, technological progress has led to a reduced number of direct jobs in the mining sector. Partly as a result of this development, there are increasing demands on the need to ensure that parts of the income accrued are transferred back to mining regions. And local communities have demanded a greater say in decision-making processes.

For public sector decision-makers, determining the method and level of compensation from mining activities is difficult, as they need to consider competitiveness vis-à-vis other potential mining regions. The recent trend in many countries is towards the strengthening of state control of, participation in, and income from mining (Williams 2012). However, negative social and environmental consequences are often most strongly experienced by local communities. For this reason there has been increased focus on how to ensure that they at least receive parts of the benefits from mining (Otto et al. 2006: 200-201).

Otto et al. suggest that royalties and local property value-based taxes are well suited for local distribution (ibid.). Thus society may legislate in order to ensure that local communities receive benefits from mining. At the other extreme, companies can also voluntarily contribute towards benefit-sharing, e.g. through philanthropic actions such as donations and support to local communities.

Another way in which local communities have been able to secure benefits is through negotiated agreements directly with mining companies. They come in different versions and with different names, such as “Impact benefit agreements” and “Community development agreements”. O’Faircheallaigh (2013) provides a review of recent trends. They have included commitments regarding preferential employment opportunities for local communities, and notably indigenous populations; procurement from local and indigenous-owned companies; support to education and training schemes; provisions regarding monitoring and protection of the environment; direct financial support; and the establishment of funds for long-term investments and economic diversification (see Söderholm & Svahn 2014; O’Faircheallaigh 2013; Fidler & Hitch 2007: 61).

In Australia and Canada, such agreements can be considered standard practice (O’Faircheallaigh 2010a: 69). Heisler & Markey (2013) frame agreements as the result of a void created by governments seeking to reduce intervention in rural areas, which is being filled by the private sector. As we will revisit later, the practice of negotiating agreements has been criticised as communities may lack information, technical expertise and financial resources in order to secure good deals with mining companies (O’Faircheallaigh & Corbett 2005). McMahon & Remy (2001: 28) argue that governments need to play an active role in tri-partite dialogues, and provide support to NGOs and consultants that offer services to communities which face mining development projects. Such mechanisms exist today (O’Faircheallaigh 2006). In practice however, mine developers are often the ones that provide financial resources to local communities for handling a project (ibid.).

5.4. Mine closure process

Mines eventually close, either because the ore has been depleted, or because technical, economic, social or political factors make further activity unviable. Globally, the number of closed mines can probably be counted in millions, yet so-called legacy mine sites have received relatively little attention in the academic literature (Worrall et al. 2009). Mining closure may be planned, but most often it happens prematurely (Laurence 2006).

Ideally, mine development should be “driven by decommissioning.” (Parsons & Barsi 2001: 290; see also Anderson 2014) In other words, mining closure should be included in planning from the start. However, it is obvious that not all mining companies have adequately planned for closure. As a result, several mine legacy sites continue to affect the local environment and communities. Important mine closure issues to consider include handling continued environmental damage control, restoration of ecosystems, employee termination compensations, transferring infrastructure to local communities. In many cases, costs associated with mine closure have been carried by society rather than by companies.

In the last decades, requirements regarding mining closure have become tougher. These have been imposed
through legislation, negotiations with companies and through company self-regulation. Otto (2009) has reviewed trends in mine reclamation and closure regulation in several jurisdictions, including various forms for financial assurance. This includes upfront company payments to land rehabilitation funds.

Otto offers a set of best practice recommendations, though very generally formulated. Better mine closure planning also demands better information on mining sites and their surroundings. Worrall et al. (2009) have therefore proposed a framework for evaluating the sustainability of mine legacy sites. In a similar vein, Laurence (2006) has developed a “Closure Risk Model” with the aim to aid decision-makers.

There is limited research conducted that explicitly evaluates the effects of mine closure regulations on future economic, environmental or social effects. However, case studies of post-mining communities exist that can offer some lessons. In two small northern Canadian communities, Bowes-Lyon et al. (2009) found that while mining had resulted in short-term positive benefits such as increased employment opportunities, better infrastructure and standard of living, much of this disappeared with the closure of the mine. A positive long-term benefit included the continued operation of some of the companies that had been created to service the mines. In conclusion, the authors argue that the mining companies and government should have placed more focus on developing human skills and infrastructure that could create more opportunities following mine closure.

5.5. Summary of trends: Moving from government to governance

In sum, these sections as well as the aforementioned policy initiatives reveal a trend towards companies, NGOs, and other stakeholders increasingly participating in as well as running decision-making processes; monitoring and controlling compliance. This trend has also been seen in other parts of society and has been framed as a move from “government to governance” (see e.g. Prno 2013; Prno & Scott Slocombe 2012: 346; Bridge 2004: 222–224).

While increased participation from stakeholders has been framed as a positive development by several researchers (O’Faircheallaigh 2010b), it also poses a number of challenges. This can be illustrated by a few examples:

Aaronsen has studied the above-mentioned Extractive Industries Transparency Initiative (EITI). She notes that the partnership is not as effective as it could be due to several reasons. Firstly, governments, industry and NGOs have divergent objectives with regards to EITI. NGOs have insufficient information and often lack capacity to participate fully in the process and thereby hold their governments accountable. And in many participating countries, neither the public nor legislators are aware of EITI as such (Aaronson 2011).

In a review of case studies of the effects of mining on local communities, McMahon & Remy (2001) conclude that trilateral dialogue between communities, companies and government is crucial for sustainable development. In a somewhat similar vein as Aaronson however, they note that dialogue and negotiations are hampered by the fact that local communities often lack social capital for true participation. This in turn may take years to create. They therefore recommend that governments fund NGOs or other institutions that may provide advice and training as an interim solution (ibid.: 34).

Cheshire et al. have explored the concept of governance in remote parts of Australia. According to them, mining companies have in some cases effectively become responsible for providing services and co-governing communities. Naturally, they raise the question of long-term viability for communities that are dependent on a time-limited mining operation (Cheshire et al. 2011; Cheshire 2010).

Finally, from a mining company perspective, they have increasingly discovered that full compliance with legal requirements is insufficient with regards to satisfying society’s expectations. Rather, companies need to earn a “social licence to operate” (Prno & Scott Slocombe 2012: 349). The blurring of boundaries between the public and private sector raises a number of issues. For example, who should be responsible for what, and how can we ensure transparency, fair representation and accountability? How companies have so far address sustainability and manage their stakeholder relations is the main topic for the next sections.
In this context, a closely related and much-discussed concept is Corporate Social Responsibility (CSR). CSR has several definitions and can encompass a broad array of activities that companies undertake to contribute to society. According to Dashwood (2013), a noteworthy feature of the mining sector is the framing of CSR policies in terms of sustainable development. Yet another related concept is the “triple bottom line”, according to which companies need to consider not only their economic outcome, but also environmental and social performance. Arguably, occupational health and safety is an early example of mining company commitment to sustainable development. Mining has historically been associated with considerable risks for employees, and health concerns have been high on the agenda of mining companies for a long time. A safe work environment is obviously important for companies’ profitability, as accidents and injuries may cause disruptions in production, compensation costs and staff absence. However, research has shown that some major mining companies’ commitment to safety goes well beyond narrow business case considerations (Dashwood 2012).

In the following sections, we will firstly discuss what factors influence why companies choose to commit
themselves to promoting sustainability. Secondly, we will look at which policies and management systems have been proposed for and implemented by mining companies.

In recent years, the concept of “social licence to operate” has gained popularity (e.g. Parsons et al. 2014; Prno 2013; Owen & Kemp 2013; Prno & Scott Slocombe 2012; Cheshire 2010). It can be understood as broad, on-going approval and acceptance of a mining company’s activities by society. Stakeholders and notably local communities are key arbiters of whether or not a social licence exists. The absence of a social licence exposes companies to business risks such as potential conflict. In order to gain and maintain a social licence, companies may need to show commitment to support sustainable development beyond legal requirement. Stakeholder management and “social licence to operate” will be the topic of the last two sections.

6.1. What influences company sustainability commitment?

The academic literature has identified several reasons for which companies invest resources in addressing sustainability issues through e.g. adopting principles and policies, implementing management reforms and standards, disclosing information et cetera. Factors may be internal or external, but often the boundary is blurred. For example, companies may commit themselves to social responsibility because they believe this will give them a competitive edge. Walsh (2014) lists a number of ways in which sustainability strategies may give a competitive advantage, such as reduced regulatory costs, access to pro-sustainability investors and greater chances of recruiting and retaining higher quality employees. However, studies of the link between CSR and corporate financial performance, some of which have focused on mining companies, have yielded varying results (ibid.). Arguably, this leaves more room for individual manager’s own conviction to determine company strategy.

Bansal (2005) has tried to determine how several factors influenced the commitment of Canadian companies in extractive industries to sustainable development over the period of 1986 to 1995. Inter alia, her findings suggest that the media played an important role early on but decreasingly so over time. In contrast, certain company resource factors such as international experience and firm size were positively associated with greater sustainability throughout the entire period. This runs counter to similar studies of the diffusion of new reforms in companies, according to which economic or technical explanations are more important early on; in other words, that sustainability commitments would be driven by companies that try to capture possible benefits from being “early adopters”, which later becomes a norm. Bansal argues that companies might have been unsure of the benefits associated with sustainability commitments, whereby institutional explanations such as public opinion played a more important role early on.

However, the academic literature on factors that influence company sustainability commitment is not entirely conclusive. Dashwood (2007) found in a study of two Canadian mining companies that the leadership of senior management, rather than global norms, were decisive in whether or not they adopted sustainability policies. Furthermore, she purports that companies themselves rather than NGOs have been active in developing and disseminating norms surrounding CSR in the mining industry.

Academic research and policymakers’ perspectives range from regarding CSR as a potentially powerful way to address poverty, to critics who regard it as a branch of public relations with the aim to reduce risks of disruption and reputational damage, and to avoid mandatory regulation (Kemp 2010). According to Bridge & McManus (2000), as environmentally-based opposition has increased both in organisational capacity and constituency, mining companies have sought to regain moral authority by appropriating the concept of sustainable development (see also Jenkins 2004). At the same time, the academic literature acknowledges that companies vary in their ability to address sustainability. For example, smaller companies with little capital may need to work with shorter time horizons and often lack competence in community relationship management, which may escalate conflicts (Bebbington et al. 2008).

6.2. Policies and management

According to Dashwood (2012), there is a convergence in mining companies’ practice of sustainability,
such as adopting similar policies, establishing senior management positions responsible for sustainability, and implementing management systems. However, in practice there still is marked variation between companies, which may be explained both by differing contexts and challenges on the one hand, and differences in management conviction on the other (Dashwood 2013: 25).

Some researchers have looked more generally at which issues mining companies should focus on in order to promote sustainability. Hilson & Murck (2000) suggest the following: improved planning and setting of sustainable development goals from the start; improved environmental management; improved waste management and implementation of cleaner technology; formation of sustainability partnerships with influential groups and organisations; and improvement of training and awareness-raising around sustainability. Laurence (2011) argues that mine managers should focus on safety; economy; resource efficiency; environment; and community.

Arguably, a first step in tackling sustainability challenges is the adoption and formulation of codes and policies. In this regard, companies in extractive industries, such as mining, are more advanced than companies in other sectors (Ranängen & Zobel 2014b: 1).

Following the formulation of sustainability policies, another focus within the literature has been the implementation of various environmental and sustainability management systems and frameworks. These include already-mentioned standards such as ISO 26000, but also “Cleaner Production”, “Industrial Ecology”, “Pollution Prevention” et cetera (see e.g. Ranängen & Zobel 2014b; Basu & van Zyl 2006).

Standard management procedures have been developed for a number of areas, such as health and safety as well as stakeholder management. These are often paired with systems for reporting. Reports in turn have become more sophisticated, especially among larger companies (Jenkins & Jakovleva 2006). Kemp et al. (2012) have criticised this “audit culture” for fostering conservatism, which create little opportunity for site and operational-level personnel to consider local context. They argue that “corporate management systems have tended to frame stakeholders as an external ‘risk’ that needs to be managed” (ibid.: 3).

In addition to management systems, companies have also established senior management positions, such as Vice President responsible for sustainable development (Dashwood 2012). In the context of mining development conflicts, Kemp et al. state that there are few studies that document a company management perspective (Kemp et al. 2011: 95). On the other hand, studies have confirmed that professional background and identity of people play an important role in how they tackle different issues. For example, there is a predominance of engineers in mining companies. Many employees have relatively narrow and technical roles, and often deal with challenges accordingly. Arguably, this may not always be suitable for sustainability issues, which by definition are ambiguous and interconnected (ibid: 55).

Finally, Kemp & Owen (2013) have studied the establishment of Community Relations and Development functions, which are responsible for engaging and managing relations with key stakeholders. Interviews of 30 such practitioners in the context of a West African mining operation reveal a perceived tension around their position: on the one hand, they are of central importance to the company by facilitating access to land and avoiding conflict; on the other, they have difficulties quantifying their value-added to the company. The authors conclude that “functional equity”, meaning equal treatment and respect of technical and social professionals, is necessary in order to sustain the sustainable development agenda within the mining industry (Kemp & Owen 2013).

6.3. Stakeholder management

A lot of the corporate-centred academic literature on sustainable development and mining focuses on stakeholder management. Already mentioned is Freeman’s definition of stakeholders as “any group or individual who can affect or is affected by the achievement of the organization’s objectives.” (Freeman 1984: 46) Mitchell et al. (1997) suggest that organisations focus on stakeholders according to their power, legitimacy and urgency. This group of stakeholders have come to grow since then. At the same time, there has been an increased focus on the need for companies to gain a “social licence to operate”. Often, local communities have been crucial in stopping potential mining projects (Esteves 2008: 42). Thus stakeholder manage-
ment has become an important strategic consideration for mining companies.

A large proportion of the academic literature on stakeholders and stakeholder relations focuses on developing countries (see Bebbington et al. 2008; Hilson 2002), but a number of studies have looked at mining in industrialised countries. In particular, they have studied stakeholder management in relation to relatively small and peripheral communities, and indigenous people.

According to Kemp et al. (2011: 95), focus is often on the most egregious cases, where conflict already has spiralled. On the other hand, several researchers have looked at agreements and partnerships between mining companies and communities, such as the already mentioned “Impact benefit agreements” and “Community development agreements”. According to Fidler & Hitch (2007) and O’Faircheallaigh (2013; 2010b), agreements have given tangible positive benefits for local communities, and are an important sign of the increasing recognition of the need for consultation and reconciliation with local and indigenous interests. On the other hand, there are challenges associated with agreements as with company–community relations in general.

One such challenge asymmetric power in the relationship between companies and communities, which is a pervasive theme in the academic literature. According to Heisler & Markey (2013) and O’Faircheallaigh (2013; 2006), communities with a greater political leverage vis-à-vis mining companies are able to secure better deals. Already noted however is the fact that stakeholders often lack the resources or technical expertise to secure a good deal (O’Faircheallaigh & Corbett 2005). Agreements are often confidential, and sometimes put constraints on the possibility for communities to object to particular parts of or entire mining projects; politically or even legally. And agreements risk perpetuating injustices if subsequent benefits are unequally distributed or if their implementation is not properly monitored. Despite obvious asymmetries in resources, however, Owen & Kemp (2013: 33) note that seemingly marginal groups may employ powerful resistance strategies.

One way in which power imbalances have been addressed in practice is by mechanisms through which communities may voice complaints and grievance against companies. Kemp et al. (2011) have surveyed such mechanisms at six different mines, inter alia in Australia and New Zealand. The purpose of these mechanisms was to meet regulatory commitments and/or manage risk by identifying issues at an early stage. Three of the surveyed mechanisms were company-controlled, two included some degree of external input which included local stakeholders, and one involved third party committees. According to Kemp et al., none of the mechanisms adequately addressed power imbalances between companies and communities; only partial attempts to facilitate dialogue had been made; and communities were not encouraged to participate in the design of the grievance mechanisms themselves. In conclusion, none were found to sufficiently advance justice.

The relationship between companies and indigenous populations has been of particular interest to researchers. Their lack of resource may be especially acute. This may further be aggravated by the difference between their traditional values vis-à-vis those of the companies and institutional setting which they are forced to deal with (see e.g. O’Faircheallaigh & Corbett 2005; Jenkins 2004). Large differences in values between companies and indigenous populations may also amplify conflicts surrounding mining development (Kemp et al. 2011: 95).

At the same time, there is a growing recognition of indigenous peoples’ rights, including the right to “free prior and informed consent” in relation to natural resource development (Owen & Kemp 2014). In a study of mining in northern Canada, Prno & Scott Slocombe (2012) note that indigenous people are increasingly distinct from other, conventional stakeholders such as environmental or labour organisations. For example, the Canadian Government now has a “duty to consult” with aboriginal communities in mining development which may infringe on their rights. According to Jenkins (2004), it has become a political and reputational imperative for mining companies to engage with indigenous populations. Notably, this is important for companies to gain a social licence to operate.

According to Esteves (2008), mining companies have come to accept a role of supporting local develop-
ment through inter alia voluntary social investments. However, they have also realised that paternalistic behaviour and the assumption of government functions may lead to social costs, obligations and expectations.

Esteves therefore argues that mining company investment in community development is more sustainable in cases where there is clear benefit for both parties (see also Harvey 2014). Esteves & Barclay (2011) have noted that companies have become more strategic with regards to which “partnerships” they enter. At the same time, companies do not seem to monitor these partnerships to see if they actually represent a strategic investment.

6.4. Social licence to operate

As mentioned earlier, a “social licence to operate” can be understood as broad, on-going approval and acceptance of a mining company’s activities by society. A social licence may be contrasted to statutory licence, which is usually granted by governments and their agencies. Social licence is intangible and unwritten, and is sometimes used as synonymous with “legitimacy”. Without it, companies may find their actions constrained or frustrated by stakeholders and in particular local communities. As a consequence, the increased focus on the need for companies to gain a social licence has been interpreted as a shift in power from companies to communities by some (Parsons et al. 2014).

“Social licence to operate” can be understood as a continuum ranging from an absence of a licence, through acceptance to societal support for and trust in a mining company (ibid.). Thomson and Boutilier (2011) distinguish between a basic level of economic legitimacy, where stakeholders consider that a mining project may offer some benefits, and socio-political legitimacy, with which companies are perceived to act according to local expectations and values, and contribute to the well-being of a region. They further identify interactive trust, where stakeholders believe that mining companies and their management actually participate in frank and mutual dialogue. If all these aspects of legitimacy and trust exist, trust may be institutionalised, thereby minimising business risk for companies.

Moffat & Zhang (2014) have also attempted to model social licence. They hypothesise that acceptance of a mining operation depends on the level of the community’s trust in the company. This should in turn depend on the social impacts of mining, the quantity and quality of contact with the company, and the degree to which individuals perceive that they have been able to participate in decision-making. The authors tested their model by conducting two surveys in the same area in Australia. Their results indicate that procedural fairness and contact quality are the two most important determinant for trust and thereby acceptance. The social impact of mining is less important, and the relationship between trust and contact quantity was weak and statistically non-significant.

A review of mining concession applications in Sweden by Tarras-Wahlberg (2014) reveals somewhat different results. As mentioned earlier, he finds that relatively new mining and exploration companies have generally been more ambitious in consultations and developing their Environmental Impact Assessments than their more established peers. Nonetheless, the applications of the younger companies have more often been subject to formal challenges by stakeholders. One explanation suggested by the author is the fact that the more established companies have been able to build up trust over a longer period of time.

Other researchers have also focused on what factors may lead to companies gaining a social licence. Based on case studies from the Canada, Papua New Guinea, Peru and the US, Prno (2013) has identified five lessons that stand out:

- Context is key. Social, environmental and economic variables including community members’ needs and values, past experience with mining and capacity to engage in a meaningful partnership. Companies need to develop community relations management strategies reflective of local circumstances.
- Relationships need to be built and maintained, and particularly with the most important community stakeholders.
- Outside perceptions of sustainable development are largely irrelevant; what matters if the community’s own vision and perceptions of what is happening.
- Local benefits provision, public access to information, decision-making and justice is crucial.
- Adaptability is needed in order to maintain an already-issued social licence.
Similar lessons have also been drawn by other researchers. For example, McMahon & Remy (2001: 36) note that communication and information-sharing is crucial in order to build strong relationships with local communities. According to Hilson (2002), local communities are often well acquainted with the negative impact of mining and can accept these. Rather, it is unexpected and often preventable complications that create the largest disputes. Examples include accidents such as chemical spillage or collapse of tailing dams. Poor communications aggravate conflicts (see also Moffat & Zhang 2014 above).

Another example includes benefit-sharing. Warhurst & Mitchell (2000) note that automation of mining has led to fewer employment opportunities. This in turn has led to reduced support for mining. As noted earlier, mining companies have engaged in a number of benefit-sharing initiatives. These stretch from donations to negotiated “impact benefit agreements”. But while mining companies have come to accept a role of supporting local development, they have also realised that paternalistic behavior and the assumption of government functions may lead to social costs, obligations and expectations (Esteves 2008). With regards to Canada, McMahon & Remy argue that the relationship between companies and communities has increasingly moved from paternalism to partnership (McMahon & Remy 2001: 28).

While the concept of “social licence to operate” has gained a lot of popularity, it has also been the target of criticism. Parsons et al. (2014) argue that the concept “conflates a diversity of opinion, implicitly privileging some ‘middle ground’ over minority views.” (ibid.: 84) Based on 16 interviews, they further note that mining industry managers conceive “social licence” from a local perspective, thereby avoiding issues that are of importance to a national or international level such as climate change. Also, the interviewees indicate that they see a social licence as a way to avoid new regulations (ibid.: 88).

According to Owen & Kemp (2013), “social licence to operate” basically rests on a business logic of managing business and reputational risks, rather than collaboration with the local community over its development priorities and rights. Kemp also affirms this following a survey and a series of interviews with practitioners and managers in the mining industry. She concludes that community relations work is limited by relatively weak feedback into the company’s own organisation (Kemp 2010).

6.5. Summary of trends: What counts, counts

The sections above reveal a clear trend that companies have increased their attention and commitment to sustainability. This is illustrated by the adoption of policies and management systems, and the establishment of specialised positions responsible for sustainability and stakeholder management. Companies are driven by both internal and external factors, such as beliefs and values, media and shareholders.

Community relations, including indigenous populations, have become a prominent part of mining companies’ sustainability strategies. Arguably, following laws and regulations do not suffice anymore, rather companies need to earn a “licence to operate” to avoid potentially costly conflicts. And local communities are considered key arbiters of such a licence. On the one hand, this points to a shift in power relations between companies and communities. On the other, researchers note that communities differ in their ability to leverage good deals.

There are still large differences between how companies approach sustainable development and “social licence to operate”. For example, larger companies have adopted more sophisticated policies. Bice (2014) as well as Kemp & Owen (2013) argue that quantifiable issues are given greater priority. This is problematic since many challenges, especially social, are difficult to value in numbers. “Social licence” itself lacks clearly defined criteria (Bice 2014). And like many other research areas, there is a lack of research that explicitly relates company policies and practice with actual short- and long-term effects.
7. Directions for Future Research

There is no doubt that the last decade has seen an increased interest in the economic, environmental and social effects of mining. Both research and various initiatives have identified key challenges that need to be managed. And in many cases, companies, communities and governments have taken steps to address these challenges. Yet much has yet to be done, both in practice and within research.

More detailed suggestions future economic, environmental and social research can be found in the other background reports, Abrahamsson et al. (2014), Söderholm & Svahn (2014), Söderholm et al. (2014) and Widerlund et al. (2014). Additionally, at least five broad areas merit more additional attention: what is being done to promote sustainability; why it is being done; what the effects are; which trade-offs exist; and long-term development.

First, a lot has happened since even before sustainability entered the political vocabulary. Within research, focus has often been on formal agreements and processes, adopted standards and published reports, both in the corporate and public sector. However, there is still a need for more information on what is being done in practice. How are agreements, standards and policies being translated on the ground?

And in addition to documentation of company and public sector actions, what actions are being taken by other stakeholders? So far, a number of more detailed single-case studies exist. More comparative studies of different companies and countries would be helpful, for example in showing how similar policies may be translated differently in different contexts.

Second, whereas some of the existing literature investigates why mining companies commit themselves
to acting sustainably, other actors are often presented as black boxes. Governments, public agencies and local authorities are seldom monoliths. Rather, they are an arena on which different interests and ideas meet, and where compromises sometimes are made. There are also large differences between companies. For example, large mining companies differ in their role and resources from smaller, junior companies, yet research is skewed towards the former. And last but not least, existing differences in interests and opinions both within and between stakeholder groups have not been made evident in the research literature. This includes indigenous populations and environmental NGOs, but also other stakeholder groups that have garnered less attention so far. Opening up black boxes can improve our understanding the motivation of different actors.

Third, there is a need for more research that links what is being done to their effects. Examples include statutory licensing processes, the adoption of policies and management standards, impact benefit agreements as well as the day-to-day work done by authorities, companies and communities. The economic, environmental and social effects of these actions are largely under-researched. This is exemplified by O’Faircheallaigh who writes that “it is ‘essentially unknown’ for the state to review [mining] project impacts after granting approvals” (O’Faircheallaigh 2007: 322). Likewise, the trend towards self-regulation among companies through voluntary initiatives needs to be reviewed from the perspective of both companies and society. There are obvious difficulties in evaluating the effects of various actions as they can seldom be isolated from the larger number of interfering factors, inter alia the general economic situation. But without such research it will be impossible to draw lessons and identify best practice.

A related area that deserves more research is synergies and trade-offs between different dimensions of sustainability. As studies reviewed in this report have shown, plenty of these exist. For example, depending on design, stringent environmental regulation may pose a challenge to mineral development, at least in the short run. Approaches such as public deliberation have sometimes been presented as a way to reconcile opposing interests, to the bigger benefit for all. Increased knowledge about trade-offs and synergies is crucial not only for evaluating the effects of different actions and policies, but also alternative attempts at settling conflict.

Finally, as mentioned in the introduction to this report, the mining sector has undergone a boom period during the last decade. Research and public interest tend to gravitate to areas of increased activity. However, sustainability cannot be only judged by how well booms are being handled. Rather, future research needs to consider the effects of a mine during the entirety of its lifetime, as well what it leaves behind. This calls for more historical studies of mining regions.
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Consultations

As a part of this pre-study, the author has conducted a number of consultations with public sector representatives. These are listed below. A workshop has also been arranged, to which senior civil servants from municipalities and regional authorities in the mining-dominated northern parts of Sweden were invited. Persons consulted carry no responsibility for the contents of this report.

Abbe Sahli, Norrbotten County Administrative Board
Anita Lindfors, Association of Local Authorities in Norrbotten
Anja Palm, Skellefteå Municipality
Anna Lindberg, Norrbotten County Council
Bernt Wennström, Gällivare Municipality
Christina Lugnet, Swedish Ministry of Enterprise, Energy and Communications
Gunnar Plym Forsell, Norrbotten County Administrative Board
Johan Antti, Norrbotten County Administrative Board
Johanna Alm, Pajala Municipality
Jonas Sukloed, Jokkmokk Municipality
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Kent Ögren, Norrbotten County Council
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Sabine Mayer, Bergforsk Foundation
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Ulrika Nilsson, Norrbotten County Council
Ylva Ågren, Västerbotten County Administrative Board